



Junos[®] OS

ICMP Router Discovery Protocol Feature Guide for Routing Devices

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Junos[®] OS ICMP Router Discovery Protocol Feature Guide for Routing Devices

15.1

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About the Documentation

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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 <http://www.juniper.net/techpubs/>.

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 <http://www.juniper.net/books>.

Supported Platforms

For the features described in this document, the following platforms are supported:

- [SRX Series](#)
- [T Series](#)
- [MX Series](#)
- [M Series](#)

Using the Examples in This Manual

If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. The example does not become active until you commit the candidate configuration.

If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.

If the example configuration does not start at the top level of the hierarchy, the example is a *snippet*. In this case, use the **load merge relative** command. These procedures are described in the following sections.

Merging a Full Example

To merge a full example, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration example into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following configuration to a file and name the file **ex-script.conf**. Copy the **ex-script.conf** file to the **/var/tmp** directory on your routing platform.

```
system {
  scripts {
    commit {
      file ex-script.xml;
    }
  }
}
interfaces {
  fxp0 {
    disable;
    unit 0 {
      family inet {
        address 10.0.0.1/24;
      }
    }
  }
}
```

2. Merge the contents of the file into your routing platform configuration by issuing the **load merge** configuration mode command:

```
[edit]
user@host# load merge /var/tmp/ex-script.conf
load complete
```

Merging a Snippet

To merge a snippet, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration snippet into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following snippet to a file and name the file **ex-script-snippet.conf**. Copy the **ex-script-snippet.conf** file to the **/var/tmp** directory on your routing platform.

```
commit {
  file ex-script-snippet.xml; }
```

2. Move to the hierarchy level that is relevant for this snippet by issuing the following configuration mode command:

```
[edit]
user@host# edit system scripts
[edit system scripts]
```

3. Merge the contents of the file into your routing platform configuration by issuing the **load merge relative** configuration mode command:

```
[edit system scripts]
user@host# load merge relative /var/tmp/ex-script-snippet.conf
load complete
```

For more information about the **load** command, see the *CLI User Guide*.

Documentation Conventions

Table 1 on page xi 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
Bold text like this	Represents text that you type.	To enter configuration mode, type the configure command: user@host> configure
Fixed-width text like this	Represents output that appears on the terminal screen.	user@host> show chassis alarms No alarms currently active
<i>Italic text like this</i>	<ul style="list-style-type: none"> Introduces or emphasizes important new terms. Identifies guide names. Identifies RFC and Internet draft titles. 	<ul style="list-style-type: none"> A policy <i>term</i> is a named structure that defines match conditions and actions. <i>Junos OS CLI User Guide</i> RFC 1997, <i>BGP Communities Attribute</i>
<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@# set system domain-name <i>domain-name</i>
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"> To configure a stub area, include the stub statement at the [edit protocols ospf area area-id] hierarchy level. The console port is labeled CONSOLE.
< > (angle brackets)	Encloses optional keywords or variables.	stub <default-metric <i>metric</i> >;
(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.	broadcast multicast (<i>string1</i> <i>string2</i> <i>string3</i>)
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	rsvp { # Required for dynamic MPLS only
[] (square brackets)	Encloses a variable for which you can substitute one or more values.	community name members [<i>community-ids</i>]
Indentation and braces ({ })	Identifies a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop <i>address</i> ; retain; } } }
;(semicolon)	Identifies a leaf statement at a configuration hierarchy level.	

GUI Conventions

Table 2: Text and Syntax Conventions (*continued*)

Convention	Description	Examples
Bold text like this	Represents graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none"> In the Logical Interfaces box, select All Interfaces. To cancel the configuration, click Cancel.
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select Protocols>Ospf .

Documentation Feedback

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

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

Requesting Technical Support

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

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

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- Search for known bugs: <http://www2.juniper.net/kb/>
- Find product documentation: <http://www.juniper.net/techpubs/>
- Find solutions and answer questions using our Knowledge Base: <http://kb.juniper.net/>
- Download the latest versions of software and review release notes: <http://www.juniper.net/customers/csc/software/>
- Search technical bulletins for relevant hardware and software notifications: <http://kb.juniper.net/InfoCenter/>
- Join and participate in the Juniper Networks Community Forum: <http://www.juniper.net/company/communities/>
- Open a case online in the CSC Case Management tool: <http://www.juniper.net/cm/>

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

Opening a Case with JTAC

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

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

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

CHAPTER 1

Overview

- [ICMP Router Discovery Overview on page 15](#)
- [Supported ICMP Router Discovery and IPv6 Neighbor Discovery Standards on page 17](#)

ICMP Router Discovery Overview

Router discovery uses Internet Control Message Protocol (ICMP) router advertisements and router solicitation messages to allow a host to discover the addresses of operational routers on the subnet. Hosts must discover routers before they can send IP datagrams outside their subnet. Router discovery allows a host to discover the addresses of operational routers on the subnet.

Router discovery uses Internet Control Message Protocol (ICMP) router advertisements and router solicitation messages to allow a host to discover the addresses of operational routers on the subnet. Hosts must discover routers before they can send IP datagrams outside their subnet.

Router discovery allows a host to discover the addresses of operational routers on the subnet. The Junos[®] operating system (Junos OS) implementation of router discovery supports server mode only.

Each router periodically multicasts a router advertisement from each of its multicast interfaces, announcing the IP address of that interface. Hosts listen for advertisements to discover the addresses of their neighboring routers. When a host starts, it can send a multicast router solicitation to ask for immediate advertisements.

The router discovery messages do not constitute a routing protocol. They enable hosts to discover the existence of neighboring routers, but do not determine which router is best to reach a particular destination.

This section discusses the following topics:

- [Operation of a Router Discovery Server on page 15](#)
- [Router Advertisement Messages on page 16](#)

Operation of a Router Discovery Server

The router discovery server distributes information about the addresses of all routers on directly connected networks and about their preferences for becoming the default router.

(A host sends a packet to the default router if the host does not have a route to a destination in its routing table.) The server does this by periodically sending router advertisement packets out each interface on which router discovery is enabled. In addition to containing the router addresses, these packets also announce the existence of the server itself.

The server can either transmit broadcast or multicast router advertisement packets. Multicast packets are sent to 224.0.0.1, which is the all-hosts multicast address. When packets are sent to the all-hosts multicast address, or when an interface is configured for the limited-broadcast address 255.255.255.255, all IP addresses configured on the physical interface are included in the router advertisement. When the packets are being sent to a network or subnet broadcast address, only the address associated with that network or subnet is included in the router advertisement.

When the routing protocol process first starts on the server router, the server sends router advertisement packets every few seconds. Then, the server sends these packets less frequently, commonly every 10 minutes.

The server responds to router solicitation packets it receives from a client. The response is sent unicast unless a router advertisement packet is due to be sent out momentarily.



NOTE: Junos OS does not support the ICMP router solicitation message with the source address as 0.0.0.0.

Router Advertisement Messages

Router advertisement messages include a preference level and a lifetime field for each advertised router address.

The preference level specifies the router's preference to become the default router. When a host chooses a default router address, it chooses the address with the highest preference. You can configure the preference level by including the **priority** statement.

The lifetime field indicates the maximum length of time that the advertised addresses are to be considered valid by hosts in the absence of further advertisements. You can configure the advertising rate by including the **max-advertisement-interval** and **min-advertisement-interval** statements, and you can configure the lifetime by including the **lifetime** statement. .

Related Documentation

- [Example: Configuring the ICMP Protocol for Discovering Gateways to Other Networks on page 20](#)

Supported ICMP Router Discovery and IPv6 Neighbor Discovery Standards

Junos OS substantially supports the following RFCs, which define standards for the Internet Control Message Protocol (ICMP for IP version 4 [IPv4]) and neighbor discovery (for IP version 6 [IPv6]).

- RFC 1256, *ICMP Router Discovery Messages*
- RFC 4861, *Neighbor Discovery for IP version 6 (IPv6)*
- RFC 2462, *IPv6 Stateless Address Autoconfiguration*
- RFC 2463, *Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification*
- RFC 4443, *Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification*
- RFC 4861, *IPv6 Stateless Address Autoconfiguration*
- RFC 4862, *Neighbor Discovery for IP version 6 (IPv6)*
- RFC 6106, *IPv6 Router Advertisement Options for DNS Configuration*

Related Documentation

- *Supported IPv4, TCP, and UDP Standards*
- *Supported IPv6 Standards*
- *Accessing Standards Documents on the Internet*

CHAPTER 2

Configuring the ICMP Protocol

- [Understanding the ICMP Protocol for Discovering Gateways to Other Networks on page 19](#)
- [Example: Configuring the ICMP Protocol for Discovering Gateways to Other Networks on page 20](#)

Understanding the ICMP Protocol for Discovering Gateways to Other Networks

The ICMP Router Discovery Protocol (IRDP) enables hosts to locate routers on the local subnet and use them as a gateway to reach other networks. Junos OS supports running IRDP in server mode, meaning that router discovery packets are generated. Junos OS does not support IRDP in client mode running as a host sending router solicitation messages. IRDP is specified in RFC 1256, *ICMP Router Discovery Messages*.

For a host to participate on an internetwork, it needs connectivity to at least one router on the local network. One way to ensure that this is the case is to manually configure each host with the address of a local router as its default router (also called a *gateway*). This method is time-consuming to set up, difficult to maintain, and inflexible.

When you enable the Dynamic Host Configuration Protocol (DHCP) on a host, you do not need to configure the default router. DHCP uses a method called router discovery to automatically discover local routers, and learn other information about them.

The information provided includes the router's address (or addresses, if it has more than one) and how long the host should retain information about the router. Router advertisement messages are sent periodically. Hosts listen for these messages. When an advertisement is received, the host processes it and adds the information about the router to its routing table. A host that has no manually configured routing information has no connectivity to routers when it first powers on. Instead of waiting for the next Router Advertisement message, the host sends a router solicitation message on its local network. This prompts any router that receives this message to immediately send an extra router advertisement message directly to that host.

By default, router discovery is disabled on Junos OS routing devices. When router discovery is enabled, the default behavior is to advertise all interfaces. If the router supports multicast, all the IPv4 Layer 3 interfaces are advertised through multicast. Otherwise, all the IPv4 Layer 3 interfaces are advertised through broadcast.

- Related Documentation**
- [Example: Configuring the ICMP Protocol for Discovering Gateways to Other Networks on page 20](#)

Example: Configuring the ICMP Protocol for Discovering Gateways to Other Networks

This example shows how to configure Internet Control Message Protocol (ICMP) router advertisements to allow IPv4 hosts to discover the addresses of operational routers on the subnet. Hosts must discover routers before they can send IP datagrams outside their subnet.

- [Requirements on page 20](#)
- [Overview on page 20](#)
- [Configuration on page 22](#)
- [Verification on page 23](#)

Requirements

This example assumes that a server or a client computer on the local network supports RFC 1256, *ICMP Router Discovery Messages*.

Overview

Before a host is able to send a message to a host outside its own subnet, it must be able to identify the address of the immediate router. This is typically done through reading a configuration file upon startup, and on some multicast networks by listening to routing protocol traffic. When a server or a client computer on the local network that supports RFC 1256 needs to locate a default gateway (router), the server or client computer uses ICMP to send a router solicitation. Hosts that support RFC 1256 send an ICMP router discovery message on the multicast address 224.0.0.2. Routers on the local network that support RFC 1256 immediately respond with a router advertisement.

The all-routers IP multicast address, 224.0.0.2, is the local IP broadcast address that IPv4 reserved. IPv4 multicast addresses in the range 224.0.0.0/24 (from 224.0.0.0 to 224.0.0.255) are reserved for the local subnet.

The ICMP Router Discovery Protocol (IRDP) uses router advertisements as well as router solicitation messages to allow hosts to learn the IP addresses of the router that is attached to the immediate network. When a host is started, it sends router solicitation messages to check for the address of the immediate router.



NOTE: Not all hosts perform router discovery using the method specified in RFC 1256. If the host has DHCP enabled, it might not use ICMP router discovery. The performance of router discovery is one of the DHCP options that is defined in RFC 1541, *Dynamic Host Configuration Protocol*. This option specifies whether the client solicits routers using the ICMP router discovery method specified in RFC 1256. A value of 1 indicates that the client performs router discovery. A value of 0 indicates that the client does not.

To configure the router to be a router discovery server, you must include at least the following statement in the configuration. All other router discovery configuration statements are optional.

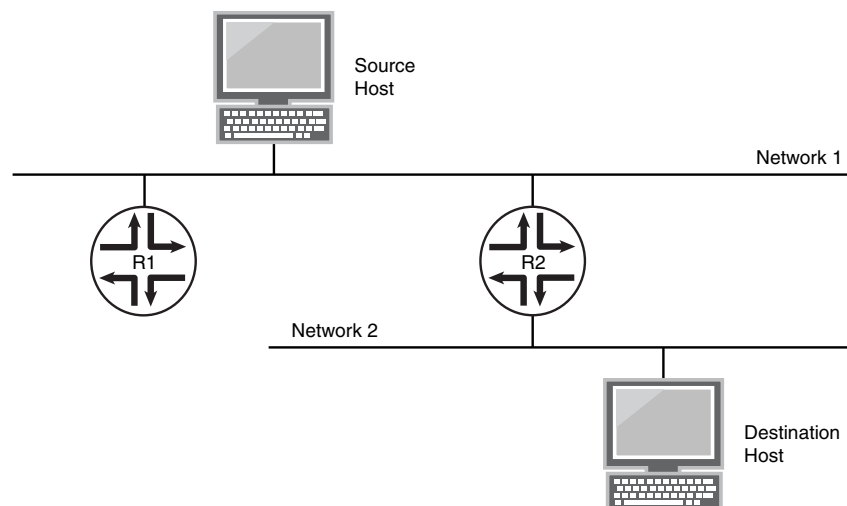
```
[edit]
protocols {
  router-discovery;
}
```

To configure a router as a server for ICMP router discovery, you can include the following statements in the configuration:

```
[edit]
protocols {
  router-discovery {
    disable;
    address address {
      (advertise | ignore);
      (broadcast | multicast);
      (ineligible | priority number);
    }
    interface interface-name {
      lifetime seconds;
      max-advertisement-interval seconds;
      min-advertisement-interval seconds;
    }
    traceoptions {
      file filename <files number> <size size> <world-readable | no-world-readable>;
      flag flag <detail> <disable>;
    }
  }
}
```

Figure 1 on page 21 shows a simplified sample topology.

Figure 1: ICMP Router Discovery Topology



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Configuration

CLI Quick Configuration To quickly configure this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the **[edit]** hierarchy level.

```
set interfaces ge-1/2/0 unit 6 description to-R2
set interfaces ge-1/2/0 unit 6 family inet address 10.0.0.6/24
set protocols router-discovery traceoptions file icmp-log
set protocols router-discovery traceoptions flag all
set protocols router-discovery interface ge-1/2/0.6 max-advertisement-interval 60
set protocols router-discovery interface ge-1/2/0.6 min-advertisement-interval 10
set protocols router-discovery interface ge-1/2/0.6 lifetime 120
set protocols router-discovery address 10.0.0.6 multicast
set protocols router-discovery address 10.0.0.6 priority 900
```

Step-by-Step Procedure The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure ICMP router discovery:

1. Configure the network interfaces.

This example shows multiple loopback interface addresses to simulate attached networks.

```
[edit interfaces]
user@R1# set ge-1/2/0 unit 6 description to-R2
user@R1# set ge-1/2/0 unit 6 family inet address 10.0.0.6/24
```

2. Enable router discovery.

```
[edit protocols]
user@R1# set router-discovery
```

3. (Optional) Enable trace operations for router discovery.

```
[edit protocols router-discovery]
user@R1# set traceoptions file icmp-log
user@R1# set traceoptions flag all
```

4. (Optional) Set the IRDP maximum interval between advertisements.

```
[edit protocols router-discovery]
user@R1# set interface ge-1/2/0.6 max-advertisement-interval 60
```

5. (Optional) Set the IRDP minimum interval between advertisements.

```
[edit protocols router-discovery]
user@R1# set interface ge-1/2/0.6 min-advertisement-interval 10
```

6. (Optional) Set the IRDP period for which advertisements are valid.

```
[edit protocols router-discovery]
user@R1# set interface ge-1/2/0.6 lifetime 120
```

7. (Optional) Configure the router to include the 10.0.0.6 IP address in IRDP advertisements to the all-hosts multicast address (224.0.0.1).

If the router supports IP multicast, and if the interface supports IP multicast, **multicast** is the default. Otherwise, the addresses are included in broadcast router advertisement packets.

```
[edit protocols router-discovery]
user@R1# set address 10.0.0.6 multicast
```

8. (Optional) Set the preference of the address to become a default router.

This preference is set relative to the preferences of other router addresses on the same subnet.

```
[edit protocols router-discovery]
user@R1# set address 10.0.0.6 priority 900
```

Results From configuration mode, confirm your configuration by entering the **show interfaces** and **show protocols** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
user@R1# show interfaces
ge-1/2/0 {
  unit 6 {
    description to-R2;
    family inet {
      address 10.0.0.6/24;
    }
  }
}

user@R1# show protocols
router-discovery {
  traceoptions {
    file icmp-log;
    flag all;
  }
  interface ge-1/2/0.6 {
    max-advertisement-interval 60;
    min-advertisement-interval 10;
    lifetime 120;
  }
  address 10.0.0.6 {
    multicast;
    priority 900;
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Checking the Trace Log

Purpose Verify that the expected interfaces are sending messages.

Action From operational mode, enter the **show log icmp-log** command.

```
user@R1> show log icmp-log
Mar 21 14:42:54 trace_on: Tracing to "/var/log/icmp-log" started
Mar 21 14:42:54.409027 rdisc_ifa_change: Preference for address
10.0.0.6(ge-1/2/0.6) set to 900
Mar 21 14:43:33.983695 task_timer_uset: timer RouterDiscoveryServer_Group <Touched
Processing> set to offset 22 at 14:43:16
Mar 21 14:43:33.984263 rdisc_server_timer: group ge-1/2/0.6 timer set to 22
Mar 21 14:43:55.985225 task_timer_uset: timer RouterDiscoveryServer_Group <Touched
Processing> set to offset 37 at 14:44:10
Mar 21 14:43:55.985520 rdisc_server_timer: group ge-1/2/0.6 timer set to 37
Mar 21 14:44:32.986407 task_timer_uset: timer RouterDiscoveryServer_Group <Touched
Processing> set to offset 39 at 14:44:44
Mar 21 14:44:32.986961 rdisc_server_timer: group ge-1/2/0.6 timer set to 39
Mar 21 14:45:11.987331 task_timer_uset: timer RouterDiscoveryServer_Group <Touched
Processing> set to offset 10 at 14:44:42
Mar 21 14:45:11.987888 rdisc_server_timer: group ge-1/2/0.6 timer set to 10
Mar 21 14:45:21.990974 task_timer_uset: timer RouterDiscoveryServer_Group <Touched
Processing> set to offset 23 at 14:45:34
Mar 21 14:45:21.991548 rdisc_server_timer: group ge-1/2/0.6 timer set to 23
Mar 21 14:45:44.992150 task_timer_uset: timer RouterDiscoveryServer_Group <Touched
Processing> set to offset 45 at 14:46:06
Mar 21 14:45:44.992710 rdisc_server_timer: group ge-1/2/0.6 timer set to 45
```

Meaning The log output shows that the preference was set to 900 for IP address 10.0.0.6 and that messages are being sent on the ge-1/2/0.6 interface.

Related Documentation

- [ICMP Router Discovery Overview on page 15](#)
- [Understanding the ICMP Protocol for Discovering Gateways to Other Networks on page 19](#)

CHAPTER 3

Configuring Recursive DNS Servers

- [Understanding Recursive DNS Servers for IPv6 on page 25](#)
- [Configuring a Recursive DNS Server Address for IPv6 Hosts on page 26](#)
- [Example: Configuring Recursive DNS Server Addresses for IPv6 Hosts on page 27](#)

Understanding Recursive DNS Servers for IPv6

To access any location on the Internet, the domain name system (DNS) server plays a pivotal role in resolving the domain name into its associated IP address. The DNS resolution service can also be provided by the DHCP server. The routing protocol process (rpd) of routers generates router advertisements to facilitate IPv6 hosts in autoconfiguration and in learning network information. For IPv6 stateless autoconfiguration, DNS configuration is provided by router advertisements. The router advertisement-based DNS configuration is useful in networks where an IPv6 host's address is autoconfigured through an IPv6 stateless address and where there is no existing DHCPv6 infrastructure.

Depending on their configuration, DNS servers can be classified into the following types:

- Recursive domain name system
- Nonrecursive domain name system

DNS servers can resolve either recursive or nonrecursive queries. For a recursive query by a DNS client, the DNS server returns either the IP address associated with the domain name or an error. A recursive query does not return a referral. For a nonrecursive query, the DNS server returns the IP address of the domain name or an error or a referral to another DNS server which might have the resolution of the query.

For IPv6 hosts, a maximum of three recursive DNS server addresses can be configured along with their respective lifetimes. The default value of the lifetime of the configured recursive DNS server addresses is 1800 seconds. The configured IPv6 host uses the specified recursive DNS server address for DNS resolution where the IPv6 host's address is autoconfigured through an IPv6 stateless address and where there is no DHCPv6 infrastructure available.



CAUTION: The recursive DNS server configuration is included in the router advertisement packet, which is a part of the Neighbor Discovery Protocol

(NDP). In general, in an unsecured deployment scenario, an attacker could send a router advertisement with a fraudulent recursive DNS server address, misleading the IPv6 host into contacting an unintended DNS server for DNS name resolution. These attacks are similar to neighbor discovery attacks and attacks against unauthenticated DHCP. We recommend using the Secure Neighbor Discovery (SEND) protocol as a security mechanism for neighbor discovery to allow all the neighbor discovery options including the recursive DNS server options to be automatically included in the signatures.

For more information about configuring the SEND protocol, see www.juniper.net/techpubs/en_US/junos14.1/topics/topic-map/ipv6-secure-neighbor.html

- Related Documentation**
- [dns-server-address on page 47](#)
 - [lifetime on page 50](#)
 - [Configuring a Recursive DNS Server Address for IPv6 Hosts on page 26](#)
 - [Example: Configuring Recursive DNS Server Addresses for IPv6 Hosts on page 27](#)

Configuring a Recursive DNS Server Address for IPv6 Hosts

For IPv6 hosts, a maximum of three recursive DNS server addresses can be configured along with their respective lifetimes. The configured IPv6 host uses the specified recursive DNS server address for DNS resolution where the IPv6 host's address is autoconfigured through an IPv6 stateless address and where there is no DHCPv6 infrastructure available.

To configure a recursive DNS server address on IPv6 hosts, follow these steps:

1. Configure the recursive DNS server address for the IPv6 host.

```
[edit protocols router-advertisement]
user@host# set interfaces interface name dns-server-address address
```

For example, to assign IPv6 address abcd:1::1 as the recursive dns server address to interface fe-1/0/1:

```
[edit protocols router-advertisement]
user@host# set interfaces fe-1/0/1 dns-server-address abcd:1::1
```

2. Configure the lifetime to specify the time in seconds for which the recursive DNS server address remains valid.

```
[edit protocols router-advertisement interfaces interface name dns-server-address
address]
user@host# set lifetime seconds
```

For example, to specify a lifetime of 60 seconds for the recursive DNS server address:

```
[edit protocols router-advertisement interfaces interface name dns-server-address
address]
user@host# set lifetime 60
```

The default value of the lifetime of the configured recursive DNS server address is 1800 seconds.

- Related Documentation**
- [dns-server-address on page 47](#)
 - [lifetime on page 50](#)
 - [Understanding Recursive DNS Servers for IPv6 on page 25](#)
 - [Example: Configuring Recursive DNS Server Addresses for IPv6 Hosts on page 27](#)

Example: Configuring Recursive DNS Server Addresses for IPv6 Hosts

This example shows how to configure the recursive DNS server address of an IPv6 host. The recursive DNS server address is included in the router advertisement that is sent to the neighboring devices.

- [Requirements on page 27](#)
- [Overview on page 27](#)
- [Configuration on page 28](#)
- [Verification on page 30](#)

Requirements

This example uses the following hardware and software components:

- Two MX Series routers with IPv6 enabled on the connected interfaces.
- Junos OS Release 14.1 or later running on all devices.

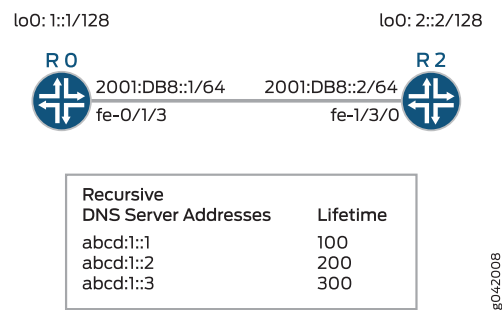
Overview

The example includes two routers that are directly connected. Configure IPv6 on the directly connected interfaces. Enable router advertisement on the interfaces and configure the recursive DNS server addresses and their lifetimes on the interfaces. This example verifies that the router advertisement sent to the neighboring device includes the configured recursive DNS server addresses.

Topology

[Figure 2 on page 28](#) shows the sample topology.

Figure 2: Configuring Recursive DNS Server Address for IPv6 Hosts



Configuration

CLI Quick Configuration To quickly configure this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the **[edit]** hierarchy level.

Router R0

```
set interfaces fe-0/1/3 unit 0 family inet6 address 2001:DB8::1/64
set interfaces lo0 unit 0 family inet6 address 1::1/128
set protocols router-advertisement interface fe-0/1/3 max-advertisement-interval 4
set protocols router-advertisement interface fe-0/1/3 min-advertisement-interval 3
set protocols router-advertisement interface fe-0/1/3 dns-server-address abcd:1::1 lifetime 100
set protocols router-advertisement interface fe-0/1/3 dns-server-address abcd:1::2 lifetime 200
set protocols router-advertisement interface fe-0/1/3 dns-server-address abcd:1::3 lifetime 300
```

Router R1

```
set interfaces fe-1/3/0 unit 0 family inet6 address 2001:DB8::2/64
set interfaces lo0 unit 0 family inet6 address 1::2/128
set protocols router-advertisement interface fe-1/3/0 max-advertisement-interval 4
set protocols router-advertisement interface fe-1/3/0 min-advertisement-interval 3
set protocols router-advertisement interface fe-1/3/0 dns-server-address abcd:1::4 lifetime 100
```

Configuring the Recursive DNS Server Address

Step-by-Step Procedure The following example requires that you navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.



NOTE: Repeat this procedure for Router R1, modifying the appropriate interface names, addresses, and any other parameters for the router.

To configure the recursive DNS server address on Router R0:

1. Enable IPv6 on the physical interface.
[edit interfaces]

```
user@R0# set fe-0/1/3 unit 0 family inet6 address 2001:DB8::1/64
```

2. Configure the loopback address.

```
[edit interfaces]
user@R0# set lo0 unit 0 family inet6 address 1::1/128
```

3. Specify the time interval between router advertisements on the interface.

The router sends advertisements to neighbors after the specified time interval. In this example, Router R0 sends router advertisements to Router R1 after a minimum interval of 3 seconds and a maximum interval of 4 seconds.

```
[edit protocols router-advertisement]
user@R0# set interface fe-0/1/3 max-advertisement-interval 4
user@R0# set interface fe-0/1/3 min-advertisement-interval 3
```

4. Configure the recursive DNS addresses and their lifetimes on the interface.

```
[edit protocols router-advertisement]
user@R0# set interface fe-0/1/3 dns-server-address abcd:1::1 lifetime 100
user@R0# set interface fe-0/1/3 dns-server-address abcd:1::2 lifetime 200
user@R0# set interface fe-0/1/3 dns-server-address abcd:1::3 lifetime 300
```

Results

From configuration mode, confirm your configuration by entering the **show interfaces** and **show protocols** commands. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@R0# show interfaces
fe-0/1/3 {
  unit 0 {
    family inet6 {
      address 2001:DB8::1/64;
    }
  }
}
lo0 {
  unit 0 {
    family inet6 {
      address ::1/128;
    }
  }
}
user@R0# show protocols
router-advertisement {
  interface fe-0/1/3.0 {
    max-advertisement-interval 4;
    min-advertisement-interval 3;
    dns-server-address abcd:1::1 {
      lifetime 100;
    }
    dns-server-address abcd:1::2 {
      lifetime 200;
    }
    dns-server-address abcd:1::3 {
      lifetime 300;
    }
  }
}
```

```
    }  
  }  
}
```

If you are done configuring the device, commit the configuration.

```
user@R0# commit
```

Verification

Verifying That the Router Advertisement Includes the Recursive DNS Server Address

Purpose Verify that the router advertisement on Router R1 includes the recursive DNS server address configured on Router R0.

Action From operational mode on Router R1, enter the **show ipv6 router-advertisement** command.

```
user@R1> show ipv6 router-advertisement
```

```
Interface: fe-1/3/0.0  
  Advertisements sent: 18, last sent 00:00:02 ago  
  Solicits received: 0  
  Advertisements received: 18  
  Advertisement from fe80::214:f6ff:fe22:5422, heard 00:00:02 ago  
    Managed: 0  
    Other configuration: 0  
    Reachable time: 0 ms  
    Default lifetime: 12 sec  
    Retransmit timer: 0 ms  
    Current hop limit: 64  
    RDNSS address: abcd:1::1  
      Lifetime: 100 sec  
    RDNSS address: abcd:1::2  
      Lifetime: 200 sec  
    RDNSS address: abcd:1::3  
      Lifetime: 300 sec
```

Meaning The recursive DNS server address and the configured lifetime are included in the router advertisements on Router R1.

Related Documentation

- [Configuring a Recursive DNS Server Address for IPv6 Hosts on page 26](#)
- [Understanding Recursive DNS Servers for IPv6 on page 25](#)
- [dns-server-address on page 47](#)
- [lifetime on page 50](#)

CHAPTER 4

Monitoring ICMP Router Discovery

- [Example: Tracing Global Routing Protocol Operations on page 31](#)

Example: Tracing Global Routing Protocol Operations

This example shows how to list and view files that are created when you enable global routing trace operations.

- [Requirements on page 31](#)
- [Overview on page 31](#)
- [Configuration on page 32](#)
- [Verification on page 34](#)

Requirements

You must have the **view** privilege.

Overview

To configure global routing protocol tracing, include the **traceoptions** statement at the **[edit routing-options]** hierarchy level:

```
traceoptions {  
  file filename <files number> <size size> <world-readable | no-world-readable>;  
  flag flag <disable>;  
}
```

The flags in a **traceoptions flag** statement are identifiers. When you use the **set** command to configure a flag, any flags that might already be set are not modified. In the following example, setting the **timer** tracing flag has no effect on the already configured **task** flag. Use the **delete** command to delete a particular flag.

```
[edit routing-options traceoptions]  
user@host# show  
flag task;  
user@host# set traceoptions flag timer  
user@host# show  
flag task;  
flag timer;  
user@host# delete traceoptions flag task  
user@host# show
```

flag timer;

This example shows how to configure and view a trace file that tracks changes in the routing table. The steps can be adapted to apply to trace operations for any Junos OS hierarchy level that supports trace operations.



TIP: To view a list of hierarchy levels that support tracing operations, enter the `help apropos traceoptions` command in configuration mode.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the **[edit]** hierarchy level.

```
set routing-options traceoptions file routing-table-changes
set routing-options traceoptions file size 10m
set routing-options traceoptions file files 10
set routing-options traceoptions flag route
set routing-options static route 1.1.1.2/32 next-hop 10.0.45.6
```

Configuring Trace Operations

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure the trace operations:

1. Configure trace operations.

```
[edit routing-options traceoptions]
user@host# set file routing-table-changes
user@host# set file size 10m
user@host# set file files 10
user@host# set flag route
```

2. Configure a static route to cause a change in the routing table.

```
[edit routing-options static]
user@host# set route 1.1.1.2/32 next-hop 10.0.45.6
```

3. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

Viewing the Trace File

Step-by-Step Procedure

To view the trace file:

1. In operational mode, list the log files on the system.

```
user@host> file list /var/log
/var/log:
...
routing-table-changes
...
```

2. View the contents of the **routing-table-changes** file.

```
user@host> file show /var/log/routing-table-changes
Dec 15 11:09:29 trace_on: Tracing to "/var/log/routing-table-changes" started
Dec 15 11:09:29.496507
Dec 15 11:09:29.496507 Tracing flags enabled: route
Dec 15 11:09:29.496507
Dec 15 11:09:29.533203 inet_routerid_notify: Router ID: 192.168.4.1
Dec 15 11:09:29.533334 inet_routerid_notify: No Router ID assigned
Dec 15 11:09:29.533381 inet_routerid_notify: No Router ID assigned
Dec 15 11:09:29.533420 inet_routerid_notify: No Router ID assigned
Dec 15 11:09:29.534915 inet_routerid_notify: Router ID: 192.168.4.1
Dec 15 11:09:29.542934 inet_routerid_notify: No Router ID assigned
Dec 15 11:09:29.549253 inet_routerid_notify: No Router ID assigned
Dec 15 11:09:29.556878 inet_routerid_notify: No Router ID assigned
Dec 15 11:09:29.582990 rt_static_reinit: examined 3 static nexthops, 0
unreferenced
Dec 15 11:09:29.589920
Dec 15 11:09:29.589920 task_reconfigure reinitializing done
...
```

3. Filter the output of the log file.

```
user@host> file show /var/log/routing-table-changes | match 1.1.1.2
Dec 15 11:15:30.780314 ADD      1.1.1.2/32          nhid 0 gw 10.0.45.6
      Static   pref 5/0 metric at-0/2/0.0 <ctive Int Ext>
Dec 15 11:15:30.782276 KRT Request: send len 216 v104 seq 0 ADD route/user
af 2 table 0 infot 0 addr 1.1.1.2 nhop-type unicast nhindex 663
```

4. View the tracing operations in real time by running the **monitor start** command with an optional **match** condition.

```
user@host> monitor start routing-table-changes | match 1.1.1.2
Aug 10 19:21:40.773467 BGP RECV      0.0.0.0/0
Aug 10 19:21:40.773685 bgp_rcv_nlri: 0.0.0.0/0
Aug 10 19:21:40.773778 bgp_rcv_nlri: 0.0.0.0/0 belongs to meshgroup
Aug 10 19:21:40.773832 bgp_rcv_nlri: 0.0.0.0/0 qualified bnp->ribact 0x0
12afcb 0x0
```

5. Deactivate the static route.

```
user@host# deactivate routing-options static route 1.1.1.2/32
user@host# commit

*** routing-table-changes ***
Dec 15 11:42:59.355557 CHANGE      1.1.1.2/32          nhid 663 gw 10.0.45.6
      Static   pref 5/0 metric at-0/2/0.0 <Delete Int Ext>
Dec 15 11:42:59.426887 KRT Request: send len 216 v104 seq 0 DELETE route/user
af 2 table 0 infot 0 addr 1.1.1.2 nhop-type discard filtidx 0
```

```
Dec 15 11:42:59.427366 RELEASE 1.1.1.2/32          nhid 663 gw 10.0.45.6
Static   pref 5/0 metric  at-0/2/0.0 <Release Delete Int Ext>
```

6. Halt the **monitor** command by pressing Enter and typing **monitor stop**.

```
[Enter]
user@host> monitor stop
```

7. When you are finished troubleshooting, consider deactivating trace logging to avoid any unnecessary impact to system resources.

When configuration is deactivated, it appears in the configuration with the **inactive** tag.

```
[edit routing-options]
user@host# deactivate traceoptions
user@host# commit
```

```
[edit routing-options]
user@host# show
```

```
inactive: traceoptions {
  file routing-table-changes size 10m files 10;
  flag route;
}
static {
  inactive: route 1.1.1.2/32 next-hop 10.0.45.6;
}
```

8. To reactivate trace operations, use the **activate** configuration-mode statement.

```
[edit routing-options]
user@host# activate traceoptions
user@host# commit
```

Results

From configuration mode, confirm your configuration by entering the **show routing-options** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show routing-options
traceoptions {
  file routing-table-changes size 10m files 10;
  flag route;
}
static {
  route 1.1.1.2/32 next-hop 10.0.45.6;
}
```

Verification

Confirm that the configuration is working properly.

Verifying That the Trace Log File Is Operating

Purpose Make sure that events are being written to the log file.

Action user@host> `show log routing-table-changes`

Dec 15 11:09:29 trace_on: Tracing to "/var/log/routing-table-changes" started

- Related Documentation**
- *Understanding Global Routing Protocol Tracing Operations*
 - [CLI Explorer](#)

CHAPTER 5

Troubleshooting Network Issues

- [Working with Problems on Your Network on page 37](#)
- [Isolating a Broken Network Connection on page 38](#)
- [Identifying the Symptoms of a Broken Network Connection on page 39](#)
- [Isolating the Causes of a Network Problem on page 40](#)
- [Taking Appropriate Action for Resolving the Network Problem on page 41](#)
- [Evaluating the Solution to Check Whether the Network Problem Is Resolved on page 41](#)

Working with Problems on Your Network

Problem **Description:** This checklist provides links to troubleshooting basics, an example network, and includes a summary of the commands you might use to diagnose problems with the router and network.

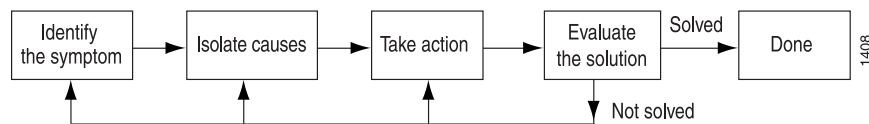
Table 3: Checklist for Working with Problems on Your Network

Tasks	Command or Action
“Isolating a Broken Network Connection” on page 38	
1. Identifying the Symptoms of a Broken Network Connection on page 39	<code>ping (ip-address hostname)</code> <code>show route (ip-address hostname)</code> <code>tracert (ip-address hostname)</code>
2. Isolating the Causes of a Network Problem on page 40	<code>show < configuration interfaces protocols route ></code>
3. Taking Appropriate Action for Resolving the Network Problem on page 41	<code>[edit]</code> <code>delete routing options static route destination-prefix</code> <code>commit and-quit</code> <code>show route destination-prefix</code>
4. Evaluating the Solution to Check Whether the Network Problem Is Resolved on page 41	<code>show route (ip-address hostname)</code> <code>ping (ip-address hostname) count 3</code> <code>tracert (ip-address hostname)</code>

Isolating a Broken Network Connection

By applying the standard four-step process illustrated in [Figure 3 on page 38](#), you can isolate a failed node in the network.

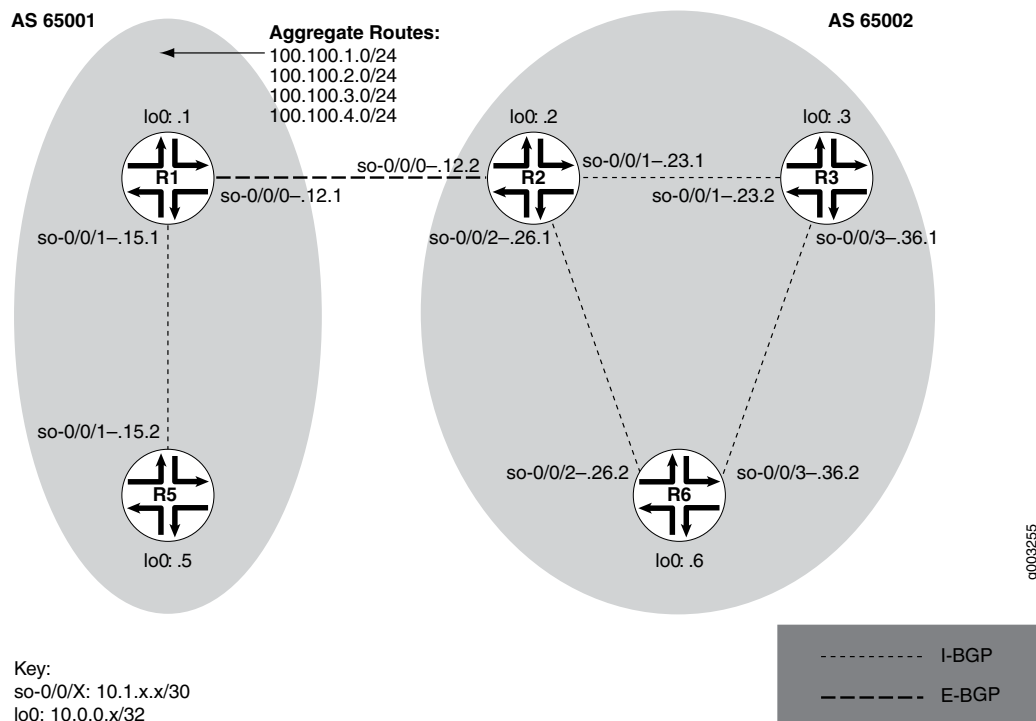
Figure 3: Process for Diagnosing Problems in Your Network



Before you embark on the four-step process, however, it is important that you are prepared for the inevitable problems that occur on all networks. While you might find a solution to a problem by simply trying a variety of actions, you can reach an appropriate solution more quickly if you are systematic in your approach to the maintenance and monitoring of your network. To prepare for problems on your network, understand how the network functions under normal conditions, have records of baseline network activity, and carefully observe the behavior of your network during a problem situation.

[Figure 4 on page 38](#) shows the network topology used in this topic to illustrate the process of diagnosing problems in a network.

Figure 4: Network with a Problem



The network in [Figure 4 on page 38](#) consists of two autonomous systems (ASs). AS 65001 includes two routers, and AS 65002 includes three routers. The border router (R1) in AS 65001 announces aggregated prefixes **100.100/24** to the AS 65002 network. The

problem in this network is that **R6** does not have access to **R5** because of a loop between **R2** and **R6**.

To isolate a failed connection in your network, follow these steps:

Identifying the Symptoms of a Broken Network Connection

Problem **Description:** The symptoms of a problem in your network are usually quite obvious, such as the failure to reach a remote host.

Solution To identify the symptoms of a problem on your network, start at one end of your network and follow the routes to the other end, entering all or one of the following Junos OS command-line interfaces (CLI) operational mode commands:

```
user@host> ping (ip-address | host-name)
user@host> show route (ip-address | host-name)
user@host> traceroute (ip-address | host-name)
```

Sample Output

```
user@R6> ping 10.0.0.5
PING 10.0.0.5 (10.0.0.5): 56 data bytes
36 bytes from 10.1.26.1: Time to live exceeded
Vr HL TOS Len ID Flg off TTL Pro cks Src Dst
 4 5 00 0054 e2db 0 0000 01 01 a8c6 10.1.26.2 10.0.0.5

36 bytes from 10.1.26.1: Time to live exceeded
Vr HL TOS Len ID Flg off TTL Pro cks Src Dst
 4 5 00 0054 e2de 0 0000 01 01 a8c3 10.1.26.2 10.0.0.5

36 bytes from 10.1.26.1: Time to live exceeded
Vr HL TOS Len ID Flg off TTL Pro cks Src Dst
 4 5 00 0054 e2e2 0 0000 01 01 a8bf 10.1.26.2 10.0.0.5

^C
--- 10.0.0.5 ping statistics ---
3 packets transmitted, 0 packets received, 100% packet loss

user@R6> show route 10.0.0.5

inet.0: 20 destinations, 20 routes (20 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

10.0.0.5/32          *[IS-IS/165] 00:02:39, metric 10
                    > to 10.1.26.1 via so-0/0/2.0

user@R6> traceroute 10.0.0.5
traceroute to 10.0.0.5 (10.0.0.5), 30 hops max, 40 byte packets
 1 10.1.26.1 (10.1.26.1) 0.649 ms 0.521 ms 0.490 ms
 2 10.1.26.2 (10.1.26.2) 0.521 ms 0.537 ms 0.507 ms
 3 10.1.26.1 (10.1.26.1) 0.523 ms 0.536 ms 0.514 ms
 4 10.1.26.2 (10.1.26.2) 0.528 ms 0.551 ms 0.523 ms
 5 10.1.26.1 (10.1.26.1) 0.531 ms 0.550 ms 0.524 ms
```

Meaning

The sample output shows an unsuccessful **ping** command in which the packets are being rejected because the time to live is exceeded. The output for the **show route** command

shows the interface (10.1.26.1) that you can examine further for possible problems. The **tracert** command shows the loop between 10.1.26.1 (R2) and 10.1.26.2 (R6), as indicated by the continuous repetition of the two interface addresses.

Isolating the Causes of a Network Problem

Problem **Description:** A particular symptom can be the result of one or more causes. Narrow down the focus of your search to find each individual cause of the unwanted behavior.

Solution To isolate the cause of a particular problem, enter one or all of the following Junos OS CLI operational mode command:

To isolate the cause of a particular problem, enter one or all of the following Junos OS CLI operational mode command:

```
user@host> show < configuration | bgp | interfaces | isis | ospf | route >
```

Your particular problem may require the use of more than just the commands listed above. See the appropriate command reference for a more exhaustive list of commonly used operational mode commands.

Sample Output

```
user@R6> show interfaces terse
Interface      Admin Link Proto Local Remote
so-0/0/0       up   up   inet  10.1.56.2/30
so-0/0/0.0     up   up   inet  10.1.56.2/30
so-0/0/2       up   up   inet  10.1.26.2/30
so-0/0/2.0     up   up   inet  10.1.26.2/30
so-0/0/3       up   up   inet  10.1.36.2/30
so-0/0/3.0     up   up   inet  10.1.36.2/30
[...Output truncated...]
```

The following sample output is from R2:

```
user@R2> show route 10.0.0.5

inet.0: 22 destinations, 25 routes (22 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

10.0.0.5/32      *[Static/5] 00:16:21
> to 10.1.26.2 via so-0/0/2.0
[BGP/170] 3d 20:23:35, MED 5, localpref 100
AS path: 65001 I
> to 10.1.12.1 via so-0/0/0.0
```

Meaning

The sample output shows that all interfaces on R6 are up. The output from R2 shows that a static route [Static/5] configured on R2 points to R6 (10.1.26.2) and is the preferred route to R5 because of its low preference value. However, the route is looping from R2 to R6, as indicated by the missing reference to R5 (10.1.15.2).

Taking Appropriate Action for Resolving the Network Problem

Problem **Description:** The appropriate action depends on the type of problem you have isolated. In this example, a static route configured on **R2** is deleted from the **[routing-options]** hierarchy level. Other appropriate actions might include the following:

Solution

- Check the local router's configuration and edit it if appropriate.
- Troubleshoot the intermediate router.
- Check the remote host configuration and edit it if appropriate.
- Troubleshoot routing protocols.
- Identify additional possible causes.

To resolve the problem in this example, enter the following Junos OS CLI commands:

```
[edit]
user@R2# delete routing-options static route destination-prefix
user@R2# commit and-quit
user@R2# show route destination-prefix
```

Sample Output

```
[edit]
user@R2# delete routing-options static route 10.0.0.5/32

[edit]
user@R2# commit and-quit
commit complete
Exiting configuration mode

user@R2> show route 10.0.0.5

inet.0: 22 destinations, 24 routes (22 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

10.0.0.5/32          *[BGP/170] 3d 20:26:17, MED 5, localpref 100
                    AS path: 65001 I
                    > to 10.1.12.1 via so-0/0/0.0
```

Meaning

The sample output shows the static route deleted from the **[routing-options]** hierarchy and the new configuration committed. The output for the **show route** command now shows the BGP route as the preferred route, as indicated by the asterisk (*).

Evaluating the Solution to Check Whether the Network Problem Is Resolved

Problem **Description:** If the problem is solved, you are finished. If the problem remains or a new problem is identified, start the process over again.

You can address possible causes in any order. In relation to the network in [“Isolating a Broken Network Connection” on page 38](#), we chose to work from the local router toward the remote router, but you might start at a different point, particularly if you have reason

to believe that the problem is related to a known issue, such as a recent change in configuration.

Solution To evaluate the solution, enter the following Junos OS CLI commands:

```
user@host> show route (ip-address | host-name)
user@host> ping (ip-address | host-name)
user@host> traceroute (ip-address | host-name)
```

Sample Output

```
user@R6> show route 10.0.0.5

inet.0: 20 destinations, 20 routes (20 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

10.0.0.5/32          *[BGP/170]  00:01:35, MED 5, localpref 100, from 10.0.0.2
                    AS path: 65001 I
                    > to 10.1.26.1 via so-0/0/2.0

user@R6> ping 10.0.0.5
PING 10.0.0.5 (10.0.0.5): 56 data bytes
64 bytes from 10.0.0.5: icmp_seq=0 ttl=253 time=0.866 ms
64 bytes from 10.0.0.5: icmp_seq=1 ttl=253 time=0.837 ms
64 bytes from 10.0.0.5: icmp_seq=2 ttl=253 time=0.796 ms
^C
--- 10.0.0.5 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.796/0.833/0.866/0.029 ms

user@R6> traceroute 10.0.0.5
traceroute to 10.0.0.5 (10.0.0.5), 30 hops max, 40 byte packets
 1  10.1.26.1 (10.1.26.1)  0.629 ms  0.538 ms  0.497 ms
 2  10.1.12.1 (10.1.12.1)  0.534 ms  0.538 ms  0.510 ms
 3  10.0.0.5 (10.0.0.5)   0.776 ms  0.705 ms  0.672 ms
```

Meaning

The sample output shows that there is now a connection between **R6** and **R5**. The **show route** command shows that the BGP route to **R5** is preferred, as indicated by the asterisk (*). The **ping** command is successful and the **traceroute** command shows that the path from **R6** to **R5** is through **R2** (10.1.26.1), and then through **R1** (10.1.12.1).

CHAPTER 6

Configuration Statements

- [\[edit protocols router-discovery\] Hierarchy Level](#) on page 43
- [address \(Protocols Router Discovery\)](#) on page 44
- [advertise](#) on page 45
- [broadcast](#) on page 46
- [disable \(Protocols Router Discovery\)](#) on page 47
- [dns-server-address](#) on page 47
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- [interface \(Protocols Router Discovery\)](#) on page 49
- [lifetime \(Router Advertisement\)](#) on page 50
- [lifetime \(Router Discovery\)](#) on page 51
- [max-advertisement-interval \(Protocols Router Discovery\)](#) on page 52
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- [multicast \(Protocols Router Discovery\)](#) on page 54
- [priority \(Protocols Router Discovery\)](#) on page 55
- [router-discovery](#) on page 56
- [traceoptions \(Protocols Router Discovery\)](#) on page 57

[\[edit protocols router-discovery\] Hierarchy Level](#)

The following statement hierarchy can also be included at the [\[edit logical-systems *logical-system-name*\]](#) hierarchy level.

```
protocols {
  router-discovery {
    disable;
    address address {
      (advertise | ignore);
      (broadcast | multicast);
      (ineligible | priority number);
    }
    interface interface-name {
      lifetime seconds;
    }
  }
}
```

```
        max-advertisement-interval seconds;  
        min-advertisement-interval seconds;  
    }  
    traceoptions {  
        file filename <files number> <size size> <world-readable | no-world-readable>;  
        flag flag <flag-modifier> <disable>;  
    }  
}
```

- Related Documentation**
- *Notational Conventions Used in Junos OS Configuration Hierarchies*
 - *[edit protocols] Hierarchy Level*

address (Protocols Router Discovery)

Syntax	<code>address (Protocols Router Discovery) address { (advertise ignore); (broadcast multicast); (ineligible priority number); }</code>
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols <code>router-discovery</code>], [edit protocols <code>router-discovery</code>]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Specify the IP addresses to include in router advertisement packets.
Options	address —IP address. To specify more than one address, specify multiple addresses or include multiple address statements. The remaining statements are explained separately.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Understanding the ICMP Protocol for Discovering Gateways to Other Networks on page 19• Example: Configuring the ICMP Protocol for Discovering Gateways to Other Networks on page 20

advertise

Syntax	(advertise ignore);
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols router-discovery address address], [edit protocols router-discovery address address]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	<p>Specify whether the server should advertise the IP address in its router advertisement packets:</p> <ul style="list-style-type: none">• advertise—Advertise the IP address in its router advertisement packets.• ignore—Do not advertise the IP addresses in router advertisement packets.
Default	advertise
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Understanding the ICMP Protocol for Discovering Gateways to Other Networks on page 19• Example: Configuring the ICMP Protocol for Discovering Gateways to Other Networks on page 20

broadcast

Syntax	(broadcast multicast);
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols router-discovery address address], [edit protocols router-discovery address address]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	<p>Specify when the server should include the IP addresses in router advertisement packets. On the same physical interfaces, some addresses might be included only in multicast packets, while others might be included only in broadcast packets.</p> <p>If you specify broadcast, the server includes the addresses in router advertisement packets only if the packets are broadcast.</p>
Default	multicast if the router supports IP multicast; broadcast if the router does not support IP multicast.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Understanding the ICMP Protocol for Discovering Gateways to Other Networks on page 19• Example: Configuring the ICMP Protocol for Discovering Gateways to Other Networks on page 20• multicast on page 54

disable (Protocols Router Discovery)

Syntax	disable;
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols router-discovery], [edit protocols router-discovery]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Disable router discovery.
Default	The configured object is enabled (operational) unless explicitly disabled.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Understanding the ICMP Protocol for Discovering Gateways to Other Networks on page 19 • Example: Configuring the ICMP Protocol for Discovering Gateways to Other Networks on page 20

dns-server-address

Syntax	dns-server-address <i>address</i> { lifetime <i>seconds</i> ; }
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols router-advertisement interface <i>interface-name</i>], [edit protocols router-advertisement interface <i>interface-name</i>]
Release Information	Statement introduced in Junos OS Release 14.1.
Description	Specify the recursive DNS server address that the device must use to resolve DNS names. The recursive DNS server address is the 128-bit IPv6 address of the recursive DNS server. You can configure a maximum of three recursive DNS server addresses at the interface level. The remaining statement is explained separately.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Example: Configuring Recursive DNS Server Addresses for IPv6 Hosts on page 27 • Understanding Recursive DNS Servers for IPv6 on page 25 • lifetime (Router Advertisement) on page 50

ignore

See [advertise](#)

ineligible

Syntax ineligible;

Hierarchy Level [edit logical-systems *logical-system-name* protocols router-discovery [address address](#)],
[edit protocols router-discovery [address address](#)]

Release Information Statement introduced before Junos OS Release 7.4.

Description Specify that the address can never become the default router.

Required Privilege Level routing—To view this statement in the configuration.

Related Documentation

- [Understanding the ICMP Protocol for Discovering Gateways to Other Networks on page 19](#)
- [Example: Configuring the ICMP Protocol for Discovering Gateways to Other Networks on page 20](#)
- [priority on page 55](#)

interface (Protocols Router Discovery)

Syntax	<pre>interface <i>interface-name</i> { lifetime <i>seconds</i>; max-advertisement-interval <i>seconds</i>; min-advertisement-interval <i>seconds</i>; }</pre>
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols router-discovery], [edit protocols router-discovery]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Specify physical interfaces on which to configure timers for router advertisement messages.
Options	<p>interface-name—Name of an interface. Specify the full interface name, including the physical and logical address components. To configure all interfaces, specify all.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	routing—To view this statement in the configuration.
Related Documentation	<ul style="list-style-type: none"> • Understanding the ICMP Protocol for Discovering Gateways to Other Networks on page 19 • Example: Configuring the ICMP Protocol for Discovering Gateways to Other Networks on page 20

lifetime (Router Advertisement)

Syntax	<code>lifetime seconds;</code>
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols router-advertisement interface <i>interface-name</i> dns-server-address <i>address</i>], [edit protocols router-advertisement interface <i>interface-name</i> dns-server-address <i>address</i>]
Release Information	Statement introduced in Junos OS Release 14.1.
Description	<p>Specify the maximum time in seconds for which the recursive DNS server address remains valid. The device can use the specified recursive DNS server address for DNS name resolution until the time specified by this statement.</p> <p><i>seconds</i>— Maximum time for which the recursive DNS server address remains valid.</p>
Options	<p>Range: 0 through 4294967295 seconds</p> <p>Default: 1800 seconds</p> <p>Values: 0 indicates that the advertised recursive DNS server address is no longer valid and that this recursive DNS server address entry can be deleted. 4294967295 seconds indicates an infinite lifetime and a persistent entry in the device for this recursive DNS server address.</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• Understanding Recursive DNS Servers for IPv6 on page 25• Example: Configuring Recursive DNS Server Addresses for IPv6 Hosts on page 27• dns-server-address on page 47

lifetime (Router Discovery)

Syntax	<code>lifetime seconds;</code>
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols router-discovery interface interface-name], [edit protocols router-discovery interface interface-name]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Specify how long the addresses sent by the server in its router advertisement packets are valid. This time must be long enough so that another router advertisement packet is sent before the lifetime has expired. The lifetime value is placed in the advertisement lifetime field of the router advertisement packet. If this amount of time passes and the host has not received a router advertisement from the server, the router marks the advertised addresses as invalid.
Options	<p>seconds—Lifetime value. A value of 0 indicates that one or more addresses are no longer valid.</p> <p>Range: Three times the value set by the max-advertisement-interval statement through 2 hours, 30 minutes (9000 seconds)</p> <p>Default: 1800 seconds (30 minutes, which is three times the default value for the max-advertisement-interval statement)</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Understanding the ICMP Protocol for Discovering Gateways to Other Networks on page 19 • Example: Configuring the ICMP Protocol for Discovering Gateways to Other Networks on page 20 • max-advertisement-interval on page 52

max-advertisement-interval (Protocols Router Discovery)

Syntax	max-advertisement-interval <i>seconds</i> ;
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols router-discovery interface interface-name], [edit protocols router-discovery interface interface-name]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Specify the maximum time the router waits before sending periodic router advertisement packets out the interface. These packets are broadcast or multicast, depending on how the address corresponding to this physical interface is configured.
Options	seconds —Maximum time between router advertisement packets. Range: 4 through 1800 seconds Default: 600 seconds (10 minutes)
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Understanding the ICMP Protocol for Discovering Gateways to Other Networks on page 19• Example: Configuring the ICMP Protocol for Discovering Gateways to Other Networks on page 20• broadcast on page 46• lifetime on page 51• min-advertisement-interval on page 53• multicast on page 54

min-advertisement-interval (Protocols Router Discovery)

Syntax	<code>min-advertisement-interval <i>seconds</i>;</code>
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols router-discovery interface interface-name], [edit protocols router-discovery interface interface-name]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Specify the minimum time the router waits before sending router advertisement packets out the interface in response to router solicitation packets it receives from a client. These packets are broadcast or multicast, depending on how the address corresponding to this physical interface is configured.
Options	<p><i>seconds</i>—Minimum time between router advertisement packets.</p> <p>Range: 3 seconds through 1800 seconds</p> <p>Default: 400 seconds (0.75 times the default value for the max-advertisement-interval statement)</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Understanding the ICMP Protocol for Discovering Gateways to Other Networks on page 19 • Example: Configuring the ICMP Protocol for Discovering Gateways to Other Networks on page 20 • broadcast on page 46 • max-advertisement-interval on page 52 • multicast on page 54

multicast (Protocols Router Discovery)

Syntax	(multicast broadcast);
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols router-discovery address address], [edit protocols router-discovery address address]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	<p>Specify when the server should include the IP addresses in router advertisement packets. On the same physical interfaces, some addresses might be included only in multicast packets, while others might be included only in broadcast packets.</p> <p>If you specify multicast, the server includes the addresses in router advertisement packets only if the packets are multicast. If the router supports IP multicast, and if the interface supports IP multicast, multicast is the default. Otherwise, the addresses are included in broadcast router advertisement packets. If the router does not support IP multicast, the addresses are not included.</p>
Default	multicast if the router supports IP multicast; broadcast if the router does not support IP multicast.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Understanding the ICMP Protocol for Discovering Gateways to Other Networks on page 19• Example: Configuring the ICMP Protocol for Discovering Gateways to Other Networks on page 20• broadcast on page 46

priority (Protocols Router Discovery)

Syntax	<code>priority <i>number</i>;</code>
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols router-discovery address address], [edit protocols router-discovery address address]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Specify the preference of the address to become a default router. This preference is set relative to the preferences of other router addresses on the same subnet.
Options	<p><i>number</i>—Preference of the addresses for becoming the default router. A higher value indicates that the address has a greater preference for becoming the default router.</p> <p>Range: 0 through 0x80000000</p> <p>Default: 0 (This address has the least chance of becoming the default router.)</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Understanding the ICMP Protocol for Discovering Gateways to Other Networks on page 19 • Example: Configuring the ICMP Protocol for Discovering Gateways to Other Networks on page 20

router-discovery

Syntax	<pre>router-discovery { disable; address address { (advertise ignore); (broadcast multicast); (ineligible priority number); } interface interface-name { lifetime seconds; max-advertisement-interval seconds; min-advertisement-interval seconds; } traceoptions { file filename <files number> <size size> <world-readable no-world-readable>; flag flag <flag-modifier> <disable>; } }</pre>
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols], [edit protocols]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Enable ICMP router discovery (server mode) on the router. The remaining statements are explained separately.
Default	Router discovery is disabled on the router. When router discovery is enabled, the default behavior is to advertise all interfaces. If the router supports multicast, all the IPv4 Layer 3 interfaces are advertised through multicast. Otherwise, all the IPv4 Layer 3 interfaces are advertised through broadcast.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Understanding the ICMP Protocol for Discovering Gateways to Other Networks on page 19• Example: Configuring the ICMP Protocol for Discovering Gateways to Other Networks on page 20

traceoptions (Protocols Router Discovery)

Syntax	<pre> traceoptions { file <i>filename</i> <files <i>number</i>> <size <i>size</i>> <world-readable no-world-readable>; flag <i>flag</i> <flag-modifier> <disable>; } </pre>
Hierarchy Level	[edit logical-systems <i>logical-system-name</i> protocols router-discovery], [edit protocols router-discovery]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	<p>Configure ICMP protocol-level tracing options.</p> <p>To specify more than one tracing operation, include multiple flag statements.</p>
Default	The default ICMP protocol-level tracing options are inherited from the routing protocols traceoptions statement included at the [edit routing-options] hierarchy level.
Options	<p>disable—(Optional) Disable the tracing operation. One use of this option is to disable a single operation when you have defined a broad group of tracing operations, such as all.</p> <p>file <i>filename</i>—Name of the file to receive the output of the tracing operation. Enclose the name within quotation marks. All files are placed in the directory /var/log. We recommend that you place ICMP tracing output in the file icmp-log.</p> <p>files <i>number</i>—(Optional) Maximum number of trace files. When a trace file named trace-file reaches its maximum size, it is renamed trace-file.0, then trace-file.1, and so on, until the maximum number of trace files is reached. Then, the oldest trace file is overwritten.</p> <p>If you specify a maximum number of files, you also must specify a maximum file size with the size option.</p> <p>Range: 2 through 1000 files</p> <p>Default: 2 files</p> <p>flag <i>flag</i>—Tracing operation to perform. To specify more than one tracing operation, include multiple flag statements. These are the ICMP-specific tracing options:</p> <ul style="list-style-type: none"> • error—Errored ICMP packets • info—ICMP information packets • packets—All packets • router-discovery—All ICMP packets • redirect—ICMP redirect packets <p>These are the global tracing options:</p>

- **all**—All tracing operations
- **general**—A combination of the **normal** and **route** trace operations
- **normal**—All normal operations

Default: If you do not specify this option, only unusual or abnormal operations are traced.

- **policy**—Policy operations and actions
- **route**—Routing table changes
- **state**—State transitions
- **task**—Interface transactions and processing
- **timer**—Timer usage

flag-modifier—(Optional) Modifier for the tracing flag. You can specify one or more of these modifiers:

- **detail**—Provide detailed trace information
- **receive**—Packets being received
- **send**—Packets being transmitted

no-world-readable—(Optional) Prevent any user from reading the log file.

size size—(Optional) Maximum size of each trace file, in kilobytes (KB), megabytes (MB), or gigabytes (GB). When a trace file named **trace-file** reaches this size, it is renamed **trace-file.0**. When the **trace-file** again reaches its maximum size, **trace-file.0** is renamed **trace-file.1** and **trace-file** is renamed **trace-file.0**. This renaming scheme continues until the maximum number of trace files is reached. Then, the oldest trace file is overwritten.

If you specify a maximum file size, you also must specify a maximum number of trace files with the **files** option.

Syntax: **xk** to specify KB, **xm** to specify MB, or **xg** to specify GB

Range: 10 KB through the maximum file size supported on your system

Default: 1 MB

world-readable—(Optional) Allow any user to read the log file.

Required Privilege Level	routing and trace—To view this statement in the configuration. routing-control and trace-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Understanding the ICMP Protocol for Discovering Gateways to Other Networks on page 19• Example: Configuring the ICMP Protocol for Discovering Gateways to Other Networks on page 20

CHAPTER 7

Operational Commands

- `monitor interface`
- `monitor start`
- `monitor stop`
- `ping`
- `show log`
- `traceroute`

monitor interface

Syntax `monitor interface`
`<interface-name> | traffic <detail>`

Release Information Command introduced before Junos OS Release 7.4.
 Command introduced in Junos OS Release 9.0 for EX Series switches.
 Command introduced in Junos OS Release 11.1 for the QFX Series.
 Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description Display real-time statistics about interfaces, updating the statistics every second. Check for and display common interface failures, such as SONET/SDH and T3 alarms, loopbacks detected, and increases in framing errors.



NOTE: This command is not supported on the QFX3000 QFabric system.

Options **none**—Display real-time statistics for all interfaces.

detail—(Optional) With traffic option only, display detailed output.

interface-name—(Optional) Display real-time statistics for the specified interface. In a TX Matrix or TX Matrix Plus router, display real-time statistics for the physical interfaces on the specified line-card chassis (LCC) only.

traffic—(Optional) Display traffic data for all active interfaces. In a TX Matrix or TX Matrix Plus router, display real-time statistics for the physical interfaces on the specified LCC only.

Additional Information The output of this command shows how much each field has changed since you started the command or since you cleared the counters by pressing the c key. For a description of the statistical information provided in the output of this command, see the **show interfaces extensive** command for a particular interface type in the [CLI Explorer](#). To control the output of the **monitor interface** command while it is running, use the keys listed in [Table 4 on page 60](#). The keys are not case-sensitive.

Table 4: Output Control Keys for the monitor interface Command

Key	Action
c	Clears (returns to zero) the delta counters since monitor interface was started. This does not clear the accumulative counter. To clear the accumulative counter, use the clear interfaces interval command.
f	Freezes the display, halting the display of updated statistics and delta counters.
i	Displays information about a different interface. The command prompts you for the name of a specific interface.

Table 4: Output Control Keys for the monitor interface Command (*continued*)

Key	Action
n	Displays information about the next interface. The monitor interface command displays the physical or logical interfaces in the same order as the show interfaces terse command.
q or Esc	Quits the command and returns to the command prompt.
t	Thaws the display, resuming the update of the statistics and delta counters.

To control the output of the **monitor interface traffic** command while it is running, use the keys listed in [Table 5 on page 61](#). The keys are not case-sensitive.

Table 5: Output Control Keys for the monitor interface traffic Command

Key	Action
b	Displays the statistics in units of bits and bits per second (bps).
c	Clears (return to 0) the delta counters in the Current Delta column. The statistics counters are not cleared.
d	Displays the Current Delta column (instead of the rate column) in Bps or packets per second (pps).
p	Displays the statistics in units of packets and packets per second (pps).
q or Esc	Quits the command and returns to the command prompt.
r	Displays the rate column (instead of the Current Delta column) in Bps and pps.

Required Privilege Level trace

List of Sample Output

- [monitor interface \(Physical\) on page 63](#)
- [monitor interface \(OTN Interface\) on page 64](#)
- [monitor interface \(MX480 Router with MPC5E and 10-Gigabit Ethernet OTN Interface\) on page 65](#)
- [monitor interface \(MX480 Router with MPC5E and 100-Gigabit Ethernet Interface\) on page 66](#)
- [monitor interface \(MX2010 Router with MPC6E and 10-Gigabit Ethernet OTN Interface\) on page 66](#)
- [monitor interface \(MX2010 Router with MPC6E and 100-Gigabit Ethernet OTN Interface\) on page 67](#)
- [monitor interface \(MX2020 Router with MPC6E and 10-Gigabit Ethernet OTN Interface\) on page 68](#)
- [monitor interface \(Logical\) on page 68](#)
- [monitor interface \(QFX3500 Switch\) on page 69](#)

[monitor interface traffic on page 69](#)

[monitor interface traffic \(QFX3500 Switch\) on page 70](#)

[monitor interface traffic detail \(QFX3500 Switch\) on page 70](#)

Output Fields [Table 6 on page 62](#) describes the output fields for the **monitor interface** command. Output fields are listed in the approximate order in which they appear.

Table 6: monitor interface Output Fields

Field Name	Field Description	Level of Output
routerl	Hostname of the router.	All levels
Seconds	How long the monitor interface command has been running or how long since you last cleared the counters.	All levels
Time	Current time (UTC).	All levels
Delay x/y/z	Time difference between when the statistics were displayed and the actual clock time. <ul style="list-style-type: none"> x—Time taken for the last polling (in milliseconds). y—Minimum time taken across all pollings (in milliseconds). z—Maximum time taken across all pollings (in milliseconds). 	All levels
Interface	Short description of the interface, including its name, status, and encapsulation.	All levels
Link	State of the link: Up , Down , or Test .	All levels
Current delta	Cumulative number for the counter in question since the time shown in the Seconds field, which is the time since you started the command or last cleared the counters.	All levels
Local Statistics	(Logical interfaces only) Number and rate of bytes and packets destined to the router or switch through the specified interface. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. It usually takes less than 1 second for this counter to stabilize. <ul style="list-style-type: none"> Input bytes—Number of bytes received on the interface. Output bytes—Number of bytes transmitted on the interface. Input packets—Number of packets received on the interface. Output packets—Number of packets transmitted on the interface. 	All levels
Remote Statistics	(Logical interfaces only) Statistics for traffic transiting the router or switch. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. It usually takes less than 1 second for this counter to stabilize. <ul style="list-style-type: none"> Input bytes—Number of bytes received on the interface. Output bytes—Number of bytes transmitted on the interface. Input packets—Number of packets received on the interface. Output packets—Number of packets transmitted on the interface. 	All levels

Table 6: monitor interface Output Fields (*continued*)

Field Name	Field Description	Level of Output
Traffic statistics	<p>Total number of bytes and packets received and transmitted on the interface. These statistics are the sum of the local and remote statistics. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. It usually takes less than 1 second for this counter to stabilize.</p> <ul style="list-style-type: none"> • Input bytes—Number of bytes received on the interface. • Output bytes—Number of bytes transmitted on the interface. • Input packets—Number of packets received on the interface. • Output packets—Number of packets transmitted on the interface. 	All levels
Description	With the traffic option, displays the interface description configured at the [edit interfaces <i>interface-name</i>] hierarchy level.	detail

Sample Output

monitor interface (Physical)

```

user@host> monitor interface so-0/0/0
router1                               Seconds: 19                      Time: 15:46:29

Interface: so-0/0/0, Enabled, Link is Up
Encapsulation: PPP, Keepalives, Speed: 0C48
Traffic statistics:
    Input packets:                6045 (0 pps)
    Input bytes:                  6290065 (0 bps)
    Output packets:               10376 (0 pps)
    Output bytes:                 10365540 (0 bps)
Encapsulation statistics:
    Input keepalives:             1901
    Output keepalives:            1901
    NCP state: Opened
    LCP state: Opened
Error statistics:
    Input errors:                 0
    Input drops:                 0
    Input framing errors:         0
    Policed discards:            0
    L3 incompletes:              0
    L2 channel errors:           0
    L2 mismatch timeouts:        0
    Carrier transitions:          1
    Output errors:               0
    Output drops:                0
    Aged packets:                0
Active alarms : None
Active defects: None
SONET error counts/seconds:
    LOS count                    1
    LOF count                    1
    SEF count                    1
    ES-S                        0
    SES-S                       0
SONET statistics:
    BIP-B1                      458871

```

```

BIP-B2                      460072          [0]
REI-L                       465610          [0]
BIP-B3                      458978          [0]
REI-P                       458773          [0]

```

Received SONET overhead:

```

F1      : 0x00 J0      : 0x00 K1      : 0x00
K2      : 0x00 S1      : 0x00 C2      : 0x00
C2(cmp) : 0x00 F2      : 0x00 Z3      : 0x00
Z4      : 0x00 S1(cmp) : 0x00

```

Transmitted SONET overhead:

```

F1      : 0x00 J0      : 0x01 K1      : 0x00
K2      : 0x00 S1      : 0x00 C2      : 0xcf
F2      : 0x00 Z3      : 0x00 Z4      : 0x00

```

Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'

monitor interface (OTN Interface)

```
user@host> monitor interface ge-7/0/0
```

```

Interface: ge-7/0/0, Enabled, Link is Up
Encapsulation: Ethernet, Speed: 10000mbps
Traffic statistics:
  Input bytes:                0 (0 bps)
  Output bytes:               0 (0 bps)
  Input packets:              0 (0 pps)
  Output packets:             0 (0 pps)
Error statistics:
  Input errors:                0
  Input drops:                 0
  Input framing errors:        0
  Policed discards:           0
  L3 incompletes:              0
  L2 channel errors:           0
  L2 mismatch timeouts:        0
  Carrier transitions:         5
  Output errors:               0
  Output drops:                0
  Aged packets:                0
Active alarms : None
Active defects: None
Input MAC/Filter statistics:
  Unicast packets              0
  Broadcast packets            0
  Multicast packets            0
  Oversized frames             0
  Packet reject count          0
  DA rejects                   0
  SA rejects                   0
Output MAC/Filter Statistics:
  Unicast packets              0
  Broadcast packets            0
  Multicast packets            0
  Packet pad count             0
  Packet error count           0
OTN Link 0
  OTN Alarms: OTU_BDI, OTU_TTIM, ODU_BDI
  OTN Defects: OTU_BDI, OTU_TTIM, ODU_BDI, ODU_TTIM
  OTN OC - Seconds
    LOS                        2

```

```

LOF 9
OTN OTU - FEC Statistics
  Corr err ratio N/A
  Corr bytes 0
  Uncorr words 0
OTN OTU - Counters
  BIP 0
  BBE 0
  ES 0
  SES 0
  UAS 422
OTN ODU - Counters
  BIP 0
  BBE 0
  ES 0
  SES 0
  UAS 422
OTN ODU - Received Overhead APSPCC 0-3: 0

```

monitor interface (MX480 Router with MPC5E and 10-Gigabit Ethernet OTN Interface)

```

user@host> monitor interface xe-0/0/3
Interface: xe-0/0/3, Enabled, Link is Up
Encapsulation: Ethernet, Speed: 10000mbps
Traffic statistics:
  Input bytes: 0 (0 bps)
  Output bytes: 0 (0 bps)
  Input packets: 0 (0 pps)
  Output packets: 0 (0 pps)
Error statistics:
  Input errors: 0
  Input drops: 0
  Input framing errors: 0
  Policed discards: 0
  L3 incompletes: 0
  L2 channel errors: 0
  L2 mismatch timeouts: 0
  Carrier transitions: 5
  Output errors: 0
  Output drops: 0
  Aged packets: 0
Active alarms : None
Active defects: None
PCS statistics:
  Bit Errors 0
  Errored blocks 4
Input MAC/Filter statistics:
  Unicast packets 0
  Broadcast packets 0
  Multicast packets 0
  Oversized frames 0
  Packet reject count 0
  DA rejects 0
  SA rejects 0
Output MAC/Filter Statistics:
  Unicast packets 0
  Broadcast packets 0
  Multicast packets 0
  Packet pad count 0
  Packet error count 0

```

Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'

monitor interface (MX480 Router with MPC5E and 100-Gigabit Ethernet Interface)

```

user@host> monitor interface et-2/1/0
Interface: et-2/1/0, Enabled, Link is Up
Encapsulation: Ethernet, Speed: 100000mbps
Traffic statistics:
Input bytes: 0 (0 bps) [0]
Output bytes: 0 (0 bps) [0]
Input packets: 0 (0 pps) [0]
Output packets: 0 (0 pps) [0]
Error statistics:
Input errors: 0 [0]
Input drops: 0 [0]
Input framing errors: 0 [0]
Policed discards: 0 [0]
L3 incompletes: 0 [0]
L2 channel errors: 0 [0]
L2 mismatch timeouts: 0 [0]
Carrier transitions: 263 [0]
Output errors: 0 [0]
Output drops: 0 [0]
Aged packets: 0 [0]
OTN Link 0
OTN Alarms:
OTN Defects:
OTN OC - Seconds
LOS 129 [0]
LOF 2 [0]
OTN OTU - FEC Statistics
Corr err ratio <8E-5
Corr bytes 169828399453 [0]
Uncorr words 28939961456 [0]
OTN OTU - Counters
BIP 0 [0]
BBE 0 [0]
ES 24 [0]
SES 0 [0]
UAS 1255 [0]
OTN ODU - Counters
BIP 0 [0]
BBE 0 [0]
ES 24 [0]
SES 0 [0]
UAS 1256 [0]
OTN ODU - Received Overhead
APSPCC 0-3: 00 00 00 00 [0]

```

Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'

monitor interface (MX2010 Router with MPC6E and 10-Gigabit Ethernet OTN Interface)

```

user@host> monitor interface xe-6/1/0
Interface: xe-6/1/0, Enabled, Link is Up
Encapsulation: Ethernet, Speed: 10000mbps
Traffic statistics:
Input bytes: 0 (0 bps) [0]

```

```

Output bytes:                0 (0 bps)                [0]
Input packets:               0 (0 pps)                [0]
Output packets:              0 (0 pps)                [0]
Error statistics:
Input errors:                0                        [0]
Input drops:                 0                        [0]
Input framing errors:        0                        [0]
Policed discards:            0                        [0]
L3 incompletes:              0                        [0]
L2 channel errors:           0                        [0]
L2 mismatch timeouts:        0                        [0]
Carrier transitions:          1                        [0]
Output errors:               0                        [0]
Output drops:                0                        [0]
Aged packets:                0                        [0]
Active alarms : None
Active defects: None
PCS statistics:
    Seconds
    Bit Errors                0                        [0]
    Errored blocks            1                        [0]
Input MAC/Filter statistics:
Unicast packets              0                        [0]
Broadcast packets            0                        [0]
Multicast packets            0                        [0]
Oversized frames             0                        [0]
Packet reject count          0                        [0]
DA rejects                   0                        [0]
SA rejects                   0                        [0]
Output MAC/Filter Statistics:
Unicast packets              0                        [0]
Broadcast packets            0                        [0]
Multicast packets            0                        [0]
Packet pad count             0                        [0]
Packet error count           0                        [0]

```

Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'

monitor interface (MX2010 Router with MPC6E and 100-Gigabit Ethernet OTN Interface)

```

user@host> monitor interface et-9/0/0
Interface: et-9/0/0, Enabled, Link is Up
Encapsulation: Ethernet, Speed: 100000mbps
Traffic statistics:
Input bytes:                0 (0 bps)                [0]
Output bytes:               0 (0 bps)                [0]
Input packets:              0 (0 pps)                [0]
Output packets:             0 (0 pps)                [0]
Error statistics:
Input errors:                0                        [0]
Input drops:                 0                        [0]
Input framing errors:        0                        [0]
Policed discards:            0                        [0]
L3 incompletes:              0                        [0]
L2 channel errors:           0                        [0]
L2 mismatch timeouts:        0                        [0]
Carrier transitions:          1                        [0]
Output errors:               0                        [0]
Output drops:                0                        [0]
Aged packets:                0                        [0]

```

Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'

monitor interface (MX2020 Router with MPC6E and 10-Gigabit Ethernet OTN Interface)

```

user@host> monitor interface xe-3/0/0
host name                               Seconds: 67                               Time: 23:46:46
                                          Delay: 0/0/13

Interface: xe-3/0/0, Enabled, Link is Up
Encapsulation: Ethernet, Speed: 10000Mbps
Traffic statistics:                               Current delta
  Input bytes:                                0 (0 bps)                [0]
  Output bytes:                               0 (0 bps)                [0]
  Input packets:                              0 (0 pps)                [0]
  Output packets:                             0 (0 pps)                [0]
Error statistics:
  Input errors:                               0                        [0]
  Input drops:                                0                        [0]
  Input framing errors:                       0                        [0]
  Policed discards:                           0                        [0]
  L3 incompletes:                             0                        [0]
  L2 channel errors:                          0                        [0]
  L2 mismatch timeouts:                       0                        [0]
  Carrier transitions:                         3                        [0]
  Output errors:                              0                        [0]
  Output drops:                               0                        [0]
  Aged packets:                               0                        [0]
OTN Link 0
OTN Alarms:
OTN Defects:
OTN OC - Seconds
  LOS                                         0                        [0]
  LOF                                         0                        [0]
OTN OTU - FEC Statistics
  Corr err ratio                             N/A
  Corr bytes                                 0                        [0]
  Uncorr words                               0                        [0]
OTN OTU - Counters
  BIP                                         0                        [0]
  BBE                                         0                        [0]
  ES                                          0                        [0]
  SES                                         0                        [0]
  UAS                                         0                        [0]
OTN ODU - Counters
  BIP                                         0                        [0]
  BBE                                         0                        [0]
  ES                                          0                        [0]
  SES                                         0                        [0]
  UAS                                         0                        [0]
OTN ODU - Received Overhead
  APSPCC 0-3:                               00 00 00 00

```

Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'

monitor interface (Logical)

```

user@host> monitor interface so-1/0/0.0

```

```

host name                Seconds: 16                Time: 15:33:39
                                           Delay: 0/0/1

Interface: so-1/0/0.0, Enabled, Link is Down
Flags: Hardware-Down Point-To-Point SNMP-Traps
Encapsulation: PPP
Local statistics:
  Input bytes:            0                        [0]
  Output bytes:           0                        [0]
  Input packets:          0                        [0]
  Output packets:         0                        [0]
Remote statistics:
  Input bytes:            0 (0 bps)                [0]
  Output bytes:           0 (0 bps)                [0]
  Input packets:          0 (0 pps)                [0]
  Output packets:         0 (0 pps)                [0]
Traffic statistics:
  Destination address: 192.168.8.193, Local: 192.168.8.21

Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'

```

monitor interface (QFX3500 Switch)

```

user@switch> monitor interface ge-0/0/0
Interface: ge-0/0/0, Enabled, Link is Down
Encapsulation: Ethernet, Speed: Unspecified
Traffic statistics:
  Input bytes:            0 (0 bps)                [0]
  Output bytes:           0 (0 bps)                [0]
  Input packets:          0 (0 pps)                [0]
  Output packets:         0 (0 pps)                [0]
Error statistics:
  Input errors:           0                        [0]
  Input drops:            0                        [0]
  Input framing errors:   0                        [0]
  Policed discards:      0                        [0]
  L3 incompletes:         0                        [0]
  L2 channel errors:     0                        [0]
  L2 mismatch timeouts:  0                        [0]
  Carrier transitions:    0                        [0]
  Output errors:          0                        [0]
  Output drops:           0                        [0]
  Aged packets:           0                        [0]
Active alarms : LINK
Active defects: LINK
Input MAC/Filter statistics:
  Unicast packets         0                        [0]
  Broadcast packets       0 Multicast packet      [0]

Interface warnings:
  o Outstanding LINK alarm

```

monitor interface traffic

```

user@host> monitor interface traffic
host name                Seconds: 15                Time: 12:31:09

Interface  Link  Input packets  (pps)  Output packets  (pps)
so-1/0/0   Down    0              (0)      0              (0)
so-1/1/0   Down    0              (0)      0              (0)
so-1/1/1   Down    0              (0)      0              (0)
so-1/1/2   Down    0              (0)      0              (0)

```

so-1/1/3	Down	0	(0)	0	(0)
t3-1/2/0	Down	0	(0)	0	(0)
t3-1/2/1	Down	0	(0)	0	(0)
t3-1/2/2	Down	0	(0)	0	(0)
t3-1/2/3	Down	0	(0)	0	(0)
so-2/0/0	Up	211035	(1)	36778	(0)
so-2/0/1	Up	192753	(1)	36782	(0)
so-2/0/2	Up	211020	(1)	36779	(0)
so-2/0/3	Up	211029	(1)	36776	(0)
so-2/1/0	Up	189378	(1)	36349	(0)
so-2/1/1	Down	0	(0)	18747	(0)
so-2/1/2	Down	0	(0)	16078	(0)
so-2/1/3	Up	0	(0)	80338	(0)
at-2/3/0	Up	0	(0)	0	(0)
at-2/3/1	Down	0	(0)	0	(0)

Bytes=b, Clear=c, Delta=d, Packets=p, Quit=q or ESC, Rate=r, Up=^U, Down=^D

monitor interface traffic (QFX3500 Switch)

```
user@switch> monitor interface traffic
switch                                     Seconds: 7                               Time: 16:04:37
```

Interface	Link	Input packets	(pps)	Output packets	(pps)
ge-0/0/0	Down	0	(0)	0	(0)
ge-0/0/1	Up	392187	(0)	392170	(0)
ge-0/0/2	Down	0	(0)	0	(0)
ge-0/0/3	Down	0	(0)	0	(0)
ge-0/0/4	Down	0	(0)	0	(0)
ge-0/0/5	Down	0	(0)	0	(0)
ge-0/0/6	Down	0	(0)	0	(0)
ge-0/0/7	Down	0	(0)	0	(0)
ge-0/0/8	Down	0	(0)	0	(0)
ge-0/0/9	Up	392184	(0)	392171	(0)
ge-0/0/10	Down	0	(0)	0	(0)
ge-0/0/11	Down	0	(0)	0	(0)
ge-0/0/12	Down	0	(0)	0	(0)
ge-0/0/13	Down	0	(0)	0	(0)
ge-0/0/14	Down	0	(0)	0	(0)
ge-0/0/15	Down	0	(0)	0	(0)
ge-0/0/16	Down	0	(0)	0	(0)
ge-0/0/17	Down	0	(0)	0	(0)
ge-0/0/18	Down	0	(0)	0	(0)
ge-0/0/19	Down	0	(0)	0	(0)
ge-0/0/20	Down	0	(0)	0	(0)
ge-0/0/21	Down	0	(0)	0	(0)
ge-0/0/22	Up	392172	(0)	392187	(0)
ge-0/0/23	Up	392185	(0)	392173	(0)
vcp-0	Down	0		0	
vcp-1	Down	0		0	
ae0	Down	0	(0)	0	(0)
bme0	Up	0		1568706	

monitor interface traffic detail (QFX3500 Switch)

```
user@switch> monitor interface traffic detail
switch                                     Seconds: 74                               Time: 16:03:02
```

Interface Description	Link	Input packets	(pps)	Output packets	(pps)
--------------------------	------	---------------	-------	----------------	-------

ge-0/0/0	Down	0	(0)	0	(0)
ge-0/0/1	Up	392183	(0)	392166	(0)
ge-0/0/2	Down	0	(0)	0	(0)
ge-0/0/3	Down	0	(0)	0	(0)
ge-0/0/4	Down	0	(0)	0	(0)
ge-0/0/5	Down	0	(0)	0	(0)
ge-0/0/6	Down	0	(0)	0	(0)
ge-0/0/7	Down	0	(0)	0	(0)
ge-0/0/8	Down	0	(0)	0	(0)
ge-0/0/9	Up	392181	(0)	392168	(0)
ge-0/0/10	Down	0	(0)	0	(0)
ge-0/0/11	Down	0	(0)	0	(0)
ge-0/0/12	Down	0	(0)	0	(0)
ge-0/0/13	Down	0	(0)	0	(0)
ge-0/0/14	Down	0	(0)	0	(0)
ge-0/0/15	Down	0	(0)	0	(0)
ge-0/0/16	Down	0	(0)	0	(0)
ge-0/0/17	Down	0	(0)	0	(0)
ge-0/0/18	Down	0	(0)	0	(0)
ge-0/0/19	Down	0	(0)	0	(0)
ge-0/0/20	Down	0	(0)	0	(0)
ge-0/0/21	Down	0	(0)	0	(0)
ge-0/0/22	Up	392169	(0)	392184	(1)
ge-0/0/23	Up	392182	(0)	392170	(0)
vcp-0	Down	0		0	
vcp-1	Down	0		0	
ae0	Down	0	(0)	0	(0)
bme0	Up	0		1568693	

monitor start

Syntax	<code>monitor start <i>filename</i></code>
Release Information	Command introduced before Junos OS Release 7.4. Command introduced in Junos OS Release 9.0 for EX Series switches.
Description	Start displaying the system log or trace file and additional entries being added to those files.
Options	<i>filename</i> —Specific log or trace file.
Additional Information	Log files are generated by the routing protocol process or by system logging. The log files generated by system logging are configured with the syslog statement at the [edit system] hierarchy level and the options statement at the [edit routing-options] hierarchy level. The trace files generated by the routing protocol process are configured with traceoptions statements at the [edit routing-options] , [edit interfaces] , and [edit protocols protocol] hierarchy levels.



NOTE: To monitor a log file within a logical system, issue the `monitor start logical-system-name/filename` command.

Required Privilege Level	trace
Related Documentation	<ul style="list-style-type: none"> monitor list monitor stop on page 74
List of Sample Output	monitor start on page 73
Output Fields	Table 7 on page 72 describes the output fields for the monitor start command. Output fields are listed in the approximate order in which they appear.

Table 7: monitor start Output Fields

Field Name	Field Description
<i>filename</i>	Name of the file from which entries are being displayed. This line is displayed initially and when the command switches between log files.
<i>Date and time</i>	Timestamp for the log entry.

Sample Output

monitor start

```
user@host> monitor start system-log
*** system-log***
Jul 20 15:07:34 hang sshd[5845]: log: Generating 768 bit RSA key.
Jul 20 15:07:35 hang sshd[5845]: log: RSA key generation complete.
Jul 20 15:07:35 hang sshd[5845]: log: Connection from 204.69.248.180 port 912
Jul 20 15:07:37 hang sshd[5845]: log: RSA authentication for root accepted.
Jul 20 15:07:37 hang sshd[5845]: log: ROOT LOGIN as 'root' from trip.jcmax.com
Jul 20 15:07:37 hang sshd[5845]: log: Closing connection to 204.69.248.180
```

monitor stop

Syntax	<code>monitor stop <i>filename</i></code>
Release Information	Command introduced before Junos OS Release 7.4. Command introduced in Junos OS Release 9.0 for EX Series switches.
Description	Stop displaying the system log or trace file.
Options	<i>filename</i> —Specific log or trace file.
Additional Information	Log files are generated by the routing protocol process or by system logging. The log files generated by system logging are those configured with the syslog statement at the [edit system] hierarchy level and the options statement at the [edit routing-options] hierarchy level. The trace files generated by the routing protocol process are those configured with traceoptions statements at the [edit routing-options] , [edit interfaces] , and [edit protocols <i>protocol</i>] hierarchy levels.
Required Privilege Level	trace
Related Documentation	<ul style="list-style-type: none">• <i>monitor list</i>• monitor start on page 72
List of Sample Output	monitor stop on page 74
Output Fields	This command produces no output.

Sample Output

monitor stop

```
user@host> monitor stop
```


ping

List of Syntax [Syntax on page 75](#)
[Syntax \(QFX Series\) on page 75](#)

Syntax `ping host`
`<bypass-routing>`
`<count requests>`
`<detail>`
`<do-not-fragment>`
`<inet | inet6>`
`<interface source-interface>`
`<interval seconds>`
`<logical-system logical-system-name>`
`<loose-source value>`
`<mac-address mac-address>`
`<no-resolve>`
`<pattern string>`
`<rapid>`
`<record-route>`
`<routing-instance routing-instance-name>`
`<size bytes>`
`<source source-address>`
`<strict >`
`<strict-source value.>`
`<tos type-of-service>`
`<ttl value>`
`<verbose>`
`<vpls instance-name>`
`<wait seconds>`

Syntax (QFX Series) `ping host`
`<bypass-routing>`
`<count requests>`
`<detail>`
`<do-not-fragment>`
`<inet>`
`<interface source-interface>`
`<interval seconds>`
`<logical-system logical-system-name>`
`<loose-source value>`
`<mac-address mac-address>`
`<no-resolve>`
`<pattern string>`
`<rapid>`
`<record-route>`
`<routing-instance routing-instance-name>`
`<size bytes>`
`<source source-address>`
`<strict>`
`< strict-source value>`
`<tos type-of-service>`
`<ttl value>`
`<verbose>`

<wait *seconds*>

Release Information	Command introduced before Junos OS Release 7.4. Command introduced in Junos OS Release 9.0 for EX Series switches. Command introduced in Junos OS Release 11.1 for the QFX Series. Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.
Description	Check host reachability and network connectivity. The ping command sends Internet Control Message Protocol (ICMP) ECHO_REQUEST messages to elicit ICMP ECHO_RESPONSE messages from the specified host. Press Ctrl+c to interrupt a ping command.
Options	<p>host—IP address or hostname of the remote system to ping.</p> <p>bypass-routing—(Optional) Bypass the normal routing tables and send ping requests directly to a system on an attached network. If the system is not on a directly attached network, an error is returned. Use this option to ping a local system through an interface that has no route through it.</p> <p>count <i>requests</i>—(Optional) Number of ping requests to send. The range of values is 1 through 2,000,000,000. The default value is an unlimited number of requests.</p> <p>detail—(Optional) Include in the output the interface on which the ping reply was received.</p> <p>do-not-fragment—(Optional) Set the do-not-fragment (DF) flag in the IP header of the ping packets. For IPv6 packets, this option disables fragmentation.</p> <div><div></div><div><p>NOTE: In Junos OS Release 11.1 and later, when issuing the ping command for an IPv6 route with the do-not-fragment option, the maximum ping packet size is calculated by subtracting 48 bytes (40 bytes for the IPV6 header and 8 bytes for the ICMP header) from the MTU. Therefore, if the ping packet size (including the 48-byte header) is greater than the MTU, the ping operation might fail.</p></div></div>
	<p>inet—(Optional) Ping Packet Forwarding Engine IPv4 routes.</p> <p>inet6—(Optional) Ping Packet Forwarding Engine IPv6 routes.</p> <p>interface <i>source-interface</i>—(Optional) Interface to use to send the ping requests.</p> <p>interval <i>seconds</i>—(Optional) How often to send ping requests. The range of values, in seconds, is 1 through infinity. The default value is 1.</p> <p>logical-system <i>logical-system-name</i>—(Optional) Name of logical system from which to send the ping requests.</p> <p>Alternatively, enter the set cli logical-system <i>logical-system-name</i> command and then run the ping command. To return to the main router or switch, enter the clear cli logical-system command.</p>

loose-source *value*—(Optional) Intermediate loose source route entry (IPv4). Open a set of values.

mac-address *mac-address*—(Optional) Ping the physical or hardware address of the remote system you are trying to reach.

no-resolve—(Optional) Do not attempt to determine the hostname that corresponds to the IP address.

pattern *string*—(Optional) Specify a hexadecimal fill pattern to include in the ping packet.

rapid—(Optional) Send ping requests rapidly. The results are reported in a single message, not in individual messages for each ping request. By default, five ping requests are sent before the results are reported. To change the number of requests, include the **count** option.

record-route—(Optional) Record and report the packet's path (IPv4).

routing-instance *routing-instance-name*—(Optional) Name of the routing instance for the ping attempt.

size *bytes*—(Optional) Size of ping request packets. The range of values, in bytes, is **0** through **65,468**. The default value is **56**, which is effectively 64 bytes because 8 bytes of ICMP header data are added to the packet.

source *source-address*—(Optional) IP address of the outgoing interface. This address is sent in the IP source address field of the ping request. If this option is not specified, the default address is usually the loopback interface (**lo.0**).

strict—(Optional) Use the strict source route option (IPv4).

strict-source *value*—(Optional) Intermediate strict source route entry (IPv4). Open a set of values.

tos *type-of-service*—(Optional) Set the type-of-service (ToS) field in the IP header of the ping packets. The range of values is **0** through **255**.

If the device configuration includes the **dscp-code-point *value*** statement at the **[edit class-of-service host-outbound-traffic]** hierarchy level, the configured DSCP value overrides the value specified in this command option. In this case, the ToS field of ICMP echo request packets sent on behalf of this command carries the DSCP value specified in the **dscp-code-point** configuration statement instead of the value you specify in this command option.

ttl *value*—(Optional) Time-to-live (TTL) value to include in the ping request (IPv6). The range of values is **0** through **255**.

verbose—(Optional) Display detailed output.

vpls *instance-name*—(Optional) Ping the instance to which this VPLS belongs.

wait *seconds*—(Optional) Maximum wait time, in seconds, after the final packet is sent. If this option is not specified, the default delay is **10** seconds. If this option is used without the count option, a default count of **5** packets is used.

Required Privilege Level	network
Related Documentation	<ul style="list-style-type: none">• <i>Configuring Junos OS ICMPv4 Rate Limit for ICMPv4 Routing Engine Messages</i>
List of Sample Output	ping hostname on page 78 ping hostname rapid on page 78 ping hostname size count on page 78
Output Fields	When you enter this command, you are provided feedback on the status of your request. An exclamation point (!) indicates that an echo reply was received. A period (.) indicates that an echo reply was not received within the timeout period. An x indicates that an echo reply was received with an error code. These packets are not counted in the received packets count. They are accounted for separately.

Sample Output

ping hostname

```
user@host> ping skye
PING skye.net (192.168.169.254): 56 data bytes
64 bytes from 192.168.169.254: icmp_seq=0 ttl=253 time=1.028 ms
64 bytes from 192.168.169.254: icmp_seq=1 ttl=253 time=1.053 ms
64 bytes from 192.168.169.254: icmp_seq=2 ttl=253 time=1.025 ms
64 bytes from 192.168.169.254: icmp_seq=3 ttl=253 time=1.098 ms
64 bytes from 192.168.169.254: icmp_seq=4 ttl=253 time=1.032 ms
64 bytes from 192.168.169.254: icmp_seq=5 ttl=253 time=1.044 ms
^C [abort]
```

ping hostname rapid

```
user@host> ping skye rapid
PING skye.net (192.168.169.254): 56 data bytes
!!!!
--- skye.net ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.956/0.974/1.025/0.026 ms
```

ping hostname size count

```
user@host> ping skye size 200 count 5
PING skye.net (192.168.169.254): 200 data bytes
208 bytes from 192.168.169.254: icmp_seq=0 ttl=253 time=1.759 ms
208 bytes from 192.168.169.254: icmp_seq=1 ttl=253 time=2.075 ms
208 bytes from 192.168.169.254: icmp_seq=2 ttl=253 time=1.843 ms
208 bytes from 192.168.169.254: icmp_seq=3 ttl=253 time=1.803 ms
208 bytes from 192.168.169.254: icmp_seq=4 ttl=253 time=17.898 ms

--- skye.net ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 1.759/5.075/17.898 ms
```

show log

List of Syntax	Syntax on page 79 Syntax (QFX Series and OCX Series) on page 79 Syntax (TX Matrix Routers) on page 79
Syntax	<pre>show log <filename user <username>></pre>
Syntax (QFX Series and OCX Series)	<pre>show log filename <device-type (device-id device-alias)></pre>
Syntax (TX Matrix Routers)	<pre>show log <all-lcc lcc number scc> <filename user <username>></pre>
Release Information	<p>Command introduced before Junos OS Release 7.4.</p> <p>Command introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Command introduced in Junos OS Release 11.1 for the QFX Series.</p> <p>Option <i>device-type (device-id device-alias)</i> is introduced in Junos OS Release 13.1 for the QFX Series.</p> <p>Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
Description	List log files, display log file contents, or display information about users who have logged in to the router or switch.



NOTE: On MX Series routers, modifying a configuration to replace a service interface with another service interface is treated as a catastrophic event. When you modify a configuration, the entire configuration associated with the service interface—including NAT pools, rules, and service sets—is deleted and then re-created for the newly specified service interface. If there are active sessions associated with the service interface that is being replaced, these sessions are deleted and the NAT pools are then released, which leads to the generation of the NAT_POOL_RELEASE system log messages. However, because NAT pools are already deleted as a result of the catastrophic configuration change and no longer exist, the NAT_POOL_RELEASE system log messages are not generated for the changed configuration.

Options none—List all log files.

<all-lcc | lcc number | scc>—(TX Matrix routers only) (Optional) Display logging information about all T640 routers (or line-card chassis) or a specific T640 router (replace *number* with a value from 0 through 3) connected to a TX Matrix router. Or, display logging information about the TX Matrix router (or switch-card chassis).

device-type—(QFabric system only) (Optional) Display log messages for only one of the following device types:

- **director-device**—Display logs for Director devices.
- **infrastructure-device**—Display logs for the logical components of the QFabric system infrastructure, including the diagnostic Routing Engine, fabric control Routing Engine, fabric manager Routing Engine, and the default network Node group and its backup (NW-NG-0 and NW-NG-0-backup).
- **interconnect-device**—Display logs for Interconnect devices.
- **node-device**—Display logs for Node devices.



NOTE: If you specify the **device-type** optional parameter, you must also specify either the **device-id** or **device-alias** optional parameter.

(device-id | device-alias)—If a device type is specified, display logs for a device of that type. Specify either the device ID or the device alias (if configured).

filename—(Optional) Display the log messages in the specified log file. For the routing matrix, the filename must include the chassis information.



NOTE: The **filename** parameter is mandatory for the QFabric system. If you did not configure a syslog filename, specify the default filename of messages.

user <username>—(Optional) Display logging information about users who have recently logged in to the router or switch. If you include **username**, display logging information about the specified user.

Required Privilege Level trace

List of Sample Output [show log on page 80](#)
[show log filename on page 81](#)
[show log filename \(QFabric System\) on page 81](#)
[show log user on page 82](#)

Sample Output

[show log](#)

```
user@host> show log
total 57518
-rw-r--r-- 1 root bin      211663 Oct  1 19:44 dcd
-rw-r--r-- 1 root bin      999947 Oct  1 19:41 dcd.0
-rw-r--r-- 1 root bin      999994 Oct  1 17:48 dcd.1
-rw-r--r-- 1 root bin      238815 Oct  1 19:44 rpd
-rw-r--r-- 1 root bin     1049098 Oct  1 18:00 rpd.0
-rw-r--r-- 1 root bin     1061095 Oct  1 12:13 rpd.1
-rw-r--r-- 1 root bin     1052026 Oct  1 06:08 rpd.2
-rw-r--r-- 1 root bin     1056309 Sep 30 18:21 rpd.3
```

```
-rw-r--r-- 1 root bin 1056371 Sep 30 14:36 rpd.4
-rw-r--r-- 1 root bin 1056301 Sep 30 10:50 rpd.5
-rw-r--r-- 1 root bin 1056350 Sep 30 07:04 rpd.6
-rw-r--r-- 1 root bin 1048876 Sep 30 03:21 rpd.7
-rw-rw-r-- 1 root bin 19656 Oct 1 19:37 wtmp
```

show log filename

```
user@host> show log rpd
Oct 1 18:00:18 trace_on: Tracing to ?/var/log/rpd? started
Oct 1 18:00:18 EVENT <MTU> ds-5/2/0.0 index 24 <Broadcast PointToPoint Multicast
Oct 1 18:00:18
Oct 1 18:00:19 KRT recv len 56 V9 seq 148 op add Type route/if af 2 addr
13.13.13.21 nhop type local nhop 13.13.13.21
Oct 1 18:00:19 KRT recv len 56 V9 seq 149 op add Type route/if af 2 addr
13.13.13.22 nhop type unicast nhop 13.13.13.22
Oct 1 18:00:19 KRT recv len 48 V9 seq 150 op add Type ifaddr index 24 devindex
43
Oct 1 18:00:19 KRT recv len 144 V9 seq 151 op chnge Type ifdev devindex 44
Oct 1 18:00:19 KRT recv len 144 V9 seq 152 op chnge Type ifdev devindex 45
Oct 1 18:00:19 KRT recv len 144 V9 seq 153 op chnge Type ifdev devindex 46
Oct 1 18:00:19 KRT recv len 1272 V9 seq 154 op chnge Type ifdev devindex 47
...
```

show log filename (QFabric System)

```
user@qfabric> show log messages
Mar 28 18:00:06 qfabric chassisd: QFABRIC_INTERNAL_SYSLOG: Mar 28 18:00:06 ED1486
chassisd: CHASSISD_SNMP_TRAP10: SNMP trap generated: FRU power on
(jnxFruContentsIndex 8, jnxFruL1Index 1, jnxFruL2Index 1, jnxFruL3Index 0,
jnxFruName PIC: 48x 10G-SFP+ @ 0/0/*, jnxFruType 11, jnxFruSlot 0,
jnxFruOfflineReason 2, jnxFruLastPowerOff 0, jnxFruLastPowerOn 2159)
Mar 28 18:00:07 qfabric chassisd: QFABRIC_INTERNAL_SYSLOG: Mar 28 18:00:07 ED1486
chassisd: CHASSISD_SNMP_TRAP10: SNMP trap generated: FRU power on
(jnxFruContentsIndex 8, jnxFruL1Index 1, jnxFruL2Index 2, jnxFruL3Index 0,
jnxFruName PIC: @ 0/1/*, jnxFruType 11, jnxFruSlot 0, jnxFruOfflineReason 2,
jnxFruLastPowerOff 0, jnxFruLastPowerOn 2191)
Mar 28 18:00:07 qfabric chassisd: QFABRIC_INTERNAL_SYSLOG: Mar 28 18:00:07 ED1492
chassisd: CHASSISD_SNMP_TRAP10: SNMP trap generated: FRU power on
(jnxFruContentsIndex 8, jnxFruL1Index 1, jnxFruL2Index 1, jnxFruL3Index 0,
jnxFruName PIC: 48x 10G-SFP+ @ 0/0/*, jnxFruType 11, jnxFruSlot 0,
jnxFruOfflineReason 2, jnxFruLastPowerOff 0, jnxFruLastPowerOn 242726)
Mar 28 18:00:07 qfabric chassisd: QFABRIC_INTERNAL_SYSLOG: Mar 28 18:00:07 ED1492
chassisd: CHASSISD_SNMP_TRAP10: SNMP trap generated: FRU power on
(jnxFruContentsIndex 8, jnxFruL1Index 1, jnxFruL2Index 2, jnxFruL3Index 0,
jnxFruName PIC: @ 0/1/*, jnxFruType 11, jnxFruSlot 0, jnxFruOfflineReason 2,
jnxFruLastPowerOff 0, jnxFruLastPowerOn 242757)
Mar 28 18:00:16 qfabric file: QFABRIC_INTERNAL_SYSLOG: Mar 28 18:00:16 ED1486
file: UI_COMMIT: User 'root' requested 'commit' operation (comment: none)
Mar 28 18:00:27 qfabric file: QFABRIC_INTERNAL_SYSLOG: Mar 28 18:00:27 ED1486
file: UI_COMMIT: User 'root' requested 'commit' operation (comment: none)
Mar 28 18:00:50 qfabric file: QFABRIC_INTERNAL_SYSLOG: Mar 28 18:00:50
_DCF_default__NW-INE-0_RE0_ file: UI_COMMIT: User 'root' requested 'commit'
operation (comment: none)
Mar 28 18:00:50 qfabric file: QFABRIC_INTERNAL_SYSLOG: Mar 28 18:00:50
_DCF_default__NW-INE-0_RE0_ file: UI_COMMIT: User 'root' requested 'commit'
operation (comment: none)
Mar 28 18:00:55 qfabric file: QFABRIC_INTERNAL_SYSLOG: Mar 28 18:00:55 ED1492
file: UI_COMMIT: User 'root' requested 'commit' operation (comment: none)
Mar 28 18:01:10 qfabric file: QFABRIC_INTERNAL_SYSLOG: Mar 28 18:01:10 ED1492
file: UI_COMMIT: User 'root' requested 'commit' operation (comment: none)
```

```
Mar 28 18:02:37 qfabric chassisd: QFABRIC_INTERNAL_SYSLOG: Mar 28 18:02:37 ED1491
chassisd: CHASSISD_SNMP_TRAP10: SNMP trap generated: FRU power on
(jnxFruContentsIndex 8, jnxFruL1Index 1, jnxFruL2Index 1, jnxFruL3Index 0,
jnxFruName PIC: 48x 10G-SFP+ @ 0/0/*, jnxFruType 11, jnxFruSlot 0,
jnxFruOfflineReason 2, jnxFruLastPowerOff 0, jnxFruLastPowerOn 33809)
```

show log user

```
user@host> show log user
darius  mg2546                Thu Oct  1 19:37   still logged in
darius  mg2529                Thu Oct  1 19:08 - 19:36 (00:28)
darius  mg2518                Thu Oct  1 18:53 - 18:58 (00:04)
root    mg1575                Wed Sep 30 18:39 - 18:41 (00:02)
root    ttyp2      jun.site.per Wed Sep 30 18:39 - 18:41 (00:02)
alex    ttyp1      192.168.1.2 Wed Sep 30 01:03 - 01:22 (00:19)
```

traceroute

List of Syntax [Syntax on page 83](#)
 [Syntax \(QFX Series and OCX Series\) on page 83](#)

Syntax `traceroute host`
 `<as-number-lookup>`
 `<bypass-routing>`
 `<clns>`
 `<gateway address>`
 `<inet | inet6>`
 `<interface interface-name>`
 `<logical system logical-system-name>`
 `<monitor host>`
 `<mpls (ldp FEC address | rsvp label-switched-path-name)>`
 `<no-resolve>`
 `<propagate-ttl>`
 `<routing-instance routing-instance-name>`
 `<source source-address>`
 `<tos value>`
 `<ttl value>`
 `<wait seconds>`

Syntax (QFX Series and OCX Series) `traceroute host`
 `<as-number-lookup>`
 `<bypass-routing>`
 `<gateway address>`
 `<inet>`
 `<inet6>`
 `<interface interface-name>`
 `<monitor host>`
 `<no-resolve>`
 `<routing-instance routing-instance-name>`
 `<source source-address>`
 `<tos value>`
 `<ttl value>`
 `<wait seconds>`

Release Information Command introduced before Junos OS Release 7.4.
 Command introduced in Junos OS Release 9.0 for EX Series switches.
 mpls option introduced in Junos OS Release 9.2.
 Command introduced in Junos OS Release 11.1 for the QFX Series.
 propagate-ttl option introduced in Junos OS Release 12.1.
 Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description Display the route that packets take to a specified network host. Use **traceroute** as a debugging tool to locate points of failure in a network.

Options **host**—IP address or name of remote host.

as-number-lookup—(Optional) Display the autonomous system (AS) number of each intermediate hop on the path from the host to the destination.

bypass-routing—(Optional) Bypass the normal routing tables and send requests directly to a system on an attached network. If the system is not on a directly attached network, an error is returned. Use this option to display a route to a local system through an interface that has no route through it.

clns—(Optional) Trace the route belonging to the Connectionless Network Service (CLNS).

gateway address—(Optional) Address of a router or switch through which the route transits.

inet | inet6—(Optional) Trace the route belonging to IPv4 or IPv6, respectively.

interface *interface-name*—(Optional) Name of the interface over which to send packets.

logical-system *logical-system-name*—(Optional) Perform this operation on all logical systems or on a particular logical system.

monitor *host*—(Optional) Display real-time monitoring information for the specified host.

mpls (*ldp FEC address* | *rsvp label-switched-path name*)—(Optional) See *traceroute mpls ldp* and *traceroute mpls rsvp*.

no-resolve—(Optional) Do not attempt to determine the hostname that corresponds to the IP address.

propagate-ttl—(Optional) On the PE routing device, use this option to view locally generated Routing Engine transit traffic. This is applicable for MPLS L3VPN traffic only.

Use for troubleshooting, when you want to view hop-by-hop information from the local provider router to the remote provider router, when TTL decrementing is disabled on the core network using the **no-propagate-ttl** configuration statement.



NOTE: Using **propagate-ttl** with **traceroute** on the CE router does not show hop-by-hop information.

routing-instance *routing-instance-name*—(Optional) Name of the routing instance for the traceroute attempt.

source *source-address*—(Optional) Source address of the outgoing traceroute packets.

tos *value*—(Optional) Value to include in the IP type-of-service (ToS) field. The range of values is 0 through 255.

ttl *value*—(Optional) Maximum time-to-live value to include in the traceroute request. The range of values is 0 through 128.

wait *seconds*—(Optional) Maximum time to wait for a response to the traceroute request.

**Required Privilege
Level** network

Related Documentation

- *traceroute monitor*

List of Sample Output

- [traceroute on page 85](#)
- [traceroute as-number-lookup host on page 85](#)
- [traceroute no-resolve on page 85](#)
- [traceroute propagate-ttl on page 86](#)
- [traceroute \(Between CE Routers, Layer 3 VPN\) on page 86](#)
- [traceroute \(Through an MPLS LSP\) on page 86](#)

Output Fields Table 8 on page 85 describes the output fields for the **traceroute** command. Output fields are listed in the approximate order in which they appear.

Table 8: traceroute Output Fields

Field Name	Field Description
traceroute to	IP address of the receiver.
hops max	Maximum number of hops allowed.
byte packets	Size of packets being sent.
<i>number-of-hops</i>	Number of hops from the source to the named router or switch.
<i>router-name</i>	Name of the router or switch for this hop.
<i>address</i>	Address of the router or switch for this hop.
Round trip time	Average round-trip time, in milliseconds (ms).

Sample Output

traceroute

```
user@host> traceroute santacruz
traceroute to green.company.net (10.156.169.254), 30 hops max, 40 byte packets
 1 blue23 (10.168.1.254)  2.370 ms  2.853 ms  0.367 ms
 2 red14 (10.168.255.250) 0.778 ms  2.937 ms  0.446 ms
 3 yellow (10.156.169.254) 7.737 ms  89.905 ms  0.834 ms
```

traceroute as-number-lookup host

```
user@host> traceroute as-number-lookup 10.100.1.1
traceroute to 10.100.1.1 (10.100.1.1), 30 hops max, 40 byte packets
 1 10.39.1.1 (10.39.1.1) 0.779 ms 0.728 ms 0.562 ms
 2 10.39.1.6 (10.39.1.6) [AS 32] 0.657 ms 0.611 ms 0.617 ms
 3 10.100.1.1 (10.100.1.1) [AS 10, 40, 50] 0.880 ms 0.808 ms 0.774 ms
```

traceroute no-resolve

```
user@host> traceroute santacruz no-resolve
```

```
traceroute to green.company.net (10.156.169.254), 30 hops max, 40 byte packets
 1  10.168.1.254  0.458 ms  0.370 ms  0.365 ms
 2  10.168.255.250  0.474 ms  0.450 ms  0.444 ms
 3  10.156.169.254  0.931 ms  0.876 ms  0.862 ms
```

traceroute propagate-ttl

```
user@host> traceroute propagate-ttl 100.200.2.2 routing-instance VPN-A
traceroute to 100.200.2.2 (100.200.2.2) from 1.1.0.2, 30 hops max, 40 byte packets

 1  1.2.0.2 (1.2.0.2)  2.456 ms  1.753 ms  1.672 ms
    MPLS Label=299776 CoS=0 TTL=1 S=0
    MPLS Label=299792 CoS=0 TTL=1 S=1
 2  1.3.0.2 (1.3.0.2)  1.213 ms  1.225 ms  1.166 ms
    MPLS Label=299792 CoS=0 TTL=1 S=1
 3  100.200.2.2 (100.200.2.2)  1.422 ms  1.521 ms  1.443 ms
```

traceroute (Between CE Routers, Layer 3 VPN)

```
user@host> traceroute vpn09
traceroute to vpn09.skybank.net (10.255.14.179), 30 hops max, 40
byte packets
 1  10.39.10.21 (10.39.10.21)  0.598 ms  0.500 ms  0.461 ms
 2  10.39.1.13 (10.39.1.13)  0.796 ms  0.775 ms  0.806 ms
    MPLS Label=100006 CoS=0 TTL=1 S=1
 3  vpn09.skybank.net (10.255.14.179)  0.783 ms  0.716 ms  0.686
```

traceroute (Through an MPLS LSP)

```
user@host> traceroute mpls1
traceroute to 10.168.1.224 (10.168.1.224), 30 hops max, 40 byte packets
 1  mpls1-sr0.company.net (10.168.200.101)  0.555 ms  0.393 ms  0.367 ms
    MPLS Label=1024 CoS=0 TTL=1
 2  mpls5-lo0.company.net (10.168.1.224)  0.420 ms  0.394 ms  0.401 ms
```

CHAPTER 8

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