

Contrail Release 3.2.3 Release Notes

Release 3.2.3
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Introduction

Juniper Networks Contrail is an open, standards-based software solution that delivers network virtualization and service automation for federated cloud networks. It provides self-service provisioning, improves network troubleshooting and diagnostics, and enables service chaining for dynamic application environments across enterprise virtual private cloud (VPC), managed Infrastructure as a Service (IaaS), and Networks Functions Virtualization (NFV) use cases.

These release notes accompany Release 3.2.3 of Juniper Networks Contrail. They describe new features, limitations, and known problems.

These release notes are displayed on the Juniper Networks Contrail Documentation Web page at http://www.juniper.net/techpubs/en_US/contrail3.2/information-products/topic-collections/release-notes/index.html.

New and Changed Features

The features and enhancements listed in this section are new or changed as of Contrail Release 3.2. A brief description of each new feature is included.

- [New and Changed Features in Contrail Release 3.2.3 on page 3](#)
- [New and Changed Features in Contrail Release 3.2.2 on page 3](#)
- [New and Changed Features in Contrail Release 3.2.1 on page 4](#)
- [New and Changed Features in Contrail Release 3.2 on page 4](#)

New and Changed Features in Contrail Release 3.2.3

The features listed in this section are new as of Contrail Release 3.2.3.

New Driver-Support

Contrail Release 3.2.3 supports the following drivers:

- i40e driver for Intel Ethernet Network Adapter XXV710 cards
- bnxt driver for Broadcom 25G NICs

Support for CentOS 7.3

Contrail Release 3.2.3 is supported on CentOS 7.3 for OpenStack Liberty and OpenStack Mitaka platforms.

New and Changed Features in Contrail Release 3.2.2

The features listed in this section are new as of Contrail Release 3.2.2.

Support for Red Hat OpenStack Platform 8

Contrail Release 3.2.2 is supported on OpenStack Liberty RHOSP8 release.

For information on Contrail bring up on RHOSP8 using Red Hat OpenStack Platform Director, see:

- <https://github.com/Juniper/contrail-tripleo-heat-templates/blob/master/Juniper%20Test%20Env%20for%20Contrail%20BOSP%20Deployments%20.pdf>
- https://github.com/Juniper/contrail-tripleo-heat-templates/blob/master/RHT_JNPR%20-%20OSP8%20Contrail%203.0.pdf

Support for Red Hat OpenStack Platform 10

Contrail Release 3.2.2 is supported on OpenStack Newton RHOSP10 release. For more information, see [Contrail bring up on RHOSP10 using Red Hat OpenStack Platform Director](#).

New and Changed Features in Contrail Release 3.2.1

The feature listed in this section is new as of Contrail Release 3.2.1.

Support for Ubuntu 14.04.5 and Kernel 3.13.0-106

Contrail Release 3.2.1 is qualified on Ubuntu 14.04.5 and kernel version 3.13.0-106.

New and Changed Features in Contrail Release 3.2

The feature listed in this section is new as of Contrail Release 3.2.

BGP Persistence with Graceful Restart/Long-lived Graceful Restart, Beta

Graceful restart and long-lived graceful restart features are supported for the control node in Contrail Release 3.2. The graceful restart features can be used to ensure that traffic is not affected by temporary outage of processes.

In Release 3.2, this feature is a Beta version, focused on graceful restart of the Contrail control node. Graceful restart of vrouter agents will be available in a future release.

See [Configuring Graceful Restart for BGP Persistence](#).

In-Service Software Upgrade (ISSU) Support

You can use an in-service software upgrade to upgrade Contrail networking components with minimal traffic disruption during the upgrade.

See [Contrail In-Service Software Upgrade](#)

Mirroring Enhancements

Parameter options are added to mirroring to control the addition of a Juniper header to mirrored packets and to determine whether the next hop is dynamic or static.

See [Mirroring Enhancements](#).

Multiqueue Virtio Interfaces in Virtual Machines

Contrail Release 3.2 with OpenStack Mitaka adds support for multiple queues with the DPDK-based vRouter. Virtio is a Linux platform for I/O virtualization, providing a common set of I/O virtualization drivers. Multiqueue virtio is an approach that enables the

processing of packet sending and receiving to be scaled to the number of available virtual CPUs (vCPUs) of a guest, through the use of multiple queues.

See [Multiqueue Virtio Interfaces in Virtual Machines](#).

QoS Queuing

Contrail Release 3.2 supports QoS vSW traffic classification, copy of IP precedence bits, and QoS queuing.

See [Quality of Service in Contrail](#).

Role- and Resource-Based Access Control

Contrail Release 3.2 provides role- and resource-based access control (RBAC) with configuration -level access control.

See [Role- and Resource-Based Access Control](#).

Using Gateway Mode with vCenter

You can use the gateway mode with active-backup vRouter when using Contrail with VMware vCenter. The VMware virtual machines are the remote instances, and traffic can be configured to arrive VLAN-tagged at the gateway node.

See [Using Gateway Mode to Support Remote Instances](#).

Supported Platforms

[Table 1 on page 6](#) lists the operating system versions and the corresponding Linux or Ubuntu kernel versions supported by Contrail Release 3.2 on OpenStack Kilo, Liberty, and Mitaka releases.

Table 1: Supported Platforms

Contrail Release	OpenStack Release	Operating System and Kernel Versions
Contrail Release 3.2.3	OpenStack Kilo	<ul style="list-style-type: none"> CentOS 7.1—Linux kernel version 3.10.0-229 Ubuntu 14.04.5—Linux kernel version 3.13.0-106-generic Red Hat 7.1—Linux kernel version 3.10.0-229 VMware vCenter 5.5, 6.0—Ubuntu 14.04.4 kernel version 3.13.0-106-generic
	OpenStack Liberty	<ul style="list-style-type: none"> CentOS 7.3—Linux kernel version 3.10.0-514.6.2 Ubuntu 14.04.5—Linux kernel version 3.13.0-106-generic Red Hat 7.2—Linux kernel version 3.10.0-327.10.1 Red Hat 7.3—Linux kernel version 3.10.0-514.6.2 VMware vCenter 5.5, 6.0—Ubuntu 14.04.4 kernel version 3.13.0-106-generic
	OpenStack Mitaka	<ul style="list-style-type: none"> CentOS 7.3—Linux kernel version 3.10.0-514.6.2 Ubuntu 14.04.5—Linux kernel version 3.13.0-106-generic Red Hat 7.2—Linux kernel version 3.10.0-327.10.1
	OpenStack Newton	<ul style="list-style-type: none"> Red Hat 7.3—Linux kernel version 3.10.0-514.6.2
Contrail Release 3.2.2	OpenStack Kilo	<ul style="list-style-type: none"> CentOS 7.1—Linux kernel version 3.10.0-229 Ubuntu 14.04.5—Linux kernel version 3.13.0-106-generic Red Hat 7.1—Linux kernel version 3.10.0-229 VMware vCenter 5.5, 6.0—Ubuntu 14.04.4 kernel version 3.13.0-106-generic
	OpenStack Liberty	<ul style="list-style-type: none"> CentOS 7.2—Linux kernel version 3.10.0-327.10.1 Ubuntu 14.04.5—Linux kernel version 3.13.0-106-generic Red Hat 7.2—Linux kernel version 3.10.0-327.10.1 Red Hat 7.3—Linux kernel version 3.10.0-514.6.2 VMware vCenter 5.5, 6.0—Ubuntu 14.04.4 kernel version 3.13.0-106-generic
	OpenStack Mitaka	<ul style="list-style-type: none"> CentOS 7.2—Linux kernel version 3.10.0-327.10.1 Ubuntu 14.04.5—Linux kernel version 3.13.0-106-generic Red Hat 7.2—Linux kernel version 3.10.0-327.10.1
	OpenStack Newton	<ul style="list-style-type: none"> Red Hat 7.3—Linux kernel version 3.10.0-514.6.2

Table 1: Supported Platforms (*continued*)

Contrail Release	OpenStack Release	Operating System and Kernel Versions
Contrail Release 3.2.1	OpenStack Kilo	<ul style="list-style-type: none"> CentOS 7.1—Linux kernel version 3.10.0-229 Ubuntu 14.04.5—Linux kernel version 3.13.0-106-generic Red Hat 7.1—Linux kernel version 3.10.0-229 VMware vCenter 5.5, 6.0—Ubuntu 14.04.4 kernel version 3.13.0-106-generic
	OpenStack Liberty	<ul style="list-style-type: none"> CentOS 7.2—Linux kernel version 3.10.0-327.10.1 Ubuntu 14.04.5—Linux kernel version 3.13.0-106-generic Red Hat 7.2—Linux kernel version 3.10.0-327.10.1 VMware vCenter 5.5, 6.0—Ubuntu 14.04.4 kernel version 3.13.0-106-generic
	OpenStack Mitaka	<ul style="list-style-type: none"> CentOS 7.2—Linux kernel version 3.10.0-327.10.1 Ubuntu 14.04.5—Linux kernel version 3.13.0-106-generic Red Hat 7.2—Linux kernel version 3.10.0-327.10.1
Contrail Release 3.2	OpenStack Kilo	<ul style="list-style-type: none"> CentOS 7.1—Linux Kernel version- 3.10.0-229 Ubuntu 14.04.4—Linux kernel versions 3.13.0-85-generic and 4.4.0-34-generic Red Hat 7.1—Linux Kernel version- 3.10.0-229 VMware vCenter 5.5, 6.0—Ubuntu 14.04.4 kernel version 3.13.0-85-generic
	OpenStack Liberty	<ul style="list-style-type: none"> CentOS 7.2—Linux kernel version 3.10.0-327.10.1 Ubuntu 14.04.4—Linux kernel versions 3.13.0-85-generic and 4.4.0-34-generic Red Hat 7.2—Linux kernel version 3.10.0-327.10.1 VMware vCenter 5.5, 6.0—Ubuntu 14.04.4 kernel version 3.13.0-85-generic
	OpenStack Mitaka	<ul style="list-style-type: none"> CentOS 7.2—Linux kernel version 3.10.0-327.10.1 Ubuntu 14.04.4—Linux kernel version 3.13.0-85-generic



NOTE: If the stock kernel version of your Ubuntu system is older than the required version, the following Fabric task can be used to upgrade the kernel version in all nodes after initial package installation:

```
cd /opt/contrail/utils; fab upgrade_kernel_all
```

Known Behavior

This section lists known limitations with this release. Bug numbers are listed and can be researched in [Launchpad.net](https://bugs.launchpad.net/juniperopenstack) at <https://bugs.launchpad.net/juniperopenstack>.

- [Known Behavior in Contrail Release 3.2.3 on page 8](#)
- [Known Behavior in Contrail Release 3.2.2 on page 8](#)
- [Known Behavior in Contrail Release 3.2.1 on page 9](#)
- [Known Behavior in Contrail Release 3.2 on page 9](#)

Known Behavior in Contrail Release 3.2.3

- 1648728 On vCenter-only, upon fresh installation with kernel 4.4.0-34, compute VM/vRouter may be down.
- 1651258 On CentOS 7.2 HA cluster, sometimes **rabbitmq** fails after provisioning. As a workaround, re-cluster **rabbitmq** using the **fab setup_rabbitmq_cluster:force=yes** command.
- 1664452 Ceilometer sample-list and meter-list do not work on OpenStack Liberty.
- 1673239 On a RHOSP10 cluster provisioned with Red Hat OpenStack Platform Director, the LBaaS service fails to come up if Selinux is enabled on the compute nodes. As a workaround, disable Selinux on the compute nodes.
- 1675224 VMs in non-HA cluster in SHUTOFF are in shutdown state after upgrade. As a workaround, set **resume_guests_state_on_host_boot = True** in the **nova.conf** file of the compute node, for the guest VMs to be resumed.

Known Behavior in Contrail Release 3.2.2

- 1648728 On vCenter-only, upon fresh installation with kernel 4.4.0-34, compute VM/vRouter may be down.
- 1651258 On CentOS 7.2 HA cluster, sometimes **rabbitmq** fails after provisioning. As a workaround, re-cluster **rabbitmq** using the **fab setup_rabbitmq_cluster:force=yes** command.
- 1668271 Server Manager: Unable to log in to virtual machine console with error in nova-novncproxy.
- 1668510 For OpenStack Kilo-based deployments, while provisioning Contrail using Server Manager, disable Ceilometer provisioning. After contrail provisioning is done, if Ceilometer service is required to be running, bring up Ceilometer service separately by following OpenStack Ceilometer bring-up procedure.
- 1673239 On a RHOSP10 cluster provisioned with Red Hat OpenStack Platform Director, the LBaaS service fails to come up if Selinux is enabled on the compute nodes. As a workaround, disable Selinux on the compute nodes.

Known Behavior in Contrail Release 3.2.1

- 1623695 In case of RBAC enabled clusters, user should create network-ipam in their own tenant configuration instead of using the default network-ipam for which the user doesn't have permissions.
- 1624148 In case of RBAC enabled clusters, service instance automatically created by the system on behalf of a user will not be visible in the UI.
- 1650420 In case of RBAC enabled clusters, objects created through LBaaS plugin are created with Neutron ownership.
- 1651258 On CentOS 7.2 HA cluster, sometimes **rabbitmq** fails after provisioning. As a workaround, re-cluster **rabbitmq** using the **fab setup_rabbitmq_cluster:force=yes** command.
- 1661426 After a Contrail software upgrade, if an upgrade of the Contrail storage packages fails, the Contrail WebUI doesn't display, because the versions of WebUI and storage are not compatible.

The workaround:

1. Comment out the following 3 lines:

`/usr/src/contrail/contrail-web-core/config/config.global.js`
 2. Restart **supervisor-webui**. WebUI should now display, because it is not trying to display an incompatible version of storage.
 3. Perform the storage upgrade, then uncomment the 3 lines, and restart **supervisor-webui**.
- 1663408 Underlay-overlay correlation: Multiple physical switches show the same vRouter.
 - 1664932 Analyser Wireshark does not decode Juniper header.
 - 1668510 For OpenStack Kilo-based deployments, while provisioning Contrail using Server Manager, disable Ceilometer provisioning. After contrail provisioning is done, if Ceilometer service is required to be running, bring up Ceilometer service separately by following OpenStack Ceilometer bring-up procedure.

Known Behavior in Contrail Release 3.2

- 1623695 In case of RBAC enabled clusters, user should create network-ipam in their own tenant configuration instead of using the default network-ipam for which the user doesn't have permissions.
- 1624148 In case of RBAC enabled clusters, service instance automatically created by the system on behalf of a user will not be visible in the UI.
- 1650420 In case of RBAC enabled clusters, objects created through LBaaS plugin are created with Neutron ownership.
- 1650709 DPDK is not supported in R3.2 for 4.4.0-34 Kernel.

- 1651258 On CentOS 7.2 HA cluster, sometimes **rabbitmq** fails after provisioning. As a workaround, re-cluster **rabbitmq** using the **fab setup_rabbitmq_cluster:force=yes** command.
- 1657393 Routes are not leaked when policy is attached to virtual networks.
- 1661426 After a Contrail software upgrade, if an upgrade of the Contrail storage packages fails, the Contrail WebUI doesn't display, because the versions of WebUI and storage are not compatible.

The workaround:

1. Comment out the following 3 lines:

`/usr/src/contrail/contrail-web-core/config/config.global.js`
 2. Restart **supervisor-webui**. WebUI should now display, because it is not trying to display an incompatible version of storage.
 3. Perform the storage upgrade, then uncomment the 3 lines, and restart **supervisor-webui**.
- 1663408 Underlay-overlay correlation: Multiple physical switches show the same vRouter .

Resolved Issues

This section lists limitations that are resolved with this release.

- [Resolved Issues in Contrail Release 3.2.3 on page 10](#)
- [Resolved Issues in Contrail Release 3.2.2 on page 10](#)
- [Resolved Issues in Contrail Release 3.2.1 on page 10](#)
- [Resolved Issues in Contrail Release 3.2 on page 11](#)

Resolved Issues in Contrail Release 3.2.3

You can research limitations that are resolved with Contrail Release 3.2.3 in Launchpad at:

<https://launchpad.net/juniperopenstack/+milestone/r3.2.3.0> .

Resolved Issues in Contrail Release 3.2.2

You can research limitations that are resolved with Contrail Release 3.2.2 in Launchpad at:

<https://launchpad.net/juniperopenstack/+milestone/r3.2.2.0> .

Resolved Issues in Contrail Release 3.2.1

You can research limitations that are resolved with Contrail Release 3.2.1 in Launchpad at:

<https://launchpad.net/juniperopenstack/+milestone/r3.2.1.0> .

Resolved Issues in Contrail Release 3.2

You can research limitations that are resolved with Contrail Release 3.2 in Launchpad at:

<https://launchpad.net/juniperopenstack/+milestone/r3.2.0.0-fcs> .

Deprecated Items

The following features are scheduled to be changed in the current or forthcoming release (4.x) of Contrail. This information is provided to help your future planning.

- Service Chain v1 is deprecated in Contrail Release 3.2.
- In a forthcoming release (4.x), the Contrail controller will be distributed as a Docker container. The controller host must have Docker installed.
- In a forthcoming release (4.x), Contrail Discovery Services will be removed. Any Discovery APIs will cease to work.

Upgrading Contrail Software

Use the following procedure to upgrade an installation of Contrail software from one release to a more recent release. This procedure is valid for upgrading Contrail Release 3.0 and later to Contrail Release 3.2.



NOTE: If you are installing Contrail for the first time, refer to the full documentation and installation instructions in *Installing the Operating System and Contrail Packages*.

Instructions are given for both CentOS and Ubuntu versions. The Ubuntu versions supported for upgrading are Ubuntu 14.04.4 and Ubuntu 14.04.5.

To upgrade Contrail software from Contrail Releases 3.0 and later to Release 3.2:

1. Download the **contrail-install-packages-x.x.x.x-xxnoarch.rpm | deb** file from <http://www.juniper.net/support/downloads/?p=contrail#sw> and copy it to the **/tmp** directory on the config node, as follows:

CentOS : `scp <id@server>:/path/to/contrail-install-packages-x.x.x.x-xxnoarch.rpm /tmp`

Ubuntu : `scp <id@server>:/path/to/contrail-install-packages-x.x.x.x-xx~<openstack_version>_all.deb /tmp`



NOTE: The variables **x.x.x.x-xx** and so on represent the release and build numbers that are present in the name of the installation packages that you download.

2. Install the **contrail-install-packages**, using the correct command for your operating system:

CentOS: `yum localinstall /tmp/contrail-install-packages-x.x.x.x-xx.noarch.rpm`

Ubuntu: `dpkg -i /tmp/contrail-install-packages_x.x.x.x-xx~_all.deb`

3. Set up the local repository by running the **setup.sh**:

`cd /opt/contrail/contrail_packages; ./setup.sh`

4. Ensure that the **testbed.py** file that was used to set up the cluster with Contrail is intact in the **/opt/contrail/utils/fabfile/testbeds/** directory.

See *Setting Up the Testbed Definitions File*.

5. In release packages prior to Contrail Release 3.0, the packaged Cassandra version is 1.2.11. In the 3.0 release, the packaged Cassandra version is 2.1.9. Upgrading Cassandra from 1.2.11 to 2.1.9 directly is not supported by Cassandra. For more information, refer to [DataStax Upgrade Guide, Cassandra 2.1.x restrictions](#).

The **fab upgrade_contrail** command sequence enables upgrading Cassandra from 1.2.11 to 2.1.9 by performing necessary intermediate upgrades. Consequently, during the Contrail upgrade procedure (**fab upgrade_contrail**), the Cassandra SSTables are upgraded, which takes a long time if the Cassandra data is huge (usually because the Contrail Analytics keyspace is huge).

There is an option to minimize upgrade down time by dropping the Contrail Analytics keyspace before the upgrade, by issuing the following fab command:

```
fab drop_analytics_keyspace
```

6. Upgrade the software, using the correct set of commands to match your operating system and vRouter, as described in the following:

Change directory to the **utils** folder:

```
cd /opt/contrail/utils; \
```

Select the correct upgrade procedure from the following to match your operating system and vRouter. In the following, *<from>* refers to the currently installed release number, such as 3.0.2.0, and so on:

CentOS Upgrade Procedure:

```
fab upgrade_contrail:<from>,/tmp/contrail-install-packages-x.x.x.x-xxnoarch.rpm;
```

Ubuntu 14.04 Upgrade, Two Procedures:

There are two different upgrade procedures for the upgrade to Contrail Release 3.2, depending on which vRouter (**3.13.0-X-generic** or **contrail-vrouter-dkms**) is installed in your current setup. Both procedures can use the command **fab upgrade_kernel_all** to upgrade the kernel.

In Contrail Release 3.2, the recommended kernel version for an Ubuntu 14.04-based system is 3.13.0-85-. In Contrail Release 3.2.1, the recommended kernel version for an Ubuntu 14.04-based system is 3.13.0-106.

**Ubuntu 14.04 Upgrade Procedure For a System With
contrail-vrouter-3.13.0-X-generic:**

Use the following upgrade procedure for Contrail systems based on Ubuntu 14.04 without the **contrail-vrouter-3.13.0-85-generic** installed in Contrail Release 3.2 or without the **contrail-vrouter-3.13.0-106-generic** installed in Contrail Release 3.2.1. The command sequence upgrades the kernel version and also reboots the compute nodes when finished.

```
fab
install_pkg_all:/tmp/contrail-install-packages-x.x.x.x-xx~<openstack_version>_all.deb;

fab migrate_compute_kernel;

fab
upgrade_contrail:<from>,/tmp/contrail-install-packages-x.x.x.x-xx~<openstack_version>_all.deb;

fab upgrade_kernel_all;

fab restart_openstack_compute;
```

Ubuntu 14.04 Upgrade Procedure For System with contrail-vrouter-dkms:

Use the following upgrade procedure for Contrail systems based on Ubuntu 14.04 with **contrail-vrouter-dkms** installed. The command sequence upgrades the kernel version and also reboots the compute nodes when finished.

```
fab upgrade_contrail:
<from>,/tmp/contrail-install-packages-x.x.x.x-xx~<openstack_version>_all.deb;
```

All nodes in the cluster can be upgraded to kernel version 3.13.0-85 on Contrail Release 3.2 or to kernel version 3.13.0-106 on Contrail Release 3.2.1, by using the following **fab** command:

```
fab upgrade_kernel_all
```

7. (For Contrail Storage option, only.)

Contrail Storage has its own packages.

To upgrade Contrail Storage, download the file:

```
contrail-storage-packages_x.x.x.x-xx*.deb
```

from <http://www.juniper.net/support/downloads/?p=contrail#sw>

and copy it to the **/tmp** directory on the config node, as follows:

```
Ubuntu: scp <id@server>:/path/to/contrail-storage-packages_x.x.x.x-xx*.deb /tmp
```

Use the following statement to upgrade the software:

```
cd /opt/contrail/utils; \
```

```
Ubuntu: fab
```

```
upgrade_storage:<from>,/tmp/contrail-storage-packages_x.x.x.x-xx~<openstack_version>_all.deb;
```

Additional Steps for CentOS 7.2 Installation

The default kernel version in CentOS 7.2 is 3.10.0-327. The recommended kernel version is 3.10.0-327.10.1. During installation of Contrail on CentOS 7.2, use the following command to change the kernel version to 3.10.0-327.10.1, before using the **install_contrail** command:

```
cd /opt/contrail/Utils; fab upgrade_kernel_all
```

Installing Contrail with Kernel 4.4.0-34 on Ubuntu-14.04.4 Computes

The **upgrade_kernel_all** step while installing Contrail boots the compute kernel to the default kernel of the release. For Contrail Release 3.2, the default kernel is 3.13.0-85. To boot the compute with kernel 4.4.0-34, add “version=4.4.0-34” to the **fab upgrade_kernel_all** command as shown below:

```
fab upgrade_kernel_all:version=4.4.0-34
```

Documentation Feedback

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

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

Requesting Technical Support

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

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

Self-Help Online Tools and Resources

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: <http://kb.juniper.net/InfoCenter/>
- Join and participate in the Juniper Networks Community Forum: <http://www.juniper.net/company/communities/>
- Open a case online in the CSC Case Management tool: <http://www.juniper.net/cm/>

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

Opening a Case with JTAC

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

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

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

Revision History

May 2017—Revision 1, Contrail 3.2.3

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