

# Release Notes for NorthStar Controller

**Release 3.0.0**  
**24 July 2017**

These release notes accompany Juniper Networks NorthStar Controller Release 3.0.0.

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## Introduction

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The Juniper Networks NorthStar Controller is an SDN controller that enables granular visibility and control of IP/MPLS flows in large service provider and enterprise networks. Network operators can use the NorthStar Controller to optimize their network infrastructure through proactive monitoring, planning, and explicit routing of large traffic loads dynamically based on user-defined constraints.

The NorthStar Controller 3.0.0 release is fully supported with Junos OS Release 17.2R1 only.

NorthStar Controller 3.0.0 can be deployed with Junos OS Releases 15.1F6, 16.1R1, and 17.1R1, but the segment routing (SPRING) feature would not be available.

The NorthStar 3.0.0 Analytics features require specific Junos OS Releases to be able to obtain LSP and interface statistics. This is a Junos Telemetry Interface (JTI) dependency. See [Overview of the Junos Telemetry Interface](#) for information on JTI.

NorthStar Controller 3.0.0 can be deployed with Junos OS Releases 14.2R6, 15.1F4, and 15.1R4, but the following features would not be available:

- MD5 authentication for PCEP
- P2MP support
- Administrative group support

By default, the NorthStar Controller Release 3.0 and later requires that the external Junos VM be Release 17.2 or later. If you are using an older version of Junos OS, you can change the NorthStar configuration to support it, but segment routing support will not be available. See the *Known Behavior* section for the configuration steps.

Other Junos OS releases are not supported.



**NOTE:** The Path Computation Element Protocol (PCEP) configuration on the PCC routers does not persist across upgrades when the SDN package is not part of the installation binary. Before upgrading the Junos OS image to this release, save the existing configuration to a file by using the `save` command. After you upgrade the Junos OS image on each PCC router, use the `load override` command to restore the PCEP configuration.

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The NorthStar Controller is supported on the following Juniper platforms: M Series, T Series, MX Series, PTX Series, QFX10008, and ACX5000.

Junos OS supports Internet draft `draft-crabbe-pce-pce-initiated-lsp-03` for the stateful PCE-initiated LSP implementation (M Series, MX Series, PTX Series, T Series, QFX Series, and ACX Series).

## Contents of this Release

Table 1 on page 3 describes the downloadable files.

**Table 1: NorthStar Controller 3.0.0 Downloadable Files**

File	Description
NorthStar Application  NOTE: E-signature also available.	Northstar_Bundle_3_0_0.tar.gz which includes: <ul style="list-style-type: none"> <li>NorthStar-Bundle-3.0.0-20170630_141113_70366_586.x86_64.rpm .rpm installation file for use with:               <ul style="list-style-type: none"> <li>Bare metal server installation in which the JunosVM will be running as a virtual machine using qemu hypervisor via CLI.</li> <li>Installation onto a CentOS 6 VM running on the OpenStack virtualization platform.</li> </ul> </li> <li>Readme file.</li> </ul>
NorthStar JunosVM  NOTE: E-signature also available.	northstar_junosvm.tar.gz which includes: <ul style="list-style-type: none"> <li>northstar_junosvm.img, a Qcow2 formatted file to be run as a virtual machine on OpenStack.                 NOTE: The junos_vm file has no configuration.</li> <li>Sample junos_vm configuration file.</li> <li>Sample HEAT templates for use when installing the NorthStar Controller in an OpenStack virtual environment:               <ul style="list-style-type: none"> <li>northstar300.heat.official for launching the NorthStar Controller in standalone mode without a floating IP address.</li> <li>northstar300.floating.heat.official for launching the NorthStar Controller in standalone mode with a floating IP address.</li> <li>northstar300.3instances.heat.official for launching the NorthStar Controller in cluster mode without a floating IP address.</li> <li>northstar300.3instances.floating.heat.official for launching the NorthStar Controller in cluster mode with a floating IP address.</li> </ul> </li> <li>Readme file.</li> </ul>

## New Features

This section lists new features in the NorthStar Controller Release 3.0.0.

### High Availability Enhancements

Enhancements to NorthStar Controller's high availability (HA) implementation include:

- LSP discrepancy report

During an HA switchover, the PCS server performs LSP reconciliation. Prior to this release, there was no report or status available to users during switchover, so there was no indication as to what happened to the LSPs. The LSP reconciliation now produces the new LSP discrepancy report which identifies LSPs that the PCS server has discovered might require re-provisioning.



**NOTE:** Only PCC-initiated and PCC-delegated LSPs are included in the report.

- Simplification of PCEP configuration on the PCC

Prior to this release, HA configuration on the PCC required that the PCEP session be configured with the physical IP addresses of all the nodes in the cluster. Now, the HA setup menu offers the option to use the cluster virtual IP (VIP) address instead. The default is `physical_ip`.



**NOTE:** All of your PCC sessions must use either physical IP or VIP, and that must also be reflected in the PCEP configuration on the router.

- Fast failure detection between JunosVM and PCC

You can use Bidirectional Forward Detection (BFD) in deploying the NorthStar application to provide faster failure detection as compared to BGP or IGP keepalive and hold timers.

To utilize this feature, configure **`bfd-liveness-detection minimum-interval milliseconds`** on the PCC, and mirror this configuration on the JunosVM. We recommend a value of 1000 ms or higher for each cluster node. Ultimately, the appropriate BFD value depends on your requirements and environment.

- Support for NorthStar to execute custom scripts

One application for NorthStar's ability to execute custom scripts is the extension of NorthStar support for HA VIP into an L3 environment. If NorthStar determines that it is the active node, it executes the scripts that reside in the `post_active` directory. Similarly, if NorthStar is a backup node, it executes the scripts that reside in the `post_backup` directory. The locations of the directories are:

- `/opt/northstar/utils/custom_scripts/post_active`

After a failover, or when HA is restarted, NorthStar executes all scripts in this directory if it is the active node.

- `/opt/northstar/utils/custom_scripts/post_backup`

After a failover, or when HA is restarted, NorthStar executes all scripts in this directory if it is the backup node.

- `/opt/northstar/utils/examples`

This directory contains the following sample Python-based scripts:

- `start_advertise_vip_route.py`
- `stop_advertise_vip_route.py`

The example script was developed using the Junos PyEZ Python library which simplifies script creation for use in a Junos environment. You must download and install the Junos PyEZ Python library before you can use it. For instructions on installing PyEZ for your own use, see [Installing Junos PyEZ](#).

For complete HA documentation, see the following topics in the *NorthStar Controller User Guide*:

- [High Availability Overview](#)
- [Configuring a NorthStar Cluster for High Availability](#)
- [Using Custom Scripts to Support HA VIP in an L3 Environment](#)

## Segment Routing

With this release, NorthStar Controller supports Source Packet Routing in Networking (SPRING), also known as segment routing. Segment routing is a control-plane architecture that enables an ingress router to steer a packet through a specific set of nodes and links in the network. Junos OS Release 17.2R1 is required to utilize NorthStar Controller SPRING features. For more information about segment routing, see [Understanding Source Packet Routing in Networking \(SPRING\)](#).

Some highlights of SPRING-related features available in the NorthStar Controller are:

- Adjacency segment ID (SID) labels (associated with links) and node SID labels (associated with nodes) can be displayed on the topological map.



**NOTE:** You can use either BGP-LS peering or IGP adjacency from the JunosVM to the network to acquire network topology. However, for SPRING information to be properly learned by NorthStar when using BGP-LS, the network should have RSVP enabled on the links and the TED database available in the network.

- SR-LSP tunnels can be created using both adjacency SID and node SID labels.

An SR-LSP tunnel is a label stack that consists of a list of adjacency SID labels, node SID labels, or a mix of both. To create an SR-LSP, navigate to the Tunnel tab in the network information table and click **Add** at the bottom of the table to display the Provision LSP window. The Provision LSP window now has a Provisioning Type drop-down selection offering RSVP and SR options. Select **SR**. Complete the remaining fields as needed and click **Submit** to see the new path highlighted in the topology map.

- SR-LSPs can be configured with a secondary path.



**NOTE:** Although NorthStar permits adding a secondary path to an SR-LSP, it is not provisioned as a secondary path to the PCC because the SR-LSP protocol itself does not support secondary paths.

- Provisioning of an SR-LSP can include hop information that somewhat influences the routing. In the Provision LSP window, select the **Path** tab. There, you can select hops up to the MSD hop limitation that is imposed on the ingress router, and specify **Strict** or **Loose** adherence.
- NorthStar diverse LSP and multiple LSP provisioning supports segment routing. Select **SR** from the Provisioning Type drop-down menu on the Provision Diverse LSP or Provision Multiple LSPs window.
- For SR-LSPs, the router is only able to report on the operational status (Op Status in the Network Information Table) of the first hop. After the first hop, the NorthStar Controller takes responsibility for monitoring the SID labels, and reporting on the operational status. If the labels change or disappear from the network, the NorthStar Controller tries to reroute and re-provision the LSPs that are in a non-operational state. If NorthStar is not able to find an alternative routing path that complies with the constraints, the LSP is deleted from the network. These LSPs are not, however, deleted from the data model (they are deleted from the network, and persist in the data storage mechanism). The goal is to minimize traffic loss from non-viable SR-LSPs (black holes) by deleting them from the network. Op Status is listed as Unknown when an SR-LSP is deleted, and the Controller Status is listed as No path found or Reschedule in x minutes.

You can mitigate the risk of traffic loss by creating a secondary path for the LSP with fewer or more relaxed constraints. If the NorthStar Controller learns that the original constraints are not being met, the first thing it tries is to reroute using the secondary path.

- Maintenance events are supported with SR LSPs.



**NOTE:** OSPF is not supported for SPRING.

For complete documentation on the NorthStar Controller's support for segment routing, see [Segment Routing](#) in the *NorthStar Controller User Guide*.

## NorthStar REST API Notifications

This feature allows third-party applications to receive NorthStar Controller event notifications. The notifications are pushed by way of the socket.io interface. NorthStar Controller event notifications include the following event types:

- Node (nodeEvent)
- Link (linkEvent)
- LSP (lspEvent)

- P2MP (p2mpEvent)
- Facility (facilityEvent)
- HA (haEvent)

For schemas and Python examples, see [NorthStar REST API Notifications](#) in the *NorthStar Controller User Guide*.

## Multi-User Login

It is now possible for multiple full-access users to be logged into the NorthStar Controller simultaneously. This is achieved with an updated architecture that distributes the responsibilities of the NorthStar server. The benefits of this new architecture include:

- Users experience significant performance improvement when logging into or navigating in the NorthStar Controller UI.
- A single user can log into the NorthStar Controller multiple times from different devices, each login occupying one licensed user session slot.
- A maximum of 64 view-only users and ten full-access users can simultaneously log in to the NorthStar Controller UI.
- The Admin user can always log in to perform admin-only functions, even when all licensed user session slots are occupied.
- The Admin user can selectively disconnect user sessions.

To disconnect a user session, the Admin user navigates to the User Options drop-down menu and selects **Active Users** to display the Active Users window. A new Force Log Out button is now included, available only to the Admin.

## Health Monitoring

A new Health Monitor process has been added to the NorthStar Controller architecture to enhance the health monitoring functionality in the areas of process, server, connectivity, and license monitoring, and the monitoring of distributed analytics collectors in an HA environment.

- NorthStar Controller licenses are inspected to determine validity. When a login is attempted on a license that is not valid, a license upload page is presented to the user.
- The health monitor displays cluster, data collector, and connectivity information by navigating to **Administration > System Health** in the web UI. For HA cluster environments, you can now view the process status of all processes in all cluster members right in the web UI. Both BGP-LS and ISIS/OSPF peering statuses are also available.
- Critical health monitoring information is pushed to a web UI banner that appears above the Juniper Networks logo.



**NOTE:** The health monitor does not enable NorthStar Controller to take any corrective action regarding these notices; its responsibility is to monitor and report so the user can respond as appropriate.

## Analytics

The Analytics functionality streams data from the network devices, via data collectors, to the NorthStar Controller where it is processed, stored, and made available for viewing in the web UI.

The Analytics features require that the NorthStar Controller periodically connect to the network in order to obtain the configuration of the network devices. It uses this information to correlate IP addresses, interfaces, and devices. The collection schedule is user-configured.

- You can install data collectors either in the same machine as the NorthStar Controller application server (single-server deployment) or in other machines that are dedicated to log collection and storage (standalone deployment). In both cases, the supplied install scripts take care of installing the required packages and dependencies.
- JTI sensors generate data from the PFE (LSP traffic data, logical and physical interface traffic data), and only send probes through the data-plane. So in addition to connecting the routing engine to the management network, a data port must be connected to the collector on one of your devices. The rest of the devices in the network can use that interface to reach the collector.
- New views and work flows in the web UI support visualization of collected data so it can be interpreted.

Data collectors must be installed and devices must be configured to push the data to the data collectors. The health monitoring feature also uses information from the data collectors.

To view information about installed data collectors, navigate to **Administration > System Health**.

- Prior to this release, it was not possible to see how much traffic was actually going through the network as a function of time; you could only see reserved bandwidth. Interface Utilization is now offered as an option in the left pane of the topology view under Options. When selected, the amount of traffic (RSVP and other traffic) that is going through the network at the time is displayed in the topology, and is updated once every minute.
- You can opt to display interface delay measurements on the topology map.





**NOTE:** Interface delay information is only available if the devices have been prepared:

- RPM probes have been configured.
- The rpm-log.slax script has been loaded, to send the results of the probes to the data collectors.



**NOTE:** The NorthStar Controller does not automate the installation of this script on the router. You must install the script manually.

- The Performance View shows how utilization has changed over time. In the left pane of the topology view, select **Performance** from the drop-down menu.
- Two new columns of data have been added to the Nodes View to reflect a snapshot of traffic in bps and pps over the last hour. This is for quick reference in case there are conditions that require attention. You can see this snapshot for both Interfaces and Tunnels.
- Data collection allows the NorthStar Controller to gather information about the protocols that are configured on each interface. The Protocols column in the network information table under the Interface tab displays OSPF, LDP, RSVP, and MPLS when configured.
- You can configure NorthStar Controller to automatically reroute LSPs based on interface traffic or link delay conditions. To access these configuration parameters, navigate to **Administration > Analytics**.

For full Analytics documentation, see the following topics in the *NorthStar Controller User Guide*:

- [Installing Data Collectors for Analytics](#)
- [Configuring Routers to Send JVision Telemetry Data and RPM Statistics to the Data Collectors](#)
- [Viewing Analytics Data in the Web UI](#)
- [Netconf Persistence](#)
- [Health Monitoring](#)

## Netconf Persistence

The Netconf Persistence feature allows you to create a collection task for netconf and display the results of the collection. In future releases, other task types (besides Netconf) will be supported. Netconf collection is used by the Analytics feature to obtain the network device configuration information needed to organize and display collected data in a meaningful way in the web UI.



**NOTE:** Completion of device profiles (**Administration > Device Profile**) is a prerequisite for successfully running collection tasks.

For complete documentation of this feature, see the following topics in the NorthStar Controller User Guide:

- [Device Profile](#)
- [Netconf Persistence](#)

## Changes in Behavior

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This section lists changes in NorthStar Controller behavior since the previous release.

- The NorthStar setup scripts and menu options have changed to support new features. See the *NorthStar Controller Getting Started Guide* and [Configuring a NorthStar Cluster for High Availability](#) in the *NorthStar Controller User Guide* for complete information.
- Certificate renewal has changed. A fresh installation of Release 3.0.0 includes a 10-year certificate. For upgrades from a 2.x release, the installation script automatically renews the certificate for 10 years if the existing certificate is due to expire in less than one year.
- The NorthStar Controller default tile map is now hidden unless you apply a MapQuest API key to enable the feature using MapQuest tiles. This change was required to conform to OpenStreetMap tile usage policies. See [Navigating in Nodes View](#) in the *NorthStar Controller User Guide* for instructions on obtaining and applying a MapQuest API key.

## Known Behavior

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The following new behaviors are known to occur in NorthStar Controller Release 3.0.0:

- Use of the **supervisorctl restart all** command to restart all services can cause a race condition. We recommend the use of the **service northstar restart** command instead.
- If you are using a two-VM installation, in which the Junos VM is not bundled with the NorthStar Controller, and if your external Junos VM is older than Release 17.2, you must edit the `northstar.cfg` file to make the NorthStar Controller compatible with the external VM.



**NOTE:** If you edit the `northstar.cfg` file to make the NorthStar Controller compatible with an older external VM, segment routing on the NorthStar Controller will no longer be supported.

Perform the following steps:

1. SSH to the NorthStar server.

- Using a text editor such as vi, edit the following statement in the `opt/northstar/data/northstar.cfg` file from the default of `use_sr=1` to `use_sr=0`:

```
JunosVM ntdad version supporting segment routing: No (0) or Yes (1)
use_sr=0
```

- Manually restart the toposerver process:

```
[root@northstar]# supervisorctl restart northstar:toposerver
```

You also need to set up the SSH key for the external VM by selecting option **H** from the Setup Main Menu when you run the `net_setup.py` script, and entering the requested information.

## Known Issues

Table 2 on page 11 lists known issues in NorthStar Controller Release 3.0.0. The identifier associated with each entry is the tracking number in the Juniper Networks Problem Report (PR) tracking system.

Table 2: Known Issues in NorthStar Controller 3.0.0

Identifier	Description
1267861	The <b>show</b> command output of a SPRING LSP on the PCC displays an incorrect node IP address; the previous hop address is displayed instead. This has no impact on the operation of the LSP.
1269162	Spring TE LSPs using node SIDs created by NorthStar are not turned down when the following command is launched on the LSP tail end: <b>deactivate protocols isis source-packet-routing node-segment</b> .
1278728	NorthStar Controller Release 3.0.0 does not report the correct RRO in the web UI and via the REST API when routers are configured with Junos OS Release 17.2R1. Instead of showing a list of link adjacency SIDs, the web UI and REST API report a list of "zero" labels. This issue has been fixed in Junos OS Releases 17.2.R1-S1 and 17.2R2.
1287508	During very rare cases, <code>pce_server</code> can linger during HA switchover and not stop completely which can be resolved manually by issuing <b>killall -9 pce_server</b> on the standby server. In NorthStar Controller 3.1.0, it will be part of HA agent failover sequences to ensure the <code>pce_server</code> completely stops during HA switchover.
1290455	We recommend the following workflow when creating or modifying a collection task for all routers in the network: <ol style="list-style-type: none"> <li>In the Modify Task - Netconf window, click <b>Selected devices</b> rather than <b>All devices</b>.</li> <li>Select the check boxes for all devices individually in the Collect column.</li> </ol> <p>This workflow will be improved in NS 3.1.0. If All devices is selected, the collection task for all routers does still work, but the status of the collection is not properly displayed.</p>
1290466	During scale tests with tens of thousands of LSPs, it has been (inconsistently) observed that the NorthStar Controller does not always re-provision existing PCE-initiated LSPs when the PCEP session is not stable. PCC-controlled LSPs and PCE-delegated LSPs are not impacted by this issue. <p>A workaround is to increase the <b>queue_high_watermark</b> parameter in the <code>northstar.cfg</code> settings file. We recommend a <code>queue_high_watermark</code> value of two times the number of LSPs in the network.</p>

Table 2: Known Issues in NorthStar Controller 3.0.0 (*continued*)

Identifier	Description
1290503	In some circumstances, PCE-initiated LSPs do not properly switch to the secondary path as expected when the primary path is no longer valid, such as when an interface that belongs to the <b>LSP return path</b> is disabled on a transit router. This issue is not always reproducible. LSPs with a standby path are not impacted. We believe the issue only occurs for PCE-initiated LSPs.

## Resolved Issues

[Table 3 on page 12](#) lists resolved issues in NorthStar Controller Release 3.0.0. The identifier associated with each entry is the tracking number in the Juniper Networks Problem Report (PR) tracking system.

Table 3: Resolved Issues in NorthStar Controller 3.0.0

Identifier	Description
1052137	When processing P flags and I flags in PCEP objects, the PCE and PCC do not honor the P flags and I flags that are carried in the PCEP object.
1106767	If you configure unnumbered interfaces on parallel links between two routers, the NorthStar Controller is not able to display accurate connections.
1175680	When you modify the attributes of an LSP, the LSP goes down while the controller remains active. When the configuration of a packet LSP is changed to a non-packet LSP configuration, we recommend that you delete the LSP and re-provision it.
1184169	The <code>/opt/pcs/db/config/pce_md5.config</code> file does not add nodes dynamically, so new PCEP-enabled nodes cannot be brought up. Reset Topology does not clear the MD5 configuration file on the controller ( <code>/opt/pcs/db/config/pce_md5.config</code> ). When you change topologies, you must manually delete this configuration file.
1193866	Output of the <code>show path-computation-client status</code> command incorrectly includes the count of externally provisioned LSPs.
1194539	The <code>set protocols pcep max-provisioned-lsps</code> command does not prohibit creation of new PCE-initiated LSPs beyond the configured limit. When changing the value of <code>max-provisioned-lsps</code> , the new value must be greater than the number of LSPs currently provisioned on the router.
1262763	The PCS is taking approximately three minutes for re-provisioning of an LSP with a link down event.
1262930	A SPRING LSP cannot be created after upgrading the NorthStar Controller build.
1265079	If an SR-LSP with required path fails because the link on its path failed, the LSP operational status displayed in the LSP window is empty, where it should display as "Unknown".

## Documentation Enhancements

Beginning with Release 3.0.0, the following NorthStar Controller documents are available:

- User Guide: A reorganized and consolidated presentation of the information previously contained in the Feature Guide, Web User Interface Guide, Java Client User Interface Guide, and part of the Getting Started Guide, with updated information that includes new features available in NorthStar Controller 3.0.0.
- Getting Started Guide: Focused presentation of the tasks required to install, configure, and begin using the NorthStar Controller application.
- REST API Documentation: Enhanced with a new NorthStar API Developer Guide which contains guidance and tutorials not previously available.

## Requesting Technical Support

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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 post-sales technical support, you can access our tools and resources online or open a case with JTAC.

## Revision History

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24 July 2017—Non-substantive editorial correction

12 July 2017—Updated to fix links to external documents

6 July 2017—NorthStar Controller Release 3.0.0.

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