



---

# NorthStar Controller Getting Started Guide

Release

3.0.0



---

Modified: 2018-10-17

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

Juniper Networks, the Juniper Networks logo, Juniper, and Junos are registered trademarks of Juniper Networks, Inc. and/or its affiliates in the United States and other countries. All other trademarks may be property of their respective owners.

Screenshots of VMware ESXi are used with permission.

Juniper Networks assumes no responsibility for any inaccuracies in this document. Juniper Networks reserves the right to change, modify, transfer, or otherwise revise this publication without notice.

*NorthStar Controller Getting Started Guide*

3.0.0

Copyright © 2018 Juniper Networks, Inc. All rights reserved.

The information in this document is current as of the date on the title page.

#### YEAR 2000 NOTICE

Juniper Networks hardware and software products are Year 2000 compliant. Junos OS has no known time-related limitations through the year 2038. However, the NTP application is known to have some difficulty in the year 2036.

#### END USER LICENSE AGREEMENT

The Juniper Networks product that is the subject of this technical documentation consists of (or is intended for use with) Juniper Networks software. Use of such software is subject to the terms and conditions of the End User License Agreement ("EULA") posted at <https://support.juniper.net/support/eula/>. By downloading, installing or using such software, you agree to the terms and conditions of that EULA.

# Table of Contents

	About the Documentation . . . . .	xi
	Documentation and Release Notes . . . . .	xi
	Documentation Conventions . . . . .	xi
	Documentation Feedback . . . . .	xiii
	Requesting Technical Support . . . . .	xiv
	Self-Help Online Tools and Resources . . . . .	xiv
	Opening a Case with JTAC . . . . .	xv
<b>Chapter 1</b>	<b>NorthStar Controller Installation and Configuration Overview . . . . .</b>	<b>17</b>
	NorthStar Controller System Requirements . . . . .	17
	Analytics Requirements . . . . .	19
	Two-VM Installation Requirements . . . . .	19
	Disk and Memory Requirements . . . . .	19
	VM Image Requirements . . . . .	19
	Junos VM Version Requirements . . . . .	20
	VM Networking Requirements . . . . .	20
	Deployment Scenarios . . . . .	20
	Changing Control Packet Classification Using the Mangle Table . . . . .	22
<b>Chapter 2</b>	<b>NorthStar Controller Installation on a Physical Server . . . . .</b>	<b>25</b>
	Installing the NorthStar Controller 3.0.0 RPM Bundle . . . . .	25
	Download the Software . . . . .	26
	If Upgrading, Back Up Your JunosVM Configuration and iptables . . . . .	26
	Install the RPM Bundle . . . . .	27
	Configure Support for Older Junos VM Versions . . . . .	28
	Create Passwords . . . . .	28
	Enable the NorthStar License . . . . .	29
	Renew the SSL Certificate . . . . .	29
	Adjust Firewall Policies . . . . .	31
	Launch the Net Setup Utility . . . . .	32
	Configure the Host Server . . . . .	33
	Configure the JunosVM and its Interfaces . . . . .	38
	Set Up the SSH Key for External JunosVM . . . . .	43
<b>Chapter 3</b>	<b>NorthStar Controller Installation in an OpenStack Environment . . . . .</b>	<b>45</b>
	Overview of NorthStar Controller Installation in an OpenStack Environment . . .	46
	Testing Environment . . . . .	47
	Networking Scenarios . . . . .	47
	HEAT Templates . . . . .	48
	HEAT Template Input Values . . . . .	48

	Known Limitations . . . . .	49
	Virtual IP Limitations from ARP Proxy Being Enabled . . . . .	49
	Hostname Changes if DHCP is Used Rather than a Static IP Address . . . . .	49
	Disk Resizing Limitations . . . . .	50
	OpenStack Resources for NorthStar Controller Installation . . . . .	50
	NorthStar Controller in an OpenStack Environment Pre-Installation Steps . . . . .	51
	Installing the NorthStar Controller in Standalone Mode Using a HEAT Template . . . . .	52
	Template . . . . .	52
	Launch the Stack . . . . .	52
	Obtain the Stack Attributes . . . . .	52
	Resize the Image . . . . .	53
	Install the NorthStar Controller RPM Bundle . . . . .	55
	Configure the JunosVM . . . . .	55
	Configure SSH Key Exchange . . . . .	55
	Installing a NorthStar Cluster Using a HEAT Template . . . . .	56
	System Requirements . . . . .	56
	Launch the Stack . . . . .	56
	Obtain the Stack Attributes . . . . .	57
	Configure the Virtual IP Address . . . . .	57
	Resize the Image . . . . .	58
	Install the NorthStar Controller RPM Bundle . . . . .	60
	Configure the JunosVM . . . . .	60
	Configure SSH Key Exchange . . . . .	60
	Configure the HA Cluster . . . . .	61
<b>Chapter 4</b>	<b>Configuring Topology Acquisition and Connectivity Between the NorthStar Controller and the Path Computation Clients . . . . .</b>	<b>63</b>
	Understanding Network Topology Acquisition on the NorthStar Controller . . . . .	63
	Configuring Topology Acquisition . . . . .	64
	Configuring Topology Acquisition Using BGP-LS . . . . .	65
	Configuring BGP-LS Topology Acquisition on the NorthStar Controller . . . . .	65
	Configuring the Peering Router to Support Topology Acquisition . . . . .	66
	Configuring Topology Acquisition Using OSPF . . . . .	67
	Configuring OSPF on the NorthStar Controller . . . . .	67
	Configuring OSPF over GRE on the NorthStar Controller . . . . .	68
	Configuring Topology Acquisition Using IS-IS . . . . .	68
	Configuring IS-IS on the NorthStar Controller . . . . .	68
	Configuring IS-IS over GRE on the NorthStar Controller . . . . .	69
	Configuring PCEP on a PE Router (from the CLI) . . . . .	70
	Mapping a Path Computation Client PCEP IP Address . . . . .	72
<b>Chapter 5</b>	<b>Accessing the User Interface . . . . .</b>	<b>75</b>
	NorthStar Controller UI Overview . . . . .	75
	UI Feature Comparison . . . . .	75
	Groups and Privileges . . . . .	78
	The Administrator Role . . . . .	79
	The NorthStar Controller Login Window . . . . .	79
	Logging In to and Out of the Web UI . . . . .	80

Logging In to and Out of the Java Client Network Planner UI . . . . .	81
NorthStar Controller Web UI Overview . . . . .	81
NorthStar Controller Network Planner UI Overview . . . . .	85
NorthStar Controller Network Planner UI . . . . .	85
Menu Options for the Network Planner UI . . . . .	86
RSVP Live Util Legend . . . . .	86
Customizing Nodes and Links in the Map Legends . . . . .	87



# List of Figures

<b>Chapter 2</b>	<b>NorthStar Controller Installation on a Physical Server . . . . .</b>	<b>25</b>
	Figure 1: NorthStar Controller Setup Main Menu . . . . .	32
	Figure 2: NorthStar Controller Host Configuration Menu . . . . .	34
	Figure 3: NorthStar Controller JunosVM Configuration Menu . . . . .	39
<b>Chapter 3</b>	<b>NorthStar Controller Installation in an OpenStack Environment . . . . .</b>	<b>45</b>
	Figure 4: OpenStack Environment, Standalone Mode . . . . .	46
	Figure 5: OpenStack Environment, Cluster Mode . . . . .	47
<b>Chapter 4</b>	<b>Configuring Topology Acquisition and Connectivity Between the NorthStar Controller and the Path Computation Clients . . . . .</b>	<b>63</b>
	Figure 6: Modify Device Window . . . . .	73
<b>Chapter 5</b>	<b>Accessing the User Interface . . . . .</b>	<b>75</b>
	Figure 7: NorthStar Controller Login Window . . . . .	80
	Figure 8: User Options Menu . . . . .	81
	Figure 9: Web UI View Selection Buttons . . . . .	81
	Figure 10: Dashboard View . . . . .	82
	Figure 11: Topology View . . . . .	83
	Figure 12: Nodes View . . . . .	83
	Figure 13: Tunnels View . . . . .	84
	Figure 14: Right Side of the Top Menu Bar . . . . .	84
	Figure 15: Network Planner Main Window . . . . .	85





# List of Tables

	<b>About the Documentation . . . . .</b>	<b>xi</b>
	Table 1: Notice Icons . . . . .	xii
	Table 2: Text and Syntax Conventions . . . . .	xii
<b>Chapter 1</b>	<b>NorthStar Controller Installation and Configuration Overview . . . . .</b>	<b>17</b>
	Table 3: Ports That Must Be Allowed by External Firewalls . . . . .	18
	Table 4: Disk and Memory Requirements for NorthStar OpenStack Installation . . . . .	19
	Table 5: Supported NorthStar Deployment Configurations . . . . .	20
<b>Chapter 3</b>	<b>NorthStar Controller Installation in an OpenStack Environment . . . . .</b>	<b>45</b>
	Table 6: HEAT Template Input Values . . . . .	48
	Table 7: Required OpenStack Resources . . . . .	50
	Table 8: Optional OpenStack Resources . . . . .	50
<b>Chapter 5</b>	<b>Accessing the User Interface . . . . .</b>	<b>75</b>
	Table 9: Internet Browsers Compatible with the NorthStar Controller Web UI . . . . .	75
	Table 10: Comparison of UI Features . . . . .	76
	Table 11: Menu Options for the Network Planner UI . . . . .	86



# About the Documentation

- Documentation and Release Notes on page xi
- Documentation Conventions on page xi
- Documentation Feedback on page xiii
- Requesting Technical Support on page xiv

## Documentation and Release Notes

---

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

If the information in the latest release notes differs from the information in the documentation, follow the product Release Notes.

Juniper Networks Books publishes books by Juniper Networks engineers and subject matter experts. These books go beyond the technical documentation to explore the nuances of network architecture, deployment, and administration. The current list can be viewed at <https://www.juniper.net/books>.

## Documentation Conventions

---

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:  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>  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:  [edit] root@# <b>set system domain-name</b> <i>domain-name</i>

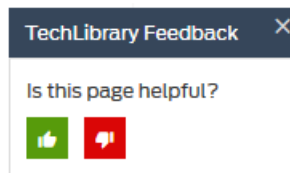
Table 2: Text and Syntax Conventions (continued)

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>  <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> .

## Documentation Feedback

We encourage you to provide feedback so that we can improve our documentation. You can use either of the following methods:

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



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

## Requesting Technical Support

---

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

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

## Self-Help Online Tools and Resources

For quick and easy problem resolution, Juniper Networks has designed an online self-service portal called the Customer Support Center (CSC) that provides you with the following features:

- Find CSC offerings: <https://www.juniper.net/customers/support/>
- Search for known bugs: <https://prsearch.juniper.net/>
- Find product documentation: <https://www.juniper.net/documentation/>
- Find solutions and answer questions using our Knowledge Base: <https://kb.juniper.net/>
- Download the latest versions of software and review release notes: <https://www.juniper.net/customers/csc/software/>
- Search technical bulletins for relevant hardware and software notifications: <https://kb.juniper.net/InfoCenter/>

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

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

## Opening a Case with JTAC

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

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

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





## 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 22](#)

## NorthStar Controller System Requirements

---

You can install the NorthStar Controller in the following ways:

- RPM bundle installation on a physical server
- Two-VM installation in an OpenStack environment, in which the Junos VM is not bundled with the NorthStar Controller software

Before you install the NorthStar Controller software, ensure that your system meets the following requirements:

- Recommended minimum hardware requirements.
  - 32 GB RAM
  - 500 GB HDD
  - Intel i5/i7
  - Host must support hardware virtualization (VT-d) capability
- The NorthStar Controller supports CentOS Linux and Red Hat Linux. These are our Linux recommendations:
  - CentOS Linux 6.8 or 6.9 image—earlier CentOS versions are not supported
  - Red Hat Enterprise Linux 6.8 or 6.9
  - Install your choice of Linux with the minimal ISO

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

- The ports listed in [Table 3 on page 18](#) must be 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 3: 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
17000	Cassandra database cluster
7001	Cassandra database cluster
7199	Cassandra database cluster
4369	Rabbitmq cluster
25672	Rabbitmq cluster
35197	Rabbitmq cluster
2888, 3888	Zookeeper cluster
2000	Default jVision reports for IFD (supports Analytics)
2001	Default jVision reports for IFL (supports Analytics)
2002	Default jVision reports for LSP (supports Analytics)
1514	Default jVision reports for RPM probe statistics (supports Analytics)



**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, you need to counter the effects of Reverse Path Filtering (RPF) if your kernel does RPF by default. In that case, you must do one of the following:

- Disable RPF, or
- Ensure there is a route to the source IP address of the probes pointing to the interface where those probes are received, or
- 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

### Disk and Memory Requirements

The disk and memory requirements for installing NorthStar Controller in an OpenStack or other hypervisor environment are described in [Table 4 on page 19](#).

*Table 4: 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-Junos VM	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 Junos VM is provided in Qcow2 format.

The Junos VM image is only compatible with IDE disk controllers. You must configure the hypervisor to use IDE rather than SATA controller type for the Junos VM disk image.

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

### Junos VM Version Requirements

By default, the NorthStar Controller Release 3.0 and later requires that the external Junos VM be Release 15.1F6 or later. If you are using an older version of Junos OS (Release 14.2 or older than Release 15.1F6), you can change the NorthStar configuration to support it, but segment routing support will not be available. See [“Installing the NorthStar Controller 3.0.0 RPM Bundle” 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 Junos VM
  - 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 5 on page 20](#) lists the supported deployment configurations supported by NorthStar Controller Release 3.0.

**Table 5: Supported NorthStar Deployment Configurations**

Deployment Configuration	Features Available <i>NorthStar Release 3.0.0</i>
<b>Description:</b> <ul style="list-style-type: none"> <li>• NorthStar application (no Analytics, no HA)</li> </ul>	<ul style="list-style-type: none"> <li>• PCEP provisioning</li> <li>• NETCONF device collection</li> </ul>
<b>Number of Servers:</b> <ul style="list-style-type: none"> <li>• NorthStar: 1</li> <li>• Total: 1</li> </ul>	

Table 5: Supported NorthStar Deployment Configurations (continued)

Deployment Configuration	Features Available <i>NorthStar Release 3.0.0</i>
<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>
<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>
<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>
<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>

Table 5: Supported NorthStar Deployment Configurations (continued)

Deployment Configuration	Features Available <i>NorthStar Release 3.0.0</i>
<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>
<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>
<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

### Related Documentation

## 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 3.0.0 RPM Bundle on page 25](#)

## Installing the NorthStar Controller 3.0.0 RPM Bundle

---

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.

You can use the procedures described in the following sections if you are performing a fresh install of NorthStar Controller Release 3.0.0, or upgrading from a 2.x release.



**NOTE:** The NorthStar software and data are installed in the /opt directory. Be sure to allocate sufficient disk space. See [“NorthStar Controller System Requirements” on page 17](#) for our memory recommendations.



**NOTE:** When upgrading NorthStar Controller, ensure that 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.

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 -y install ntp
```

2. Specify the preferred NTP server in `ntp.conf`.
3. Verify the configuration.

```
ntpq -p
```

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 the RPM Bundle on page 27](#)
- [Configure Support for Older Junos VM 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 32](#)
- [Configure the Host Server on page 33](#)
- [Configure the JunosVM and its Interfaces on page 38](#)
- [Set Up the SSH Key for External JunosVM on page 43](#)

## 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 **3.0**.
2. Click the NorthStar Application (which includes the RPM bundle) and the NorthStar Junos VM 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 Junos VM 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/pcs/util/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
```



**NOTE:** See 10

## Install the RPM Bundle

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 Junos VM 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 the RPM bundle:

```
[root@hostname~]# rpm -Uvh <rpm-filename>
[root@hostname~]# cd /opt/northstar/northstar_bundle_3.0.0/
[root@hostname~]# ./install.sh
```

- For a two-VM installation, execute the following commands to install the RPM bundle:

```
[root@hostname~]# rpm -Uvh <rpm-filename>
[root@hostname~]# cd /opt/northstar/northstar_bundle_3.0.0/
[root@hostname~]# ./install-vm.sh
```

The script offers the opportunity to change the Junos VM 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 Junos VM Versions

If you are using a two-VM installation, in which the Junos VM is not bundled with the NorthStar Controller, and if your external Junos VM is Release 14.2, or older than Release 15.1F6, 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

Enabling the NorthStar license is not necessary if 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:pcserver
```

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-3.0.0-20170119_191203_68973_316.x86_64
VzNode2 : NorthStar-Bundle-3.0.0-20170119_191203_68973_316.x86_64
VzNode3 : NorthStar-Bundle-3.0.0-20170119_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/utils/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
```

Figure 1 on page 32 shows the NorthStar Controller setup Main Menu.

*Figure 1: NorthStar Controller Setup Main Menu*

```
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 PCS user
    Only applicable for 2-VM 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 shown in [Figure 2 on page 34](#).

Figure 2: NorthStar Controller 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]:

```

Interact with this menu by typing the number or letter corresponding to the item you want to add or change, and pressing **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 : external0

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 external0

```

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 external0
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 external0

```

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 : external0
      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**.

The JunosVM Configuration menu is displayed as shown in [Figure 3 on page 39](#).

*Figure 3: NorthStar Controller 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]:

```

Interact with this menu by entering the number or letter corresponding to the item you want to add or change, and pressing **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
*****
.....
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. Type **H** and press **Enter**.

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

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



## CHAPTER 3

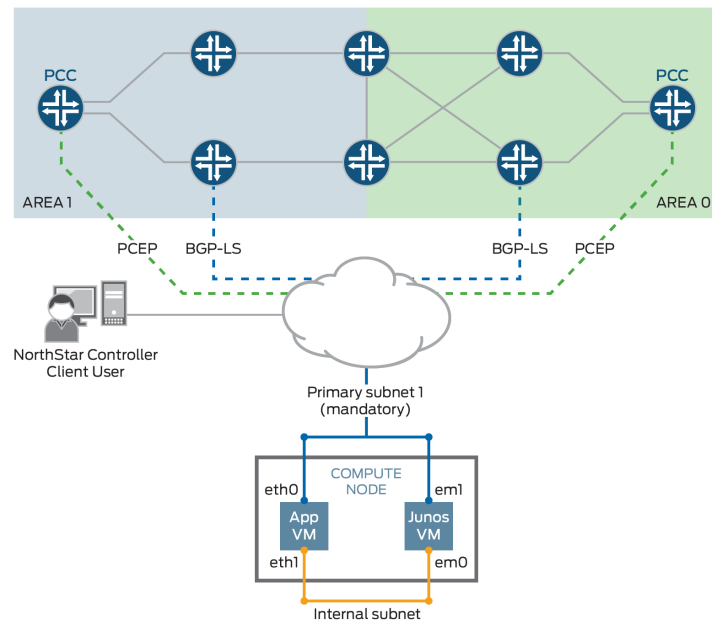
# NorthStar Controller Installation in an OpenStack Environment

- [Overview of NorthStar Controller Installation in an OpenStack Environment on page 46](#)
- [OpenStack Resources for NorthStar Controller Installation on page 50](#)
- [NorthStar Controller in an OpenStack Environment Pre-Installation Steps on page 51](#)
- [Installing the NorthStar Controller in Standalone Mode Using a HEAT Template on page 52](#)
- [Installing a NorthStar Cluster Using a HEAT Template on page 56](#)

## Overview of NorthStar Controller Installation in an OpenStack Environment

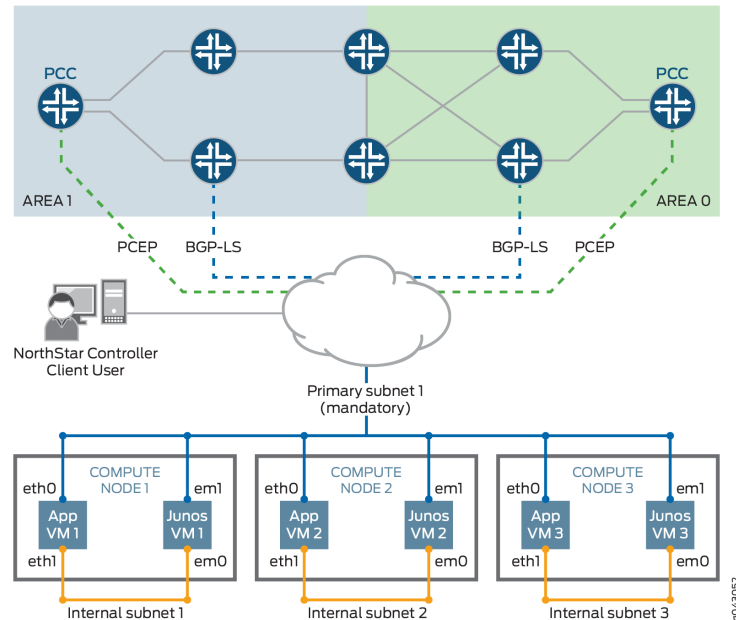
The NorthStar Controller can be installed in an OpenStack environment in either standalone or cluster mode. [Figure 4 on page 46](#) illustrates standalone mode. [Figure 5 on page 47](#) illustrates cluster mode. Note that in both cases, each node has one NorthStar Controller application VM and one JunosVM.

*Figure 4: OpenStack Environment, Standalone Mode*



g0-3051

Figure 5: OpenStack Environment, Cluster Mode



## Testing Environment

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

- OpenStack Kilo with OpenSwitch as Neutron ML2 plugins on Redhat 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:

- `northstar300.heat` (standalone installation) and `northstar300.3instances.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.

- `northstar210.floating.heat` (standalone installation) and `northstar210.3instances.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 6 on page 48](#).

**Table 6: HEAT Template Input Values**

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



Table 6: 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 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 50](#)
- [NorthStar Controller in an OpenStack Environment Pre-Installation Steps on page 51](#)
- [Installing the NorthStar Controller in Standalone Mode Using a HEAT Template on page 52](#)
- [Installing a NorthStar Cluster Using a HEAT Template on page 56](#)

## OpenStack Resources for NorthStar Controller Installation

[Table 7 on page 50](#) and [Table 8 on page 50](#) describe the required and optional OpenStack resources for running the NorthStar Controller in an OpenStack environment.

**Table 7: 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 Junos VM.
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 8: 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 8: 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 46](#)

## 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_14.2R4.9.openstack.qcow2
--disk-format qcow2 --container-format bare --file
images/northstar_junosvm_14.2R4.9.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 46](#)
  - [OpenStack Resources for NorthStar Controller Installation on page 50](#)

## 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 that one of the provided HEAT templates is being used.

### 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 northstar210.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 credential is 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 *NorthStar Controller 3.0.0 RPM Bundle Installation*. 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 46](#)
- [OpenStack Resources for NorthStar Controller Installation on page 50](#)
- [NorthStar Controller in an OpenStack Environment Pre-Installation Steps on page 51](#)
- [NorthStar Controller 3.0.0 RPM Bundle Installation](#)

## 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 one of the provided HEAT templates is being used.

### 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 host 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 have 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

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 northstar220.3instances.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 as described in *NorthStar Controller 2.2 RPM Bundle Installation*. 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 Feature 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 46](#)
- [OpenStack Resources for NorthStar Controller Installation on page 50](#)
- [NorthStar Controller in an OpenStack Environment Pre-Installation Steps on page 51](#)
- [NorthStar Controller 2.2 RPM Bundle Installation](#)



## 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 63](#)
- [Configuring Topology Acquisition on page 64](#)
- [Configuring PCEP on a PE Router \(from the CLI\) on page 70](#)
- [Mapping a Path Computation Client PCEP IP Address on page 72](#)

## Understanding Network Topology Acquisition on the NorthStar Controller

---

After you use BGP-LS to establish BGP peering between the NorthStar Controller and a Path Computation Client (PCC) in the 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 NorthStar Controller 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** • *Understanding the NorthStar Controller*

---

## 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 from, for example, 0.0.0.0/0. 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 daemon 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 daemon:

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

Use the following command to verify that the NTAD daemon 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 65](#)
- [Configuring Topology Acquisition Using OSPF on page 67](#)
- [Configuring Topology Acquisition Using IS-IS on page 68](#)

## Configuring Topology Acquisition Using BGP-LS

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

- [Configuring BGP-LS Topology Acquisition on the NorthStar Controller on page 65](#)
- [Configuring the Peering Router to Support Topology Acquisition on page 66](#)

### Configuring 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.

---

### Configuring 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:

- [Configuring OSPF on the NorthStar Controller on page 67](#)
- [Configuring OSPF over GRE on the NorthStar Controller on page 68](#)

### Configuring 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
```

---

### Configuring 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:

- [Configuring IS-IS on the NorthStar Controller on page 68](#)
- [Configuring IS-IS over GRE on the NorthStar Controller on page 69](#)

---

### Configuring 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
```

---

### Configuring 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 70](#)

---

## 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.

The following requirements apply for each PCC in the network that the NorthStar Controller can access:

- The Junos OS release officially supported by the NorthStar Controller as designated in the *NorthStar Controller Release Notes* (jinstall 32 bit) is running on the router.



**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 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 72](#)

---

## 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 70](#) 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 Path Computation Client (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 6 on page 73](#) shows the Modify Device window.



Figure 6: 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 70](#)

## CHAPTER 5

# Accessing the User Interface

- [NorthStar Controller UI Overview on page 75](#)
- [NorthStar Controller Web UI Overview on page 81](#)
- [NorthStar Controller Network Planner UI Overview on page 85](#)

### 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

[Table 9 on page 75](#) shows the Internet browsers that have been tested and confirmed compatible with the NorthStar Controller web UI.

*Table 9: 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>

### UI Feature Comparison

[Table 10 on page 76](#) summarizes the features available through the Operator and Network Planner UIs.



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

**Table 10: Comparison of UI Features**

Feature	Operator UI (Web)	Network Planner UI (Java Client)
Live network model	✓	
Archived and current network models		✓
Planned network models		✓
Network information for nodes, links, tunnels, SRLGs	✓	✓
Network information real-time updates from live network	✓	
Network information add, modify, delete planned elements that are not part of the live network, for simulation purposes		✓
Network information add, modify, delete live elements	✓	
Network information add, modify elements with optional constraints and parameters	✓	✓
Topology map display	✓	✓
Topology interactive with LSP paths, elements, layout, grouping, country map	✓	✓
Topology real-time updates from live network	✓	
Topology managing layout views	✓	✓
Topology subviews for protocols, AS, IS-IS, OSPF	✓	✓
Topology legend RSVP live utilization	✓	
Topology legend RSVP controller calculated utilization	✓	✓
Topology legend RSVP failure simulation peak utilization		✓
Provision one or multiple primary LSPs	✓	✓
Provision secondary LSP	✓	✓
Provision standby LSP	✓	✓

Table 10: Comparison of UI Features (continued)

Feature	Operator UI (Web)	Network Planner UI (Java Client)
Provision LSP with optional design constraints and routing methods	✓	✓
Provision LSP with explicit paths	✓	✓
Provision diverse LSP pair	✓	✓
Preview controller calculated LSP path	✓	✓
Provision immediately in real-time	✓	
Delta provision: compare current model to live network		✓
Delta provision: compare current model to a planned network model		✓
Maintenance event scheduling	✓	
Maintenance event simulation	✓	
Report manager for maintenance event simulation	✓	
Bandwidth calendar scheduling	✓	✓
Bandwidth calendar timeline	✓	
Path analysis		✓
Path design		✓
Path optimization with Analyze Now option	✓	
FRR design		✓
P2MP tree design		✓
Interactive simulation		✓
Simulation scenarios		✓
Report manager for simulation scenarios		✓
Dashboard	✓	
Timeline for events	✓	

Table 10: Comparison of UI Features (continued)

Feature	Operator UI (Web)	Network Planner UI (Java Client)
Event viewer	✓	
User administration	✓	
Server and cluster status monitoring	✓	
Server logs	✓	
System process monitoring	✓	
Device profile	✓	
Transport controller	✓	
Authentication	✓	
System administration	✓	
Network information transport elements	✓	✓
Multilayer topology map display	✓	✓
Topology interaction with transport paths, elements, SRLG, layout	✓	✓

## 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, Full Access group 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.

In the address bar of your browser window, type the secure host external IP address, followed by a colon and port number 8443 (for example, <https://10.0.1.29:8443>). Your external IP address is provided to you when you install the application. The NorthStar Controller login window is displayed, as shown in [Figure 7 on page 80](#). 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 7: NorthStar Controller Login Window



**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 your username and password. Optionally select the **Enable Full Access** check box. Click **Log In**.

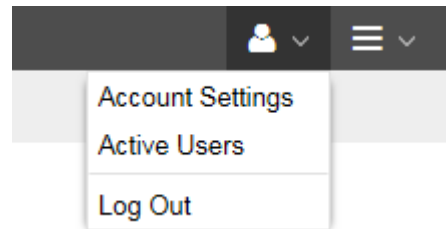


**NOTE:** You will be required to change your password after logging in for the first time.



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 8 on page 81](#) shows the User Options drop-down menu.

*Figure 8: 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, 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 81](#)

## NorthStar Controller Web UI Overview

The web UI has four main views:

- Dashboard
- Topology
- Nodes
- Tunnels

[Figure 9 on page 81](#) shows the buttons for selecting a view. They are located in the top menu bar.

*Figure 9: Web UI View Selection Buttons*

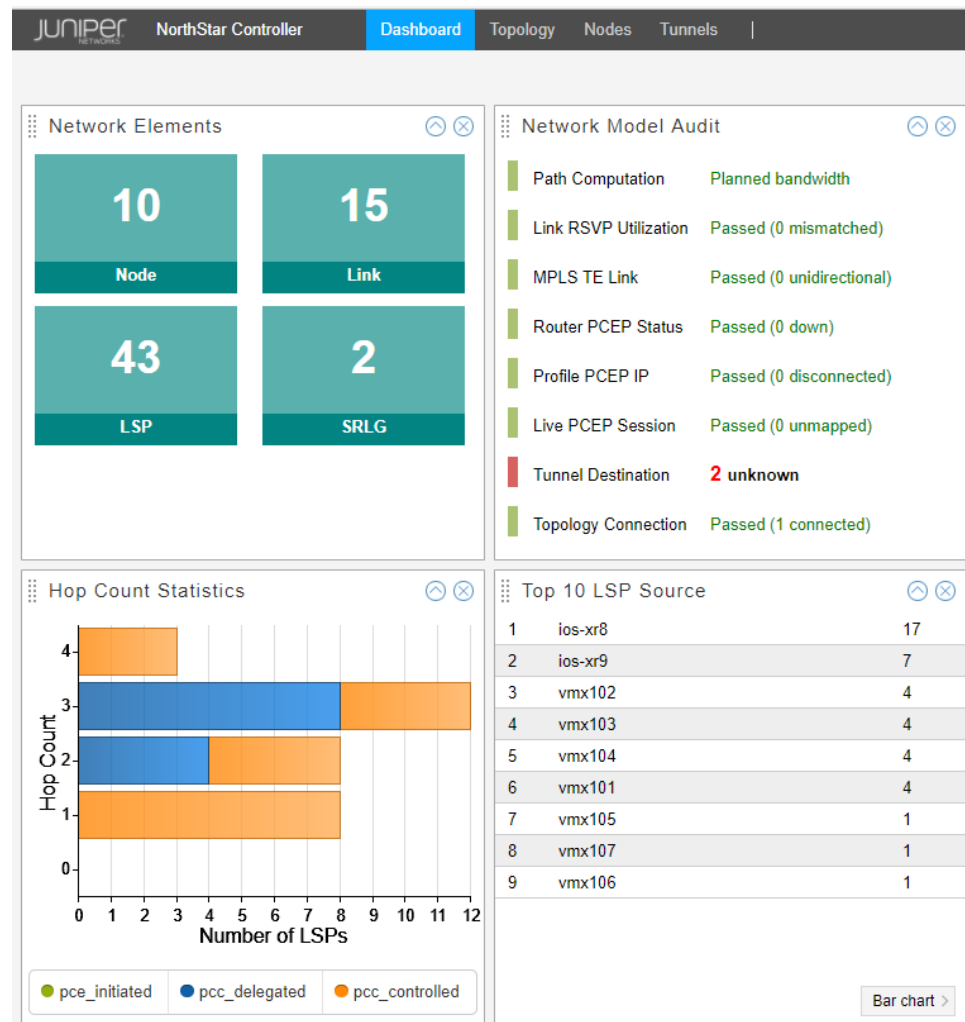




**NOTE:** Some functions and features are not available to users logged in with view-only privilege.

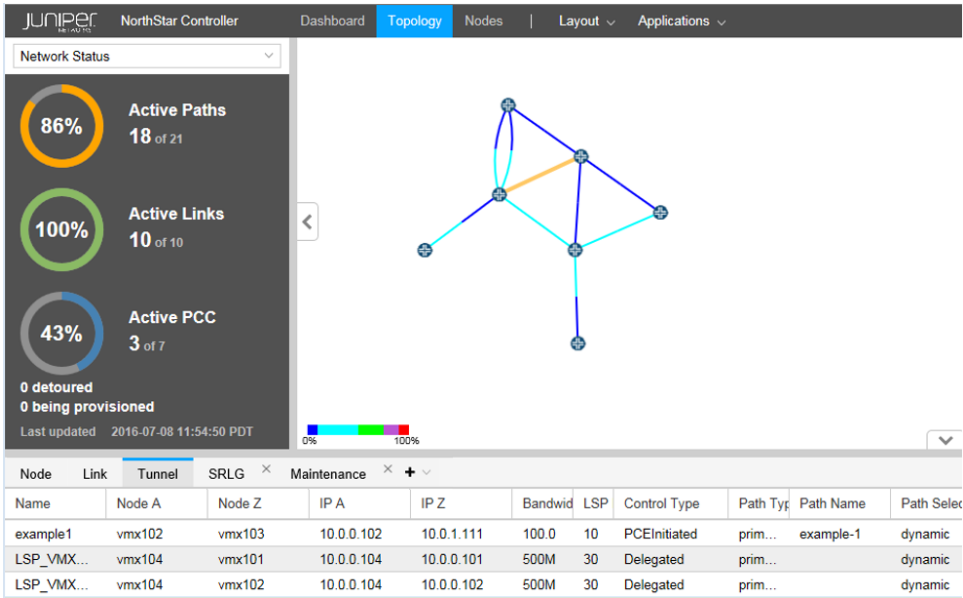
The Dashboard view presents a variety of status and statistics information related to the network, in the form of widgets. [Figure 10 on page 82](#) shows a sample of the available widgets.

*Figure 10: Dashboard View*



The Topology view is displayed by default when you first log in to the web UI. [Figure 11 on page 83](#) shows the Topology view.

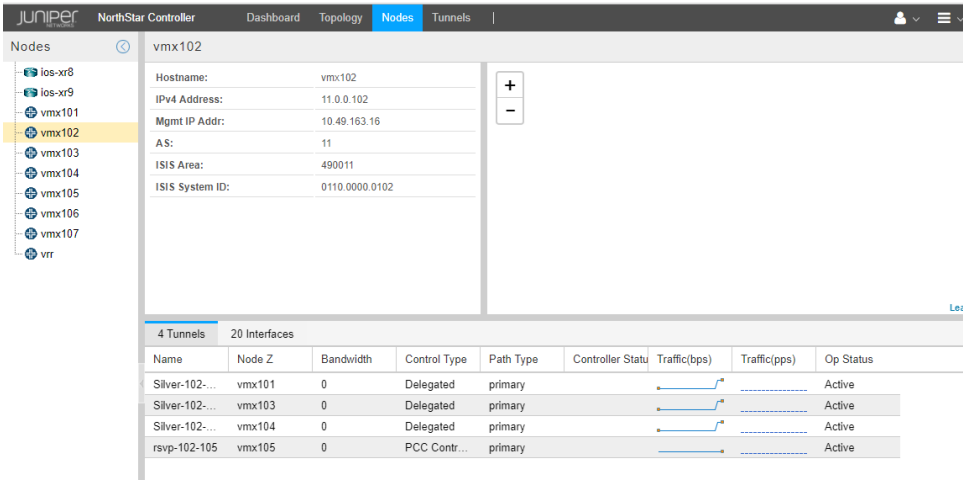
Figure 11: Topology View



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.

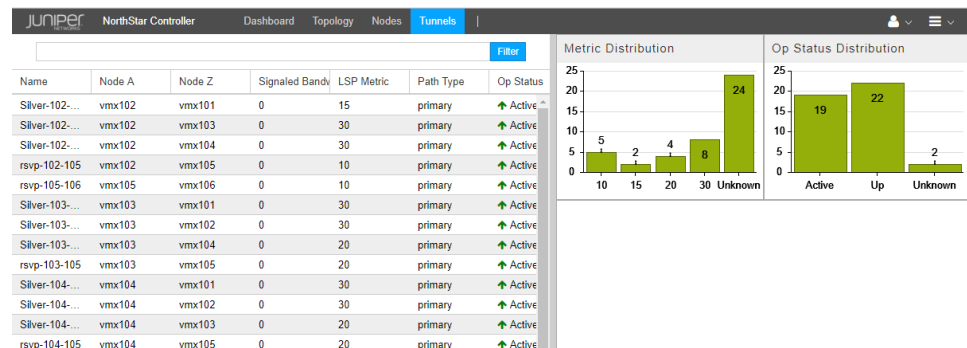
The Nodes view, shown in [Figure 12 on page 83](#), displays detailed information about the nodes in the network. With this view, you can see node details, tunnel and interface summaries, groupings, and geographic placement (if enabled), all in one place.

Figure 12: Nodes View



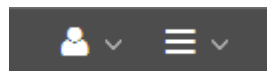
The Tunnels view, shown in [Figure 13 on page 84](#), provides detailed information about all the configured tunnels in the network, along with analytics information for the selected tunnel(s).

Figure 13: Tunnels View



Functions accessible from the right side of the top menu bar have to do with user and administrative management. Figure 14 on page 84 shows that portion of the top menu bar. These functions are accessible whether you are in the Dashboard, Topology, Nodes, or Tunnels view.

Figure 14: Right Side of the Top Menu Bar



The user and administrative management functions consist of:

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

The following Administration menu items are only available to the System Administrator, and only when logged in with full-access:

- Authentication
- License

- Subscribers
- Users
- System Settings
- Documentation
- About (version and license information)

**Related Documentation** • [NorthStar Controller UI Overview on page 75](#)

## 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.

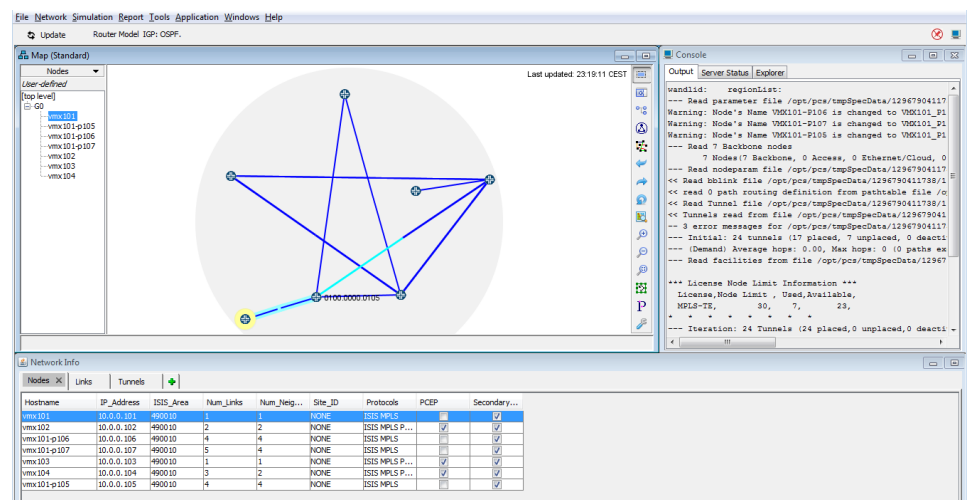
This topic describes some of the elements displayed from the Network Planner main window from which all other windows are launched or opened.

- [NorthStar Controller Network Planner UI on page 85](#)
- [Menu Options for the Network Planner UI on page 86](#)
- [RSVP Live Util Legend on page 86](#)
- [Customizing Nodes and Links in the Map Legends on page 87](#)

## 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 15 on page 85](#). 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 15: 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 11 on page 86 describes the options available from the main window.

*Table 11: 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 75](#)

