Junos® OS Release 15.1X54–D20 Release Notes

Release 15.1X54-D20
10 August, 2015
Revision 1

These release notes accompany Release 15.1X54–D20 of the Junos operating system (Junos OS) for Juniper Networks ACX5000 Universal Access Routers. They describe device documentation and known problems with the software. Junos OS runs on all ACX Series routers.

For the latest, most complete information about outstanding and resolved issues with the Junos OS software, see the Juniper Networks online software defect search application at http://www.juniper.net/prsearch.

You can also find these release notes on the Juniper Networks Junos OS Documentation Web page, which is located at https://www.juniper.net/techpubs/software/junos/.

Contents

Junos OS Release Notes for ACX Series Routers

New Features in Junos OS Release 15.1X54–D20 for ACX Series Routers

Powered by Junos OS, the ACX5000 Universal Access Routers are low-cost, high-density, high-capacity, low-power consumption aggregation routers that support 1-Gigabit Ethernet, 10-Gigabit Ethernet, and 40-Gigabit Ethernet interfaces and provide E-LINE, E-LAN, and IP-VPN services for Metro and Carrier Ethernet aggregation environments.

The following features have been added to Junos OS Release 15.1X54–D20 for the ACX5000 line of universal access routers. Following the description is the title of the manual or manuals to consult for further information:

Hardware

- **New ACX5000 Universal Access Routers**—Starting in Release 15.1X54-D20, Junos OS supports the ACX5000 Universal Access Routers (model numbers: ACX5048-AC, ACX5048-DC, ACX5096-AC, ACX5096-DC). The ACX5000 routers are high-capacity and low-cost aggregation routers best suited for Metro and Carrier Ethernet Aggregation deployments. The ACX5000 routers are available in AC and DC power variants.

  The following are the key features of the ACX5048 router:

  - Forty-eight 10-Gigabit Ethernet SFP+ ports that can be configured as 1-Gigabit Ethernet ports that support 1-gigabit small form-factor pluggable transceivers (SFP)
  - Six 40-Gigabit Ethernet ports with quad form-factor pluggable plus transceivers (QSFP+)
  - Aggregate throughput of up to 1.44 Tbps
  - Maximum power requirement of up to 350 W (with optical SFPs)
  - Supports channelized 10-Gigabit Ethernet interfaces

  NOTE: You can configure one 40-Gigabit Ethernet interface to be channelized into four 10-Gigabit Ethernet interfaces.

The following are the key features of the ACX5096 router:

- Ninety-six 10-Gigabit Ethernet SFP+ ports that can be configured as 1-Gigabit Ethernet ports and support 1-gigabit small form-factor pluggable transceivers (SFP)
- Eight 40-Gigabit Ethernet ports with quad form-factor pluggable plus transceivers (QSFP+)
- Aggregate throughput of up to 2.56 Tbps
- Maximum power requirement of up to 550 W (with optical SFPs)
- Supports channelized 10-Gigabit Ethernet interfaces

NOTE:
- You can configure one 40-Gigabit Ethernet interface to be channelized into four 10-Gigabit Ethernet interfaces.
- When channelizing the 40-Gigabit Ethernet interfaces on the ACX5096 router, the router's Packet Forwarding Engine is expected to reboot.
- ACX5048 and ACX5096 routers do not support 10 Mbps and 100 Mbps speed on copper SFP ports.

Software

- **Support for virtual private LAN service**—Starting in Release 15.1X54-D20, Junos OS for ACX5000 Universal Access Routers supports the virtual private LAN service (VPLS) feature. With this feature, you can deploy the ACX5000 line of routers as part of a full-mesh VPLS domain, as well as a hub site for hierarchical VPLS (H-VPLS).

  NOTE: Applying a forwarding table filter to a VPLS routing instance is not supported on ACX5048 and ACX5096 routers.

- **Support for Ethernet ring protection switching (G.8032v2)**—Starting in Release 15.1X54-D20, Junos OS for ACX5000 Universal Access Routers supports Ethernet ring protection switching (G.8032v2). With the G.8032v2 capability, the ACX5000 line of routers support manual commands (force switch, manual switch, and clear commands) and interconnection of multiple Ethernet rings without virtual channels.
- **Support for OAM features**—Starting in Release 15.1X54-D20, Junos OS for ACX5000 Universal Access Routers supports the following OAM features:
  - Ethernet OAM
    - IEEE 802.3ah link fault management
    - Connectivity fault management (CFM) of down MEPs and up MEPs
    - ITU Y.1731 delay measurement and synthetic loss measurement (SLM)
  - Virtual circuit connection verification (VCCV) and Bidirectional Forwarding Detection (BFD)

- **Support for QoS, filter, and policer with VPLS**—Starting in Release 15.1X54-D20, Junos OS for ACX5000 Universal Access Routers supports quality of serice (QoS), firewall filters, and policers with the VPLS feature. The ACX5000 line of routers support QoS ingress classification and egress rewrite features with VPLS. VPLS firewall filters and policers can be configured at the logical interface family level.
- **Support for Layer 2, IP, MPLS, QoS, firewall, and OAM features**—Starting in Release 15.1X54-D20, Junos OS for ACX5000 Universal Access Routers supports Layer 2, IP, MPLS, multicast, QoS, firewall, and OAM features. All the features supported in Junos OS Release 12.3X54 for ACX Series Universal Access Routers are also supported on the ACX5000 line of routers, except for the following features:
  - T1/E1 interfaces
  - IPsec and NAT services
  - Hierarchical policer
  - RFC 2544 generator
  - Real-time performance monitoring and Two-Way Active Measurement Protocol
  - Precision Timing Protocol (PTP) and Synchronized Ethernet
- **Support for class of service (CoS)**—Starting in Release 15.1X54-D20, Junos OS for ACX5000 Universal Access Routers supports the following CoS features:
  - Ingress classification
  - Fixed classification (interface-based classification)
  - Behavior aggregate (BA) classification
  - Multifield (MF) classification

  CoS features include rewrite, scheduling and buffer management, host outbound traffic, and statistics.

  In addition to these features, you can configure buffer partitions for multicast packets and shared buffer that the multicast packets of the queue can consume. To configure these features, use the **buffer-partition multicast percent** and **multicast** statements at the **[edit class-of-service schedulers]** hierarchy level.

  The following CoS behaviors are specific to the ACX5000 routers:
  - Strict priority queuing—Unlike other ACX Series routers, ACX5000 routers support committed information rate (CIR) among strict-priority queues. There is no implicit queue number-based priority among the strict-priority queues.
  - Weighted random early detection (WRED)—Unlike other ACX Series routers, ACX5000 routers support configuring drop profiles (to specify different drop behavior) for loss priorities low, medium-high, and high for both TCP and non-TCP protocols.
- **Support for unified forwarding table**—Starting in Release 15.1X54-D20, Junos OS for ACX5000 Universal Access Routers supports the use of a unified forwarding table to optimize address storage. Using this feature, you can control the allocation of forwarding table memory available to store the following entries:

- MAC addresses
- Layer 3 host entries
- Longest prefix match (LPM) table entries

You can use five predefined profiles (**l2-profile-one, l2-profile-two, l2-profile-three, l3-profile, lpm-profile**) to allocate the table memory space differently for each of these entries. You configure and select the profiles that best suits your network environment needs.

In addition to interface statistics, the following statistics are also supported on ACX5000 routers with increased scale:

- Logical interface statistics
- MPLS unicast next hops statistics
- Multicast route statistics

- **Connectivity fault management (CFM) support for maintenance association intermediate points (MIPs)**—Starting in Release 15.1X54-D20, Junos OS for ACX5000 Universal Access Routers supports CFM for MIPs. A MIP provides monitoring capability of intermediate points within a service.
- **Filter support on loopback interface**—Starting in Release 15.1X54-D20, Junos OS for ACX5000 Universal Access Routers provides support for applying a firewall filter on the loopback interface (**lo0**). Filters on the loopback interface are applied to protect the Routing Engine from various attacks.
- **Support for RFC 2544 reflector**—Starting in Release 15.1X54-D20, Junos OS for ACX5000 Universal Access Routers supports the Layer 1 reflector functionality for performing RFC 2544 benchmarking tests. The device that is configured as a reflector reflects or sends back the packets as they are received on the pseudowire. This feature does not support any packet modification functionality. To enable your ACX Series router to reflect the packets back to the initiator, you can configure any unused physical port on the router as the reflector port. Use the **reflector-port** statement at the **[edit services rpm rfc2544-benchmarking tests *test-name*]** hierarchy level to configure the reflector port.
- **Enhancement for logical tunnel interface with Ethernet VPLS and VLAN VPLS encapsulations**—Starting in Release 15.1X54-D20, Junos OS for ACX5000 Universal Access Routers supports logical tunnel interfaces with Ethernet VPLS and VLAN VPLS encapsulations. These encapsulations are required for configuring hierarchial VPLS.
- **Support for transparent clock**—Starting in Release 15.1X54-D20, Junos OS for ACX5000 Universal Access Routers supports the transparent clock functionality. Transparent clocks measure packet residence time for Precision Time Protocol (PTP) events. The packet delay variation experienced by PTP packets can be attributed to queuing and buffering delays inside the router. ACX5000 routers support only end-to-end transparent clock functionality as defined in the IEEE 1588 standard. The transparent clock functionality works for both PTP over IP (PTPoIP), and PTP over Ethernet (PTPoE).

To configure the transparent clock functionality, you must include the **e2e-transparent** statement at the **[edit protocol ptp]** hierarchy level.

Use the **show ptp global-information** command to check the status of the transparent clock functionality configured on the router.

- **Support for dynamic ternary content addressable memory (TCAM)**—Starting in Release 15.1X54-D20, Junos OS for ACX5000 Universal Access Routers supports the dynamic allocation of TCAM space that efficiently allocates the available TCAM resources for various filter applications. In the dynamic TCAM model, various filter applications (such as IPv4 firewall, bridge firewall, CFM filters, and so on) can optimally utilize the available TCAM resources as and when required. Dynamic TCAM resource allocation is usage driven and is dynamically allocated for filter applications on a need basis. When a filter application no longer uses the TCAM space, the resource is freed and available for use by other applications. This dynamic TCAM model caters to a higher scale of TCAM resource utilization based on an application's demand.

Related Documentation

- Known Limitations in Junos OS Release 15.1X54-D20 for ACX Series Routers on page 7
- Upgrade and Downgrade Instructions for Junos OS Release 15.1X54-D20 for ACX Series Routers on page 12

Known Limitations in Junos OS Release 15.1X54-D20 for ACX Series Routers

The following software limitations currently exist in Juniper Networks ACX Series Universal Access Routers. The identifier following the descriptions is the tracking number in the Juniper Networks Problem Report (PR) tracking system.

Interfaces and Chassis

- The counters for oversized frames and jabber frames does not increment properly. This happens in the case of a tagged interface for a packet size between 1519 and 1522 bytes. [PR1060169: This is a known limitation.]
- A commit error is not seen while configuring channelization in the following scenario:

  If you configure channelization on a port, the configuration should throw a commit error when the channelization on the port is configured individually and as well as configured as a part of port-range as shown below:

```
[edit chassis]
fpc 0 {
  pic 0 {
    port 53 {
      channel-speed 10g;
    }
    port 54 {
      channel-speed 10g;
    }
    port-range 53 54 {
      channel-speed 10g;
    }
  }
}
```

[PR1051245: This is a known limitation.]

Class of Service

- When the **show class-of-service scheduler-map** CLI command is run, the output does not show the drop profiles attached to a non-TCP traffic. Drop profiles attached to only TCP traffic are displayed. [PR1048408: This is a known limitation.]
- Weighted random early detection (WRED) profiles do not have any effect on multicast, unknown unicast, broadcast, and mirrored packets. WRED profiles affect only queue tail drops.
- ACX5048 and ACX5096 routers do not support DSCP classification for MPLS packets received from core on routing instance configured with BGP for per-prefix-label.
- On ACX5048 and ACX5096 routers, whenever scheduler parameters are changed while the traffic is flowing with shaping applied, the entire traffic on the egress physical interface is blocked temporarily.

VPN

- When the router restores from fast reroute (FRR) link failures, less than 1 millisecond traffic loss is seen on few Layer 3 VPNs. [PR1017210: This is a known limitation.]

VPLS

- When the **show vpls statistics** CLI command is run, the statistics for various output fields show value as 0. [PR1057240: This is a known limitation.]
- The **ping vpls** CLI command is not supported on ACX5048 and ACX5096 routers. [PR1065202: This is a known limitation.]
- The shaping rate for VPLS flood cases with bidirectional traffic does not work correctly. [PR1078664: This is a known limitation.]
- When a VLAN tagged traffic is sent on a logical interface with Ethernet-VPLS encapsulation configured, only single VLAN tagged traffic is received instead of dual tagged traffic. This occurs when you configure Ethernet-VPLS encapsulation and VLAN-VPLS encapsulation on logical interfaces that are part of a VPLS routing instance configured with vlan-id none. [PR1100255: This is a known limitation.]

Firewall

- When you configure firewall on a logical interface with **native-vlan-id** configured, the configuration might erroneously match the traffic on other logical interfaces on the same physical interface. [PR1048860: This is a known limitation.]

Operations Administration and Maintenance

- Customer edge (CE-to-CE) link fault management (LFM) session does not come up on circuit cross-connect (CCC) logical interface configured with **native-vlan** and input (push-pop) VLAN map operation. [PR1044997: This is a known limitation.]

- When a bridge domain interface is configured with explicit VLAN map (input or output), maintenance association intermediate point (MIP) cannot be configured. [PR1058393: This is a known limitation.]
- If you make any changes to the COS configuration after the CFM (OAM) session is up then those changes will not have any effect on the CCM (OAM) packets generated from the device. The workaround is to deactivate and activate the OAM protocol for the COS configuration changes to take effect. [PR1054908: This is a known limitation.]

Transparent Clock

- When transparent clock is configured in the router and when the router resumes after reboot, the transparent clock status is shown as **ENABLED** and **ACTIVE**, instead of **ENABLED** and **INACTIVE**. This condition is transient and has no functional impact.

```
user@host# run show ptp global-information
PTP Global Configuration:
Transparent-clock-config : ENABLED
Transparent-clock-status : ACTIVE
```

  [PR1051500: This is a known limitation.]
- When you run the **restart clksyncd-service** CLI command, incorrect correction field values are seen when transparent clock is **INACTIVE**. This does not have any functional impact. [PR1067583: This is a known limitation.]
- When transparent clock is in **ENABLED** or **DISABLED** state and if you try to add, delete, or modify any of the interfaces, the transparent clock **ENABLED** or **DISABLED** messages are seen in the packet forwarding engine (PFE). This does not have any functional impact. [PR1069516: This is a known limitation.]

Messages

- The following error message is seen whenever the PFE is restarted:

```
LOG: Err] PORTDEV: OPTIC State changed for port
```

  This does not have any functional impact. [PR1066899]
- The following error message is seen in the PFE when **firewall family ccc filter** scale is reached:

```
LOG: Info] ipc_pipe_write_wait(): Failed! (broken pipe)
```

  This does not have any functional impact. [PR1098169]
- The following error message is seen in the PFE when you delete the pseudowire with scale:

```
LOG: Err] acx_bcm_mpls_nni_port_delete: port stat ctr get failed VPN:12295
mpls_gport:402657148 (-7:Entry not found)
```

  This does not have any functional impact. [PR1096405]
- The following error message is seen when multiple MPLS service scale configuration is replaced with another multiple MPLS service scale configuration:

```
LOG: Err] ACX_NH::acx_nh_mpls_tunnel_uninstall(),1142:acx_nh_mpls_tunnel_uninstall:
 BCM L3 Egress destroy object failed for (-10:Operation still running),
BCM NH Obj: 0x1875a
```

This does not have any functional impact. [PR1093326]

- An error message is seen when aggregated Ethernet interface configuration is removed from the VPLS service. This does not have any functional impact. [PR1090923]
- The following messages are seen when the MPLS label-switched path (LSP) configurations are removed at scale:

  ```
  LIBJSNMP_NS_LOG_NOTICE: NOTICE: Dropping Trap - Defer send disabled
  ```

  This does not have any functional impact. [PR1077913]

Related Documentation

- New Features in Junos OS Release 15.1X54–D20 for ACX Series Routers on page 3
- Upgrade and Downgrade Instructions for Junos OS Release 15.1X54-D20 for ACX Series Routers on page 12

Errata and Changes in Documentation for Junos OS Release 15.1X54-D20 for ACX Series Routers

Errata

- Support for multifield classifiers is incorrectly omitted from the ACX Series documentation. Multifield classifiers allow fine grained classification by examination of multiple fields in the packet header—for example, the source and destination address of the packet, and the source and destination port numbers of the packet. A multifield classifier typically matches one or more of the six packet header fields: destination address, source address, IP protocol, source port, destination port, and DSCP. Multifiled classifiers are used when a simple BA classifier is insufficient to classify a packet.

  In the Juniper Networks Junos operating system (Junos OS), you configure a multifield classifier with a firewall filter and its associated match conditions. This enables you to use any filter match criteria to locate packets that require classification. From a CoS perspective, multifield classifiers (or firewall filter rules) provide the following services:

  - Classify packets to a forwarding class and loss priority. The forwarding class determines the output queue. The loss priority is used by schedulers in conjunction with the random early discard (RED) algorithm to control packet discard during periods of congestion.
  - Police traffic to a specific bandwidth and burst size. Packets exceeding the policer limits can be discarded, or can be assigned to a different forwarding class, to a different loss priority, or to both.

NOTE: You police traffic on input to conform to established CoS parameters, setting loss handling and forwarding class assignments as needed. You shape traffic on output to make sure that router resources, especially bandwidth, are distributed fairly. However, input policing and output shaping are two different CoS processes, each with their own configuration statements.

To configure multifield classifiers, include the following statements at the [**edit firewall**] hierarchy level:

```
[edit firewall]
family family-name {
     filter filter-name {
          term term-name {
               from {
                    match-conditions;
               }
               then {
                    dscp 0;
                    forwarding-class class-name;
                    loss-priority (high | low);
               }
          }
     }
     simple-filter filter-name {
          term term-name {
               from {
                    match-conditions;
               }
               then {
                    forwarding-class class-name;
                    loss-priority (high | low | medium);
               }
          }
     }
}
```

The minimum configuration required to define a multifield classifier is the following:

```
[edit firewall]
family family-name {
     simple-filter filter-name {
          term term-name {
               then {
                    forwarding-class class-name;
                    loss-priority (high | low | medium);
               }
          }
     }
}
```

After defining the multified classifier, you can apply the multified classifier to an individual interface with the following configuration:

```
[edit interfaces]
```

```
interface-name{
     unit logical-unit-number{
          family family {
               filter {
                    input filter-name;
               }
          }
     }
}
```

[ACX Series Universal Access Router Configuration Guide]

- The *Configuring Load Balancing Based on MPLS Labels on ACX Series Routers* topic fails to explicitly state that load balancing using MPLS labels is supported only for aggregated Ethernet (ae) or LAG interfaces and not for equal-cost multipath (ECMP) links. To load-balance based on the MPLS label information for LAG interfaces, configure the **family mpls** statement at the **[edit forwarding-options hash-key]** hierarchy level.

  [*ACX Series Universal Access Router Configuration Guide*]

Changes to the Junos OS ACX Documentation

There are no changes to the ACX Documentation in Junos OS Release 15.1X54-D20.

Related Documentation

- New Features in Junos OS Release 15.1X54–D20 for ACX Series Routers on page 3
- Known Limitations in Junos OS Release 15.1X54-D20 for ACX Series Routers on page 7
- Upgrade and Downgrade Instructions for Junos OS Release 15.1X54-D20 for ACX Series Routers on page 12

Upgrade and Downgrade Instructions for Junos OS Release 15.1X54-D20 for ACX Series Routers

This section discusses the following topics:

- Basic Procedure for Upgrading to Release 15.1X54-D20 on page 12
- Upgrade and Downgrade Support Policy for Junos OS Releases on page 15

Basic Procedure for Upgrading to Release 15.1X54-D20

When upgrading or downgrading Junos OS, always use the **jinstall** package. Use other packages (such as the **jbundle** package) only when so instructed by a Juniper Networks support representative. For information about the contents of the **jinstall** package and details of the installation process, see the *Installation and Upgrade Guide*.

NOTE: Before upgrading, back up the file system and the currently active Junos configuration so that you can recover to a known, stable environment in case the upgrade is unsuccessful. Issue the following command:

```
user@host> request system snapshot
```

The installation process rebuilds the file system and completely reinstalls Junos OS. Configuration information from the previous software installation is retained, but the contents of log files might be erased. Stored files on the routing platform, such as configuration templates and shell scripts (the only exceptions are the **juniper.conf** and **ssh** files), might be removed. To preserve the stored files, copy them to another system before upgrading or downgrading the routing platform. For more information, see *Understanding System Snapshot on an ACX Series Router*.

On ACX5000 series router, you can take a snapshot of the existing Junos OS by inserting an external USB storage device and executing the **request system snapshot slice alternate** command. This command takes a snapshot of the current running Junos OS on to the external USB storage device.

The download and installation process for Junos OS Release 15.1X54-D20 is different from previous Junos OS releases.

1. Using a Web browser, navigate to the **All Junos Platforms** software download URL on the Juniper Networks web page:

   http://www.juniper.net/support/downloads/

2. Select the name of the Junos platform for the software that you want to download.
3. Select the release number (the number of the software version that you want to download) from the **Release** drop-down list to the right of the Download Software page.
4. Select the **Software** tab.
5. In the **Install Package** section of the **Software** tab, 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 Juniper Networks representatives.
7. Review and accept the End User License Agreement.
8. Download the software to a local host.
9. Copy the software to the routing platform or to your internal software distribution site.
10. Install the new **jinstall** package on the routing platform.

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.

Customers in the United States and Canada use the following command:

```
user@host> request system software add validate reboot
source/jinstall-acx5k-15.1X54-D20.7-domestic-signed.tgz force-host
```

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

- ***/pathname***—For a software package that is installed from a local directory on the router.
- For software packages that are downloaded and installed from a remote location:
  - **ftp://*hostname/pathname***
  - **http://*hostname/pathname***
  - **scp://*hostname/pathname*** (available only for Canada and U.S. version)

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

Adding the **reboot** command reboots the router after the upgrade is validated and installed. When the reboot is complete, the router displays the login prompt. The loading process can take 5 to 10 minutes.

Rebooting occurs only if the upgrade is successful.

NOTE: **After you install a Junos OS Release 15.1X54-D20 jinstall package, you cannot issue the request system software rollback command to return to the previously installed software. Instead you must issue the request system software add validate command and specify the jinstall package that corresponds to the previously installed software.**

Upgrade and Downgrade Support Policy for Junos OS Releases

Support for upgrades and downgrades that span more than three Junos OS releases at a time is not provided, except for releases that are designated as Extended End-of-Life (EEOL) releases. EEOL releases provide direct upgrade and downgrade paths—you can upgrade directly from one EEOL release to the next EEOL release even though EEOL releases generally occur in increments beyond three releases.

You can upgrade or downgrade to the EEOL release that occurs directly before or after the currently installed EEOL release, or to two EEOL releases before or after. For example, Junos OS Releases 10.0, 10.4, and 11.4 are EEOL releases. You can upgrade from Junos OS Release 10.0 to Release 10.4 or even from Junos OS Release 10.0 to Release 11.4. However, you cannot upgrade directly from a non-EEOL release that is more than three releases ahead or behind. For example, you cannot directly upgrade from Junos OS Release 10.3 (a non-EEOL release) to Junos OS Release 11.4 or directly downgrade from Junos OS Release 11.4 to Junos OS Release 10.3.

To upgrade or downgrade from a non-EEOL release to a release more than three releases before or after, first upgrade to the next EEOL release and then upgrade or downgrade from that EEOL release to your target release.

For more information on EEOL releases and to review a list of EEOL releases, see http://www.juniper.net/support/eol/junos.html.

Related Documentation

- New Features in Junos OS Release 15.1X54–D20 for ACX Series Routers on page 3
- Known Limitations in Junos OS Release 15.1X54-D20 for ACX Series Routers on page 7

Junos OS Documentation and Release Notes

For a list of related Junos OS documentation, see http://www.juniper.net/techpubs/software/junos/.

If the information in the latest release notes differs from the information in the documentation, follow the *Junos OS Release Notes*.

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

Juniper Networks supports a technical book program to publish books by Juniper Networks engineers and subject matter experts with book publishers around the world. These books go beyond the technical documentation to explore the nuances of network architecture, deployment, and administration using the Junos operating system (Junos OS) and Juniper Networks devices. In addition, the Juniper Networks Technical Library, published in conjunction with O'Reilly Media, explores improving network security, reliability, and availability using Junos OS configuration techniques. All the books are for sale at technical bookstores and book outlets around the world. The current list can be viewed at http://www.juniper.net/books.

Documentation Feedback

We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation. You can send your comments to techpubs-comments@juniper.net, or fill out the documentation feedback form at https://www.juniper.net/cgi-bin/docbugreport/. If you are using e-mail, be sure to include the following information with your comments:

- Document name
- Document part number
- Page number
- Software release version

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 JNASC support contract, or are covered under warranty, and need postsales technical support, you can access our tools and resources online or open a case with JTAC.

- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the JTAC User Guide located at http://www.juniper.net/customers/support/downloads/710059.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: http://www.juniper.net/customers/support/
- Search for known bugs: http://www2.juniper.net/kb/
- Find product documentation: http://www.juniper.net/techpubs/
- Find solutions and answer questions using our Knowledge Base: http://kb.juniper.net/
- Download the latest versions of software and review release notes: http://www.juniper.net/customers/csc/software/
- Search technical bulletins for relevant hardware and software notifications: https://www.juniper.net/alerts/
- Join and participate in the Juniper Networks Community Forum: http://www.juniper.net/company/communities/
- Open a case online in the CSC Case Management tool: http://www.juniper.net/cm/

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

Opening a Case with JTAC

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

- Use the Case Management tool in the CSC at http://www.juniper.net/cm/ .
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, visit us at http://www.juniper.net/support/requesting-support.html.

If you are reporting a hardware or software problem, issue the following command from the CLI before contacting support:

`user@host>` **request support information** | **save** *filename*

To provide a core file to Juniper Networks for analysis, compress the file with the **gzip** utility, rename the file to include your company name, and copy it to **ftp.juniper.net:pub/incoming**. Then send the filename, along with software version information (the output of the **show version** command) and the configuration, to **support@juniper.net**. For documentation issues, fill out the bug report form located at https://www.juniper.net/cgi-bin/docbugreport/.

Revision History

10 August, 2015—Revision 1, Junos OS Release 15.1X54-D20 – ACX Series Routers.