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# NorthStar Controller Getting Started Guide

Release  
3.1.0



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Juniper Networks, Inc.  
1133 Innovation Way  
Sunnyvale, California 94089  
USA  
408-745-2000  
[www.juniper.net](http://www.juniper.net)

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*NorthStar Controller Getting Started Guide*

3.1.0

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# About the Documentation

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## Documentation and Release Notes

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## Documentation Conventions

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Table 1 on page xii defines notice icons used in this guide.

Table 1: Notice Icons







| Icon   | Meaning            | Description   |
|--|--------------------|---|
|   | Informational note | Indicates important features or instructions.                               |
|   | Caution            | Indicates a situation that might result in loss of data or hardware damage. |
|   | Warning            | Alerts you to the risk of personal injury or death.                         |
|   | Laser warning      | Alerts you to the risk of personal injury from a laser.                     |
|   | Tip                | Indicates helpful information.  |
|  | Best practice      | Alerts you to a recommended use or implementation.                          |

Table 2 on page xii defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

| Convention                   | Description   | Examples   |
|------------------------------|---|--|
| <b>Bold text like this</b>   | Represents text that you type.  | To enter configuration mode, type the <b>configure</b> command:<br><br>user@host> <b>configure</b>   |
| Fixed-width text like this   | Represents output that appears on the terminal screen.  | user@host> <b>show chassis alarms</b><br><br>No alarms currently active  |
| <i>Italic text like this</i> | <ul style="list-style-type: none"> <li>Introduces or emphasizes important new terms.</li> <li>Identifies guide names.</li> <li>Identifies RFC and Internet draft titles.</li> </ul> | <ul style="list-style-type: none"> <li>A policy <i>term</i> is a named structure that defines match conditions and actions.</li> <li><i>Junos OS CLI User Guide</i></li> <li>RFC 1997, <i>BGP Communities Attribute</i></li> </ul> |
| <i>Italic text like this</i> | Represents variables (options for which you substitute a value) in commands or configuration statements.  | Configure the machine's domain name:<br><br>[edit]<br>root@# <b>set system domain-name</b><br><i>domain-name</i>   |

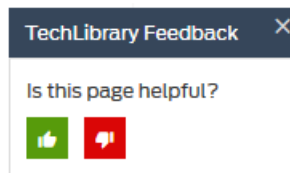
Table 2: Text and Syntax Conventions (continued)

| Convention                     | Description  | Examples  |
|--------------------------------|--|---|
| Text like this                 | Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.              | <ul style="list-style-type: none"><li>To configure a stub area, include the <b>stub</b> statement at the <b>[edit protocols ospf area area-id]</b> hierarchy level.</li><li>The console port is labeled <b>CONSOLE</b>.</li></ul> |
| < > (angle brackets)           | Encloses optional keywords or variables.   | <b>stub &lt;default-metric <i>metric</i>&gt;;</b>   |
| (pipe symbol)                  | Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity. | <b>broadcast   multicast</b><br><br><b>(<i>string1</i>   <i>string2</i>   <i>string3</i>)</b>   |
| # (pound sign)                 | Indicates a comment specified on the same line as the configuration statement to which it applies.   | <b>rsvp { # Required for dynamic MPLS only</b>  |
| [ ] (square brackets)          | Encloses a variable for which you can substitute one or more values.   | <b>community name members [ <i>community-ids</i> ]</b>  |
| Indentation and braces ( { } ) | Identifies a level in the configuration hierarchy.   | <pre>[edit] routing-options {   static {     route default {       nexthop <i>address</i>;       retain;     }   } }</pre>  |
| ;(semicolon)                   | Identifies a leaf statement at a configuration hierarchy level.  |   |
| GUI Conventions                |  |   |
| Bold text like this            | Represents graphical user interface (GUI) items you click or select.   | <ul style="list-style-type: none"><li>In the Logical Interfaces box, select <b>All Interfaces</b>.</li><li>To cancel the configuration, click <b>Cancel</b>.</li></ul>  |
| > (bold right angle bracket)   | Separates levels in a hierarchy of menu selections.  | In the configuration editor hierarchy, select <b>Protocols&gt;Ospf</b> .  |

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- Download the latest versions of software and review release notes: <https://www.juniper.net/customers/csc/software/>
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- Use the Case Management tool in the CSC at <https://www.juniper.net/cm/>.
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

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## CHAPTER 1

# NorthStar Controller Installation and Configuration Overview

- [NorthStar Controller System Requirements on page 17](#)
- [Changing Control Packet Classification Using the Mangle Table on page 23](#)

## NorthStar Controller System Requirements

You can install the NorthStar Controller in the following ways:

- Installation on a physical server
- Two-VM installation in an OpenStack environment (JunosVM is not bundled with the NorthStar Controller software)

Before you install the NorthStar Controller software, ensure that your system meets the requirements described in [Table 3 on page 17](#).

*Table 3: Hardware Requirements for NorthStar Servers*

| Server Type                          | RAM   | HDD    | Core Processor | Host must support hardware virtualization (VT-d) |
|--------------------------------------|-------|--------|----------------|--|
| NorthStar Application Only           | 48 GB | 500 GB | Intel i5/i7    | Yes  |
| NorthStar Application with Analytics | 64 GB | 1.5 T  | Intel i5/i7    | Yes  |
| Analytics Only                       | 32 GB | 1 T    | Intel i5/i7    | No   |

In addition to the hardware requirements, ensure that:

- When upgrading NorthStar Controller, the /tmp directory has enough free space to save the contents of the /opt/pcs/data directory because the /opt/pcs/data directory contents are backed up to /tmp during the upgrade process.
- You use a supported version of CentOS Linux or Red Hat Enterprise Linux. These are our Linux recommendations:
  - CentOS Linux 6.8, 6.9, or 7.2 image—earlier CentOS versions are not supported

- Red Hat Enterprise Linux 6.8, 6.9, or 7.2
- Install your choice of supported Linux version using the minimal ISO

CentOS can be downloaded from <https://www.centos.org/download/>.

- The ports listed in [Table 4 on page 18](#) are allowed by any external firewall being used. The ports with the word **cluster** in their purpose descriptions are associated with high availability (HA) functionality. If you are not planning to configure an HA environment, you can ignore those ports. The ports with the word **Analytics** in their purpose descriptions are associated with the Analytics feature. If you are not planning to use Analytics, you can ignore those ports. The remaining ports listed must be kept open in all configurations.

*Table 4: Ports That Must Be Allowed by External Firewalls*

| Port  | Purpose   |
|-------|---|
| 22    | SSH daemon  |
| 179   | JunosVM for router BGP-LS—not needed if IGP is used for topology acquisition  |
| 4189  | PCC (router) to NorthStar PCE server  |
| 7000  | Communications port to NorthStar Planner  |
| 7003  | Communications port to NorthStar Operator   |
| 7004  | Communications port to NorthStar Operator (view only)   |
| 8091  | Web client/REST to webserver (http)   |
| 8443  | Web client/REST to secure webserver (https)   |
| 830   | Netconf communication between NorthStar Controller and routers  |
| 7001  | Cassandra database cluster  |
| 7199  | Cassandra database cluster  |
| 9042  | Cassandra client port   |
| 17000 | Cassandra database cluster  |
| 5672  | Rabbitmq<br><br>NorthStar application servers must allow incoming traffic to this port. Analytics nodes must allow outgoing traffic to this port. |
| 4369  | Rabbitmq cluster  |
| 25672 | Rabbitmq cluster  |

Table 4: Ports That Must Be Allowed by External Firewalls (continued)

| Port       | Purpose   |
|------------|---|
| 35197      | Rabbitmq cluster  |
| 2888, 3888 | Zookeeper cluster   |
| 1514       | Default Junos Telemetry Interface reports for RPM probe statistics (supports Analytics) |
| 2000       | Default Junos Telemetry Interface reports for IFD (supports Analytics)                  |
| 2001       | Default Junos Telemetry Interface reports for IFL (supports Analytics)                  |
| 2002       | Default Junos Telemetry Interface reports for LSP (supports Analytics)                  |
| 6379       | Redis   |
| 9200       | Elasticsearch   |



**NOTE:** Sample iptable rules are available in `/opt/northstar/utls/firewall.sh` on the NorthStar application server.

## Analytics Requirements

In addition to ensuring that ports 2000, 2001, 2002, and 1514 are kept open, using the NorthStar analytics features requires that you counter the effects of Reverse Path Filtering (RPF) if necessary. If your kernel does RPF by default, you must do **one** of the following to counter the effects:

- Disable RPF.
- Ensure there is a route to the source IP address of the probes pointing to the interface where those probes are received.
- Specify loose mode reverse filtering (if the source address is routable with any of the routes on any of the interfaces).

## Two-VM Installation Requirements

A two-VM installation is one in which the JunosVM is not bundled with the NorthStar Controller software.

### Disk and Memory Requirements

The disk and memory requirements for installing NorthStar Controller in an OpenStack or other hypervisor environment are described in [Table 5 on page 20](#).

*Table 5: Disk and Memory Requirements for NorthStar OpenStack Installation*

| VM                       | Virtual CPU | Virtual RAM | Disk Size | Virtual NIC |
|--------------------------|-------------|-------------|-----------|-------------|
| NorthStar Application VM | 4           | 32 GB       | 100 GB    | 2 minimum   |
| NorthStar-JunosVM        | 1           | 4 GB        | 20 GB     | 2 minimum   |

### VM Image Requirements

- The NorthStar Controller application VM is installed on top of a Linux VM, so Linux VM is required. You can obtain a Linux VM image in either of the following ways:
  - Use the generic version provided by most Linux distributors. Typically, these are cloud-based images for use in a cloud-init-enabled environment, and do not require a password. These images are fully compatible with OpenStack.
  - Create your own VM image. Some hypervisors, such as generic DVM, allow you to create your own VM image. We recommend this approach if you are not using OpenStack and your hypervisor does not natively support cloud-init.
- The JunosVM is provided in Qcow2 format when inside the NorthStar Controller bundle. If you download the JunosVM separately (not bundled with NorthStar) from the NorthStar download site, it is provided in VMDK format.
- The JunosVM image is only compatible with IDE disk controllers. You must configure the hypervisor to use IDE rather than SATA controller type for the JunosVM disk image.

```
glance image-update --property
hw_disk_bus=ide --property
hw_cdrom_bus=ide
```

### JunosVM Version Requirements

By default, the NorthStar Controller Release 3.0.0 and later requires that the external JunosVM 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 [“Installing the NorthStar Controller 3.1.0” on page 25](#) for the configuration steps.

### VM Networking Requirements

The following networking requirements must be met for the two-VM installation approach to be successful:

- Each VM requires the following virtual NICs:
  - One connected to the external network
  - One for the internal connection between the NorthStar application and the JunosVM
  - One connected to the management network if a different interface is required between the router facing and client facing interfaces
- We recommend a flat or routed network without any NAT for full compatibility.

- A virtual network with one-to-one NAT (usually referenced as a floating IP) can be used as long as BGP-LS is used as the topology acquisition mechanism. If IS-IS or OSPF adjacency is required, it should be established over a GRE tunnel.



**NOTE:** A virtual network with n-to-one NAT is not supported.

## Deployment Scenarios

Table 6 on page 21 lists the supported deployment configurations by NorthStar release.

**Table 6: Supported NorthStar Deployment Configurations by Release Number**

| Deployment Configuration  | Features Available<br><i>NorthStar Release 3.0.0</i>  | Features Available<br><i>NorthStar Release 3.1.0</i>  |
|---|---|---|
| <b>Description:</b> <ul style="list-style-type: none"> <li>• NorthStar application (no Analytics, no HA)</li> </ul> <b>Number of Servers:</b> <ul style="list-style-type: none"> <li>• NorthStar: 1</li> <li>• Total: 1</li> </ul>  | <ul style="list-style-type: none"> <li>• PCEP provisioning</li> <li>• NETCONF device collection</li> </ul>  | <ul style="list-style-type: none"> <li>• PCEP and NETCONF provisioning</li> <li>• NETCONF device collection</li> </ul>  |
| <b>Description:</b> <ul style="list-style-type: none"> <li>• NorthStar application and Analytics, both installed in a single server</li> <li>• One or more optional slave collector servers</li> </ul> <b>Number of Servers:</b> <ul style="list-style-type: none"> <li>• NorthStar + Analytics: 1</li> <li>• Total: 1</li> <li>• Total with optional slave collector servers: 2 or more</li> </ul>               | <ul style="list-style-type: none"> <li>• PCEP provisioning</li> <li>• NETCONF device collection</li> <li>• Telemetry</li> <li>• (Slave collectors not supported in this release)</li> </ul> | <ul style="list-style-type: none"> <li>• PCEP and NETCONF provisioning</li> <li>• NETCONF device collection</li> <li>• Telemetry</li> <li>• Data Collection: <ul style="list-style-type: none"> <li>• SNMP</li> <li>• Link latency</li> </ul> </li> <li>• (Slave collectors not supported in this release)</li> </ul> |
| <b>Description:</b> <ul style="list-style-type: none"> <li>• NorthStar application and Analytics, each installed in a separate server</li> <li>• One or more optional slave collector servers</li> </ul> <b>Number of servers:</b> <ul style="list-style-type: none"> <li>• NorthStar: 1</li> <li>• Analytics: 1</li> <li>• Total: 2</li> <li>• Total with optional slave collector servers: 3 or more</li> </ul> | <ul style="list-style-type: none"> <li>• PCEP provisioning</li> <li>• NETCONF device collection</li> <li>• Telemetry</li> <li>• (Slave collectors not supported in this release)</li> </ul> | <ul style="list-style-type: none"> <li>• PCEP and NETCONF provisioning</li> <li>• NETCONF device collection</li> <li>• Telemetry</li> <li>• Data Collection: <ul style="list-style-type: none"> <li>• SNMP</li> <li>• Link latency</li> </ul> </li> <li>• (Slave collectors not supported in this release)</li> </ul> |

Table 6: Supported NorthStar Deployment Configurations by Release Number (continued)

| Deployment Configuration  | Features Available<br><i>NorthStar Release 3.0.0</i>  | Features Available<br><i>NorthStar Release 3.1.0</i>  |
|---|---|---|
| <b>Description:</b> <ul style="list-style-type: none"> <li>NorthStar application HA</li> </ul> <b>Number of servers:</b> <ul style="list-style-type: none"> <li>NorthStar: minimum of 3 (odd numbers only)</li> <li>Total: 3 or more</li> </ul>   | <ul style="list-style-type: none"> <li>PCEP provisioning</li> <li>NETCONF device collection</li> <li>NorthStar HA</li> </ul>  | <ul style="list-style-type: none"> <li>PCEP and NETCONF provisioning</li> <li>NETCONF device collection</li> <li>NorthStar HA</li> </ul>  |
| <b>Description:</b> <ul style="list-style-type: none"> <li>NorthStar application HA and separate, single Analytics server</li> <li>One or more optional slave collector servers</li> </ul> <b>Number of servers:</b> <ul style="list-style-type: none"> <li>NorthStar: minimum of 3 (odd numbers only)</li> <li>Analytics: 1</li> <li>Total: 4 or more</li> <li>Total with optional slave collector servers: 5 or more</li> </ul>                   | <ul style="list-style-type: none"> <li>PCEP provisioning</li> <li>NETCONF device collection</li> <li>NorthStar HA</li> <li>Telemetry</li> <li>(Slave collectors not supported in this release)</li> </ul>                       | <ul style="list-style-type: none"> <li>PCEP and NETCONF provisioning</li> <li>NETCONF device collection</li> <li>NorthStar HA</li> <li>Telemetry</li> <li>Data Collection: <ul style="list-style-type: none"> <li>SNMP</li> <li>Link latency</li> </ul> </li> <li>(Slave collectors not supported in this release)</li> </ul>                       |
| <b>Description:</b> <ul style="list-style-type: none"> <li>Single NorthStar application server and Analytics HA</li> <li>One or more optional slave collector servers</li> </ul> <b>Number of servers:</b> <ul style="list-style-type: none"> <li>NorthStar: 1</li> <li>Analytics: minimum of 3 (odd numbers only)</li> <li>Total: 4 or more</li> <li>Total with optional slave collector servers: 5 or more</li> </ul>                             | <ul style="list-style-type: none"> <li>PCEP provisioning</li> <li>NETCONF device collection</li> <li>Analytics HA</li> <li>Telemetry</li> <li>(Slave collectors not supported in this release)</li> </ul>                       | <ul style="list-style-type: none"> <li>PCEP and NETCONF provisioning</li> <li>NETCONF device collection</li> <li>Analytics HA</li> <li>Telemetry</li> <li>Data Collection: <ul style="list-style-type: none"> <li>SNMP</li> <li>Link latency</li> </ul> </li> <li>(Slave collectors not supported in this release)</li> </ul>                       |
| <b>Description:</b> <ul style="list-style-type: none"> <li>NorthStar application HA and separate Analytics HA</li> <li>One or more optional slave collector servers</li> </ul> <b>Number of servers:</b> <ul style="list-style-type: none"> <li>NorthStar: minimum of 3 (odd numbers only)</li> <li>Analytics: minimum of 3 (odd numbers only)</li> <li>Total: 6 or more</li> <li>Total with optional slave collector servers: 7 or more</li> </ul> | <ul style="list-style-type: none"> <li>PCEP provisioning</li> <li>NETCONF device collection</li> <li>NorthStar HA</li> <li>Analytics HA</li> <li>Telemetry</li> <li>(Slave collectors not supported in this release)</li> </ul> | <ul style="list-style-type: none"> <li>PCEP and NETCONF provisioning</li> <li>NETCONF device collection</li> <li>NorthStar HA</li> <li>Analytics HA</li> <li>Telemetry</li> <li>Data Collection: <ul style="list-style-type: none"> <li>SNMP</li> <li>Link latency</li> </ul> </li> <li>(Slave collectors not supported in this release)</li> </ul> |

Table 6: Supported NorthStar Deployment Configurations by Release Number (continued)

| Deployment Configuration   | Features Available<br><i>NorthStar Release 3.0.0</i> | Features Available<br><i>NorthStar Release 3.1.0</i> |
|--|--|--|
| <b>Description:</b> <ul style="list-style-type: none"> <li>NorthStar application HA sharing servers with Analytics HA.</li> <li>One or more optional slave collector servers</li> </ul> <b>Number of servers:</b> <ul style="list-style-type: none"> <li>NorthStar + Analytics: minimum of 3 (odd numbers only)</li> <li>Total: 3 or more</li> <li>Total with optional slave collector servers: 4 or more</li> </ul> | Not supported  | Not supported  |

## Changing Control Packet Classification Using the Mangle Table

The NorthStar application uses default classification for control packets. To support a different packet classification, you can use Linux firewall iptables to reclassify packets to a different priority.

The following sample configuration snippets show how to modify the ToS bits using the mangle table, changing DSCP values to cs6.

Zookeeper:

```
iptables -t mangle -A POSTROUTING -p tcp -sport 3888 -j DSCP -set-dscp-class cs6
iptables -t mangle -A POSTROUTING -p tcp -dport 3888 -j DSCP -set-dscp-class cs6
iptables -t mangle -A POSTROUTING -p tcp -sport 2888 -j DSCP -set-dscp-class cs6
iptables -t mangle -A POSTROUTING -p tcp -dport 2888 -j DSCP -set-dscp-class cs6
```

Cassandra database:

```
iptables -t mangle -A POSTROUTING -p tcp -sport 7001 -j DSCP -set-dscp-class cs6
iptables -t mangle -A POSTROUTING -p tcp -dport 7001 -j DSCP -set-dscp-class cs6

iptables -t mangle -A POSTROUTING -p tcp -sport 17000 -j DSCP -set-dscp-class cs6
iptables -t mangle -A POSTROUTING -p tcp -dport 17000 -j DSCP -set-dscp-class cs6
iptables -t mangle -A POSTROUTING -p tcp -sport 7199 -j DSCP -set-dscp-class cs6
iptables -t mangle -A POSTROUTING -p tcp -dport 7199 -j DSCP -set-dscp-class cs6
```

RabbitMQ:

```
iptables -t mangle -A POSTROUTING -p tcp -sport 25672 -j DSCP -set-dscp-class cs6
iptables -t mangle -A POSTROUTING -p tcp -dport 25672 -j DSCP -set-dscp-class cs6
iptables -t mangle -A POSTROUTING -p tcp -sport 15672 -j DSCP -set-dscp-class cs6
iptables -t mangle -A POSTROUTING -p tcp -dport 15672 -j DSCP -set-dscp-class cs6
iptables -t mangle -A POSTROUTING -p tcp -sport 4369 -j DSCP -set-dscp-class cs6
iptables -t mangle -A POSTROUTING -p tcp -dport 4369 -j DSCP -set-dscp-class cs6
```

NTAD:

```
iptables -t mangle -A POSTROUTING -p tcp -dport 450 -j DSCP -set-dscp-class cs6
```

PCEP protocol:

```
iptables -t mangle -A POSTROUTING -p tcp -sport 4189 -j DSCP -set-dscp-class cs6
```

ICMP packets used by `ha_agent` (replace the variable `NET-SUBNET` with your configured network subnet):

```
iptables -t mangle -A POSTROUTING -p icmp -s NET-SUBNET -d NET-SUBNET -j DSCP -set-dscp-class cs6
```

To verify that the class of service setting matches best effort, use the following command on the NorthStar server:

```
tcpdump -i interface-name -v -n -s 1500 "(src host host-IP ) && (ip[1]==0)"
```

To verify that the class of service setting matches cs6, use the following command on the NorthStar server:

```
tcpdump -i interface-name -v -n -s 1500 "(src host host-IP ) && (ip[1]==192)"
```

**Related Documentation**

- [Understanding the NorthStar Controller](#)



## CHAPTER 2

# NorthStar Controller Installation on a Physical Server

- [Installing the NorthStar Controller 3.1.0 on page 25](#)
- [Uninstalling the NorthStar Controller Application on page 41](#)

### Installing the NorthStar Controller 3.1.0

---

You can use the procedures described in the following sections if you are performing a fresh install of NorthStar Controller Release 3.1.0, or upgrading from a 2.x or 3.0.x release.

If you are configuring a high availability (HA) cluster, ensure that:

- You configure each server individually using these instructions before proceeding to HA setup.
- The database and rabbitmq passwords are the same for all servers that will be in the cluster.
- All server time is synchronized by NTP using the following procedure:

1. Install NTP.

```
yum -u install ntp
```

2. Specify the preferred NTP server in ntp.conf.

3. Verify the configuration.

```
ntpq -p
```



**NOTE:** The NorthStar Controller software includes a number of third-party packages. To avoid possible conflict, we recommend that you only install these packages as part of the NorthStar Controller RPM bundle installation rather than installing them manually.

The following sections describe the download, installation, and initial configuration of the NorthStar Controller. For HA setup after all the servers that will be in the cluster have been configured, see *Configuring a NorthStar Cluster for High Availability*.

- [Download the Software on page 26](#)
- [If Upgrading, Back Up Your JunosVM Configuration and iptables on page 26](#)
- [Install NorthStar Controller on page 27](#)
- [Configure Support for Older JunosVM Versions on page 28](#)
- [Create Passwords on page 28](#)
- [Enable the NorthStar License on page 29](#)
- [Renew the SSL Certificate on page 29](#)
- [Adjust Firewall Policies on page 31](#)
- [Launch the Net Setup Utility on page 31](#)
- [Configure the Host Server on page 32](#)
- [Configure the JunosVM and its Interfaces on page 36](#)
- [Set Up the SSH Key for External JunosVM on page 40](#)

## Download the Software

The NorthStar Controller software download page is available at <http://www.juniper.net/support/downloads/?p=northstar#sw>.

1. From the Version drop-down list, select **3.1**.
2. Click the NorthStar Application (which includes the RPM bundle) and the NorthStar JunosVM to download them.

## If Upgrading, Back Up Your JunosVM Configuration and iptables

If you are doing an upgrade from Release 2.x, back up your JunosVM configuration before installing the new software. Restoration of the JunosVM configuration is performed automatically after the upgrade is complete as long as you use the *net\_setup.py* utility to save your backup.

1. Launch the *net\_setup.py* script:  

```
[root@hostname~]# /opt/northstar/utils/net_setup.py
```
2. Type **D** and press **Enter** to select Maintenance and Troubleshooting.
3. Type **1** and press **Enter** to select Backup JunosVM Configuration.
4. Confirm the backup JunosVM configuration is stored at `'/opt/northstar/data/junosvm/junosvm.conf'`.
5. Save the iptables.

```
iptables-save > /opt/northstar/data/iptables.conf
```

## Install NorthStar Controller

You can either install the RPM bundle on a physical server or use a two-VM installation method in an OpenStack environment, in which the JunosVM is not bundled with the NorthStar Controller software.

The following optional parameters are available for use with the *install.sh* command:

- **-vm**—Same as *./install-vm.sh*, creates a two-VM installation.
- **-setup-fw**—For either physical server installation or two-VM installation, reinitializes the firewall using the NorthStar Controller recommended rules. Without this option, the firewall is not changed.
- **-skip-bridge**—For a physical server installation, skips checking if the external0 and mgmt0 bridges exist.

The default bridges are external0 and mgmt0. If you have two interfaces such as eth0 and eth1 in the physical setup, you must configure the bridges to those interfaces. However, you can also define any bridge names relevant to your deployment.



**NOTE:** We recommend that you configure the bridges before running *install.sh*.

- For a physical server installation, execute the following commands to install NorthStar Controller:

```
[root@hostname~]# rpm -Uvh <rpm-filename>
[root@hostname~]# cd /opt/northstar/northstar_bundle_3.1.0/
[root@hostname~]# ./install.sh
```



**NOTE:** -Uvh works for both upgrade and fresh installation.

- For a two-VM installation, execute the following commands to install NorthStar Controller:

```
[root@hostname~]# rpm -Uvh <rpm-filename>
[root@hostname~]# cd /opt/northstar/northstar_bundle_3.1.0/
[root@hostname~]# ./install-vm.sh
```



**NOTE:** -Uvh works for both upgrade and fresh installation.

The script offers the opportunity to change the JunosVM IP address from the system default of 172.16.16.2.

Checking current disk space

```
INFO: Current available disk space for /opt/northstar is 34G. Will proceed with
installation.
System currently using 172.16.16.2 as NTAD/junosvm ip
Do you wish to change NTAD/junosvm ip (Y/N)? y
Please specify junosvm ip:
```

## Configure Support for Older JunosVM Versions

If you are using a two-VM installation, in which the JunosVM is not bundled with the NorthStar Controller, and if your external JunosVM 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.
2. 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 ntad version supporting segment routing: No (0) or Yes (1)

use_sr=0
```

3. Restart the toposerver process:

```
supervisorctl restart northstar:toposerver
```

## Create Passwords

When prompted, enter new database/rabbitmq and web UI Admin passwords.

1. Create an initial database/rabbitmq password by typing the password at the following prompts:

```
Please enter new DB and MQ password (at least one digit, one lowercase, one
uppercase and no space):
Please confirm new DB and MQ password:
```

2. Create an initial Admin password for the web UI by typing the password at the following prompts:

```
Please enter new UI Admin password:
Please confirm new UI Admin password:
```

## Enable the NorthStar License

You must enable the NorthStar license as follows, unless you are upgrading from Release 2.x and you have an activated license.

1. Copy or move the license file.

```
[root@northstar]# cp /path-to-license-file/npatpw /opt/pcs/db/sys/npatpw
```

2. Set the license file owner to the PCS user.

```
[root@northstar]# chown pcs:pcs /opt/pcs/db/sys/npatpw
```

3. Restart all the NorthStar Controller processes.

```
[root@northstar]# supervisorctl restart northstar_pcs:PCServer &&
supervisorctl restart infra:web
```

4. Check the status of the NorthStar Controller processes until they are all up and running.

```
[root@northstar]# supervisorctl status
```

## Renew the SSL Certificate

For NorthStar standalone mode (as opposed to a cluster configuration), the installation script automatically renews the SSL certificate.



**NOTE:** For both standalone and cluster configurations, the certificate renewal is only applicable if the certificate owner is *NorthStar*.

1. Check the certificate expiration date using the following command:

```
[root@node1 root]# openssl x509 -enddate -noout -in
/opt/northstar/data/apache-cassandra/conf/client.pem
```

If the certificate is set to expire in more than one year, you can stop here.

2. Source the environment variable.

```
[root@node1 root]# . /opt/northstar/northstar.env
```

3. Obtain the current certificate and keystore password.

```
[root@node1 root]# cat
/opt/northstar/data/apache-cassandra/conf/cassandra.yaml | grep
keystore_password
```

4. Verify the existing certificate.

```
[root@node1 root]# keytool -list -v -keystore
/opt/northstar/data/apache-cassandra/conf/server.keystore -storepass
${password}
```

5. For a cluster configuration, run the *ha\_update\_ssl\_cert.py* (located in the */opt/northstar/utils* directory) in a maintenance window on any cluster member to renew the certificate. If you run the script when the current certificate is set to expire in more than one year, a new certificate is not generated.

Running the script on one cluster member restarts the *infra:Cassandra* process and renews the certificate on all cluster members, but only if all cluster members can communicate with one another. Before running the script, ensure that they can.

```
[root@node1 root]# cd /opt/northstar/utils/
[root@node1 utils]# ./ha_update_ssl_cert.py

WARNING !
This operation will restart the database process in each cluster member.
Please ensure that this operation is performed in maintenance window
Type YES to continue...
YES

Checking connectivity of cluster_communication_interface...
Cluster communications status for node VzNode1 cluster interface external1
ip 172.16.1.1: OK
Cluster communications status for node VzNode2 cluster interface external1
ip 172.16.1.2: OK
Cluster communications status for node VzNode3 cluster interface external1
ip 172.16.1.3: OK

Verifying the NorthStar version on each node:
VzNode1 : NorthStar-Bundle-3.1.0-20170119_191203_68973_316.x86_64
VzNode2 : NorthStar-Bundle-3.1.0-20170119_191203_68973_316.x86_64
VzNode3 : NorthStar-Bundle-3.1.0-20170119_191203_68973_316.x86_64

Verifying current ssl cert on each node:
VzNode1 : n9HN_6svZEitaP8_QqyD20HsMVigb501ayx9kbqq12w_
VzNode2 : n9HN_6svZEitaP8_QqyD20HsMVigb501ayx9kbqq12w_
VzNode3 : n9HN_6svZEitaP8_QqyD20HsMVigb501ayx9kbqq12w_

Verifying current ssl cert owner on each node:
VzNode1 : Owner: CN=NorthStar, OU=NorthStar, O=Juniper, L=Sunnyvale, ST=CA,
C=US
VzNode2 : Owner: CN=NorthStar, OU=NorthStar, O=Juniper, L=Sunnyvale, ST=CA,
C=US
VzNode3 : Owner: CN=NorthStar, OU=NorthStar, O=Juniper, L=Sunnyvale, ST=CA,
C=US

SSL certifications Owner: CN=NorthStar, OU=NorthStar, O=Juniper, L=Sunnyvale,
ST=CA, C=US
SSL certifications validity period is 0

SSL certifications owner is NorthStar
SSL certifications year to expire is 0

Proceed to renew SSL certifications
```

```

Certificate stored in file
</opt/northstar/data/apache-cassandra/conf/server.publickey>
Certificate was added to keystore
Certificate stored in file
</opt/northstar/data/apache-cassandra/conf/client.pem>

Updating SSL cert for HA
Updating SSL cert for node #1: VzNode1
Updating SSL cert for node #2: VzNode2
Updating SSL cert for node #3: VzNode3

Restart database at node VzNode1
Restart database at node VzNode2
Restart database at node VzNode3

Please wait...
SSL certifications has been successfully renewed

```

6. Obtain the new certificate and keystore password.

```

[root@node1 root]# cat
/opt/northstar/data/apache-cassandra/conf/cassandra.yaml | grep
keystore_password

```

7. Verify the new certificate. You should see a new expiration date on the “Valid from” line. All cluster members should have the same SSL certificate and password.

```

[root@node1 root]# keytool -list -v -keystore
/opt/northstar/data/apache-cassandra/conf/server.keystore -storepass
${password}
.
.
.
Valid from: Wed May 10 21:15:20 EDT 2017 until: Sat May 08 21:15:20 EDT
2027
.
.
.

```

## Adjust Firewall Policies

The iptables default rules could interfere with NorthStar-related traffic. If necessary, adjust the firewall policies.

Refer to [“NorthStar Controller System Requirements” on page 17](#) for a list of ports that must be allowed by iptables and firewalls.

A sample set of iptables rules is available in the `/opt/northstar/utls/firewall.sh` directory.

## Launch the Net Setup Utility

Launch the *Net Setup* utility to perform host server configuration.

```

[root@northstar]# /opt/northstar/utls/net_setup.py

```

```

Main Menu:
.....
A.) Host Setting
.....
B.) JunosVM Setting
.....
C.) Check Network Setting
.....
D.) Maintenance & Troubleshooting
.....
E.) HA Setting
.....
F.) Collect Trace/Log
.....
G.) Data Collector Setting
.....
H.) Setup SSH Key for external JunosVM setup
.....
X.) Exit
.....
Please select a letter to execute.

```

## Configure the Host Server

1. From the NorthStar Controller setup Main Menu, type **A** and press **Enter** to display the Host Configuration menu:

```

Host Configuration:
*****
In order to commit your changes you must select option Z
*****
.....
1. ) Hostname                               : northstar
2. ) Host default gateway                   :
3A.) Host Interface #1 (external_interface)
      Name                               : external0
      IPv4                               :
      Netmask                           :
      Type (network/management)         : network
3B.) Delete Host Interface #1 (external_interface) data
4A.) Host Interface #2 (mgmt_interface)
      Name                               : mgmt0
      IPv4                               :
      Netmask                           :
      Type (network/management)         : management
4B.) Delete Host Interface #2 (mgmt_interface) data
5A.) Host Interface #3
      Name                               :
      IPv4                               :
      Netmask                           :
      Type (network/management)         : network
5B.) Delete Host Interface #3 data
6A.) Host Interface #4
      Name                               :
      IPv4                               :
      Netmask                           :
      Type (network/management)         : network
6B.) Delete Host Interface #4 data
7A.) Host Interface #5

```



```

Name :
IPv4 :
Netmask :
Type (network/management) : network
7B.) Delete Host Interface #5 data
8. ) Show Host current static route
9. ) Show Host candidate static route
A. ) Add Host candidate static route
B. ) Remove Host candidate static route

.....
X. ) Host current setting
Y. ) Apply Host static route only
Z. ) Apply Host setting and static route
.....
.....

Please select a number to modify.
[<CR>=return to main menu]:

```

To interact with this menu, type the number or letter corresponding to the item you want to add or change, and press **Enter**.

2. Type **1** and press **Enter** to configure the hostname. The existing hostname is displayed. Type the new hostname and press **Enter**.

```

Please select a number to modify.
[<CR>=return to main menu]:
1
current host hostname : northstar
new host hostname : node1

```

3. Type **2** and press **Enter** to configure the host default gateway. The existing host default gateway IP address (if any) is displayed. Type the new gateway IP address and press **Enter**.

```

Please select a number to modify.
[<CR>=return to main menu]:
2
current host default_gateway :
new host default_gateway : 10.25.152.1

```

4. Type **3A** and press **Enter** to configure the host interface #1 (external\_interface). The first item of existing host interface #1 information is displayed. Type each item of new information (interface name, IPv4 address, netmask, type), and press **Enter** to proceed to the next.



**NOTE:** The designation of network or management for the type of interface is a label only, for your convenience. NorthStar Controller does not use this information.

```

Please select a number to modify.
[<CR>=return to main menu]:
3A
current host interface1 name : external0
new host interface1 name : external10

current host interface1 ipv4 :
new host interface1 ipv4 : 10.25.153.6

current host interface1 netmask :
new host interface1 netmask : 255.255.254.0

current host interface1 type (network/management) : network
new host interface1 type (network/management) : network

```

5. Type **A** and press **Enter** to add a host candidate static route. The existing route, if any, is displayed. Type the new route and press **Enter**.

```

Please select a number to modify.
[<CR>=return to main menu]:
A
Candidate static route:
new static route (format: x.x.x.x/xy via a.b.c.d dev <interface_name>):
10.25.158.0/24 via 10.25.152.2 dev external10

```

6. If you have more than one static route, type **A** and press **Enter** again to add each additional route.

```

Please select a number to modify.
[<CR>=return to main menu]:
A
Candidate static route:
[0] 10.25.158.0/24 via 10.25.152.2 dev external10
new static route (format: x.x.x.x/xy via a.b.c.d dev <interface_name>):
10.25.159.0/24 via 10.25.152.2 dev external10

```

7. Type **Z** and press **Enter** to save your changes to the host configuration.



**NOTE:** If the host has been configured using the CLI, the Z option is not required.

The following example shows saving the host configuration.

```

Host Configuration:
*****
In order to commit your changes you must select option Z
*****
.....
1. ) Hostname                               : node1
2. ) Host default gateway                   : 10.25.152.1
3A.) Host Interface #1 (external_interface)
      Name                                  : external10

```

```

IPv4 : 10.25.153.6
Netmask : 255.255.254.0
Type (network/management) : network
3B.) Delete Host Interface #1 (external_interface) data
4A.) Host Interface #2 (mgmt_interface)
Name : mgmt0
IPv4 :
Netmask :
Type (network/management) : management
4B.) Delete Host Interface #2 (mgmt_interface) data
5A.) Host Interface #3
Name :
IPv4 :
Netmask :
Type (network/management) : network
5B.) Delete Host Interface #3 data
6A.) Host Interface #4
Name :
IPv4 :
Netmask :
Type (network/management) : network
6B.) Delete Host Interface #4 data
7A.) Host Interface #5
Name :
IPv4 :
Netmask :
Type (network/management) : network
7B.) Delete Host Interface #5 data
8.) Show Host current static route
9.) Show Host candidate static route
A.) Add Host candidate static route
B.) Remove Host candidate static route
.....
X.) Host current setting
Y.) Apply Host static route only
Z.) Apply Host setting and static route
.....
Please select a number to modify.
[<CR>=return to main menu]:
z
Are you sure you want to setup host and static route configuration? This
option will restart network services/interfaces (Y/N) y
Current host/PCS network configuration:
host current interface external0 IP: 10.25.153.6/255.255.254.0
host current interface internal0 IP: 172.16.16.1/255.255.255.0
host current default gateway: 10.25.152.1
Current host static route:
[0] 10.25.158.0/24 via 10.25.152.2 dev external0
[1] 10.25.159.0/24 via 10.25.152.2 dev external0

Applying host configuration: /opt/northstar/data/net_setup.json
Please wait ...
Restart Networking ...
Current host static route:
[0] 10.25.158.0/24 via 10.25.152.2 dev external0
[1] 10.25.159.0/24 via 10.25.152.2 dev external0
Deleting current static routes ...
Applying candidate static routes
Static route has been added successfully for cmd 'ip route add 10.25.158.0/24

```

```
via 10.25.152.2'
Static route has been added successfully for cmd 'ip route add 10.25.159.0/24
via 10.25.152.2'
Host has been configured successfully
```

8. Press **Enter** to return to the Main Menu.

## Configure the JunosVM and its Interfaces

From the Setup Main Menu, configure the JunosVM and its interfaces. Ping the JunosVM to ensure that it is up before attempting to configure it. The `net_setup` script uses IP 172.16.16.2 to access the JunosVM using the login name **northstar**.

1. From the Main Menu, type **B** and press **Enter** to display the JunosVM Configuration menu:

```
Junos VM Configuration Settings:
*****
In order to commit your changes you must select option Z
*****
.....
1. ) JunosVM hostname                      : northstar_junosvm
2. ) JunosVM default gateway              :
3. ) BGP AS number                        : 100
4A.) JunosVM Interface #1 (external_interface)
      Name                               : em1
      IPv4                               :
      Netmask                            :
      Type(network/management)           : network
4B.) Delete JunosVM Interface #1 (external_interface) data
5A.) JunosVM Interface #2 (mgmt_interface)
      Name                               : em2
      IPv4                               :
      Netmask                            :
      Type(network/management)           : management
5B.) Delete JunosVM Interface #2 (mgmt_interface) data
6A.) JunosVM Interface #3
      Name                               :
      IPv4                               :
      Netmask                            :
      Type(network/management)           : network
6B.) Delete JunosVM Interface #3 data
7A.) JunosVM Interface #4
      Name                               :
      IPv4                               :
      Netmask                            :
      Type(network/management)           : network
7B.) Delete JunosVM Interface #4 data
8A.) JunosVM Interface #5
      Name                               :
      IPv4                               :
      Netmask                            :
      Type(network/management)           : network
8B.) Delete JunosVM Interface #5 data
9. ) Show JunosVM current static route
A. ) Show JunosVM candidate static route
B. ) Add JunosVM candidate static route
```

```

C. ) Remove JunosVM candidate static route
.....
X. ) JunosVM current setting
Y. ) Apply JunosVM static route only
Z. ) Apply JunosVM Setting and static route
.....

Please select a number to modify.
[<CR>=return to main menu]:

```

To interact with this menu, type the number or letter corresponding to the item you want to add or change, and press **Enter**.

2. Type **1** and press **Enter** to configure the JunosVM hostname. The existing JunosVM hostname is displayed. Type the new hostname and press **Enter**.

```

Please select a number to modify.
[<CR>=return to main menu]:
1
current junosvm hostname : northstar_junosvm
new junosvm hostname : junosvm_node1

```

3. Type **2** and press **Enter** to configure the JunosVM default gateway. The existing JunosVM default gateway IP address is displayed. Type the new IP address and press **Enter**.

```

Please select a number to modify.
[<CR>=return to main menu]:
2
current junosvm default_gateway :
new junosvm default_gateway : 10.25.152.1

```

4. Type **3** and press **Enter** to configure the JunosVM BGP AS number. The existing JunosVM BGP AS number is displayed. Type the new BGP AS number and press **Enter**.

```

Please select a number to modify.
[<CR>=return to main menu]:
3
current junosvm AS Number : 100
new junosvm AS Number: 100

```

5. Type **4A** and press **Enter** to configure the JunosVM interface #1 (external\_interface). The first item of existing JunosVM interface #1 information is displayed. Type each item of new information (interface name, IPv4 address, netmask, type), and press **Enter** to proceed to the next.



**NOTE:** The designation of network or management for the type of interface is a label only, for your convenience. NorthStar Controller does not use this information.

```

Please select a number to modify.
[<CR>=return to main menu]:
4A
current junosvm interface1 name : em1
new junosvm interface1 name: em1

current junosvm interface1 ipv4 :
new junosvm interface1 ipv4 : 10.25.153.144

current junosvm interface1 netmask :
new junosvm interface1 netmask : 255.255.254.0

current junosvm interface1 type (network/management) : network
new junosvm interface1 type (network/management) : network

```

6. Type **B** and press **Enter** to add a JunosVM candidate static route. The existing JunosVM candidate static route (if any) is displayed. Type the new candidate static route and press **Enter**.

```

Please select a number to modify.
[<CR>=return to main menu]:
B
Candidate static route:
new static route (format: x.x.x.x/xy via a.b.c.d):
10.25.158.0/24 via 10.25.152.2

```

7. If you have more than one static route, type **B** and press **Enter** again to add each additional route.

```

Please select a number to modify.
[<CR>=return to main menu]:
B
Candidate static route:
[0] 10.25.158.0/24 via 10.25.152.2 dev any
new static route (format: x.x.x.x/xy via a.b.c.d):
10.25.159.0/24 via 10.25.152.2

```

8. Type **Z** and press **Enter** to save your changes to the JunosVM configuration.

The following example shows saving the JunosVM configuration.

```

Junos VM Configuration Settings:
*****
In order to commit your changes you must select option Z
*****
.....
1. ) JunosVM hostname : northstar_junosvm
2. ) JunosVM default gateway :
3. ) BGP AS number : 100
4A.) JunosVM Interface #1 (external_interface)
      Name : em1
      IPv4 :
      Netmask :
      Type(network/management) : network
4B.) Delete JunosVM Interface #1 (external_interface) data

```

```

5A.) JunosVM Interface #2 (mgmt_interface)
      Name                               : em2
      IPv4                               :
      Netmask                           :
      Type(network/management)          : management
5B.) Delete JunosVM Interface #2 (mgmt_interface) data
6A.) JunosVM Interface #3
      Name                               :
      IPv4                               :
      Netmask                           :
      Type(network/management)          : network
6B.) Delete JunosVM Interface #3 data
7A.) JunosVM Interface #4
      Name                               :
      IPv4                               :
      Netmask                           :
      Type(network/management)          : network
7B.) Delete JunosVM Interface #4 data
8A.) JunosVM Interface #5
      Name                               :
      IPv4                               :
      Netmask                           :
      Type(network/management)          : network
8B.) Delete JunosVM Interface #5 data
9. ) Show JunosVM current static route
A. ) Show JunosVM candidate static route
B. ) Add JunosVM candidate static route
C. ) Remove JunosVM candidate static route
.....
X.) JunosVM current setting
Y.) Apply JunosVM static route only
Z.) Apply JunosVM Setting and static route
.....

Please select a number to modify.
[<CR>=return to main menu]:
z
Are you sure you want to setup junosvm and static route configuration? (Y/N)
y

Current junosvm network configuration:
junosvm current interface em0 IP: 10.16.16.2/255.255.255.0
junosvm current interface em1 IP: 10.25.153.144/255.255.254.0
junosvm current default gateway: 10.25.152.1
junosvm current asn: 100
Current junosvm static route:
[0] 10.25.158.0/24 via 10.25.152.2 dev any
[1] 10.25.159.0/24 via 10.25.152.2 dev any
Applying junosvm configuration ...
Please wait ...
Commit Success.
JunosVM has been configured successfully.
Please wait ... Backup Current JunosVM config ...

Connecting to JunosVM to backup the config ...
Please check the result at /opt/northstar/data/junosvm/junosvm.conf
JunosVm configuration has been successfully backed up

```

9. Press **Enter** to return to the Main Menu.
10. If you are doing an upgrade from a 2.x release, use the following command to restore the iptables that you previously saved:

```
iptables-restore < /opt/northstar/data/iptables.conf
```

## Set Up the SSH Key for External JunosVM

For a two-VM installation, you must set up the SSH key for the external JunosVM.

1. From the Main Menu, type **H** and press **Enter**.

```
Please select a number to modify.
[<CR>=return to main menu]:
H
```

Follow the prompts to provide your JunosVM username and router login class (super-user, for example). The script verifies your login credentials, downloads the JunosVM SSH key file, and returns you to the main menu.

For example:

```
Main Menu:
.....
A.) Host Setting
.....
B.) JunosVM Setting
.....
C.) Check Network Setting
.....
D.) Maintenance & Troubleshooting
.....
E.) HA Setting
.....
F.) Collect Trace/Log
.....
G.) Data Collector Setting
.....
H.) Setup SSH Key for external JunosVM setup
.....
X.) Exit
.....

Please select a letter to execute.
H
Please provide JunosVM login:
admin

2 VMs Setup is detected

Script will create user: northstar. Please provide user northstar router
login class e.g super-user, operator:
super-user

The authenticity of host '10.49.118.181 (10.49.118.181)' can't be
established.
```



```
Applying user northstar login configuration
Downloading JunosVM ssh key file. Login to JunosVM
Checking md5 sum. Login to JunosVM
SSH key has been sucessfully updated
```

```
A.) Host Setting
.....
B.) JunosVM Setting
.....
C.) Check Network Setting
.....
D.) Maintenance & Troubleshooting
.....
E.) HA Setting
.....
F.) Collect Trace/Log
.....
G.) Data Collector Setting
.....
H.) Setup SSH Key for external JunosVM setup
.....
X.) Exit
.....
```

Please select a letter to execute.

- [NorthStar Controller System Requirements on page 17](#)
- *Configuring a NorthStar Cluster for High Availability*

The following sections provide the steps to follow.

- Uninstall the NorthStar Software on page 42
- Reinstall the License File on page 42

## Uninstall the NorthStar Software

Use the following procedure to uninstall NorthStar:

1. Preserve your license file by copying it to the root directory:

```
cp -prv /u/wandl/db/sys/npatpw /root/
```



**NOTE:** You can also preserve any other important user or configuration data you have on the server using the same method.

2. Navigate to the NorthStar bundle directory:

```
cd /opt/northstar/northstar_bundle_x_x_x
```

3. Run the uninstall script:

```
./uninstall_all.sh
```

4. When prompted, confirm that you want to uninstall NorthStar.

## Reinstate the License File

After you have reinstalled the NorthStar application, use the following procedure to reinstate the license file that you copied to the root directory:

1. Copy the license file from the root directory back to its original directory:

```
cp -prv /root/npatpw /u/wandl/db/sys/
```



**NOTE:** You can also restore any other data preserved in the root directory by copying it back to its original directory.

2. Change the user and group ownership to pcs. This is likely unnecessary if you used -prv (preserve) in the copy command.

```
chown pcs:pcs /u/wandl/db/sys/npatpw
```

## CHAPTER 3

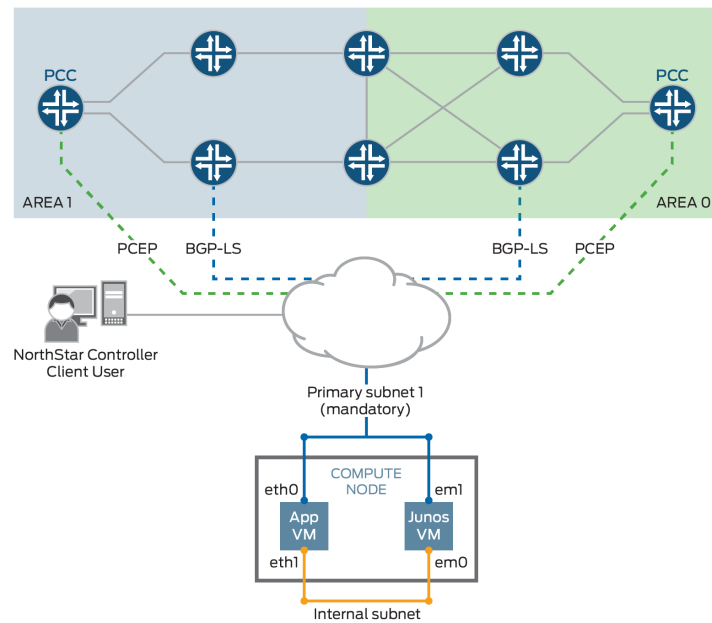
# NorthStar Controller Installation in an OpenStack Environment

- [Overview of NorthStar Controller Installation in an OpenStack Environment on page 44](#)
- [OpenStack Resources for NorthStar Controller Installation on page 48](#)
- [NorthStar Controller in an OpenStack Environment Pre-Installation Steps on page 49](#)
- [Installing the NorthStar Controller in Standalone Mode Using a HEAT Template on page 50](#)
- [Installing a NorthStar Cluster Using a HEAT Template on page 54](#)

## Overview of NorthStar Controller Installation in an OpenStack Environment

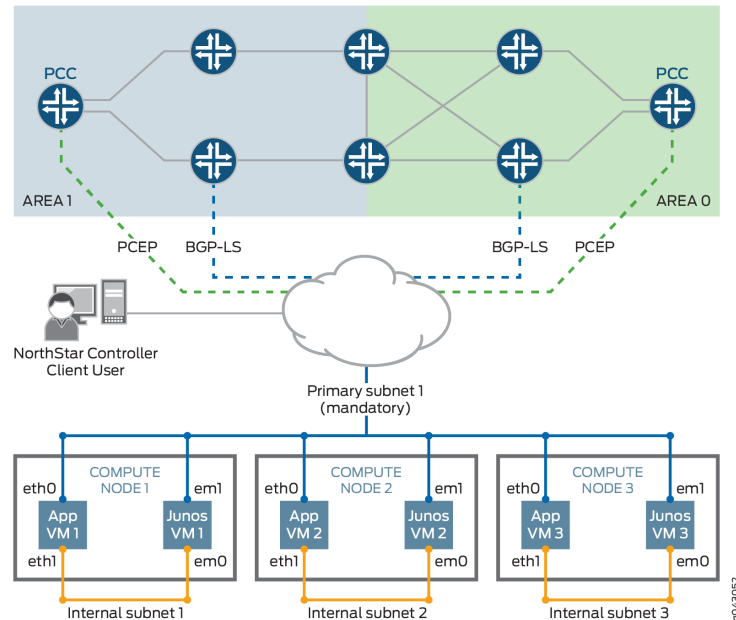
The NorthStar Controller can be installed in an OpenStack environment in either standalone or cluster mode. [Figure 1 on page 44](#) illustrates standalone mode. [Figure 2 on page 45](#) illustrates cluster mode. Note that in both cases, each node has one NorthStar Controller application VM and one JunosVM.

*Figure 1: OpenStack Environment, Standalone Mode*



g0-3051

Figure 2: OpenStack Environment, Cluster Mode



## Testing Environment

The Juniper Networks NorthStar Controller testing environment included the following OpenStack configurations:

- OpenStack Kilo with Open vSwitch (OVS) as Neutron ML2 plugins on Red Hat 7 Host
- OpenStack Juno with Contrail as Neutron ML2 plugins on Ubuntu 14.04 Host
- OpenStack Liberty with Contrail 3.0.2

## Networking Scenarios

There are two common networking scenarios for using VMs on OpenStack:

- The VM is connected to a private network, and it uses a floating IP address to communicate with the external network.

A limitation to this scenario is that direct OSPF or IS-IS adjacency does not work behind NAT. You should, therefore, use BGP-LS between the JunosVM and the network devices for topology acquisition.

- The VM is connected or bridged directly to the provider network (flat networking).

In some deployments, a VM with flat networking is not able to access OpenStack metadata services. In that case, the official CentOS cloud image used for the NorthStar Controller application VM cannot install the SSH key or post-launch script, and you might not be able to access the VM.

One workaround is to access metadata services from outside the DHCP namespace using the following procedure:



**CAUTION:** This procedure interrupts traffic on the OpenStack system. We recommend that you consult with your OpenStack administrator before proceeding.

1. Edit the `/etc/neutron/dhcp_agent.ini` file to change “enable\_isolated\_metadata = False” to “enable\_isolated\_metadata = True”.
2. Stop all neutron agents on the network node.
3. Stop any dnsmasq processes on network node or on the node that serves the flat network subnet.
4. Restart all neutron agents on the network node.

## HEAT Templates

The following HEAT templates are provided with the NorthStar Controller software:

- `northstar310.heat` (standalone installation) and `northstar310.3instances.heat` (cluster installation)

These templates can be appropriate when the NorthStar Controller application VM and the JunosVM are to be connected to a virtual network that is directly accessible from outside OpenStack, without requiring NAT. Typical scenarios include a VM that uses flat networking, or an existing OpenStack system that uses Contrail as the Neutron plugin, advertising the VM subnet to the MX Series Gateway device.

- `northstar310.floating.heat` (standalone installation) and `northstar310.3instances.floating.heat` (cluster installation)

These templates can be appropriate if the NorthStar Controller application VM and the JunosVM are to be connected to a private network behind NAT, and require a floating IP address for one-to-one NAT.

We recommend that you begin with a HEAT template rather than manually creating and configuring all of your resources from scratch. You might still need to modify the template to suit your individual environment.

## HEAT Template Input Values

The provided HEAT templates require the input values described in [Table 7 on page 46](#).

*Table 7: HEAT Template Input Values*

| Parameter                  | Default | Notes  |
|----------------------------|---------|--|
| <code>customer_name</code> | (empty) | User-selected name to identify the NorthStar stack |

Table 7: HEAT Template Input Values (continued)

| Parameter         | Default                            | Notes  |
|-------------------|------------------------------------|--|
| app_image         | CentOS-6-x86_64-GenericCloud.qcow2 | Modify this variable with the Centos 6 cloud image name that is available in Glance    |
| junosvm_image     | northstar-junosvm                  | Modify this variable with the JunosVM image name that is available in Glance           |
| app_flavor        | m1.large                           | Instance flavor for the NorthStar Controller VM with a minimum 40 GB disk and 8 GB RAM |
| junosvm_flavor    | m1.small                           | Instance flavor for the JunosVM with a minimum of a 20 GB disk and 2GB of RAM          |
| public_network    | (empty)                            | UUID of the public-facing network, mainly for managing the server                      |
| asn               | 11                                 | AS number of the backbone routers for BGP-LS peering                                   |
| rootpassword      | northstar                          | Root password  |
| availability_zone | nova                               | Availability zone for spawning the VMs   |
| key_name          | (empty)                            | Your ssh-key must be uploaded in advance   |

## Known Limitations

The following limitations apply to installing and using the NorthStar Controller in a virtualized environment.

### Virtual IP Limitations from ARP Proxy Being Enabled

In some OpenStack implementations, ARP proxy is enabled, so virtual switch forwarding tables are not able to learn packet destinations (no ARP snooping). Instead, ARP learning is based on the hypervisor configuration.

This can prevent the virtual switch from learning that the virtual IP address has been moved to a new active node as a result of a high availability (HA) switchover.

There is currently no workaround for this issue other than disabling ARP proxy on the network where the NorthStar VM is connected. This is not always possible or allowed.

### Hostname Changes if DHCP is Used Rather than a Static IP Address

If you are using DHCP to assign IP addresses for the NorthStar application VM (or NorthStar on a physical server), you should never change the hostname manually.

Also if you are using DHCP, you should not use `net_setup.py` for host configuration.

### Disk Resizing Limitations

OpenStack with cloud-init support is supposed to resize the VM disk image according to the version you select. Unfortunately, the CentOS 6 official cloud image does not auto-resize due to an issue within the cloud-init agent inside the VM.

The only known workaround at this time is to manually resize the partition to match the allocated disk size after the VM is booted for the first time. A helper script for resizing the disk (`/opt/northstar/utls/resize_vm.sh`) is included as part of the NorthStar Controller RPM bundle.

#### Related Documentation

- [OpenStack Resources for NorthStar Controller Installation on page 48](#)
- [NorthStar Controller in an OpenStack Environment Pre-Installation Steps on page 49](#)
- [Installing the NorthStar Controller in Standalone Mode Using a HEAT Template on page 50](#)
- [Installing a NorthStar Cluster Using a HEAT Template on page 54](#)

## OpenStack Resources for NorthStar Controller Installation

[Table 8 on page 48](#) and [Table 9 on page 48](#) describe the required and optional OpenStack resources for running the NorthStar Controller in an OpenStack environment.

**Table 8: Required OpenStack Resources**

| Resource            | Description   |
|---------------------|---|
| OS::Nova::Server    | Two of these resources are required: one for the NorthStar Controller application VM and one for the JunosVM.   |
| OS::Neutron::Port   | At least two of these resources are required for the Ethernet connections of each OS::Nova::Server resource.  |
| OS::Neutron::Net    | Each NorthStar installation requires one of this resource for internal communication between the NorthStar Controller application VM and the JunosVM. Connection to an existing OS::Neutron::Net resource for public network connectivity is also required. |
| OS::Neutron::Subnet | A fixed 172.16.16.0/24 subnet is required for internal communication between the NorthStar Controller application VM and the JunosVM.   |

**Table 9: Optional OpenStack Resources**

| Resource                   | Description   |
|----------------------------|---|
| OS::Neutron::SecurityGroup | Use this resource (either new or existing) to access the NorthStar Controller application VM and JunosVM from outside OpenStack.  |
| OS::Neutron::FloatingIP    | Use this resource if the NorthStar Controller application VM and JunosVM are connected to a virtual private network behind NAT. This resource is not usually necessary in a flat networking scenario or a private network using Contrail. |



Table 9: Optional OpenStack Resources (continued)

| Resource                  | Description   |
|---------------------------|---|
| OS::Nova::ServerGroup     | Use this resource with an anti-affinity rule to ensure that no more than one NorthStar Controller application VM, or no more than one JunosVM are spawned in the same compute node. This is for additional redundancy purposes. |
| OS::Neutron::Port for VIP | Use an additional OS::Neutron::Port for cluster setup, to provide a virtual IP address for the client facing connection.  |

**Related Documentation** • [Overview of NorthStar Controller Installation in an OpenStack Environment on page 44](#)

## NorthStar Controller in an OpenStack Environment Pre-Installation Steps

Before you install the NorthStar Controller in an OpenStack environment, prepare your system by performing the following pre-installation steps.

1. (Optional) Upload an SSH keypair.

```
# nova keypair-add --pub-key ssh-public-key-file keypair-name
```

Alternatively, you can use any existing keypair that is available in your OpenStack system. You can also use Horizon UI to upload the image. Consult your OpenStack user guide for more information about creating, importing, and using keypairs.

2. Upload an official CentOS 6 Cloud image.

```
# glance image-create --name glance-centos-image-name --disk-format qcow2
--container-format bare --file image-location-and-filename-to-upload
```

For example:

```
# glance image-create --name northstar_junosvm_17.2R1.openstack.qcow2
--disk-format qcow2 --container-format bare --file
images/northstar_junosvm_17.2R1.openstack.qcow2
```

3. Change the JunosVM disk bus type to IDE and the Ethernet driver to e1000.

```
# glance image-update --property hw_disk_bus=ide --property hw_cdrom_bus=ide
--property hw_vif_model=e1000 junosvm-image-id
```



**NOTE:** The variable *junosvm-image-id* is the UUID of the JunosVM image. You can find this ID in the output of the following command:

```
# glance image-list
```

- Related Documentation**
- [Overview of NorthStar Controller Installation in an OpenStack Environment on page 44](#)
  - [OpenStack Resources for NorthStar Controller Installation on page 48](#)

## Installing the NorthStar Controller in Standalone Mode Using a HEAT Template

---

This topic describes installing a standalone NorthStar Controller in an OpenStack environment using a HEAT template. These instructions assume you are using one of the provided HEAT templates.

### Launch the Stack

Perform the following steps to launch the stack.

1. Create a stack from the HEAT template file using the **heat stack-create** command.

```
# heat stack-create stack-name -f northstar310.heat.official --parameters
customer_name=instance-name;app_image=centos6-image-name;junosvm_image=
junosvm-image-name;public_network=public-network-uuid;key_name=
keypair-name;app_flavor=app-vm-flavor;junosvm_flavor=junosvm-flavor
```

### Obtain the Stack Attributes

1. Ensure that the stack creation is complete by examining the output of the **heat stack-show** command.

```
# heat stack-show stack-name | grep stack_status
```

2. Obtain the UUID of the NorthStar Controller VM and the JunosVM instances by executing the **resource-list** command.

```
# heat resource-list stack-name | grep ::Server
```

3. Using the UUIDs obtained from the **resource-list** command output, obtain the associated IP addresses by executing the **interface-list** command for each UUID.

```
# nova interface-list uuid
```

4. Once the NorthStar Controller VM finishes its booting process, you should be able to ping its public IP address.



**NOTE:** You can use the **nova console-log** command to monitor the booting status.

At this point, the NorthStar Controller VM is remotely accessible, but the JunosVM is not because it does not support DHCP. Once the NorthStar Controller RPM bundle installation is completed, the JunosVM can be remotely accessed.

5. Connect to the NorthStar Controller VM using SSH.

If you are using a different SSH key from the one that is defined in the HEAT template, the default credentials are root/northstar and centos/northstar.

## Resize the Image

The CentOS 6 official cloud image does not resize correctly for the selected OpenStack flavor. This results in the NorthStar Controller VM filesystem size being set at 8G instead of the size that is actually specified by the flavor. Using the following procedure, you can adjust your filesystem to be in sync with the allocated disk size. Alternatively, you can hold off on the resizing procedure until after you complete the NorthStar Controller RPM bundle installation. There is a `resize-vm` script inside `/opt/northstar/utils/`.



**CAUTION:** The `fdisk` command can have undesirable effects if used inappropriately. We recommend that you consult with your system administrator before proceeding with this workaround, especially if you are unfamiliar with the `fdisk` command.

1. Determine whether the size of the VM is correct. If it is correct, you do not need to proceed with resizing.

```
# ssh centos@App_Public_IPv4
Warning: Permanently added '172.25.158.161' (RSA) to the list of known
hosts.

[centos@app_instance ~]$ df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/vda1       7.8G  646M   6.8G   9% /
tmpfs           1.9G    0    1.9G   0% /dev/shm
```

2. Use the `fdisk` command to recreate the partition.

```
# ssh centos@App_Public_IPv4
Warning: Permanently added '172.25.158.161' (RSA) to the list of known
hosts.

[user@demo-northstar-app centos]# fdisk /dev/vda

WARNING: DOS-compatible mode is deprecated. It's strongly recommended to
switch off the mode (command 'c') and change display units to
sectors (command 'u').

Command (m for help): c
DOS Compatibility flag is not set

Command (m for help): u
```

Changing display/entry units to sectors

Command (m for help): **p**

Disk /dev/vda: 85.9 GB, 85899345920 bytes  
 255 heads, 63 sectors/track, 10443 cylinders, total 167772160 sectors  
 Units = sectors of 1 \* 512 = 512 bytes  
 Sector size (logical/physical): 512 bytes / 512 bytes  
 I/O size (minimum/optimal): 512 bytes / 512 bytes  
 Disk identifier: 0x00050c05

| Device    | Boot | Start | End      | Blocks  | Id | System |
|-----------|------|-------|----------|---------|----|--------|
| /dev/vda1 | *    | 2048  | 16777215 | 8387584 | 83 | Linux  |

Command (m for help): **d**

Selected partition 1

Command (m for help): **n**

Command action

e extended

p primary partition (1-4)

p

Partition number (1-4): **1**

First sector (2048-167772159, default 2048):

Using default value 2048

Last sector, +sectors or +size{K,M,G} (2048-167772159, default 167772159):

Using default value 167772159

Command (m for help): **w**

The partition table has been altered!

Calling ioctl() to re-read partition table.

WARNING: Re-reading the partition table failed with error 16: Device or resource busy.

The kernel still uses the old table. The new table will be used at the next reboot or after you run partprobe(8) or kpartx(8)

Syncing disks.

[user@demo-northstar-app centos]#

3. Reboot the VM to apply the partition changes.

[user@app\_instance centos]# **reboot**

Broadcast message from centos@app\_instance  
 (/dev/pts/0) at 14:54 ...

The system is going down for reboot NOW!

4. Wait until the NorthStar Controller VM has returned to an up state.
5. Reconnect to the VM using SSH.
6. Check the partition size again to verify that the partition was resized.

7. If the partition size is still incorrect, use the **resize2fs** command to adjust the filesystem.

```
# resize2fs /dev/vda1
```

## Install the NorthStar Controller RPM Bundle

Install the NorthStar Controller RPM bundle for an OpenStack environment as described in [“Installing the NorthStar Controller 3.1.0” on page 25](#). The procedure uses the **rpm** and **install-vm.sh** commands.

## Configure the JunosVM

For security reasons, the JunosVM does not come with a default configuration. Use the following procedure to manually configure the JunosVM using the OpenStack novnc client.

1. Obtain the novnc client URL.

```
# nova get-vnc-console JunosVM-ID novnc
```

2. Configure the JunosVM as you would in a fresh install of the Junos OS.
3. Copy the root user of the NorthStar Controller VM SSH public key to the JunosVM. This allows configuration from the NorthStar Controller VM to the JunosVM using an ssh-key based connection.
4. On the NorthStar Controller VM, run the `net_setup.py` script, and select option B to complete the configuration of the JunosVM. Once complete, you should be able to remotely ping the JunosVM IP address.

## Configure SSH Key Exchange

Use the following procedure to configure SSH key exchange between the NorthStar Controller VM and the JunosVM.

1. Log in to the NorthStar Controller server and display the contents of the `id_rsa.pub` file by executing the **concatenate** command.

```
$cat /opt/pcs/.ssh/id_rsa.pub
```

You will need the `ssh-rsa` string from the output.

2. Log in to the JunosVM and replace the `ssh-rsa` string with the one from the `id_rsa.pub` file by executing the following commands.

```
ssh northstar@JunosVM-ip
configure
set system login user northstar authentication ssh-rsa replacement-string
commit
exit
```

3. On the NorthStar Controller server, update the known hosts file by executing the following commands.

```
$su - pcs
$ssh -o UserKnownHostsFile=/opt/pcs/.ssh/known_hosts -i /opt/pcs/.ssh/id_rsa
northstar@JunosVM- ip
exit
exit
```

#### Related Documentation

- [Introduction to NorthStar Controller Installation and Configuration](#)
- [NorthStar Controller System Requirements on page 17](#)
- [Overview of NorthStar Controller Installation in an OpenStack Environment on page 44](#)
- [OpenStack Resources for NorthStar Controller Installation on page 48](#)
- [NorthStar Controller in an OpenStack Environment Pre-Installation Steps on page 49](#)
- [Installing the NorthStar Controller 3.1.0 on page 25](#)

---

## Installing a NorthStar Cluster Using a HEAT Template

This topic describes installing a NorthStar cluster in an OpenStack environment using a HEAT template. These instructions assume that you are using one of the provided HEAT templates.

### System Requirements

In addition to the system requirements for installing the NorthStar Controller in a two-VM environment, a cluster installation also requires that:

- An individual compute node is hosting only one NorthStar Controller VM and one JunosVM. You can ensure this by launching the NorthStar Controller VM into a specific availability zone and compute node, or by using a host affinity such as OS::Nova::ServerGroup with an anti-affinity rule.
- The cluster has a single virtual IP address for the client facing connection. If promiscuous mode is disabled in OpenStack (blocking the virtual IP address), you can use the Neutron::Port allowed-address-pair attribute to permit the additional address.

### Launch the Stack

Create a stack from the HEAT template file using the **heat stack-create** command.

```
# heat stack-create stack-name -f northstar310.3instances.heat.official
--parameters
customer_name=instance-name;app_image=centos6-image-name;junosvm_image=
junosvm-image-name;public_network=public-network-uuid;key_name=
keypair-name;app_flavor=app-vm-flavor;junosvm_flavor=junosvm-flavor
```

## Obtain the Stack Attributes

1. Ensure that the stack creation is complete by examining the output of the **heat stack-show** command.

```
# heat stack-show stack-name | grep stack_status
```

2. Obtain the UUID of the NorthStar Controller VM and the JunosVM instances for each node in the cluster by executing the **resource-list** command.

```
# heat resource-list stack-name | grep ::Server
```

3. Using the UUIDs obtained from the **resource-list** command output, obtain the associated IP addresses by executing the **interface-list** command for each UUID.

```
# nova interface-list uuid
```

4. Verify that each compute node in the cluster has only one NorthStar Controller VM and only one JunosVM by executing the following command for each UUID:

```
# nova show uuid | grep hypervisor
```

## Configure the Virtual IP Address

1. Find the UUID of the virtual IP port that is defined in the HEAT template by examining the output of the **heat resource-list** command.

```
# heat resource-list stack-name | grep vip_port
```

2. Find the assigned virtual IP address for that UUID by examining the output of the **neutron port-show** command.

```
# neutron port-show vip-port-uuid
```

3. Find the UUID of each public-facing NorthStar Controller port by examining the output of the **neutron port-list** command.

```
# neutron port-list | grep stack-name-app_port_eth0
```

For example:

```
# neutron port-list | grep northstarHAexample-app_port_eth0
```

4. Update each public-facing NorthStar Controller port to accept the virtual IP address by executing the **neutron port-update** command for each port.

```
# neutron port-update vip-port-uuid --allowed_address_pairs list=true
type=dict ip_address=vip-ip
```

For example:

```
# neutron port-update a15578e2-b9fb-405c-b4c4-1792f5207003
--allowed_address_pairs list=true type=dict ip_address=172.25.158.139
```

5. Wait until each NorthStar Controller VM finishes its booting process, at which time, you should be able to ping its public IP address. You can also use the **nova console-log** command to monitor the booting status of the NorthStar Controller VM.

## Resize the Image

The CentOS 6 official cloud image does not resize correctly for the selected OpenStack flavor. This results in the NorthStar Controller VM filesystem size being set at 8G instead of the size that is actually specified by the flavor. Using the following procedure, you can adjust your filesystem to be in sync with the allocated disk size. Alternatively, you can hold off on the resizing procedure until after you complete the NorthStar RPM bundle installation. There is a `resize-vm` script inside `/opt/northstar/utlis/`.



**CAUTION:** The **fdisk** command can have undesirable effects if used inappropriately. We recommend that you consult with your system administrator before proceeding with this workaround, especially if you are unfamiliar with the **fdisk** command.

Use the following procedure for each NorthStar Controller VM. Replace **XX** in the commands with the number of the VM (01, 02, 03, and so on).

1. Determine whether the size of the VM is correct. If it is correct, you do not need to proceed with the resizing.

```
# ssh centos@App_XX_Public_IPv4
Warning: Permanently added '172.25.158.161' (RSA) to the list of known
hosts.

[centos@app_instance_XX ~]$ df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/vda1        7.8G  646M   6.8G   9% /
tmpfs            1.9G   0    1.9G   0% /dev/shm
```

2. Use the **fdisk** command to recreate the partition.

```
# ssh centos@App_XX_Public_IPv4
Warning: Permanently added '172.25.158.161' (RSA) to the list of known
hosts.

[user@demo-northstar-app centos]# fdisk /dev/vda

WARNING: DOS-compatible mode is deprecated. It's strongly recommended to
```



```

switch off the mode (command 'c') and change display units to
sectors (command 'u').

Command (m for help): c
DOS Compatibility flag is not set

Command (m for help): u
Changing display/entry units to sectors

Command (m for help): p

Disk /dev/vda: 85.9 GB, 85899345920 bytes
255 heads, 63 sectors/track, 10443 cylinders, total 167772160 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00050c05

Device Boot      Start         End      Blocks   Id  System
/dev/vda1   *        2048     16777215      8387584   83   Linux

Command (m for help): d
Selected partition 1

Command (m for help): n
Command action
e   extended
p   primary partition (1-4)
p
Partition number (1-4): 1
First sector (2048-167772159, default 2048):
Using default value 2048
Last sector, +sectors or +size{K,M,G} (2048-167772159, default 167772159):
Using default value 167772159

Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.

WARNING: Re-reading the partition table failed with error 16: Device or
resource busy.
The kernel still uses the old table. The new table will be used at
the next reboot or after you run partprobe(8) or kpartx(8)
Syncing disks.
[user@demo-northstar-app centos]#

```

3. Reboot the VM to apply the partition changes.

```

[user@app_instance_XX centos]# reboot

Broadcast message from centos@app_instance_XX
(/dev/pts/0) at 14:54 ...

The system is going down for reboot NOW!

```

4. Wait until the NorthStar Controller VM has returned to an up state.

5. Reconnect to the VM using SSH.
6. Check the partition size again to verify that the partition was resized.
7. If the partition size is still incorrect, use the **resize2fs** command to adjust the filesystem.

```
# resize2fs /dev/vda1
```

## Install the NorthStar Controller RPM Bundle

Install the NorthStar Controller RPM bundle for an OpenStack environment. The procedure uses the **rpm** and **install-vm.sh** commands.

## Configure the JunosVM

For security reasons, the JunosVM does not come with a default configuration. Use the following procedure to manually configure the JunosVM using the OpenStack novnc client.

1. Obtain the novnc client URL.

```
# nova get-vnc-console JunosVM-ID novnc
```

2. Configure the JunosVM as you would in a fresh install of the Junos OS.
3. Copy the root user of the NorthStar Controller VM SSH public key to the JunosVM. This allows configuration from the NorthStar Controller VM to the JunosVM using an ssh-key based connection.
4. On the NorthStar Controller VM, run the `net_setup.py` script, and select option **B** to complete the configuration of the JunosVM. Once complete, you should be able to remotely ping the JunosVM IP address.

## Configure SSH Key Exchange

Use the following procedure to configure SSH key exchange between the NorthStar Controller VM and the JunosVM. For High Availability (HA) in a cluster, this must be done for every pair of VMs.

1. Log in to the NorthStar Controller server and display the contents of the `id_rsa.pub` file by executing the **concatenate** command.

```
$cat /opt/pcs/.ssh/id_rsa.pub
```

You will need the ssh-rsa string from the output.

2. Log in to the JunosVM and replace the ssh-rsa string with the one from the `id_rsa.pub` file by executing the following commands.

```
ssh northstar@JunosVM- ip
configure
set system login user northstar authentication ssh-rsa replacement-string
commit
exit
```

3. On the NorthStar Controller server, update the known hosts file by executing the following commands.

```
$su - pcs
$ssh -o UserKnownHostsFile=/opt/pcs/.ssh/known_hosts -i /opt/pcs/.ssh/id_rsa
northstar@JunosVM- ip
exit
exit
```

## Configure the HA Cluster

HA on the NorthStar Controller is an active/standby solution. That means that there is only one active node at a time, with all other nodes in the cluster serving as standby nodes. All of the nodes in a cluster must be on the same local subnet for HA to function. On the active node, all processes are running. On the standby nodes, those processes required to maintain connectivity are running, but NorthStar processes are in a stopped state.

If the active node experiences a hardware- or software-related connectivity failure, the NorthStar HA\_agent process elects a new active node from amongst the standby nodes. Complete failover is achieved within five minutes. One of the factors in the selection of the new active node is the user-configured priorities of the candidate nodes.

All processes are started on the new active node, and the node acquires the virtual IP address that is required for the client-facing interface. This address is always associated with the active node, even if failover causes the active node to change.

See the *NorthStar Controller User Guide* for further information on configuring and using the HA feature.

### Related Documentation

- [Introduction to NorthStar Controller Installation and Configuration](#)
- [NorthStar Controller System Requirements on page 17](#)
- [Overview of NorthStar Controller Installation in an OpenStack Environment on page 44](#)
- [OpenStack Resources for NorthStar Controller Installation on page 48](#)
- [NorthStar Controller in an OpenStack Environment Pre-Installation Steps on page 49](#)
- [Installing the NorthStar Controller 3.1.0 on page 25](#)



## CHAPTER 4

# Configuring Topology Acquisition and Connectivity Between the NorthStar Controller and the Path Computation Clients

- [Understanding Network Topology Acquisition on the NorthStar Controller on page 61](#)
- [Configuring Topology Acquisition on page 62](#)
- [Configuring PCEP on a PE Router \(from the CLI\) on page 68](#)
- [Mapping a Path Computation Client PCEP IP Address on page 70](#)

## Understanding Network Topology Acquisition on the NorthStar Controller

---

After you use BGP-LS to establish BGP peering between the Junos VM and one or more routers in the backbone network, the NorthStar Controller acquires real-time topology changes, which are recorded in the traffic engineering database (TED). To compute optimal paths through the network, the NorthStar Controller requires a consolidated view of the network topology. This routing view of the network includes the nodes, links, and their attributes (metric, link utilization bandwidth, and so on) that comprise the network topology. Thus, any router CLI configuration changes to IGP metric, RSVP bandwidth, Priority/Hold values, and so on are instantly available from the NorthStar Controller UI topology view.

To provide a network view, the NorthStar Controller runs Junos OS in a virtual machine (JunosVM) that uses routing protocols to communicate with the network and dynamically learn the network topology. To provide real-time updates of the network topology, the JunosVM, which is based on a virtual Route Reflector (vRR), establishes a BGP-LS peering session with one or more routers from the existing MPLS TE backbone network. A router from the MPLS TE backbone advertises its traffic engineering database (TED) in BGP-LS. The JunosVM receives real-time BGP-LS updates and forwards this topology data into the Network Topology Abstractor Daemon (NTAD), which is a server daemon that runs in the JunosVM.

The NorthStar Controller stores network topology data in the following routing tables:

- `Isdist.0`—stores the network topology from TED

- `lsdist.1`—stores the network topology from IGP database

NTAD then forwards a copy of the updated topology information to the Path Computation Server (PCS), which displays the live topology update from the NorthStar Controller UI.

To provide a real-time topology update of the network, you can configure direct IS-IS or OSPF adjacency between the NorthStar Controller and an existing MPLS TE backbone router, but we recommend that you use BGP-LS rather than direct IGP adjacency or IGP adjacency over GRE.



**NOTE:**

The current BGP-LS implementation only considers TED information, and some IGP-specific attributes might not be forwarded during topology acquisition. The following IGP attributes are not forwarded:

- Link net mask.
- IGP metric (TED provides TE metric only).

In some cases, using IS-IS or OSPF adjacency instead of BGP-LS might produce stale data because IS-IS and OSPF have a database lifetime period that is not automatically cleared when the adjacency is down. In this case, NTAD will export all information in the OSPF or IS-IS database to the NorthStar Path Computation Server (PCS), so the NorthStar Controller might show incorrect topology.

**Related Documentation**

- [Configuring Topology Acquisition on page 62](#)

---

## Configuring Topology Acquisition

After you have successfully established a connection between the NorthStar Controller and the network, you can configure topology acquisition using Border Gateway Protocol Link State (BGP-LS) or an IGP (OSPF or IS-IS). For BGP-LS topology acquisition, you must configure both the NorthStar Controller and the PCC routers.

We recommend that you use BGP-LS instead of IGP adjacency for the following reasons:

- The OSPF and IS-IS databases have lifetime timers. If the OSPF or IS-IS neighbor goes down, the corresponding database is not immediately removed, making it impossible for the NorthStar Controller to determine whether the topology is valid.
- Using BGP-LS minimizes the risk of making the JunosVM a transit router between AS areas if the GRE metric is not properly configured.
- Typically, the NorthStar Controller is located in a network operations center (NOC) data center, multihops away from the backbone and MPLS TE routers. This is easily accommodated by BGP-LS, but more difficult for IGP protocols because they would have to employ a tunneling mechanism such as GRE to establish adjacency.



**NOTE:** If BGP-LS is used, the JunosVM is configured to automatically accept any I-BGP session. However, you must verify that the JunosVM is correctly configured and that it has IP reachability to the peering router.

Before you begin, complete the following tasks:

- Verify IP connectivity between a switch (or router) and the x86 appliance on which the NorthStar Controller software is installed.
- Configure the Network Topology Acquisition Daemon (NTAD). The NTAD forwards topology information from the network to the NorthStar application, and it must be running on the JunosVM.

Use the following command to enable the NTAD:

```
junosVM# set protocols topology-export
```

Use the following command to verify that the NTAD is running; if the topology-export statement is missing, the match produces no results:

```
junosVM> show system processes extensive | match ntad
2462 root      1  96    0 6368K 1176K select  1:41  0.00% ntad
```

Configure topology acquisition using one of these methods:

- [Configuring Topology Acquisition Using BGP-LS on page 63](#)
- [Configuring Topology Acquisition Using OSPF on page 65](#)
- [Configuring Topology Acquisition Using IS-IS on page 66](#)

## Configuring Topology Acquisition Using BGP-LS

Complete the steps in the following sections to configure topology acquisition using BGP-LS:

- [Configure BGP-LS Topology Acquisition on the NorthStar Controller on page 63](#)
- [Configure the Peering Router to Support Topology Acquisition on page 64](#)

### Configure BGP-LS Topology Acquisition on the NorthStar Controller

To configure BGP-LS topology acquisition on the NorthStar Controller, perform the following configuration steps from the NorthStar JunosVM:

1. Initiate an SSH or a telnet session to the JunosVM external IP or management IP address.
2. Specify the autonomous system (AS) number for the node (BGP peer).

```
[edit routing-options]
user@northstar_junosvm# set autonomous-system AS_number
```

3. Specify the BGP group name and type for the node.

```
[edit protocols bgp]
user@northstar_junosvm# set group group_1 type internal
```

4. Specify a description for the BGP group for the node.

```
[edit protocols bgp group group_1]
user@northstar_junosvm# set description "NorthStar BGP-TE Peering"
```

5. Specify the address of the local end of a BGP session.

This is the IP address for the JunosVM external IP address that is used to accept incoming connections to the JunosVM peer and to establish connections to the remote peer.

```
[edit protocols bgp group group_1]
user@northstar_junosvm# set local-address <junosVM IP address>
```

6. Enable the traffic engineering features for the BGP routing protocol.

```
[edit protocols bgp group group_1]
user@northstar_junosvm# set family traffic-engineering unicast
```

7. Specify the IP address for the neighbor router that connects with the NorthStar Controller.

```
[edit protocols bgp group group_1]
user@northstar_junosvm# set neighbor <router loopback IP address>
```



**NOTE:** You can specify the router loopback address if it is reachable by the BGP peer on the other end. But for loopback to be reachable, usually some IGP has to be enabled between the NorthStar JunosVM and the peer on the other end.

---

### Configure the Peering Router to Support Topology Acquisition

To enable the NorthStar Controller to discover the network, you must add the following configuration on each router that peers with the NorthStar Controller. The NorthStar JunosVM must peer with at least one router from each area (autonomous system).

To enable topology acquisition, initiate a telnet session to each PCC router and add the following configuration:

1. Configure a policy.

```
[edit policy-options]
```



```
user@PE1# set policy-statement TE term 1 from family traffic-engineering
user@PE1# set policy-statement TE term 1 then accept
```



**NOTE:** This configuration is appropriate for both OSPF and IS-IS.

2. Import the routes into the traffic-engineering database.

```
[edit protocols mpls traffic-engineering database]
user@PE1# set import policy TE
```

3. Configure a BGP group by specifying the IP address of the router that peers with the NorthStar Controller as the local address (typically the loopback address) and the JunosVM external IP address as the neighbor.

```
[edit routing-options]
user@PE1# set autonomous-system AS Number

[edit protocols bgp group northstar]
user@PE1# set type internal
user@PE1# set description "NorthStar BGP-TE Peering"
user@PE1# set local-address <router-IP-address>
user@PE1# set family traffic-engineering unicast
user@PE1# set export TE
user@PE1# set neighbor <JunosVM IP-address>
```

## Configuring Topology Acquisition Using OSPF

The following sections describe how to configure topology acquisition using OSPF:

- [Configure OSPF on the NorthStar Controller on page 65](#)
- [Configure OSPF over GRE on the NorthStar Controller on page 66](#)

### Configure OSPF on the NorthStar Controller

To configure OSPF on the NorthStar Controller:

1. Configure the policy.

```
[edit policy-options]
user@northstar_junosvm# set policy-statement TE term 1 from family traffic-engineering
user@northstar_junosvm# set policy-statement TE term 1 then accept
```

2. Populate the traffic engineering database.

```
[edit]
user@northstar_junosvm# set protocols mpls traffic-engineering database import
policy TE
```

3. Configure OSPF.

```
[edit]
user@northstar_junosvm# set protocols ospf area area interface interface interface-type
p2p
```

---

### Configure OSPF over GRE on the NorthStar Controller

Once you have configured OSPF on the NorthStar Controller, you can take the following additional steps to configure OSPF over GRE:

1. Initiate an SSH or telnet session using the NorthStar JunosVM external IP address.
2. Configure the tunnel.

```
[edit interfaces]
user@northstar_junosvm# set gre unit 0 tunnel source local-physical-ip
user@northstar_junosvm# set gre unit 0 tunnel destination destination-ip
user@northstar_junosvm# set gre unit 0 family inet address tunnel-ip-addr
user@northstar_junosvm# set gre unit 0 family iso
user@northstar_junosvm# set gre unit 0 family mpls
```

3. Enable OSPF traffic engineering on the JunosVM and add the GRE interface to the OSPF configuration.

```
[edit protocols ospf]
user@northstar_junosvm# set traffic-engineering
user@northstar_junosvm# set area area interface gre.0 interface-type p2p
user@northstar_junosvm# set area area interface gre.0 metric 65530
```

## Configuring Topology Acquisition Using IS-IS

The following sections describe how to configure topology acquisition using IS-IS:

- [Configure IS-IS on the NorthStar Controller on page 66](#)
- [Configure IS-IS over GRE on the NorthStar Controller on page 67](#)

---

### Configure IS-IS on the NorthStar Controller

To configure IS-IS topology acquisition and enable IS-IS routing, perform the following steps on the NorthStar JunosVM:

1. Configure interfaces for IS-IS routing. For example:

```
[edit]
user@northstar_junosvm# set interfaces em0 unit 0 family inet address 172.16.16.2/24
user@northstar_junosvm# set interfaces em1 unit 0 family inet address
192.168.179.117/25
user@northstar_junosvm# set interfaces em0 unit 0 family inet address 172.16.16.2/24
user@northstar_junosvm# set interfaces em2 unit 0 family mpls
```

```
user@northstar_junosvm# set interfaces lo0 unit 0 family inet address 88.88.88.88/32
primary
user@northstar_junosvm# set routing-options static route 0.0.0.0/0 next-hop
192.168.179.126
user@northstar_junosvm# set routing-options autonomous-system 1001
```

2. Configure the policy.

```
[edit policy-options]
user@northstar_junosvm# set policy-statement TE term 1 from family
traffic-engineering
user@northstar_junosvm# set policy-statement TE term 1 then accept
```

3. Populate the traffic engineering database.

```
[edit protocols]
user@northstar_junosvm# set mpls traffic-engineering database import policy TE
```

4. Configure IS-IS.

```
[edit protocols]
user@northstar_junosvm# set isis interface interface level level metric metric
user@northstar_junosvm# set isis interface interface point-to-point
```

---

### Configure IS-IS over GRE on the NorthStar Controller

Once you have configured IS-IS on the NorthStar Controller, you can take the following additional steps to configure IS-IS over GRE:

1. Initiate an SSH or telnet session using the IP address for the NorthStar JunosVM external IP address.
2. Configure the tunnel.

```
[edit interfaces]
user@northstar_junosvm# set gre unit 0 tunnel source local-physical-ip
user@northstar_junosvm# set gre unit 0 tunnel destination destination
user@northstar_junosvm# set gre unit 0 family inet address tunnel-ip-addr
user@northstar_junosvm# set gre unit 0 family iso
user@northstar_junosvm# set gre unit 0 family mpls
```

3. Add the GRE interface to the IS-IS configuration.

```
[edit protocols isis]
user@northstar_junosvm# set interface gre.0 level level metric 65530
user@northstar_junosvm# set interface gre.0 point-to-point
```

- Related Documentation**
- [Configuring PCEP on a PE Router \(from the CLI\) on page 68](#)

---

## Configuring PCEP on a PE Router (from the CLI)

---

A Path Computation Client (PCC) supports the configurations related to the Path Computation Element (PCE) and communicates with the NorthStar Controller, which by default is configured to accept a Path Computation Element Protocol (PCEP) connection from any source address. However, you must configure PCEP on each PE router to configure the router as a PCC and establish a connection between the PCC and the NorthStar Controller. A PCC initiates path computation requests, which are then executed by the NorthStar Controller.

Each PCC in the network that the NorthStar Controller can access must be running a Junos OS release that is officially supported by the NorthStar Controller as designated in the *NorthStar Controller Release Notes* (jinstall 32 bit).



**NOTE:** For a PCEP connection, the PCC can connect to the NorthStar Controller using an in-band or out-of-band management network, provided that IP connectivity is established between the Path Computation Server (PCS) and the specified PCEP local address. In some cases, an additional static route might be required from the NorthStar Controller to reach the PCC, if the IP address is unreachable from the NorthStar Controller default gateway.

To configure a PE router as a PCC:

1. Enable external control of LSPs from the PCC router to the NorthStar Controller.

```
[edit protocols]
user@PE1# set mpls lsp-external-controller pccd
```

2. Specify the loopback address of the PCC router as the local address, for example:

```
[edit protocols]
user@PE1# set pcep pce northstar1 local-address 10.0.0.101
```



**NOTE:** As a best practice, the router ID is usually the loopback address, but it is not necessarily configured that way.

3. Specify the NorthStar Controller (**northstar1**) as the PCE that the PCC connects to, and specify the NorthStar Controller host external IP address as the destination address.

```
[edit protocols]
```

```
user@PE1# set pcep pce northstar1 destination-ipv4-address 10.99.99.1
```

4. Configure the destination port for the PCC router that connects to the NorthStar Controller (PCE server) using the TCP-based PCEP.

```
[edit protocols]  
user@PE1# set pcep pce northstar1 destination-port 4189
```

5. Configure the PCE type.

```
[edit protocols]  
user@PE1# set pcep pce northstar1 pce-type active  
user@PE1# set pcep pce northstar1 pce-type stateful
```

6. Enable LSP provisioning.

```
[edit protocols]  
user@PE1# set pcep pce northstar1 lsp-provisioning
```

7. To verify that PCEP has been configured on the router, open a telnet session to access the router, and run the following commands:

```
user@PE1> show configuration protocols mpls
```

Sample output:

```
lsp-external-controller pccd;
```

```
user@PE1> show configuration protocols pcep
```

Sample output:

```
pce northstar1 {  
  local-address 10.0.0.101;  
  destination-ipv4-address 10.99.99.1;  
  destination-port 4189;  
  pce-type active-stateful;  
  lsp-provisioning;  
}
```

#### Related Documentation

- [Mapping a Path Computation Client PCEP IP Address on page 70](#)

## Mapping a Path Computation Client PCEP IP Address

---

A Path Computation Client (PCC) supports the configurations related to the Path Computation Element (PCE) and communicates with the NorthStar Controller, which by default is configured to accept a PCEP connection from any source address. Use the Device Profile window in the NorthStar Controller web UI to map a PCEP IP address for a PCC device.

A PCEP IP address (the local address of the PCC) is required when both of the following are true:

- PCEP is established through an IP address that is not supplied in the TED, such as an out-of-band IP address that uses an fxp0 management interface.
- There is no PCC-owned or PCC-delegated LSP configured on the router.

Before you begin, you must perform the configuration steps described in [“Configuring PCEP on a PE Router \(from the CLI\)” on page 68](#) to configure the PE router as a PCC and establish a connection between the PCC and the NorthStar Controller.

To map a PCEP IP address for a PCC to the NorthStar Controller:

1. Log in to the NorthStar Controller web UI.
2. Navigate to **More Options>Administration**.
3. From the Administration menu at the far left of the screen, select **Device Profile**.
4. The Device List pane shows all the devices in the selected profile along with many of their properties, including the PCEP IP address, if they are already known. If they are not already known, the fields are blank.

To add or change a PCEP IP address, select the device row and click the Modify button. [Figure 3 on page 71](#) shows the Modify Device window.

Figure 3: Modify Device Window

**Modify Device(s)**

Autofill parameters from the selected profile entry:

**Access Parameters**

**Profile**

Device Name: vmx104

Device IP: 10.0.0.104

Management IP:

PCEP IP: 172.25.159.125

Vendor:

Model:

OS:

OS Version:

**Connectivity**

Access Method: telnet|ssh

Telnet Port: 23

Timeout: 300

Retry: 3

SSH Command: ssh

Agent(s):

**Credentials**

Login:

Password:

MD5 String:

Privilege Login:

Privilege Password:

Reset Cancel Modify

5. In the PCEP IP field, enter the PCEP IP address for the PCC.

You can find the PCEP IP address in the PCE statement stanza block. Either of the following two CLI **show** commands can help you locate it:

```
northstar@vmx101> show path-computation-client statistics
```

```
PCE_jnc
```

```
-----
```

```
General
```

```

PCE IP address      : 172.25.152.134
Local IP address    : 172.25.157.129
Priority             : 0
PCE status          : PCE_STATE_UP
Session type        : PCE_TYPE_STATEFULACTIVE
LSP provisioning allowed : On
PCE-mastership      : main

```

```
Counters
```

```

PCReqs              Total: 0          last 5min: 0          last
hour: 0

```

```

    PCReps          Total: 0          last 5min: 0          last
hour: 0
    PCRpts          Total: 204        last 5min: 0          last
hour: 0
    PCUpdates       Total: 9          last 5min: 0          last
hour: 0
    PCCreates       Total: 21         last 5min: 0          last
hour: 0

Timers
  Local Keepalive timer: 30 [s] Dead timer: 120 [s] LSP cleanup
timer: 0 [s]
  Remote Keepalive timer: 30 [s] Dead timer: 120 [s] LSP cleanup
timer: 0 [s]

Errors
  PCErr-recv
  PCErr-sent
  PCE-PCC-NTFS
  PCC-PCE-NTFS

```

```

northstar@vmx101> show configuration protocols pcep
pce jnc {
  local-address 172.25.157.129;
  destination-ipv4-address 172.25.152.134;
  destination-port 4189;
  pce-type active stateful;
  lsp-provisioning;
}

```

6. Click **Submit**.
7. Repeat this process for each PCC device for which you want to map a PCEP IP address.

#### Related Documentation

- [Configuring PCEP on a PE Router \(from the CLI\) on page 68](#)



# Accessing the User Interface

- [NorthStar Controller UI Overview on page 73](#)
- [NorthStar Controller Web UI Overview on page 77](#)
- [NorthStar Controller Network Planner UI Overview on page 81](#)

## NorthStar Controller UI Overview

The NorthStar Controller has two user interfaces (UIs):

- NorthStar Controller Operator UI (web)—for working with a live network
- NorthStar Controller Network Planner UI (Java client)—for simulating the effect of various scenarios on the network, without affecting the live network

### UI Comparison

[Table 10 on page 73](#) summarizes the major use cases for the Operator and Network Planner UIs.



**NOTE:** All user administration (adding, modifying, and deleting users) must be done from the web UI.

*Table 10: Operator Versus Planner Comparison*

| NorthStar Controller Operator (web client)                                    | Network Planner (Java client)  |
|---|--|
| Manage, monitor, and provision a live network in real-time.                   | Design, simulate, and analyze a network offline.                                       |
| Live network topology map shows node status, link utilization, and LSP paths. | Network topology map shows simulated or imported data for nodes, links, and LSP paths. |
| Network information grid shows live status of nodes, links, and LSPs.         | Network information grid shows simulated or imported data for nodes, links, and LSPs.  |
| Discover nodes, links, and LSPs from the live network using PCEP or NETCONF.  | Import or add nodes, links, and LSPs for network modeling.                             |
| Provision LSPs directly to the network.                                       | Add and stage LSPs for provisioning to the network.                                    |

Table 10: Operator Versus Planner Comparison (continued)

| NorthStar Controller Operator (web client)  | Network Planner (Java client)   |
|---|---|
| Create or schedule maintenance events to re-route LSPs around the impacted nodes and links.                             | Create or schedule simulation events to analyze the network model from failure scenarios.                           |
| Dashboard reports shows current status and KPIs of the live network.  | Report manager provides extensive reports for simulation and planning.  |
| Analytics collects real-time interface traffic or delay statistics and stores the data for querying and chart displays. | Import interface data or aggregate archived data to generate historical statistics for querying and chart displays. |

## Groups and Privileges

Users are created into two different permission levels, called groups—Full Access group and View Only group. A user's group determines the privilege level the user is allowed, either full-access privilege or view-only privilege. Full Access group users can log in with either full-access or view-only privilege. View-only group users are restricted to view-only privilege.

In the Operator UI, users logged in with full-access privilege have provision and modify actions available to them in the NorthStar Controller application, while users logged in with view-only privilege do not. The default privilege is view-only. You must click the Enable Full Access checkbox on the login window to request full-access privilege.

Only Full Access group users have access to the Network Planner UI; View Only group users do not. In the Network Planner, users can delta provision, add planned elements, and run design.

Full-access login is granted when requested if:

- The user belongs to the Full Access group, and
- The permitted number of logged-in full-access privilege users has not been reached.

A maximum of 64 view-only users and ten full-access users can simultaneously log in to the NorthStar Controller. Because full-access users can log in to either the Operator UI or the Network Planner UI, this means there can be a total of ten full-access users combined between both UIs. If a user attempts to log in with full-access privilege when all of the full-access slots are occupied, an error message is displayed. For the web UI, the user can still log in, but with view-only privilege, assuming there are view-only slots available.



**NOTE:** A single user can log into the NorthStar Controller multiple times from different devices, each login occupying one user session slot.

## The Administrator Role

The NorthStar Administrator is a special user type, belonging to the Full Access user group. The Administrator (Admin) can log in with either full-access or view-only privilege.

When logged in with full-access privilege, the Admin is the only user who can access the User Administration functions. The Admin can always log in to perform admin-only functions, even when all user session slots are occupied. The Admin can also selectively disconnect user sessions.

## The NorthStar Controller Login Window

You connect to the NorthStar Controller using a modern web browser such as Google Chrome, Mozilla Firefox, or later versions of Internet Explorer.

Table 11 on page 75 shows the Internet browsers that have been tested and confirmed compatible with the NorthStar Controller web UI.

*Table 11: Internet Browsers Compatible with the NorthStar Controller Web UI*

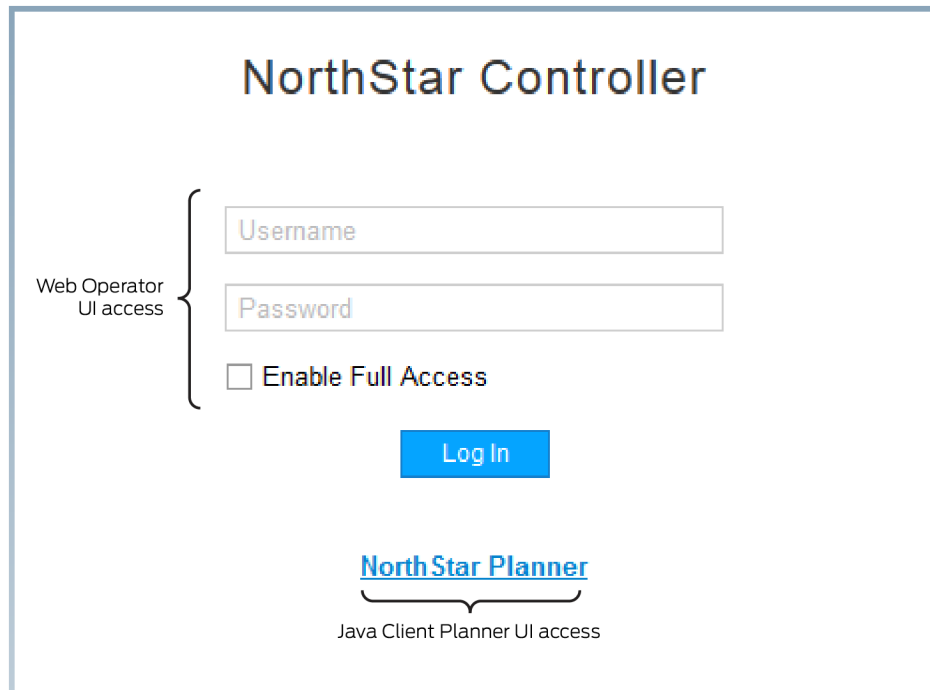
| OS             | Browser   |
|----------------|---|
| Windows 10     | <ul style="list-style-type: none"> <li>Google Chrome versions 55, 56</li> <li>Firefox version 53</li> <li>Internet Explorer version 11</li> </ul> |
| Windows 7      | <ul style="list-style-type: none"> <li>Google Chrome versions 58</li> <li>Firefox version 53</li> <li>Internet Explorer version 11</li> </ul>     |
| CentOS 6.8/6.9 | <ul style="list-style-type: none"> <li>Google Chrome versions 56</li> <li>Firefox version 53</li> </ul>   |
| Mac OS         | <ul style="list-style-type: none"> <li>Google Chrome versions 58</li> <li>Safari version 10.1.1</li> </ul>  |

Your external IP address is provided to you when you install the NorthStar Controller application. In the address bar of your browser window, type that secure host external IP address, followed by a colon and port number 8443 (for example, **https://10.0.1.29:8443**). The NorthStar Controller login window is displayed, as shown in Figure 4 on page 76. This same login window grants access to the Operator UI and the Network Planner UI.



**NOTE:** If you attempt to reach the login window, but instead, are routed to a message window that says, “Please enter your confirmation code to complete setup,” you must go to your license file and obtain the confirmation code as directed. Enter the confirmation code along with your administrator password to be routed to the web UI login window. The requirement to enter the confirmation code only occurs when the installation process was not completed correctly and the NorthStar Controller application needs to confirm that you have the authorization to continue.

Figure 4: NorthStar Controller Login Window

The image shows the NorthStar Controller login window. At the top, the title "NorthStar Controller" is displayed. Below the title, there are two input fields: "Username" and "Password". To the left of these fields, a bracket indicates "Web Operator UI access". Below the password field, there is a checkbox labeled "Enable Full Access". A blue "Log In" button is positioned below the checkbox. At the bottom, the text "NorthStar Planner" is underlined, with a bracket below it indicating "Java Client Planner UI access".

**WARNING:** To avoid a Browser Exploit Against SSL/TLS (BEAST) attack, whenever you log in to the NorthStar Controller through a browser tab or window, make sure that the tab or window was not previously used to surf a non-HTTPS website. A best practice is to close your browser and relaunch it before logging in to the NorthStar Controller.

NorthStar Operator features are available through the web UI. NorthStar Planner features are available through the Java Client UI.

A configurable User Inactivity Timer is available to the System Administrator (only). If set, any user who is idle and has not performed any actions (keystrokes or mouse clicks) is automatically logged out of the NorthStar Controller after the specified number of minutes. By default, the timer is disabled. To set the timer, navigate to **Administration > System Settings**.

## Logging In to and Out of the Web UI

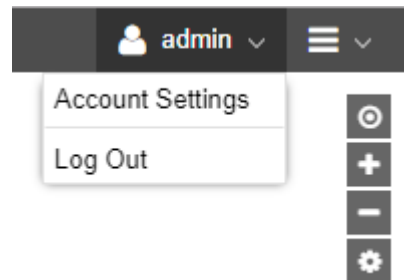
To access the NorthStar Controller web UI, enter the username and password provided to you when you installed the controller application. Optionally select the **Enable Full Access** check box. Click **Log In**.



**NOTE:** You will be required to change your password after logging in for the first time.

To log out of the web UI, click the User Options drop-down menu (person icon) in the upper right corner of the main window and select **Log Out**. [Figure 5 on page 77](#) shows the User Options drop-down menu.

*Figure 5: User Options Menu*



## Logging In to and Out of the Java Client Network Planner UI

To log in to the Java Client Network Planner UI, ignore the Username and Password fields on the NorthStar Controller login window, and just click **NorthStar Planner** at the bottom of the window. The NorthStar Planner login window displays the default memory allocation. There is no Enable Full Access check box for the NorthStar Planner, so simply click **Launch**.

Depending on the browser you are using, a dialog box might be displayed, asking if you want to open or save the .jnlp file. Once you respond to any browser requests, a dialog box is displayed in which you enter your user ID and password. Click **Login**.

To log out of the NorthStar Network Planner UI, select **File>Exit** to display the Confirm Exit screen. Click **Yes** to exit.

- Related Documentation**
- [NorthStar Controller Web UI Overview on page 77](#)
  - [NorthStar Controller Network Planner UI Overview on page 81](#)

## NorthStar Controller Web UI Overview

The web UI has four main views:

- Dashboard
- Topology
- Nodes
- Tunnels

[Figure 6 on page 78](#) shows the buttons for selecting a view. They are located in the top menu bar.

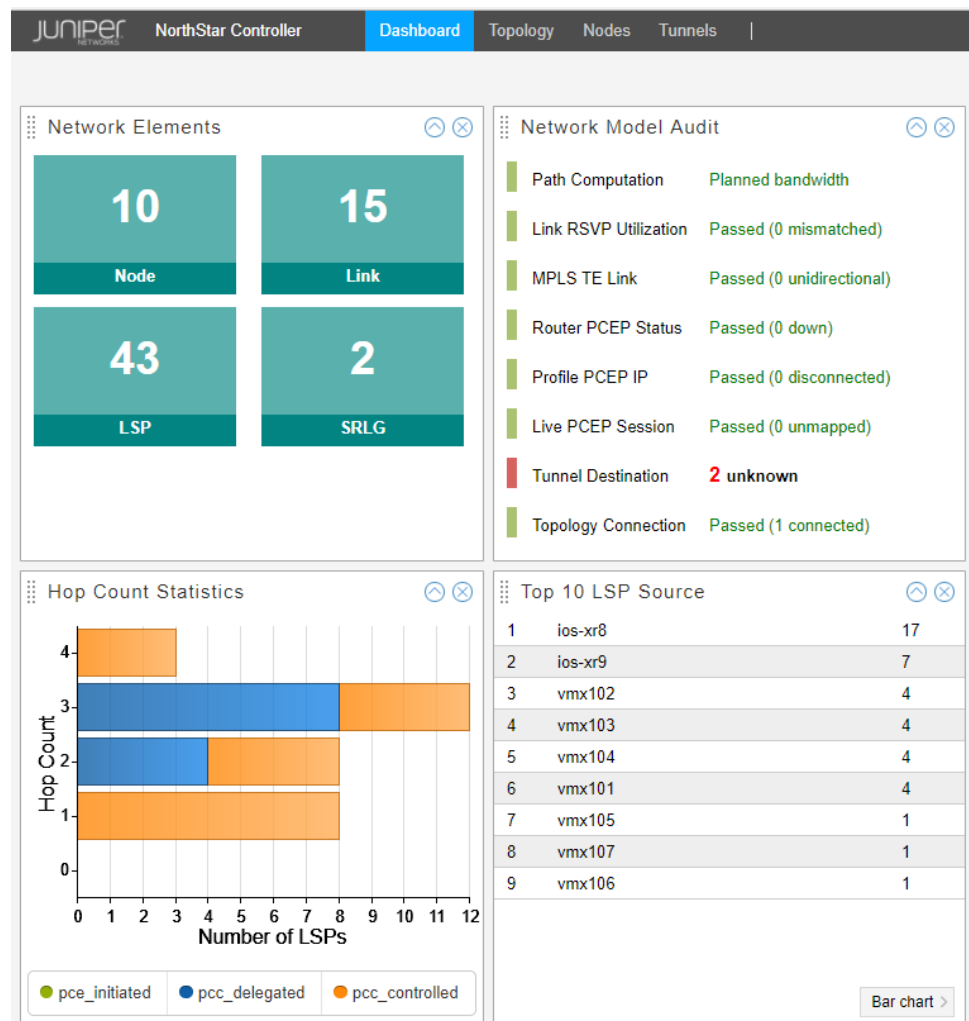
Figure 6: Web UI View Selection Buttons



**NOTE:** Some functions and features are not available to users logged in with view-only privilege.

The Dashboard view presents a variety of status and statistics information related to the network, in the form of widgets. [Figure 7 on page 78](#) shows a sample of the available widgets.

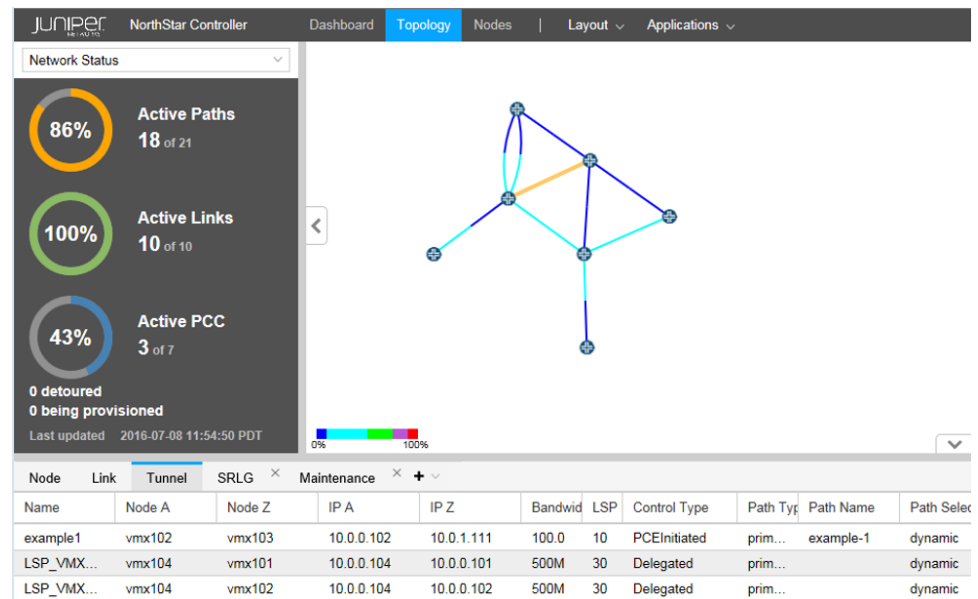
Figure 7: Dashboard View



The Topology view is displayed by default when you first log in to the web UI.

[Figure 8 on page 79](#) shows the Topology view.

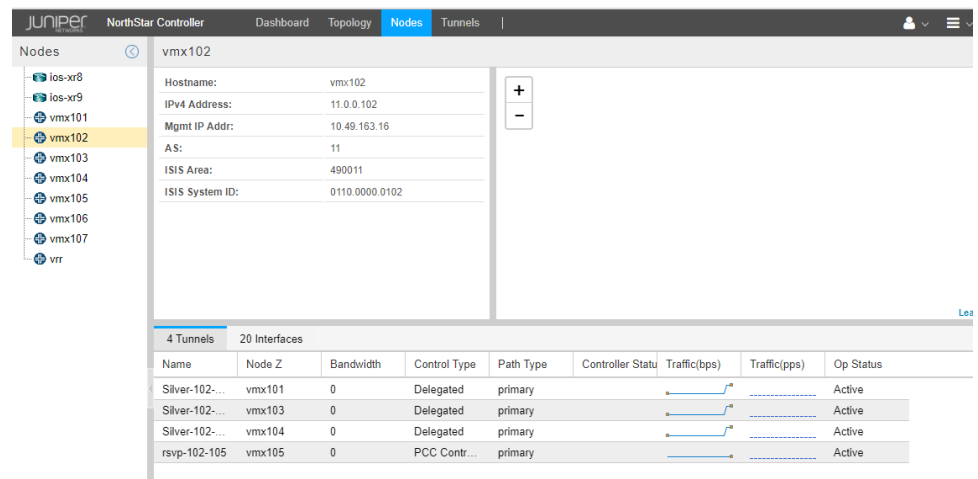
Figure 8: Topology View



The Topology view is the main work area for the live network you load into the system. The Layout and Applications drop-down menus in the top menu bar are only available in Topology view.

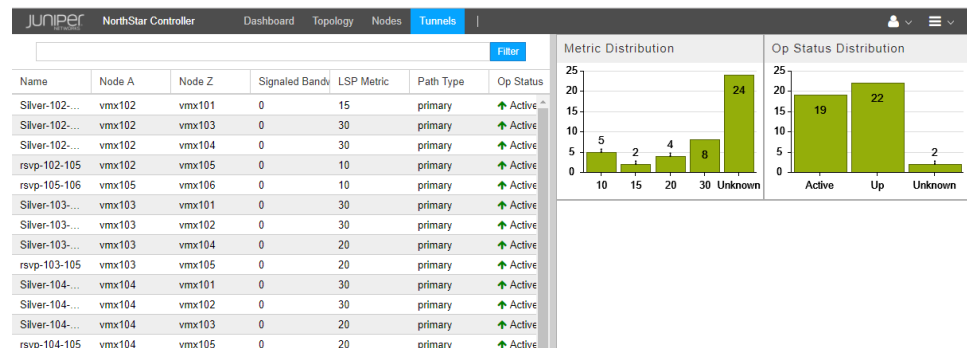
The Nodes view, shown in [Figure 9 on page 79](#), displays detailed information about the nodes in the network. With this view, you can see node details, tunnel and interface summaries, groupings, and geographic placement (if enabled), all in one place.

Figure 9: Nodes View



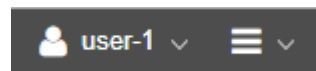
The Tunnels view, shown in [Figure 10 on page 80](#), provides detailed information about all the configured tunnels in the network, along with analytics information for the selected tunnel(s).

Figure 10: Tunnels View



Functions accessible from the right side of the top menu bar have to do with user and administrative management. Figure 11 on page 80 shows that portion of the top menu bar. These functions are accessible whether you are in the Dashboard, Topology, Nodes, or Tunnels view.

Figure 11: Right Side of the Top Menu Bar



The user and administrative management functions consist of:

- User Options (person icon)
  - Account Settings
  - Log Out
- More Options (horizontal bars icon)
  - Active Users
  - Administration (the options available to any particular user depend on the user's group and full-access versus view-only privilege level)
    - System Health
    - Analytics
    - Authentication (System administrator only)
    - Device Profile
    - Device Collection
    - License (System administrator only)
    - Logs
    - Server Status
    - Subscribers (System administrator only)
    - System Settings (System administrator only)



- Transport Controller
- Users (System administrator only)

The system administrator (admin) functions can only be accessed by the admin and only when logged in with full-access privilege.

- Documentation (link to NorthStar Controller customer documentation)
- About (version and license information)

**Related Documentation** • [NorthStar Controller UI Overview on page 73](#)

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## NorthStar Controller Network Planner UI Overview

Use the NorthStar Controller Network Planner to simulate the effect on the network of various scenarios without affecting the live network.

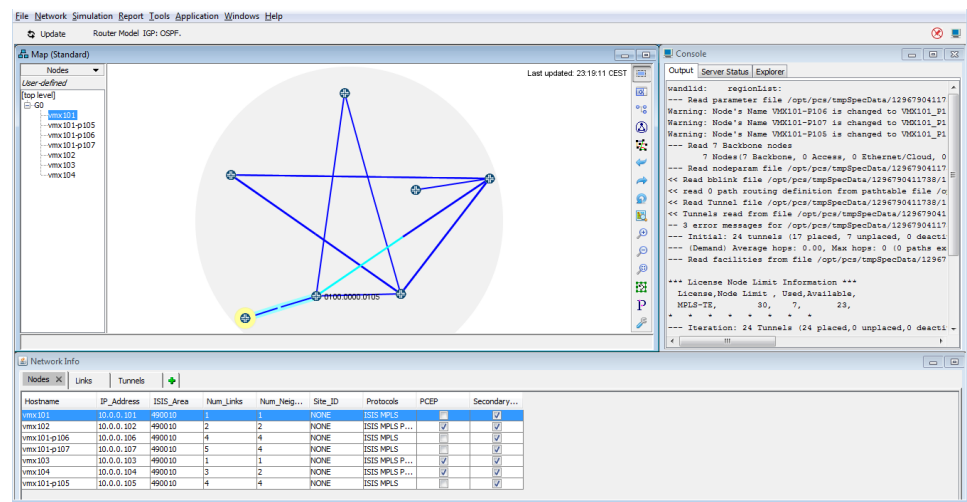
This topic describes some of the elements displayed from the Network Planner main window from which all other windows are launched or opened.

- [NorthStar Controller Network Planner UI on page 81](#)
- [Menu Options for the Network Planner UI on page 82](#)
- [RSVP Live Util Legend on page 83](#)
- [Customizing Nodes and Links in the Map Legends on page 83](#)

## NorthStar Controller Network Planner UI

After you log in to the NorthStar Controller Network Planner, the NorthStar Controller main window shows the Map, Console, and Network Info panes, as shown in [Figure 12 on page 82](#). However, many standard functions and features do not become available until a network topology is loaded. This includes some of the menus as well as the topology view from the Map.

Figure 12: Network Planner Main Window



**NOTE:** To refresh the network view, click Update at the top left corner of the window under the toolbar.

## Menu Options for the Network Planner UI

Table 12 on page 82 describes the options available from the main window.

Table 12: Menu Options for the Network Planner UI

| Menu Option | Description   |
|-------------|---|
| Application | The Application menu shows a calendar view of maintenance events and provides path optimization information.  |
| File        | The File menu contains network file functions such as opening the File Manager, loading network files, and exiting the UI.  |
| Help        | The Help menu provides basic system information, including NorthStar product version, server version and IP address, operating system information, and Java virtual machine (JVM) details.  |
| Network     | The Network menu includes network summary information (network elements, LSP placement, LSP types, hop counts, and LSP bandwidth).  |
| Tools       | <p>The Tools menu includes general options to monitor network progress, show login/logout activities, configure the interval between keep-alive messages, and specify network map preferences.</p> <p>An Admin user can also connect to the NorthStar server and perform NorthStar user administration tasks.</p> |
| Windows     | The Windows menu provides options to display, hide, or reset the Map, Console, and Network Info windows of the NorthStar UI.  |

## RSVP Live Util Legend

Use the drop-down menu in the left pane to configure the map view. By default, the RSVP Live Util legend is displayed. The RSVP (Live) Util view allows you to configure the link color based on utilization. The scale of colors can be configured in this section. Both the colors and the range of utilization can be changed and added. A right click on the scale provides access to the menu for configuring the scale (Edit Color, Add Divider, and so on).

Links are not always displayed as a single solid color. Some are displayed as half one color and half another color. The presence of two different colors indicates that the utilization in one direction (A->Z) is different from the utilization in the other direction (Z->A). The half of the link originating from a certain node is colored according to the link utilization in the direction from that node to the other node.

On the color bar, drag the separator between two colors up and down to move the separator and release it at the desired position. The number to the right of the separator indicates the utilization percentage corresponding to the selected position. For example, if you move the separator between the dark-blue segment and light-blue segment of the bar up to 40.0%, some formerly light-blue links might change to dark blue.

## Customizing Nodes and Links in the Map Legends

From the RSVP Util drop-down menu, you can use the following four submenus (Filters, Network Elements, Utilization Legends, and Subviews).

- Select **Subviews > Types**. Select the drop-down menu a second time and notice that the Subviews submenu is now shown with the selected option button on its left, and the items underneath it are provided as a shortcut to other menu items in the same category. To view other information such as the vendor and media information, click the relevant item in the list.
- Note that each legend has its own color settings. Some legends, such as “RSVP Util”, change link colors, but leave the node colors the same as for the previous legend. Other legends change the node colors, but not the link colors. Others, such as “Types”, change both.
- Colors can be changed by clicking the button next to the type of element you want to change.
- In addition to colors, node icons and line styles (for example, solid vs. dotted) can be changed by right-clicking one of the buttons for nodes or links. For node icons, the menu is Set This Icon, and for link styles it is Set Line Style. The setting applies when the particular legend in which you set the line style is open.
- Right-click a node or link icon in the left pane. Notice that the menu item Highlight These Items can be used to highlight all nodes (or links) of a particular type.

**Related Documentation** • [NorthStar Controller UI Overview on page 73](#)

