

Release Notes: Junos[®] OS Evolved Release 20.1R1 for the PTX10003, PTX10008 and QFX5220 Devices

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Introduction

Junos OS Evolved is the next-generation Junos OS. It has the same CLI, the same features, and, in some cases, even the same processes as on the previous versions of Junos OS. However, its infrastructure is entirely modernized.

Use these release notes to find new and updated features, software limitations, and open issues for Junos OS Evolved Release 20.1R1.

These release notes are cumulative and are updated for later releases.

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

Junos OS Evolved Release Notes for PTX10003 and PTX10008 Devices

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These release notes accompany Junos OS Evolved Release 20.1R1 for PTX10003 and PTX10008 (with the JNP10008-SF3 SIB) Packet Transport Routers. They describe new and changed features, limitations, and known and resolved problems in the hardware and software.

What's New

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Learn about new features introduced in Junos OS Evolved Release 20.1R1 for the PTX10003 and PTX10008.

Hardware

- **PTX10008 Packet Transport Router**—Starting with Junos OS Evolved Release 20.1R1, the modular chassis can now support more than 115 Tbps capacity with the addition of these new components:
 - *PTX10K-LC1201-36CD* 14.4 Tbps capacity, 400-Gigabit Ethernet line card—Provides 36 ports of QSFP56-DD. Each port defaults to 400 Gigabit Ethernet, but can be individually channelized using breakout cables to speeds of 200 Gbps, 100 Gbps, 50 Gbps, 25 Gbps, or 10 Gbps.
 - *JNP0K-RE1-E and JNP10K-RE1-E128* Routing and Control Boards (RCBs)—Provides 64 Gigabytes or 128 Gigabytes of memory running on an 8-core 2.1 GHz processor.
 - *JNP10008-SF3* Switch Interface Board (SIB)—Provides support for 14.4 Tbps line cards.

The new components are designed to work with the existing 5.5 KW power supplies, the JNP10008-FAN2 fan tray, and the JNP10008-FTC2 fan tray controller. The new components cannot be mixed with earlier RCBs, line cards, original fan trays, original fan tray controllers, or with 3 KW power supplies. [See [PTX System Overview](#).]

Authentication, Authorization, and Accounting

- **Support for RADIUS and TACACS+ features (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, PTX10008 devices support the following AAA features for both RADIUS and TACACS+:
 - Local authentication with local authorization
 - AAA default routing instance and nondefault management routing instance (mgmt_junos)
 - Template user authentication and authorization
 - Enhanced accounting to monitor attributes of logged-in users such as access method, remote port, and access privileges
 - Reachable over Packet Forwarding Engine interfaces

Additionally, VRF routing instances for AAA are supported only for TACACS+.

Junos OS Evolved Release 20.1R1 does not support the following features for TACACS+ and RADIUS:

- Password change policy enforcement
- Regular expressions to allow or deny CLI operational commands
- Local authentication with remote authorization
- Periodic refresh of the remote authorization profile that is received from the AAA server

[See [Junos OS User Authentication Overview](#), [RADIUS Authentication](#), [TACACS+ Authentication](#), [Configuring RADIUS System Accounting](#), and [tacplus-options](#).]

- **Link Layer Discovery Protocol (LLDP) (PTX10003)**—LLDP is supported on PTX10003 routers, including on em0 interfaces. Disabling of LLDP time, length, and value (TLV) messages is also supported.

[See [Device Discovery Using LLDP and LLDP-MED on Switches.](#)]

- **Link Layer Discovery Protocol (LLDP) (PTX10008)**—LLDP is supported on PTX10008 routers, including on WAN and management interfaces. In addition, the LLDP MIB and Junos Telemetry Interface (JTI) for LLDP is also supported. Disabling of LLDP time, length, and value (TLV) messages is also supported.

The following are not supported in this release:

- LLDP-MED
- Port VLAN ID, VLAN name, and Chassis ID TLVs

[See [Device Discovery Using LLDP and LLDP-MED on Switches.](#)]

- **Support for AAA features (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, PTX10008 routers support the following AAA features:

- SSH and SSHv2
- Telnet

Class of Service

- **Support for CoS/QoS features for PTX10008 platforms**—Starting in Junos OS Evolved Release 20.1R1, you can configure Class of Service (CoS) / Quality of Service (QoS) features for 14.4 Tbps line cards or lite fixed chassis for PTX10008 platforms that include classifiers (packet, behavior aggregate [BA], fixed, and multifield [MF]), rewrite rules, forwarding classes, loss priorities, transmission scheduling, rate control and drop-profiles.

The following CoS features are supported in this release:

- 16 forwarding classes
- 8 forwarding classes
- Classification: DSCP IPv4 and IPv6 for L3 logical interfaces
- Classification: IEEE 802.1p for L3 logical interfaces
- Classification: MPLS EXP for family bridge / ethernet-switching
- Classification: MPLS EXP for L3 logical interfaces
- Congestion Avoidance: 32 RED profile, with 64 fill levels per profile
- Congestion Avoidance: Weighted random early detection (WRED) and tail-drop profiles
- Congestion Avoidance: WRED Drop and Tail Drop Differentiation
- Host Outbound: Forwarding Class Selection
- Host Outbound: Rewrite
- Rewrite: 802.1p for L3 (together with IP)

- Rewrite: CoS supports 64 rewrite tables across L2/L3 rewrites. MPLS EXP, IP DSCP, and Ethernet 802.1p rewrites are supported. Rewrite of both L2 and L3 header CoS fields can occur simultaneously.
- Rewrite: IPv4 TOS/ DSCP and IPv6 DSCP
- Rewrite: MPLS EXP Push, MPLS EXP SWAP
- Scheduling and Shaping: Buffer size configuration
- Scheduling and Shaping: CoS scheduler configurability
- Scheduling and Shaping: eight queues, per queue priority scheduling, strict priority, and WRR
- Scheduling and Shaping: Physical Interface Scheduler
- Scheduling and Shaping: Physical Interface Shaping
- Scheduling and Shaping: Queue Shaping
- Scheduling and Shaping: Strict Priority Scheduling
- RSVP-TE: Class Based Forwarding (CBF)

[See [Understanding Class of Service](#).]

- **Support for CoS features on 400-Gigabit Ethernet interfaces (PTX10003)**—Starting with Junos OS Evolved 20.1R1, the 400-Gbps interfaces on PTX10003 devices support standard classifier, rewrite, and scheduler functionality as listed in the following link.

[See [CoS Features and Limitations on PTX Series Routers](#).]

- **Support for enabling a queue's buffer space to be 100 percent of the interface's buffer space (PTX10003)**—Starting in Junos OS Evolved Release 20.1R1, PTX10003 devices support the CLI option that enables you to set a queue's buffer space to be up to 100 percent of the interface's buffer space. This option allows the queue to grow as large as 100 percent of the interface's buffer if and only if it is the only active queue for the interface. You can enable this option by setting the **buffer-size-shared** statement at the **[edit class-of-service schedulers *scheduler-name*]** hierarchy level.

[See [buffer-size \(Schedulers\)](#).]

- **Classification override support (PTX10003-80C and PTX10003-160C)**—Starting in Junos OS Evolved Release 20.1R1, we have extended support for classification override configured under a forwarding policy to PTX10003-80C and PTX10003-160C devices.

[See [CoS Features and Limitations on PTX Series Routers](#) and [Overriding the Input Classification](#).]

Dynamic Host Configuration Protocol

- **DHCPv4 and DHCPv6 Relay Agent (PTX10008)**—DHCPv4 and DHCPv6 relay agent is supported on PTX10008 routers.

The following DHCP Relay Agent features are supported in this release:

- DHCP Relay: L3 interfaces
- DHCP Relay: Option 82 for Layer 2 VLANs
- DHCP Relay: Option 82 for Layer 3 interfaces
- Extended DHCP Relay Agent
- Virtual router aware DHCP (VR-aware DHCP)

[See [Extended DHCP Relay Agent](#).]

- **Dynamic Host Control Protocol (DHCP) Client (PTX10003)**—DHCPv4 and DHCPv6 for dynamic configuration of IP addresses on client interfaces, including management interfaces, is supported on PTX10003 routers.

[See [DHCP for Routing Devices](#).]

General Routing

- **View ARP table entries and IPv6 neighbor information (PTX10003-80C and PTX10003-160C)**—Starting in Junos OS Evolved Release 20.1R1, on PTX10003 routers, you can view the following:
 - Address Resolution Protocol (ARP) details such as the next-hop reference count and the next-hop current state, using the commands **show arp reference-count** and **show arp state**.
 - IPv6 neighbor cache information, using the following commands: **show ipv6 neighbors flags**, **show ipv6 neighbors host**, **show ipv6 neighbors interface *interface-name***, **show ipv6 neighbors reference-count**, **show ipv6 neighbors vpn *vpn-name***.

[See [show arp](#) and [show ipv6 neighbors](#).]

- **Support for running applications signed by users (PTX10003, PTX10008, QFX5220)**—Starting with Junos OS Evolved Release 20.1R1, root users can generate signing keys which can be used to sign Linux applications and allow them to run on your device.

Signing keys are stored in the **system-keystore** by using the following CLI command: **request security system-keystore import key-name *key-name* private-key *key-path* x509-cert *certificate-path***. Once a key is stored in the **system-keystore**, it can be used to sign a file with the following CLI command: **request security integrity measure file *file-name* key *key-name***.

[See [Junos OS Evolved Overview](#).]

High Availability and Resiliency

- **Packet Forwarding Engine resiliency (PTX10008 router)**—Starting in Junos OS Evolved Release 20.1R1, in the PTX10008 router, the Packet Forwarding Engine software supports resiliency. The software detects, reports and takes action on Packet Forwarding Engine faults. Actions are taken based on the default configuration or a user-configuration available for the errors. You can use the **show system errors active** and **show system errors active detail** commands to view the error details.

[See [show system errors active](#).]

- **Fabric link autoheal (PTX10003)**—Starting in Junos OS Evolved Release 20.1R1, the PTX10003 router supports fabric link autoheal, a mechanism that attempts recovery of faulty fabric links from a link error condition. Autoheal involves bringing down the faulty fabric link and then training it. The system attempts to recover a faulty link from a maximum of three link error instances (per link) within the span of 24 hours or until the FPC or the switch fabric is rebooted. This means, for instance, if the same link encounters a fourth error within 24 hours from the first error instance, autoheal is not attempted on that link. You can use the existing **show chassis fabric errors autoheal** command to view the details the autoheal actions performed by the system.

NOTE: The FPC and switch fabric are logical entities in the PTX10003.

[See [show system errors active](#) and [show chassis fabric errors](#).]

- **Resiliency application supports application-level restart (PTX10003-80C and PTX10003-160C)**—Starting in Junos OS Evolved Release 20.1R1, the resiliency application on PTX10003 routers supports application-level restart, in case of failures. This feature ensures that a failure of the resiliency application such as crash or termination is handled gracefully without causing the entire platform to reboot.

[See [PTX10003 System Overview](#)]

- **Error management at the switch fabric level (PTX10003-80C and PTX10003-160C)**—Starting in Junos OS Evolved Release 20.1R1, the PTX10003 router supports the configuration of error scope, category, threshold, and corrective actions at the switch fabric level for the fabric errors. The PTX10003, being a fixed configuration chassis, does not have any physical switch fabric card that can be installed. Instead, it provides two logical SIBs. You can use the existing command **show chassis hardware** to view information about the logical SIBs in the system. The router also supports multilevel fault actions for repeated faults—that is, to move the switch fabric (logical SIB) to the offline state when it is rebooted consecutively for three times within a time span of 900 seconds. The software supports a new error scope **switch** and an error category **internal**. All the errors from the fabric modules and a few errors from Packet Forwarding Engine are mapped to the internal category.

[See [error](#).]

- **BFD sessions for LAGs (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, the following are supported with interface IP addresses:

- Micro BFD sessions
- Child links of aggregated Ethernet or LAG bundle

[See [Configuring Micro BFD Sessions for LAG](#).]

Interfaces and Chassis

- **Power budgeting and support for overriding the default power budget (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, the PTX10008 router supports power budgeting, management, and environment monitoring. You can also override the default power budget for a line card, by using the CLI command **set chassis fpc slot max-power power-number**. The PTX10008 supports power management at the switch fabric level. The switch fabric has a higher priority over the line cards with regard to power allocation. You can configure the ambient temperatures of 25°C and 40°C on this router. The PTX10008 also supports the following power-related alarms:

- **Insufficient Power - FRU(s) went offline**—Raised in case FRUs are powered off because of insufficient power.
- **No Redundant Power**—Raised in case the power redundancy requirements are not met.

[See [Managing Power](#).]

- **Support for AC and DC PSMs (PTX10008)**—Starting in Release 20.1R1, Junos OS Evolved supports the following power supply modules (PSMs) on the PTX10008 router:
 - JNP10K-PWR-AC2—This power supply supports AC, high voltage AC (HVAC), or high voltage DC (HVDC) systems in either a 20-A or a 30-A mode. It feeds AC input and provides a DC output of 5000 W with a single feed and 5500 W with dual feeds. For AC systems, the operating input voltage is 180 to 305 VAC and for DC systems, the operating input voltage is 190 to 410 VDC.
 - JNP10K-PWR-DC2—This DC power supply provides two power supplies (PS_0 and PS_1) in a single housing that accepts either 60 A or 80 A using four redundant input power feeds. PS_0 and PS_1 together provide a combined output of up to 5500 W.

[See [PTX10000 Power System](#).]

- **Cooling management on PTX10008**—Starting in Junos OS Evolved Release 20.1R1, the PTX10008 routers support cooling management with the fan tray JNP10008-FAN2 and the fan tray controller JNP10008-FTC2. The PTX10008 supports two fan trays. The fan tray contains 22 fans. Under normal operating conditions, the fans run at less than full speed. However, if a fan is faulty, the remaining working fans in that fan tray run at the maximum speed. If one fan tray is removed, all the fans in the other fan tray run at the maximum speed.

NOTE: You must use the fan tray JNP10008-FAN2 only along with the fan tray controller JNP10008-FTC2.

[See [PTX10008 Cooling System](#).]

- **Support for Pre-FEC BER and link degradation monitoring (PTX10008 routers)**—Starting in Junos OS Evolved Release 20.1R2, you can monitor the quality of physical links on Ethernet Interfaces and take corrective action when the link quality degrades beyond a certain value and the pre-forward error correction (pre-FEC) bit error rate (BER). To enable your device to monitor the links, use the **link-degrade-monitor** statement at the **[edit interfaces interface-name]** hierarchy level. This feature monitors the BER of the link and initiates corrective action when the BER value crosses a user-configured threshold.

[See [Link Degrade Monitoring Overview](#).]

- **Support for DCU accounting and SCU accounting (PTX10008 routers)**—Starting in Junos OS Evolved Release 20.1R2, PTX10008 routers support destination class usage (DCU) accounting and source class usage (SCU) accounting. With SCU accounting, you can track traffic that originates from specific prefixes on the provider core. You can use DCU accounting to track traffic that originates from the customer edge and is destined for specific prefixes on the provider core router.

[See [Understanding Source Class Usage and Destination Class Usage Options](#).]

- **60-A power source for PTX10003 DC power supply (PTX10003-80C and PTX10003-160C)**—Starting in Junos OS Evolved Release 20.1R1, the PTX10003 DC power supply supports a 60-A power source. If you choose the 60-A setting, the power supply limits its output power capacity to 2700 W at an input voltage of 48 V and linearly increases the output power if the input voltage increases. The power supply provides a maximum output of 3000W at input voltage greater than 55V, assuming 92 percent efficiency. If the voltage drops below 48 V but is above 40 V, the software raises a minor alarm **Input Under Voltage Warning** and reduces the output power capacity to 2200 W. The PSM is powered off if the voltage drops below 40 V.

[See [PTX10003 Power System](#).]

- **Dedicated virtual routing and forwarding (VRF) instance for management Ethernet interface (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, you can confine the management interface on your device to a dedicated VRF management instance, `mgmt_junos`. To configure the `mgmt_junos` routing instance, include the **management-instance** statement at the **[edit system]** hierarchy level. After you enable `mgmt_junos`, the management traffic does not share the default routing table (`default.inet.0`) with other control or protocol traffic in the system. This improves the security of management traffic and makes it easier to troubleshoot issues on your device.

[See [Management Interface in a Nondefault Instance](#) and [management-instance](#).]

- **Support for 400-Gbps speed using PTX10K-LC1201-36CD optics (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, you can use the QSFP56-DD optic transceiver to configure 400-Gbps speed on the PTX10K-LC1201-36CD line card of PTX10008 routers. The complete list of transceivers is available in the [Hardware Compatibility Tool](#) (HCT).
- **Support for rate selectability on PTX10K-LC1201-36CD line cards (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, we introduce a new fixed-configuration, rate-selectable line card,

PTX10K-LC1201-36CD, with 36 built-in ports. The default port speed is 400 Gbps for all ports. Each PTX10K-LC1201-36CD line card provides a maximum bandwidth of 14.4 Tbps.

On the PTX10K-LC1201-36CD, you can choose to configure the following port speeds on all 36 ports:

- 4x10 Gbps, 4x25 Gbps, and 2x50 Gbps
- 40 Gbps, 100 Gbps, 200 Gbps, and 400 Gbps

[See [Introduction to Rate Selectability](#)].

- **Support for resilient hashing and consistent hashing (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, you can configure resilient hashing on PTX10008 routers to minimize flow remapping across link aggregation groups (LAGs) or equal cost paths. Resilient hashing works in conjunction with the default static hashing algorithm. When you configure resilient hashing on LAGs, the configuration is applicable to a specific aggregated Ethernet Interface.

Also, you can configure consistent hashing across ECMP groups by using BGP multipath on PTX10008 routers. You can configure a maximum of 64 member links for resilient hashing on LAG and consistent hashing on BGP.

[See [Resilient Hashing on LAGs and ECMP groups](#) and [Load Balancing for a BGP Session](#)].

- **Support for Link Aggregation Control Protocol Features (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, you can configure LACP to bundle several physical interfaces to form one logical aggregated Ethernet interface. By default, LACP is disabled on aggregated Ethernet interfaces. You can configure LACP in active or passive mode. If LACP is configured, it is in passive mode, by default. To initiate transmission of LACP packets and response to LACP packets, you must configure LACP in active mode. LACP monitors the links to check whether both ends of the bundle are connected to the correct group. You can also configure the following supported LACP features on PTX10008 routers:

- Configuration Synchronization for MC-LAG groups
- Distributed LACP (AFT-based PPMAN)
- Load balancing
- MC-LAG Links or Interfaces with limited LACP capability to be up
- Telemetry Support (Periodic streaming and On-change)

[See [Configuring Aggregated Ethernet Interfaces and LACP](#).]

- **Support for LACP features (PTX10003)**—In Junos OS Evolved Release 20.1R1, the PTX10003 supports LACP in the default periodic packet management (PPM) mode. The router supports the following LACP features:

- LACP load balancing
- OpenConfig
- Telemetry
- **Sync-reset** with minimum-link

- LACP force-up
- LACP hold up
- **Support for Layer 2 bridging (PTX10003)**—In Junos OS Evolved Release 20.1R1, PTX10003 routers support Layer 2 bridging. You create a bridge domain by adding a set of Layer 2 logical interfaces (on your device) to represent a broadcast domain. All the member ports of the bridge domain participate in Layer 2 learning and forwarding. You can configure one or more bridge domains to perform Layer 2 bridging. You can optionally disable learning on a bridge domain. You can configure the Layer 2 interfaces either by configuring the access and trunk port of the **ethernet-switching** family or by **vlan-tagging**.
[See [Configuring Layer 2 Bridging Interfaces](#).]
- **Support for resilient hashing (PTX10003)**—Starting in Junos OS Evolved Release 20.1R1, the PTX10003 supports resilient hashing by link aggregation groups (LAGs) and equal-cost multipath (ECMP) sets. Working together with the default static hashing algorithm, resilient hashing enhances LAGs and ECMP sets by minimizing destination remapping when a new member is added to or deleted from the LAG or ECMP set. When a LAG member change affects the traffic flow, the Packet Forwarding Engine rebalances the flow by reprogramming the flow set table. Both consistent hash and resilient hash (on LAG) support only 64-way ECMP routing.
[See [Understanding Consistent Load Balancing Through Resilient Hashing on ECMP Groups](#).]

Junos OS XML API and Scripting

- **The jcs:load-configuration template supports loading the rescue configuration (PTX Series and QFX Series)**—Starting in Junos OS Evolved Release 20.1R1, the **jcs:load-configuration** template supports the **rescue** parameter to load and commit the rescue configuration on a device. SLAX and XSLT scripts can call the **jcs:load-configuration** template with the **rescue** parameter set to "rescue" to replace the active configuration with the rescue configuration.
[See [Changing the Configuration Using SLAX and XSLT Scripts](#) and [jcs:load-configuration Template](#).]
- **Support for automation scripting features (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, PTX10008 routers include support for the following automation scripting features:
 - SLAX and XSLT commit, event, op, and SNMP scripts
 - Python commit, event, op, and SNMP scripts
 - Event policies and event policy features including:
 - Event correlation using **attributes-match**
 - Event policy action to change the configuration using Junos OS configuration mode commands
 - Ability to override the system log priority of the triggering event
 - Ability to limit permissions for executing event policy actions
 - Dedicated **lib** directory for user script libraries

- Global variable provided to Junos OS automation scripts
- Loading scripts from flash
- Refreshing scripts from a configured or specified source location
- Configuring checksums to verify the integrity of scripts
- Script dampening
- Junos PyEZ library on box
- Allowing operational commands in op scripts
- Uploading files generated by event scripts or other event policy actions
- Remote RPC support for event scripts
- libslax distribution, including the libslax default extension libraries: **bit**, **curl**, **db**, **os**, and **xutil**

[See [Junos Automation Scripts Overview](#).]

- **Support for ECMP path trace tool using APIs (PTX10003)**—Starting in Junos OS Evolved Release 20.1R1, you can use ECMP tracer JET APIs to monitor traffic flow, trace the ECMP path used by packets entering and exiting a CLOS network, and get flow counters without changing the configuration on your device. You provide match criteria to the ECMP path trace tool, `ecmptacerd`, through JET API requests. The `ecmptacerd` process then installs firewall filters for the inputs on all the interfaces on the device except the private interfaces. The counters associated with these filters increment as packets matching the firewall filter criteria arrive and leave. These APIs provide similar functionality to the `ecmp-tracer` on-box shell utility. Do not use the JET client and the `ecmp-tracer` on-box shell utility simultaneously.

[See [ecmp](#), [Juniper Extension Toolkit Developer Guide](#), and [Juniper Engineering Network website](#).]

Junos Telemetry Interface

- **IPFIX process statistics on JTI (PTX10003)**—Junos OS Evolved Release 20.1R1 supports IPFIX process statistics using Junos telemetry interface (JTI) and remote procedure calls (gRPC) services. Use the inline J-flow sensor to monitor Inline J-flow service statistics on the router and export these to a collector at configurable intervals. The minimum interval is 30 seconds.

Use the resource path `/junos/system/linecard/services/inline-jflow` in a gRPC subscription to export these statistics to a collector.

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

- **JTI support for Packet Forwarding Engine statistics for (PTX10008)**—Junos OS Evolved Release 20.1R1 supports the Junos telemetry interface (JTI) export of Packet Forwarding Engine statistics using remote procedure call (gRPC) services or gRPC Network Management Interface (gNMI) services. Using gRPC or gNMI and JTI, data is streamed from devices to outside collectors at configurable intervals.

Export the following statistics:

- Packet Forwarding Engine statistics (resource path `/junos/system/linecard/packet/usage`)
- Network processing unit (NPU) memory statistics (resource path `/junos/system/linecard/npu/memory/`)
- NPU utilization statistics (resource path `/junos/system/linecard/npu/utilization/`)

To provision the sensor to export data through gRPC services, use the **telemetrySubscribe** RPC.

To provision the sensor to export data through gNMI services, use the **Subscribe** RPC. The **Subscribe** RPC and subscription parameters are defined in the **gnmi.proto** file. Streaming telemetry data through gRPC or gNMI also requires the OpenConfig for Junos OS module.

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

- **Chassis, environmental, and power sensor support using JTI (PTX10008)**—Junos OS Evolved Release 20.1R1 supports Junos telemetry interface (JTI) sensors that provide the operational state of Routing Engines, power supplies and fan trays, FPCs, SIBs, and PICs on PTX10008 routers. JTI enables the export of statistics from these sensors to outside collectors at configurable intervals using remote procedure call (gRPC) services.

To provision a sensor to export data through gRPC services, use the **telemetrySubscribe** RPC to specify telemetry parameters. Streaming telemetry data through gRPC also requires the OpenConfig for Junos OS module.

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

- **Support for gNMI services with JTI for Routing Engine and Packet Forwarding Engine sensors (PTX10003)**—Junos OS Evolved Release 20.1R1 introduced support to export the statistics using JTI and remote procedure call (gRPC) services. In Junos OS Evolved Release 20.1R1, you can also export statistics for these sensors using gRPC Network Management Interface (gNMI) services.
 - Routing Engine internal interfaces (physical interface state and statistics) (resource path `/interfaces/`)
 - Firewall filter counters and policer counters (resource path `/junos/system/linecard/firewall/`)
 - Packet Forwarding Engine (resource path `/junos/system/linecard/packet/usage/`)
 - NPU memory utilization statistics (resource path `/junos/system/linecard/npu/memory/`)
 - NPU utilization statistics (resource path `/junos/system/linecard/npu/utilization/`)

To provision the sensor to export data through gRPC services, use the **telemetrySubscribe** RPC.

To provision the sensor to export data through gNMI services, use the **Subscribe** RPC. The **Subscribe** RPC and subscription parameters are defined in the **gnmi.proto** file. Streaming telemetry data through gRPC or gNMI also requires the OpenConfig for Junos OS module.

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

- **Supporting gRPC services with JTI for Routing Engine sensors (PTX10008)**—Junos OS Evolved 20.1R1 supports the following Routing Engine sensors on the PTX10008. You can export statistics using Junos telemetry interface (JTI) and remote procedure call (gRPC) services.

- Routing Engine logical interface statistics (resource path `/interfaces/interface/`). Applicable for management interfaces (re0:mgmt-0 and re1:mgmt-0).
- Address Resolution Protocol (ARP) (resource path `/arp-information/`)
- Network Discovery Protocol (NDP) (resource path `/nd6-information/`)
- Operational state of AE with LACP (resource path `/lACP/`)
- Operational state of LLDP (neighbors information) (resource path `/lldp/`)
- Sensor for NDP router-advertisement statistics (resource path `/ipv6-ra/`)

To provision the sensor to export data through gRPC services, use the **telemetrySubscribe** RPC.

Streaming telemetry data through gRPC or gNMI also requires the OpenConfig for Junos OS module.

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

- **JTI support for kernel statistics (PTX10003)**—Junos OS Evolved Release 20.1R1 supports Junos telemetry interface (JTI) sensors for Address Resolution Protocol (ARP/IPv4 routes), Network Discovery Protocol (NDP/IPv6 routes), and management interface statistics on PTX10003 routers. Statistics are delivered with gRPC Network Management Interface (gNMI) to stream statistics at regular intervals to an outside collector.

To stream statistics, include the resource paths in a subscription:

- Sensor for ARP statistics for IPv4 routes (resource path `/arp-information/`)
- Sensor for NDP table state information for IPv6 routes (resource path `/nd6-information/`)
- Sensor for management interface statistics (re0:mgmt-0) (resource path `/interfaces/interface/`)

To provision a sensor to export data through gNMI, use the **Subscribe** RPC defined in the [gnmi.proto](#) file to specify request parameters.

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

- **IPFIX process statistics on JTI (PTX10008)**—Junos OS Evolved Release 20.1R1 supports IPFIX process statistics using Junos telemetry interface (JTI) and Remote Procedure Calls (gRPC) services. Use the inline Jflow sensor to monitor Inline Jflow service statistics on the router and export these to a collector at configurable intervals. The minimum interval is 30 seconds.

Use the resource path `/junos/system/linecard/services/inline-jflow` in a gRPC subscription to export these statistics to a collector.

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

- **Packet Forwarding Engine sensor enhanced on JTI (PTX10003)**—Junos OS Evolved Release 20.1R1 supports enhanced Packet Forwarding Engine sensor enhancements for firewall filters and policers to

stream statistics using Junos telemetry interface (JTI) and Remote Procedure Calls (gRPC) services or Network Management Information (gNMI) services.

Use the resource path `/junos/system/linecard/npu/memory/` in a gRPC or gNMI subscription to export these statistics to a collector.

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

- **Sensor level statistics support on Junos Telemetry Interface (JTI) (QFX Series, PTX Series)**—Starting with Junos OS Evolved Release 20.1R1, you can issue the Junos operational mode command **show network-agent statistics** to provide more information on a per-sensor level for statistics being streamed to an outside collector by means of remote procedure calls (gRPC) and JTI. Only sensors exported with gRPC are supported. The command does not support UDP-based sensors.

[See [show network-agent statistics](#).]

- **Routing Engine sensor support with gNMI services and JTI (PTX10008)**—Junos OS Evolved Release 20.1R1 supports Routing Engine statistics using Junos telemetry interface (JTI) and gRPC Network Management Interface (gNMI) services.

Include the following resource paths in a gNMI subscription to periodically stream statistics to an outside collector:

- Address Resolution Protocol (ARP) (resource path `/arp-information/`)
- Network Discovery Protocol (NDP) (resource path `/nd6-information/`)
- Physical interface traffic (resource path `/interfaces/interface/`) on management interfaces (re0:mgmt-0)

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

Layer 2 Features

- **Support for Q-in-Q tunneling (PTX10003)**—Starting in Junos OS Evolved Release 20.1R1, Q-in-Q tunneling allows service providers on Ethernet access networks to extend a Layer 2 Ethernet connection between two customer sites. Using this feature, providers can also segregate or bundle customer traffic into fewer VLANs or different VLANs by adding another layer of 802.1Q tags. Q-in-Q tunneling is useful when customers have overlapping VLAN IDs, because the customer's 802.1Q (dot1Q) VLAN tags are prepended by the service VLAN (S-VLAN) tag.

[See [Configuring Q-in-Q Tunneling and VLAN Q-in-Q Tunneling and VLAN Translation](#).]

- **Proxy ARP (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, PTX10008, both restricted and unrestricted ARP are supported. With restricted ARP, the device responds to the ARP requests in which the physical networks of the source and target are not the same and the device has an active route to the target address in the ARP request. The device does not reply if the target address is on the same subnet and the same interface as the ARP requestor. With unrestricted ARP, the device responds to any ARP request, on the condition that the device has an active route to the destination address of the ARP

request. The route is not limited to the incoming interface of the request, nor is it required to be a direct route. By default, proxy ARP is unrestricted.

Proxy ARP is supported on `et` and `ae` interfaces and interface routes only.

To enable unrestricted proxy ARP, enable the **unrestricted** statement at the `[edit interfaces interface-name proxy-arp]` CLI hierarchy.

To enable restricted proxy ARP, enable the **restricted** statement at the `[edit interfaces interface-name proxy-arp]` CLI hierarchy.

To enable default mode (unrestricted), enable the **proxy-arp** statement at the `[edit interfaces interface-name]` CLI hierarchy.

[See [Restricted and Unrestricted Proxy ARP Overview](#).]

- **Support for basic Layer 2 features (PTX10003)**—Starting in Junos OS Evolved Release 20.1R1, PTX10003 routers supports the following basic Layer 2 features:

- Layer 2 bridging with trunk and access modes
- MAC learning and aging
- Handling BUM (broadcast, unknown unicast and multicast) traffic, including split horizon
- Spanning tree functionalities
- MAC limiting
- Static MAC addresses

[See [Understanding Layer 2 Bridge Domains](#), [Understanding Layer 2 Learning and Forwarding](#).]

- **Layer 2 features on PTX10003**—Starting in Junos OS Evolved Release 20.1R1, you can configure the following Layer 2 features on the PTX10003 router:

- Circuit cross-connect (CCC) with and without control word
- Transport protocols in CCC
- Layer 2 connection
- Layer 2 circuit
- Layer 2 VPN configuration with **ethernet-ccc** and **vlan-ccc** encapsulation types

The following Layer 2 features are not supported:

- Translational cross-connect (TCC)
- Layer 2 configuration with **flexible-ethernet-services** encapsulation type

[See [Layer 2 VPNs and VPLS Feature Guide for Routing Devices](#), and [Configuring Circuit Cross-Connect \(CCC\) and Translational Cross-Connect \(TCC\)](#).]

Layer 3 Features

- **Support for Layer 3 Features (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, you can configure the following Layer 3 forwarding features on the PTX10008 router:
 - IPv4
 - IPv6
 - IPv6 accounting, includes interface statistics for explicit null, PTX10008 hop popping (UHP), 6PE, and BGP labeled unicast (BGP LU).
 - IPv6 subnet support on loopback interfaces
 - IPv4 and IPv6 forwarding – limited longest prefix match (LPM) entries for OSPFv3, ISIS, BGP, static routes
 - IPv4 and IPv6 traceroute
 - IPv4 and IPv6 ping
 - IPv4 and IPv6 multicast and unicast traffic statistics
 - Junos Telemetry Interface (JTI), including routing process daemon (RPD) and RPD Task Memory
 - Interface ranges
 - Flexible VLAN-tagged Layer 3 logical interfaces
 - Single VLAN-tagged Layer 3 logical interfaces
 - Virtual router routing instances for unicast protocols
 - MPLS
 - LAG
 - ECMP
 - Path MTU discovery
 - MTU checks
 - Routing protocol next-hop acknowledgements and time intervals
 - ICMP
 - OSPF, including support for:
 - LDP synchronization
 - Multitopology
 - OSPF database protection for OSPF and OSPFv3
 - OSPF export and import policies for network-summary LSAs
 - OSPFv2

- OSPFv3
- Policy based support for LFA in OSPF
- Remote LFA support in OSPF (IGP and LDP)
- Shortcuts
- SNMP MIB support for OSPFv3
- Stub network overload and external route leaking

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

- IS-IS, including support for:
 - IPv6 and IPV6 unicast topology
 - JTI adjacency, link state database (LSDB) streaming, state, interface, adjacency statistics, and LSDB export
 - LDP synchronization
 - LFA and LFA policy based support
 - Multitopology
 - Remote LFA support for LDP in IS-IS
 - Shortcuts
 - Stub network overload

[See [IS-IS User Guide](#).]

- Route-filter walkup
- ARP
- Static ARP
- NDP
- BGP
- BFD
- LACP
- LDP
- RSVP
- LLDP
- VRF-lite
- TTL expiry
- IP options

- IP Fragmentation
- DDOS

Management

- **Programmable Routing Protocol API support (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, the Programmable Routing Protocol (prpd) is supported on PTX10008. Through JET, the prpd provides public APIs to program routing systems, making it possible for users to directly access the APIs to customize, create, and modify the behavior of their network. The supported APIs include:

- BGP route monitoring
- BGP route APIs used to program the virtual Route Server (vRS)
- BGP route APIs used to program inet and inet6 routes
- BGP route APIs used to program l3vpn-inet and l3vpn-inet6 in Route Reflector
- BGP Labeled Unicast (BGP-LU) route monitoring
- RIB route monitoring
- RIB MPLS routes
- RIB static routes
- RIB APIs that support the preference, tag, and color attributes
- Interface notifications

[See [Juniper Extension Toolkit Developer Guide](#) and [Juniper Engineering Network website](#).]

- **Support for management features (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, PTX10008 routers support the following management features:
 - DNS
 - FTP
 - IPv6 support for SSH, Telnet, path MTU, CoS, VRRPv3, Radius, TACACS+, AAA, NTP, syslog, on network interfaces
 - SFTP
 - Configuring the terminal width with the [set cli screen-width](#) command
 - Support for forwarding structured system log messages to a remote system log server
 - System logging (syslog) over IPv4 and IPv6
 - System logging (syslog) over IPv4 and IPv6: Management vRF support

MPLS

- **sFlow support (PTX10003)**—Starting in Junos OS Evolved Release 20.1R1, sFlow supports the sampling and detecting of MPLS traffic on the PTX10003 router.

[See [Overview of sFlow Technology](#).]

- **MPLS Support for PTX10008**—In Junos OS Evolved Release 20.1R1, the following MPLS features are supported:
 - CLI support for monitoring MPLS label usage
 - Inline MPLS and IPv6 lookup for explicit null
 - 32K transit LSPs
 - Explicit null support for MPLS LSPs
 - MPLS Label Block Configuration
 - MPLS over untagged Layer 3 interfaces
 - MPLS OAM - LSP ping
 - JTI: OCST: MPLS operational state streaming (v2.2.0)
 - 2K ingress LSP support
 - 2K egress LSP support
 - Entropy Label support
 - MPLS: JTI: Junos Telemetry Interface MPLS self-ping, TE++, and misc augmentation
 - LDP, including:
 - Configurable label withdraw delay
 - Egress policy
 - Explicit null
 - Graceful restart signalling
 - IGP synchronization
 - Ingress policy
 - IPv6 for LDP transport session
 - Strict targeted hellos
 - Track IGP metric
 - Tunneling (LDP over RSVP)
 - RSVP++
 - RSVP-TE, including:

- Bypass LSP static configuration
- Ingress LSP statistics in a file
- RSVP-TE Hitless-MBB with no artificial delays
- 32K transit LSPs
- Auto bandwidth
- Class based forwarding (CBF) with 16 classes
- CBF with next-hop resolution
- Convergence and scalability
- Graceful restart signalling
- JTI interface statistics and LSP event export
- LSP next-hop policy
- LSP self ping
- MPLS fast reroute (FRR)
- MTU signaling
- Optimize adaptive teardown
- Node/link protection
- Refresh reduction
- Soft preemption
- Shared Risk Link Group (SRLG)
- Static LSPs with IPv4 next-hop, IPv6 next-hop, and IPv6 next-hop with next-table support for bypass
- Traffic engineering, including:
 - TE++: Dynamic ingress LSP splitting
 - Traffic engineering extensions (OSPF-TE and ISIS-TE)
 - Traffic engineering options: bgp, bgp-igp, bgp-igp-both-ribs, mpls-forwarding

[See [MPLS Applications User Guide](#).]

- **no-decrement-ttl and no-propagate-ttl statements support (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, you can configure the following configuration statements at the **[edit protocols mpls]** hierarchy level on the PTX10008 routers:
 - **no-decrement-ttl**—Decrements the IP time-to-live (TTL) by 1 before encapsulating the IP packet within an MPLS packet.
 - **no-propagate-ttl**—Disables normal TTL decrementing for all RSVP-signaled or LDP-signaled LSPs.

[See [no-decrement-ttl](#) and [no-propagate-ttl](#).]

- **RSVP and LDP LSPs on PTX10003**—Starting in Junos OS Evolved Release 20.1R1, you can configure RSVP and LDP point-to-multipoint label-switched paths (LSPs) on the ingress, transit, egress, PHP and bud interfaces of PTX10003 routers.

The following features are supported:

- RSVP-based point-to-multipoint LSPs
- Multicast LDP-based point-to-multipoint LSPs
- Point-to-multipoint LSP statistics

The following features are not supported:

- Point-to-multipoint LSP correlation
- Fast make-before-break (FMBB) protected Packet Forwarding Engine (PFE) support
- Point-to-multipoint LSP traceroute
- Virtual private LAN service (VPLS)
- Ethernet VPN (EVPN)

[See [Point-to-Multipoint LSPs Overview](#).]

- **Higher scale of transit LSPs with link protection (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, PTX10008 routers support a higher scale of transit RSVP-TE signaled MPLS label-switched paths (LSPs) that are enabled with link protection.

Multicast

- **MoFRR for PIM SM and SSM modes (PTX10003)**—Starting with Junos OS Evolved Release 20.1R1, PTX10003 routers support Multicast-only fast reroute (MoFRR) for both IPv4 and IPv6 traffic flows. MoFRR minimizes multicast packet loss in Protocol Independent Multicast (PIM) domains when there are link failures. When a failure is detected on the primary path, the repair is made locally by changing the interface on which packets are accepted to the secondary interface for the backup path, which greatly improves subsequent convergence times.

MoFRR is supported for PIM sparse mode (SM) and source-specific multicast (SSM) modes only. Support does not extend to Multipoint LDP-based MoFRR.

[See [Understanding Multicast-Only Fast Reroute](#).]

Network Management and Monitoring

- **Local port mirroring and analyzer support (PTX10003)**—Starting with Junos OS Evolved Release 20.1R1, you can use port mirroring and port analyzers to copy packets entering or exiting a port or entering a VLAN and to send the copies to a local interface for local monitoring. You can send traffic to applications that analyze traffic for purposes such as monitoring compliance, enforcing policies, detecting intrusions, monitoring and predicting traffic patterns, correlating events, and so on.

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

- **Support for adding custom YANG data models to the Junos OS schema (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, PTX10008 routers support loading custom YANG data models on the device, which enables you to add RPCs or configuration hierarchies that are customized for your operations. The ability to add data models to a device is beneficial when you want to create device-agnostic RPCs and configuration models that can be used on different devices from one or more vendors.

[See [Understanding the Management of Non-Native YANG Modules on Devices Running Junos OS](#).]

- **Chef and Puppet provided as third-party applications (PTX10008)**— Starting in Junos OS Evolved Release 20.1R1, PTX10008 routers support Chef and Puppet, which are included in the software image.

[See [Chef for Junos OS Getting Started Guide](#) and [Puppet for Junos OS Administration Guide](#).]

- **Support for running a Puppet agent as a Docker container (PTX10003-80C, PTX10003-160C, QFX5220-32CD, and QFX5220-128C)**—Starting in Release 20.1R1, devices running Junos OS Evolved support running a Puppet agent as a Docker container. As an alternative to using the Puppet agent that is integrated into the Junos OS Evolved software image, you can use the Puppet agent Docker container provided by Juniper Networks. Using the container enables you to use standard Docker tools to manage the container and mount or unmount the Puppet agent as needed.

[See [Installing Puppet for Junos OS](#).]

- **Support for running a Chef client as a Docker container (PTX10003-80C, PTX10003-160C, QFX5220-32CD, and QFX5220-128C)**—Starting in Junos OS Evolved Release 20.1R1, devices running Junos OS Evolved support running a Chef client as a Docker container. As an alternative to using the Chef client that is integrated into the Junos OS Evolved software image, you can use the Chef client Docker container provided by Juniper Networks. Using the container enables you to use standard Docker tools to manage the container and mount or unmount the Chef client as needed.

[See [Deploying Chef for Junos OS](#).]

- **sFlow support (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, Juniper Networks supports sFlow on the PTX10008 router. The sFlow technology is a monitoring technology for high-speed switched or routed networks. The sFlow monitoring technology randomly samples network packets and sends the samples to a monitoring station. The following sFlow features are supported:

- Adaptive sampling
- Adaptive sampling fallback, which decreases the sampling load when the traffic load decreases after adaptive sampling has taken place.
- Ability to configure forwarding class and DSCP values per collector.

[See [Understanding How to Use sFlow Technology for Network Monitoring](#).]

- **Open-R supported (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, third-party application Open-R can operate on PTX10008 routers.
- **sFlow support for MPLS (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, you can configure sFlow on interfaces configured with the MPLS family to sample and report MPLS traffic on the PTX10008 routers.

See [[Overview of sFlow Technology](#)].

- **Support for DCU accounting and SCU accounting (PTX10003 routers)**—Starting in Junos OS Evolved Release 20.1R1, the destination class usage (DCU) accounting and source class usage (SCU) accounting are supported on PTX10003 routers. You can maintain packet counts based on the entry and exit points for traffic passing through your network. Entry and exit points are identified by source and destination prefixes grouped into disjoint sets, which are defined as source classes and destination classes. SCU counts packets sent to customers by performing lookups on the source IP address and the destination IP address. SCU accounting enables you to track traffic originating from specific prefixes on the provider core and destined for specific prefixes on the customer edge. DCU counts packets from customers by performing lookups of the IP destination address. DCU accounting enables you to track traffic originating from the customer edge and destined for specific prefixes on the provider core router.

Network Security

- **Control plane protection against DDoS attacks (PTX10008)**—Distributed denial-of-service (DDoS) attacks typically use a large number of network control packets to trigger exceptions in the network, consuming resources and bringing down network operations. Starting in Junos OS Evolved Release 20.1R1, PTX10008 routers have control plane DDoS protection enabled by default for many Layer 2 and Layer 3 protocols. Control plane DDoS protection uses firewall filters and policers to discard or rate-limit control plane traffic so that malicious traffic does not interfere with device operations. You can configure **ddos-protection** options at the **[edit system]** hierarchy level to disable DDoS protection or change default policer parameters for a protocol group or for supported packet types in a protocol group.

[See [Control Plane Distributed Denial-of-Service \(DDoS\) Protection Overview](#).]

Port Security

- **Media Access Control Security (MACsec) enhancements (PTX10003)**—The following MACsec enhancements are supported on PTX10003 routers:
 - Pre-shared key (PSK) hitless rollover keychain
 - Fallback PSK
 - Configuration option for the destination EAPoL address

MACsec is an industry-standard security technology that provides secure communication for all traffic on point-to-point Ethernet links. MACsec is standardized in IEEE 802.1AE.

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

Routing Policy and Firewall Filters

- **Firewall filters support (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, you can configure IPv4 and IPv6 firewall filters on your PTX10008. Firewall filters provide rules that define whether to permit, deny, or forward packets that are transiting an interface on the router from a source address to a destination address. You configure firewall filters at the **[edit firewall]** hierarchy level.
- [See [Firewall Filter Match Conditions and Actions \(PTX Series Routers\)](#).]
- **MPLS LSP policer support (PTX10003)**—Starting in Junos OS Evolved Release 20.1R1, you can apply MPLS LSP policing on your PTX10003. Policing allows you to control the amount of traffic forwarded through a particular LSP and ensures that the amount of traffic forwarded through an LSP never exceeds the requested bandwidth allocation. The router supports automatic policing only on regular LSPs. Automatic policing allows you to provide strict service guarantees for network traffic. Such guarantees are especially useful in the context of Differentiated Services for traffic-engineered LSPs, providing better emulation for ATM wires over an MPLS network.

[See [Configuring MPLS Firewall Filters and Policers on Routers.](#)]

Routing Protocols

- **BGP PIC edge support for inet and MPLS VPNs (PTX10003)**—Prefix-Independent Convergence (PIC) edge support is extended to BGP with multiple routes in the global tables such as **inet** and **inet6 unicast**, and **inet** and **inet6 labeled unicast**. When the BGP PIC feature is enabled on a router, BGP installs in the forwarding table the second best path in addition to the calculated best path to a destination. When an IGP loses reachability to a prefix, the router uses this backup path to reduce traffic loss until the global convergence through BGP is resolved, thereby drastically reducing the outage duration.

You can also install a Layer 3 VPN route in the forwarding table as an alternate path, enabling fast failover when a provider edge (PE) router fails or you lose connectivity to a PE router. This already installed path is used until global convergence through the IGP is resolved.

To enable BGP PIC edge in an MPLS VPN, include the **protect-core** statement at the **[edit routing-instances routing-instance-name routing-options]** hierarchy level. Both IS-IS LDP and OSPF LDP are supported. When BGP PIC edge is enabled, the **show route extensive** command now displays the weight assigned to the indirect hop.

[See [Configuring BGP PIC Edge for MPLS Layer 3 VPNs](#) and [Use Case for BGP PIC for Inet.](#)]

- **Redistribution of IPv4 routes with IPv6 next hop into BGP (PTX10008)**—Devices running Junos OS Evolved Release 20.1R1, can forward IPv4 traffic over an IPv6-only network, which generally cannot forward IPv4 traffic. As described in RFC 5549, IPv4 traffic is tunneled from CPE devices to IPv4-over-IPv6 gateways. These gateways are announced to CPE devices through anycast addresses. The gateway devices then create dynamic IPv4-over-IPv6 tunnels to remote CPE devices and advertise IPv4 aggregate routes to steer traffic. Route reflectors with programmable interfaces inject the tunnel information into the network. The route reflectors are connected through IBGP to gateway routers, which advertise the IPv4 addresses of host routes with IPv6 addresses as the next hop.

To configure a dynamic IPv4-over-IPv6 tunnel, include the **dynamic-tunnels** statement at the **[edit routing-options]** hierarchy level.

[See [Understanding Redistribution of IPv4 Routes with IPv6 Next Hop into BGP.](#)]

- **Support for inline BFD (PTX10003)**—Starting in Junos OS Evolved Release 20.1R1, PTX10003 routers support inline BFD.

[See [Understanding BFD for Static Routes for Faster Network Failure Detection.](#)]

- **Support for 128-way ECMP for MPLS transit case (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, 128-way equal-cost multipath routing (ECMP) is supported. The following features do not support 128-way ECMP:
 - consistent hashing
 - link protection (MPLS)

- class-based forwarding
- **BGP flow specification (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, BGP can carry flow-specification network layer reachability information (NLRI) messages on PTX10008 devices running 14.4 Tbps line cards. Propagating firewall filter information as part of BGP enables you to propagate firewall filters against denial-of-service (DOS) attacks dynamically across autonomous systems.

The following match conditions are not supported:

- ICMP Codes alone [inet/inet6]
- Source/Destination Prefix with offset for inet6
- Flow label for inet6
- Fragment [for inet6]

The following actions are not supported:

- Traffic Marking

To configure flow routes statically, configure the match conditions and actions under the **[edit routing-options]** hierarchy level.

[See [Understanding BGP Flow Routes for Traffic Filtering](#).]

- **Distributed BFD and BFD-triggered local repair (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, PTX10008 routers support distributed BFD and BFD-triggered local repair. BFD authentication is not supported.

[See [BFD-Triggered Local Repair for Rapid Convergence](#) .]

- **Support for NTP (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, PTX10008 routers support NTP. The following features are supported:
 - NTP over WAN ports with IPV4 or IPV6 configuration.
 - Authentication Over WAN ports
 - Support for MD5, SHA1, and SHA256 authentication
 - Support for the following NTP modes:
 - Client/server
 - Peer mode
 - Broadcast mode

Services Applications

- **Support for real-time performance monitoring (RPM) on PTX10003**—Starting with Junos OS Evolved Release 20.1R1, PTX10003 routers support RPM. However, in this release, Junos OS Evolved supports only the following RPM features:

- User configuration parsing for RPM
- Probe generation and reception (client) as well as reflection (server) for the following RPM probe types:
 - icmp-ping probes
 - icmp-timestamp probes
 - udp-ping probes
 - udp-timestamp probes
- Probe history management as well as reporting through syslog.

[See [Understanding Using Probes for Real-Time Performance Monitoring on M, T, PTX and MX Series Routers.](#)]

- **Support for MPLS-based J-Flow (PTX10003)**—Starting in Junos OS Evolved Release 20.1R1, the PTX10003 routers supports MPLS-based inline J-Flow for ingress sampling. MPLS-based flow records are based on Version 10 (IPFIX) and Version 9.

[See [Configuring Inline Active Flow Monitoring on PTX Series Routers.](#)]

- **MPLS-based J-Flow support (PTX10008)**—Starting with Junos OS Evolved Release 20.1R1, the PTX10008 routers supports MPLS-based inline J-Flow for ingress sampling. MPLS-based flow records are based on Version 10 (IPFIX) and Version 9.

[See [Configuring Inline Active Flow Monitoring on PTX Series Routers.](#)]

- **Support for J-Flow monitoring (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, the PTX10008 router with the JNP10K-LC1201 line card supports inline J-Flow monitoring. J-Flow templates support both Version 9 and Version 10 (IPFIX) formats.

[See [Understanding Inline Active Flow Monitoring.](#)]

- **Support for real-time performance monitoring (RPM) on PTX10008**—Starting in Junos OS Evolved Release 20.1R1, PTX10008 routers support RPM. However, in this release, Junos OS Evolved supports only the following RPM features:

- User configuration parsing for RPM
- Probe generation and reception (client) as well as reflection (server) for the following RPM probe types:
 - icmp-ping probes
 - icmp-timestamp probes

- udp-ping probes
- udp-timestamp probes
- Probe history management and reporting through syslog

Consider the following caveats while configuring RPM:

- Configure **probe-server** at the **[edit services rpm]** hierarchy level mandatorily for ICMP and UDP probes.
- Specify **address** (or **inet6-address**) keyword for an IPv4 (or IPv6) address for **target** at the **[edit services rpm probe owner1 test test1 rpm-scale]** hierarchy level. The **target** type is deduced.
- Need not specify **std-dev-egress**, **std-dev-ingress**, and **std-dev-rtt** thresholds for the probes at the **[edit services rpm probe owner test test-name]** hierarchy level.
- Configure **offload-type** (**none|pfe-timestamp**) instead of **hardware-timestamp** to enable timestamping.

[See [Understanding Using Probes for Real-Time Performance Monitoring on M, T, PTX and MX Series Routers.](#)]

Software Defined Networking

- **PCE-initiated point-to-multipoint LSPs support (PTX10003)**—Starting in Junos OS Evolved Release 20.1R1, the Path Computation Element Protocol (PCEP) support on PTX10003 routers is extended to include Path Computation Element (PCE)-initiated point-to-multipoint LSPs.

With this feature, a PCE can initiate and provision a point-to-multipoint LSP dynamically without the need for local LSP configuration on the Path Computation Client (PCC). This enables the PCE to control the timing and sequence of the point-to-multipoint path computations within and across the PCEP sessions, thereby creating a dynamic network that is centrally controlled and deployed.

[See [Understanding Path Computation Element Protocol for MPLS RSVP-TE with Support for PCE-Initiated Point-to-Multipoint LSPs.](#)]

- **PCEP support (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, the Path Computation Element Protocol (PCEP) is supported on PTX10008 routers.

[See [PCEP Overview.](#)]

Software Installation and Upgrade

- **Zero touch provisioning dynamically detects port speed of WAN interfaces (PTX10003)**—Starting in Junos OS Evolved Release 20.1R1, Zero Touch Provisioning (ZTP) dynamically detects the port speed of WAN interfaces and uses this information to create ZTP server ports with the same speed. ZTP cannot proceed unless the WAN and ZTP server interface speeds match. To make sure the interface speeds

match, ZTP configures the interfaces in the various port speeds supported by the platform. This happens automatically and does not require any configuration by the user.

ZTP automatically cycles through the WAN ports that can support different speeds until it receives DHCP arguments from the port connected to the DHCP server, and then connects your device to the Dynamic Host Configuration Protocol (DHCP) server to perform the bootstrap process.

[See [Zero Touch Provisioning](#).]

- **Zero touch provisioning on management interface (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, PTX10008 devices support automation of the device configuration and software upgrade over the management interface of Routing Engine 0 (RE0).

[See [Zero Touch Provisioning](#).]

Spanning Tree Protocols

- **Spanning-Tree Protocol (STP), Rapid Spanning-Tree Protocol (RSTP), Multiple Spanning-Tree Protocol (MSTP), and VLAN Spanning-Tree Protocol (VSTP) support (PTX10003)**—Starting in Junos OS Evolved Release 20.1R1, You can use STP, RSTP, MSTP, and VSTP to provide Layer 2 loop prevention.

[See [Spanning-Tree Protocol Overview](#).]

System Logging

- **Support for system log notifications over MQTT when configuring JET applications (PTX10003, PTX10008, and QFX5220)**—Starting in Junos OS Evolved Release 20.1R1, you can configure JET applications by using the CLI and then enable the applications to subscribe to system log events. The Junos OS Evolved eventd process sends system log notifications to the event broker. The broker then sends the notifications formatted as JSON messages to the JET application over the Message Queuing Telemetry Transport (MQTT) protocol.

To enable a JET application to subscribe to system log events, configure the **extension-service** statement at the **[edit system extensions]** hierarchy level. You can manage the JET application by using commands at the **[edit system extensions]** and **[edit system services extension-service]** hierarchy levels.

[See [JET Architecture](#), [request extension-service \(start | stop\)](#), [show extension-service status](#), [extensions](#), and [extension-service \(System Services gRPC\)](#).]

System Management

- **Commit Synchronize redesigned (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, **commit synchronize** is enabled by default. If you issue **commit** from the master Routing Engine, you see that the backup Routing Engine is automatically synchronized. You can see the details of various tasks performed during commit of both the Routing Engines in the **commit** output.

[See [Synchronizing Configurations Across Routing Engines](#).]

- **SNMP and RMON Support (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, the following SNMP and RMON features are supported on the PTX10008 router:
 - SNMP version 1, version 2, and version 3
 - RMON events, alarms, and history—Junos OS supports monitoring routers from remote devices. These values are measured against thresholds and trigger events when the thresholds are crossed. You configure remote monitoring (RMON) alarm and event entries to monitor the value of a MIB object.
 - Juniper Networks enterprise-specific SNMP utility MIB

- Subagent statistics using **show snmp statistics subagent**
- Enabling SNMP management routing instances using the **routing-instance-access** statement at the **[edit snmp]** hierarchy level

[See [Junos OS SNMP FAQs](#).]

- **Passive monitoring support (PTX10003)**—Starting in Junos OS Evolved Release 20.1R1, you can enable passive monitoring on your PTX10003 so that any network interface can be configured as a passive monitoring interface. Passive monitoring provides filtering capabilities for monitoring ingress and egress traffic at the Internet point of presence (PoP) where security networks are attached. When you enable passive monitoring, the device accepts and monitors traffic on the interface and forwards the traffic to monitoring tools such as IDS servers and packet analyzers, or other devices such as routers or end-node hosts. To enable this feature, include the **passive-monitor-mode** statement at the **[edit interface]** hierarchy level.

[See [Understanding Passive Monitoring](#).]

- **Run third-party applications in Docker or LXC containers (PTX10008)**—Starting with Junos OS Evolved Release 20.1R1, you can run applications inside containers. You can run third-party applications in two types of containers: Docker containers and LXC containers.

[See [Junos OS Evolved Overview](#)]

What's Changed

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Learn about what changed in Junos OS Evolved Release 20.1R1 for the PTX10003 and PTX10008.

Changes in CLI Statements and Commands

- To see the list of CLI statements and commands changed in Junos OS Evolved, see *How Junos OS Evolved Differs from Junos OS* in the [Introducing Junos OS Evolved Guide](#).

Interfaces and Chassis

- **Modified Ethernet interface configuration (PTX10003, PTX10008, and QFX5220)**—Starting in Junos OS Evolved Release 20.1R1, you'll no longer see the **gigether-options** statement at the **[edit interfaces interface-name]** hierarchy level. To configure Ethernet interfaces and link aggregation groups (LAGs), use the **set interfaces interface-name ether-options** command instead.

The following options are added to the **ether-options** statement:

- **fec**
- **loopback-remote**

[See [ether-options](#).]

Junos Telemetry Interface (JTI)

- **LLDP ON_CHANGE statistics support with JTI (PTX Series, QFX Series)**—Enhanced telemetry ON_CHANGE event support provides the following LLDP attributes: - When LLDP is enabled on interfaces, LLDP interface counters are notified along with other interface-level attributes. - ON_CHANGE event reports LLDP neighbor age and custom TLVs, as well as when a neighbor is initially discovered

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

MPLS

- **Introduction of name option (PTX10003-160C and PTX10008)**—We've introduced the **name** option for the **show path-computation-client lsp** command and the **show path-computation-client lsp extensive** command. You can filter a particular LSP from a large number of LSPs by entering the specific name of the LSP.

[See [show path-computation-client lsp..](#)]

- **Root XML tag change for show rsvp pop-and-forward | display xml command (PTX10003, PTX10008, and QFX5220)**—We've changed the root XML tag for the **show rsvp pop-and-forward | display xml** command to **rsvp-pop-and-fwd-information** to make it consistent with the XML tag convention. In earlier releases, the command output displays **rsvp-pop-and-fwd-info** XML tag. Update the scripts with the **rsvp-pop-and-fwd-info** XML tag to reflect the new **rsvp-pop-and-fwd-information** XML tag.

[See [Junos XML API Explorer - Operational Tags](#).]

System Logging

- **Removal of `show system queues` command (PTX10003, PTX10008, and QFX5220)**—Starting in Junos OS Evolved Release 20.1R1, you'll no longer be able to use the `show system queues` command because the information in the command output is not relevant.

System Management

- **Change of default wait time between Routing Engine switchovers (PTX10008)**—Starting in Junos OS Evolved Release 20.1R1, we've increased the default wait time between Routing Engine switchovers from 120 seconds to 360 seconds when using the `request chassis routing-engine master switch`.

[See [request chassis routing-engine master](#).]

User Interface and Configuration

- Network Time Protocol supports source address and virtual routing and forwarding (VRF) on Junos OS Evolved release. Hence, the `set system ntp source-address` option is enabled by default.

Known Behavior

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Learn about limitations in this release for the PTX10003 and PTX10008. For the most complete and latest information about known Junos OS Evolved defects, use the Juniper Networks online [Juniper Problem Report Search](#) application.

General Routing

- Static link protection is not supported on the PTX10003 router. [PR1382692](#)
- Some XML tags for the **show system buffers** command are missing in Junos OS Evolved. [PR1429626](#)
- **zxchip_plct_counter_read(858): ZXCHIP handle NULL** errors are flooded after FPCs are taken offline. [PR1441340](#)
- Misleading result is seen between sib-online state and empty fabric links. [PR1459430](#)
- The minimum number of supported PSMs to be available on the chassis to bring up the base system without any line cards is three, with two feeds connected. [PR1459474](#)
- Instead of querying for a particular interface, all interface resources need to be exported. [PR1459482](#)
- On PTX10008 routers, control packets statistics are not accurate for aggregated Ethernet subinterfaces (logical units). [PR1460631](#)
- Route record and loose/strict route record are not currently supported in Junos OS Evolved releases. Packets containing these options are dropped. [PR1472499](#)
- After Routing Engine switchover, it takes around two and a half minutes for the new master Routing Engine applications to reconcile fabric state. Therefore, any fabric operation or CLI command does not function properly if issued after two and a half minutes of Routing Engine switchover. [PR1474316](#)
- On PTX10008 routers, the counter per aggregated Ethernet child member for egress statistics are not accurate for aggregated Ethernet subinterface (logical units) and they should be ignored. [PR1475078](#)

Interfaces and Chassis

- **request chassis routing-engine master switch** should display a warning message when issued. [PR1228051](#)
- DAC cables might not be working when connected to ports on PTX10008. [PR1422021](#)

MPLS

- rpd might generate a core file in case **srgb** is configured to take over complete label space. [PR1480427](#)

User Interface and Configuration

- As the system is not clogged with stale users, but merely messages appear when the user enters configure mode. However, this does not have any functional impact on the system. The issue is not seen with the case of graceful reboot or a clean exit. **request system logout user regress terminal pts/0** can be used to remove the stale user as a workaround. [PR1409851](#)
- For large YANG files, augmentation might not work. [PR1416972](#)

- In some cases, the command **request support information** might take more time to complete when journalctl gives a lot of boot messages as output. However, there is no impact on the functionality. [PR1449792](#)

Open Issues

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Learn about open issues in this release for the PTX10003 and PTX10008. For the most complete and latest information about known Junos OS Evolved defects, use the Juniper Networks online [Juniper Problem Report Search](#) application.

Class of Service (CoS)

- CoS classifier or rewrite is not supported for the ccc family. [PR1465087](#)

General Routing

- The convergence time is of the order of 3508 ms for OSPF or IS-IS (50,000 routes scale, which is equivalent to 14,253 routes per second). In case of BGP, it is of the order of around 17,000 routes per second. [PR1379961](#)
- Packets sent with an incorrect IPv6 hop-by-hop type are not dropped. The same issue with IPv4. [PR1403686](#)
- PTX10003-160C and PTX10003-80C: CoS aggregated Ethernet Queue statistics for the **show interfaces queue ae0** CLI command are displayed as zero (whereas the rate, pps, and bps statistics are displayed correctly) after the **clear interfaces statistics all** commands and when one aggregated Ethernet member link flaps (24x10G ae0). [PR1423134](#)

- There are differences in XML tags for the Junos OS **show interfaces**, **show interfaces terse**, and **show interfaces statistics** compared to Junos OS. [PR1433459](#)
- No application is detected during unified ISSU if the same application is in offline state in the base image. [PR1438686](#)
- Need configuration check during commit for port speed 400GE or 100GE configuration validation. [PR1461703](#)
- J-Flow sampling traffic is not rate-limited in host pipe. [PR1473844](#)
- After deleting customized scheduler, default scheduler is applied but not working. Default scheduler can work with only default classifier. For default scheduler to work, please ensure default classifier is used and no traffic over unconfigured queues. [PR1476883](#)
- After OIR feed to the PSM, PSM capacity gets stuck at 0 W capacity with output error in **show system alarm**. The system does not recover from this failure even after the **request system shutdown reboot** command is issued. [PR1477975](#)
- Scheduler with all queues oversubscribed, max latency is different on different queues - 21ms ~ 29ms [PR1478811](#)
- Traffic scheduling exclusively based on excess rate configuration might show some deviation when the excess-rates on queues are quite varying and the ingress traffic on the OQs are significantly oversubscribed in lower excess-rate queues and quite less oversubscription on higher excess-rate. This is applicable when more than 6 output queues are congested simultaneously. [PR1485730](#)
- We might see a FPC evo-aftmand-zx process core when OSPF is configured and one of the interface in the configuration undergoes a major change. A major interface configuration change would involve deletion and re-installation of the interface and its subcomponents in the forwarding path. To recover from this crash, the FPC needs to be rebooted. [PR1491548](#)
- For PTX10008 in Junos OS Evolved 20.1R1, IPv4 and IPv6 CBF will not work as expected in negative triggers such as PIC poffline/online or deactivate/activate or DUT interfaces flapping. Traffic is getting dropped which were supposed to take AF and NC queue to egress out. Whenever CBF enabled, in forwarding block of chip cos bits of incoming packet will be used to choose the egress path, and this broken in this release whenever mentioned triggered carried out. [PR1492707](#)
- In StrictPriority mode scheduler, low priority traffic may get lesser than the expected share of the port bandwidth. For a good workaround Just run strict-priority-scheduler with Strict-High/High/Medium-High/Medium-Low and avoid using priority Low. [PR1492985](#)
- After achieving the guaranteed rate all well, there could be more allocation of excess bandwidth for some queues. This is applicable when more than 6 output queues are congested simultaneously. [PR1494486](#)
- Scheduler ingress Packet Forwarding Engine VOQ drop counters does not match egress queue drop counters, diff > 10,0000. [PR1494785](#)
- JNP10K-LC1201 - Interfaces do not show up after it was offlined or onlined or OIR or restarted then becoming online. [PR1494793](#)

- After removing custom CoS scheduler on a port, the default scheduler might show some deviation with respect to traffic distribution over Queues 0 & 3. [PR1495081](#)
- CoS LAG with 2 member links statistic shows 0, but member link shows 100Gbps. [PR1495649](#)
- The error is not affecting any functionality. Only debug variables are missing. [PR1496077](#)
- When there is a route add or delete, some times out of order deletion of AftNode causes route delete to fail and IRP wedge happens. [PR1496444](#)
- At time of switchovers, logical interface disappear issue is seen. [PR1496887](#)
- After switchover, traffic drops due to stalled VOQ at ingress. [PR1496889](#)

Infrastructure

- IPv6 ping does not support **do-not-fragment** in the Junos OS Evolved 20.1R1 Release. [PR1362365](#)
- Problem: When tacacs user or radius user logs in through telnet, username displayed in login prompt **show cli authorization** output, **show system users** output and accounting logs is template username and not the actual username that is logged in. The issue here is a display issue where the username displayed will be template username instead of the actual logged in username and there is no functional issue. The problem is specific to telnet and when user logs in through ssh, actual logged in username is displayed. [PR1482363](#)

Interfaces and Chassis

- When there is a change in IPv6 address, ifmand crashes. No impact to system. [PR1496361](#)
- Sensor telemetry is not supported on the backup Routing Engine. Sensor telemetry is supported only on the master Routing Engine. [PR1473271](#)

Layer 3 Features

- The "virtual-router" option is not supported under routing-instance in lean rpd image. [PR1494029](#)

User Interface and Configuration

- In Junos OS Evolved, logging in to same Routing Engine gives the following error **We're on same RE as requested**. [PR1472435](#)

Resolved Issues

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Learn which issues were resolved in Junos OS Evolved Release 20.1R1 for the PTX10003 and PTX10008. For the most complete and latest information about known Junos OS Evolved defects, use the Juniper Networks online [Juniper Problem Report Search](#) application.

Authentication and Access Control

- TACACS authentication might not fall back to the remote user template for platforms based on Junos OS Evolved releases. [PR1463705](#)

Class of Service (CoS)

- cosd core is seen at CosRewriteRulesFCLossSniplet::populateOperObject when core profile configuration rollback is done to the base configuration. [PR1475637](#)

- COS EXP classifier and rewrite with protocol option **mpls-inet-both-non-vpn** is not working as expected. [PR1479575](#)
- 32 dscp classifier/rewrite functionality does not work after the cosd restart. [PR1479676](#)

General Routing

- LSP statistics CLI is slow in a scaled scenario during installation time. [PR1416363](#)
- Differences in XML tags fo the **show pfe statistics traffic** command. [PR1430821](#)
- Output MTU Error statistics does not increase on **show pfe statistics traffic**. [PR1434860](#)
- **show route forwarding-table** commands are not supported in Junos OS Evolved releases. [PR1438744](#)
- evo-aftmand-zx generates a core file while loading a BGP configuration. [PR1439366](#)
- Operational and configuration CLIs changed. [PR1451455](#)
- Traffic hitting SRTE label/transit route might have multiple primary next hops, leading to silent dropping of packets. [PR1453446](#)
- With 3000 LSPs, about 500 ms of traffic loss is observed for Routing Engine driven local-repair. [PR1459265](#)
- Ports are in disabled state after continuous triggers are given on setup and incomplete objects in app-controller and binding queue. (This happened on MTU change.) [PR1460063](#)
- System software issue where PSM firmware version is not refreshed after hot-plugging an updated PSM into the chassis. [PR1460409](#)
- Sometimes dhclient generates a core file during ZTP retry when the dhclient process is exiting. [PR1460906](#)
- Support information is not available in the **show system errors** CLI hierarchy. [PR1461691](#)
- Policer drop statistics are not updated for the software policer at the Packet Forwarding Engine level. [PR1463997](#)
- UDP feature is not enabled for the Packet Forwarding Engine statistics on PTX10003-80C and PTX10003-160C. [PR1467333](#)
- Ports are in disabled State. Platform binding queue points to incomplete objects in evo-aftmand-zx with "Waiting usr inc : true" in one guid and also it can be recovered only by reboot. [PR1467546](#)
- Block unified ISSU commands from the CLI for Junos OS Evolved Release 19.4R1. [PR1470943](#)
- Ping to an IPv6 logical interface fails after multiple triggers of an aggregated Ethernet member. [PR1472033](#)
- The master-only configuration in the management Ethernet configuration does not work. [PR1473388](#)
- Enhancements to **request system software sync** command. [PR1473572](#)
- All images except current and rollback removed when /var is full on the backup Routing Engine. [PR1475655](#)

- NPU memory/utilization sensor - show agent sensor blank after the interface is deactivated or deleted. [PR1476886](#)
- USB upgrade fails from Junos OS Evolved Release 19.3R2.1 to Junos OS Evolved Release 19.4R1.8. [PR1480371](#)
- Hardware crashes when removing and replacing FPCs after performing back to back Routing Engine mastership switch-overs. [PR1482453](#)

Infrastructure

- Ping does not work when we set record-route. [PR1474649](#)

Interfaces and Chassis

- A 400GE interface might take a longer time (about 50s) to come up. [PR1450606](#)
- picd becomes unresponsive while powering off three PSMs in 16T setup. [PR1460185](#)
- SIB major error seen upon removal of three DC 80-A PSMs. [PR1461179](#)

Network Management and Monitoring

- mib2d generates a core file in jnxHrStorageEntry_get_value (lastmatch=< optimized out>, pktp=< optimized out>, vbp=0x7f1978e35a80, object=0x7f181564cd60) at ../../src/storage_mthd.cpp:357. [PR1475159](#)

User Interface and Configuration

- CMDD application restart issue: command-handler subsystem is not responding. [PR1434409](#)
- Delete **show system ntp source-address** command before upgrading to Junos OS Evolved Release 19.3R1 from Junos OS Evolved Release 19.1R1. [PR1462728](#)
- Initiate an empty commit from the master Routing Engine when a different Routing Engine is inserted in backup node. [PR1465291](#)
- Configd generates a core file after commit, restart, and rollback 1 with a firewall filter configuration if the filter-term has more than 122 **from source-address** statements. [PR1477772](#)

Junos OS Evolved Release Notes for QFX5220 Devices

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These release notes accompany Junos OS Evolved Release 20.1R1 for QFX5220-32CD and QFX5220-128C Switches. They describe new and changed features, limitations, and known and resolved problems in the hardware and software.

What's New

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Learn about new features introduced in Junos OS Evolved Release 20.1R1 for the QFX5220.

Forwarding and Sampling

- **Customizing hashing parameters and shared-buffer alpha values for better load balancing (QFX5220)**—The QFX5220 switches achieve load balancing through the use of a hashing algorithm, which determines how to forward traffic over LAG bundles or to next-hop devices when ECMP is enabled. Starting with Junos OS Evolved Release 20.1R1, you can explicitly configure some hashing parameters to make hashing more efficient. The shared-buffer pool is a global memory space that all ports on the switch share dynamically as they need buffers. The switch uses the shared-buffer pool to absorb traffic bursts after the dedicated-buffer pool is exhausted. The shared-buffer pool threshold is dynamically calculated based on a factor called alpha. You can also specify the alpha, or dynamic threshold, value to determine the change threshold of shared buffer pools for both ingress and egress buffer partitions.

To specify hashing parameters:

```
user@switch# set forwarding-options enhanced-hash-key hash-parameters (ecmp | lag)
```

To specify a threshold value for a particular queue:

```
user@switch# set class-of-service shared-buffer (ingress | egress) buffer-partition buffer
dynamic-threshold value
```

[See [hash-parameters](#) and [buffer-partition](#).]

General Routing

- **View ARP table entries and IPv6 neighbor information (QFX5220)**—Starting in Junos OS Evolved Release 20.1R1, on QFX5220 switches, you can view the following:
 - Address Resolution Protocol (ARP) details such as the next-hop reference count and the next-hop current state, using the commands **show arp reference-count** and **show arp state**.
 - IPv6 neighbor cache information, using the following commands: **show ipv6 neighbors flags**, **show ipv6 neighbors host**, **show ipv6 neighbors interface *interface-name***, **show ipv6 neighbors reference-count**, **show ipv6 neighbors vpn *vpn-name***.

[See [show arp](#) and [show ipv6 neighbors](#).]

- **Support for running applications signed by users (PTX10003, PTX10008, QFX5220)**—Starting with Junos OS Evolved Release 20.1R1, root users can generate signing keys which can be used to sign Linux applications and allow them to run on your device.

Signing keys are stored in the **system-keystore** by using the following CLI command: **request security system-keystore import key-name *key-name* private-key *key-path* x509-cert *certificate-path***. Once a

key is stored in the **system-keystore**, it can be used to sign a file with the following CLI command: **request security integrity measure file *file-name* key *key-name***.

[See [Junos OS Evolved Overview](#)]

Interfaces and Chassis

- **Support for dynamic load balancing (QFX5220)**—In Junos OS Evolved Release 20.1R1, QFX5220 switches support dynamic load balancing (DLB) for ECMP. DLB is an enhancement to static load balancing. DLB considers member bandwidth utilization along with packet content for member selection.

You can use the following DLB modes to load-balance traffic:

- Flowlet
- Assigned flow
- Per-packet

To configure DLB for ECMP, include the **ecmp-dlb** statement at the **[edit forwarding-options enhanced-hash-key]** hierarchy level.

NOTE: You cannot configure both DLB and resilient hashing at the same time.

[See [Understanding Dynamic Load Balancing](#) and [Configuring Dynamic Load Balancing](#).]

Junos OS XML API and Scripting

- **The jcs:load-configuration template supports loading the rescue configuration (PTX Series and QFX Series)**—Starting in Junos OS Evolved Release 20.1R1, the **jcs:load-configuration** template supports the **rescue** parameter to load and commit the rescue configuration on a device. SLAX and XSLT scripts can call the **jcs:load-configuration** template with the **rescue** parameter set to "rescue" to replace the active configuration with the rescue configuration.

[See [Changing the Configuration Using SLAX and XSLT Scripts](#) and [jcs:load-configuration Template](#).]

- **Requests library support in Python scripts (QFX5220-32CD and QFX5220-128C)**—Starting in Junos OS Evolved Release 20.1R1, QFX5220 switches support the Requests library, an HTTP library for Python. Python scripts can import the **requests** module to send HTTP/1.1 requests. The Requests library provides additional methods for supporting initial deployments as well as for performing routine monitoring and configuration changes on devices running Junos OS Evolved.

[See [Using the Requests Library for Python on Devices Running Junos OS](#).]

Multicast

- **Support for multicast forwarding (QFX5220-32CD and QFX5220-128C)**—Starting with Junos OS Evolved Release 20.1R1, the following multicast features are supported:

- IPv4 and IPv6 multicast
- Internet Group Management Protocol (IGMP)
- Multicast Listener Discovery (MLD)
- Protocol Independent Multicast source-specific multicast (PIM SSM)
- Protocol Independent Multicast sparse mode (PIM SM)

Support does not extend to features beyond those listed above. That is, in this release, IGMP snooping, MLD snooping, MVPN Multicast, PIM MoFRR, PIM First Hop router (FHR), Rendezvous point (RP), and Last Hop Router (LHR) are not supported. In addition, IRB interface is not supported as either a source or receiver, and make before break (MBB) is not supported for existing layer 3 Aggregated Ethernet (AE) and link aggregation group (LAG) receivers (member addition/deletions or up/downs).

[See [Multicast Routing Protocols](#)].

Network Management and Monitoring

- **Support for running a Puppet agent as a Docker container (PTX10003-80C, PTX10003-160C, QFX5220-32CD, and QFX5220-128C)**—Starting in Release 20.1R1, devices running Junos OS Evolved support running a Puppet agent as a Docker container. As an alternative to using the Puppet agent that is integrated into the Junos OS Evolved software image, you can use the Puppet agent Docker container provided by Juniper Networks. Using the container enables you to use standard Docker tools to manage the container and mount or unmount the Puppet agent as needed.

[See [Installing Puppet for Junos OS](#) .]

- **Support for running a Chef client as a Docker container (PTX10003-80C, PTX10003-160C, QFX5220-32CD, and QFX5220-128C)**—Starting in Release 20.1R1, devices running Junos OS Evolved support running a Chef client as a Docker container. As an alternative to using the Chef client that is integrated into the Junos OS Evolved software image, you can use the Chef client Docker container provided by Juniper Networks. Using the container enables you to use standard Docker tools to manage the container and mount or unmount the Chef client as needed.

[See [Deploying Chef for Junos OS](#) .]

Routing Policy and Firewall Filters

- **Support for 2000 egress firewall filters (QFX5220)**—Starting in Junos OS Evolved Release 20.1R1, you can configure up to 2000 VLAN firewall filters on the QFX5220 switch. This feature is supported only in the egress direction (traffic exiting the VLAN). To configure, include the **egress-scale** option under the **erac1-profile** statement at the **[edit system packet-forwarding-options firewall]** hierarchy level.

[See [erac1-profile](#) and [Configuring Firewall Filters](#).]

Software Installation and Upgrade

- **Zero touch provisioning using WAN interfaces (QFX5220-32CD)**—Starting in Junos OS Evolved Release 20.1R1, Zero Touch Provisioning (ZTP) uses either WAN interfaces or the management interface to automatically download and install the appropriate software and the configuration file on your device during the bootstrap process.

ZTP starts with the management interface, and if it does not receive the minimal set of DHCP parameters, it will then try any of the interfaces that has WAN links that are up. If none of the interfaces provide a minimal set of DHCP parameters, ZTP retries the process again.

[See [Zero Touch Provisioning](#).]

- **Support for asynchronous notifications, SIOCETHTOOL ioctl, and multipath routes (QFX Series)**—Junos OS Evolved Release 20.1R1 supports the following features:

- Use the **set system netlink-async-mode** configuration to enable NETLINK_ROUTE asynchronous notifications. This feature is disabled by default. Use **show nsld mode** to show the current netlink asynchronous mode.
- **SIOCETHTOOL ioctl**, which can be used by other applications.
- Multipath next-hop route information through netlink route attributes.

[See [Running Linux Tools on Junos OS Evolved](#).]

- **Support for curl binary on Junos OS Evolved (QFX Series)**—The curl binary is a command-line utility, used from the shell, that you can use to perform operations over several transport protocols including FILE, FTP, HTTP, and SMTP. The curl binary can improve your workflow by making it much easier to gather information about a device. Junos OS Evolved Release 20.1R1 supports curl version 7.50.1 and libcurl version 7.50.1.

Spanning Tree Protocols

- **Spanning-Tree Protocol (STP), Rapid Spanning-Tree Protocol (RSTP), Multiple Spanning-Tree Protocol (MSTP), and VLAN Spanning-Tree Protocol (VSTP) support (QFX5220)**—Starting in Junos OS Evolved Release 20.1R1, You can use STP, RSTP, MSTP, and VSTP to provide Layer 2 loop prevention.

[See [Spanning-Tree Protocol Overview](#).]

System Logging

- **Support for system log notifications over MQTT when configuring JET applications (PTX10003, PTX10008, and QFX5220)**—Starting in Junos OS Evolved Release 20.1R1, you can configure JET applications by using the CLI and then enable the applications to subscribe to system log events. The Junos OS Evolved eventd process sends system log notifications to the event broker. The broker then sends the notifications formatted as JSON messages to the JET application over the Message Queuing Telemetry Transport (MQTT) protocol.

To enable a JET application to subscribe to system log events, configure the **extension-service** statement at the **[edit system extensions]** hierarchy level. You can manage the JET application by using commands at the **[edit system extensions]** and **[edit system services extension-service]** hierarchy levels.

[See [JET Architecture](#), [request extension-service \(start | stop\)](#), [show extension-service status](#), [extensions](#), and [extension-service \(System Services gRPC\)](#).]

System Management

- **Boundary clock and enterprise profile support for Precision Time Protocol (PTP) (QFX5220 devices)**—Starting in Junos OS Evolved Release 20.1R1, the enterprise profile, which is based on PTPv2, provides the ability for enterprise and financial markets to timestamp on different systems and to handle a range of latency and delays.

The enterprise profile supports the following options:

- IPv4 multicast transport
- Boundary clocks
- 512 downstream slave clocks

You can enable the enterprise profile at the **[edit protocols ptp profile-type]** CLI hierarchy.

[See [Understanding the Precision Time Protocol Enterprise Profile](#).]

- **Precision Time Protocol (PTP) transparent clock (QFX5220)**—Starting in Junos OS Release 20.1R1 EVO, you can use a transparent clock to update the PTP packets with the residence time as the packets pass through the switch. There is no master/slave designation. The switches support end-to-end transparent

clocks, which include only the residence time. The transparent clock can update the residence time in a one-step process, which means it sends the timestamps in one packet.

To use a transparent clock, enable the **e2e-transparent** statement at the **[edit protocols ptp]**.

[See [Understanding Transparent Clocks in Precision Time Protocol](#).]

- **Packet Timestamping using PTP Reference Clock (QFX5220)**—Starting in Junos OS Evolved Release 20.1R1, flow-based packets are timestamped with the recovered PTP clock. Packet timestamping is supported on family ethernet-switching, inet and inet6.

[See [Understanding Transparent Clocks in Precision Time Protocol](#).]

What's Changed

IN THIS SECTION

- [Changes in CLI Statements and Commands | 52](#)
- [Interfaces and Chassis | 52](#)
- [Junos Telemetry Interface \(JTI\) | 53](#)
- [MPLS | 53](#)
- [System Logging | 54](#)

Learn about what changed in Junos OS Evolved Release 20.1R1 for the QFX5220.

Changes in CLI Statements and Commands

- To see the list of CLI statements and commands changed in Junos OS Evolved, see *How Junos OS Evolved Differs from Junos OS* in the [Introducing Junos OS Evolved Guide](#).

Interfaces and Chassis

- **Modified Ethernet interface configuration (PTX10003, PTX10008, and QFX5220)**—Starting in Junos OS Evolved Release 20.1R1, you'll no longer see the **gigether-options** statement at the **[edit interfaces interface-name]** hierarchy level. To configure Ethernet interfaces and link aggregation groups (LAGs), use the **set interfaces interface-name ether-options** command instead.

The following options are added to the **ether-options** statement:

- fec
- loopback-remote

[See [ether-options](#).]

Junos Telemetry Interface (JTI)

- **LLDP ON_CHANGE statistics support with JTI (PTX Series, QFX Series)**—Enhanced telemetry ON_CHANGE event support provides the following LLDP attributes: - When LLDP is enabled on interfaces, LLDP interface counters are notified along with other interface-level attributes. - ON_CHANGE event reports LLDP neighbor age and custom TLVs, as well as when a neighbor is initially discovered

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

MPLS

- **Introduction of name option (PTX10003-160C and PTX10008)**—We've introduced the **name** option for the **show path-computation-client lsp** command and the **show path-computation-client lsp extensive** command. You can filter a particular LSP from a large number of LSPs by entering the specific name of the LSP.

[See [show path-computation-client lsp](#).]

- **Root XML tag change for show rsvp pop-and-forward | display xml command (PTX10003, PTX10008, and QFX5220)**—We've changed the root XML tag for the **show rsvp pop-and-forward | display xml** command to **rsvp-pop-and-fwd-information** to make it consistent with the XML tag convention. In earlier releases, the command output displays **rsvp-pop-and-fwd-info** XML tag. Update the scripts with the **rsvp-pop-and-fwd-info** XML tag to reflect the new **rsvp-pop-and-fwd-information** XML tag.

[See [Junos XML API Explorer - Operational Tags](#).]

System Logging

- **Removal of show system queues command (PTX10003, PTX10008, and QFX5220)**—Starting in Junos OS Evolved Release 20.1R1, you'll no longer be able to use the **show system queues** command because the information in the command output is not relevant.

Known Limitations

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- [System Management | 54](#)
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Learn about limitations in this release for the QFX5220. For the most complete and latest information about known Junos OS Evolved defects, use the Juniper Networks online [Junos Problem Report Search](#) application.

Interfaces and Chassis

- It takes up to 420 seconds in QFX5220-128C switch for interfaces to come up after reboot when all ports are channelized. The higher time is due to the time taken to download firmware for all 64 dies. [PR1433083](#)

Multicast

- Auto-RP announce and mapping is not currently supported for Junos OS Evolved, only discovery is supported. [PR1459187](#)

System Management

- XML Tags are missing for the output of the **show system statistics** command. [PR1429644](#)

- When many member links are added to an aggregated Ethernet or MTU is changed for many interfaces at the same time, CPU can remain high for many minutes. The CPU remains high till the all interfaces are flapped. [PR1470353](#)

User Interface and Configuration

- For large YANG files, augmentation might not work. [PR1416972](#)

Open Issues

IN THIS SECTION

- [Interfaces and Statistics | 55](#)
- [Layer 2 Features | 56](#)
- [System Management | 56](#)

Learn about open issues in this release for the QFX5220. For the most complete and latest information about known Junos OS Evolved defects, use the Juniper Networks online [Junos Problem Report Search](#) application.

Interfaces and Statistics

- **show interfaces** to view traffic statistics does not show any traffic statistics for IPv6. [PR1421685](#)
- With LACP configurations present, some of the channelized interfaces remain down after a reboot. [PR1459554](#)
- After committing the IPCLOS scaled profile configuration with 32 ports or software image upgrade, some DAC interfaces might remain down. Workaround: Reboot the switch with the saved IPCLOS configuration. [PR1460442](#)

Layer 2 Features

- When removing and inserting a 400G AOC module, there can be a delay of up to 90 seconds before the link establishes after insertion. [PR1454259](#)

System Management

- A QFX5220 switch might fail during an upgrade from Junos OS Evolved 19.3R2.1 to Junos OS Evolved 19.4-202002240046.0 or later releases due to `clksyncd` failure. [PR1491803](#)

Resolved Issues

IN THIS SECTION

- [Interfaces and Chassis | 56](#)
- [Routing Protocols | 57](#)
- [System Management | 57](#)
- [User Interface and Configuration | 57](#)

Learn which issues were resolved in Junos OS Evolved Release 20.1R1 for the QFX5220.

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

Interfaces and Chassis

- Physical interface statistics retain old values after statistics are cleared and interfaces deactivated and then activated.. [PR1403606](#)
- The 400 Gigabit link might take a longer time (about 50 seconds) to come up. [PR1450606](#)
- The 40-Gbps or 100-Gbps interface goes down after the profile configuration is committed. [PR1454412](#)
- Multiple interfaces might go down after the interface speed configuration is changed on many interfaces, and the following error log is seen: `evo-pfemamd[]: [Error] Interface: can't get pfe_portE for ifd:et-x/y/z` [PR1461868](#)

Routing Protocols

- Sometimes dhclient generates a core file during ZTP retry when dhclient process is exiting. [PR1460906](#)
- SFTP does not connect properly. The following error is displayed **Received message too long**. [PR1475255](#)

System Management

- **Output MTU Error** statistics dos not increase when the **show pfe statistics traffic** command is issued. [PR1434860](#)
- In certain configurations, DHCPv6 client fails to bind over L2 LDRA-connected DHCPv6 Relay. [PR1458040](#)
- On platforms running Junos OS Evolved, multiple syslog servers are not being configured on the device when multiple syslog servers are configured on the DHCP server. [PR1458931](#)
- Output **1PPS and 10MHz** measurement ports on QFX5220-32CD are not fully available. [PR1464452](#)
- The timingd process generates a core file rarely after a switch reboot. [PR1464493](#)
- High CPU consumption is seen when a scaled VLAN configuration having 3965 VLANs is committed for 30 minutes. [PR1474374](#)
- Lo0 firewall filter might affect Layer 3 forwarding traffic on QFX5220 platforms. [PR1475620](#)
- QFX5220-128C: INPHI firmware upgrade requires power cycling. [PR1477124](#)

User Interface and Configuration

- CMDD application restart issue: command-handler subsystem does not respond. [PR1434409](#)

Upgrade your Junos OS Evolved Software

Products impacted: PTX10003, PTX10008, QFX5220-32CD, QFX5220-128C.

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 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.

NOTE: We don't recommend that you download the Services Profile 1 image to use the lean rpd profile. We will deprecate this image in Junos OS Evolved 21.4R1. For more information about the types of Junos OS Evolved installation package prefixes, see [Junos OS Evolved Installation Packages](#).

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/>.

Finding More Information

Learn about more information on Junos OS Evolved and other Juniper products.

- Feature Explorer—The Juniper Networks Feature Explorer is a Web-based app that helps you to explore and compare Junos OS and Junos OS Evolved feature information to find the right software release and hardware platform for your network. <https://pathfinder.juniper.net/feature-explorer/>
- PR Search Tool—Keep track of the latest and additional information about Junos OS Evolved open defects and issues resolved. prsearch.juniper.net
- Hardware Compatibility Tool—Determine optical interfaces and transceivers supported across all platforms. apps.juniper.net/hct/home

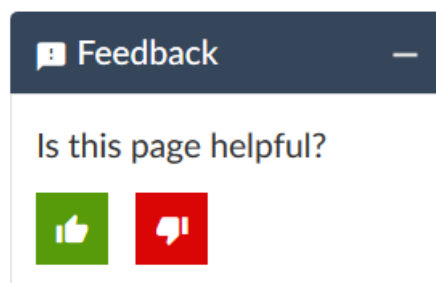
NOTE: To obtain information about the components that are supported on the devices, and the special compatibility guidelines with the release, see the Hardware Guide for the product.

- Juniper Networks Compliance Advisor—Review regulatory compliance information about Common Criteria, FIPS, Homologation, RoHS2, and USGv6 for Juniper Networks products. apps.juniper.net/compliance/

Documentation Feedback

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

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



- Click the thumbs-up icon if the information on the page was helpful to you.

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

Requesting Technical Support

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

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

Self-Help Online Tools and Resources

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

28 January 2022—Revision 12, Junos OS Evolved Release 20.1R1 for the PTX10003, PTX10008, and QFX5220 Devices.

7 October 2021—Revision 11, Junos OS Evolved Release 20.1R1 for the PTX10003, PTX10008, and QFX5220 Devices.

16 July 2021—Revision 10, Junos OS Evolved Release 20.1R1 for the PTX10003, PTX10008, and QFX5220 Devices.

13 January 2021—Revision 9, Junos OS Evolved Release 20.1R1 for the PTX10003, PTX10008, and QFX5220 Devices.

16 July 2020—Revision 8, Junos OS Evolved Release 20.1R1 for the PTX10003, PTX10008, and QFX5220 Devices.

14 May 2020—Revision 7, Junos OS Evolved Release 20.1R1 for the PTX10003, PTX10008, and QFX5220 Devices.

30 April 2020—Revision 6, Junos OS Evolved Release 20.1R1 for the PTX10003, PTX10008, and QFX5220 Devices.

23 April 2020—Revision 5, Junos OS Evolved Release 20.1R1 for the PTX10003, PTX10008, and QFX5220 Devices.

16 April 2020—Revision 4, Junos OS Evolved Release 20.1R1 for the PTX10003, PTX10008, and QFX5220 Devices.

9 April 2020—Revision 3, Junos OS Evolved Release 20.1R1 for the PTX10003, PTX10008, and QFX5220 Devices.

6 April 2020—Revision 2, Junos OS Evolved Release 20.1R1 for the PTX10003, PTX10008, and QFX5220 Devices.

30 March 2020—Revision 1, Junos OS Evolved Release 20.1R1 for the PTX10003, PTX10008, and QFX5220 Devices.

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