ipinfusion™

DANOS-Vyatta edition

Disaggregated Network Operating System Version 2009a

Basic Routing Configuration Guide

October 2020

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Chapter 1. Copyright Statement

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Chapter 2. Preface

Document conventions

The document conventions describe text formatting conventions, command syntax conventions, and important notice formats used in this document.

Notes, cautions, and warnings

Notes, cautions, and warning statements may be used in this document. They are listed in the order of increasing severity of potential

hazards.

Note: A Note provides a tip, guidance, or advice, emphasizes important information, or provides a reference to related information.

Attention: An Attention statement indicates a stronger note, for example, to alert you when traffic might be interrupted or the device might reboot.

CAUTION: A Caution statement alerts you to situations that can be potentially hazardous to you or cause damage to hardware, firmware, software, or data.

DANGER: A Danger statement indicates conditions or situations that can be potentially lethal or extremely hazardous to you. Safety labels are also attached directly to products to warn of these conditions or situations.

Text formatting conventions

Text formatting conventions such as boldface, italic, or Courier font are used to highlight specific words or phrases.

Format	Description
bold text	Identifies command names. Identifies keywords and operands.
italic text	Identifies emphasis. Identifies variables. Identifies document titles.
`Courier font`	Identifies CLI output. Identifies command syntax examples.

Command syntax conventions

Bold and italic text identify command syntax components. Delimiters and operators define groupings of parameters and their logical relationships.

Convention	Description
bold text	Identifies command names, keywords, and command options.
italic text	Identifies a variable.
[ ]	Syntax components displayed within square brackets are optional. Default responses to system prompts are enclosed in square brackets.
{ **x** | **y** | **z** }	A choice of required parameters is enclosed in curly brackets separated by vertical bars. You must select one of the options.
x | **y**	A vertical bar separates mutually exclusive elements.
< >	Nonprinting characters, for example, passwords, are enclosed in angle brackets.
...	Repeat the previous element, for example, *member*[*member*...].
\	Indicates a “soft” line break in command examples. If a backslash separates two lines of a command input, enter the entire command at the prompt without the backslash.

Chapter 3. About This Guide

This guide describes how to configure forwarding and routing in DANOS-Vyatta edition.

Chapter 4. Forwarding and Routing Commands

clear ip prefix-list

Clears statistics for or the status of a prefix list.

```
clear ip prefix-list [ list-name [ ipv4net ] ]
```

Statistics for or the status of all prefix lists is cleared.

list-name

Optional. A prefix list.

ipv4net

Optional. A network.

Operational mode

Use this command to clear statistics for or the status of a prefix list.

clear ipv6 prefix-list

Clears statistics for or the status of an IPv6 prefix list.

```
clear ipv6 prefix-list [ list-name [ ipv6net ] ]
```

Statistics for or the status of all IPv6 prefix lists is cleared.

list-name

Optional. An IPv6 prefix list.

ipv6net

Optional. An IPv6 network.

Operational mode

Use this command to clear statistics for or the status of an IPv6 prefix list.

monitor command

Monitors a traceroute command.

```
monitor command traceroute-command
```

```
run monitor command traceroute-command
```

traceroute-command

The `traceroute` command to be monitored. The `traceroute` command must be enclosed in quotation marks.

Operational mode

Configuration mode

Use this command to display the output of a `traceroute` command. The display information is refreshed every two seconds.

Use the `run` form of this command in configuration mode.

ping

Sends Internet Control Message Protocol (ICMP) ECHO_REQUEST packets to a network host.

```
ping { ipv4_address | ipv6_address | hostname }
```

ipv4_address

Pings the IPv4 address of the host.

ipv6_address

Pings the IPv6 address of the host.

hostname

A host being pinged. This keyword is used when the host is specified as a host name rather than as an IP address.

Operational mode

The `ping` command tests whether a network host is reachable.

The `ping` command uses the ECHO_REQUEST datagram (ping) of the ICMP protocol to get an ICMP ECHO_RESPONSE from a host or gateway. ECHO_REQUEST datagrams have an IP and an ICMP header, followed by a *struct timeval* data type and then an arbitrary number of pad bytes that are used to fill the packet.

The host is specified either as host name (if DNS is being used on the network) or as an IPv4 or IPv6 address. If a host name is specified and neither the **ipv4** nor **ipv6** keyword is used, the IPv4 or IPv6 address associated with the host name is pinged, depending on which address is resolved first.

When using the `ping` command for fault isolation, enter the command on the local host to verify that the local network interface is up and running. Then, ping hosts and gateways farther away. Round-trip times and packet-loss statistics are computed.

If duplicate packets are received, they are not included in the packet-loss calculation, although the round-trip time of these packets is used in calculating the minimum, average, and maximum round-trip times.

When the `ping` command is interrupted by typing `<Ctrl>+c`, a brief statistical summary is displayed.

This example shows how to test whether the network host, www.google.com is reachable.

```
vyatta@vyatta:~$ ping www.google.com
PING www.google.com (216.58.196.100) 56(84) bytes of data.
64 bytes from maa03s19-in-f4.1e100.net (216.58.196.100): icmp_req=1 ttl=54
 time=42.3 ms
^C
--- www.google.com ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 42.364/42.364/42.364/0.000 ms
```

ping adaptive

Sets the interpacket interval adaptively such that the interpacket interval adjusts to round-trip time.

`ping { ipv4_address | ipv6_address | hostname } adaptive option`

ipv4_address

The IPv4 address of the host.

ipv6_address

The IPv6 address of the host.

hostname

A host being pinged. This keyword is used when the host is specified as a host name rather than as an IP address.

adaptive

Sets the interpacket interval adaptively such that the interpacket interval adjusts to round-trip time. The adaptive setting ensures that not more than one (or more, if preload is set) unanswered probes are present in the network.

option

Each of the following entries are considered options. These options can be issued consecutively, that is, in the same command line.

adaptive

Adaptively sets interpacket interval.

allow-broadcast

Allows you to ping broadcast address.

audible

Makes a beep sound on every ping, while the router pings for host details.

bypass-route

Bypasses normal routing tables during ping.

count

Specifies the number of ping requests to send.

deadline

Specifies the number of seconds before which ping expires.

ether-size

Matches the overall size of the data packet with the resultant size of the Layer 3 packet.

flood

Sends 100 ping requests each second.

interface

Specifies an interface that the device must use as the source address.

interval

Specifies the time in seconds for which the device must wait between ping requests.

mark

Specifies that the device must consider the ping request for special processing.

mtu-discovery

Specifies the path MTU discovery strategy.

no-loopback

Suppresses loop-back of multicast pings.

numeric

Does not resolve domain name system (DNS) names during ping.

pattern

Specifies the hexadecimal digit pattern to fill the packet.

quiet

Prints only the ping summary page.

record-route

Records the route that the packet takes.

size

Specifies the number of bytes to send for a ping request.

timestamp

Displays the timestamp during ping output.

tos

Marks packet with specified type of service (TOS).

ttl

Specifies the maximum packet life-time for a host.

verbose

Displays a detailed output for the ping command.

Operational mode

The `ping` command tests whether a network host is reachable.

The `ping` command uses the ECHO_REQUEST datagram (ping) of the ICMP protocol to get an ICMP ECHO_RESPONSE from a host or gateway. ECHO_REQUEST datagrams have an IP and an ICMP header, followed by a *struct timeval* data type and then an arbitrary number of pad bytes that are used to fill the packet.

The host is specified either as host name (if DNS is being used on the network) or as an IPv4 or IPv6 address. If a host name is specified and neither the **ipv4** nor **ipv6** keyword is used, the IPv4 or IPv6 address associated with the host name is pinged, depending on which address is resolved first.

When using the `ping` command for fault isolation, enter the command on the local host to verify that the local network interface is up and running. Then, ping hosts and gateways farther away. Round-trip times and packet-loss statistics are computed.

If duplicate packets are received, they are not included in the packet-loss calculation, although the round-trip time of these packets is used in calculating the minimum, average, and maximum round-trip times.

Note: The minimum interpacket interval is 200 ms for all users, except for a super-user.

When the `ping` command is interrupted by typing `<Ctrl>+c` , a brief statistical summary is displayed.

This example shows how to test whether the www.google.com network is reachable with an interpacket interval. The example also displays the time stamp in the ping output.

```
vyatta@vyatta:~$ ping www.google.com adaptive timestamp audible
PING www.google.com (216.58.216.164) 56(84) bytes of data.
[1428886179.416698] 64 bytes from sea15s02-in-f4.1e100.net
 (216.58.216.164): icmp_req=2 ttl=54 time=20.0 ms
[1428886179.457896] 64 bytes from sea15s02-in-f4.1e100.net
 (216.58.216.164): icmp_req=4 ttl=54 time=20.0 ms
[1428886179.499170] 64 bytes from sea15s02-in-f4.1e100.net
 (216.58.216.164): icmp_req=6 ttl=54 time=20.2 ms
[1428886179.539836] 64 bytes from sea15s02-in-f4.1e100.net
 (216.58.216.164): icmp_req=8 ttl=54 time=19.9 ms
[1428886179.580788] 64 bytes from sea15s02-in-f4.1e100.net
 (216.58.216.164): icmp_req=10 ttl=54 time=19.9 ms
[1428886179.621507] 64 bytes from sea15s02-in-f4.1e100.net
 (216.58.216.164): icmp_req=12 ttl=54 time=20.0 ms
[1428886179.662363] 64 bytes from sea15s02-in-f4.1e100.net
 (216.58.216.164): icmp_req=14 ttl=54 time=19.8 ms
[1428886179.703528] 64 bytes from sea15s02-in-f4.1e100.net
 (216.58.216.164): icmp_req=16 ttl=54 time=20.1 ms
[1428886179.744554] 64 bytes from sea15s02-in-f4.1e100.net
 (216.58.216.164): icmp_req=18 ttl=54 time=20.0 ms
```

```
[1428886179.785702] 64 bytes from sea15s02-in-f4.1e100.net
 (216.58.216.164): icmp_req=20 ttl=54 time=20.1 ms
[1428886179.826861] 64 bytes from sea15s02-in-f4.1e100.net
 (216.58.216.164): icmp_req=22 ttl=54 time=20.2 ms
[1428886181.384621] From 10.18.170.201 icmp_seq=1 Destination Host
 Unreachable
[1428886181.385770] From 10.18.170.201 icmp_seq=3 Destination Host
 Unreachable
[1428886181.386512] From 10.18.170.201 icmp_seq=5 Destination Host
 Unreachable
[1428886181.387046] From 10.18.170.201 icmp_seq=7 Destination Host
 Unreachable
[1428886181.387599] From 10.18.170.201 icmp_seq=9 Destination Host
 Unreachable
[1428886181.388177] From 10.18.170.201 icmp_seq=11 Destination Host
 Unreachable
[1428886181.388707] From 10.18.170.201 icmp_seq=13 Destination Host
 Unreachable
[1428886181.389269] From 10.18.170.201 icmp_seq=15 Destination Host
 Unreachable
[1428886181.389865] From 10.18.170.201 icmp_seq=17 Destination Host
 Unreachable
[1428886181.390681] From 10.18.170.201 icmp_seq=19 Destination Host
 Unreachable
[1428886181.391494] From 10.18.170.201 icmp_seq=21 Destination Host
 Unreachable
[216.164): icmp_req=165 ttl=54 time=20.4 ms
```

ping allow-broadcast

Allows the pinging of a broadcast address.

`ping { ipv4_address | ipv6_address | hostname } allow-broadcast option`

ipv4_address

The IPv4 address of the host.

ipv6_address

The IPv6 address of the host.

hostname

A host being pinged. This keyword is used when the host is specified as a host name rather than as an IP address.

allow-broadcast

Allows pinging a broadcast address.

option

Each of the following entries are considered options. These options can be issued consecutively, that is, in the same command line.

adaptive

Adaptively sets interpacket interval.

allow-broadcast

Allows you to ping broadcast address.

audible

Makes a beep sound on every ping, while the router pings for host details.

bypass-route

Bypasses normal routing tables during ping.

count

Specifies the number of ping requests to send.

deadline

Specifies the number of seconds before which ping expires.

ether-size

Matches the overall size of the data packet with the resultant size of the Layer 3 packet.

flood

Sends 100 ping requests each second.

interface

Specifies the interface that the device must use as source address.

interval

Specifies the time in seconds for which the device must wait between ping requests.

mark

Specifies that the device must consider the request for special processing.

mtu-discovery

Specifies the path MTU discovery strategy.

no-loopback

Suppresses loop-back of multicast pings.

numeric

Does not resolve domain name system (DNS) names during ping.

pattern

Specifies the hexadecimal digit pattern to fill the packet.

quiet

Prints only the ping summary page.

record-route

Records the route that the packet takes.

size

Specifies the number of bytes to send for a ping request.

timestamp

Displays the timestamp during ping output.

tos

Marks packet with specified type of service (TOS).

ttl

Specifies the maximum packet life-time for a host.

verbose

Displays a detailed output for the ping command.

Operational mode.

The `ping` command tests whether a network host is reachable.

The `ping` command uses the ECHO_REQUEST datagram (ping) of the ICMP protocol to get an ICMP ECHO_RESPONSE from a host or gateway. ECHO_REQUEST datagrams have an IP and an ICMP header, followed by a *struct timeval* data type and then an arbitrary number of pad bytes that are used to fill the packet.

The host is specified either as host name (if DNS is being used on the network) or as an IPv4 or IPv6 address. If a host name is specified and neither the **ipv4** nor **ipv6** keyword is used, the IPv4 or IPv6 address associated with the host name is pinged, depending on which address is resolved first.

When using the `ping` command for fault isolation, enter the command on the local host to verify that the local network interface is up and running. Then, ping hosts and gateways farther away. Round-trip times and packet-loss statistics are computed.

If duplicate packets are received, they are not included in the packet-loss calculation, although the round-trip time of these packets is used in calculating the minimum, average, and maximum round-trip times.

When the `ping` command is interrupted by typing `<Ctrl>+c`s, a brief statistical summary is displayed.

This example shows how to test whether www.google.com network is reachable. It also shows how to allow the pinging of the broadcast address and define a life-time of 30 hops for each host.

```
vyatta@vyatta:~$ ping www.google.com allow-broadcast ttl
Possible completions:
  <hops>    Number of hops

vyatta@vyatta:~$ ping www.google.com allow-broadcast ttl 30
PING www.google.com (216.58.216.164) 56(84) bytes of data.
64 bytes from sea15s02-in-f4.1e100.net (216.58.216.164): icmp_req=2 ttl=54
 time=20.1 ms
From 10.18.170.201 icmp_seq=1 Destination Host Unreachable
From 10.18.170.201 icmp_seq=3 Destination Host Unreachable
64 bytes from sea15s02-in-f4.1e100.net (216.58.216.164): icmp_req=4 ttl=54
 time=20.2 ms
```

```
64 bytes from sea15s02-in-f4.1e100.net (216.58.216.164): icmp_req=6 ttl=54
 time=20.3 ms
From 10.18.170.201 icmp_seq=5 Destination Host Unreachable
From 10.18.170.201 icmp_seq=7 Destination Host Unreachable
64 bytes from sea15s02-in-f4.1e100.net (216.58.216.164): icmp_req=8 ttl=54
 time=19.9 ms
64 bytes from sea15s02-in-f4.1e100.net (216.58.216.164): icmp_req=10 ttl=54
 time=20.4 ms
From 10.18.170.201 icmp_seq=9 Destination Host Unreachable
From 10.18.170.201 icmp_seq=11 Destination Host Unreachable
64 bytes from sea15s02-in-f4.1e100.net (216.58.216.164): icmp_req=12 ttl=54
 time=20.0 ms
```

ping audible

Makes a beep sound when the router pings for the host details.

`ping { ipv4_address | ipv6_address | hostname } audible option`

ipv4_address

The IPv4 address of the host.

ipv6_address

The IPv6 address of the host.

hostname

A host being pinged. This keyword is used when the host is specified as a host name rather than as an IP address.

audible

Makes a beep sound while the device pings for the host details.

option

Each of the following entries are considered options. These options can be issued consecutively, that is, in the same command line.

adaptive

Adaptively sets interpacket interval.

allow-broadcast

Allows you to ping broadcast address.

audible

Makes a beep sound on every ping, while the router pings for host details.

bypass-route

Bypasses normal routing tables during ping.

count

Specifies the number of ping requests to send.

deadline

Specifies the number of seconds before which ping expires.

ether-size

Matches the overall size of the data packet with the resultant size of the Layer 3 packet.

flood

Sends 100 ping requests each second.

interface

Specifies the interface that the device must use as source address.

interval

Specifies the time in seconds for which the device must wait between ping requests.

mark

Specifies that the device must consider the request for special processing.

mtu-discovery

Specifies the path MTU discovery strategy.

no-loopback

Suppresses loop-back of multicast pings.

numeric

Does not resolve domain name system (DNS) names during ping.

pattern

Specifies the hexadecimal digit pattern to fill the packet.

quiet

Prints only the ping summary page.

record-route

Records the route that the packet takes.

size

Specifies the number of bytes to send for a ping request.

timestamp

Displays the timestamp during ping output.

tos

Marks packet with specified type of service (TOS).

ttl

Specifies the maximum packet life-time for a host.

verbose

Displays a detailed output for the ping command.

Operational mode

The `ping` command tests whether a network host is reachable.

The `ping` command uses the ECHO_REQUEST datagram (ping) of the ICMP protocol to get an ICMP ECHO_RESPONSE from a host or gateway. ECHO_REQUEST datagrams have an IP and an ICMP header, followed by a *struct timeval* data type and then an arbitrary number of pad bytes that are used to fill the packet.

The host is specified either as host name (if DNS is being used on the network) or as an IPv4 or IPv6 address. If a host name is specified and neither the **ipv4** nor **ipv6** keyword is used, the IPv4 or IPv6 address associated with the host name is pinged, depending on which address is resolved first.

When using the `ping` command for fault isolation, enter the command on the local host to verify that the local network interface is up and running. Then, ping hosts and gateways farther away. Round-trip times and packet-loss statistics are computed.

If duplicate packets are received, they are not included in the packet-loss calculation, although the round-trip time of these packets is used in calculating the minimum, average, and maximum round-trip times.

When the `ping` command is interrupted by typing `<Ctrl>+c`, a brief statistical summary is displayed.

This example shows how to configure the router to send an ICMP_ECHO request five times, making a beep sound on every ping.

```
vyatta@vyatta:~$ ping www.google.com audible count 5
PING www.google.com (216.58.216.164) 56(84) bytes of data.
64 bytes from sea15s02-in-f4.1e100.net (216.58.216.164): icmp_req=2 ttl=54
 time=20.0 ms
From 10.18.170.201 icmp_seq=1 Destination Host Unreachable
From 10.18.170.201 icmp_seq=3 Destination Host Unreachable
64 bytes from sea15s02-in-f4.1e100.net (216.58.216.164): icmp_req=4 ttl=54
 time=20.1 ms

--- www.google.com ping statistics ---
5 packets transmitted, 2 received, +2 errors, 60% packet loss, time 4010ms
rtt min/avg/max/mdev = 20.048/20.075/20.103/0.144 ms, pipe 3
vyatta@vyatta:~$
```

ping bypass-route

Bypasses the normal routing tables and sends a ping request directly to a host on an attached interface.

`ping { ipv4_address | ipv6_address | hostname } bypass-route option`

ipv4_address

The IPv4 address of the host.

ipv6_address

The IPv6 address of the host.

hostname

A host being pinged. This keyword is used when the host is specified as a host name rather than as an IP address.

bypass-route

Bypasses the normal routing tables and sends directly to a host on an attached interface. If the host is not directly attached to a network, an error is returned.

option

Each of the following entries are considered options. These options can be issued consecutively, that is, in the same command line.

adaptive

Adaptively sets interpacket interval.

allow-broadcast

Allows you to ping broadcast address.

audible

Makes a beep sound on every ping, while the router pings for host details.

bypass-route

Bypasses normal routing tables during ping.

count

Specifies the number of ping requests to send.

deadline

Specifies the number of seconds before which ping expires.

ether-size

Matches the overall size of the data packet with the resultant size of the Layer 3 packet.

flood

Sends 100 ping requests each second.

interface

Specifies an interface that the device must use as the source address.

interval

Specifies the time in seconds for which the device must wait between ping requests.

mark

Specifies that the device must consider the ping request for special processing.

mtu-discovery

Specifies the path MTU discovery strategy.

no-loopback

Suppresses loop-back of multicast pings.

numeric

Does not resolve domain name system (DNS) names during ping.

pattern

Specifies the hexadecimal digit pattern to fill the packet.

quiet

Prints only the ping summary page.

record-route

Records the route that the packet takes.

size

Specifies the number of bytes to send for a ping request.

timestamp

Displays the timestamp during ping output.

tos

Marks packet with specified type of service (TOS).

ttl

Specifies the maximum packet life-time for a host.

verbose

Displays a detailed output for the ping command.

Operational mode

The `ping` command tests whether a network host is reachable.

The `ping` command uses the ECHO_REQUEST datagram (ping) of the ICMP protocol to get an ICMP ECHO_RESPONSE from a host or gateway. ECHO_REQUEST datagrams have an IP and an ICMP header, followed by a *struct timeval* data type and then an arbitrary number of pad bytes that are used to fill the packet.

If the host is not directly attached to a network, an error is returned.

When the `ping` command is interrupted by typing `<Ctrl>+c`, a brief statistical summary is displayed.

This example shows how to bypass the normal routing tables and send a ping request directly to a host on an attached interface.

```
vyatta@vyatta:~$ ping www.google.com bypass-route
PING www.google.com (216.58.216.164) 56(84) bytes of data.
ping: sendmsg: Network is unreachable
ping: sendmsg: Network is unreachable
ping: sendmsg: Network is unreachable
ping: sendmsg: Network is unreachable
ping: sendmsg: Network is unreachable
ping: sendmsg: Network is unreachable
```

ping count

Specifies a number of ping requests that the router must send.

`ping { ipv4_address | ipv6_address | hostname } count requests option`

ipv4_address

The IPv4 address of the host.

ipv6_address

The IPv6 address of the host.

hostname

A host being pinged. This keyword is used when the host is specified as a host name rather than as an IP address.

requests

The number of ping requests to send.

option

Each of the following entries are considered options. These options can be issued consecutively, that is, in the same command line.

adaptive

Adaptively sets interpacket interval.

allow-broadcast

Allows you to ping broadcast address.

audible

Makes a beep sound, while the router pings for host details.

bypass-route

Bypasses normal routing tables during ping.

count

Specifies the number of ping requests to send.

deadline

Specifies the number of seconds before which ping expires.

ether-size

Matches the overall size of the data packet with the resultant size of the Layer 3 packet.

flood

Sends 100 ping requests each second.

interface

Specifies an interface that the device must use as the source address.

interval

Specifies the time in seconds for which the device must wait between ping requests.

mark

Specifies that the device must consider the ping request for special processing.

mtu-discovery

Specifies the path MTU discovery strategy.

no-loopback

Supress loop-back of multicast pings.

numeric

Does not resolve domain name system (DNS) names during ping.

pattern

Specifies the hexadecimal digit pattern to fill the packet.

quiet

Prints only the ping summary page.

record-route

Records the route that the packet takes.

size

Specifies the number of bytes to send for a ping request.

timestamp

Displays the timestamp during ping output.

tos

Marks packet with specified type of service (TOS).

ttl

Specifies the maximum packet life-time for a host.

verbose

Displays a detailed output for the ping command.

Operational mode.

The `ping` command tests whether a network host is reachable.

The `ping` command uses the ECHO_REQUEST datagram (ping) of the ICMP protocol to get an ICMP ECHO_RESPONSE from a host or gateway. ECHO_REQUEST datagrams have an IP and an ICMP header, followed by a *struct timeval* data type and then an arbitrary number of pad bytes that are used to fill the packet.

When the `ping` command is interrupted by typing `<Ctrl>+c`, a brief statistical summary is displayed.

This example shows how to test whether www.google.com network is reachable by sending five ICMP_ECHO requests and that the router waits for five reply packets for ten seconds.

```
vyatta@vyatta:~$ ping www.google.com count 5 deadline 10
PING www.google.com (216.58.216.164) 56(84) bytes of data.
```

```
64 bytes from sea15s02-in-f4.1e100.net (216.58.216.164): icmp_req=2 ttl=54
 time=20.0 ms
From 10.18.170.201 icmp_seq=1 Destination Host Unreachable
From 10.18.170.201 icmp_seq=3 Destination Host Unreachable
64 bytes from sea15s02-in-f4.1e100.net (216.58.216.164): icmp_req=4 ttl=54
 time=20.1 ms

--- www.google.com ping statistics ---
5 packets transmitted, 2 received, +2 errors, 60% packet loss, time 4010ms
rtt min/avg/max/mdev = 20.048/20.075/20.103/0.144 ms, pipe 3
```

```
vyatta@vyatta:~$ ping www.google.com count 5
```

ping deadline

Specifies the number of seconds before which the ping expires.

`ping { ipv4_address | ipv6_address | hostname } deadline seconds option`

ipv4_address

The IPv4 address of the host.

ipv6_address

The IPv6 address of the host.

hostname

A host being pinged. This keyword is used when the host is specified as a host name rather than as an IP address.

seconds

The number of seconds before which ping exits.

option

Each of the following entries are considered options. These options can be issued consecutively, that is, in the same command line.

adaptive

Adaptively sets interpacket interval.

allow-broadcast

Allows you to ping broadcast address.

audible

Makes a beep sound on every ping, while the router pings for host details.

bypass-route

Bypasses normal routing tables during ping.

count

Specifies the number of ping requests to send.

deadline

Specifies the number of seconds before which ping expires.

ether-size

Matches the overall size of the data packet with the resultant size of the Layer 3 packet.

flood

Sends 100 ping requests each second.

interface

Specifies an interface that the device must use as the source address.

interval

Specifies the time in seconds for which the device must wait between ping requests.

mark

Specifies that the device must consider the request for special processing.

mtu-discovery

Specifies the path MTU discovery strategy.

no-loopback

Suppresses loop-back of multicast pings.

numeric

Does not resolve domain name system (DNS) names during ping.

pattern

Specifies the hexadecimal digit pattern to fill the packet.

quiet

Prints only the ping summary page.

record-route

Records the route that the packet takes.

size

Specifies the number of bytes to send for a ping request.

timestamp

Displays the timestamp during ping output.

tos

Marks packet with specified type of service (TOS).

ttl

Specifies the maximum packet life-time for a host.

verbose

Displays a detailed output for the ping command.

Operational mode

The `ping` command tests whether a network host is reachable.

The `ping` command uses the ECHO_REQUEST datagram (ping) of the ICMP protocol to get an ICMP ECHO_RESPONSE from a host or gateway. ECHO_REQUEST datagrams have an IP and an ICMP header, followed by a *struct timeval* data type and then an arbitrary number of pad bytes that are used to fill the packet.

When the `ping` command is interrupted by typing `<Ctrl>+c` , a brief statistical summary is displayed.

This example shows how to test whether www.google.com network is reachable within three seconds.

```
vyatta@vyatta:~$ ping www.google.com deadline 3
PING www.google.com (216.58.216.164) 56(84) bytes of data.
64 bytes from sea15s02-in-f4.1e100.net (216.58.216.164): icmp_req=1 ttl=54
 time=19.8 ms
64 bytes from sea15s02-in-f4.1e100.net (216.58.216.164): icmp_req=3 ttl=54
 time=20.1 ms

--- www.google.com ping statistics ---
3 packets transmitted, 2 received, 33% packet loss, time 2004ms
rtt min/avg/max/mdev = 19.873/19.995/20.118/0.187 ms
```

ping ether-size

Matches the overall size of the data packet with the resultant size of the Layer 3 packet.

`ping { ipv4_address | ipv6_address | hostname } ether-size bytes option`

ipv4_address

The IPv4 address of the host.

ipv6_address

The IPv6 address of the host.

hostname

A host being pinged. This keyword is used when the host is specified as a host name rather than as an IP address.

bytes

The number of bytes.

Each of the following entries are considered options. These options can be issued consecutively, that is, in the same command line.

adaptive

Adaptively sets interpacket interval.

allow-broadcast

Allows you to ping broadcast address.

audible

Makes a beep sound during every ping, while the router pings for host details.

bypass-route

Bypasses normal routing tables during ping.

count

Specifies the number of ping requests to send.

deadline

Specifies the number of seconds before which ping expires.

ether-size

Matches the overall size of the data packet with the resultant size of the Layer 3 packet.

flood

Sends 100 ping requests each second.

interface

Specifies the interface that the device must use as source address.

interval

Specifies the time in seconds for which the device must wait between ping requests.

mark

Specifies that the device must consider the ping request for special processing.

mtu-discovery

Specifies the path MTU discovery strategy.

no-loopback

Suppresses loop-back of multicast pings.

numeric

Does not resolve domain name system (DNS) names during ping.

pattern

Specifies the hexadecimal digit pattern to fill the packet.

quiet

Prints only the ping summary page.

record-route

Records the route that the packet takes.

size

Specifies the number of bytes to send for a ping request.

timestamp

Displays the timestamp during ping output.

tos

Marks packet with specified type of service (TOS).

ttl

Specifies the maximum packet life-time for a host.

verbose

Displays a detailed output for the ping command.

Operational mode

The `ping` command tests whether a network host is reachable.

The `ping` command when used with the ether-size option specifies the size of the resultant Layer 3 packet, such as ICMP data plus ICMP headers, IP headers, and so on.

The `ping` ***host*** `ether-size` command ensures that the resultant size supports Layer 3 IP packet size. The Ethernet MTU is 1,500 bytes. Therefore, the `ping` ***host*** `ether-size` command subtracts 28 bytes from the host size of the Layer 3 packet to ensure that the resultant value matches the overall size of the data packet. The `ping` ***host*** `ether-size` command avoids the fragmentation overhead due to the MTU.

Note: You can use either the `ping` ***host*** `size` or `ping` ***host*** `ether-size` command to ping a host network. You cannot use both commands simultaneously.

ping flood

Sends 100 ping requests each second.

`ping { ipv4_address | ipv6_address | hostname }` **`flood`** *`option`*

ipv4_address

The IPv4 address of the host.

ipv6_address

The IPv6 address of the host.

hostname

A host being pinged. This keyword is used when the host is specified as a host name rather than as an IP address.

option

Each of the following entries are considered options. These options can be issued consecutively, that is, in the same command line.

adaptive

Adaptively sets interpacket interval.

allow-broadcast

Allows you to ping broadcast address.

audible

Makes noise while the device pings for the host details.

bypass-route

Bypasses normal routing tables during ping.

count

Specifies the number of ping requests to send.

deadline

Specifies the number of seconds before which ping expires.

ether-size

Matches the overall size of the data packet with the resultant size of the Layer 3 packet.

flood

Sends 100 ping requests each second.

interface

Specifies the interface that the device must use as source address.

interval

Specifies the time in seconds for which the device must wait between ping requests.

mark

Specifies that the device must consider the ping request for special processing.

mtu-discovery

Specifies the path MTU discovery strategy.

no-loopback

Suppresses loop-back of multicast pings.

numeric

Does not resolve domain name system (DNS) names during ping.

pattern

Specifies the hexadecimal digit pattern to fill the packet.

quiet

Prints only the ping summary page.

record-route

Records the route that the packet takes.

size

Specifies the number of bytes to send for a ping request.

timestamp

Displays the timestamp during ping output.

tos

Marks packet with specified type of service (TOS).

ttl

Specifies the maximum packet life-time for a host.

verbose

Displays a detailed output for the ping command.

Operational mode

The `ping` command tests whether a network host is reachable.

The `ping` command uses the ECHO_REQUEST datagram (ping) of the ICMP protocol to get an ICMP ECHO_RESPONSE from a host or gateway. ECHO_REQUEST datagrams have an IP and an ICMP header, followed by a *struct timeval* data type and then an arbitrary number of pad bytes that are used to fill the packet.

When the `ping` command is interrupted by typing `<Ctrl>+c`, a brief statistical summary is displayed.

This example shows how to test whether www.google.com network is reachable by sending a maximum of 100 ping requests each second.

```
vyatta@vyatta:~$ ping www.google.com flood
PING www.google.com (216.58.216.164) 56(84) bytes of data.
..........E..........E..........E..........E..........E..........E..
.........E..........E..........E..........E..........E..........E.....
......E..........E.......^C
--- www.google.com ping statistics ---
345 packets transmitted, 169 received, +168 errors, 51% packet loss, time
 42361ms
rtt min/avg/max/mdev = 19.917/20.779/33.826/1.092 ms, pipe 24, ipg/ewma
 123.144/20.398 ms
```

ping interface

Specifies an interface that the device must use as the source address.

`ping { ipv4_addres | ipv6_address | hostname } interface { ipv4_addres | ipv6_address | hostname } option`

ipv4_address

The IPv4 address of the host.

ipv6_address

The IPv6 address of the host.

hostname

A host being pinged. This keyword is used when the host is specified as a host name rather than as an IP address.

option

Each of the following entries are considered options. These options can be issued consecutively, that is, in the same command line.

adaptive

Adaptively sets interpacket interval.

allow-broadcast

Allows you to ping broadcast address.

audible

Makes a beep sound on every ping, while the device pings for host details.

bypass-route

Bypasses normal routing tables during ping.

count

Specifies the number of ping requests to send.

deadline

Specifies the number of seconds before which ping expires.

ether-size

Matches the overall size of the data packet with the resultant size of the Layer 3 packet.

flood

Sends 100 ping requests each second.

interface

Specifies an interface that the device must use as the source address.

interval

Specifies the time in seconds for which the device must wait between ping requests.

mark

Specifies that the device must consider the ping request for special processing.

mtu-discovery

Specifies the path MTU discovery strategy.

no-loopback

Suppresses loop-back of multicast pings.

numeric

Does not resolve domain name system (DNS) names during ping.

pattern

Specifies the hexadecimal digit pattern to fill the packet.

quiet

Prints only the ping summary page.

record-route

Records the route that the packet takes.

size

Specifies the number of bytes to send for a ping request.

timestamp

Displays the timestamp during ping output.

tos

Marks packet with specified type of service (TOS).

ttl

Specifies the maximum packet life-time for a host.

verbose

Displays a detailed output for the ping command.

Operational mode

The `ping` command tests whether a network host is reachable.

The `ping` command uses the ECHO_REQUEST datagram (ping) of the ICMP protocol to get an ICMP ECHO_RESPONSE from a host or gateway. ECHO_REQUEST datagrams have an IP and an ICMP header, followed by a *struct timeval* data type and then an arbitrary number of pad bytes that are used to fill the packet.

Use the `ping` *host* `interface` command when pinging IPv6 link-local address.

When the `ping` command is interrupted by typing `<Ctrl>+c`, a brief statistical summary is displayed.

This example shows how to test whether an IPv4 interface is reachable.

```
vyatta@vyatta:~$ ping 192.1.2.2 interface dp0s6
PING 192.1.2.2 (192.1.2.2) from 192.1.2.1 dp0s6: 56(84) bytes of data.
64 bytes from 192.1.2.2: icmp_req=1 ttl=64 time=1.66 ms
^C
--- 192.1.2.2 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 1.664/1.664/1.664/0.000 ms
```

This example shows how to test whether an IPv4 address is reachable using the specified interface address.

```
vyatta@vyatta:~$ ping 192.1.2.2 interface 192.1.2.1
PING 192.1.2.2 (192.1.2.2) from 192.1.2.1 : 56(84) bytes of data.
64 bytes from 192.1.2.2: icmp_req=1 ttl=64 time=1.02 ms
^C
```

This example shows how to test whether an IPv6 interface is reachable.

```
vyatta@vyatta:~$ ping  2012:dead::2 interface  2012:dead::1
PING 2012:dead::2(2012:dead::2) from 2012:dead::1 : 56 data bytes
64 bytes from 2012:dead::2: icmp_seq=1 ttl=64 time=3.04 ms
64 bytes from 2012:dead::2: icmp_seq=2 ttl=64 time=1.01 ms
^C
--- 2012:dead::2 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 1.012/2.027/3.043/1.016 ms
```

ping interval

Specifies the time in seconds for which the device must wait between ping requests.

`ping { ipv4_address | ipv6_address | hostname } interval seconds option`

ipv4_address

The IPv4 address of the host.

ipv6_address

The IPv6 address of the host.

hostname

A host being pinged. This keyword is used when the host is specified as a host name rather than as an IP address.

seconds

The number of seconds for which the device must wait between ping requests.

option

Each of the following entries are considered options. These options can be issued consecutively, that is, in the same command line.

adaptive

Adaptively sets interpacket interval.

allow-broadcast

Allows you to ping broadcast address.

audible

Makes a beep sound on every ping, while the device pings for host details.

bypass-route

Bypasses normal routing tables during ping.

count

Specifies the number of ping requests to send.

deadline

Specifies the number of seconds before which ping expires.

ether-size

Matches the overall size of the data packet with the resultant size of the Layer 3 packet.

flood

Sends 100 ping requests each second.

interface

Specifies an interface that the device must use as the source address.

interval

Specifies the time in seconds for which the device must wait between ping requests.

mark

Specifies that the device must consider the ping request for special processing.

mtu-discovery

Specifies the path MTU discovery strategy.

no-loopback

Suppresses loop-back of multicast pings.

numeric

Does not resolve domain name system (DNS) names during ping.

pattern

Specifies the hexadecimal digit pattern to fill the packet.

quiet

Prints only the ping summary page.

record-route

Records the route that the packet takes.

size

Specifies the number of bytes to send for a ping request.

timestamp

Displays the timestamp during ping output.

tos

Marks packet with specified type of service (TOS).

ttl

Specifies the maximum packet life-time for a host.

verbose

Displays a detailed output for the ping command.

Operational mode

The `ping` command tests whether a network host is reachable.

The `ping` command uses the ECHO_REQUEST datagram (ping) of the ICMP protocol to get an ICMP ECHO_RESPONSE from a host or gateway. ECHO_REQUEST datagrams have an IP and an ICMP header, followed by a *struct timeval* data type and then an arbitrary number of pad bytes that are used to fill the packet.

When the `ping` command is interrupted by typing `<Ctrl>+c`, a brief statistical summary is displayed.

This example shows how to test whether www.google.com network is reachable by providing 3 seconds of time between 5 ping attempts.

```
vyatta@vyatta:~$ ping www.google.com interval 3 count 15
```

```
PING www.google.com (216.58.216.164) 56(84) bytes of data.
64 bytes from sea15s02-in-f4.1e100.net (216.58.216.164): icmp_req=1 ttl=54
 time=20.2 ms
From 10.18.170.201 icmp_seq=2 Destination Host Unreachable
From 10.18.170.201 icmp_seq=3 Destination Host Unreachable
From 10.18.170.201 icmp_seq=4 Destination Host Unreachable
From 10.18.170.201 icmp_seq=5 Destination Host Unreachable
From 10.18.170.201 icmp_seq=6 Destination Host Unreachable
From 10.18.170.201 icmp_seq=7 Destination Host Unreachable
From 10.18.170.201 icmp_seq=8 Destination Host Unreachable
From 10.18.170.201 icmp_seq=9 Destination Host Unreachable
From 10.18.170.201 icmp_seq=10 Destination Host Unreachable
From 10.18.170.201 icmp_seq=11 Destination Host Unreachable
From 10.18.170.201 icmp_seq=12 Destination Host Unreachable
From 10.18.170.201 icmp_seq=13 Destination Host Unreachable
From 10.18.170.201 icmp_seq=14 Destination Host Unreachable
From 10.18.170.201 icmp_seq=15 Destination Host Unreachable

--- www.google.com ping statistics ---
15 packets transmitted, 1 received, +14 errors, 93% packet loss, time
 41999ms
rtt min/avg/max/mdev = 20.264/20.264/20.264/0.000 ms
```

ping mark

Specifies that the device must consider the ping request for special processing.

`ping { ipv4_address | ipv6_address | hostname } mark fwmark option`

ipv4_address

The IPv4 address of the host.

ipv6_address

The IPv6 address of the host.

hostname

A host being pinged. This keyword is used when the host is specified as a host name rather than as an IP address.

fwmark

Marks the outgoing packet.

option

Each of the following entries are considered options. These options can be issued consecutively, that is, in the same command line.

adaptive

Adaptively sets interpacket interval.

allow-broadcast

Allows you to ping broadcast address.

audible

Makes a beep sound on every ping, while the device pings for host details.

bypass-route

Bypasses normal routing tables during ping.

count

Specifies the number of ping requests to send.

deadline

Specifies the number of seconds before which ping expires.

ether-size

Matches the overall size of the data packet with the resultant size of the Layer 3 packet.

flood

Sends 100 ping requests each second.

interface

Specifies an interface that the device must use as the source address.

interval

Specifies the time in seconds for which the device must wait between ping requests.

mark

Specifies that the device must consider the request for special processing.

mtu-discovery

Specifies the path MTU discovery strategy.

no-loopback

Suppresses loop-back of multicast pings.

numeric

Does not resolve domain name system (DNS) names during ping.

pattern

Specifies the hexadecimal digit pattern to fill the packet.

quiet

Prints only the ping summary page.

record-route

Records the route that the packet takes.

size

Specifies the number of bytes to send for a ping request.

timestamp

Displays the timestamp during ping output.

tos

Marks packet with specified type of service (TOS).

ttl

Specifies the maximum packet life-time for a host.

verbose

Displays a detailed output for the ping command.

Operational mode

The `ping` command tests whether a network host is reachable.

The `ping` command uses the ECHO_REQUEST datagram (ping) of the ICMP protocol to get an ICMP ECHO_RESPONSE from a host or gateway. ECHO_REQUEST datagrams have an IP and an ICMP header, followed by a *struct timeval* data type and then an arbitrary number of pad bytes that are used to fill the packet.

The `ping` *host* mark *fwmark* command is used in usecases within the operating system. For example, to tag the outgoing packets while configuring policy routing, to select specific outbound processing.

When the `ping` command is interrupted by typing `<Ctrl>+c`, a brief statistical summary is displayed.

ping mtu-discovery

Selects the discovery strategy of the path maximum transmission unit (PMTU).

`ping { ipv4_address | ipv6_address | hostname } mtu-discovery { do | dont | want } option`

ipv4_address

The IPv4 address of the host.

ipv6_address

The IPv6 address of the host.

hostname

A host being pinged. This keyword is used when the host is specified as a host name rather than as an IP address.

do

Prohibits fragmentation, even for the local packet. Sets a do-not fragment (DF) flag to the router.

want

Performs a PMTU discovery. During the discovery the device fragments the packet locally.

dont

Prohibits fragmentation, but does not set a DF flag.

option

Each of the following entries are considered options. These options can be issued consecutively, that is, in the same command line.

adaptive

Adaptively sets interpacket interval.

allow-broadcast

Allows you to ping broadcast address.

audible

Makes a beep sound on every ping, while the device pings for host details.

bypass-route

Bypasses normal routing tables during ping.

count

Specifies the number of ping requests to send.

deadline

Specifies the number of seconds before which ping expires.

ether-size

Matches the overall size of the data packet with the resultant size of the Layer 3 packet.

flood

Sends 100 ping requests each second.

interface

Specifies an interface that the device must use as the source address.

interval

Specifies the time in seconds for which the device must wait between ping requests.

mark

Specifies that the device must consider the ping request for special processing.

mtu-discovery

Specifies the path MTU discovery strategy.

no-loopback

Suppresses loop-back of multicast pings.

numeric

Does not resolve domain name system (DNS) names during ping.

pattern

Specifies the hexadecimal digit pattern to fill the packet.

quiet

Prints only the ping summary page.

record-route

Records the route that the packet takes.

size

Specifies the number of bytes to send for a ping request.

timestamp

Displays the timestamp during ping output.

tos

Marks packet with specified type of service (TOS).

ttl

Specifies the maximum packet life-time for a host.

verbose

Displays a detailed output for the ping command.

Operational mode

The ping *host* mtu-discovery command selects the discovery strategy of the PMTU, based on the parameters provided. The command checks the size of the packet. If the size is equal to or greater than the maximum data payload that is available in a packet, the device determines whether the packet has to be fragmented, based on the discovery strategy of the PMTU.

This example shows how to test 1472 bytes of data of the host 10.0.0.103 for network reachability while prohibiting network fragmentation during the ping. However a do-not-fragment flag is set for the router.

```
vyatta@vyatta:~$ ping 10.0.0.103 size 1472 mtu-discovery do
PING 10.0.0.103 (10.0.0.103) 1472(1500) bytes of data.
1480 bytes from 10.0.0.103: icmp_req=1 ttl=64 time=0.923 ms
^[[A1480 bytes from 10.0.0.103: icmp_req=2 ttl=64 time=1.35 ms
^C
--- 10.0.0.103 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 999ms
rtt min/avg/max/mdev = 0.923/1.137/1.352/0.217 ms
```

This example shows how to test 1472 bytes of data of the host 10.0.0.103 for network reachability while prohibiting network fragmentation during the ping. However a do-not-fragment flag is not set for the router.

```
vyatta@VR-1:~$ ping 10.0.0.103 size 1472 mtu-discovery dont
PING 10.0.0.103 (10.0.0.103) 1472(1500) bytes of data.
1480 bytes from 10.0.0.103: icmp_req=1 ttl=64 time=1.25 ms
^C
--- 10.0.0.103 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 1.250/1.250/1.250/0.000 ms
```

This example shows how to perform a discovery strategy for PMTU during a ping request. During the discovery, the router fragments the packet locally.

```
vyatta@VR-1:~$ ping 10.0.0.103 size 1472 mtu-discovery want
PING 10.0.0.103 (10.0.0.103) 1472(1500) bytes of data.
1480 bytes from 10.0.0.103: icmp_req=1 ttl=64 time=1.00 ms
```

```
^C
--- 10.0.0.103 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 1.005/1.005/1.005/0.000 ms
```

ping no-loopback

Suppresses loopback of multicast pings.

`ping { ipv4_address | ipv6_address | hostname} no-loopback option`

ipv4_address

The IPv4 address of the host.

ipv6_address

The IPv6 address of the host.

hostname

A host being pinged. This keyword is used when the host is specified as a host name rather than as an IP address.

option

Each of the following entries are considered options. These options can be issued consecutively, that is, in the same command line.

adaptive

Adaptively sets interpacket interval.

allow-broadcast

Allows you to ping broadcast address.

audible

Makes noise while the device pings for the host details.

bypass-route

Bypasses normal routing tables during ping.

count

Specifies the number of ping requests to send.

deadline

Specifies the number of seconds before which ping expires.

ether-size

Matches the overall size of the data packet with the resultant size of the Layer 3 packet.

flood

Sends 100 ping requests each second.

interface

Specifies an interface that the device must use as the source address.

interval

Specifies the time in seconds for which the device must wait between ping requests.

mark

Specifies that the device must consider the ping request for special processing.

mtu-discovery

Specifies the path MTU discovery strategy.

no-loopback

Suppresses loop-back of multicast pings.

numeric

Does not resolve domain name system (DNS) names during ping.

pattern

Specifies the hexadecimal digit pattern to fill the packet.

quiet

Prints only the ping summary page.

record-route

Records the route that the packet takes.

size

Specifies the number of bytes to send for a ping request.

timestamp

Displays the timestamp during ping output.

tos

Marks packet with specified type of service (TOS).

ttl

Specifies the maximum packet life-time for a host.

verbose

Displays a detailed output for the ping command.

Operational mode

The `ping` command tests whether a network host is reachable.

The `ping` command uses the ECHO_REQUEST datagram (ping) of the ICMP protocol to get an ICMP ECHO_RESPONSE from a host or gateway. ECHO_REQUEST datagrams have an IP and an ICMP header, followed by a *struct timeval* data type and then an arbitrary number of pad bytes that are used to fill the packet.

When the `ping` command is interrupted by typing `<Ctrl>+c` , a brief statistical summary is displayed.

ping numeric

Specifies that the router must not resolve domain name system (DNS) names during a ping.

`ping { ipv4_address | ipv6_address | hostname } numeric option`

ipv4_address

The IPv4 address of the host.

ipv6_address

The IPv6 address of the host.

hostname

A host being pinged. This keyword is used when the host is specified as a host name rather than as an IP address.

numeric

The number of ping requests to send.

option

Each of the following entries are considered options. These options can be issued consecutively, that is, in the same command line.

adaptive

Adaptively sets interpacket interval.

allow-broadcast

Allows you to ping broadcast address.

audible

Makes a beep sound on every ping, while the device pings for host details.

bypass-route

Bypasses normal routing tables during ping.

count

Specifies the number of ping requests to send.

deadline

Specifies the number of seconds before which ping expires.

ether-size

Matches the overall size of the data packet with the resultant size of the Layer 3 packet.

flood

Sends 100 ping requests each second.

interface

Specifies an interface that the device must use as the source address.

interval

Specifies the time in seconds for which the device must wait between ping requests.

mark

Specifies that the device must consider the ping request for special processing.

mtu-discovery

Specifies the path MTU discovery strategy.

no-loopback

Suppresses loop-back of multicast pings.

numeric

Does not resolve domain name system (DNS) names during ping.

pattern

Specifies the hexadecimal digit pattern to fill the packet.

quiet

Prints only the ping summary page.

record-route

Records the route that the packet takes.

size

Specifies the number of bytes to send for a ping request.

timestamp

Displays the timestamp during ping output.

tos

Marks packet with specified type of service (TOS).

ttl

Specifies the maximum packet life-time for a host.

verbose

Displays a detailed output for the ping command.

Operational mode

The `ping` command tests whether a network host is reachable.

The `ping` command uses the ECHO_REQUEST datagram (ping) of the ICMP protocol to get an ICMP ECHO_RESPONSE from a host or gateway. ECHO_REQUEST datagrams have an IP and an ICMP header, followed by a *struct timeval* data type and then an arbitrary number of pad bytes that are used to fill the packet.

When the `ping` command is interrupted by typing `<Ctrl>+c`, a brief statistical summary is displayed.

This example shows how to ensure that a ping command provides only numeric output, which means that the router does not look up symbolic names for host addresses.

```
vyatta@vyatta:~$ ping www.google.com numeric.
PING www.google.com (216.58.196.100) 56(84) bytes of data.
```

```
64 bytes from 216.58.196.100: icmp_req=1 ttl=54 time=42.1 ms
64 bytes from 216.58.196.100: icmp_req=2 ttl=54 time=44.3 ms
^C
--- www.google.com ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 42.177/43.278/44.379/1.101 ms
```

ping pattern

Specifies a hexadecimal digit pattern to fill the packet.

`ping { ipv4_addres | ipv6_address | hostname } pattern hexadecimal-digit option`

ipv4_address

The IPv4 address of the host.

ipv6_address

The IPv6 address of the host.

hostname

A host being pinged. This keyword is used when the host is specified as a host name rather than as an IP address.

hexadecimal-digit

Hexadecimal digit to fill the packet.

option

Each of the following entries are considered options. These options can be issued consecutively, that is, in the same command line.

adaptive

Adaptively sets interpacket interval.

allow-broadcast

Allows you to ping broadcast address.

audible

Makes a beep sound on every ping, while the device pings for host details.

bypass-route

Bypasses normal routing tables during ping.

count

Specifies the number of ping requests to send.

deadline

Specifies the number of seconds before which ping expires.

ether-size

Matches the overall size of the data packet with the resultant size of the Layer 3 packet.

flood

Sends 100 ping requests each second.

interface

Specifies the interface that the device must use as source address.

interval

Specifies the time in seconds for which the device must wait between ping requests.

mark

Specifies that the device must consider the ping request for special processing.

mtu-discovery

Specifies the path MTU discovery strategy.

no-loopback

Suppresses loop-back of multicast pings.

numeric

Does not resolve domain name system (DNS) names during ping.

pattern

Specifies the hexadecimal digit pattern to fill the packet.

quiet

Prints only the ping summary page.

record-route

Records the route that the packet takes.

size

Specifies the number of bytes to send for a ping request.

timestamp

Displays the timestamp during ping output.

tos

Marks packet with specified type of service (TOS).

ttl

Specifies the maximum packet life-time for a host.

verbose

Displays a detailed output for the ping command.

Operational mode

The `ping` command tests whether a network host is reachable.

The `ping` command uses the ECHO_REQUEST datagram (ping) of the ICMP protocol to get an ICMP ECHO_RESPONSE from a host or gateway. ECHO_REQUEST datagrams have an IP and an ICMP header, followed by a *struct timeval* data type and then an arbitrary number of pad bytes that are used to fill the packet.

When the `ping` command is interrupted by typing `<Ctrl>+c`, a brief statistical summary is displayed.

This example shows how to send a packet that contains all 1's. This example helps to diagnose data-dependent problems in a network.

```
vyatta@vyatta:~$ ping www.google.com pattern BCD
PATTERN: 0xbc0d
PING www.google.com (173.194.33.176) 56(84) bytes of data.
64 bytes from sea09s18-in-f16.1e100.net (173.194.33.176): icmp_req=1 ttl=54
 time=20.4 ms
64 bytes from sea09s18-in-f16.1e100.net (173.194.33.176): icmp_req=3 ttl=54
 time=20.3 ms
From 10.18.170.201 icmp_seq=2 Destination Host Unreachable
From 10.18.170.201 icmp_seq=4 Destination Host Unreachable

--- www.google.com ping statistics ---
205 packets transmitted, 103 received, +102 errors, 49% packet loss, time
 204233ms
rtt min/avg/max/mdev = 20.095/20.417/20.861/0.235 ms, pipe 4
vyatta@vyatta:~$ ^C
vyatta@vyatta:~$
```

ping quiet

Prints only the ping summary page.

`ping { ipv4_address | ipv6_address | hostname } quiet option`

ipv4_address

The IPv4 address of the host.

ipv6_address

The IPv6 address of the host.

hostname

A host being pinged. This keyword is used when the host is specified as a host name rather than as an IP address.

option

Each of the following entries are considered options. These options can be issued consecutively, that is, in the same command line.

adaptive

Adaptively sets interpacket interval.

allow-broadcast

Allows you to ping broadcast address.

audible

Makes a beep sound on every ping, while the device pings for host details.

bypass-route

Bypasses normal routing tables during ping.

count

Specifies the number of ping requests to send.

deadline

Specifies the number of seconds before which ping expires.

ether-size

Matches the overall size of the data packet with the resultant size of the Layer 3 packet.

flood

Sends 100 ping requests each second.

interface

Specifies an interface that the device must use as the source address.

interval

Specifies the time in seconds for which the device must wait between ping requests.

mark

Specifies that the device must consider the request for special processing.

mtu-discovery

Specifies the path MTU discovery strategy.

no-loopback

Suppresses loop-back of multicast pings.

numeric

Does not resolve domain name system (DNS) names during ping.

pattern

Specifies the hexadecimal digit pattern to fill the packet.

quiet

Prints only the ping summary page.

record-route

Records the route that the packet takes.

size

Specifies the number of bytes to send for a ping request.

timestamp

Displays the timestamp during ping output.

tos

Marks packet with specified type of service (TOS).

ttl

Specifies the maximum packet life-time for a host.

verbose

Displays a detailed output for the ping command.

Operational mode

The `ping` command tests whether a network host is reachable.

The `ping` command uses the ECHO_REQUEST datagram (ping) of the ICMP protocol to get an ICMP ECHO_RESPONSE from a host or gateway. ECHO_REQUEST datagrams have an IP and an ICMP header, followed by a *struct timeval* data type and then an arbitrary number of pad bytes that are used to fill the packet.

When the `ping` command is interrupted by typing `<Ctrl>+c`, a brief statistical summary is displayed.

This example shows how to print only the ping summary page for www.google.com.

```
vyatta@vyatta:~$ ping www.google.com quiet
--- www.google.com ping statistics ---
15 packets transmitted, 1 received, +14 errors, 93% packet loss, time
 41999ms
rtt min/avg/max/mdev = 20.264/20.264/20.264/0.000 ms
```

ping record-route

Records the route that a packet takes.

`ping { ipv4_address | ipv6_address | hostname } record-route option`

ipv4_address

Pings the IPv4 address of the host.

ipv6_address

Pings the IPv6 address of the host.

hostname

A host being pinged. This keyword is used when the host is specified as a host name rather than as an IP address.

option

Each of the following entries are considered options. These options can be issued consecutively, that is, in the same command line.

adaptive

Adaptively sets interpacket interval.

allow-broadcast

Allows you to ping broadcast address.

audible

Makes a beep sound on every ping, while the device pings for the host details.

bypass-route

Bypasses normal routing tables during ping.

count

Specifies the number of ping requests to send.

deadline

Specifies the number of seconds before which ping expires.

ether-size

Matches the overall size of the data packet with the resultant size of the Layer 3 packet.

flood

Sends 100 ping requests each second.

interface

Specifies an interface that the device must use as the source address.

interval

Specifies the time in seconds for which the device must wait between ping requests.

mark

Specifies that the device must consider the request for special processing.

mtu-discovery

Specifies the path MTU discovery strategy.

no-loopback

Suppresses loop-back of multicast pings.

numeric

Does not resolve domain name system (DNS) names during ping.

pattern

Specifies the hexadecimal digit pattern to fill the packet.

quiet

Prints only the ping summary page.

record-route

Records the route that the packet takes.

size

Specifies the number of bytes to send for a ping request.

timestamp

Displays the timestamp during ping output.

tos

Marks packet with specified type of service (TOS).

ttl

Specifies the maximum packet life-time for a host.

verbose

Displays a detailed output for the ping command.

Operational mode

The `ping` command tests whether a network host is reachable.

The `ping` command uses the ECHO_REQUEST datagram (ping) of the ICMP protocol to get an ICMP ECHO_RESPONSE from a host or gateway. ECHO_REQUEST datagrams have an IP and an ICMP header, followed by a *struct timeval* data type and then an arbitrary number of pad bytes that are used to fill the packet.

When the `ping` command is interrupted by typing `<Ctrl>+c`, a brief statistical summary is displayed.

ping size

Specifies the number of bytes to send for a ping request.

`ping { ipv4_address | ipv6_address | hostname } size bytes option`

ipv4_address

Pings the IPv4 address of the host.

ipv6_address

Pings the IPv6 address of the host.

hostname

A host being pinged. This keyword is used when the host is specified as a host name rather than as an IP address.

bytes

The number of bytes to send for a ping request.

option

Each of the following entries are considered options. These options can be issued consecutively, that is, in the same command line.

adaptive

Adaptively sets interpacket interval.

allow-broadcast

Allows you to ping broadcast address.

audible

Makes a beep sound during every ping, while the device pings for the host details.

bypass-route

Bypasses normal routing tables during ping.

count

Specifies the number of ping requests to send.

deadline

Specifies the number of seconds before which ping expires.

ether-size

Matches the overall size of the data packet with the resultant size of the Layer 3 packet.

flood

Sends 100 ping requests each second.

interface

Specifies an interface that the device must use as the source address.

interval

Specifies the time in seconds for which the device must wait between ping requests.

mark

Specifies that the device must consider the request for special processing.

mtu-discovery

Specifies the path MTU discovery strategy.

no-loopback

Suppresses loop-back of multicast pings.

numeric

Does not resolve domain name system (DNS) names during ping.

pattern

Specifies the hexadecimal digit pattern to fill the packet.

quiet

Prints only the ping summary page.

record-route

Records the route that the packet takes.

size

Specifies the number of bytes to send for a ping request.

timestamp

Displays the timestamp during ping output.

tos

Marks packet with specified type of service (TOS).

ttl

Specifies the maximum packet life-time for a host.

verbose

Displays a detailed output for the ping command.

Operational mode

The `ping` command tests whether a network host is reachable.

The `ping` command uses the ECHO_REQUEST datagram (ping) of the ICMP protocol to get an ICMP ECHO_RESPONSE from a host or gateway. ECHO_REQUEST datagrams have an IP and an ICMP header, followed by a *struct timeval* data type and then an arbitrary number of pad bytes that are used to fill the packet.

When the `ping` command is interrupted by typing `<Ctrl>+c`, a brief statistical summary is displayed.

This example shows how to specify the number of bytes to send while testing the IP address for network reachability.

```
vyatta@vyatta:~$ ping  2012:dead::1 size 1200
PING 2012:dead::1(2012:dead::1) 1200 data bytes
1208 bytes from 2012:dead::1: icmp_seq=1 ttl=64 time=0.046 ms
1208 bytes from 2012:dead::1: icmp_seq=2 ttl=64 time=0.128 ms
^C
--- 2012:dead::1 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 999ms
rtt min/avg/max/mdev = 0.046/0.087/0.128/0.041 ms
vyatta@VR-1:~$ ping  2012:dead::1
PING 2012:dead::1(2012:dead::1) 56 data bytes
64 bytes from 2012:dead::1: icmp_seq=1 ttl=64 time=0.026 ms
64 bytes from 2012:dead::1: icmp_seq=2 ttl=64 time=0.034 ms
^C
```

ping tos

Marks a packet with a specified time of service (TOS).

`ping { ipv4_address | ipv6_address | hostname } tos number option`

ipv4_address

Pings the IPv4 address of the host.

ipv6_address

Pings the IPv6 address of the host.

hostname

A host being pinged. This keyword is used when the host is specified as a host name rather than as an IP address.

number

The tos number.

option

Each of the following entries are considered options. These options can be issued consecutively, that is, in the same command line.

adaptive

Adaptively sets interpacket interval.

allow-broadcast

Allows you to ping broadcast address.

audible

Makes a beep sound during every ping, while the device pings for the host details.

bypass-route

Bypasses normal routing tables during ping.

count

Specifies the number of ping requests to send.

deadline

Specifies the number of seconds before which ping expires.

ether-size

Matches the overall size of the data packet with the resultant size of the Layer 3 packet.

flood

Sends 100 ping requests each second.

interface

Specifies an interface that the device must use as the source address.

interval

Specifies the time in seconds for which the device must wait between ping requests.

mark

Specifies that the device must consider the ping request for special processing.

mtu-discovery

Specifies the path MTU discovery strategy.

no-loopback

Suppresses loop-back of multicast pings.

numeric

Does not resolve domain name system (DNS) names during ping.

pattern

Specifies the hexadecimal digit pattern to fill the packet.

quiet

Prints only the ping summary page.

record-route

Records the route that the packet takes.

size

Specifies the number of bytes to send for a ping request.

timestamp

Displays the timestamp during ping output.

tos

Marks packet with specified type of service (TOS).

ttl

Specifies the maximum packet life-time for a host.

verbose

Displays a detailed output for the ping command.

Operational mode

The `ping` command tests whether a network host is reachable.

The `ping` command uses the ECHO_REQUEST datagram (ping) of the ICMP protocol to get an ICMP ECHO_RESPONSE from a host or gateway. ECHO_REQUEST datagrams have an IP and an ICMP header, followed by a *struct timeval* data type and then an arbitrary number of pad bytes that are used to fill the packet.

When the `ping` command is interrupted by typing `<Ctrl>+c`, a brief statistical summary is displayed.

This example shows how to test a packet for network reachability by defining the time of service as one second.

```
vyatta@vyatta:~$ ping 127.0.0.1 tos 1
PING 127.0.0.1 (127.0.0.1) 56(84) bytes of data.
64 bytes from 127.0.0.1: icmp_req=1 ttl=64 time=0.409 ms
64 bytes from 127.0.0.1: icmp_req=2 ttl=64 time=0.027 ms
^C
--- 127.0.0.1 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 999ms
rtt min/avg/max/mdev = 0.027/0.218/0.409/0.191 ms
```

ping ttl

Specifies the maximum packet life-time for a host.

`ping { ipv4_address | ipv6_address | hostname } ttl seconds option`

ipv4_address

The IPv4 address of the host.

ipv6_address

The IPv6 address of the host.

hostname

A host being pinged. This keyword is used when the host is specified as a host name rather than as an IP address.

seconds

The time in milliseconds to specify the maximum packet life-time for a host.

option

Each of the following entries are considered options. These options can be issued consecutively, that is, in the same command line.

adaptive

Adaptively sets interpacket interval.

allow-broadcast

Allows you to ping broadcast address.

audible

Makes a beep sound during every ping, while the device pings for the host details.

bypass-route

Bypasses normal routing tables during ping.

count

Specifies the number of ping requests to send.

deadline

Specifies the number of seconds before which ping expires.

ether-size

Matches the overall size of the data packet with the resultant size of the Layer 3 packet.

flood

Sends 100 ping requests each second.

interface

Specifies an interface that the device must use as the source address.

interval

Specifies the time in seconds for which the device must wait between ping requests.

mark

Specifies that the device must consider the ping request for special processing.

mtu-discovery

Specifies the path MTU discovery strategy.

no-loopback

Supress loop-back of multicast pings.

numeric

Does not resolve domain name system (DNS) names during ping.

pattern

Specifies the hexadecimal digit pattern to fill the packet.

quiet

Prints only the ping summary page.

record-route

Records the route that the packet takes.

size

Specifies the number of bytes to send for a ping request.

timestamp

Displays the timestamp during ping output.

tos

Marks packet with specified type of service (TOS).

ttl

Specifies the maximum packet life-time for a host.

verbose

Displays a detailed output for the ping command.

Operational mode

The `ping` command tests whether a network host is reachable.

The `ping` command uses the ECHO_REQUEST datagram (ping) of the ICMP protocol to get an ICMP ECHO_RESPONSE from a host or gateway. ECHO_REQUEST datagrams have an IP and an ICMP header, followed by a *struct timeval* data type and then an arbitrary number of pad bytes that are used to fill the packet.

When the `ping` command is interrupted by typing `<Ctrl>+c`, a brief statistical summary is displayed.

This example shows how to specify the maximum packet life-time for a host while testing the host for network reachability. The life-time defined in this example is 200 seconds.

```
vyatta@vyatta:~$ ping 192.1.2.2 ttl 200
PING 192.1.2.2 (192.1.2.2) 56(84) bytes of data.
64 bytes from 192.1.2.2: icmp_req=1 ttl=64 time=1.41 ms
^C
--- 192.1.2.2 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 1.412/1.412/1.412/0.000 ms
```

ping verbose

Displays a detailed output for the ping command.

```
ping { ipv4_address | ipv6_address | hostname } verbose option
```

ipv4_address

Pings the IPv4 address of the host.

ipv6_address

Pings the IPv6 address of the host.

hostname

A host being pinged. This keyword is used when the host is specified as a host name rather than as an IP address.

option

Each of the following entries are considered options. These options can be issued consecutively, that is, in the same command line.

adaptive

Adaptively sets interpacket interval.

allow-broadcast

Allows you to ping broadcast address.

audible

Makes a beep sound during every ping, while the device pings for the host details.

bypass-route

Bypasses normal routing tables during ping.

count

Specifies the number of ping requests to send.

deadline

Specifies the number of seconds before which ping expires.

ether-size

Matches the overall size of the data packet with the resultant size of the Layer-3 packet.

flood

Sends 100 ping requests each second.

interface

Specifies an interface that the device must use as the source address.

interval

Specifies the time in seconds for which the device must wait between ping requests.

mark

Specifies that the device must consider the ping request for special processing.

mtu-discovery

Specifies the path MTU discovery strategy.

no-loopback

Suppresses loop-back of multicast pings.

numeric

Does not resolve domain name system (DNS) names during ping.

pattern

Specifies the hexadecimal digit pattern to fill the packet.

quiet

Prints only the ping summary page.

record-route

Records the route that the packet takes.

size

Specifies the number of bytes to send for a ping request.

timestamp

Displays the timestamp during ping output.

tos

Marks packet with specified type of service (TOS).

ttl

Specifies the maximum packet life-time for a host.

verbose

Displays a detailed output for the ping command.

Operational mode

The `ping` command tests whether a network host is reachable.

The `ping` command uses the ECHO_REQUEST datagram (ping) of the ICMP protocol to get an ICMP ECHO_RESPONSE from a host or gateway. ECHO_REQUEST datagrams have an IP and an ICMP header, followed by a *struct timeval* data type and then an arbitrary number of pad bytes that are used to fill the packet.

When the `ping` command is interrupted by typing `<Ctrl>+c`, a brief statistical summary is displayed.

protocols nsm log

Enables logging for NSM.

```
set protocols nsm  { all | events | ha | kernel | packet }
```

```
delete protocols nsm  { all | events | ha | kernel | packet }
```

```
show protocols nsm  { all | events | ha | kernel | packet }
```

None

all

Enables all NSM logs.

events

Enables only NSM event logs.

ha

Enables only NSM high availability (HA) logs.

kernel

Enables only NSM kernel logs.

packet

Enables only NSM packet logs.

Configuration mode

```
protocols {
  nsm {
   log {
          all
       events
           ha
       kernel
       packet
           }
        }
    }
```

Use the `set` form of this command to enable NSM logs.

Use the `delete` form of this command to remove NSM logs.

Use the `show` form of this command to view NSM logs.

protocols nsm log ha

Enables logging for NSM HA.

`set protocols nsm ha { **all** }`

`delete protocols nsm ha { **all** }`

`show protocols nsm ha { **all** }`

None

all

Enables all NSM HA logs

Configuration mode

```
protocols {
  nsm {
   log {
        ha {
           all
            }
         }
      }
 }
```

Use the `set` form of this command to enable NSM high availability (HA) logs.

Use the `delete` form of this command to remove NSM HA logs.

Use the `show` form of this command to view NSM HA logs.

reset ip route kernel

Clears all the entries from the IP kernel route.

```
reset ip route kernel
```

Operational mode

Use this command to clear the entries from the IP kernel route.

reset ipv6 route kernel

Clears all the entries from the IPv6 kernel route.

```
reset ipv6 route kernel
```

Operational mode

Use this command to clear the entries from the IPv6 kernel route.

resources group address-group

Defines a group of IP addresses that are referenced in firewall rules.

`set resources group address-group` *`group-name`* { **`address`** *`address`* | **`description`** *`desc`* }

`delete resources group address-group` *`group-name`* { **`address`** *`address`* | **`description`** *`desc`* }

`show resources group address-group` *`group-name`* { **`address`** *`address`* | **`description`** *`desc`* }

group-name

Name of the firewall address group.

address

IPv4 address or range of IPv4 addresses. Specify IPv4 address ranges by separating two contiguous IPv4 addresses with a hyphen, for example, 10.0.0.1-10.0.0.50. The maximum number of addresses that you can add to an address group is 1024.

desc

Description of the firewall address group.

Configuration mode

```
resources {
    group {
        address-group group-name {
            address address
            description desc
        }
    }
}
```

Use this command to specify an address group. A firewall address group is a collection of host IP addresses and address ranges that, once defined, can be collectively referenced within a firewall command.

A firewall address group is considered matched if the packet address matches any address or address range within the group.

Use the `set` form of this command to specify the address group.

Use the `delete` form of this command to remove a firewall address group or its members.

Use the `show` form of this command to view the configuration of a firewall address group.

resources group icmp-group

Defines a group of ICMP types that may be referenced in firewall rules, policy-based routing rules, or QoS rules.

`set resources group icmp-group` *`group-name`* { **`description`** *`description`* | **`name`** *`name`* | **`type`** *`number`* [**`code`** *`number`*] }

`delete resources group icmp-group` *`group-name`* [**`description`** *`description`* | **`name`** *`name`* | **`type`** *`number`* [**`code`** *`number`*]]

`show resources group icmp-group` *`group-name`* [**`description`** *`description`* | **`name`** *`name`* | **`type`** *`number`* [**`code`** *`number`*]]

group-name

Name of the IPv4 ICMP group.

description

Description of the IPv4 ICMP group.

name

Name of an ICMP type.

type ***number***

IPv4 ICMP type (0-255).

code ***number***

IPv4 ICMP code (0-255).

Configuration mode

```
resources {
    group {
        icmp-group group-name {
            description description
            name name
            type number {
                code number
            }
        }
    }
}
```

Use this command to define an IPv4 Internet Control Message Protocol (ICMP) group. An ICMP group is a collection of ICMP types that, once defined, can be collectively referenced in firewall rules, policy-based routing rules, and Quality of Service (QoS) rules.

An ICMP group is considered matched if any ICMP type in the group is matched.

Use the `set` form of this command to define an ICMP group.

Use the `delete` form of this command to remove an ICMP group or its members.

Use the `show` form of this command to display an ICMP group or its members.

resources group icmpv6-group

Defines a group of ICMPv6 types that may be referenced in firewall rules, policy-based routing rules, or QoS rules.

`set resources group icmpv6-group` *`group-name`* { **`description`** *`description`* | **`name`** *`name`* | **`type`** *`number`* [**`code`** *`number`*] }

`delete resources group icmpv6-group` *`group-name`* [**`description`** *`description`* | **`name`** *`name`* | **`type`** *`number`* [**`code`** *`number`*]]

`show resources group icmpv6-group` *`group-name`* [**`description`** *`description`* | **`name`** *`name`* | **`type`** *`number`* [**`code`** *`number`*]]

group-name

Name of an ICMPv6 group.

description

Describes an ICMPv6 group.

name

Specifies the name of an ICMPv6 type.

type *number*

ICMPv6 type (0-255).

code *number*

ICMPv6 code (0-255).

Configuration mode

```
resources {
    group {
        icmpv6-group group-name {
            description description
            name name
            type number {
                code number
            }
        }
    }
}
```

Use this command to define an Internet Control Message Protocol Version 6 (ICMPv6) group. An ICMPv6 group is a collection of ICMPv6 types that, once defined, can be collectively referenced in firewall rules, policy-based routing rules, and Quality of Service (QoS) rules.

An ICMPv6 group is considered matched if any ICMPv6 type in the group is matched.

Use the `set` form of this command to define an ICMPv6 group.

Use the `delete` form of this command to remove an ICMPv6 group or its members.

Use the `show` form of this command to display an ICMPv6 group or its members.

resources group port-group

Defines a group of ports that are referenced in firewall rules.

`set resources group port-group` *`port-group-name`* { **`description`** *`description`* { **`port`** [*`name`* | *`1-65535`* | *`start`* **`-`** *`end`*] }

`delete resources group port-group` *`port-group-name`* { **`description`** *`description`* | **`port`** [*`name`* | *`1-65535`* | *`start`* **`-`** *`end`*] }

`show resources group port-group` *`port-group-name`* { **`description`** *`description`* | **`port`** *`name`* | *`1-65535`* | *`start`* **`-`** *`end`*] }

port-group-name

Name of the port group.

description

Description of the port group.

port [*name* | *1-65535* | *start* - *end*]

Port group parameters.

name

Name of an IP service; for example, http. You can specify any service name in the file `/etc/services`.

1-65535

Port number (1-65535).

start-end

Range of ports; for example, 1001-1005.

Configuration mode

```
resources {
 group {
  port-group group-name {
   port name
   description desc
  }
 }
}
```

Use this command to define a network group. A network group is a collection of network addresses that, once defined, can be collectively referenced within a firewall command. Only one port group can be specified. The port group must already be defined. A packet is considered a match for an address, a network, or a port group if it matches any host IP address, network address, or port name or number, respectively, in the group. However, if more than one group is specified, the packet must be a match for both groups in order to be considered a match. For example, if an address group and a port group are both specified, the packet's destination must match at least one item in the address group and at least one item in the port group.

Use the `set` form of this command to define a network group.

Use the `delete` form of this command to remove a network group or its members.

Use the `show` form of this command to view the configuration of a network group.

show ip forwarding

Displays IP forwarding status.

```
show ip forwarding
```

Operational mode

Use this command to display IP forwarding status.

The following example shows how to display the status of IP forwarding.

```
vyatta@vyatta:~$ show ip forwarding
IP forwarding is on
vyatta@vyatta:~$
```

show ip route

Displays routes stored in the Routing Information Base (RIB) and Forwarding Information Base (FIB).

```
show ip route [ ipv4 | ipv4net ]
```

Lists all routes stored in the RIB and FIB.

ipv4

Optional. An IP address.

ipv4net

Optional. A prefix.

Operational mode

Use this command to display routes stored in the RIB and FIB.

You can also see the routes shown in the FIB by using show ip route forward.

The following example shows how to display routes stored in the RIB and FIB.

```
vyatta@vyatta:~$ show ip route
Codes: K - kernel route, C - connected, S - static, R - RIP, O - OSPF,
       I - ISIS, B - BGP, > - selected route, * - FIB route
S>* 0.0.0.0/0 [1/0] via 10.1.0.1, dp0p0p0
O   10.1.0.0/24 [110/10] is directly connected, dp0p0p0, 05:35:15
C>* 10.1.0.0/24 is directly connected, dp0p0p0
O>* 10.192.32.0/24 [110/20] via 10.1.0.45, dp0p0p0, 05:35:15
O>* 10.192.128.0/24 [110/11] via 10.1.0.66, dp0p0p0, 05:35:15
O>* 10.192.128.1/32 [110/11] via 10.1.0.66, dp0p0p0, 05:35:15
O>* 10.192.129.0/24 [110/11] via 10.1.0.66, dp0p0p0, 05:35:15
```

```
O>* 10.192.130.0/24 [110/11] via 10.1.0.66, dp0p0p0, 05:35:15
O>* 10.192.131.0/24 [110/11] via 10.1.0.66, dp0p0p0, 05:35:15
C>* 127.0.0.0/8 is directly connected, lo
O>* 172.16.0.0/24 [110/11] via 10.1.0.4, dp0p0p0, 05:35:15
O>* 172.16.1.0/24 [110/11] via 10.1.0.4, dp0p0p0, 05:35:15
O>* 172.16.2.0/24 [110/11] via 10.1.0.4, dp0p0p0, 05:35:15
O>* 172.16.3.0/24 [110/11] via 10.1.0.4, dp0p0p0, 05:35:15
O>* 172.16.4.0/24 [110/11] via 10.1.0.4, dp0p0p0, 05:35:15
O>* 172.16.5.0/24 [110/11] via 10.1.0.4, dp0p0p0, 05:35:15
O>* 172.16.6.0/24 [110/11] via 10.1.0.4, dp0p0p0, 05:35:15
O>* 172.16.7.0/24 [110/11] via 10.1.0.4, dp0p0p0, 05:35:15
O>* 172.16.8.0/24 [110/11] via 10.1.0.4, dp0p0p0, 05:35:15
O>* 172.16.9.0/24 [110/11] via 10.1.0.4, dp0p0p0, 05:35:15
C>* 172.16.234.0/25 is directly connected, dp0p0p1
S>* 192.94.202.0/24 [1/0] via 172.16.234.27, dp0p0p1
```

The following example shows how to display information for the route to the 10.192.128.1 IP address.

```
vyatta@vyatta:~$ show ip route 10.192.128.1
Routing entry for 10.192.128.1/32
  Known via "ospf", distance 110, metric 11, best
  Last update 09:47:07 ago
  * 10.1.0.66, via dp0p0p0
vyatta@vyatta:~$
```

show ip route longer-prefixes

Displays prefixes in the Routing Information Base (RIB) that are longer than a specific IP address or prefix.

`show ip route` *`ipv4net`* **`longer-prefixes`**

ipv4net

Mandatory. An IP address or prefix.

Operational mode

Use this command to display all prefixes in the RIB that are longer than a specific IP address or prefix.

The following example shows how to display prefixes that are longer than the 10.192.128.0/24 prefix.

```
vyatta@vyatta:~$ show ip route 10.192.128.0/24 longer-prefixes
Codes: K - kernel route, C - connected, S - static, R - RIP, O - OSPF,
       I - ISIS, B - BGP, > - selected route, * - FIB route
O>* 10.192.128.0/24 [110/11] via 10.1.0.66, dp0p0p0, 09:36:20
```

```
O>* 10.192.128.1/32 [110/11] via 10.1.0.66, dp0p0p0, 09:36:20
vyatta@vyatta:~$
```

show ip route connected

Displays directly connected routes.

```
show ip route connected
```

Operational mode

Use this command to display routes that are directly connected to the local system.

The following example shows how to display directly connected routes.

```
vyatta@vyatta:~$ show ip route connected
Codes: K - kernel route, C - connected, S - static, R - RIP, O - OSPF,
       I - ISIS, B - BGP, > - selected route, * - FIB route
C>* 10.1.0.0/24 is directly connected, dp0p0p0
C>* 127.0.0.0/8 is directly connected, lo
C>* 172.16.234.0/25 is directly connected, dp0p0p1
vyatta@vyatta:~$
```

show ip route forward

Displays routes stored in the Forwarding Information Base (FIB).

```
show ip route forward [ ipv4net ]
```

Displays routes stored in the FIB.

ipv4net

Optional. A route for which information from the kernel forwarding table is displayed.

Operational mode

Use this command to display routes that are stored in the FIB.

The FIB contains multiple equal-cost paths, if they exist. Multiple equal-cost paths are needed before equal-cost multipath (ECMP) routing or WAN load balancing is performed.

The following example shows how to display routes stored in the FIB.

```
vyatta@vyatta:~$ show ip route forward
default via 10.1.0.1 dev dp0p0p0  proto zebra
10.1.0.0/24 dev dp0p0p0  proto kernel  scope link  src 10.1.0.62
10.192.32.0/24 via 10.1.0.45 dev dp0p0p0  proto zebra  metric 20
```

```
10.192.128.0/24 via 10.1.0.66 dev dp0p0p0  proto zebra  metric 11
10.192.128.1 via 10.1.0.66 dev dp0p0p0  proto zebra  metric 11
10.192.129.0/24 via 10.1.0.66 dev dp0p0p0  proto zebra  metric 11
10.192.130.0/24 via 10.1.0.66 dev dp0p0p0  proto zebra  metric 11
10.192.131.0/24 via 10.1.0.66 dev dp0p0p0  proto zebra  metric 11
172.16.0.0/24 via 10.1.0.4 dev dp0p0p0  proto zebra  metric 11
172.16.1.0/24 via 10.1.0.4 dev dp0p0p0  proto zebra  metric 11
172.16.2.0/24 via 10.1.0.4 dev dp0p0p0  proto zebra  metric 11
172.16.3.0/24 via 10.1.0.4 dev dp0p0p0  proto zebra  metric 11
172.16.4.0/24 via 10.1.0.4 dev dp0p0p0  proto zebra  metric 11
172.16.5.0/24 via 10.1.0.4 dev dp0p0p0  proto zebra  metric 11
172.16.6.0/24 via 10.1.0.4 dev dp0p0p0  proto zebra  metric 11
172.16.7.0/24 via 10.1.0.4 dev dp0p0p0  proto zebra  metric 11
172.16.8.0/24 via 10.1.0.4 dev dp0p0p0  proto zebra  metric 11
172.16.9.0/24 via 10.1.0.4 dev dp0p0p0  proto zebra  metric 11
172.16.234.0/25 dev dp0p0p1  proto kernel  scope link  src 172.16.234.23
192.94.202.0/24 via 172.16.234.27 dev dp0p0p1  proto zebra
vyatta@vyatta:~$
```

The following example shows how to display information from the FIB about the 10.1.0.0/24 route.

```
vyatta@vyatta:~$ show ip route forward 10.1.0.0/24
10.1.0.0/24 dev dp0p0p0  proto kernel  scope link  src 10.1.0.62
vyatta@vyatta:~$
```

show ip route kernel

Displays kernel routes.

```
show ip route kernel
```

Operational mode

Use this command to display kernel routes. Kernel routes are routes that have been added through a means other than by using the Vyatta CLI; for example, by using the operating system **route** command as shown here:

```
route add -net 10.172.24.0 netmask 255.255.255.0 gw 10.1.0.1
```

The following example shows how to display kernel routes.

```
vyatta@vyatta:~$ show ip route kernel
Codes: K - kernel route, C - connected, S - static, R - RIP, O - OSPF,
  I - ISIS, B - BGP, > - selected route, * - FIB route
K>* 10.172.24.0/24 via 10.1.0.1, dp0p0p0
vyatta@vyatta:~$
```

show ip route static

Displays static routes in the Routing Information Base (RIB).

```
show ip route static
```

Operational mode

Use this command to display static routes in the RIB.

The following example shows how to display static routes in the RIB.

```
vyatta@vyatta:~$ show ip route static
Codes: K - kernel route, C - connected, S - static, R - RIP, O - OSPF,
       I - ISIS, B - BGP, > - selected route, * - FIB route
S>* 0.0.0.0/0 [1/0] via 10.1.0.1, dp0p0p0
S>* 192.94.202.0/24 [1/0] via 172.16.234.27, dp0p0p1
vyatta@vyatta:~$
```

show ip route summary

Displays a summary of routes.

```
show ip route summary
```

Operational mode

Use this command to display a summary of the various routes by route source.

The following example shows how to display a summary of routes.

```
vyatta@vyatta:~$ show ip route summary
Route Source         Routes               FIB
connected            4                    4
static               2                    2
ospf                 1                    0
ebgp                 0                    0
ibgp                 289016               289011
------
Totals               289023               289017
vyatta@vyatta:~$
```

show ip route supernets-only

Displays supernet routes.

```
show ip route supernets-only
```

Operational mode

Use this command to display supernet routes.

Supernet routes are routes that have a subnet mask that is less specific than the usual classful mask.

The following example shows how to display supernet routes.

```
vyatta@vyatta:~$ show ip route supernets-only
Codes: K - kernel route, C - connected, S - static, R - RIP, O - OSPF,
       I - ISIS, B - BGP, > - selected route, * - FIB route
S>* 0.0.0.0/0 [1/0] via 10.1.0.1, dp0p0p0
vyatta@vyatta:~$
```

show ip route table

Displays routes stored in an alternate routing table.

```
show ip route table table-number
```

table *table-number*

An alternate routing table.

Operational mode

Use this command to view routes stored in an alternate routing table. Alternate routing tables are used with policy-based routing. Refer to *Policy-based Routing Configuration Guide* for information on policy-based routing.

The following example shows how to display routes in alternate routing table 5.

```
vyatta@vyatta:~$ show ip route table 5
table 5:
Codes: K - kernel route, C - connected, S - static, R - RIP, O - OSPF,
       I - ISIS, B - BGP, > - selected route, * - FIB route
S>* 12.34.56.0/24 [1/0] via 192.168.1.254, dp0p0p0
vyatta@vyatta:~$
```

show ip route variance

Detects the routes that are missing from the RIB, kernel, and data plane table and stores the discrepancy in a file.

```
show ip route variance
```

Operational mode

Detects the routes that are missing from the RIB, kernel, and data plane table and stores the discrepancy in the following file: `/home/<username>/vyatta_rtvariance.output`. A missing route is identified by using codes such as R for RIB, K for kernel, and D for data plane. This command verifies only active routes and interfaces and can help during debugging.

Note: IP Infusion Inc. recommends that you use the command in a stable environment to ensure that you do not get wrong results. The router may take more time to generate the output if the system has millions of routes.

The following example shows how to store the discrepancy in the following file: `/home/vyatta/vyatta_rtvariance.output`. The following output indicates that an IPv4 route is missing from the kernel.

```
vyatta@vyatta# show ip route variance
Output is dumped in the file: /home/vyatta/vyatta_rtvariance.output
```

show ip route variance console

Detects the routes that are missing from the RIB, kernel, and data plane table and displays the discrepancy at the console.

```
show ip route variance console
```

Operational mode

Compares the routes in the RIB, kernel, and data plane table, detects missing routes, and displays the discrepancy at the console . The discrepancy contains IPv4 routes and addresses that are missing from the RIB, kernel, and data plane table. A missing route is identified by using codes such as R for RIB, K for kernel, and D for data plane. This command verifies only active routes and interfaces and can help during debugging.

Note: IP Infusion Inc. recommends that you use the command in a stable environment to ensure that you do not get wrong results. The router may take more time to generate the output if the system has millions of routes.

The following example shows how to display the discrepancy information at the console. The output displays the following information:

- The interface variance table indicates that the 88.88.88.4 address which is configured on the lo4 interface is missing from the data plane.
- The route variance table indicates that the 200.9.9.0/32 address route with the 12.12.12.20 nexthop is missing from both the kernel and data plane.

```
vyatta@vyatta# show ip route variance console
```

```
Codes: R - RIB, K - Kernel, D - Dataplane
(Indicates the table Id in which the address/route is missing)

Interface Variance Table:
D  88.88.88.4 lo4 (present in Kernel)
K  201.202.203.0 dp0s8 (present in RIB)
K  6.6.6.0 dp0s7.1 (present in RIB)
R  12.12.12.0 dp0s7 (present in Kernel)

Route Variance Table:
Table Absence  Route
def   D        100.4.4.4/32 via 12.12.12.18
def   K        100.1.1.1/32 via 12.12.12.19
def   KD       200.9.9.0/24 via 12.12.12.20
def   R        100.1.1.1/32 via 12.12.12.17
def   R        200.1.1.1/32 via 12.12.12.20
def   RK       100.4.4.4/32 via 12.12.12.28
def   RK       200.20.20.20/32 via 12.12.12.30
```

The following example shows how to display the discrepancy at the console. The output indicates that all tables are synchronized and that no routes and interfaces are missing.

```
vyatta@vyatta# show ip route variance console

No Variance, Inteface addresses and Routes are in sync
```

show ipv6 route

Displays IPv6 routes stored in the Routing Information Base (RIB) and Forwarding Information Base (FIB).

```
show ipv6 route   [ ipv6 | ipv6net ]
```

Displays all IPv6 routes in the RIB and FIB.

ipv6

Optional. An IPv6 address.

ipv6net

Optional. An IPv6 prefix.

Operational mode

Use this command to display IPv6 routes stored in the RIB and FIB.

You can also see the routes shown in the FIB by using show ip route forward.

show ipv6 route longer-prefixes

Displays IPv6 prefixes in the Routing Information Base (RIB) that are longer than a specific IPv6 address or prefix.

```
show ipv6 route ipv6net longer-prefixes
```

ipv6net

Mandatory. An IPv6 address or prefix.

Operational mode

Use this command to display all prefixes in the RIB that are longer than a specific IPv6 address or prefix.

show ipv6 route bgp

Displays IPv6 Border Gateway Protocol (BGP) routes.

```
show ipv6 route bgp
```

Operational mode

Use this command to display IPv6 BGP routes.

show ipv6 route connected

Displays IPv6 connected routes.

```
show ipv6 route connected
```

Operational mode

Use this command to display IPv6 routes that are directly connected to the local system.

show ipv6 route forward

Displays IPv6 routes stored in the Forwarding Information Base (FIB).

```
show ipv6 route forward [ ipv6net ]
```

Displays IPv6 routes stored in the FIB.

ipv6net

Optional. An IPv6 route for which information from the kernel forwarding table is displayed.

Operational mode

Use this command to display routes that are stored in the FIB.

The FIB contains multiple equal-cost paths, if they exist. Multiple equal-cost paths are needed before equal-cost multipath (ECMP) routing or WAN load balancing is performed.

show ipv6 route kernel

Displays IPv6 kernel routes.

```
show ipv6 route kernel
```

Operational mode

Use this command to display IPv6 kernel routes. Kernel routes are routes that have been added through a means other than by using the Vyatta CLI.

show ipv6 route ripng

Displays IPv6 Routing Information Protocol next generation (RIPng) routes.

```
show ipv6 route ripng
```

Operational mode

Use this command to display IPv6 RIPng routes.

show ipv6 route static

Displays IPv6 static routes.

```
show ipv6 route static
```

Operational mode

Use this command to display IPv6 static routes.

show ipv6 route variance

Detects the IPv6 routes that are missing from the RIB, kernel, and data plane table and stores the discrepancy in a file.

```
show ipv6 route variance
```

Operational mode

Compares the routes in the RIB, kernel, and data plane table, detects missing IPv6 routes, and stores the discrepancy in the following file: `/home/<username>/`

`vyatta_rtvariance.output`. The discrepancy contains IPv6 routes and addresses that are missing from the RIB, kernel, or data plane table. A missing route is identified by using codes such as R for RIB, K for kernel, and D for data plane. This command verifies only active routes and interfaces and can help during debugging.

Note: IP Infusion Inc. recommends that you use the command in a stable environment to ensure that you do not get wrong results. The router may take more time to generate the output if the system has millions of routes.

The following example shows how to store the discrepancy in the following file: `/home/<username>/vyatta_rtvariance.output`.

```
vyatta@vyatta# show ipv6 route variance
Output is dumped in the file: /home/vyatta/vyatta_rtvariance.output
```

show ipv6 route variance console

Detects IPv6 routes that are missing from the RIB, kernel, and data plane table and displays the discrepancy at the console.

```
show ipv6 route variance console
```

Operational mode

Detects the IPv6 routes that are missing from the RIB, kernel, and data plane tables and displays the discrepancy at the console. The discrepancy contains IPv6 routes and addresses that are missing from the RIB, kernel, and data plane table. A missing route is identified by using codes such as R for RIB, K for kernel, and D for data plane. This command verifies only active routes and interfaces and can help during debugging.

Note: IP Infusion Inc. recommends that you use the command in a stable environment to ensure that you do not get wrong results. The router may take more time to generate the output if the system has millions of routes.

The following example shows how to display the discrepancy at the console. The following output indicates that 2626:1111:2222:3333:4444:5555:8888:1 address is missing from the data plane. The route variance table indicates that all tables are synchronized and that no IPv6 route is missing.

```
vyatta@vyatta# show ipv6 route variance console

Codes: R - RIB, K - Kernel, D - Dataplane (Indicates the table Id in which
 the address/route is missing)

Interface Variance Table:

     D    2626:1111:2222:3333:4444:5555:8888:1 dp0s3 (present in Kernel)
```

```
Route Variance Table:
Routes are in sync
```

show monitoring protocols rib

Displays Routing Information Base (RIB) debugging flags.

```
show monitoring protocols rib
```

Operational mode

Use this command to display RIB debugging flags.

traceroute as-path

Displays the route that packets take to a network host.

`traceroute` [**ipv4** | **ipv6**] *host* **as-path** [**options**]

ipv4

Explicitly force IPv4 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv4.

ipv6

Explicitly force IPv6 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv6.

host

A host that is the destination for the trace. The host is specified as a name (if DNS is being used on the network), as an IPv4 or IPv6 address, or as a MAC address (format h:h:h:h:h:h:h:h).

as-path

Performs AS path lookups in routing registries and print results directly after the corresponding addresses.

options

The following entries are options. Multiple options can be included on the same command line.

bypass-routing

Bypasses the normal routing tables and send directly to a host on an attached network. If the host is not on a directly-attached network, an error is returned. This option can be used to ping a local host through an interface that has no route through it.

debug-socket

Enables socket level debugging.

first-ttl *value*

Specifies the first time-to-live value. Defaults to 1.

gateway *address*

Routes the request through a specified gateway.

icmp-echo

Uses ICMP echo for the traceroute probe.

icmp-extensions

Shows ICMP extensions (rfc4884). The general form is *CLASS/TYPE:* followed by a hexadecimal dump.

interface *value*

Specifies the interface that the device must use for traceroute requests.

interval *value*

Specifies the time in seconds between traceroute requests from the device.

max-ttl *value*

Specifies the maximum number of hops for the probe.

no-fragment

Does not fragment the probe packets.

num-queries *number*

Specifies the number of probe packets per hop. The default is 3.

port *number*

For UDP tracing, specifies the destination port base traceroute will use (the destination port number will be incremented by each probe). For ICMP tracing, specifies the initial icmp sequence value (incremented by each probe too). For TCP specifies just the (constant) destination port to connect.

seq-queries *number*

Specifies the number of sequential probe packets.

source-addr *host*

Specifies an alternative source host by hostname, IPv4 address, or MAC address.

tcp-syn

Uses TCP SYN for the probes.

tos *value*

Marks the packets with the specified Type of Service (TOS) value.

version

Displays the timestamp during ping output.

wait-time *value*

Specifies the time (seconds) to wait for a response from the probe. Default is 5 seconds.

Operational mode

Use this command to perform a “traceroute” operation for a network host. This operation uses the IP protocol time-to-live (TTL) field and attempts to elicit an Internet Control Message Protocol (ICMP) TIME_EXCEEDED response from each gateway along the path to a host to track the route that a set of packets follows. It attempts to trace the route an IP packet follows to an Internet host by launching User Datagram Protocol (UDP) probe packets with a small time to live, then listening for an ICMP “Time exceeded” reply from a gateway.

The following example illustrates a traceroute to google.com including AS path information.

```
vyatta@vyatta#traceroute google.com as-path
traceroute to google.com (216.58.192.14), 30 hops max, 60 byte packets
 1  10.18.170.1 (10.18.170.1) [*]  0.681 ms  0.529 ms  0.580 ms
 2  10.31.23.6 (10.31.23.6) [*]  0.476 ms  0.433 ms  0.481 ms
 3  10.254.33.1 (10.254.33.1) [*]  0.864 ms  0.831 ms  0.826 ms
 4  144.49.130.145 (144.49.130.145) [AS29791/AS21948]  8.022 ms  1.183 ms
 1.295 ms
 5  ae6-395.edge8.sanjose1.level3.net (209.244.104.65) [AS3356]  2.106 ms
 2.046 ms  2.006 ms
 6  ae-1-60.edge1.sanjose3.level3.net (4.69.152.16) [AS3356]  2.887 ms * *
 7  72.14.223.91 (72.14.223.91) [AS15169]  2.878 ms  2.972 ms  2.938 ms
 8  209.85.249.3 (209.85.249.3) [AS15169]  3.430 ms  4.754 ms  3.460 ms
 9  74.125.37.41 (74.125.37.41) [AS15169]  4.568 ms  4.516 ms  4.455 ms
10  nuq04s29-in-f14.1e100.net (216.58.192.14) [AS15169]  3.159 ms  3.134 ms
  3.097 ms
```

traceroute bypass-routing

Displays the route that packets take to a network host.

`traceroute` [**ipv4** | **ipv6**] *host* **bypass-routing** [**options**]

ipv4

Explicitly force IPv4 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv4.

ipv6

Explicitly force IPv6 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv6.

host

A host that is the destination for the trace. The host is specified as a name (if DNS is being used on the network), as an IPv4 or IPv6 address, or as a MAC address (format h:h:h:h:h:h:h:h).

bypass-routing

Bypasses the normal routing tables and send directly to a host on an attached network. If the host is not on a directly-attached network, an error is returned. This option can be used to ping a local host through an interface that has no route through it.

options

The following entries are options. Multiple options can be included on the same command line.

as-path

Performs AS path lookups in routing registries and print results directly after the corresponding addresses.

debug-socket

Enables socket level debugging.

first-ttl *value*

Specifies the first time-to-live value. Defaults to 1.

gateway *address*

Routes the request through a specified gateway.

icmp-echo

Uses ICMP echo for the traceroute probe.

icmp-extensions

Shows ICMP extensions (rfc4884). The general form is *CLASS/TYPE:* followed by a hexadecimal dump.

interface *value*

Specifies the interface that the device must use for traceroute requests.

interval *value*

Specifies the time in seconds between traceroute requests from the device.

max-ttl *value*

Specifies the maximum number of hops for the probe.

no-fragment

Does not fragment the probe packets.

num-queries *number*

Specifies the number of probe packets per hop. The default is 3.

port *number*

For UDP tracing, specifies the destination port base traceroute will use (the destination port number will be incremented by each probe). For ICMP tracing, specifies the initial icmp sequence value (incremented by each probe too). For TCP specifies just the (constant) destination port to connect.

seq-queries *number*

Specifies the number of sequential probe packets.

source-addr *host*

Specifies an alternative source host by hostname, IPv4 address, or MAC address.

tcp-syn

Uses TCP SYN for the probes.

tos *value*

Marks the packets with the specified Type of Service (TOS) value.

version

Displays the timestamp during ping output.

wait-time *value*

Specifies the time (seconds) to wait for a response from the probe. Default is 5 seconds.

Operational mode

Use this command to perform a “traceroute” operation for a network host. This operation uses the IP protocol time-to-live (TTL) field and attempts to elicit an Internet Control Message Protocol (ICMP) TIME_EXCEEDED response from each gateway along the path to a host to track the route that a set of packets follows. It attempts to trace the route an IP packet follows to an Internet host by launching User Datagram Protocol (UDP) probe packets with a small time to live, then listening for an ICMP “Time exceeded” reply from a gateway.

The following example illustrates a traceroute to google.com bypassing the normal routing tables. Note that an error message appears because google.com is not on a directly attached network.

```
vyatta@vyatta#traceroute google.com bypass-routing
traceroute to google.com (216.58.192.14), 30 hops max, 60 byte packets
connect:network is unreachable
```

traceroute debug-socket

Displays the route that packets take to a network host.

`traceroute [ ipv4 | ipv6 ] host debug-socket [ options ]`

ipv4

Explicitly force IPv4 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv4.

ipv6

Explicitly force IPv6 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv6.

host

A host that is the destination for the trace. The host is specified as a name (if DNS is being used on the network), as an IPv4 or IPv6 address, or as a MAC address (format h:h:h:h:h:h:h:h).

debug-socket

Enables socket level debugging.

options

The following entries are options. Multiple options can be included on the same command line.

as-path

Performs AS path lookups in routing registries and print results directly after the corresponding addresses.

bypass-routing

Bypasses the normal routing tables and send directly to a host on an attached network. If the host is not on a directly-attached network, an error is returned. This option can be used to ping a local host through an interface that has no route through it.

first-ttl *value*

Specifies the first time-to-live value. Defaults to 1.

gateway *address*

Routes the request through a specified gateway.

icmp-echo

Uses ICMP echo for the traceroute probe.

icmp-extensions

Shows ICMP extensions (rfc4884). The general form is *CLASS/TYPE:* followed by a hexadecimal dump.

interface *value*

Specifies the interface that the device must use for traceroute requests.

interval *value*

Specifies the time in seconds between traceroute requests from the device.

max-ttl *value*

Specifies the maximum number of hops for the probe.

no-fragment

Does not fragment the probe packets.

num-queries *number*

Specifies the number of probe packets per hop. The default is 3.

port *number*

For UDP tracing, specifies the destination port base traceroute will use (the destination port number will be incremented by each probe). For ICMP tracing, specifies the initial icmp sequence value (incremented by each probe too). For TCP specifies just the (constant) destination port to connect.

seq-queries *number*

Specifies the number of sequential probe packets.

source-addr *host*

Specifies an alternative source host by hostname, IPv4 address, or MAC address.

tcp-syn

Uses TCP SYN for the probes.

tos *value*

Marks the packets with the specified Type of Service (TOS) value.

version

Displays the timestamp during ping output.

wait-time *value*

Specifies the time (seconds) to wait for a response from the probe. Default is 5 seconds.

Operational mode

Use this command to perform a “traceroute” operation for a network host. This operation uses the IP protocol time-to-live (TTL) field and attempts to elicit an Internet Control Message Protocol (ICMP) TIME_EXCEEDED response from each gateway along the path to a host to track the route that a set of packets follows. It attempts to trace the route an IP packet follows to an Internet host by launching User Datagram Protocol (UDP) probe packets with a small time to live, then listening for an ICMP “Time exceeded” reply from a gateway.

The following example illustrates a traceroute to google.com with socket level debugging enabled.

```
vyatta@vyatta#traceroute google.com debug-socket
traceroute to google.com (216.58.216.14), 30 hops max, 60 byte packets
1  gateway.attlocal.net (10.0.6.1)  0.422 ms  0.399 ms  0.498 ms
2  75-25-153-214.uvs.sntcca.sbcglobal.net (75.25.153.214)  16.520 ms  6.484
 ms  6.460 ms
3  76-198-128-2.lightspeed.mtvwca.sbcglobal.net (76.198.128.2)  33.529 ms
 36.814 ms  26.584 ms
4  71.145.0.192 (71.145.0.192)  26.546 ms  39.056 ms  38.523 ms
5  12.83.39.189 (12.83.39.189)  39.763 ms  30.819 ms  44.405 ms
6  12.122.136.181 (12.122.136.181)  44.407 ms  43.366 ms  43.334 ms
7  * * *
8  216.239.49.170 (216.239.49.170)  28.635 ms 216.239.49.168
 (216.239.49.168)  28.293 ms
                                                          216.239.49.170
 (216.239.49.170)  25.805 ms
9  209.85.246.253 (209.85.246.253)  32.914 ms  34.112 ms 209.85.246.20
 (209.85.246.20)  30.330 ms
10  64.233.174.204 (64.233.174.204)  36.979 ms  36.492 ms  38.584 ms
11  64.233.175.151 (64.233.175.151)  37.497 ms  37.496 ms 64.233.174.189
 (64.233.174.189)  37.503 ms
12  209.85.142.91 (209.85.142.91)  36.126 ms  36.735 ms  36.686 ms
```

```
13  lax02s21-in-f14.1e100.net (216.58.216.14)  34.280 ms  32.453 ms  31.764
 ms
```

traceroute first-ttl

Displays the route that packets take to a network host.

`traceroute` [**ipv4** | **ipv6**] *host* **first-ttl** *value* [**options**]

ipv4

Explicitly force IPv4 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv4.

ipv6

Explicitly force IPv6 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv6.

host

A host that is the destination for the trace. The host is specified as a name (if DNS is being used on the network), as an IPv4 or IPv6 address, or as a MAC address (format h:h:h:h:h:h:h:h).

first-ttl *value*

Specifies the first time-to-live value. Defaults to 1.

options

The following entries are options. Multiple options can be included on the same command line.

as-path

Performs AS path lookups in routing registries and print results directly after the corresponding addresses.

bypass-routing

Bypasses the normal routing tables and send directly to a host on an attached network. If the host is not on a directly-attached network, an error is returned. This option can be used to ping a local host through an interface that has no route through it.

debug-socket

Enables socket level debugging.

gateway *address*

Routes the request through a specified gateway.

icmp-echo

Uses ICMP echo for the traceroute probe.

icmp-extensions

Shows ICMP extensions (rfc4884). The general form is *CLASS/TYPE:* followed by a hexadecimal dump.

interface *value*

Specifies the interface that the device must use for traceroute requests.

interval *value*

Specifies the time in seconds between traceroute requests from the device.

max-ttl *value*

Specifies the maximum number of hops for the probe.

no-fragment

Does not fragment the probe packets.

num-queries *number*

Specifies the number of probe packets per hop. The default is 3.

port *number*

For UDP tracing, specifies the destination port base traceroute will use (the destination port number will be incremented by each probe). For ICMP tracing, specifies the initial icmp sequence value (incremented by each probe too). For TCP specifies just the (constant) destination port to connect.

seq-queries *number*

Specifies the number of sequential probe packets.

source-addr *host*

Specifies an alternative source host by hostname, IPv4 address, or MAC address.

tcp-syn

Uses TCP SYN for the probes.

tos *value*

Marks the packets with the specified Type of Service (TOS) value.

version

Displays the timestamp during ping output.

wait-time *value*

Specifies the time (seconds) to wait for a response from the probe. Default is 5 seconds.

Operational mode

Use this command to perform a “traceroute” operation for a network host. This operation uses the IP protocol time-to-live (TTL) field and attempts to elicit an Internet Control Message Protocol (ICMP) TIME_EXCEEDED response from each gateway along the path to a host to track the route that a set of packets follows. It attempts to trace the route an IP packet follows to an Internet host by launching User Datagram Protocol (UDP) probe packets with a small time to live, then listening for an ICMP “Time exceeded” reply from a gateway.

The following example illustrates a traceroute to google.com with the first time-to-live set to 3.

```
vyatta@vyatta#traceroute google.com first-ttl 3
traceroute to google.com (74.125.224.7), 30 hops max, 60 byte packets
3  76-198-128-2.lightspeed.mtvwca.sbcglobal.net (76.198.128.2)  36.929 ms
 38.025 ms  38.016 ms
4  71.145.0.192 (71.145.0.192)  37.998 ms  41.153 ms  40.586 ms
5  12.83.39.189 (12.83.39.189)  43.315 ms 12.83.39.185 (12.83.39.185)
 39.053 ms
                                                              12.83.39.189
 (12.83.39.189)  43.311 ms
6  12.122.136.181 (12.122.136.181)  69.120 ms  69.564 ms  69.086 ms
7  * * *
8  216.239.49.168 (216.239.49.168)  49.860 ms  53.125 ms  39.522 ms
9  72.14.232.33 (72.14.232.33)  35.172 ms  34.588 ms  35.129 ms
10  nuq04s18-in-f7.1e100.net (74.125.224.7)  37.639 ms  36.897 ms  32.858
 ms
```

traceroute gateway

Displays the route that packets take to a network host.

`traceroute` [**ipv4** | **ipv6**] *host* **gateway** *address* [**options**]

ipv4

Explicitly force IPv4 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv4.

ipv6

Explicitly force IPv6 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv6.

host

A host that is the destination for the trace. The host is specified as a name (if DNS is being used on the network), as an IPv4 or IPv6 address, or as a MAC address (format h:h:h:h:h:h:h:h).

gateway *address*

Routes the request through a specified gateway.

options

The following entries are options. Multiple options can be included on the same command line.

as-path

Performs AS path lookups in routing registries and print results directly after the corresponding addresses.

bypass-routing

Bypasses the normal routing tables and send directly to a host on an attached network. If the host is not on a directly-attached network, an error is returned.

This option can be used to ping a local host through an interface that has no route through it.

debug-socket

Enables socket level debugging.

first-ttl *value*

Specifies the first time-to-live value. Defaults to 1.

icmp-echo

Uses ICMP echo for the traceroute probe.

icmp-extensions

Shows ICMP extensions (rfc4884). The general form is *CLASS/TYPE:* followed by a hexadecimal dump.

interface *value*

Specifies the interface that the device must use for traceroute requests.

interval *value*

Specifies the time in seconds between traceroute requests from the device.

max-ttl *value*

Specifies the maximum number of hops for the probe.

no-fragment

Does not fragment the probe packets.

num-queries *number*

Specifies the number of probe packets per hop. The default is 3.

port *number*

For UDP tracing, specifies the destination port base traceroute will use (the destination port number will be incremented by each probe). For ICMP tracing, specifies the initial icmp sequence value (incremented by each probe too). For TCP specifies just the (constant) destination port to connect.

seq-queries *number*

Specifies the number of sequential probe packets.

source-addr *host*

Specifies an alternative source host by hostname, IPv4 address, or MAC address.

tcp-syn

Uses TCP SYN for the probes.

tos *value*

Marks the packets with the specified Type of Service (TOS) value.

version

Displays the timestamp during ping output.

wait-time *value*

Specifies the time (seconds) to wait for a response from the probe. Default is 5 seconds.

Operational mode

Use this command to perform a “traceroute” operation for a network host. This operation uses the IP protocol time-to-live (TTL) field and attempts to elicit an Internet Control Message Protocol (ICMP) TIME_EXCEEDED response from each gateway along the path to a host to track the route that a set of packets follows. It attempts to trace the route an IP packet follows to an Internet host by launching User Datagram Protocol (UDP) probe packets with a small time to live, then listening for an ICMP “Time exceeded” reply from a gateway.

The following example illustrates a traceroute to google.com with the gateway set.

```
vyatta@vyatta#traceroute google.com gateway
```

traceroute icmp-echo

Displays the route that packets take to a network host.

`traceroute [ ipv4 | ipv6 ] host icmp-echo [ options ]`

ipv4

Explicitly force IPv4 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv4.

ipv6

Explicitly force IPv6 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv6.

host

A host that is the destination for the trace. The host is specified as a name (if DNS is being used on the network), as an IPv4 or IPv6 address, or as a MAC address (format h:h:h:h:h:h:h:h).

icmp-echo

Uses ICMP echo for the traceroute probe.

options

The following entries are options. Multiple options can be included on the same command line.

as-path

Performs AS path lookups in routing registries and print results directly after the corresponding addresses.

bypass-routing

Bypasses the normal routing tables and send directly to a host on an attached network. If the host is not on a directly-attached network, an error is returned.

This option can be used to ping a local host through an interface that has no route through it.

debug-socket

Enables socket level debugging.

first-ttl *value*

Specifies the first time-to-live value. Defaults to 1.

gateway *address*

Routes the request through a specified gateway.

icmp-extensions

Shows ICMP extensions (rfc4884). The general form is *CLASS/TYPE:* followed by a hexadecimal dump.

interface *value*

Specifies the interface that the device must use for traceroute requests.

interval *value*

Specifies the time in seconds between traceroute requests from the device.

max-ttl *value*

Specifies the maximum number of hops for the probe.

no-fragment

Does not fragment the probe packets.

num-queries *number*

Specifies the number of probe packets per hop. The default is 3.

port *number*

For UDP tracing, specifies the destination port base traceroute will use (the destination port number will be incremented by each probe). For ICMP tracing, specifies the initial icmp sequence value (incremented by each probe too). For TCP specifies just the (constant) destination port to connect.

seq-queries *number*

Specifies the number of sequential probe packets.

source-addr *host*

Specifies an alternative source host by hostname, IPv4 address, or MAC address.

tcp-syn

Uses TCP SYN for the probes.

tos *value*

Marks the packets with the specified Type of Service (TOS) value.

version

Displays the timestamp during ping output.

wait-time *value*

Specifies the time (seconds) to wait for a response from the probe. Default is 5 seconds.

Operational mode

Use this command to perform a “traceroute” operation for a network host. This operation uses the IP protocol time-to-live (TTL) field and attempts to elicit an Internet Control Message Protocol (ICMP) TIME_EXCEEDED response from each gateway along the path to a host to track the route that a set of packets follows. It attempts to trace the route an IP packet follows to an Internet host by launching User Datagram Protocol (UDP) probe packets with a small time to live, then listening for an ICMP “Time exceeded” reply from a gateway.

The following example illustrates a traceroute to google.com using ICMP echo for the traceroute probe.

```
vyatta@vyatta#traceroute google.com icmp-echo
traceroute to google.com (74.125.224.9), 30 hops max, 60 byte packets
 1  gateway.attlocal.net (10.0.6.1)  0.512 ms  0.510 ms  0.507 ms
 2  75-25-153-214.uvs.sntcca.sbcglobal.net (75.25.153.214)  3.175 ms  3.194
 ms  3.194 ms
 3  76-198-128-2.lightspeed.mtvwca.sbcglobal.net (76.198.128.2)  24.351 ms
 25.192 ms  25.201 ms
 4  71.145.0.192 (71.145.0.192)  26.644 ms  27.905 ms  27.910 ms
 5  12.83.39.185 (12.83.39.185)  28.728 ms  32.328 ms  32.335 ms
 6  12.122.136.181 (12.122.136.181)  68.186 ms  67.898 ms  67.853 ms
 7  * * *
 8  216.239.49.168 (216.239.49.168)  25.336 ms  26.631 ms  27.460 ms
 9  72.14.232.33 (72.14.232.33)  26.151 ms  26.620 ms  27.186 ms
10  nuq04s18-in-f9.1e100.net (74.125.224.9)  27.531 ms  24.783 ms  24.752
 ms
```

traceroute icmp-extensions

Displays the route that packets take to a network host.

`traceroute [ ipv4 | ipv6 ] host icmp-extensions [ options ]`

ipv4

Explicitly force IPv4 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv4.

ipv6

Explicitly force IPv6 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv6.

host

A host that is the destination for the trace. The host is specified as a name (if DNS is being used on the network), as an IPv4 or IPv6 address, or as a MAC address (format h:h:h:h:h:h:h:h).

icmp-extensions

Shows ICMP extensions (rfc4884). The general form is *CLASS/TYPE:* followed by a hexadecimal dump.

options

The following entries are options. Multiple options can be included on the same command line.

as-path

Performs AS path lookups in routing registries and print results directly after the corresponding addresses.

bypass-routing

Bypasses the normal routing tables and send directly to a host on an attached network. If the host is not on a directly-attached network, an error is returned. This option can be used to ping a local host through an interface that has no route through it.

debug-socket

Enables socket level debugging.

first-ttl *value*

Specifies the first time-to-live value. Defaults to 1.

gateway *address*

Routes the request through a specified gateway.

icmp-echo

Uses ICMP echo for the traceroute probe.

interface *value*

Specifies the interface that the device must use for traceroute requests.

interval *value*

Specifies the time in seconds between traceroute requests from the device.

max-ttl *value*

Specifies the maximum number of hops for the probe.

no-fragment

Does not fragment the probe packets.

num-queries *number*

Specifies the number of probe packets per hop. The default is 3.

port *number*

For UDP tracing, specifies the destination port base traceroute will use (the destination port number will be incremented by each probe). For ICMP tracing, specifies the initial icmp sequence value (incremented by each probe too). For TCP specifies just the (constant) destination port to connect.

seq-queries *number*

Specifies the number of sequential probe packets.

source-addr *host*

Specifies an alternative source host by hostname, IPv4 address, or MAC address.

tcp-syn

Uses TCP SYN for the probes.

tos *value*

Marks the packets with the specified Type of Service (TOS) value.

version

Displays the timestamp during ping output.

wait-time *value*

Specifies the time (seconds) to wait for a response from the probe. Default is 5 seconds.

Operational mode

Use this command to perform a “traceroute” operation for a network host. This operation uses the IP protocol time-to-live (TTL) field and attempts to elicit an Internet Control Message Protocol (ICMP) TIME_EXCEEDED response from each gateway along the path to a host to track the route that a set of packets follows. It attempts to trace the route an IP packet follows to an Internet host by launching User Datagram Protocol (UDP) probe packets with a small time to live, then listening for an ICMP “Time exceeded” reply from a gateway.

The following example illustrates a traceroute to google.com showing ICMP extensions.

```
vyatta@vyatta#traceroute google.com icmp-extensions
traceroute to google.com (74.125.224.1), 30 hops max, 60 byte packets
1  gateway.attlocal.net (10.0.6.1)  0.482 ms  0.458 ms  0.452 ms
2  75-25-153-214.uvs.sntcca.sbcglobal.net (75.25.153.214)  13.714 ms
 13.703 ms  13.673 ms
3  76-198-128-2.lightspeed.mtvwca.sbcglobal.net (76.198.128.2)  35.518 ms
 34.284 ms  35.492 ms
4  71.145.0.192 (71.145.0.192)  34.201 ms  35.828 ms  35.385 ms
5  12.83.39.189 (12.83.39.189)  39.513 ms 12.83.39.185 (12.83.39.185)
 39.510 ms 12.83.39.189 (12.83.39.189)  44.236 ms
6  12.122.136.181 (12.122.136.181)  47.009 ms  46.105 ms  46.052 ms
7  * * *
8  216.239.49.168 (216.239.49.168)  31.725 ms  28.023 ms  28.467 ms
9  72.14.232.33 (72.14.232.33)  32.480 ms  31.081 ms  31.791 ms
10  nuq04s18-in-f1.1e100.net (74.125.224.1)  32.791 ms  26.412 ms  25.713
 ms
```

traceroute interface

Displays the route that packets take to a network host.

`traceroute [ ipv4 | ipv6 ] host interface value [ options ]`

ipv4

Explicitly force IPv4 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv4.

ipv6

Explicitly force IPv6 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv6.

host

A host that is the destination for the trace. The host is specified as a name (if DNS is being used on the network), as an IPv4 or IPv6 address, or as a MAC address (format h:h:h:h:h:h:h:h).

interface *value*

Specifies the interface that the device must use for traceroute requests.

options

The following entries are options. Multiple options can be included on the same command line.

as-path

Performs AS path lookups in routing registries and print results directly after the corresponding addresses.

bypass-routing

Bypasses the normal routing tables and send directly to a host on an attached network. If the host is not on a directly-attached network, an error is returned. This option can be used to ping a local host through an interface that has no route through it.

debug-socket

Enables socket level debugging.

first-ttl *value*

Specifies the first time-to-live value. Defaults to 1.

gateway *address*

Routes the request through a specified gateway.

icmp-echo

Uses ICMP echo for the traceroute probe.

icmp-extensions

Shows ICMP extensions (rfc4884). The general form is *CLASS/TYPE:* followed by a hexadecimal dump.

interval *value*

Specifies the time in seconds between traceroute requests from the device.

max-ttl *value*

Specifies the maximum number of hops for the probe.

no-fragment

Does not fragment the probe packets.

num-queries *number*

Specifies the number of probe packets per hop. The default is 3.

port *number*

For UDP tracing, specifies the destination port base traceroute will use (the destination port number will be incremented by each probe). For ICMP tracing, specifies the initial icmp sequence value (incremented by each probe too). For TCP specifies just the (constant) destination port to connect.

seq-queries *number*

Specifies the number of sequential probe packets.

source-addr *host*

Specifies an alternative source host by hostname, IPv4 address, or MAC address.

tcp-syn

Uses TCP SYN for the probes.

tos *value*

Marks the packets with the specified Type of Service (TOS) value.

version

Displays the timestamp during ping output.

wait-time *value*

Specifies the time (seconds) to wait for a response from the probe. Default is 5 seconds.

Operational mode

Use this command to perform a “traceroute” operation for a network host. This operation uses the IP protocol time-to-live (TTL) field and attempts to elicit an Internet Control Message Protocol (ICMP) TIME_EXCEEDED response from each gateway along the path to a host to track the route that a set of packets follows. It attempts to trace the route an IP packet follows to an Internet host by launching User Datagram Protocol (UDP) probe packets with a small time to live, then listening for an ICMP “Time exceeded” reply from a gateway.

The following example illustrates a traceroute to google.com through interface dp0p1s2.

```
vyatta@vyatta#traceroute google.com interface dp0p1s2
```

traceroute max-ttl

Displays the route that packets take to a network host.

`traceroute [ ipv4 | ipv6 ] host max-ttl value [ options ]`

ipv4

Explicitly force IPv4 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv4.

ipv6

Explicitly force IPv6 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv6.

host

A host that is the destination for the trace. The host is specified as a name (if DNS is being used on the network), as an IPv4 or IPv6 address, or as a MAC address (format h:h:h:h:h:h:h:h).

max-ttl *value*

Specifies the maximum number of hops for the probe.

options

The following entries are options. Multiple options can be included on the same command line.

as-path

Performs AS path lookups in routing registries and print results directly after the corresponding addresses.

bypass-routing

Bypasses the normal routing tables and send directly to a host on an attached network. If the host is not on a directly-attached network, an error is returned. This option can be used to ping a local host through an interface that has no route through it.

debug-socket

Enables socket level debugging.

first-ttl *value*

Specifies the first time-to-live value. Defaults to 1.

gateway *address*

Routes the request through a specified gateway.

icmp-echo

Uses ICMP echo for the traceroute probe.

icmp-extensions

Shows ICMP extensions (rfc4884). The general form is *CLASS/TYPE:* followed by a hexadecimal dump.

interface *value*

Specifies the interface that the device must use for traceroute requests.

interval *value*

Specifies the time in seconds between traceroute requests from the device.

no-fragment

Does not fragment the probe packets.

num-queries *number*

Specifies the number of probe packets per hop. The default is 3.

port *number*

For UDP tracing, specifies the destination port base traceroute will use (the destination port number will be incremented by each probe). For ICMP tracing, specifies the initial icmp sequence value (incremented by each probe too). For TCP specifies just the (constant) destination port to connect.

seq-queries *number*

Specifies the number of sequential probe packets.

source-addr *host*

Specifies an alternative source host by hostname, IPv4 address, or MAC address.

tcp-syn

Uses TCP SYN for the probes.

tos *value*

Marks the packets with the specified Type of Service (TOS) value.

version

Displays the timestamp during ping output.

wait-time *value*

Specifies the time (seconds) to wait for a response from the probe. Default is 5 seconds.

Operational mode

Use this command to perform a “traceroute” operation for a network host. This operation uses the IP protocol time-to-live (TTL) field and attempts to elicit an Internet Control Message Protocol (ICMP) TIME_EXCEEDED response from each gateway along the path to a host to track the route that a set of packets follows. It attempts to trace the route an IP packet follows to an Internet host by launching User Datagram Protocol (UDP) probe packets with a small time to live, then listening for an ICMP “Time exceeded” reply from a gateway.

The following example illustrates a traceroute to google.com with a maximum of 4 hops.

```
vyatta@vyatta#traceroute google.com max-ttl 4
traceroute to google.com (74.125.224.8), 4 hops max, 60 byte packets
1  gateway.attlocal.net (10.0.6.1)  0.362 ms  0.333 ms  0.340 ms
2  75-25-153-214.uvs.sntcca.sbcglobal.net (75.25.153.214)  9.559 ms  9.553
 ms  9.529 ms
3  76-198-128-2.lightspeed.mtvwca.sbcglobal.net (76.198.128.2)  30.061 ms
 31.737 ms  31.773 ms
4  71.145.0.192 (71.145.0.192)  31.776 ms  31.763 ms  31.758 ms
```

traceroute interval

Displays the route that packets take to a network host.

`traceroute [ ipv4 | ipv6 ] host interval value [ options ]`

ipv4

Explicitly force IPv4 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv4.

ipv6

Explicitly force IPv6 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv6.

host

A host that is the destination for the trace. The host is specified as a name (if DNS is being used on the network), as an IPv4 or IPv6 address, or as a MAC address (format h:h:h:h:h:h:h:h).

interval *value*

Specifies the time in seconds between traceroute requests from the device.

options

The following entries are options. Multiple options can be included on the same command line.

as-path

Performs AS path lookups in routing registries and print results directly after the corresponding addresses.

bypass-routing

Bypasses the normal routing tables and send directly to a host on an attached network. If the host is not on a directly-attached network, an error is returned. This option can be used to ping a local host through an interface that has no route through it.

debug-socket

Enables socket level debugging.

first-ttl *value*

Specifies the first time-to-live value. Defaults to 1.

gateway *address*

Routes the request through a specified gateway.

icmp-echo

Uses ICMP echo for the traceroute probe.

icmp-extensions

Shows ICMP extensions (rfc4884). The general form is *CLASS/TYPE:* followed by a hexadecimal dump.

interface *value*

Specifies the interface that the device must use for traceroute requests.

max-ttl *value*

Specifies the maximum number of hops for the probe.

no-fragment

Does not fragment the probe packets.

num-queries *number*

Specifies the number of probe packets per hop. The default is 3.

port *number*

For UDP tracing, specifies the destination port base traceroute will use (the destination port number will be incremented by each probe). For ICMP tracing, specifies the initial icmp sequence value (incremented by each probe too). For TCP specifies just the (constant) destination port to connect.

seq-queries *number*

Specifies the number of sequential probe packets.

source-addr *host*

Specifies an alternative source host by hostname, IPv4 address, or MAC address.

tcp-syn

Uses TCP SYN for the probes.

tos *value*

Marks the packets with the specified Type of Service (TOS) value.

version

Displays the timestamp during ping output.

wait-time *value*

Specifies the time (seconds) to wait for a response from the probe. Default is 5 seconds.

Operational mode

Use this command to perform a “traceroute” operation for a network host. This operation uses the IP protocol time-to-live (TTL) field and attempts to elicit an Internet Control Message Protocol (ICMP) TIME_EXCEEDED response from each gateway along the path to a host to track the route that a set of packets follows. It attempts to trace the route an IP packet follows to an Internet host by launching User Datagram Protocol (UDP) probe packets with a small time to live, then listening for an ICMP “Time exceeded” reply from a gateway.

The following example illustrates a traceroute to google.com with 3 seconds between traceroute requests.

```
vyatta@vyatta#traceroute google.com interval 3
```

traceroute max-ttl

Displays the route that packets take to a network host.

`traceroute [ ipv4 | ipv6 ] host max-ttl value [ options ]`

ipv4

Explicitly force IPv4 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv4.

ipv6

Explicitly force IPv6 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv6.

host

A host that is the destination for the trace. The host is specified as a name (if DNS is being used on the network), as an IPv4 or IPv6 address, or as a MAC address (format h:h:h:h:h:h:h:h).

max-ttl *value*

Specifies the maximum number of hops for the probe.

options

The following entries are options. Multiple options can be included on the same command line.

as-path

Performs AS path lookups in routing registries and print results directly after the corresponding addresses.

bypass-routing

Bypasses the normal routing tables and send directly to a host on an attached network. If the host is not on a directly-attached network, an error is returned. This option can be used to ping a local host through an interface that has no route through it.

debug-socket

Enables socket level debugging.

first-ttl *value*

Specifies the first time-to-live value. Defaults to 1.

gateway *address*

Routes the request through a specified gateway.

icmp-echo

Uses ICMP echo for the traceroute probe.

icmp-extensions

Shows ICMP extensions (rfc4884). The general form is *CLASS/TYPE:* followed by a hexadecimal dump.

interface *value*

Specifies the interface that the device must use for traceroute requests.

interval *value*

Specifies the time in seconds between traceroute requests from the device.

no-fragment

Does not fragment the probe packets.

num-queries *number*

Specifies the number of probe packets per hop. The default is 3.

port *number*

For UDP tracing, specifies the destination port base traceroute will use (the destination port number will be incremented by each probe). For ICMP tracing, specifies the initial icmp sequence value (incremented by each probe too). For TCP specifies just the (constant) destination port to connect.

seq-queries *number*

Specifies the number of sequential probe packets.

source-addr *host*

Specifies an alternative source host by hostname, IPv4 address, or MAC address.

tcp-syn

Uses TCP SYN for the probes.

tos *value*

Marks the packets with the specified Type of Service (TOS) value.

version

Displays the timestamp during ping output.

wait-time *value*

Specifies the time (seconds) to wait for a response from the probe. Default is 5 seconds.

Operational mode

Use this command to perform a “traceroute” operation for a network host. This operation uses the IP protocol time-to-live (TTL) field and attempts to elicit an Internet Control Message Protocol (ICMP) TIME_EXCEEDED response from each gateway along the path to a host to track the route that a set of packets follows. It attempts to trace the route an IP packet follows to an Internet host by launching User Datagram Protocol (UDP) probe packets with a small time to live, then listening for an ICMP “Time exceeded” reply from a gateway.

The following example illustrates a traceroute to google.com with a maximum of 4 hops.

```
vyatta@vyatta#traceroute google.com max-ttl 4
traceroute to google.com (74.125.224.8), 4 hops max, 60 byte packets
1  gateway.attlocal.net (10.0.6.1)  0.362 ms  0.333 ms  0.340 ms
2  75-25-153-214.uvs.sntcca.sbcglobal.net (75.25.153.214)  9.559 ms  9.553
 ms  9.529 ms
```

```
3  76-198-128-2.lightspeed.mtvwca.sbcglobal.net (76.198.128.2)  30.061 ms
 31.737 ms  31.773 ms
4  71.145.0.192 (71.145.0.192)  31.776 ms  31.763 ms  31.758 ms
```

traceroute no-fragment

Displays the route that packets take to a network host.

`traceroute` [**ipv4** | **ipv6**] *host* **no-fragment** [**options**]

ipv4

Explicitly force IPv4 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv4.

ipv6

Explicitly force IPv6 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv6.

host

A host that is the destination for the trace. The host is specified as a name (if DNS is being used on the network), as an IPv4 or IPv6 address, or as a MAC address (format h:h:h:h:h:h:h:h).

no-fragment

Does not fragment the probe packets.

options

The following entries are options. Multiple options can be included on the same command line.

as-path

Performs AS path lookups in routing registries and print results directly after the corresponding addresses.

bypass-routing

Bypasses the normal routing tables and send directly to a host on an attached network. If the host is not on a directly-attached network, an error is returned. This option can be used to ping a local host through an interface that has no route through it.

debug-socket

Enables socket level debugging.

first-ttl *value*

Specifies the first time-to-live value. Defaults to 1.

gateway *address*

Routes the request through a specified gateway.

icmp-echo

Uses ICMP echo for the traceroute probe.

icmp-extensions

Shows ICMP extensions (rfc4884). The general form is *CLASS/TYPE:* followed by a hexadecimal dump.

interface *value*

Specifies the interface that the device must use for traceroute requests.

interval *value*

Specifies the time in seconds between traceroute requests from the device.

max-ttl *value*

Specifies the maximum number of hops for the probe.

num-queries *number*

Specifies the number of probe packets per hop. The default is 3.

port *number*

For UDP tracing, specifies the destination port base traceroute will use (the destination port number will be incremented by each probe). For ICMP tracing, specifies the initial icmp sequence value (incremented by each probe too). For TCP specifies just the (constant) destination port to connect.

seq-queries *number*

Specifies the number of sequential probe packets.

source-addr *host*

Specifies an alternative source host by hostname, IPv4 address, or MAC address.

tcp-syn

Uses TCP SYN for the probes.

tos *value*

Marks the packets with the specified Type of Service (TOS) value.

version

Displays the timestamp during ping output.

wait-time *value*

Specifies the time (seconds) to wait for a response from the probe. Default is 5 seconds.

Operational mode

Use this command to perform a “traceroute” operation for a network host. This operation uses the IP protocol time-to-live (TTL) field and attempts to elicit an Internet Control Message Protocol (ICMP) TIME_EXCEEDED response from each gateway along the path to a host to track the route that a set of packets follows. It attempts to trace the route an IP packet follows to an Internet host by launching User Datagram Protocol (UDP) probe packets with a small time to live, then listening for an ICMP “Time exceeded” reply from a gateway.

The following example illustrates a traceroute to google.com with no fragmented probe packets.

```
vyatta@vyatta#traceroute google.com no-fragment
traceroute to google.com (74.125.224.0), 30 hops max, 60 byte packets
1  pipsqueak.attlocal.net (10.0.6.1)  0.394 ms  0.564 ms  0.356 ms
2  75-25-153-214.uvs.sntcca.sbcglobal.net (75.25.153.214)  9.799 ms  9.771
 ms  9.748 ms
3  76-198-128-2.lightspeed.mtvwca.sbcglobal.net (76.198.128.2)  31.504 ms
 30.107 ms  36.088 ms
4  71.145.0.192 (71.145.0.192)  36.139 ms  31.473 ms  31.441 ms
5  12.83.39.189 (12.83.39.189)  38.391 ms  37.441 ms 12.83.39.185
 (12.83.39.185)  36.589 ms
6  12.122.136.181 (12.122.136.181)  83.786 ms  82.908 ms  82.880 ms
7  * * *
8  216.239.49.168 (216.239.49.168)  27.049 ms  36.183 ms  33.859 ms
9  72.14.232.33 (72.14.232.33)  33.652 ms  33.064 ms  33.645 ms
10  nuq04s18-in-f0.1e100.net (74.125.224.0)  36.182 ms  36.165 ms  36.142
 ms
```

traceroute num-queries

Displays the route that packets take to a network host.

`traceroute [ ipv4 | ipv6 ] host num-queries number [ options ]`

ipv4

Explicitly force IPv4 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv4.

ipv6

Explicitly force IPv6 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv6.

host

A host that is the destination for the trace. The host is specified as a name (if DNS is being used on the network), as an IPv4 or IPv6 address, or as a MAC address (format h:h:h:h:h:h:h:h).

num-queries *number*

Specifies the number of probe packets per hop. The default is 3.

options

The following entries are options. Multiple options can be included on the same command line.

as-path

Performs AS path lookups in routing registries and print results directly after the corresponding addresses.

bypass-routing

Bypasses the normal routing tables and send directly to a host on an attached network. If the host is not on a directly-attached network, an error is returned. This option can be used to ping a local host through an interface that has no route through it.

debug-socket

Enables socket level debugging.

first-ttl *value*

Specifies the first time-to-live value. Defaults to 1.

gateway *address*

Routes the request through a specified gateway.

icmp-echo

Uses ICMP echo for the traceroute probe.

icmp-extensions

Shows ICMP extensions (rfc4884). The general form is *CLASS/TYPE:* followed by a hexadecimal dump.

interface *value*

Specifies the interface that the device must use for traceroute requests.

interval *value*

Specifies the time in seconds between traceroute requests from the device.

max-ttl *value*

Specifies the maximum number of hops for the probe.

no-fragment

Does not fragment the probe packets.

port *number*

For UDP tracing, specifies the destination port base traceroute will use (the destination port number will be incremented by each probe). For ICMP tracing, specifies the initial icmp sequence value (incremented by each probe too). For TCP specifies just the (constant) destination port to connect.

seq-queries *number*

Specifies the number of sequential probe packets.

source-addr *host*

Specifies an alternative source host by hostname, IPv4 address, or MAC address.

tcp-syn

Uses TCP SYN for the probes.

tos *value*

Marks the packets with the specified Type of Service (TOS) value.

version

Displays the timestamp during ping output.

wait-time *value*

Specifies the time (seconds) to wait for a response from the probe. Default is 5 seconds.

Operational mode

Use this command to perform a “traceroute” operation for a network host. This operation uses the IP protocol time-to-live (TTL) field and attempts to elicit an Internet Control Message Protocol (ICMP) TIME_EXCEEDED response from each gateway along the path to a host to track the route that a set of packets follows. It attempts to trace the route an IP packet follows to an Internet host by launching User Datagram Protocol (UDP) probe packets with a small time to live, then listening for an ICMP “Time exceeded” reply from a gateway.

The following example illustrates a traceroute to google.com with 4 probes per hop.

```
vyatta@vyatta#traceroute google.com num-queries 2
traceroute to google.com (74.125.224.9), 30 hops max, 60 byte packets
1  gateway.attlocal.net (10.0.6.1)  0.411 ms  0.387 ms
2  75-25-153-214.uvs.sntcca.sbcglobal.net (75.25.153.214)  14.167 ms
 14.145 ms
3  76-198-128-2.lightspeed.mtvwca.sbcglobal.net (76.198.128.2)  36.338 ms
 35.080 ms
4  71.145.0.192 (71.145.0.192)  36.862 ms  36.338 ms
5  12.83.39.189 (12.83.39.189)  49.387 ms 12.83.39.185 (12.83.39.185)
 49.374 ms
6  12.122.136.181 (12.122.136.181)  41.428 ms  41.419 ms
7  * *
8  216.239.49.168 (216.239.49.168)  41.356 ms  49.198 ms
9  72.14.232.33 (72.14.232.33)  39.738 ms  39.720 ms
10  nuq04s18-in-f9.1e100.net (74.125.224.9)  34.504 ms  34.474 ms
```

traceroute port

Displays the route that packets take to a network host.

`traceroute` [**ipv4** | **ipv6**] *host* **port** *number* [**options**]

ipv4

Explicitly force IPv4 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv4.

ipv6

Explicitly force IPv6 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv6.

host

A host that is the destination for the trace. The host is specified as a name (if DNS is being used on the network), as an IPv4 or IPv6 address, or as a MAC address (format h:h:h:h:h:h:h:h).

port *number*

For UDP tracing, specifies the destination port base traceroute will use (the destination port number will be incremented by each probe). For ICMP tracing, specifies the initial icmp sequence value (incremented by each probe too). For TCP specifies just the (constant) destination port to connect.

options

The following entries are options. Multiple options can be included on the same command line.

as-path

Performs AS path lookups in routing registries and print results directly after the corresponding addresses.

bypass-routing

Bypasses the normal routing tables and send directly to a host on an attached network. If the host is not on a directly-attached network, an error is returned. This option can be used to ping a local host through an interface that has no route through it.

debug-socket

Enables socket level debugging.

first-ttl *value*

Specifies the first time-to-live value. Defaults to 1.

gateway *address*

Routes the request through a specified gateway.

icmp-echo

Uses ICMP echo for the traceroute probe.

icmp-extensions

Shows ICMP extensions (rfc4884). The general form is *CLASS/TYPE:* followed by a hexadecimal dump.

interface *value*

Specifies the interface that the device must use for traceroute requests.

interval *value*

Specifies the time in seconds between traceroute requests from the device.

max-ttl *value*

Specifies the maximum number of hops for the probe.

no-fragment

Does not fragment the probe packets.

num-queries *number*

Specifies the number of probe packets per hop. The default is 3.

seq-queries *number*

Specifies the number of sequential probe packets.

source-addr *host*

Specifies an alternative source host by hostname, IPv4 address, or MAC address.

tcp-syn

Uses TCP SYN for the probes.

tos *value*

Marks the packets with the specified Type of Service (TOS) value.

version

Displays the timestamp during ping output.

wait-time *value*

Specifies the time (seconds) to wait for a response from the probe. Default is 5 seconds.

Operational mode

Use this command to perform a “traceroute” operation for a network host. This operation uses the IP protocol time-to-live (TTL) field and attempts to elicit an Internet Control Message Protocol (ICMP) TIME_EXCEEDED response from each gateway along the path to a host to track the route that a set of packets follows. It attempts to trace the route an IP packet follows to an Internet host by launching User Datagram Protocol (UDP) probe packets with a small time to live, then listening for an ICMP “Time exceeded” reply from a gateway.

The following example illustrates a traceroute to google.com through port 80.

```
vyatta@vyatta#traceroute google.com port 80
traceroute to google.com (74.125.224.1), 30 hops max, 60 byte packets
1  gateway.attlocal.net (10.0.6.1)  0.383 ms  0.337 ms  0.327 ms
2  75-25-153-214.uvs.sntcca.sbcglobal.net (75.25.153.214)  1.689 ms  1.582
 ms  1.461 ms
3  76-198-128-2.lightspeed.mtvwca.sbcglobal.net (76.198.128.2)  22.674 ms
 21.656 ms  21.901 ms
4  71.145.0.192 (71.145.0.192)  26.552 ms  21.609 ms  21.732 ms
5  12.83.39.185 (12.83.39.185)  23.492 ms 12.83.39.189 (12.83.39.189)
 24.755 ms 12.83.39.185 (12.83.39.185) 23.333 ms
6  12.122.136.181 (12.122.136.181)  23.033 ms  22.736 ms  23.119 ms
7  * * *
8  216.239.49.168 (216.239.49.168)  25.157 ms  24.775 ms  24.790 ms
9  72.14.232.33 (72.14.232.33)  25.859 ms  25.051 ms  25.207 ms
10  nuq04s18-in-f1.1e100.net (74.125.224.1)  25.102 ms  24.958 ms  25.077
 ms
```

traceroute seq-queries

Displays the route that packets take to a network host.

`traceroute [ ipv4 | ipv6 ] host seq-queries number [ options ]`

ipv4

Explicitly force IPv4 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv4.

ipv6

Explicitly force IPv6 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv6.

host

A host that is the destination for the trace. The host is specified as a name (if DNS is being used on the network), as an IPv4 or IPv6 address, or as a MAC address (format h:h:h:h:h:h:h:h).

seq-queries *number*

Specifies the number of sequential probe packets.

options

The following entries are options. Multiple options can be included on the same command line.

as-path

Performs AS path lookups in routing registries and print results directly after the corresponding addresses.

bypass-routing

Bypasses the normal routing tables and send directly to a host on an attached network. If the host is not on a directly-attached network, an error is returned. This option can be used to ping a local host through an interface that has no route through it.

debug-socket

Enables socket level debugging.

first-ttl *value*

Specifies the first time-to-live value. Defaults to 1.

gateway *address*

Routes the request through a specified gateway.

icmp-echo

Uses ICMP echo for the traceroute probe.

icmp-extensions

Shows ICMP extensions (rfc4884). The general form is *CLASS/TYPE:* followed by a hexadecimal dump.

interface *value*

Specifies the interface that the device must use for traceroute requests.

interval *value*

Specifies the time in seconds between traceroute requests from the device.

max-ttl *value*

Specifies the maximum number of hops for the probe.

no-fragment

Does not fragment the probe packets.

num-queries *number*

Specifies the number of probe packets per hop. The default is 3.

port *number*

For UDP tracing, specifies the destination port base traceroute will use (the destination port number will be incremented by each probe). For ICMP tracing, specifies the initial icmp sequence value (incremented by each probe too). For TCP specifies just the (constant) destination port to connect.

source-addr *host*

Specifies an alternative source host by hostname, IPv4 address, or MAC address.

tcp-syn

Uses TCP SYN for the probes.

tos *value*

Marks the packets with the specified Type of Service (TOS) value.

version

Displays the timestamp during ping output.

wait-time *value*

Specifies the time (seconds) to wait for a response from the probe. Default is 5 seconds.

Operational mode

Use this command to perform a “traceroute” operation for a network host. This operation uses the IP protocol time-to-live (TTL) field and attempts to elicit an Internet Control Message Protocol (ICMP) TIME_EXCEEDED response from each gateway along the path to a host to track the route that a set of packets follows. It attempts to trace the route an IP packet follows to an Internet host by launching User Datagram Protocol (UDP) probe packets with a small time to live, then listening for an ICMP “Time exceeded” reply from a gateway.

The following example illustrates a traceroute to google.com with 2 sequential probe packets.

```
vyatta@vyatta#traceroute google.com seq-queries 2
traceroute to google.com (74.125.224.0), 30 hops max, 60 byte packets
1  pipsqueak.attlocal.net (10.0.6.1)  0.441 ms  0.416 ms  0.357 ms
2  75-25-153-214.uvs.sntcca.sbcglobal.net (75.25.153.214)  1.762 ms  2.295
 ms  1.497 ms
3  76-198-128-2.lightspeed.mtvwca.sbcglobal.net (76.198.128.2)  23.357 ms
 22.565 ms  22.219 ms
4  71.145.0.192 (71.145.0.192)  23.964 ms  22.780 ms  21.566 ms
```

```
5  12.83.39.185 (12.83.39.185)  27.362 ms 12.83.39.189 (12.83.39.189)
 26.326 ms 12.83.39.185 (12.83.39.185) 25.436 ms
6  12.122.136.181 (12.122.136.181)  113.918 ms  88.183 ms  49.824 ms
7  * * *
8  216.239.49.168 (216.239.49.168)  26.184 ms  24.964 ms  24.673 ms
9  72.14.232.33 (72.14.232.33)  25.629 ms  25.079 ms  25.069 ms
10  nuq04s18-in-f0.1e100.net (74.125.224.0)  25.164 ms  25.286 ms  24.878
 ms
```

traceroute source-addr

Displays the route that packets take to a network host.

`traceroute [ ipv4 | ipv6 ] host source-addr host [ options ]`

ipv4

Explicitly force IPv4 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv4.

ipv6

Explicitly force IPv6 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv6.

host

A host that is the destination for the trace. The host is specified as a name (if DNS is being used on the network), as an IPv4 or IPv6 address, or as a MAC address (format h:h:h:h:h:h:h:h).

source-addr *host*

Specifies an alternative source host by hostname, IPv4 address, or MAC address.

options

The following entries are options. Multiple options can be included on the same command line.

as-path

Performs AS path lookups in routing registries and print results directly after the corresponding addresses.

bypass-routing

Bypasses the normal routing tables and send directly to a host on an attached network. If the host is not on a directly-attached network, an error is returned. This option can be used to ping a local host through an interface that has no route through it.

debug-socket

Enables socket level debugging.

first-ttl *value*

Specifies the first time-to-live value. Defaults to 1.

gateway *address*

Routes the request through a specified gateway.

icmp-echo

Uses ICMP echo for the traceroute probe.

icmp-extensions

Shows ICMP extensions (rfc4884). The general form is *CLASS/TYPE:* followed by a hexadecimal dump.

interface *value*

Specifies the interface that the device must use for traceroute requests.

interval *value*

Specifies the time in seconds between traceroute requests from the device.

max-ttl *value*

Specifies the maximum number of hops for the probe.

no-fragment

Does not fragment the probe packets.

num-queries *number*

Specifies the number of probe packets per hop. The default is 3.

port *number*

For UDP tracing, specifies the destination port base traceroute will use (the destination port number will be incremented by each probe). For ICMP tracing, specifies the initial icmp sequence value (incremented by each probe too). For TCP specifies just the (constant) destination port to connect.

seq-queries *number*

Specifies the number of sequential probe packets.

tcp-syn

Uses TCP SYN for the probes.

tos *value*

Marks the packets with the specified Type of Service (TOS) value.

version

Displays the timestamp during ping output.

wait-time *value*

Specifies the time (seconds) to wait for a response from the probe. Default is 5 seconds.

Operational mode

Use this command to perform a “traceroute” operation for a network host. This operation uses the IP protocol time-to-live (TTL) field and attempts to elicit an Internet Control Message Protocol (ICMP) TIME_EXCEEDED response from each gateway along the path to a host to track the route that a set of packets follows. It attempts to trace the route an IP packet follows to an Internet host by launching User Datagram Protocol (UDP) probe

packets with a small time to live, then listening for an ICMP “Time exceeded” reply from a gateway.

The following example illustrates a traceroute to google.com with source address *client1.attlocal.net*.

```
vyatta@vyatta#traceroute google.com source-addr client.attlocal.net
```

traceroute tcp-syn

Displays the route that packets take to a network host.

`traceroute [ ipv4 | ipv6 ] host tcp-syn [ options ]`

ipv4

Explicitly force IPv4 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv4.

ipv6

Explicitly force IPv6 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv6.

host

A host that is the destination for the trace. The host is specified as a name (if DNS is being used on the network), as an IPv4 or IPv6 address, or as a MAC address (format h:h:h:h:h:h:h:h).

tcp-syn

Uses TCP SYN for the probes.

options

The following entries are options. Multiple options can be included on the same command line.

as-path

Performs AS path lookups in routing registries and print results directly after the corresponding addresses.

bypass-routing

Bypasses the normal routing tables and send directly to a host on an attached network. If the host is not on a directly-attached network, an error is returned. This option can be used to ping a local host through an interface that has no route through it.

debug-socket

Enables socket level debugging.

first-ttl *value*

Specifies the first time-to-live value. Defaults to 1.

gateway *address*

Routes the request through a specified gateway.

icmp-echo

Uses ICMP echo for the traceroute probe.

icmp-extensions

Shows ICMP extensions (rfc4884). The general form is *CLASS/TYPE:* followed by a hexadecimal dump.

interface *value*

Specifies the interface that the device must use for traceroute requests.

interval *value*

Specifies the time in seconds between traceroute requests from the device.

max-ttl *value*

Specifies the maximum number of hops for the probe.

no-fragment

Does not fragment the probe packets.

num-queries *number*

Specifies the number of probe packets per hop. The default is 3.

port *number*

For UDP tracing, specifies the destination port base traceroute will use (the destination port number will be incremented by each probe). For ICMP tracing, specifies the initial icmp sequence value (incremented by each probe too). For TCP specifies just the (constant) destination port to connect.

seq-queries *number*

Specifies the number of sequential probe packets.

source-addr *host*

Specifies an alternative source host by hostname, IPv4 address, or MAC address.

tos *value*

Marks the packets with the specified Type of Service (TOS) value.

version

Displays the timestamp during ping output.

wait-time *value*

Specifies the time (seconds) to wait for a response from the probe. Default is 5 seconds.

Operational mode

Use this command to perform a “traceroute” operation for a network host. This operation uses the IP protocol time-to-live (TTL) field and attempts to elicit an Internet Control Message Protocol (ICMP) TIME_EXCEEDED response from each gateway along the path to a host to track the route that a set of packets follows. It attempts to trace the route an

IP packet follows to an Internet host by launching User Datagram Protocol (UDP) probe packets with a small time to live, then listening for an ICMP “Time exceeded” reply from a gateway.

The following example illustrates a traceroute to google.com using tcp-syn for probes.

```
vyatta@vyatta#traceroute google.com tcp-syn
traceroute to google.com (74.125.224.6), 30 hops max, 60 byte packets
1  gateway.attlocal.net (10.0.6.1)  0.389 ms  0.341 ms  0.316 ms
2  75-25-153-214.uvs.sntcca.sbcglobal.net (75.25.153.214)  12.784 ms
 12.767 ms  12.771 ms
3  76-198-128-2.lightspeed.mtvwca.sbcglobal.net (76.198.128.2)  35.539 ms
 35.529 ms  35.517 ms
4  71.145.0.192 (71.145.0.192)  35.512 ms  35.503 ms  33.653 ms
5  12.83.39.189 (12.83.39.189)  38.888 ms  36.371 ms  37.952 ms
6  12.122.136.181 (12.122.136.181)  63.947 ms  63.087 ms  63.045 ms
7  * * *
8  216.239.49.168 (216.239.49.168)  28.752 ms  29.378 ms  29.368 ms
9  * * *
10  nuq04s18-in-f6.1e100.net (74.125.224.6)  29.669 ms  27.836 ms  29.669
 ms
```

traceroute tos

Displays the route that packets take to a network host.

`traceroute [ ipv4 | ipv6 ] host tos value [ options ]`

ipv4

Explicitly force IPv4 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv4.

ipv6

Explicitly force IPv6 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv6.

host

A host that is the destination for the trace. The host is specified as a name (if DNS is being used on the network), as an IPv4 or IPv6 address, or as a MAC address (format h:h:h:h:h:h:h:h).

tos *value*

Marks the packets with the specified Type of Service (TOS) value.

options

The following entries are options. Multiple options can be included on the same command line.

as-path

Performs AS path lookups in routing registries and print results directly after the corresponding addresses.

bypass-routing

Bypasses the normal routing tables and send directly to a host on an attached network. If the host is not on a directly-attached network, an error is returned. This option can be used to ping a local host through an interface that has no route through it.

debug-socket

Enables socket level debugging.

first-ttl *value*

Specifies the first time-to-live value. Defaults to 1.

gateway *address*

Routes the request through a specified gateway.

icmp-echo

Uses ICMP echo for the traceroute probe.

icmp-extensions

Shows ICMP extensions (rfc4884). The general form is *CLASS/TYPE:* followed by a hexadecimal dump.

interface *value*

Specifies the interface that the device must use for traceroute requests.

interval *value*

Specifies the time in seconds between traceroute requests from the device.

max-ttl *value*

Specifies the maximum number of hops for the probe.

no-fragment

Does not fragment the probe packets.

num-queries *number*

Specifies the number of probe packets per hop. The default is 3.

port *number*

For UDP tracing, specifies the destination port base traceroute will use (the destination port number will be incremented by each probe). For ICMP tracing, specifies the initial icmp sequence value (incremented by each probe too). For TCP specifies just the (constant) destination port to connect.

seq-queries *number*

Specifies the number of sequential probe packets.

source-addr *host*

Specifies an alternative source host by hostname, IPv4 address, or MAC address.

tcp-syn

Uses TCP SYN for the probes.

version

Displays the timestamp during ping output.

wait-time *value*

Specifies the time (seconds) to wait for a response from the probe. Default is 5 seconds.

Operational mode

Use this command to perform a “traceroute” operation for a network host. This operation uses the IP protocol time-to-live (TTL) field and attempts to elicit an Internet Control Message Protocol (ICMP) TIME_EXCEEDED response from each gateway along the path to a host to track the route that a set of packets follows. It attempts to trace the route an IP packet follows to an Internet host by launching User Datagram Protocol (UDP) probe packets with a small time to live, then listening for an ICMP “Time exceeded” reply from a gateway.

The following example illustrates a traceroute to google.com with packets marked with tos equal to 3.

```
vyatta@vyatta#traceroute google.com tos 3
traceroute to google.com (74.125.224.2), 30 hops max, 60 byte packets
1  gateway.attlocal.net (10.0.6.1)  0.374 ms  0.550 ms  0.353 ms
2  75-25-153-214.uvs.sntcca.sbcglobal.net (75.25.153.214)  7.270 ms  15.975
 ms  7.238 ms
3  76-198-128-2.lightspeed.mtvwca.sbcglobal.net (76.198.128.2)  29.199 ms
 38.969 ms  28.635 ms
4  71.145.0.192 (71.145.0.192)  35.803 ms  36.212 ms  28.590 ms
5  12.83.39.189 (12.83.39.189)  34.061 ms  32.033 ms  42.496 ms
6  12.122.136.181 (12.122.136.181)  39.973 ms  41.665 ms  41.608 ms
7  * * *
8  216.239.49.168 (216.239.49.168)  29.549 ms  26.607 ms  26.583 ms
9  72.14.232.33 (72.14.232.33)  28.133 ms  27.602 ms  29.294 ms
10  nuq04s18-in-f2.1e100.net (74.125.224.2)  28.553 ms  30.071 ms  28.028
 ms
```

traceroute version

Displays the route that packets take to a network host.

`traceroute` [**ipv4** | **ipv6**] *host* **version** [**options**]

ipv4

Explicitly force IPv4 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv4.

ipv6

Explicitly force IPv6 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv6.

host

A host that is the destination for the trace. The host is specified as a name (if DNS is being used on the network), as an IPv4 or IPv6 address, or as a MAC address (format h:h:h:h:h:h:h:h).

version

Displays the timestamp during ping output.

options

The following entries are options. Multiple options can be included on the same command line.

as-path

Performs AS path lookups in routing registries and print results directly after the corresponding addresses.

bypass-routing

Bypasses the normal routing tables and send directly to a host on an attached network. If the host is not on a directly-attached network, an error is returned. This option can be used to ping a local host through an interface that has no route through it.

debug-socket

Enables socket level debugging.

first-ttl *value*

Specifies the first time-to-live value. Defaults to 1.

gateway *address*

Routes the request through a specified gateway.

icmp-echo

Uses ICMP echo for the traceroute probe.

icmp-extensions

Shows ICMP extensions (rfc4884). The general form is *CLASS/TYPE:* followed by a hexadecimal dump.

interface *value*

Specifies the interface that the device must use for traceroute requests.

interval *value*

Specifies the time in seconds between traceroute requests from the device.

max-ttl *value*

Specifies the maximum number of hops for the probe.

no-fragment

Does not fragment the probe packets.

num-queries *number*

Specifies the number of probe packets per hop. The default is 3.

port *number*

For UDP tracing, specifies the destination port base traceroute will use (the destination port number will be incremented by each probe). For ICMP tracing, specifies the initial icmp sequence value (incremented by each probe too). For TCP specifies just the (constant) destination port to connect.

seq-queries *number*

Specifies the number of sequential probe packets.

source-addr *host*

Specifies an alternative source host by hostname, IPv4 address, or MAC address.

tcp-syn

Uses TCP SYN for the probes.

tos *value*

Marks the packets with the specified Type of Service (TOS) value.

wait-time *value*

Specifies the time (seconds) to wait for a response from the probe. Default is 5 seconds.

Operational mode

Use this command to perform a “traceroute” operation for a network host. This operation uses the IP protocol time-to-live (TTL) field and attempts to elicit an Internet Control Message Protocol (ICMP) TIME_EXCEEDED response from each gateway along the path to a host to track the route that a set of packets follows. It attempts to trace the route an IP packet follows to an Internet host by launching User Datagram Protocol (UDP) probe packets with a small time to live, then listening for an ICMP “Time exceeded” reply from a gateway.

The following example illustrates a traceroute to google.com showing timestamp during ping output.

```
vyatta@vyatta#traceroute google.com version
```

traceroute wait-time

Displays the route that packets take to a network host.

`traceroute [ ipv4 | ipv6 ] host wait-time value [ options ]`

ipv4

Explicitly force IPv4 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv4.

ipv6

Explicitly force IPv6 traceouting. By default, the program will try to resolve the name given, and choose the appropriate protocol automatically. If resolving a host name returns both IPv4 and IPv6 addresses, `traceroute` will use IPv6.

host

A host that is the destination for the trace. The host is specified as a name (if DNS is being used on the network), as an IPv4 or IPv6 address, or as a MAC address (format h:h:h:h:h:h:h:h).

wait-time *value*

Specifies the time (seconds) to wait for a response from the probe. Default is 5 seconds.

options

The following entries are options. Multiple options can be included on the same command line.

as-path

Performs AS path lookups in routing registries and print results directly after the corresponding addresses.

bypass-routing

Bypasses the normal routing tables and send directly to a host on an attached network. If the host is not on a directly-attached network, an error is returned. This option can be used to ping a local host through an interface that has no route through it.

debug-socket

Enables socket level debugging.

first-ttl *value*

Specifies the first time-to-live value. Defaults to 1.

gateway *address*

Routes the request through a specified gateway.

icmp-echo

Uses ICMP echo for the traceroute probe.

icmp-extensions

Shows ICMP extensions (rfc4884). The general form is *CLASS/TYPE:* followed by a hexadecimal dump.

interface *value*

Specifies the interface that the device must use for traceroute requests.

interval *value*

Specifies the time in seconds between traceroute requests from the device.

max-ttl *value*

Specifies the maximum number of hops for the probe.

no-fragment

Does not fragment the probe packets.

num-queries *number*

Specifies the number of probe packets per hop. The default is 3.

port *number*

For UDP tracing, specifies the destination port base traceroute will use (the destination port number will be incremented by each probe). For ICMP tracing, specifies the initial icmp sequence value (incremented by each probe too). For TCP specifies just the (constant) destination port to connect.

seq-queries *number*

Specifies the number of sequential probe packets.

source-addr *host*

Specifies an alternative source host by hostname, IPv4 address, or MAC address.

tcp-syn

Uses TCP SYN for the probes.

tos *value*

Marks the packets with the specified Type of Service (TOS) value.

version

Displays the timestamp during ping output.

Operational mode

Use this command to perform a “traceroute” operation for a network host. This operation uses the IP protocol time-to-live (TTL) field and attempts to elicit an Internet Control Message Protocol (ICMP) TIME_EXCEEDED response from each gateway along the path to a host to track the route that a set of packets follows. It attempts to trace the route an IP packet follows to an Internet host by launching User Datagram Protocol (UDP) probe packets with a small time to live, then listening for an ICMP “Time exceeded” reply from a gateway.

The following example illustrates a traceroute to google.com waiting 2 seconds between probes.

```
vyatta@vyatta#traceroute google.com wait-time 2
traceroute to google.com (74.125.224.2), 30 hops max, 60 byte packets
1  pipsqueak.attlocal.net (10.0.6.1)  0.409 ms  0.452 ms  0.346 ms
2  75-25-153-214.uvs.sntcca.sbcglobal.net (75.25.153.214)  13.497 ms
 13.517 ms  13.509 ms
3  76-198-128-2.lightspeed.mtvwca.sbcglobal.net (76.198.128.2)  35.910 ms
 34.763 ms  35.876 ms
4  71.145.0.192 (71.145.0.192)  35.981 ms  35.979 ms  34.775 ms
5  12.83.39.189 (12.83.39.189)  39.654 ms  39.662 ms  44.599 ms
6  12.122.136.181 (12.122.136.181)  85.423 ms  84.396 ms  84.358 ms
7  * * *
8  216.239.49.168 (216.239.49.168)  33.291 ms  27.613 ms  28.017 ms
9  72.14.232.33 (72.14.232.33)  45.214 ms  45.849 ms  44.999 ms
10  nuq04s18-in-f2.1e100.net (74.125.224.2)  30.505 ms  29.739 ms  30.298
 ms
```

traceroute

Displays the route that packets take to a network host.

```
traceroute [ ipv4 | ipv6 ] host [ option ]
```

ipv4

Displays the route that packets take to the IPv4 address of the host. This keyword is used when the host is specified as a host name rather than as an IP address.

ipv6

Displays the route that packets take to the IPv6 address of the host. This keyword is used when the host is specified as a host name rather than as an IP address.

host

A host that is the destination for the trace. The host is specified as a name (if DNS is being used on the network), as an IPv4 or IPv6 address, or as a MAC address (format <h:h:h:h:h:h:h:h>).

option

Displays the route that packets take to the host. This keyword is used when the host is specified as a host name rather than as an IP address.

Operational mode

Use this command to perform a “traceroute” operation for a network host. This operation uses the IP protocol time-to-live (TTL) field and attempts to elicit an Internet Control Message Protocol (ICMP) TIME_EXCEEDED response from each gateway along the path to a host to track the route that a set of packets follows. It attempts to trace the route an IP packet follows to an Internet host by launching User Datagram Protocol (UDP) probe packets with a small time to live, then listening for an ICMP “Time exceeded” reply from a gateway.

traceroute

Displays the route that packets take to a network host.

```
traceroute [ ipv4 | ipv6 ] host
```

ipv4

Displays the route that packets take to the IPv4 address of the host. This keyword is used when the host is specified as a host name rather than as an IP address.

ipv6

Displays the route that packets take to the IPv6 address of the host. This keyword is used when the host is specified as a host name rather than as an IP address.

host

A host that is the destination for the trace. The host is specified as a name (if DNS is being used on the network), an IPv4 or IPv6 address, or MAC address.

Operational mode

Use this command to perform a “traceroute” operation for a network host. This operation uses the IP protocol time-to-live (TTL) field and attempts to elicit an Internet Control Message Protocol (ICMP) TIME_EXCEEDED response from each gateway along the path to a host to track the route that a set of packets follows. It attempts to trace the route an IP packet follows to an Internet host by launching User Datagram Protocol (UDP) probe packets with a small time to live, then listening for an ICMP “Time exceeded” reply from a gateway.

Chapter 5. ECMP

ECMP overview

ECMP is a technique that routes packets along multiple paths of equal cost. ECMP provides a load-balancing mechanism to ensure optimum usage of a routing path.

The router supports the following load-balancing mechanisms:

- Modulo-n-hash
- Hash-threshold
- Highest Random Weight (HRW)

The router calculates the key of the packet flow for every ECMP selection algorithm. The next-hop selection algorithm calculates the key of the flow and chooses the next hop.

The router supports the HRW load-balancing mechanism by default. You can change the ECMP mode, if required.

ECMP is enabled on Border Gateway Protocol (BGP) by configuring the maximum number of ECMP routes for External BGP (eBGP) or Internal BGP (iBGP).

Chapter 6. ECMP Commands

protocols ecmp disable

Disables ECMP routing.

`set protocols ecmp disable`

None.

Configuration mode.

```
protocols {
    ecmp {
        disable {}
    }
}
```

protocols ecmp maximum-paths

Sets the maximum number of next hops for ECMP routing.

`set protocols ecmp maximum-paths` *`number`*

`delete protocols ecmp maximum-paths`

None

maximum-paths *number*

Sets the maximum number of next hops for ECMP routing.

Configuration mode.

```
protocols {
   ecmp {
      maximum-paths number{}
   }
}
```

Use the `set` form of this command to set the maximum number of next hops for ECMP routing.

Use the `delete` form of this command to remove the maximum number of next hops for ECMP routing.

protocols ecmp mode

Sets the load-balancing mechanism for ECMP.

`set protocols ecmp mode` *`hash-threshold`* | *`hrw`* | *`modulo-n`*

`delete protocols ecmp mode` *`hash-threshold`* | *`hrw`* | *`modulo-n`*

`show protocols ecmp mode` *`hash-threshold`* | *`hrw`* | *`modulo-n`*

None

hash-threshold

Sets the hash-threshold ECMP routing mode.

hrw

Sets the highest random weight ECMP routing mode. This mode is the default.

modulo-n

Sets the modulo-n-hash ECMP routing mode.

Configuration mode.

```
protocols {
   ecmp {
      mode {
         hash-threshold
         hrw
         modulo-n
         }
   }
}
```

Use the `set` form of this command to set the load-balancing mechanism for ECMP.

Use the `delete` form of this command to remove the load-balancing mechanism. The ECMP load-balancing mechanism returns to its default setting, which is HRW.

Use the `show` form of this command to display the current load-balancing mechanism for ECMP.

The following example shows how to set the hash-threshold mode with maximum number of next hops as 34 for ECMP routing.

```
vyatta@vyatta# set protocols ecmp maximum-paths 34
[edit]
vyatta@vyatta# set protocols ecmp mode hash-threshold
[edit]
vyatta@vyatta# commit
```

The output for the ECMP configuration is as follows.

```
vyatta@vyatta# show protocols ecmp
 ecmp {
        maximum-paths 34
        mode hash-threshold
 }
[edit]
```

show dataplane route

Displays forward information base (FIB) table that contain all routes including ECMP routes.

```
show dataplane route
```

None.

Operational mode.

Use this command to display the FIB table.

Note: FIB table is stored in the data plane.

show dataplane route6

Displays FIB table that contain all IPv6 routes including ECMP routes.

```
show dataplane route6
```

None

Operational mode.

Use this command to display IPv6 FIB table.

Chapter 7. Static Routes

Static route configuration

This section presents the following topics:

- Static routes overview
- Configuring static routes
- Creating floating static routes
- Showing static routes in the routing table

Static routes overview

A static route is a manually configured route, which, in general, cannot be updated dynamically from information about the network topology learned by the router. However, if a link fails, the router removes the routes, including static routes, from the Routing Information Base (RIB) that use this interface to reach the next hop.

Usually, static routes should be used only for very simple network topologies, or to override the behavior of a dynamic routing protocol for a small number of routes.

The collection of all routes the router learns from its configuration, or from its dynamic routing protocols, is stored in its RIB.

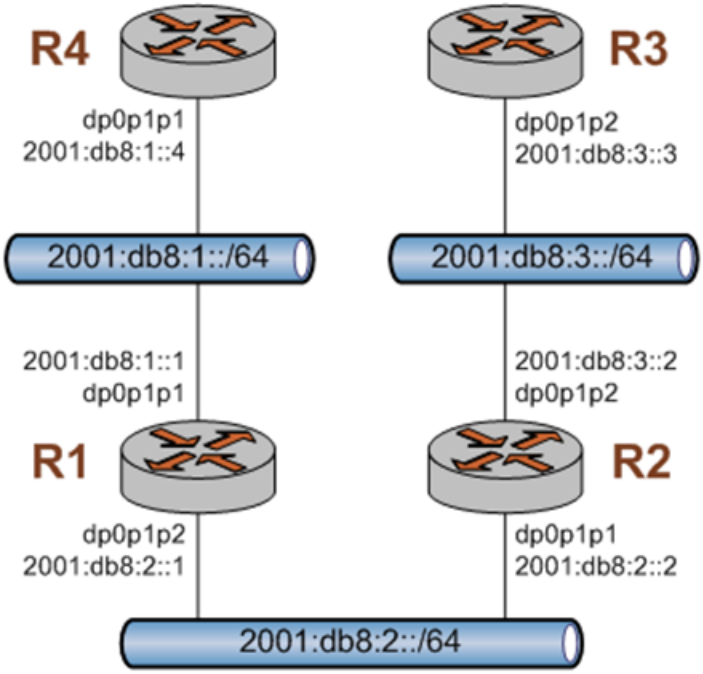
Unicast routes are directly used to determine the forwarding table for unicast packet forwarding.

Blackhole routes are static unreachable routes that can be configured to send ICMP unreachable responses on packets.

Configuring static routes

Figure 1: Static routes presents sample configurations of basic static routes. When you are finished with Configuring static routes, the system is configured as shown in the figure. In the example, a static route is created that says, in effect, “any packets destined for the 11.0.0.0/8 network should be forwarded to 172.16.0.26.”

Figure 1. Static routes



This section includes the following example:

- Configuring static routes

Configuring static routes shows how to create a static route to the 11.0.0.0/8 network that is directed toward 172.16.0.26.

To create a static route, perform the following steps in configuration mode.

Table 1. Creating a static route

Step	Command
Create a static route to R2.	`vyatta@R1# set protocols static route 11.0.0.0/8 next-hop 172.16.0.26`
Commit the configuration.	`vyatta@R1# commit`

View the configuration.	`vyatta@R1# show protocols static route`
	` route 11.0.0.0/8 {`
	` next-hop 172.16.0.26 {`
	` }`
	`}`

Creating floating static routes

Usually, static routes have a relatively short administrative distance—typically 1, and normally shorter than the administrative distances for dynamic (learned) routes. A “floating”

static route is a static route with an administrative distance greater than the administrative distance for dynamic routes.

You can configure a static route to be a floating route by setting the administrative distance higher than the distance applied to the routes in your dynamic routing protocol. This higher distance renders the static route less desirable than a dynamic route. At the same time, if the dynamic route is lost, the static route is available to take over traffic, which can be forwarded through the static route as an alternate path.

Note: When configuring the administrative distance (AD) of a protocol, keep in mind when you specify the distance value of 255, the router will disbelieve the source and will not add the route to the routing table.

Showing static routes in the routing table

To display route information, use the `show ip route` command. To show just static routes, use the `show ip route static` command, as shown in the following example.

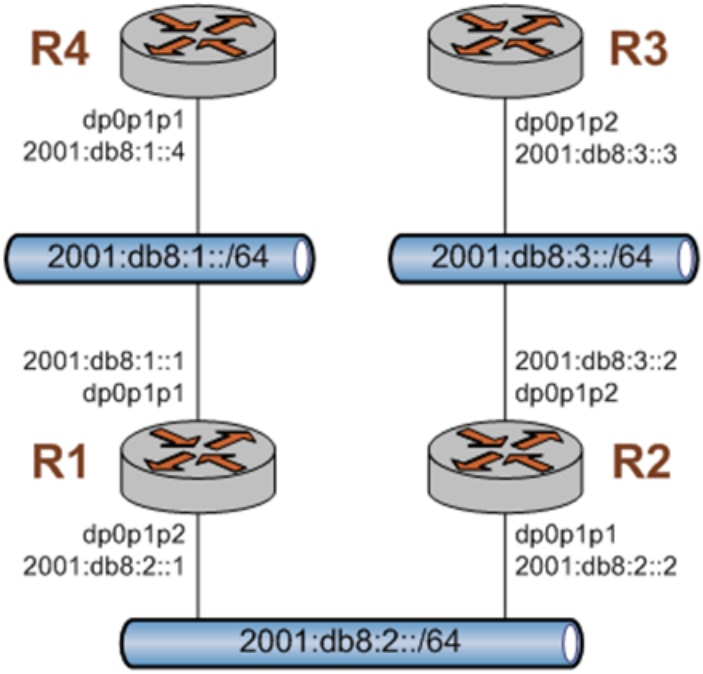
Showing static routes in the routing table

```
vyatta@R1:~$ show ip route static
Codes: K - kernel route, C - connected, S - static, R - RIP, O - OSPF,
       I - ISIS, B - BGP, > - selected route, * - FIB route
S>* 11.0.0.0/8 [1/0] via 172.16.0.26, dp0p0p0
vyatta@R1:~$
```

Static IPv6 route configuration

Figure 2: Static IPv6 routing example shows an IPv6 network with three nodes. Verify that IPv6 forwarding is enabled shows how to configure nodes that use static routes to enable R2 and R4 to communicate through R1.

Figure 2. Static IPv6 routing example



Verify that IPv6 forwarding is enabled

For R1 to be able to pass data between the dp0p0p0 and dp0p0p2 interfaces (that is, between R4 and R2), R1 must be configured to enable forwarding. To determine if forwarding is enabled, perform the following step in operational mode.

Table 2. Determining if forwarding is enabled on R1

Step	Command
Display the state of IPv6 forwarding on R1.	`vyatta@R1:~$ show ipv6 forwarding` `ipv6 forwarding is off`

If forwarding is not enabled, as in the example below, the system must be configured to enable forwarding. To enable forwarding, perform the following steps in configuration mode.

Table 3. Enable forwarding on R1

Step	Command
Enable forwarding on R1.	`vyatta@R1# set system ipv6 disable-forwarding`
Commit the change.	`vyatta@R1# commit`

Change to operational mode.	`vyatta@R1# exit`
	`exit`
	`vyatta@R1:~$`

Table 3. Enable forwarding on R1 (continued)

Step	Command
Display the state of IPv6 forwarding on R1.	`vyatta@R1:~$ show ipv6 forwarding` `ipv6 forwarding is on`

Add the default IPv6 route

On R4, all traffic that is not routed elsewhere is sent to R1. To configure the default route, perform the following steps in configuration mode.

Table 4. Adding the default route on R4

Step	Command
Add the default route on R4.	`vyatta@R4# set protocols static route6 ::/0 next-hop 2001:db8:1::1`
Commit the change.	`vyatta@R4# commit`

Change to operational mode.	`vyatta@R4# exit`
	`exit`
	`vyatta@R4:~$`

Verify the default route in the routing table.	`vyatta@R4:~$ show ipv6 route`
	`Codes: K - kernel route, C - connected, S - static, R - RIPng, O - OSPFv3,`
	`I - ISIS, B - BGP, * - FIB route.`
	`S>* ::/0 [1/0] via 2001:db8:1::1, dp0p0p0`
	`C>* ::1/128 is directly connected, lo`
	`C>* 2001:db8:1::/64 is directly connected, dp0p0p0`
	`C * fe80::/64 is directly connected, dp0p0p1`
	`C>* fe80::/64 is directly connected, dp0p0p0`
	`K>* ff00::/8 is directly connected, dp0p0p0`

Add a static IPv6 route

As an alternative to the default route created on R4, create a static route on R2. To configure a static route to the 2001:db8:1::/64 network, perform the following steps in configuration mode.

Table 5. Adding a static IPv6 route

Step	Command
Add a static route on R2.	`vyatta@R1# set protocols static route6 2001:db8:1::/64 next-hop 2001:db8:2::1`
Commit the change.	`vyatta@R1# commit`

Change to operational mode.	`vyatta@R1# exit`
	`exit`
	`vyatta@R2:~$`

Verify the static route in the routing table.	`vyatta@R2:~$ show ipv6 route` `Codes: K - kernel route, C - connected, S - static, R - RIPng, O - OSPFv3,`

Table 5. Adding a static IPv6 route (continued)

Step	Command
	I - ISIS, B - BGP, * - FIB route. C>* ::1/128 is directly connected, lo S>* 2001:db8:1::/64 [1/0] via 2001:db8:2::1, dp0p0p0 C>* 2001:db8:2::/64 is directly connected, dp0p0p0 C * fe80::/64 is directly connected, dp0p0p1 C>* fe80::/64 is directly connected, dp0p0p0 K>* ff00::/8 is directly connected, dp0p0p0

Confirm connectivity

To confirm that R2 and R4 can communicate, use the `ping` command. To confirm connectivity between R2 and R4, perform the following step in operational mode.

Table 6. Confirming connectivity between R2 and R4

Step	Command
Ping R4 from R2.	vyatta@R2:~$ ping 2001:db8:1::4 PING 2001:db8:1::4(2001:db8:1::4) 56 data bytes 64 bytes from 2001:db8:1::4: icmp_seq=1 ttl=63 time=5.65 ms 64 bytes from 2001:db8:1::4: icmp_seq=2 ttl=63 time=0.382 ms ^C --- 2001:db8:1::4 ping statistics --- 2 packets transmitted, 2 received, 0% packet loss, time 1011ms rtt min/avg/max/mdev = 0.382/3.016/5.650/2.634 ms

As an alternative, use the `traceroute` command to verify that the route goes from R2 to R1 to R4. To confirm connectivity between R2 and R4 through R1 by using the `traceroute` command, perform the following step in operational mode.

Table 7. Confirming connectivity between R2 and R4 through R1

Step	Command
Trace the route from R2 to R4.	vyatta@R2:~$ traceroute 2001:db8:1::4 traceroute to 2001:db8:1::4 (2001:db8:1::4), 30 hops max, 40 byte packets 1 (2001:db8:2::1) 4.448 ms 4.148 ms 4.092 ms 2 (2001:db8:1::4) 4.297 ms 4.306 ms 4.308 ms

Static Route Tag Configuration

Overview

Static route tags support filtering and redistributing static routes into other protocols. The filtering and redistribution of static routes into other routing protocols are based on the tag.

These commands let you assign a tag to a static route:

- protocols static route blackhole
- protocols static route next-hop

- protocols static route unreachable
- protocols static route6 blackhole
- protocols static route6 next-hop
- protocols static route6 unreachable
- protocols static interface-route next-hop-interface
- protocols static interface-route6 next-hop-interface
- protocols static route next-hop-routing-instance next-hop
- protocols static route6 next-hop-routing-instance next-hop
- protocols static interface-route next-hop-routing-instance next-hop-interface
- protocols static interface-route6 next-hop-routing-instance next-hop-interface

The routing protocols that are able to redistribute static routes based on a tag are:

- OSPFv2
- RIP
- RIPng
- BGP

Note: PBR routes (`set protocols static table ...`) do not support static route tagging because PBR routes are not redistributed to protocols.

The tag is distributed along with the route to the IGP peers. (This does not apply to BGP because it does not include a tag in its updates). The tag is visible in the peer RIB, where it can be utilized for downstream redistribution. The route-map parameter can match on the tag value to distribute static routes to dynamic routing protocols.

In addition to matching a specific tag, you can change a tag's value redistribution by using set policy route route-map name rule num set tag new-tag-value. XREF includes an example of this action.

Equal Cost Multi-Path Routing

A tag is associated with each entry in the routing information base (RIB) and a RIB can have multiple, equal-cost nexthops. The tag is specified for each nexthop and must have the same value for all nexthops with the same administrative distance.

You can use a different tag for a different administrative distance because a different distance forms a different RIB entry. For example, you might want to redistribute the route only when it is using the primary path(s) but not if it has fallen over to a back-up path. To set up this behavior, add a tag option for a static route if a distance option exists, as in the following example:

```
vyatta@yvatta# set protocols static route 11.1.4.0/24 next-hop 10.10.1.2
 tag 1
vyatta@yvatta# set protocols static route 11.1.4.0/24 next-hop 10.10.2.2
 distance 5
vyatta@yvatta# set protocols static route 11.1.4.0/24 next-hop 10.10.2.2
 tag 2
```

The preceding commands create two RIB entries:

- An entry for 10.10.1.2 with tag 1
- An entry for 10.10.2.2 with tag 2: this route is activated only if the first route goes down

Operational Mode Commands

To see the tag assigned to a static route, use a `show ip route prefix` or `show ipvx6 route prefix` command. In the following examples, 11.1.5.0/24 was configured with tag 1 and 11:1:3::/64 with tag 2.

```
vyatta@yvatta~$ show ip route 11.1.5.0
Routing entry for 11.1.5.0/24
  Known via "static", distance 1, metric 0, tag 1, best
    via 10.10.100.2, dp0p1s2.100

vyatta@yvatta~$ show ipv6 route 11:1:3::
Routing entry for 11:1:3::/64
  Known via "static", distance 1, metric 0, tag 2, best
    is a summary, Rejectt
```

Static Route/Interface-Route Example

This section shows examples of `set` commands for static routes and static interface routes and `show` commands for the results.

```
vyatta@yvatta# set protocols static route 12.1.1.0/24 next-hop 11.1.2.2 tag
 1
...
vyatta@vyatta:~$ show ip route 12.1.1.0/24
Routing entry for 12.1.1.0/24
  Known via "static", distance 1, metric 0, tag 1, best
    via 11.1.2.2, dp0p1s1.2110

vyatta@yvatta# set protocols static interface-route 13.1.1.0/24
 next-hop-interface dp0p1s1 tag 10
...
vyatta@yvatta:~$ show ip route 13.1.1.0/24
Routing entry for 13.1.1.0/24
  Known via "static", distance 1, metric 0, tag 10, best
  * is directly connected, dp0p1s1
```

Static Route6/Interface-route6 Example

This section shows examples of `set` commands for IPv6 static route and IPv6 static interface route and show commands for the results.

```
vyatta@yvatta# set protocols static route6 12:1:1::/64 next-hop
 10:10:100::2 tag 20
...
vyatta@yvatta:~$ show ipv6 route 12:1:1::/64
Routing entry for 12:1:1::/64
  Known via "static", distance 1, metric 0, tag 20, best
    via 10:10:100::2, dp0p1s2.100

vyatta@yvatta# set protocols static interface-route6 13:1:1::/64
 next-hop-interface dp0p1s2.100 tag 30
...
vyatta@yvatta:~$ show ipv6 route 13:1:1::/64
Routing entry for 13:1:1::/64
  Known via "static", distance 1, metric 0, tag 30, best
  * is directly connected, dp0p1s2.100
```

Static Cross-Routing-Instance Route Example

This section shows an examples of `set` commands for IPv6 static route and IPv6 static interface route and `show` commands for the results.

```
vyatta@yvatta# set protocols static route 14.1.1.0/24
 next-hop-routing-instance red next-hop 10.10.200.2 tag 50
...
vyatta@yvatta:~$ show ip route 14.1.1.0/24
Routing entry for 14.1.1.0/24
  Known via "static", distance 1, metric 0, tag 50, best
    via 10.10.200.2, dp0p1s2.200 (red)

vyatta@yvatta# set routing routing-instance red protocols static
 interface-route 14.1.1.0/24 next-hop-routing-instance default
 next-hop-interface dp0p1s1 tag 60
...
vyatta@yvatta:~$ show ip route routing-instance red 14.1.1.0/24
Routing entry for 14.1.1.0/24
  Known via "static", distance 1, metric 0, tag 60, best
  * is directly connected, dp0p1s1 (default)
```

Static ECMP Route Example

```
vyatta@yvatta# set protocols static route 12.1.1.0/24 next-hop 11.1.2.2 tag
 1
vyatta@yvatta# set protocols static route 12.1.1.0/24 next-hop 11.1.2.6 tag
 1
vyatta@yvatta# set protocols static route 12.1.1.0/24 next-hop 11.1.2.8
 distance 2
```

```
vyatta@yvatta# set protocols static route 12.1.1.0/24 next-hop 11.1.2.8 tag
 2

vyatta@yvatta:~$ show ip route 12.1.1.0/24
Routing entry for 12.1.1.0/24
  Known via "static", distance 2, metric 0, tag 2
    via 11.1.2.8, dp0p1s1.2112

Routing entry for 12.1.1.0/24
  Known via "static", distance 1, metric 0, tag 1, best
    via 11.1.2.6, dp0p1s1.2111
    via 11.1.2.2, dp0p1s1.2110
```

Invalid ECMP: Tag Value Conflict Example

```
vyatta@yvatta# set protocols static route 12.2.2.0/24 next-hop 11.1.2.2 tag
 1
[edit]
vyatta@yvatta# set protocols static route 12.2.2.0/24 next-hop 11.1.2.8 tag
 2
[edit]
vyatta@yvatta# commit

[protocols static route 12.2.2.0/24 next-hop 11.1.2.2]

Next-hops with the same distance must have the same tag.

[[protocols static route 12.2.2.0/24 next-hop 11.1.2.2]] failed.
[protocols static route 12.2.2.0/24 next-hop 11.1.2.8]

Next-hops with the same distance must have the same tag.

[[protocols static route 12.2.2.0/24 next-hop 11.1.2.8]] failed.
Commit failed!
```

Redistribution Example

```
vyatta@yvatta# set policy route route-map static-export rule 10 action
 permit
vyatta@yvatta# set policy route route-map static-export rule 10 match tag 5
vyatta@yvatta# set protocols ospf redistribute static route-map
 static-export
vyatta@yvatta# set protocols static route 15.1.1.0/24 next-hop 11.1.2.2 tag
 5
...
vyatta@yvatta:~$ show ip ospf database external
      OSPF Router with ID (1.1.1.1) (Process ID 0 routing-instance default)
       AS External Link States
        LS age: 90
```

```
        Options: 0x22 (-|-|DC|-|-|-|E|-)
        LS Type: AS-external-LSA
        Link State ID: 15.1.1.0 (External Network Number)
        Advertising Router: 1.1.1.1
        LS Seq Number: 80000001
        Checksum: 0x2b59
        Length: 36
        Network Mask: /24
          Metric Type: 2 (Larger than any link state path)
          TOS: 0
          Metric: 20
          Forward Address: 0.0.0.0
          External Route Tag: 5
```

Redistribution by Use of a Different Tag Example

```
vyatta@yvatta# set policy route route-map static-export rule 10 action
 permit
vyatta@yvatta# set policy route route-map static-export rule 10 match tag 5
vyatta@yvatta# set policy route route-map static-export rule 10 set tag 50
vyatta@yvatta# set protocols static interface-route6 15:1:1::/64
 next-hop-interface dp0p1s1 tag 5
vyatta@yvatta# set protocols ospfv3 redistribute static route-map
 static-export
...
vyatta@yvatta:~$ show ipv6 route 15:1:1::/64
Routing entry for 15:1:1::/64
  Known via "static", distance 1, metric 0, tag 5, best
  * is directly connected, dp0p1s1

vyatta@yvatta:~$ show ipv6 ospfv3 database external
      OSPFv3 Router with ID (1.1.1.1) (Process *null* Routing-instance
 default)
       AS-external-LSA
        LS age: 161
        LS Type: AS-External-LSA
        Link State ID: 0.0.0.1
        Advertising Router: 1.1.1.1
        LS Seq Number: 0x80000002
        Checksum: 0x4C1C
        Length: 40
         Metric Type: 2 (Larger than any link state path)
         Metric: 20
         Prefix: 15:1:1::/64
         Prefix Options: 0 (-|-|-|-)
         External Route Tag: 50
```

Troubleshooting

The following commands can help with troubleshooting:

- `show ip route prefix` or `show ipv6 route prefix`: shows the tag associated with the route
- `show ip ospf database external`: shows redistributed routes, including the external tag
- `show ipv6 ospfv3 database external`: as above, but for IPv6 and OSPFv3

Chapter 8. Static Route Commands

protocols static interface-route description

Sets the description of an interface-based static route.

`set protocols static interface-route` *`subnet`* **`description`** *`description`*

`delete protocols static interface-route` *`subnet`* **`description`** *`description`*

`show protocols static interface-route` *`subnet`* **`description`** *`description`*

subnet

Multi-node. An interface-based static route. The format is a destination subnet of the form *address*/*prefix* (*x.x.x.x/x*)).

You can define multiple interface-based routes by creating multiple **interface-route** configuration nodes.

description

Description of the static route.

Configuration mode

```
protocols {
 static {
  interface-route subnet {
   next-hop-interface {
    description
   }
  }
 }

}
```

Use the `set` form of this command to set the description of a static route.

Use the `delete` form of this command to remove the the description of a static route.

Use the `show` form of this command to view the the description of a static route.

protocols static interface-route next-hop-interface

Configures the next-hop interface for an interface-based static route.

`set protocols static interface-route` *`subnet`* **`next-hop-interface`** *`interface`* [**`disable`** | **`distance`** *`distance`* | **`tag`** *`redist-tag`* | **`path-monitor monitor`** *`monitor-name`* [**`policy`** *`policy-name`* [**`state`** { **`compliant`** | **`non-compliant`** }]]]

```
delete protocols static interface-route subnet next-hop-interface interface [
disable | distance | tag redist-tag | path-monitor monitor monitor-name [
policy policy-name [ state { compliant | non-compliant } ] ] ]

show protocols static interface-route subnet next-hop-interface interface [
disable | distance | tag redist-tag | path-monitor monitor monitor-name [
policy policy-name [ state { compliant | non-compliant } ] ] ]
```

subnet

Multi-node. An interface-based static route. The format is a destination subnet of the form *address*/*prefix* (*x.x.x.x/x*)).

You can define multiple interface-based routes by creating multiple **interface-route** configuration nodes.

interface

The next-hop interface.

disable

Disables the interface-based static route.

distance

The next-hop distance for this route (1-255). Routes with a smaller distance are selected before those with a larger distance. The default distance is 1.

redist-tag

Value to control route redistrbution (1-4294967295). All next-hops for a RIB entry (prefix + distance) must have the same tag.

monitor-name

Name of a Path Monitor instance.

policy-name

Name of a Path Monitor policy.

state

The compliance state:

compliant: All associated Path Monitor policies are compliant.

non-compliant: All associated Path Monitor policies are non-compliant.

Configuration mode

```
protocols {
        static {
                interface-route {
                        next-hop-interface  {
                                disable
                                distance
                                path-monitor {
                                        monitor  {
                                                policy  {
                                                        state
```

```
                                                }
                                            }
                                tag
                        }
                }
        }
}
```

Use the `set` form of this command to configure the next-hop interface for a static route.

Use the `delete` form of this command to remove the next-hop interface from a static route.

Use the `show` form of this command to view the next-hop interface for a static route.

protocols static interface-route next-hop-routing-instance next-hop-interface

Configures the routing instance (VRF) and next-hop interface for a static route.

`set protocols static interface-route` *subnet* **next-hop-routing-instance** *routing-instance* **next-hop-interface** *interface* [**disable** | **distance** *distance* | **tag** *redist-tag* | **path-monitor monitor** *monitor-name* [**policy** *policy-name* [**state** { **compliant** | **non-compliant** }]]]

`delete protocols static interface-route` *subnet* **next-hop-routing-instance** *routing-instance* **next-hop-interface** *interface* [**disable** | **distance** | **tag** *redist-tag* | **path-monitor monitor** *monitor-name* [**policy** *policy-name* [**state** { **compliant** | **non-compliant** }]]]

`show protocols static interface-route` *subnet* **next-hop-routing-instance** *routing-instance* **next-hop-interface** *interface* [**disable** | **distance** | **tag** *redist-tag* | **path-monitor monitor** *monitor-name* [**policy** *policy-name* [**state** { **compliant** | **non-compliant** }]]]

subnet

Multi-node. An interface-based static route. The format is a destination subnet of the form *address*/*prefix* (*x.x.x.xlx*)).

You can define multiple interface-based routes by creating multiple **interface-route** configuration nodes.

routing-instance

Destination routing instance (VRF) for the next-hop interface.

interface

The next-hop interface.

disable

Disables the interface-based static route.

distance

The next-hop distance for this route (1-255). Routes with a smaller distance are selected before those with a larger distance. The default distance is 1.

redist-tag

Value to control route redistrbution (1-4294967295). All next-hops for a RIB entry (prefix + distance) must have the same tag.

monitor-name

Name of a Path Monitor instance.

policy-name

Name of a Path Monitor policy.

state

The compliance state:

compliant: All associated Path Monitor policies are compliant.

non-compliant: All associated Path Monitor policies are non-compliant.

Configuration mode

```
protocols {
        static {
                interface-route {
                        next-hop-routing-instance {
                                next-hop-interface {
                                        disable
                                        distance
                                        path-monitor {
                                                monitor {
                                                        policy {
                                                                state
                                                        }
                                                }
                                        tag
                                }
                        }
                }
        }
}
```

Use the `set` form of this command to configure the routing instance and next-hop interface for a static route.

Use the `delete` form of this command to remove the routing instance and next-hop interface from a static route.

Use the `show` form of this command to view the routing instance and next-hop interface for a static route.

protocols static interface-route6 description

Sets the description for an interface-based IPv6 static route.

```
set protocols static interface-route6 subnet description description

delete protocols static interface-route6 subnet description description

show protocols static interface-route6 subnet description description
```

subnet

Multi-node. An interface-based static route. The format is a destination subnet of the form *address*/*prefix* (*h*:*h*:*h*:*h*:*h*:*h*:*h*/*x*).

You can define multiple interface-based routes by creating multiple **interface-route** configuration nodes.

description

The next-hop interface.

Configuration mode

```
protocols {
 static {
  interface-route6 subnet {
   next-hop-interface {
    description
   }
  }
 }

}
```

Use the `set` form of this command to set the description of an IPv6 static route.

Use the `delete` form of this command to remove the description of an IPv6 static route.

Use the `show` form of this command to view the description of an IPv6 static route.

protocols static interface-route6 next-hop-interface

Configures the next-hop interface for an interface-based IPv6 static route.

```
set protocols static interface-route6 subnet next-hop-interface interface [
disable | distance distance | tag redist-tag | path-monitor monitor monitor-
name [ policy policy-name [ state { compliant | non-compliant } ] ] ]

delete protocols static interface-route6 subnet next-hop-interface interface [
disable | distance | tag redist-tag | path-monitor monitor monitor-name [
policy policy-name [ state { compliant | non-compliant } ] ] ]

show protocols static interface-route6 subnet next-hop-interface interface [
disable | distance | tag redist-tag | path-monitor monitor monitor-name [
policy policy-name [ state { compliant | non-compliant } ] ] ]
```

subnet

Multi-node. An interface-based static route. The format is a destination subnet of the form *address*/*prefix* (*h*:*h*:*h*:*h*:*h*:*h*:*h*:*h*/*x*).

You can define multiple interface-based routes by creating multiple **interface-route** configuration nodes.

interface

The next-hop interface.

disable

Disables the interface-based IPv6 static route.

distance

The next-hop distance for this route (1-255). Routes with a smaller distance are selected before those with a larger distance. The default distance is 1.

redist-tag

Value to control route redistrbution (1-4294967295). All next-hops for a RIB entry (prefix + distance) must have the same tag.

monitor-name

Name of a Path Monitor instance.

policy-name

Name of a Path Monitor policy.

state

The compliance state:

compliant: All associated Path Monitor policies are compliant.

non-compliant: All associated Path Monitor policies are non-compliant.

Configuration mode

```
protocols {
        static {
                interface-route6 {
                        next-hop-interface {
                                disable
                                distance
                                path-monitor {
                                        monitor {
                                                policy {
                                                        state
                                                }
                                }
                                tag
                        }
                }
        }
}
```

Use the `set` form of this command to configure the next-hop interface for an IPv6 static route.

Use the `delete` form of this command to remove the next-hop interface from an IPv6 static route.

Use the `show` form of this command to view the next-hop interface for an IPv6 static route.

protocols static interface-route6 next-hop-routing-instance next-hop-interface

Configures the routing instance (VRF) and next-hop interface for an IPv6 static route.

`set protocols static interface-route6` ***subnet*** **next-hop-routing-instance** ***routing-instance*** **next-hop-interface** ***interface*** [**disable** | **distance** ***distance*** | **tag** ***redist-tag*** | **path-monitor monitor** ***monitor-name*** [**policy** ***policy-name*** [**state** { **compliant** | **non-compliant** }]]]

`delete protocols static interface-route6` ***subnet*** **next-hop-routing-instance** ***routing-instance*** **next-hop-interface** ***interface*** [**disable** | **distance** | **tag** ***redist-tag*** | **path-monitor monitor** ***monitor-name*** [**policy** ***policy-name*** [**state** { **compliant** | **non-compliant** }]]]

`show protocols static interface-route6` ***subnet*** **next-hop-routing-instance** ***routing-instance*** **next-hop-interface** ***interface*** [**disable** | **distance** | **tag** ***redist-tag*** | **path-monitor monitor** ***monitor-name*** [**policy** ***policy-name*** [**state** { **compliant** | **non-compliant** }]]]

subnet

Multi-node. An interface-based static route. The format is a destination subnet of the form *address*/*prefix* (*h*:*h*:*h*:*h*:*h*:*h*:*h*:*h*/*x*).

You can define multiple interface-based routes by creating multiple **interface-route** configuration nodes.

routing-instance

Destination routing instance (VRF) for the next-hop interface.

interface

The next-hop interface.

disable

Disables the interface-based static route.

distance

The next-hop distance for this route (1-255). Routes with a smaller distance are selected before those with a larger distance. The default distance is 1.

redist-tag

Value to control route redistrbution (1-4294967295). All next-hops for a RIB entry (prefix + distance) must have the same tag.

monitor-name

Name of a Path Monitor instance.

policy-name

Name of a Path Monitor policy.

state

The compliance state:

compliant: All associated Path Monitor policies are compliant.

non-compliant: All associated Path Monitor policies are non-compliant.

Configuration mode

```
protocols {
        static {
                interface-route6 {
                        next-hop-routing-instance {
                               next-hop-interface {
                                        disable
                                        distance
                                        path-monitor {
                                                monitor {
                                                        policy  {
                                                                state
                                                        }
                                                }
                                        tag
                                }
                        }
                }
        }
}
```

Use the `set` form of this command to configure the routing instance and next-hop interface for an IPv6 static route.

Use the `delete` form of this command to remove the routing instance and next-hop interface from an IPv6 static route.

Use the `show` form of this command to view the routing instance and next-hop interface for an IPv6 static route.

protocols static route blackhole

Configures a black hole static route, a destination that is offline and cannot receive traffic or provide messages to the source of the traffic.

`set protocols static route` ***subnet*** **blackhole** [**distance** ***distance*** | **tag** ***redist-tag***]

`delete protocols static route` *`subnet`* **`blackhole`** [**`distance`** | **`tag`** *`redist-tag`*]

`show protocols static route` *`subnet`* **`blackhole`** [**`distance`** | **`tag`** *`redist-tag`*]

subnet

Multi-node. A static route. The format is a destination subnet of the form *address*/*prefix* (*x.x.x.x/x*).

You can define multiple static routes by creating multiple **route** configuration nodes.

distance

The black hole distance for this route (1-255). Routes with a smaller distance are selected before those with a larger distance. The default distance is 1.

redist-tag

Value to control route redistrbution (1-4294967295). All next-hops for a RIB entry (prefix + distance) must have the same tag.

Configuration mode

```
protocols {
 static {
  route subnet {
   blackhole {
    distance distance
    tag value
   }
  }
 }

}
```

Use the `set` form of this command to configure a black hole static route.

Use the `delete` form of this command to remove a black hole static route.

Use the `show` form of this command to view a black hole static route.

protocols static route description

Sets the description for a static route.

`set protocols static route` *`subnet`* **`description`** *`description`*

`delete protocols static route` *`subnet`* **`description`** *`description`*

`show protocols static route` *`subnet`* **`description`** *`description`*

subnet

Multi-node. A static route. The format is a destination subnet of the form *address*/*prefix* (*x.x.x.x/x*).

You can define multiple static routes by creating multiple **route** configuration nodes.

description

The description of the static route.

Configuration mode

```
protocols {
 static {
  route subnet {
   description
  }
 }
}
```

Use the `set` form of this command to set the description of a static route.

Use the `delete` form of this command to remove the description of a static route.

Use the `show` form of this command to view the description of a static route.

protocols static route next-hop

Configures the next hop for a static route.

`set protocols static route` *subnet* **next-hop** *address* [**disable** | **distance** *distance* | **fall-over bfd** | **interface** *interface-name* | **tag** *redist-tag* | **path-monitor monitor** *monitor-name* [**policy** *policy-name* [**state** { **compliant** | **non-compliant** }]]]

`delete protocols static route` *subnet* **next-hop** *address* [**disable** | **distance** | **fall-over bfd** | **interface** *interface-name* | **tag** *redist-tag* | **path-monitor monitor** *monitor-name* [**policy** *policy-name* [**state** { **compliant** | **non-compliant** }]]]

`show protocols static route` *subnet* **next-hop** *address* [**disable** | **distance** | **fall-over** | **interface** | **tag** *redist-tag* | **path-monitor monitor** *monitor-name* [**policy** *policy-name* [**state** { **compliant** | **non-compliant** }]]]

subnet

Multi-node. A static route. The format is a destination subnet of the form *address*/*prefix* (*x.x.x.x*/*x*).

You can define multiple static routes by creating multiple **route** configuration nodes.

address

The address of the next-hop router.

disable

Disables the static route.

distance

Sets the next-hop distance for this route (1-255). Routes with a smaller distance are selected before those with a larger distance. The default distance is 1.

fall-over bfd

Enables BFD support for fallover.

interface-name

Specifies the name of the outgoing intrface.

redist-tag

Value to control route redistrbution (1-4294967295). All next-hops for a RIB entry (prefix + distance) must have the same tag.

monitor-name

Name of a Path Monitor instance.

policy-name

Name of a Path Monitor policy.

state

The compliance state:

compliant: All associated Path Monitor policies are compliant.

non-compliant: All associated Path Monitor policies are non-compliant.

Configuration mode

```
protocols {
        static {
                route {
                        next-hop {
                                disable
                                distance
                                fall-over bfd
                                interface
                                path-monitor {
                                        monitor {
                                               policy {
                                                       state
                                               }
                                }
                                tag
                        }
                }
        }
}
```

Use the `set` form of this command to configure the next hop for a static route.

Use the `delete` form of this command to remove the next hop from a static route.

Use the `show` form of this command to view the next hop for a static route.

protocols static route next-hop-routing-instance next-hop

Configures the routing instance (VRF) and next hop for a static route.

```
set protocols static route  subnet next-hop-routing-instance routing-instance
next-hop address [ disable | distance distance | interface interface-name
| tag redist-tag | path-monitor monitor monitor-name [ policy policy-name [
state { compliant | non-compliant } ] ] ]

delete protocols static route subnet next-hop-routing-instance routing-instance
next-hop address [ disable | distance distance | interface interface-name
| tag redist-tag | path-monitor monitor monitor-name [ policy policy-name [
state { compliant | non-compliant } ] ] ]

show protocols static route subnet next-hop-routing-instance routing-instance
next-hop address [ disable | distance distance | interface interface-name
| tag redist-tag | path-monitor monitor monitor-name [ policy policy-name [
state { compliant | non-compliant } ] ] ]
```

subnet

Multi-node. A static route. The format is a destination subnet of the form *address*/*prefix* (*x.x.x.x/x*).

You can define multiple static routes by creating multiple **route** configuration nodes.

routing-instance

Destination routing instance (VRF) for the next-hop address.

address

The address of the next-hop router.

disable

Disables the static route.

distance

Distance for this route (1-255). Routes with a smaller distance are selected before those with a larger distance. The default distance is 1.

interface-name

The name of the outgoing interface.

redist-tag

Value to control route redistrbution (1-4294967295). All next-hops for a RIB entry (prefix + distance) must have the same tag.

monitor-name

Name of a Path Monitor instance.

policy-name

Name of a Path Monitor policy.

state

The compliance state:

compliant: All associated Path Monitor policies are compliant.

non-compliant: All associated Path Monitor policies are non-compliant.

Configuration mode

```
protocols {
        static {
                route subnet {
                       next-hop-routing-instance {
                              next-hop address {
                                      disable
                                      distance
                                      interface
                                      path-monitor {
                                              monitor {
                                                      policy {
                                                             state
                                                      }
                                              }
                                      tag
                                }
                        }
                }
        }
}
```

Use the `set` form of this command to configure the routing instance and next hop for a static route.

Use the `delete` form of this command to remove the routing instance and next hop from a static route.

Use the `show` form of this command to view the routing instance and next hop for a static route.

protocols static route unreachable

Configures an unreachable static route, a destination for which packets are discarded and replied with an ICMP Type 3 message (destination unreachable).

`set protocols static route` ***subnet*** **unreachable** [**tag** *redist-tag*]

`delete protocols static route` ***subnet*** **unreachable** [**tag** *redist-tag*]

`show protocols static route` ***subnet*** **unreachable** [**tag** *redist-tag*]

subnet

Multi-node. A static route. The format is a destination subnet of the form *address*/*prefix* (*x.x.x.x*/*x*).

You can define multiple static routes by creating multiple **route** configuration nodes.

redist-tag

Value to control route redistrbution (1-4294967295). All next-hops for a RIB entry (prefix + distance) must have the same tag.

Configuration mode

```
protocols {
        static {
                route subnet {
                        unreachable {
                                tag
                        }
                }
        }
}
```

Use the `set` form of this command to configure an unreachable static route.

Use the `delete` form of this command to remove an unreachable static route.

Use the `show` form of this command to view an unreachable route.

protocols static route6 blackhole

Configures a black hole IPv6 static route, a destination that is offline and cannot receive traffic or provide messages to the source of the traffic.

`set protocols static route6` ***subnet*** **blackhole** [**distance** *distance* | **tag** *redist-tag*]

`delete protocols static route6` ***subnet*** **blackhole** [**distance** *distance* | **tag** *redist-tag*]

`show protocols static route6` ***subnet*** **blackhole** [**distance** *distance* | **tag** *redist-tag*]

subnet

Multi-node. An IPv6 static route. The format is a destination subnet of the form IPv6-*address*/*prefix* (*h*:*h*:*h*:*h*:*h*:*h*:*sh*:*h*/*x*).

You can define multiple static routes by creating multiple **route** configuration nodes.

distance

The black hole distance for this route (1-255). Routes with a smaller distance are selected before those with a larger distance. The default distance is 1.

redist-tag

Value to control route redistrbution (1-4294967295). All next-hops for a RIB entry (prefix + distance) must have the same tag.

Configuration mode

```
protocols {
        static {
                route6 {
                        blackhole {
                                distance
                                tag
                        }
                }
        }
}
```

Use the `set` form of this command to configure a black hole IPv6 static route.

Use the `delete` form of this command to remove a black hole IPv6 static route.

Use the `show` form of this command to view a black hole IPv6 static route.

protocols static route6 description

Sets the description of an IPv6 static route.

`set protocols static route6` ***subnet*** **`description`** ***description***

`delete protocols static route6` ***subnet*** **`description`** ***description***

`show protocols static route6` ***subnet*** **`description`** ***description***

subnet

Multi-node. An IPv6 static route. The format is a destination subnet of the form IPv6-*address*/*prefix* (*h*:*h*:*h*:*h*:*h*:*h*:*h*/*x*).

You can define multiple static routes by creating multiple **route6** configuration nodes.

description

The description of the static route.

Configuration mode

```
protocols {
        static {
                route6 {
                        description
                }
        }
}
```

Use this command to configure IPv6 static routes on the router.

Use the `set` form of this command to set the description of an IPv6 static route.

Use the `delete` form of this command to remove the description of an IPv6 static route.

Use the `show` form of this command to view the description of an IPv6 static route.

protocols static route6 next-hop

Configures the next hop for an IPv6 static route.

```
set protocols static route6 subnet next-hop address [ disable | distance
distance | interface interface | tag redist-tag | path-monitor monitor
monitor-name [ policy policy-name [ state { compliant | non-compliant } ] ] ]

delete protocols static route6 subnet next-hop address [ disable | distance
| interface | tag redist-tag | path-monitor monitor monitor-name [ policy
policy-name [ state { compliant | non-compliant } ] ] ]

show protocols static route6 subnet next-hop address [ disable | distance |
interface | tag redist-tag | path-monitor monitor monitor-name [ policy
policy-name [ state { compliant | non-compliant } ] ] ]
```

subnet

Multi-node. An IPv6 static route. The format is a destination subnet of the form IPv6-*address*/*prefix* (*h*:*h*:*h*:*h*:*h*:*h*:*h*:*h*/*x*).

You can define multiple static routes by creating multiple *subnet* configuration nodes.

address

The IPv6 address of the next hop router.

disable

Disables the IPv6 static route.

distance

The next-hop distance for this route (1-255). Routes with a smaller distance are selected before those with a larger distance. The default distance is 1.

interface

The outgoing interface used to reach the next-hop address. This interface is needed when the next-hop address is a link-local address (that is, it has a fe80::/64 prefix).

redist-tag

Value to control route redistrbution (1-4294967295). All next-hops for a RIB entry (prefix + distance) must have the same tag.

monitor-name

Name of a Path Monitor instance.

policy-name

Name of a Path Monitor policy.

state

The compliance state:

compliant: All associated Path Monitor policies are compliant.

non-compliant: All associated Path Monitor policies are non-compliant.

Configuration mode

```
protocols {
        static {
                route6 {
                        next-hop {
                                disable
                                distance
                                interface
                                        path-monitor {
                                                monitor {
                                                        policy {
                                                                state
                                                        }
                                                }
                                        }
                                tag
                        }
                }
        }
}
```

Use the `set` form of this command to configure the next hop for an IPv6 static route.

Use the `delete` form of this command to remove the next hop from an IPv6 static route.

Use the `show` form of this command to view the next hop for an IPv6 static route.

protocols static route6 next-hop-routing-instance next-hop

Configures the routing instance (VRF) and next hop for an IPv6 static route.

`set protocols static route6` *subnet* **next-hop-routing-instance** *routing-instance* **next-hop** *ipv6-address* [**disable** | **distance** *distance* | **interface** *interface-name* | **tag** *redist-tag* | **path-monitor monitor** *monitor-name* [**policy** *policy-name* [**state** { **compliant** | **non-compliant** }]]]

`delete protocols static route6` *subnet* **next-hop-routing-instance** *routing-instance* **next-hop** *ipv6-address* [**disable** | **distance** *distance* | **interface** *interface-name* | **tag** *redist-tag* | **path-monitor monitor** *monitor-name* [**policy** *policy-name* [**state** { **compliant** | **non-compliant** }]]]

`show protocols static route6` *subnet* **next-hop-routing-instance** *routing-instance* **next-hop** *ipv6-address* [**disable** | **distance** *distance* | **interface** *interface-name* | **tag** *redist-tag* | **path-monitor monitor** *monitor-name* [**policy** *policy-name* [**state** { **compliant** | **non-compliant** }]]]

subnet

Multi-node. An interface-based static route. The format is a destination subnet of the form *address*/*prefix* (*h*:*h*:*h*:*h*:*h*:*h*:*h*:*h*/*x*).

You can define multiple static routes by creating multiple **route** configuration nodes.

routing-instance

Destination routing instance (VRF) for the next-hop address.

ipv6-address

The IPv6 address of the next-hop router.

disable

Disables the static route.

distance

Next-hop distance for this route (1-255). Routes with a smaller distance are selected before those with a larger distance. The default distance is 1.

interface-name

The name of the outgoing interface.

redist-tag

Value to control route redistrbution (1-4294967295). All next-hops for a RIB entry (prefix + distance) must have the same tag.

monitor-name

Name of a Path Monitor instance.

policy-name

Name of a Path Monitor policy.

state

The compliance state:

compliant: All associated Path Monitor policies are compliant.

non-compliant: All associated Path Monitor policies are non-compliant.

Configuration mode

```
protocols {
        static {
                route6 {
                       next-hop-routing-instance {
                               next-hop {
                                       disable
                                       distance
                                       interface
                                       path-monitor {
                                               monitor {
                                                       policy {
                                                               state
                                                       }
                                               }
```

```
                                        tag
                                }
                        }
                }
        }
}
```

Use the `set` form of this command to configure the routing instance and next hop for an IPv6 static route.

Use the `delete` form of this command to remove the routing instance and next hop from an IPv6 static route.

Use the `show` form of this command to view the routing instance and next hop for an IPv6 static route.

protocols static route6 unreachable

Configures an unreachable IPv6 static route, a destination for which packets are discarded and replied with an ICMP Type 3 message (destination unreachable).

`set protocols static route6` ***subnet*** **unreachable** [**tag** *redist-tag*]

`delete protocols static route6` ***subnet*** **unreachable** [**tag** *redist-tag*]

`show protocols static route6` ***subnet*** **unreachable** [**tag** *redist-tag*]

subnet

Multi-node. An IPv6 static route. The format is a destination subnet of the form IPv6-*address*/*prefix* (*h*:*h*:*h*:*h*:*h*:*h*:*sh*:*h*/*x*).

You can define multiple static routes by creating multiple **route** configuration nodes.

redist-tag

Value to control route redistrbution (1-4294967295). All next-hops for a RIB entry (prefix + distance) must have the same tag.

Configuration mode

```
protocols {
        static {
                route6 subnet {
                        unreachable {
                                tag value
                        }
                }
        }
}
```

Use the `set` form of this command to configure an unreachable IPv6 static route.

Use the `delete` form of this command to remove an unreachable IPv6 static route.

Use the `show` form of this command to view an unreachable IPv6 static route.

protocols static table description

Sets the description of an alternate routing table.

`set protocols static table` *`table`* **`description`** *`description`*

`delete protocols static table` *`table`* **`description`** *`description`*

`show protocols static table` *`table`* **`description`** *`description`*

table

Multi-node. An alternate routing table to be used by policy-based routing rules.

description

The description of the static route.

Configuration mode

```
protocols {
        static {
                table table {
                        description
                }
        }
}
```

Use this command to configure static routes in an alternate routing table. The alternate routing tables are used with policy-based routing. Refer to *Policy-based Routing Configuration Guide* for information on policy-based routing.

Use the `set` form of this command to set the description of an alternate routing table.

Use the `delete` form of this command to remove the description of an alternate routing table.

Use the `show` form of this command to view the description of in an alternate routing table.

protocols static table interface-route description

Sets the description of an interface-based static route in an alternate routing table.

`set protocols static table` *`table`* **`interface-route`** *`subnet`* **`description`** *`description`*

`delete protocols static table` *`table`* **`interface-route`** *`subnet`* **`description`** *`description`*

`show protocols static table` *`table`* **`interface-route`** *`subnet`* **`description`** *`description`*

table

Multi-node. An alternate routing table to be used by policy-based routing rules.

subnet

Multi-node. An interface-based static route. The format is a destination subnet of the form *address*/*prefix* (*x.x.x.x/x*).

You can define multiple interface-based routes by creating multiple **interface-route** configuration nodes.

description

The description of the static route.

Configuration mode

```
protocols {
        static {
                table {
                        interface-route {
                                desccription
                                }
                }
        }
}
```

Use this command to configure interface-based static routes in an alternate routing table. The alternate routing tables are used with policy-based routing. Refer to *Policy-based Routing Configuration Guide* for information on policy-based routing.

Use the `set` form of this command to set the description of a static router in an alternate routing table.

Use the `delete` form of this command to remove the description of a static router in an alternate routing table.

Use the `show` form of this command to view the description of a static router in an alternate routing table.

protocols static table interface-route next-hop-interface

Configures the next-hop interface for an interface-based static route in an alternate routing table.

`set protocols static table` *`table`* **`interface-route`** *`subnet`* **`next-hop-interface`** *`interface`* [**`disable`** | **`distance`** *`distance`* | **`path-monitor monitor`** *`monitor-name`* [**`policy`** *`policy-name`* [**`state`** { **`compliant`** | **`non-compliant`** }]]]

`delete protocols static table` *`table`* **`interface-route`** *`subnet`* **`next-hop-interface`** *`interface`* [**`disable`** | **`distance`** | **`path-monitor monitor`** *`monitor-name`* [**`policy`** *`policy-name`* [**`state`** { **`compliant`** | **`non-compliant`** }]]]

`show protocols static table` *`table`* **`interface-route`** *`subnet`* **`next-hop-interface`** *`interface`* [**`disable`** | **`distance`** | **`path-monitor monitor`** *`monitor-name`* [**`policy`** *`policy-name`* [**`state`** { **`compliant`** | **`non-compliant`** }]]]

table

Multi-node. An alternate routing table used by policy-based routing rules.

subnet

Multi-node. An interface-based static route. The format is a destination subnet of the form *address*/*prefix* (*x.x.x.x/x*).

You can define multiple interface-based routes by creating multiple **interface-route** configuration nodes.

interface

The next-hop interface.

disable

Disables the interface-based static route.

distance

The next-hop distance for this route (1-255). Routes with a smaller distance are selected before those with a larger distance. The default distance is 1.

monitor-name

Name of a Path Monitor instance.

policy-name

Name of a Path Monitor policy.

state

The compliance state:

compliant: All associated Path Monitor policies are compliant.

non-compliant: All associated Path Monitor policies are non-compliant.

Configuration mode

```
protocols {
        static {
                table
                        interface-route {
                                next-hop-interface {
                                        disable
                                        distance
                                        path-monitor {
                                                monitor {
                                                        policy {
                                                                state
                                                        }
                                                }
                                        }
                                }
```

```
                        }
            }
}
```

Use this command to configure interface-based static routes in an alternate routing table. The alternate routing tables are used with policy-based routing. Refer to *Policy-based Routing Configuration Guide* for information on policy-based routing.

Use the `set` form of this command to configure a next-hop interface.

Use the `delete` form of this command to remove a next-hop interface.

Use the `show` form of this command to view a next-hop interface.

protocols static table interface-route6 description

Sets the description of an interface-based IPv6 static route in an alternate routing table.

`set protocols static table` *`table`* **`interface-route6`** *`subnet`* **`description`** *`description`*

`delete protocols static table` *`table`* **`interface-route6`** *`subnet`* **`description`** *`description`*

`show protocols static table` *`table`* **`interface-route6`** *`subnet`* **`description`** *`description`*

table

Multi-node. An alternate routing table to be used by policy-based routing rules.

subnet

Multi-node. An interface-based static route. The format is a destination subnet of the form *address*/*prefix* (*h*:*h*:*h*:*h*:*h*:*h*:*h*:*h*/*x*)..

You can define multiple interface-based routes by creating multiple **interface-route** configuration nodes.

description

The description of the static route.

Configuration mode

```
protocols {
 static {
  table 1
   interface-route6 subnet {
    desccription    }
  }
 }

}
```

Use this command to configure interface-based static routes in an alternate routing table. The alternate routing tables are used with policy-based routing. Refer to *Policy-based Routing Configuration Guide* for information on policy-based routing.

Use the `set` form of this command to set the description of an IPv6 static route in an alternate routing table.

Use the `delete` form of this command to remove the description of an IPv6 static route in an alternate routing table.

Use the `show` form of this command to view the description of an IPv6 static route in an alternate routing table.

protocols static table interface-route6 next-hop-interface

Configures the next hop interface for an IPv6 static route in an alternate routing table.

```
set protocols static table table interface-route6 subnet next-hop-interface
interface-name [ disable | distance distance | path-monitor monitor monitor-
name [ policy policy-name [ state { compliant | non-compliant } ] ] ]
```

```
delete protocols static table table interface-route6 subnet next-hop-interface
interface-name [ disable | distance | path-monitor monitor monitor-name [
policy policy-name [ state { compliant | non-compliant } ] ] ]
```

```
show protocols static table table interface-route6 subnet next-hop-interface
interface-name [ disable | distance | path-monitor monitor monitor-name [
policy policy-name [ state { compliant | non-compliant } ] ] ]
```

table

Multi-node. An alternate routing table to be used by policy-based routing rules.

subnet

Multi-node. An IPv6 static route. The format is a destination subnet of the form IPv6-*address*/*prefix* (*h*:*h*:*h*:*h*:*h*:*h*:*h*:*h*/*x*).

You can define multiple static routes by creating multiple **route6** configuration nodes.

disable

Disables the IPv6 static route.

distance

The next-hop distance for this route. Routes with a smaller distance are selected before those with a larger distance.

monitor-name

Name of a Path Monitor instance.

policy-name

Name of a Path Monitor policy.

state

The compliance state:

compliant: All associated Path Monitor policies are compliant.

non-compliant: All associated Path Monitor policies are non-compliant.

Configuration mode

```
protocols {
        static {
                table {
                        interface-route6 {
                                next-hop-interface {
                                        disable
                                        distance
                                        path-monitor {
                                                monitor {
                                                        policy {
                                                                state
                                                        }
                                                }
                                        }
                                }
                        }
                }
        }
}
```

Use this command to configure IPv6 static routes in an alternate routing table. The alternate routing tables are used with policy-based routing. Refer to *Policy-based Routing Configuration Guide* for information on policy-based routing.

Use the `set` form of this command to configure the next hop interface for an IPv6 static route in an alternate routing table.

Use the `delete` form of this command to remove the next hop interface for an IPv6 static route in an alternate routing table.

Use the `show` form of this command to view the next hop interface for an IPv6 static route in an alternate routing table.

protocols static table route blackhole

Configures a black hole static route in an alternate routing table.

`set protocols static table` *`table`* **`route`** *`subnet`* **`blackhole`** [**`distance`** *`distance`*]

`delete protocols static table` *`table`* **`route`** *`subnet`* **`blackhole`** [**`distance`**]

`show protocols static table` *`table`* **`route`** *`subnet`* **`blackhole`** [**`distance`**]

table *table*

Multi-node. An alternate routing table to be used by policy-based routing rules.

route *subnet*

Multi-node. Defines a static route. The format is a destination subnet of the form *address*/*prefix* (*x*.*x*.*x*.*x*/*x*).

You can define multiple static routes by creating multiple **route** configuration nodes.

distance *distance*

The black hole distance for this route. Routes with a smaller distance are selected before those with a larger distance. The distance ranges from 1 through 255. The default distance is 1.

Configuration mode

```
protocols {
        static {
                table {
                        route  {
                                blackhole {
                                        distance
                                }
                        }
                }
        }
}
```

Use this command to configure a black hole static route in an alternate policy route table. A black hole route is a route for which the system silently discards packets that are matched.

The alternate routing tables are used with policy-based routing. Refer to *Policy-based Routing Configuration Guide* for information on policy-based routing.

Use the `set` form of this command to configure a black hole static route.

Use the `delete` form of this command to remove a black hole static route.

Use the `show` form of this command to view a black hole static route.

protocols static table route description

Sets the description of a static route in an alternate routing table.

`set protocols static table` ***`table`*** **`route`** ***`subnet`*** **`description`** ***`description`***

`delete protocols static table` ***`table`*** **`route`** ***`subnet`*** **`description`** ***`description`***

`show protocols static table` ***`table`*** **`route`** ***`subnet`*** **`description`** ***`description`***

table

Multi-node. An alternate routing table to be used by policy-based routing rules.

subnet

Multi-node. Defines a static route. The format is a destination subnet of the form *address*/*prefix* (*x*.*x*.*x*.*x*/*x*).

You can define multiple static routes by creating multiple **route** configuration nodes.

description

The description of the static route.

Configuration mode

```
protocols {
        static {
                table {
                        route {
                                description
                        }
                }
        }
}
```

Use this command to configure static routes in an alternate routing table. The alternate routing tables are used with policy-based routing. Refer to *Policy-based Routing Configuration Guide* for information on policy-based routing.

Use the `set` form of this command to set the description of a route in an alternate routing table.

Use the `delete` form of this command to remove the description of a static route in an alternate routing table.

Use the `show` form of this command to view the description of a static route in an alternate routing table.

protocols static table route next-hop

Configures the next hop for a static route in an alternate routing table.

`set protocols static table` *table* **route** *subnet* **next-hop** *address* [**disable** | **distance** *distance* | **path-monitor monitor** *monitor-name* [**policy** *policy-name* [**state** { **compliant** | **non-compliant** }]]]

`delete protocols static table` *table* **route** *subnet* **next-hop** *address* [**disable** | **distance** [*distance*] | **path-monitor monitor** *monitor-name* [**policy** *policy-name* [**state** { **compliant** | **non-compliant** }]]]

`show protocols static table` *table* **route** *subnet* **next-hop** *address* [**disable** | **distance** [*distance*] | **path-monitor monitor** *monitor-name* [**policy** *policy-name* [**state** { **compliant** | **non-compliant** }]]]

table

Multi-node. An alternate routing table to be used by policy-based routing rules.

subnet

Multi-node. Defines a static route. The format is a destination subnet of the form *address*/*prefix* (*x.x.x.x*/*x*).

You can define multiple static routes by creating multiple **route** configuration nodes.

address

The address of the next-hop router.

disable

Disables the static route.

distance

The next-hop distance for this route. Routes with a smaller distance are selected before those with a larger distance. The distance ranges from 1 through 255. The default distance is 1.

monitor-name

Name of a Path Monitor instance.

policy-name

Name of a Path Monitor policy.

state

The compliance state:

compliant: All associated Path Monitor policies are compliant.

non-compliant: All associated Path Monitor policies are non-compliant.

Configuration mode

```
protocols {
        static {
                table {
                        route {
                                next-hop {
                                        disable
                                        distance
                                        path-monitor {
                                                monitor {
                                                        policy {
                                                                state
                                                        }
                                                }
                                        }
                                }
                        }
                }
        }
}
```

Use this command to configure static routes in an alternate routing table. The alternate routing tables are used with policy-based routing. Refer to *Policy-based Routing Configuration Guide* for information on policy-based routing.

Use the `set` form of this command to configure the next hop for a route in an alternate routing table.

Use the `delete` form of this command to remove the next hop from a static route in an alternate routing table.

Use the `show` form of this command to view the next hop for a static route in an alternate routing table.

protocols static table route6 blackhole

Configures a black hole static route in an alternate routing table.

`set protocols static table` *`table`* **`route6`** *`subnet`* **`blackhole distance`** [*`distance`*]

`delete protocols static table` *`table`* **`route6`** *`subnet`* **`blackhole distance`**

`show protocols static table` *`table`* **`route6`** *`subnet`* **`blackhole distance`**

table *table*

Multi-node. An alternate routing table to be used by policy-based routing rules.

route6 *subnet*

Multi-node. An IPv6 static route. The format is a destination subnet of the form IPv6-*address*/*prefix* (*h*:*h*:*h*:*h*:*h*:*h*:*h*:*h*/*x*).

You can define multiple static routes by creating multiple **route** configuration nodes.

blackhole

A destination router that is offline and cannot receive traffic or provide messages to the source of the traffic.

distance *distance*

The black hole distance for this route. Routes with a smaller distance are selected before those with a larger distance.

Configuration mode

```
protocols {
        static {
                table {
                        route6{
                                blackhole {
                                        distance
                                }
                        }
                }
        }
```

```
}
```

Use this command to configure a black hole IPv6 static route in an alternate routing table. A black hole route silently discards packets that are matched.

The alternate routing tables are used with policy-based routing. Refer to *Policy-based Routing Configuration Guide* for information on policy-based routing.

Use the `set` form of this command to configure a black hole IPv6 static route.

Use the `delete` form of this command to remove a black hole IPv6 static route.

Use the `show` form of this command to view a black hole IPv6 static route.

protocols static table route6 description

Sets the description of an IPv6 static route in an alternate routing table.

`set protocols static table` *`table`* **`route6`** *`subnet`* **`description`** *`description`*

`delete protocols static table` *`table`* **`route6`** *`subnet`* **`description`** *`description`*

`show protocols static table` *`table`* **`route6`** *`subnet`* **`description`** *`description`*

table

Multi-node. An alternate routing table to be used by policy-based routing rules.

subnet

Multi-node. An IPv6 static route. The format is a destination subnet of the form IPv6-*address*/*prefix* (*h*:*h*:*h*:*h*:*h*:*h*:*h*:*h*/*x*).

You can define multiple static routes by creating multiple **route6** configuration nodes.

description

The description of the static route.

Configuration mode

```
protocols {
        static {
                table table {
                        route6 subnet {
                                description
                        }
                }
        }
}
```

Use this command to configure IPv6 static routes on the system in an alternate routing table. The alternate routing tables are used with policy-based routing. Refer to *Policy-based Routing Configuration Guide* for information on policy-based routing.

Use the `set` form of this command to set the description of an IPv6 static route in an alternate routing table.

Use the `delete` form of this command to remove the description of an IPv6 static route in an alternate routing table.

Use the `show` form of this command to view the description of an IPv6 static route in an alternate routing table.

protocols static table route6 next-hop

Configures the next hop for an IPv6 static route in an alternate routing table.

```
set protocols static table table route6 subnet next-hop address [ disable |
distance distance | path-monitor monitor monitor-name [ policy policy-name [
state { compliant | non-compliant } ] ] ]
```

```
delete protocols static table table route6 subnet next-hop address [ disable |
distance | path-monitor monitor monitor-name [ policy policy-name [ state {
compliant | non-compliant } ] ] ]
```

```
show protocols static table table route6 subnet next-hop address [ disable |
distance | path-monitor monitor monitor-name [ policy policy-name [ state {
compliant | non-compliant } ] ] ]
```

table

Multi-node. An alternate routing table to be used by policy-based routing rules.

subnet

Multi-node. An IPv6 static route. The format is a destination subnet of the form IPv6-*address*/*prefix* (*h*:*h*:*h*:*h*:*h*:*h*:*h*:*h*/*x*).

You can define multiple static routes by creating multiple **route6** configuration nodes.

address

The address of the next-hop router.

disable

Disables the IPv6 static route.

distance

The next-hop distance for this route. Routes with a smaller distance are selected before those with a larger distance.

monitor-name

Name of a Path Monitor instance.

policy-name

Name of a Path Monitor policy.

state

The compliance state:

compliant: All associated Path Monitor policies are compliant.

non-compliant: All associated Path Monitor policies are non-compliant.

Configuration mode

```
protocols {
        static {
                table {
                        route6 {
                                next-hop {
                                        disable
                                        distance
                                        interface
                                        path-monitor {
                                                monitor {
                                                        policy {
                                                                state
                                                        }
                                                }
                                        }
                                }
                        }
                }
        }
}
```

Use this command to configure IPv6 static routes in an alternate routing table. The alternate routing tables are used with policy-based routing. Refer to *Policy-based Routing Configuration Guide* for information on policy-based routing.

Use the `set` form of this command to configure the next hop for an IPv6 static route in an alternate routing table.

Use the `delete` form of this command to remove the next hop for an IPv6 static route in an alternate routing table.

Use the `show` form of this command to view the next hop for an IPv6 static route in an alternate routing table.

Chapter 9. VRF

VRF overview

Several technologies exist to allow multiple scopes, or routing instances, within a single router. For example, some hardware-based routers can be divided into independent virtual routers in which each instance operates as a complete router that uses some of the physical interfaces of the router.

Virtual Routing and Forwarding (VRF) is a technology that controls information flow within a network by partitioning the network and separating Layer 3 traffic into different logical VRF domains. For each VRF domain, the router maintains a separate routing table and Layer 3 forwarding tables and can run separate instances of routing protocols. The separation creates isolated Layer 3 forwarding and routing instances that can support overlapping address spaces without contention. The isolation applies only to Layer 3 routing and forwarding. Layer 2 forwarding is unaffected, and from a device management perspective, the router continues to be a single entity.

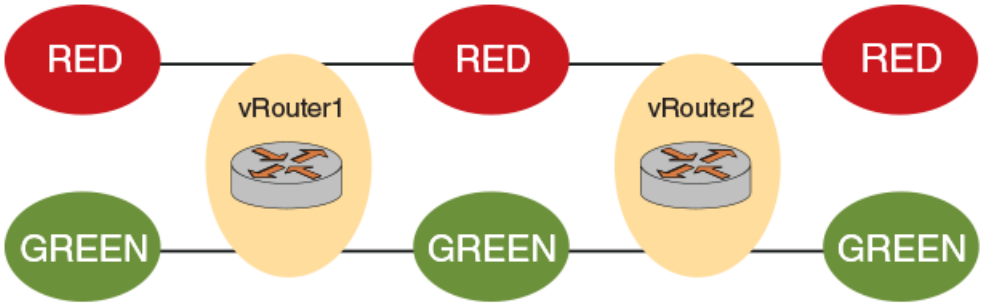
To forward traffic, the router selects a VRF routing instance that is based on the input interface (and possibly on policy configuration). Because the interface and Layer 2 information are not strictly partitioned, it is possible to use technologies such as MPLS VPN to multiplex route signaling and traffic for multiple routing instances over the same physical connections or Layer 3 interfaces.

VRF-lite refers to VRF without technologies like MPLS VPN. With VRF-lite, Layer 3 traffic is isolated into separate routing instances. However, connecting routing instances across multiple routers requires a separate physical link for each instance, or the use of Layer 2 trunking technologies, such as VLANs (802.1q), to create separate Layer 2 links over the same physical link.

Note: In this release of the router documentation, VRF refers to VRF-lite, unless otherwise specified, and routing instance refers to VRF routing instance.

The following figure shows a basic VRF-lite configuration with routing instances that are labeled RED and GREEN. The RED and GREEN traffic is completely separated over different interfaces, with no common processing or signaling within the routers. The routers are aware of both routing instances, but each interface carries traffic for only one routing instance.

Figure 3. Basic VRF-lite configuration



The following guidelines apply to VRF-lite deployments:

- The VRF-capable routers must be reachable at Layer 3, deploying BGP, OSPF, RIP, or static routes.
- Each routing instance maintains unique routing and forwarding tables.
- One or more Layer 3 interfaces on a router can be assigned to be part of a routing instance.
- Each routing instance can be configured with an IPv4 address family, an IPv6 address family, or both. The routing instance for a received packet is determined based on the VRF index of the interface on which the packet is received.
- Separate routing protocol instances are required for each routing instance.
- Overlapping address spaces can be configured on different routing instances.

A VRF-lite instance can be configured on any interface that is configured for Layer 3. For example, a bridge interface that is associated with a bridge group can have a routing instance because the bridge group is a Layer 3 interface. However, you cannot use VRF-lite with data plane interfaces that are configured as part of a bridge group because they forward traffic only at the Layer 2 level.

Management services

The router supports significant flexibility in configuring management services. Unlike many other VRF implementations, the router does not require that you separate management functions on a dedicated VRF routing instance. Instead, the router offers the ability to enable and disable management services in the context of a particular routing instance (or in some cases, instances).

This approach can be used to restrict management service access to a specific routing instance, if desired, or to create a more-complex access structure, subject to the following restrictions.

The following services must run on a single routing instance:

- SNMP
- RADIUS router

- TACACS+
- NTP

The following services can run on a single routing instance and multiple routing instances:

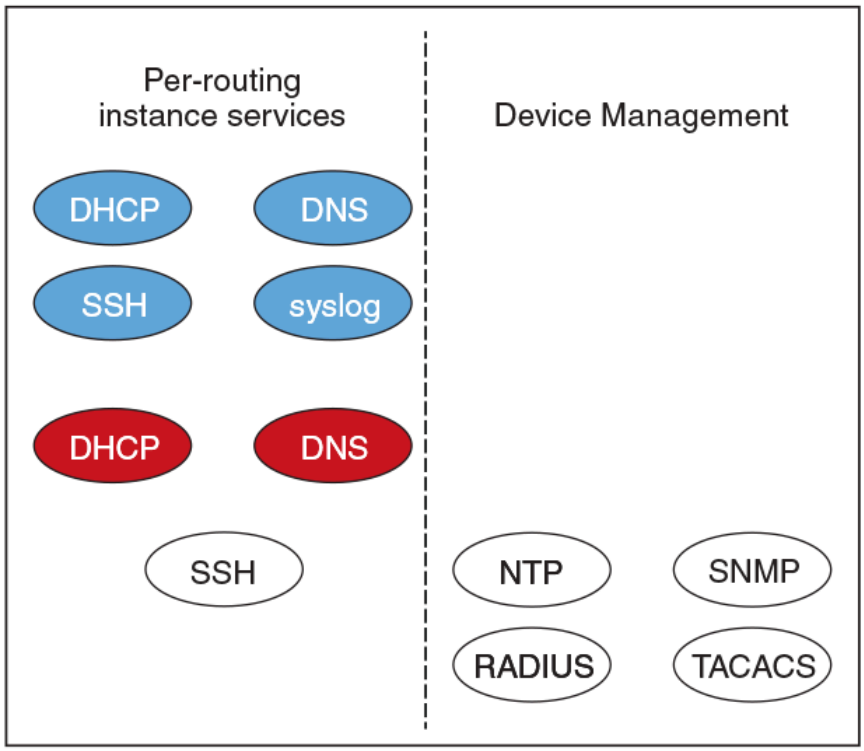
- DNS
- DHCP
- SSH
- syslog
- Telnet

Services like LLDP, which operate at Layer 2, must be configured on a systemwide basis (not bound to a particular routing instance).

When determining how to set up management services, consider the interfaces you want to use, the functions you want to perform, and whether the service can be applied to individual routing instances. For example, the following figure shows a sample division of management functions in a router with three routing instances:

- BLUE: Configured for DHCP, DNS, SSH, and syslog.
- RED: Configured for DHCP and DNS.
- WHITE: Configured for SSH, RADIUS, TACACS+, SNMP, and NTP.

Figure 4. Per-routing instance services and device management



Feature-specific VRF support

The following sections describe the VRF support for specific router features.

VRF support for DNS

The router uses DNS in both the client (resolver) and server (proxy) roles. You can configure DNS for individual routing instances. If you configure DNS without specifying a routing instance, the default routing instance is used.

For DNS client (resolver) operations, configure DNS name servers when creating a new routing instance to support DNS clients and dynamic synchronization. As a client, a set of name server addresses is used to resolve queried domain names and update DNS records dynamically.

The following example shows how to configure the 10.70.20.23 DNS name server for the default routing instance.

```
vyatta@R1# set system name-server 10.70.20.23
vyatta@R1# commit
vyatta@R1# run show configuration
system {
 name-server 10.70.20.23
}
```

The following example shows the same configuration sequence for the BLUE routing instance.

```
vyatta@R1# set routing routing-instance BLUE system name-server 10.70.20.23
vyatta@R1# commit
vyatta@R1# run show configuration
routing {
        routing-instance BLUE {
                system {
                        name-server 10.70.20.23
                }
        }
}
```

For server (proxy) operations, if the queried record is not in the cache, the router sends the query to DNS servers that are listed in the name server list for the specified routing instance. This name server list can apply to each DNS forwarding instance when configuring DNS forwarding. If not configured, the routing-instance-specific name servers that are configured are used.

The following example shows how to configure proxy settings (listen-on interface dp0s4 and cache size 1024) for the default routing instance.

```
vyatta@R1# set service dns forwarding listen-on dp0s4
vyatta@R1# set service dns forwarding cache-size 1024
vyatta@R1# commit
```

```
vyatta@R1# run show configuration
service {
        dns {
                forwarding {
                        cache-size 1024
                        listen-on dp0s3
                }
        }
}
```

The following example shows the same configuration sequence for the BLUE routing instance.

```
vyatta@R1# set routing routing-instance BLUE service dns forwarding
 listen-on dp0s4
vyatta@R1# set routing routing-instance BLUE service dns forwarding
 cache-size 1024
vyatta@R1# commit
vyatta@R1# run show configuration
routing {
        routing-instance BLUE {
                service {
                        dns {
                                forwarding {
                                        cache-size 1024
                                        listen-on dp0s4
                                }
                        }
                }
        }
}
```

For more information about DNS and configuring DNS, see *Basic System Configuration Guide*.

VRF support for DHCP

The implementation of VRF on the router supports DHCPv4 server, DHCPv6 server, DHCPv4 relay, DHCPv6 relay, DHCPv4 client, and DHCPv6 client configurations.

You can configure DHCP on individual routing instances. If you configure DHCP without specifying a routing instance, the default routing instance is used.

The DHCP server recognizes which address pool belongs to which routing instance. You can switch configurations between routing instances. However, you cannot create a DHCP relay that involves interfaces from different routing instances.

The following examples show DHCP configurations that use these values:

- routing instance = BLUE
- ipAddress = 42.42.42.42

The following example shows how to configure DHCP for the default routing instance.

```
vyatta@R1# set service dhcp-server listento interface 'dp0s3'
vyatta@R1# set service dhcp-server shared-network-name CORP subnet
 42.42.42.0/24 start 42.42.42.1 stop '42.42.42.253'
vyatta@R1# commit
vyatta@R1# run show configuration
service {
        dhcp-server {
                listento {
                        interface dp0s3
                }
                shared-network-name CORP {
                        subnet 42.42.42.0/24 {
                                start 42.42.42.1 {
                                        stop 42.42.42.253
                                }
                        }
                }
        }
}
```

The following example shows the same configuration sequence for the BLUE routing instance.

```
vyatta@R1# set routing routing-instance BLUE service dhcp-server listento
 interface 'dp0s4'
vyatta@R1# set routing routing-instance BLUE service dhcp-server
 shared-network-name CORP subnet 42.42.42.0/24 start 42.42.42.1 stop
 '42.42.42.253'
vyatta@R1# commit
vyatta@R1# run show configuration
routing {
        routing-instance BLUE {
                interface dp0s4
                service {
                        dhcp-server {
                                listento {
                                        interface dp0s4
                                }
                                shared-network-name CORP {
                                        subnet 42.42.42.0/24 {
                                                start 42.42.42.1 {
                                                        stop 42.42.42.253
                                                }
                                        }
                                }
                        }
                }
        }
}}
```

For more information about DHCP and configuring DHCP, see *Basic System Configuration Guide*.

VRF support for flow monitoring

NAT is independent of routing instances. However, because interfaces can be bound to a routing instance, if you want a VRF NAT, you must assign NAT rules to the interfaces that make up the routing instance.

VRF support for NTP

NTP must run on a single routing instance. If you configure NTP without specifying a routing instance, the default routing instance is used. You must configure multiple NTP servers one at a time.

The following examples show NTP configurations that use these values:

- routing instance = BLUE
- IP address of the NTP server = 10.0.0.1

The following example shows how to configure NTP for the default routing instance.

```
vyatta@R1# set system ntp server 10.0.0.1
vyatta@R1# commit
vyatta@R1# run show configuration
system {
        ntp {
                server 10.0.0.1
        }
}
```

The following example shows the same configuration sequence for the BLUE routing instance.

```
vyatta@R1# set routing routing-instance BLUE system ntp server 10.0.0.1
vyatta@R1# commit
vyatta@R1# run show configuration
routing {
        routing-instance BLUE {
                system {
                        ntp {
                                server 10.0.0.1
                        }
                }
        }
}
```

For more information about NTP and configuring NTP, refer to *Basic System Configuration Guide*.

VRF support for firewall

Firewall configuration is independent of routing instances. However, because interfaces can be bound to a routing instance, if you want to configure a firewall, you must assign firewall rules to the interfaces that make up the routing instance.

VRF support for RADIUS authentication

RADIUS must run on a single routing instance. If you configure a RADIUS server without specifying the routing instance, the RADIUS server starts in the default routing instance. If you specify a nondefault routing instance, you must verify that all servers configured for AAA with the RADIUS server are accessible by way of the same routing instance.

The following examples show excerpts of RADIUS configurations that use these values:

- routing instance = BLUE
- radius-server-address = 42.42.42.42
- secret-code = secured
- port-no = 1820
- timeout = 2

The following example shows how to configure RADIUS for the default routing instance.

```
vyatta@R1# set system login radius-server 42.42.42.42
vyatta@R1# set system login radius-server 42.42.42.42 secret secured
vyatta@R1# set system login radius-server 42.42.42.42 port 1820
vyatta@R1# set system login radius-server 42.42.42.42 timeout 2
vyatta@R1# commit
vyatta@R1# run show configuration
system {
        login {
                radius-server 42.42.42.42 {
                        secret secured
                        port 1820
                        timeout 2
                }
        }
}
```

The following example shows the same configuration sequence for the BLUE routing instance.

```
vyatta@R1# set routing routing-instance BLUE system login radius-server
 42.42.42.42
vyatta@R1# set routing routing-instance BLUE system login radius-server
 42.42.42.42 secret secured
vyatta@R1# set routing routing-instance BLUE system login radius-server
 42.42.42.42 port 1820
vyatta@R1# set routing routing-instance BLUE system login radius-server
 42.42.42.42 timeout 2
```

```
vyatta@R1# commit
vyatta@R1# run show configuration
vyatta@R1# routing {
        routing-instance BLUE {
                system {
                        login {
                                radius-server 42.42.42.42 {
                                        secret secured
                                        port 1820
                                        timeout 2
                                }
                        }
                }
        }
}
```

For more information about RADIUS and configuring RADIUS, see *Basic System Configuration Guide*.

VRF support for TACACS+

TACACS+ must run on a single routing instance. When you configure TACACS+ without specifying an instance, the TACACS+ servers start in the default routing instance. If you specify a nondefault routing instance, you must verify that all TACACS+ servers configured for AAA are reachable from the same routing instance.

The following examples show excerpts of TACACS+ configurations that use these values:

- routing instance = BLUE
- TACACS+ servers 10.10.30.24 (TAC-1) and 10.10.30.25 (TAC-2)
- secret = secured

In the following example, the TACACS+ servers start in the default routing instance.

```
vyatta@R1# set system login tacplus-server 10.10.30.24 secret secured
vyatta@R1# set system login tacplus-server 10.10.30.25 secret secured
vyatta@R1# commit
vyatta@R1# run show configuration
system {
        login {
                tacplus-server 10.10.30.24 {
                        secret "********"
                tacplus-server 10.10.30.25 {
                        secret "********"
                }
                user vyatta {
                        authentication {
                                encrypted-password "********"
                        }
                        level superuser
                }
```

```
        }
}
```

The following example shows how to configure the same servers to run in the BLUE routing instance.

```
vyatta@R1# set routing routing-instance BLUE system login tacplus-server
 10.10.30.24 secret secured
vyatta@R1# set routing routing-instance BLUE system login tacplus-server
 10.10.30.25 secret secured
#commit
#run sh configuration
routing {
        routing-instance BLUE {
                system {
                        login {
                                tacplus-server 10.10.30.24 {
                                        secret "********"
                                tacplus-server 10.10.30.25 {
                                        secret "********"
                                }
                        }
                }
        }
}
```

For more information about TACACS+ and configuring TACACS+, see *Basic System Configuration Guide*.

VRF support for SNMP

DANOS-Vyatta edition supports the implementation of SNMP on a routing instance, which allows the following associations and configurations:

- An SNMP client to be associated with a specific routing instance and handle context-based access to MIBs.
- An SNMP trap target to be associated with a routing instance for sending SNMP notifications that are specific to the routing instance.
- An SNMP agent to be configured to listen for incoming requests from a specific routing instance.

The SNMP V2 clients are associated with a routing instance by mapping the SNMP community strings with a routing instance, as shown in the following command:

- `set service snmp community <comm-string> [context <routing-instance>]`

When a V2 request with a community string that is mapped to a routing instance is received, an SNMP agent retrieves MIB information that is specific to the routing instance.

The SNMP V3 clients are associated with a routing instance by specifying the routing instance as context in their requests. An SNMP agent returns context-based MIB information for these requests.

The SNMP V2 and V3 trap targets can be configured to receive routing instance-specific SNMP notifications. Traps to these targets are sent out on the configured routing instance, as shown in the following sample:

- `set service snmp trap-target <ip-addr> [routing-instance <name>]`
- `set service snmp v3 trap-target <ip-addr> [routing-instance <name>]`

When no routing instance is configured for a trap target, traps are sent over a default routing instance.

An SNMP agent can be configured to accept client requests from a specific routing instance:

- `set service snmp [routing-instance <name>]`

When no routing instance is configured, an SNMP agent listens for client requests on a default routing instance.

VRF support for SSH

You can configure SSH on any routing instance. If you configure SSH without specifying a routing instance, the default routing instance is used.

The following example shows how to configure SSH for the default routing instance.

```
vyatta@R1# set service ssh listen-address 10.0.0.1
vyatta@R1# set service ssh port 21
vyatta@R1# run show configuration
service {
    ssh {
        listen-address 10.0.0.1
        port 21
                        }
}
```

The following example shows the same configuration sequence for the BLUE routing instance.

```
vyatta@R1# set routing routing-instance BLUE service ssh listen-address
 10.0.0.1
vyatta@R1# set routing routing-instance BLUE service ssh port 21
vyatta@R1# commit
vyatta@R1# run show configuration
routing {
        routing-instance BLUE {
                service {
```

```
                        ssh {
                           listen-address 10.0.0.1
                           port 21
                        }

                }
        }
}
```

For more information about SSH and configuring SSH, see *Basic System Configuration Guide*.

VRF support for Telnet

You can configure Telnet on any routing instance. If you configure Telnet without specifying a routing instance, the default routing instance is used.

When you configure Telnet service in a routing instance, the external user can connect to the router through a Telnet session by using the configuration parameters for that instance.

The Telnet service can be started with parameters that are specified in the configuration. If parameters are not specified, Telnet service starts on the default port (port 23).

The following example shows how to configure Telnet for the default routing instance.

```
vyatta@R1# set service telnet listen-address 42.42.42.42
vyatta@R1# set service telnet port 1234
vyatta@R1# commit
vyatta@R1# run show configuration
service {
        telnet {
                listen-address 42.42.42.42
                port 1234
        }
}
```

The following example shows the same configuration sequence for the BLUE routing instance.

```
vyatta@R1# set routing routing-instance BLUE service telnet listen-address
 42.42.42.42
vyatta@R1# set routing routing-instance BLUE service telnet port 1234
vyatta@R1# commit
vyatta@R1# run show configuration
routing {
        routing-instance BLUE {
                service {
                        telnet {
                                listen-address 42.42.42.42
                                port 1234
                        }
                }
        }
```

```
}
```

VRF support for syslog

You can configure syslog on any routing instance. If a routing instance is not specified for logging, the default routing instance is used to access the remote host. You can also configure a facility override value that replaces the facility fields in all log entries that are sent to a remote host. For example, you can specify multiple facility values for a set of log entries that are sent by the router to a log remote host. Before sending the entries to the remote host, the facility values are replaced with the override value.

The following examples show syslog configurations that use these values:

- Routing instance = BLUE
- IP address of the host = 10.10.10.10
- Facility value = auth (Authentication and authorization)
- Level = crit (Critical)

The following example shows how to configure syslog for the default routing instance.

```
vyatta@R1# set system syslog host 10.10.10.10 facility auth level crit
vyatta@R1# commit
vyatta@R1# run show configuration
system {
        syslog {
                host 10.10.10.10 {
                        facility auth {
                                level crit
                        }
                }
        }
}
```

The following example shows the same configuration sequence for the BLUE routing instance.

```
vyatta@R1# set routing routing-instance BLUE system syslog host 10.10.10.10
 facility auth level crit
vyatta@R1# commit
vyatta@R1# run show configuration
routing {
        routing-instance BLUE {
                system {
                        syslog {
                                host 10.10.10.10 {
                                        facility auth {
                                           level crit
                                        }
                                }
                        }
```

```
                }
        }
}
```

For more information on logging and configuring logging, refer to *Basic System Configuration Guide*.

VRF support for IPsec and GRE

The router provides the following support for IPsec Virtual Tunnel Interface (VTI) and GRE tunnels.

The inner or encapsulated address is configurable for each routing instance, provided that the tunnel interface is bound to a routing instance.

- Assign the IPsec site-to-site configuration to a VTI, which assigns the configuration to a routing-instance.
- Assign the GRE configuration to the interface or interfaces that make up the routing instance.

VRF support for ALG

You can configure ALG on any routing instance. If you configure ALG without specifying a routing instance, the default routing instance is used. You can commit the configuration before configuring a routing instance to an interface.

The following example shows how to configure ALG for the BLUE routing instance.

```
vyatta@R1# set routing routing-instance BLUE system alg ...
```

The following example shows how to configure ALG for the default routing instance.

```
vyatta@R1# set system alg ...
```

VRF support for BGP

The implementation of VRF on the router supports BGP.

If you configure BGP without specifying a VRF instance, the router uses the default routing table. BGP supports route-leaking between VRF's by using route target. To configure BGP for a particular VRF routing instance, specify the instance in the command syntax.

Note: You must configure a unique route distinguisher, before you configure BGP with a VRF routing instance. You cannot further modify the route distinguisher configuration if BGP is already configured within a routing instance. Use the following command to configure a route distinguisher:

```
vyatta@R1# set routing routing-instance VRF-NAME
 route-distinguisher RDVALUE
```

BGP monitor commands log messages from the default VRF, unless the name of the VRF is specified in the configuration of the routing instance.

The following BGP features are supported only on the default routing instance:

- Extended ASN capability
- Graceful restart
- BGP scan timer
- Cluster ID
- Confederation identifier
- Maximum AS limit

VRF support for OSPF and OSPFv3

The router supports the implementation of OSPF and OSPFv3 on routing instances.

If you configure OSPF or OSPFv3 on the router without specifying a routing instance, the router uses the default routing instance. When configuring OSPF or OSPFv3 for a particular routing instance, you must associate the instance with an OSPF process, and the process ID must be specified in the configuration command.

OSPF configuration

All OSPF configuration commands are supported on routing instances.

In the following example, OSPF area 0 is defined for the default routing instance.

```
vyatta@R1# set protocols ospf area 0
```

In the following example, OSPF area 1 is defined for the RED routing instance, which is associated with OSPF process 1.

```
vyatta@R1# set routing routing-instance RED protocols ospf process 1 area 1
```

OSPFv3 configuration

All OSPFv3 configuration commands are supported on routing instances.

Note: In the default routing instance, OSPFv3 supports the default process (configuration without including a process ID) and non-default process (configuration with a process ID). In non-default routing instances, OSPFv3 supports only non-default processes (configuration with a process ID).

The following examples show the syntax for an individual configuration command. For an example of how to configure OSPFv3 processes on routing instances, refer to the section on configuring OSPFv3 on routing instances in *Basic Routing Configuration Guide*.

In the following example, OSPFv3 access list 15 is specified for the default routing instance to filter networks in routing updates.

```
vyatta@R1# set protocols ospfv3 distribute-list 15
```

The following example shows how to apply the same configuration to the RED routing instance, which is associated with OSPFv3 process 10.

```
vyatta@R1# set routing routing-instance RED protocols ospfv3 process 10
 distribute-list 15
```

VRF support for RIP and RIPng

This section describes VRF support for RIP and RIPng configuration- and operational-mode commands. This section also describes VRF support for monitoring and logging commands.

VRF support for router-mode commands

You can run RIP and RIPng router-mode configuration commands in the context of a routing instance by using the optional **routing routing-instance** *instance-name* keywords and variable. The following examples show how to configure RIP and RIPng in the context of the RED routing instance.

```
routing routing-instance RED protocols rip …
routing routing-instance RED protocols ripng …
```

If you do not specify a routing instance, the router applies the configuration to the default routing instance.

Note: An interface belongs to only one routing instance.

VRF support for interface-mode commands

The RIP and RIPng interface-mode configuration commands do not support the **routing routing-instance** *instance-name* keywords and variable because these commands run in the context of the routing instance to which the interfaces belong.

```
interfaces <intf_type> <intf_name> ip rip …
interfaces <intf_type> <intf_name> ipv6 ripng …
```

VRF support for operational commands

You can use the optional **routing-instance** *instance-name* keyword and variable with the RIP and RIPng operational commands. If you do not use this optional keyword and variable, the commands run in the context of the default routing instance.

```
show ip rip [routing-instance <instance_name>] …
reset ip rip [routing-instance <instance_name>] route …
show ipv6 ripng [routing-instance <instance_name>] …
```

```
reset ipv6 ripng [routing-instance <interface_name>] route …
```

VRF support for monitoring and logging commands

You can run the RIP and RIPng monitoring and logging commands in the context of a routing instance with the exception of the commands that enable RIB and NSM logging. If you do not use the **routing-instance** *instance-name* keyword and variable, the commands run in the context of the default routing instance.

```
monitor protocol rip [routing-instance <instance_name>]…
[routing routing-instance <instance_name>] protocols rip log …

monitor protocol ripng [routing-instance <instance_name>] …
[routing routing-instance <instance_name>] protocols ripng log …
```

The **rib** and **nsm** logging options are global options and apply to all routing instances. The **rib** and **nsm** logging options cannot be enabled or disabled on a routing instance basis. The following commands apply to all routing instances.

```
monitor protocol rip … nsm
monitor protocol rip … rib
protocols rip log nsm
protocols rip log rib
monitor protocol ripng … nsm
monitor protocol ripng … rib
protocols ripng log nsm
protocols ripng log rib
```

The output of the following commands displays routing instance information, if relevant.

```
show monitoring protocols rip
show monitoring protocols ripng
```

VRF support for multicast

You can configure multicast within a routing instance by using the CLI, NetConf, or SNMP. When you configure multicast on the router without specifying a routing instance, the configuration applies to the default routing instance. To configure multicast for a particular routing instance, specify the instance.

All protocol-specific multicast commands can be applied to specific routing instances. For example, the following commands apply the indicated protocols to the RED routing instance.

```
vyatta@R1# set routing routing-instance RED protocols multicast ...
vyatta@R1# set routing routing-instance RED protocols pim ...
vyatta@R1# set routing routing-instance RED protocols pim6 ...
vyatta@R1# set routing routing-instance RED protocols igmp ...
vyatta@R1# set routing routing-instance RED protocols mld ...
vyatta@R1# set routing routing-instance RED protocols msdp ...
```

Any multicast configuration that is applied to an interface can be referred to under a routing instance to bind it to that instance, as in the following examples. In these examples, the dp0p161p1 interface is bound to the RED routing instance.

```
vyatta@R1# set routing routing-instance RED interfaces dp0p161p1 ip pim
vyatta@R1# set routing routing-instance RED interfaces dp0p161p1 ip igmp
vyatta@R1# set routing routing-instance RED interfaces dp0p161p1 ip
 multicast
vyatta@R1# set routing routing-instance RED interfaces dp0p161p1 ipv6 pim
vyatta@R1# set routing routing-instance RED interfaces dp0p161p1 ipv6 mld
```

You can apply routing instances to **show** commands for supported protocols. The following example shows details about IPv6 MLD groups for the RED routing instance. If no routing instance is specified, the command applies to the default routing instance.

```
vyatta@vyatta:~$ show ipv6 mld groups routing-instance RED detail
```

You can apply routing instances to **reset** commands. The following example shows how to clear IP BGP addresses for routing instance RED. If no routing instance is specified, the command applies to the default routing instance.

```
vyatta@vyatta:~$ reset ip bgp routing-instance RED detail
```

Logging by multicast protocols is configured on a per routing instance basis. If no routing instance is specified, the command applies to the default routing instance. The following example shows how to enable all PIM logs in the RED routing instance.

```
vyatta@vyatta:~$ monitor protocol multicast routing-instance RED pim enable
```

VRF support for BFD

All BFD configuration commands are supported on routing instances.

The following example shows how to configure the BFD source and destination for the default routing instance.

```
vyatta@R1# set protocols bfd destination 10.16.1.12 source 10.14.10.3
```

The following example shows how to apply the same configuration to the GREEN routing instance.

```
vyatta@R1# set routing routing-instance GREEN protocols bfd destination
 10.16.1.12 source 10.14.10.3
```

VRF support for VRRP

VRF allows a router to support multiple routing tables, one for each VRF routing instance. Virtual Router Redundancy Protocol (VRRP) operates within the context of a single Layer 3 IP subnet, so its operation is not affected by VRF routing instances. Note that VRRP operates appropriately for directly connected interfaces in different routing instances with overlapping address spaces.

The following example shows that the dp0s11 interface is bound to the BLUE routing instance and the dp0s4 interface is bound to the RED routing instance.

```
routing {
 routing-instance BLUE {
  instance-type vrf
  interface dp0s11
 }
 routing-instance RED {
  instance-type vrf
  interface dp0s4
 }
}
```

The following example shows that VRRP for IPv4 is configured with overlapping addresses for the interfaces that were created previously in the RED and BLUE routing instances.

```
dataplane dp0s4 {
 address 11.0.0.2/24
 vrrp{
  vrrp-group 1 {
   priority 254
   version 3
   virtual-address 11.0.0.10
  }
}
dataplane dp0s11 {
 address 11.0.0.2/24
 vrrp{
  vrrp-group 1 {
  priority 254
  version 3
  virtual-address 11.0.0.10
 }
}
```

The following example command sequence shows that VRRP for IPv6 is configured with overlapping addresses for the interfaces that were created previously in the RED and BLUE routing instances.

```
dataplane dp0s4 {
 address 2001::2/64
vrrp{
 vrrp-group 3 {
```

```
   priority 254
   version 3
   virtual-address 2001::10
   virtual-address fe80::10
  }
 }
}
dataplane dp0s11 {
 address 2001::2/64
 vrrp{
  vrrp-group 3 {
   priority 254
   version 3
   virtual-address 2001::10
   virtual-address fe80::10
  }
 }
}
```

For more information about VRRP, see *Basic System Configuration Guide*.

VRF support for file transfer client connections

The router uses FTP that contains several commands. If the network configuration supports VRF, the syntax for each command includes optional VRF parameters. The optional VRF parameters specify the non-default VRF that is used when running the command.

FTPs used in commands that support non-default VRFs must access servers on non-default VRFs. Therefore, commands that support non-default VRF also must also be aware of the VRF parameter that is used in the configuration.

For example, you might have router images stored on a server in the non-default VRF; so, the `add system image` command must be able to download from that server. The `add system image` command sytax consists of the routing instance parameter that specifies the non-default VRF that is used. The command follows:

```
vyatta@R1# add system image { iso-filename | [routing-instance <ri-name>]
 iso-URL [ username username password password ] }
```

An example of a routing instance follows:

```
vyatta@R1# add system image routing-instance red
 http://1.2.3.4/images/vrouter.iso
```

VRF support for TWAMP

The router supports the configuration of a TWAMP service for individual routing instances and the operation of the twping TWAMP client in the context of a specified routing instance.

To specify the routing instance in which a TWAMP server runs, use the optional **routing routing-instance** *routing-instance* keywords and variable. For example, the following command configures a TWAMP server to run in the BLUE routing instance.

```
$ set routing routing-instance BLUE service twamp server
```

If you do not specify a routing instance, the TWAMP server runs in the context of the default routing instance.

TWAMP message logging

TWAMP messages that are logged by twampd in the context of a user-configured routing instance are prepended with the name of the instance, as shown in the following example. In this example, the log message was logged in the context of the GREEN routing instance.

```
Apr 08 07:31:24 vm-next-1 twampd[22829]: [twampd@green.service]
 StartSessions 1 sessions
```

TWAMP messages that are logged by twampd in the context of the default routing instance do not specify the name of the instance, as shown in the following example.

```
Apr 05 15:32:47 vm-torrance-1 twampd[5149]: StartSessions 1 sessions
```

twping RPC VRF support

When making twping RPC calls, you can specify a routing instance, as specified by the leaf definition of the routing instance in the YANG model.

```
leaf routing-instance {
     description "The routing instance context for this session";
     type routing:routing-instance-name;
     default "default";
}
```

The following is an example of a twping RPC call.

```
<rpc xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="3">
  <twping xmlns="urn:vyatta.com:mgmt:vyatta-service-twamp:1">
    <host>10.10.3.2</host>
    <routing-instance>blue</routing-instance>
  </twping>
</rpc>]]>]]>
```

VRF configuration examples

This section presents the following topics:

- Binding interfaces to routing instances
- Configuring static routes on a routing instance

- Configuring policy-based routing on a routing instance
- Configuring OSPFv3 on routing instances
- Configuring SNMP on a routing instance

Binding interfaces to routing instances

This example shows how to specify interfaces and bind them to the RED and BLUE routing instances.

Figure 5. RED and BLUE routing instances

Table 8. Binding interfaces to routing instances

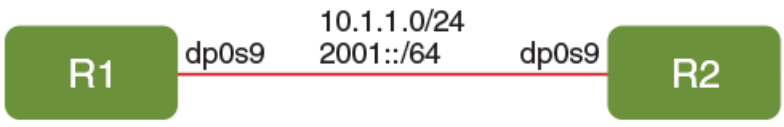
Step	Command
Define the dp0s1 and dp0s2 data plane interfaces.	`vyatta@R1# set interfaces dataplane dp0s1` `vyatta@R1# set interfaces dataplane dp0s2`
Bind dp0s1 to the BLUE routing instance and dp0s2 to the RED routing instance.	`vyatta@R1# set routing routing-instance BLUE interface dp0s1` `vyatta@R1# set routing routing-instance RED interface dp0s2`

View the configuration.	`vyatta@R1# show interfaces`
	`interfaces {`
	`  dataplane dp0s1`
	`  dataplane dp0s2`
	`  }`
	`routing {`
	`  routing-instance BLUE {`
	`  interface dp0s1`
	`  }`
	`  routing-instance RED {`
	`  interface dp0s2`
	`  }`
	`}`

Configuring static routes on a routing instance

In this example, the R1 router is connected to the R2 router through the dp0s9 interface that is bound to the RED routing instance.

Figure 6. Configuring static routes on a routing instance



The following steps create static routes for the RED routing instance.

Table 9. Configuring static routes on a routing instance

Step	Command
Define the dp0s9 interface and bind it to the RED routing instance.	`vyatta@R1# set interfaces dataplane dp0s9` `vyatta@R1# set routing routing-instance RED interface dp0s9`

Create IPv4 and IPv6 static routes under the RED routing instance.	`vyatta@R1# set routing routing-instance RED protocols static route 100.1.1.0/24`
	`next-hop 10.1.1.9`
	`vyatta@R1# set routing routing-instance RED protocols static route6 2001::/64`
	`next-hop 3001::2`

Create IPv4 and IPv6 interface static routes under the RED routing instance.	`vyatta@R1# set routing routing-instance RED protocols static interface-route`
	`100.1.2.0/24 next-hop-interface dp0s9`
	`vyatta@R1# set routing routing-instance RED protocols static interface-route6`
	`2002::/64 next-hop-interface dp0s9`

Create IPv4 and IPv6 blackhole static route configurations under routing instance RED.	`vyatta@R1# set routing routing-instance RED protocols static route 100.1.3.0/24`
	`blackhole`
	`vyatta@R1# set routing routing-instance RED protocols static route6 2003::/64`
	`blackhole`

Create unreachable IPv4 and IPv6 static routes under routing instance RED.	`vyatta@R1# set routing routing-instance RED protocols static route 100.1.4.0/24`
	`unreachable`
	`vyatta@R1# set routing routing-instance RED protocols static route6 2004::/64`
	`unreachable`

View the configuration.	`vyatta@R1# show routing`
	`routing {`
	`routing-instance RED {`
	`interface dp0s9`
	`protocols {`
	`static {`
	`route 100.1.1.0/24 {`
	`next-hop 10.1.1.9`
	`}`
	`route6 2001::/64 {`
	`next-hop 3001::2`
	`}`
	`interface-route 100.1.2.0/24 {`
	`next-hop-interface dp0s9`
	`}`
	`interface-route6 2002::/64 {`
	`next-hop-interface dp0s9`
	`}`
	`route 10.1.3.0/24 {`
	`blackhole`
	`}`
	`route 100.1.4.0/24 {`
	`unreachable`
	`}`
	`route6 2003::/64 {`
	`blackhole`
	`}`
	`route6 2004::/64 {`
	`unreachable`
	`}`
	`}`
	`}`
	`}`
	`}`

The following example shows how to add route leaking between the RED and BLUE routing instances.

Each routing instance operates independently and without knowledge of other routing instances, unless the routes are imported or exported to one another by using inter-VRF route leaking. Inter-VRF route leaking allows leaking of route prefixes from one routing instance to another on the same router. Both dynamic and static route leaking are supported; this example shows how to configure static route leaking.

In the following figure, the R1 router has the dp0s9 interface bound to the RED routing instance and the 10.1.1.0/24 IPv4 and 2001::/64 IPv6 connected networks configured on

RED. The example shows how to install a route in RED with the next hop pointing to the BLUE routing instance.

Figure 7. Route leaking between routing instances

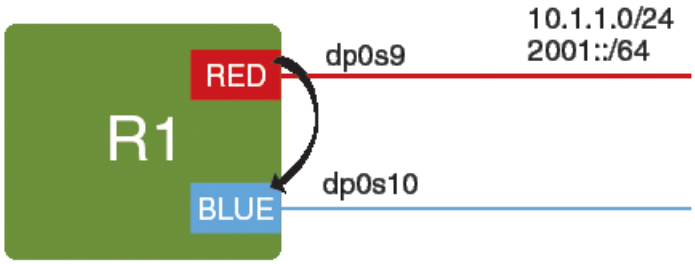


Table 10. Route leaking between routing instances

Step	Command
Configure route leaking for IPv4 and IPv6 routes by installing a route in RED with the next hop pointing to BLUE.	`vyatta@R1# set routing routing-instance RED protocols static route 20.1.1.0/24 next-hop –routing-instance BLUE next-hop 10.1.1.2` `vyatta@R1# set routing routing-instance RED protocols static route6 2009::/64 next-hop-routing-instance BLUE next-hop 2001::2`

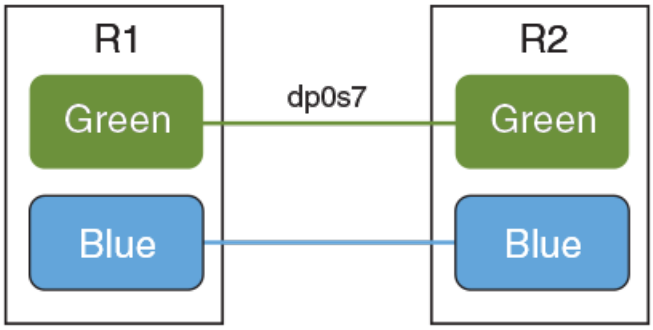
View the configuration.	`vyatta@R1# show routing`
	`routing {`
	`routing-instance RED {`
	`interface dp0s9`
	`protocols {`
	`static {`
	`route 20.1.1.0/24 {`
	`next-hop-routing-instance BLUE {`
	`next-hop 10.1.1.2`
	`}`
	`}`
	`route6 2009::/64 {`
	`next-hop-routing-instance BLUE {`
	`next-hop 2001::2`
	`}`
	`}`
	`}`
	`}`
	`}`
	`}`

Configuring policy-based routing on a routing instance

In this example, R1 is connected to R2 through the dp0s7 interface that is bound to the GREEN routing instance.

The following steps show how to create an alternate routing table in the GREEN routing instance on dp0s7.

Figure 8. Configuring policy-based routing on a routing instance



To configure policy-based routing on a router perform the following configuration and then reproduce the configuration as described in *Basic Routing Configuration Guide*.

Table 11. Configuring policy-based static routes on a routing instance

Step	Command
Define the dp0s7 interface and bind it to the GREEN routing instance.	`vyatta@R1# set interfaces dataplane dp0s7` `vyatta@R1# set routing routing-instance GREEN interface dp0s7`

Define an interface based static route.	`vyatta@R1# set routing routing-instance GREEN protocols static table 10`
	`interface-route 20.1.1.0/24 next-hop-interface dp0s7`
	`vyatta@R1# set routing routing-instance GREEN protocols static table 10`
	`interface-route6 2010::/64 next-hop-interface dp0s7`

Create IPv4 and IPv6 PBR static routes under the GREEN routing instance.	`vyatta@R1# set routing routing-instance GREEN protocols static table 10 route`
	`20.1.1.0/24 next-hop 10.1.1.2 interface dp0s7`
	
	`vyatta@R1# set routing routing-instance GREEN protocols static table 10 route6`
	`2010::/64 next-hop 1010::2 interface dp0s7`

Create the IPv4 and IPv6 static routes with distance in the GREEN routing instance in the 10 PBR table.	`vyatta@R1# set routing routing-instance GREEN protocols static table 10 route`
	`20.1.1.0/24 next-hop 10.1.1.2 distance 8`
	`vyatta@R1# set routing routing-instance GREEN protocols static table 10 route6`
	`2010::/64 next-hop 1010::2 distance 8`

Create IPv4 and IPv6 black hole PBR static route configurations under the GREEN routing instance.	`vyatta@R1# set routing routing-instance GREEN protocols static table 10 route`
	`20.1.1.0/24 blackhole`
	`vyatta@R1# set routing routing-instance GREEN protocols static table 10 route6`
	`2010::/64 blackhole`

Create unreachable IPv4 and IPv6 PBR static routes under the GREEN routing instance.	`vyatta@R1# set routing routing-instance GREEN protocols static route table 10 route`
	`20.1.1.0/24 unreachable`
	`vyatta@R1# set routing routing-instance GREEN protocols static route6 table 10`
	`route6 2010::/64 unreachable`

View the configuration.	`vyatta@R1# show routing`
	`routing {`
	`routing-instance GREEN {`
	`interface dp0s7`
	`protocols {`
	`static {`
	`table 10 {`
	`interface-route 20.1.1.0/24 {`
	`next-hop-interface dp0s7`
	`}`
	`interface-route6 2010::/64 {`
	`next-hop-interface dp0s7`
	`}`
	`route 20.1.1.0/24 {`
	`blackhole`
	`next-hop 10.1.1.2 {`
	`distance 10`
	`interface dp0s7`
	`}`
	`unreachable`
	`}`

Table 11. Configuring policy-based static routes on a routing instance (continued)

Step	Command

	route6 2010::/64 {
	blackhole
	next-hop 1010::2 {
	distance 10
	interface dp0s5
	}
	unreachable
	
	}
	
	}
	}
	}
	}

Configuring OSPFv3 on routing instances

This example shows how to configure OSPFv3 on routing instances.

Initially all of the interfaces for the R1 router (dp0s9, dp0s10, and dp0s11) are bound to the default routing instance. This example shows how to modify the configuration as illustrated in the following figure. In the figure, dp0s9 is bound the default routing instance, dp0s10 is bound to the RED routing instance, and dp0s11 is bound to the BLUE routing instance.

Figure 9. Configuring OSPFv3 on routing instances

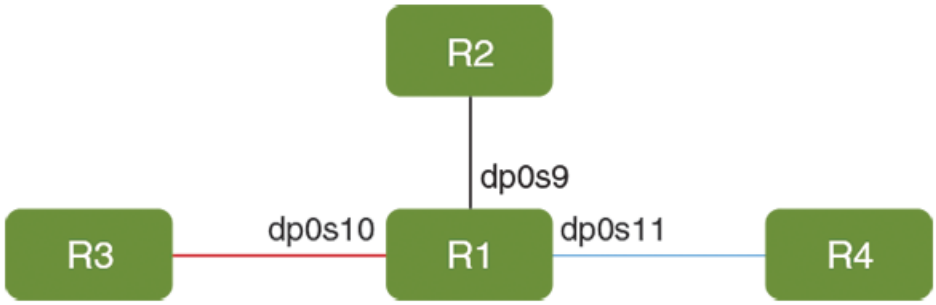


Table 12. Configuring OSPFv3 on routing instances

Step	Command
View the configuration before reassigning routing instances.	vyatta@R1:~$ show interfaces routing-instance all Codes: S - State, L - Link, u - Up, D - Down, A - Admin Down Interface IP Address S/L Description --------- ---------- --- ----------- dp0s3 192.168.122.204/24 u/u dp0s9 10.1.1.1/24 u/u dp0s10 20.1.1.1/24 u/u dp0s11 30.1.1.1/24 u/u
Move dp0s10 to the RED routing instance and dp0s11 to the BLUE routing instance.	vyatta@R1# set routing routing-instance RED interface dp0s10 vyatta@R1# set routing routing-instance BLUE interface dp0s11
Commit the changes and go to Operational mode.	vyatta@R1# commit vyatta@R1#exit
View the changes.	vyatta@R1:~$ show interfaces routing-instance all Codes: S - State, L - Link, u - Up, D - Down, A - Admin Down Interface IP Address S/L Description --------- ---------- --- ----------- dp0s3 192.168.122.204/24 u/u

Table 12. Configuring OSPFv3 on routing instances (continued)

Step	Command
	dp0s9 10.1.1.1/24 u/u Routing Instance BLUE --------------------- dp0s11 30.1.1.1/24 u/u Routing Instance RED -------------------- dp0s10 20.1.1.1/24 u/u
Create OSPFv3 processes: • Under the default routing instance toward R2 (as a non-default OSPFv3 process in the default routing instance). • Under the RED routing instance toward R3. • Under the BLUE routing instance toward R4.	vyatta@R1# set protocols ospfv3 process 1 router-id 1.1.1.1 vyatta@R1# set routing routing-instance RED protocols ospfv3 process 2 router-id 2.2.2.2 vyatta@R1# set routing routing-instance BLUE protocols ospfv3 process 3 router-id 3.3.3.3
Enable OSPFv3 on dp0s9, dp0s10, and dp0s11.	vyatta@R1# set interfaces dataplane dp0s9 ipv6 ospfv3 process 1 instance-id 0 area 0 vyatta@R1# set interfaces dataplane dp0s10 ipv6 ospfv3 process 2 instance-id 0 area 0 vyatta@R1# set interfaces dataplane dp0s11 ipv6 ospfv3 process 3 instance-id 0 area 0

View the candidate configuration.	vyatta@R1# show interfaces
	dataplane dp0s9 {
	address 10.1.1.1/24
	ipv6 {
	ospfv3 {
	process 1 {
	instance-id 0 {
	area 0
	}
	}
	}
	}
	}
	dataplane dp0s10 {
	address 20.1.1.1/24
	ipv6 {
	ospfv3 {
	process 2 {
	instance-id 0 {
	area 0
	}
	}
	}
	}
	}
	dataplane dp0s11 {
	address 30.1.1.1/24
	ipv6 {
	ospfv3 {
	process 3 {
	instance-id 0 {
	area 0
	}
	}
	}
	}
	}
	}

Configuring SNMP on a routing instance

The following sections provide examples of configuration mode commands.

Associating an SNMP client on a routing instance

The following configuration associates the commA community string with the RED routing instance and the commB community string with the BLUE routing instance. Only one context name can be mapped to a community, but multiple communities can be mapped to the same context name. A community string that is mapped to a context must have a defined view.

Table 13. Associating an SNMP client on a routing instance

Step	Command
Set the SNMP version 1 and version 2 community as commA and context as RED.	`vyatta@R1# set service snmp community commA context red`
Set the SNMP version 1 and version 2 community as commB and context as BLUE.	`vyatta@R1# set service snmp community commB context blue` `vyatta@R1# set service snmp view all oid 1`
Associate all views with the commA SNMP community.	`vyatta@R1# set service snmp community commA view all`
Associate all views with the commB SNMP community.	`vyatta@R1# set service snmp community commB view all`

View the configuration.	`vyatta@R1# show service snmp community`
	` community commA {`
	`  context red`
	`  view all`
	` }`
	` community commB {`
	`  context blue`
	`  view all`
	` }`
	`vyatta@vyatta#`

Associating a trap target with a routing instance

The following configuration associates an SNMPv2 trap target with the 1.1.1.1 IP address on the RED routing instance.

Table 14. Associating SNMPv2 trap targets on a routing instance

Step	Command
Set the SNMPv2 trap target with the 1.1.1.1 IP address on the RED routing instance.	`vyatta@R1# set service snmp v2 trap-target 1.1.1.1 routing-instance red`
Define the test community configuration node.	`vyatta@R1# set service snmp v2 trap-target 1.1.1.1 community test`
Commit the configuration.	`vyatta@R1# commit`

View the configuration.	`vyatta@R1# show service snmp v2 trap-target`
	` trap-target 1.1.1.1 {`
	`  community test`
	`  routing-instance red`
	` }`
	`vyatta@vyatta#`

The following configuration associates an SNMPv3 trap target with IP address 2.2.2.2 on the RED routing instance.

Table 15. Associating an SNMPv3 trap target on a routing instance

Step	Command
Set the SNMPv3 trap target with the 2.2.2.2 IP address on the RED routing instance.	`vyatta@R1# set service snmp v3 trap-target 2.2.2.2 routing-instance red`
Define the usr2 SNMPv3 user.	`vyatta@R1# set service snmp v3 trap-target 2.2.2.2 user usr2`
Define a cleartext password to authenticate a user.	`set service snmp v3 trap-target 2.2.2.2 auth plaintext-key "usr2usr2"`
Commit the configuration.	`vyatta@R1# commit`

View the configuration.	`vyatta@R1# show service snmp v3 trap-target`
	` trap-target 2.2.2.2 {`
	`  auth {`
	`  plaintext-key "********"`
	`  }`
	`  user usr2`
	`  routing-instance red`
	` }`
	`vyatta@vyatta#`

Configuring an SNMP agent to listen on a routing instance

The following configuration shows how to configure an SNMP agent to listen for incoming requests from the RED routing instance.

Table 16. Configuring an SNMP agent on a routing instance

Step	Command
Set an SNMP agent to listen for incoming requests from the RED routing instance.	`vyatta@R1# set service snmp routing-instance red`

View the configuration.	`vyatta@R1# show service snmp routing-instance`
	` routing-instance red`
	`vyatta@vyatta#`

Command support for VRF routing instances

VRF allows a router to support multiple routing tables, one for each VRF routing instance. Some commands in this guide support VRF and can be applied to particular routing instances.

Use the guidelines in this section to determine correct syntax when adding VRF routing instances to commands.

Adding a VRF routing instance to a Configuration mode command

For most Configuration mode commands, specify the VRF routing instance at the beginning of a command. Add the appropriate VRF keywords and variable to follow the initial action (**set**, **show**, or **delete**) and before the other keywords and variables in the command.

Configuration mode example: syslog

The following command configures the syslog logging level for the specified syslog host. The command does not include a VRF routing instance, so the command applies to the default routing instance.

```
vyatta@R1# set system syslog host 10.10.10.1 facility all level debug
vyatta@R1# show system syslog
syslog {
    host 10.10.10.1 {
            facility all {
                    level debug
            }
    }
}
```

The following example shows the same command with the VRF routing instance (GREEN) added. Notice that **routing routing-instance GREEN** has been inserted between the basic action (**set** in the example) and the rest of the command. Most Configuration mode commands follow this convention.

```
vyatta@R1# set routing routing-instance GREEN system syslog host 10.10.10.1
 facility all level debug
vyatta@R1# show routing
routing {
     routing-instance GREEN {
             system {
                     syslog {
                            host 11.12.13.2:514 {
                                     facility all {
                                             level debug
                                     }
                             }
                     }
             }
     }
}
```

Configuration mode example: SNMP

Some features, such as SNMP, are not available on a per-routing instance basis but can be bound to a specific routing instance. For these features, the command syntax is an exception to the convention of specifying the routing instance at the beginning of Configuration mode commands.

The following example shows how to configure the SNMPv1 or SNMPv2c community and context for the RED and BLUE routing instances. The first two commands specify the RED routing instance as the context for community A and BLUE routing instance as the context for community B. The subsequent commands complete the configuration.

For more information about configuring SNMP, refer to *Remote Management Configuration Guide*.

```
vyatta@R1# set service snmp community commA context RED
vyatta@R1# set service snmp community commB context BLUE
vyatta@R1# set service snmp view all oid 1
vyatta@R1# set service snmp community commA view all
vyatta@R1# set service snmp community commB view all
vyatta@R1# show service snmp community
 community commA {
        context RED
        view all
 }
 community commB {
        context BLUE
        view all
 }
[edit]
vyatta@vyatta#
```

Adding a VRF routing instance to an Operational mode command

The syntax for adding a VRF routing instance to an Operational mode command varies according to the type of command parameters:

- If the command does not have optional parameters, specify the routing instance at the end of the command.
- If the command has optional parameters, specify the routing instance after the required parameters and before the optional parameters.

Operational mode examples without optional parameters

The following command displays dynamic DNS information for the default routing instance.

```
vyatta@vyatta:~$ show dns dynamic status
```

The following command displays the same information for the specified routing instance (GREEN). The command does not have any optional parameters, so the routing instance is specified at the end of the command.

```
vyatta@vyatta:~$ show dns dynamic status routing-instance GREEN
```

Operational mode example with optional parameters

The following command obtains multicast path information for the specified host (10.33.2.5). A routing instance is not specified, so the command applies to the default routing instance.

```
vyatta@vyatta:~$ mtrace 10.33.2.5 detail
```

The following command obtains multicast path information for the specified host (10.33.2.5) and routing instance (GREEN). Notice that the routing instance is specified before the optional **detail** keyword.

```
vyatta@vyatta:~$ mtrace 10.33.2.5 routing-instance GREEN detail
```

Operational mode example output: SNMP

The following SNMP **show** commands display output for routing instances.

```
vyatta@vyatta:~$ show snmp routing-instance
Routing Instance SNMP Agent is Listening on for Incoming Requests:
Routing-Instance            RDID
-----------------           ----
RED                         5

vyatta@vyatta:~$ show snmp community-mapping
SNMPv1/v2c Community/Context Mapping:
Community                   Context
---------                   -------
commA                       'RED'
commB                       'BLUE'
deva                        'default'


vyatta@vyatta:~$ show snmp trap-target
SNMPv1/v2c Trap-targets:
Trap-target                   Port   Routing-Instance Community
-----------                   ----   ---------------- ---------
1.1.1.1                             'RED'           'test'


vyatta@vyatta:~$ show snmp v3 trap-target
SNMPv3 Trap-targets:
Trap-target                   Port   Protocol Auth Priv Type   EngineID
          Routing-Instance User
-----------                   ----   -------- ---- ---- ----   --------
          ---------------- ----
2.2.2.2                       '162'  'udp'    'md5'      'infor
          'BLUE'           'test'
```

List of commands that support VRF

List of configuration commands

```
policy route pbr <pbr-group> rule <rule-number> routing-instance <value>
protocols static route <prefix> next-hop-routing-instance
 <routing-instance>
protocols static route <prefix> next-hop-routing-instance
 <routing-instance> next-hop <address>
protocols static route <prefix> next-hop-routing-instance
 <routing-instance> next-hop <address> disable
protocols static route <prefix> next-hop-routing-instance
 <routing-instance> next-hop <address> distance <value>
protocols static route <prefix> next-hop-routing-instance
 <routing-instance> next-hop <address> interface <value>
protocols static route6 <prefix> next-hop-routing-instance
 <routing-instance>
protocols static route6 <prefix> next-hop-routing-instance
 <routing-instance> next-hop <address>
protocols static route6 <prefix> next-hop-routing-instance
 <routing-instance> next-hop <address> disable
protocols static route6 <prefix> next-hop-routing-instance
 <routing-instance> next-hop <address> distance <value>
protocols static route6 <prefix> next-hop-routing-instance
 <routing-instance> next-hop <address> interface <value>
routing routing-instance <instance-name>
routing routing-instance <instance-name> description <value>
routing routing-instance <instance-name> instance-type <value>
routing routing-instance <instance-name> interface <name>
routing routing-instance <instance-name> protocols bfd destination
 <address>
routing routing-instance <instance-name> protocols bfd destination
 <address> source <address>
routing routing-instance <instance-name> protocols bfd destination
 <address> source <address> helper-session
routing routing-instance <instance-name> protocols bfd destination
 <address> source <address> template <value>
routing routing-instance <instance-name> protocols bfd log all
routing routing-instance <instance-name> protocols bfd log event
routing routing-instance <instance-name> protocols bfd log ipc-error
routing routing-instance <instance-name> protocols bfd log ipc-event
routing routing-instance <instance-name> protocols bfd log packet
routing routing-instance <instance-name> protocols bfd log session
routing routing-instance <instance-name> protocols bgp <as-number>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast aggregate-address <address>
```

```
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast aggregate-address <address> as-set
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast aggregate-address <address> summary-only
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast auto-summary
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast network <address>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast network <address> backdoor
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast network <address> route-map <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast nexthop
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast nexthop route-map <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast parameters
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast parameters dampening
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast parameters dampening half-life <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast parameters dampening max-suppress-time <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast parameters dampening re-use <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast parameters dampening start-suppress <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast parameters dampening un-reachability-half-life
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast parameters distance
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast parameters distance global
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast parameters distance global external <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast parameters distance global internal <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast parameters distance global local <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast parameters network-synchronization
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast parameters synchronization
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast redistribute
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast redistribute connected
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast redistribute connected route-map <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast redistribute kernel
```

```
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast redistribute kernel route-map <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast redistribute ospf
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast redistribute ospf route-map <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast redistribute rip
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast redistribute rip route-map <value>
routing routing-instance <instance-name> protocols bgp <as-number>
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routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv4-unicast redistribute static route-map <value>
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routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv6-unicast aggregate-address <address>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv6-unicast aggregate-address <address> as-set
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv6-unicast aggregate-address <address> summary-only
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv6-unicast auto-summary
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv6-unicast network <address>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv6-unicast network <address> backdoor
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv6-unicast network <address> route-map <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv6-unicast nexthop
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv6-unicast nexthop route-map <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv6-unicast parameters
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv6-unicast parameters dampening
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv6-unicast parameters dampening half-life <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv6-unicast parameters dampening max-suppress-time <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv6-unicast parameters dampening re-use <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv6-unicast parameters dampening start-suppress <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv6-unicast parameters dampening un-reachability-half-life
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv6-unicast parameters distance
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv6-unicast parameters distance global
```

```
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routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv6-unicast parameters distance global internal <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv6-unicast parameters distance global local <value>
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routing routing-instance <instance-name> protocols bgp <as-number>
 address-family ipv6-unicast parameters synchronization
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routing routing-instance <instance-name> protocols bgp <as-number>
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routing routing-instance <instance-name> protocols bgp <as-number>
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routing routing-instance <instance-name> protocols bgp <as-number>
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routing routing-instance <instance-name> protocols bgp <as-number>
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 address-family ipv6-unicast redistribute static route-map <value>
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routing routing-instance <instance-name> protocols bgp <as-number>
 address-family vpnv4-unicast parameters dampening
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family vpnv4-unicast parameters dampening half-life <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family vpnv4-unicast parameters dampening max-suppress-time
 <value>
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routing routing-instance <instance-name> protocols bgp <as-number>
 address-family vpnv4-unicast parameters dampening start-suppress <value>
routing routing-instance <instance-name> protocols bgp
 <as-number> address-family vpnv4-unicast parameters dampening
 un-reachability-half-life <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family vpnv6-unicast
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family vpnv6-unicast parameters dampening
```

```
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routing routing-instance <instance-name> protocols bgp <as-number>
 address-family vpnv6-unicast parameters dampening max-suppress-time
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 address-family vpnv6-unicast parameters dampening re-use <value>
routing routing-instance <instance-name> protocols bgp <as-number>
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routing routing-instance <instance-name> protocols bgp
 <as-number> address-family vpnv6-unicast parameters dampening
 un-reachability-half-life <value>
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routing routing-instance <instance-name> protocols bgp <as-number> log bfd
routing routing-instance <instance-name> protocols bgp <as-number> log
 dampening
routing routing-instance <instance-name> protocols bgp <as-number> log
 events
routing routing-instance <instance-name> protocols bgp <as-number> log
 filters
routing routing-instance <instance-name> protocols bgp <as-number> log fsm
routing routing-instance <instance-name> protocols bgp <as-number> log
 keepalive
routing routing-instance <instance-name> protocols bgp <as-number> log msdp
routing routing-instance <instance-name> protocols bgp <as-number> log
 update all
routing routing-instance <instance-name> protocols bgp <as-number> log
 update in
routing routing-instance <instance-name> protocols bgp <as-number> log
 update out
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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```

```
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 disable
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> address-family ipv4-labeled-unicast capability orf prefix-list
 receive
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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 send
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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 standard
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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 <value>
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 <address> address-family ipv4-labeled-unicast distribute-list import
 <value>
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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 threshold <percentage>
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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 threshold <percentage> warning-only
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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 warning-only
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> address-family ipv4-labeled-unicast nexthop-self
```

```
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> address-family ipv4-unicast capability orf prefix-list send
```

```
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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 <percentage>
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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 <percentage> warning-only
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 neighbor <address> address-family ipv4-unicast maximum-prefix <address>
 warning-only
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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```

```
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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 receive
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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 send
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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 extended
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 standard
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> address-family ipv6-labeled-unicast distribute-list export
 <value>
```

```
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 <value>
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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 threshold <percentage> warning-only
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 warning-only
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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```

```
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> address-family ipv6-unicast attribute-unchanged next-hop
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> address-family ipv6-unicast capability orf prefix-list send
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> address-family ipv6-unicast maximum-prefix <address>
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 <address> address-family ipv6-unicast maximum-prefix <address> threshold
 <percentage>
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> address-family ipv6-unicast maximum-prefix <address> threshold
 <percentage> warning-only
routing routing-instance <instance-name> protocols bgp <as-number>
 neighbor <address> address-family ipv6-unicast maximum-prefix <address>
 warning-only
```

```
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> address-family ipv6-unicast nexthop-self
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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```

```
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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 <percentage>
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> address-family vpnv4-unicast maximum-prefix <address> threshold
 <percentage> warning-only
routing routing-instance <instance-name> protocols bgp <as-number>
 neighbor <address> address-family vpnv4-unicast maximum-prefix <address>
 warning-only
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> address-family vpnv4-unicast peer-group <value>
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> address-family vpnv6-unicast maximum-prefix <address>
```

```
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 <percentage>
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> address-family vpnv6-unicast maximum-prefix <address> threshold
 <percentage> warning-only
routing routing-instance <instance-name> protocols bgp <as-number>
 neighbor <address> address-family vpnv6-unicast maximum-prefix <address>
 warning-only
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> address-family vpnv6-unicast peer-group <value>
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> address-family vpnv6-unicast prefix-list
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> fall-over bfd
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> interface <ifname>
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> interface <ifname> vrrp-failover
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> interface <ifname> vrrp-failover vrrp-group <groupid>
```

```
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> interface <ifname> vrrp-failover vrrp-group <groupid> med
 <value>
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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 <value>
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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 <value>
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> log dampening
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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 <address> log filters
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> log update out
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> route-map import <value>
```

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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> timers holdtime <value>
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number> neighbor
 <address> ttl-security hops <value>
routing routing-instance <instance-name> protocols bgp <as-number> neighbor
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routing routing-instance <instance-name> protocols bgp <as-number>
 parameters
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters always-compare-med
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters bestpath
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters bestpath as-path
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters bestpath as-path confed
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters bestpath as-path ignore
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters bestpath compare-routerid
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters bestpath igp-metric-ignore
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters bestpath med
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters bestpath med confed
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters bestpath med confed missing-as-worst
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters bestpath med missing-as-worst
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters confederation
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters confederation peers <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters default
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters default local-pref <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters deterministic-med
```

```
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters enforce-first-as
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters log-neighbor-changes
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters maximum-paths ebgp <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters maximum-paths ibgp <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters med-out-delay <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters no-client-to-client-reflection all
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters no-client-to-client-reflection cluster-id <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters no-fast-external-failover
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters no-peer-damp-oscillation
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters no-rtm
routing routing-instance <instance-name> protocols bgp <as-number>
 parameters router-id <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast allowas-in
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast allowas-in
 number <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast
 attribute-unchanged
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast
 attribute-unchanged as-path
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast
 attribute-unchanged med
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast
 attribute-unchanged next-hop
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast capability
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast capability
 graceful-restart
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast capability
 graceful-restart disable
```

```
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast capability orf
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast capability orf
 prefix-list
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast capability orf
 prefix-list receive
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast capability orf
 prefix-list send
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast
 default-originate
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast
 default-originate route-map <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast
 disable-send-community
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast
 disable-send-community extended
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast
 disable-send-community standard
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast
 distribute-list
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast
 distribute-list export <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast
 distribute-list import <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast filter-list
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast filter-list
 export <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast filter-list
 import <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast maximum-prefix
 <address>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast maximum-prefix
 <address> threshold <percentage>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast maximum-prefix
 <address> threshold <percentage> warning-only
```

```
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast maximum-prefix
 <address> warning-only
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast nexthop-self
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast prefix-list
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast prefix-list
 export <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast prefix-list
 import <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast
 remove-private-as
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast route-map
 export <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast route-map
 import <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast
 route-reflector-client
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast
 route-server-client
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast
 soft-reconfiguration inbound
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast unsuppress-map
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-labeled-unicast weight <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast allowas-in
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast allowas-in number
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast as-override
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast attribute-unchanged
 as-path
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast attribute-unchanged
 med
```

```
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast attribute-unchanged
 next-hop
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast capability
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast capability
 graceful-restart
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast capability
 graceful-restart disable
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast capability orf
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast capability orf
 prefix-list
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast capability orf
 prefix-list receive
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast capability orf
 prefix-list send
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast default-originate
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast default-originate
 route-map <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast disable-send-community
 extended
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast disable-send-community
 standard
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast distribute-list export
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast distribute-list import
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast filter-list
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast filter-list export
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast filter-list import
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast maximum-prefix
 <address>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast maximum-prefix
 <address> threshold <percentage>
```

```
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast maximum-prefix
 <address> threshold <percentage> warning-only
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast maximum-prefix
 <address> warning-only
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast nexthop-self
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast prefix-list export
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast prefix-list import
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast remove-private-as
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast route-map export
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast route-map import
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast route-reflector-client
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast route-server-client
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast site-of-origin <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast soft-reconfiguration
 inbound
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast unsuppress-map <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv4-unicast weight <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast allowas-in
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast allowas-in
 number <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast
 attribute-unchanged
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast
 attribute-unchanged as-path
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast
 attribute-unchanged med
```

```
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast
 attribute-unchanged next-hop
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast capability
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast capability
 graceful-restart
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast capability
 graceful-restart disable
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast capability orf
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast capability orf
 prefix-list
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast capability orf
 prefix-list receive
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast capability orf
 prefix-list send
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast
 default-originate
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast
 default-originate route-map <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast
 disable-send-community
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast
 disable-send-community extended
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast
 disable-send-community standard
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast
 distribute-list
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast
 distribute-list export <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast
 distribute-list import <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast filter-list
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast filter-list
 export <value>
```

```
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast filter-list
 import <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast maximum-prefix
 <address>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast maximum-prefix
 <address> threshold <percentage>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast maximum-prefix
 <address> threshold <percentage> warning-only
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast maximum-prefix
 <address> warning-only
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast nexthop-self
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast prefix-list
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast prefix-list
 export <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast prefix-list
 import <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast
 remove-private-as
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast route-map
 export <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast route-map
 import <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast
 route-reflector-client
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast
 route-server-client
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast
 soft-reconfiguration inbound
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast unsuppress-map
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-labeled-unicast weight <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast allowas-in
```

```
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast allowas-in number
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast as-override
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast attribute-unchanged
 as-path
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast attribute-unchanged
 med
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast attribute-unchanged
 next-hop
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast capability
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast capability
 graceful-restart
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast capability
 graceful-restart disable
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast capability orf
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast capability orf
 prefix-list
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast capability orf
 prefix-list receive
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast capability orf
 prefix-list send
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast default-originate
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast default-originate
 route-map <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast disable-send-community
 extended
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast disable-send-community
 standard
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast distribute-list
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast distribute-list export
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast distribute-list import
 <value>
```

```
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast filter-list
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast filter-list export
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast filter-list import
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast maximum-prefix
 <address>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast maximum-prefix
 <address> threshold <percentage>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast maximum-prefix
 <address> threshold <percentage> warning-only
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast maximum-prefix
 <address> warning-only
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast nexthop-self
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast prefix-list
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast prefix-list export
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast prefix-list import
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast remove-private-as
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast route-map export
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast route-map import
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast route-reflector-client
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast route-server-client
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast site-of-origin <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast soft-reconfiguration
 inbound
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast unsuppress-map <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family ipv6-unicast weight <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family rtfilter-unicast
```

```
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family rtfilter-unicast default-originate
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family rtfilter-unicast
 route-reflector-client
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv4-unicast
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv4-unicast allowas-in
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv4-unicast allowas-in number
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv4-unicast capability
 graceful-restart
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv4-unicast capability
 graceful-restart disable
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv4-unicast distribute-list
 export <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv4-unicast distribute-list
 import <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv4-unicast filter-list
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv4-unicast filter-list export
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv4-unicast filter-list import
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv4-unicast maximum-prefix
 <address>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv4-unicast maximum-prefix
 <address> threshold <percentage>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv4-unicast maximum-prefix
 <address> threshold <percentage> warning-only
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv4-unicast maximum-prefix
 <address> warning-only
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv4-unicast prefix-list export
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv4-unicast prefix-list import
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv4-unicast route-map export
 <value>
```

```
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv4-unicast route-map import
 <value>
routing routing-instance <instance-name> protocols bgp
 <as-number> peer-group <group-name> address-family vpnv4-unicast
 route-reflector-client
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv6-unicast
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv6-unicast allowas-in
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv6-unicast allowas-in number
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv6-unicast capability
 graceful-restart
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv6-unicast capability
 graceful-restart disable
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv6-unicast distribute-list
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv6-unicast distribute-list
 export <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv6-unicast distribute-list
 import <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv6-unicast filter-list
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv6-unicast filter-list export
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv6-unicast filter-list import
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv6-unicast maximum-prefix
 <address>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv6-unicast maximum-prefix
 <address> threshold <percentage>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv6-unicast maximum-prefix
 <address> threshold <percentage> warning-only
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv6-unicast maximum-prefix
 <address> warning-only
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv6-unicast prefix-list
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv6-unicast prefix-list export
 <value>
```

```
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv6-unicast prefix-list import
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv6-unicast route-map export
 <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> address-family vpnv6-unicast route-map import
 <value>
routing routing-instance <instance-name> protocols bgp
 <as-number> peer-group <group-name> address-family vpnv6-unicast
 route-reflector-client
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> advertisement-interval <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> as-origination-interval <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> capability
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> capability disable-route-refresh
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> capability dynamic
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> capability route-refresh
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> cluster-id <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> description <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> disable-capability-negotiation
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> ebgp-multihop <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> enforce-multihop
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> interface <ifname>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> interface <ifname> vrrp-failover
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> interface <ifname> vrrp-failover vrrp-group
 <groupid>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> interface <ifname> vrrp-failover vrrp-group
 <groupid> med <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> interface <ifname> vrrp-failover vrrp-group
 <groupid> prepend-as <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> interface <ifname> vrrp-failover vrrp-group
 <groupid> route-map <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> local-as <as-number>
```

```
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> med-out igp
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> med-out igp delay-updates
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> med-out minimum-igp
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> override-capability
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> passive
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> password <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> port <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> remote-as <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> shutdown
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> strict-capability-match
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> timers
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> timers connect <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> timers holdtime <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> timers keepalive <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> ttl-security
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> ttl-security hops <value>
routing routing-instance <instance-name> protocols bgp <as-number>
 peer-group <group-name> update-source <value>
routing routing-instance <instance-name> protocols ecmp disable
routing routing-instance <instance-name> protocols ecmp maximum-paths
 <value>
routing routing-instance <instance-name> protocols igmp limit <value>
routing routing-instance <instance-name> protocols igmp limit-exception
 <value>
routing routing-instance <instance-name> protocols igmp log all
routing routing-instance <instance-name> protocols igmp log decode
routing routing-instance <instance-name> protocols igmp log encode
routing routing-instance <instance-name> protocols igmp log events
routing routing-instance <instance-name> protocols igmp log fsm
routing routing-instance <instance-name> protocols igmp log tib
routing routing-instance <instance-name> protocols igmp ssm-map
routing routing-instance <instance-name> protocols igmp ssm-map static
 access-list <access-list-number>
routing routing-instance <instance-name> protocols igmp ssm-map static
 access-list <access-list-number> source <value>
routing routing-instance <instance-name> protocols mld limit <value>
```

```
routing routing-instance <instance-name> protocols mld limit-exception
 <value>
routing routing-instance <instance-name> protocols mld log all
routing routing-instance <instance-name> protocols mld log decode
routing routing-instance <instance-name> protocols mld log encode
routing routing-instance <instance-name> protocols mld log events
routing routing-instance <instance-name> protocols mld log fsm
routing routing-instance <instance-name> protocols mld log tib
routing routing-instance <instance-name> protocols mld ssm-map
routing routing-instance <instance-name> protocols mld ssm-map static
 access-list <access-list-number>
routing routing-instance <instance-name> protocols mld ssm-map static
 access-list <access-list-number> source <value>
routing routing-instance <instance-name> protocols msdp export access-list
 <value>
routing routing-instance <instance-name> protocols msdp export rp-list
 <value>
routing routing-instance <instance-name> protocols msdp import access-list
 <value>
routing routing-instance <instance-name> protocols msdp import rp-list
 <value>
routing routing-instance <instance-name> protocols msdp log <value>
routing routing-instance <instance-name> protocols msdp mesh-group <name>
routing routing-instance <instance-name> protocols msdp mesh-group <name>
 peer <value>
routing routing-instance <instance-name> protocols msdp originated-id
 <value>
routing routing-instance <instance-name> protocols msdp peer <address>
routing routing-instance <instance-name> protocols msdp peer <address>
 connect-retry <value>
routing routing-instance <instance-name> protocols msdp peer <address>
 default-peer
routing routing-instance <instance-name> protocols msdp peer <address>
 default-peer prefix-list <value>
routing routing-instance <instance-name> protocols msdp peer <address>
 default-peer priority <value>
routing routing-instance <instance-name> protocols msdp peer <address>
 export access-list <value>
routing routing-instance <instance-name> protocols msdp peer <address>
 export rp-list <value>
routing routing-instance <instance-name> protocols msdp peer <address>
 holdtime <value>
routing routing-instance <instance-name> protocols msdp peer <address>
 import access-list <value>
routing routing-instance <instance-name> protocols msdp peer <address>
 import rp-list <value>
routing routing-instance <instance-name> protocols msdp peer <address>
 keepalive <value>
routing routing-instance <instance-name> protocols msdp peer <address>
 local-address <value>
routing routing-instance <instance-name> protocols msdp peer <address>
 password <value>
```

```
routing routing-instance <instance-name> protocols msdp peer <address>
 sa-limit <value>
routing routing-instance <instance-name> protocols msdp peer <address>
 shutdown
routing routing-instance <instance-name> protocols msdp peer-group <name>
routing routing-instance <instance-name> protocols msdp peer-group <name>
 connect-retry <value>
routing routing-instance <instance-name> protocols msdp peer-group <name>
 export access-list <value>
routing routing-instance <instance-name> protocols msdp peer-group <name>
 export rp-list <value>
routing routing-instance <instance-name> protocols msdp peer-group <name>
 holdtime <value>
routing routing-instance <instance-name> protocols msdp peer-group <name>
 import access-list <value>
routing routing-instance <instance-name> protocols msdp peer-group <name>
 import rp-list <value>
routing routing-instance <instance-name> protocols msdp peer-group <name>
 keepalive <value>
routing routing-instance <instance-name> protocols msdp peer-group <name>
 peer <value>
routing routing-instance <instance-name> protocols msdp peer-group <name>
 sa-limit <value>
routing routing-instance <instance-name> protocols msdp peer-group <name>
 shutdown
routing routing-instance <instance-name> protocols msdp sa-cache <value>
routing routing-instance <instance-name> protocols msdp sa-holdtime <value>
routing routing-instance <instance-name> protocols multicast ip log all
routing routing-instance <instance-name> protocols multicast ip log event
routing routing-instance <instance-name> protocols multicast ip log fib-msg
routing routing-instance <instance-name> protocols multicast ip log
 mrib-msg
routing routing-instance <instance-name> protocols multicast ip log mrt
routing routing-instance <instance-name> protocols multicast ip log mtrace
routing routing-instance <instance-name> protocols multicast ip log
 mtrace-detail
routing routing-instance <instance-name> protocols multicast ip log nsm-msg
routing routing-instance <instance-name> protocols multicast ip log
 register-msg
routing routing-instance <instance-name> protocols multicast ip log stats
routing routing-instance <instance-name> protocols multicast ip log vif
routing routing-instance <instance-name> protocols multicast ip log-warning
 <value>
routing routing-instance <instance-name> protocols multicast ip route-limit
 <value>
routing routing-instance <instance-name> protocols multicast ip routing
routing routing-instance <instance-name> protocols multicast ipv6 log all
routing routing-instance <instance-name> protocols multicast ipv6 log event
routing routing-instance <instance-name> protocols multicast ipv6 log
 fib-msg
routing routing-instance <instance-name> protocols multicast ipv6 log
 mrib-msg
routing routing-instance <instance-name> protocols multicast ipv6 log mrt
```

```
routing routing-instance <instance-name> protocols multicast ipv6 log
 mtrace
routing routing-instance <instance-name> protocols multicast ipv6 log
 mtrace-detail
routing routing-instance <instance-name> protocols multicast ipv6 log
 nsm-msg
routing routing-instance <instance-name> protocols multicast ipv6 log
 register-msg
routing routing-instance <instance-name> protocols multicast ipv6 log stats
routing routing-instance <instance-name> protocols multicast ipv6 log vif
routing routing-instance <instance-name> protocols multicast ipv6
 log-warning <value>
routing routing-instance <instance-name> protocols multicast ipv6
 route-limit <value>
routing routing-instance <instance-name> protocols multicast ipv6 routing
routing routing-instance <instance-name> protocols nsm log all
routing routing-instance <instance-name> protocols nsm log events
routing routing-instance <instance-name> protocols nsm log kernel
routing routing-instance <instance-name> protocols ospf process <instance>
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier>
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> area-type
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> area-type nssa
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> area-type nssa default-cost <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> area-type nssa default-information-originate
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> area-type nssa default-information-originate metric
 <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> area-type nssa default-information-originate
 metric-type <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> area-type nssa default-information-originate
 route-map <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> area-type nssa no-summary
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> area-type nssa translate <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> area-type stub
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> area-type stub default-cost <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> area-type stub no-summary
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> authentication <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> network <value>
```

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routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> range <prefix>
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> range <prefix> metric <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> range <prefix> not-advertise
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> shortcut <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> virtual-link <address>
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> virtual-link <address> authentication
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> virtual-link <address> authentication md5
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> virtual-link <address> authentication md5-key-id
 <key-id>
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> virtual-link <address> authentication md5-key-id
 <key-id> md5-key <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> virtual-link <address> authentication plaintext
routing routing-instance <instance-name> protocols ospf process
 <instance> area <area-identifier> virtual-link <address> authentication
 plaintext-password <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> virtual-link <address> dead-interval <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> virtual-link <address> fall-over bfd
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> virtual-link <address> hello-interval <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> virtual-link <address> retransmit-interval <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 area <area-identifier> virtual-link <address> transmit-delay <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 auto-cost
routing routing-instance <instance-name> protocols ospf process <instance>
 auto-cost reference-bandwidth <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 default-information originate
routing routing-instance <instance-name> protocols ospf process <instance>
 default-information originate always
routing routing-instance <instance-name> protocols ospf process <instance>
 default-information originate metric <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 default-information originate metric-type <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 default-information originate route-map <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 default-metric <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 distance
```

```
routing routing-instance <instance-name> protocols ospf process <instance>
 distance global <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 distance ospf
routing routing-instance <instance-name> protocols ospf process <instance>
 distance ospf external <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 distance ospf inter-area <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 distance ospf intra-area <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 distribute-list <access-list-name>
routing routing-instance <instance-name> protocols ospf process <instance>
 distribute-list <access-list-name> export <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 distribute-list <access-list-name> export-ospf process-id <process-id>
routing routing-instance <instance-name> protocols ospf process <instance>
 distribute-list <access-list-name> import
routing routing-instance <instance-name> protocols ospf process <instance>
 log all
routing routing-instance <instance-name> protocols ospf process <instance>
 log bfd
routing routing-instance <instance-name> protocols ospf process <instance>
 log database-timer rate-limit
routing routing-instance <instance-name> protocols ospf process <instance>
 log events abr
routing routing-instance <instance-name> protocols ospf process <instance>
 log events all
routing routing-instance <instance-name> protocols ospf process <instance>
 log events asbr
routing routing-instance <instance-name> protocols ospf process <instance>
 log events lsa
routing routing-instance <instance-name> protocols ospf process <instance>
 log events nssa
routing routing-instance <instance-name> protocols ospf process <instance>
 log events os
routing routing-instance <instance-name> protocols ospf process <instance>
 log events router
routing routing-instance <instance-name> protocols ospf process <instance>
 log events vlink
routing routing-instance <instance-name> protocols ospf process <instance>
 log ifsm all
routing routing-instance <instance-name> protocols ospf process <instance>
 log ifsm events
routing routing-instance <instance-name> protocols ospf process <instance>
 log ifsm status
routing routing-instance <instance-name> protocols ospf process <instance>
 log ifsm timers
routing routing-instance <instance-name> protocols ospf process <instance>
 log lsa all
routing routing-instance <instance-name> protocols ospf process <instance>
 log lsa flooding
```

```
routing routing-instance <instance-name> protocols ospf process <instance>
 log lsa generate
routing routing-instance <instance-name> protocols ospf process <instance>
 log lsa install
routing routing-instance <instance-name> protocols ospf process <instance>
 log lsa maxage
routing routing-instance <instance-name> protocols ospf process <instance>
 log lsa refresh
routing routing-instance <instance-name> protocols ospf process <instance>
 log nfsm all
routing routing-instance <instance-name> protocols ospf process <instance>
 log nfsm events
routing routing-instance <instance-name> protocols ospf process <instance>
 log nfsm status
routing routing-instance <instance-name> protocols ospf process <instance>
 log nfsm timers
routing routing-instance <instance-name> protocols ospf process <instance>
 log nsm all
routing routing-instance <instance-name> protocols ospf process <instance>
 log nsm interface
routing routing-instance <instance-name> protocols ospf process <instance>
 log nsm redistribute
routing routing-instance <instance-name> protocols ospf process <instance>
 log packet all
routing routing-instance <instance-name> protocols ospf process <instance>
 log packet dd
routing routing-instance <instance-name> protocols ospf process <instance>
 log packet detail
routing routing-instance <instance-name> protocols ospf process <instance>
 log packet hello
routing routing-instance <instance-name> protocols ospf process <instance>
 log packet ls-ack
routing routing-instance <instance-name> protocols ospf process <instance>
 log packet ls-request
routing routing-instance <instance-name> protocols ospf process <instance>
 log packet ls-update
routing routing-instance <instance-name> protocols ospf process <instance>
 log packet recv
routing routing-instance <instance-name> protocols ospf process <instance>
 log packet send
routing routing-instance <instance-name> protocols ospf process <instance>
 log rib all
routing routing-instance <instance-name> protocols ospf process <instance>
 log rib interface
routing routing-instance <instance-name> protocols ospf process <instance>
 log rib redistribute
routing routing-instance <instance-name> protocols ospf process <instance>
 log route all
routing routing-instance <instance-name> protocols ospf process <instance>
 log route ase
routing routing-instance <instance-name> protocols ospf process <instance>
 log route ia
```

```
routing routing-instance <instance-name> protocols ospf process <instance>
 log route install
routing routing-instance <instance-name> protocols ospf process <instance>
 log route spf
routing routing-instance <instance-name> protocols ospf process <instance>
 neighbor <address>
routing routing-instance <instance-name> protocols ospf process <instance>
 neighbor <address> poll-interval <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 neighbor <address> priority <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 overflow database external
routing routing-instance <instance-name> protocols ospf process <instance>
 overflow database external limit <number>
routing routing-instance <instance-name> protocols ospf process <instance>
 overflow database external limit <number> recovery <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 overflow database hard limit <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 overflow database soft limit <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 parameters
routing routing-instance <instance-name> protocols ospf process <instance>
 parameters abr-type <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 parameters opaque-lsa
routing routing-instance <instance-name> protocols ospf process <instance>
 parameters rfc1583-compatibility
routing routing-instance <instance-name> protocols ospf process <instance>
 parameters router-id <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 passive-interface <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 passive-interface-exclude <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute bgp
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute bgp metric <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute bgp metric-type <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute bgp route-map <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute bgp tag <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute connected
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute connected metric <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute connected metric-type <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute connected route-map <value>
```

```
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute connected tag <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute kernel
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute kernel metric <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute kernel metric-type <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute kernel route-map <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute kernel tag <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute ospf process-id <process-id>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute ospf process-id <process-id> metric <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute ospf process-id <process-id> metric-type <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute ospf process-id <process-id> route-map <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute ospf process-id <process-id> tag <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute rip
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute rip metric <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute rip metric-type <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute rip route-map <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute rip tag <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute static
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute static metric <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute static metric-type <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute static route-map <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 redistribute static tag <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 refresh
routing routing-instance <instance-name> protocols ospf process <instance>
 refresh timers <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 summary-address <address>
routing routing-instance <instance-name> protocols ospf process <instance>
 summary-address <address> advertise
routing routing-instance <instance-name> protocols ospf process <instance>
 summary-address <address> advertise tag <value>
```

```
routing routing-instance <instance-name> protocols ospf process <instance>
 summary-address <address> not-advertise
routing routing-instance <instance-name> protocols ospf process <instance>
 timers lsa arrival <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 timers throttle lsa delay <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 timers throttle lsa max-wait <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 timers throttle lsa min-wait <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 timers throttle spf delay <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 timers throttle spf max-wait <value>
routing routing-instance <instance-name> protocols ospf process <instance>
 timers throttle spf min-wait <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> abr-type <value>
routing routing-instance <instance-name> protocols ospfv3 process
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routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast area <area-identifier>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast area <area-identifier> range
 <prefix>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast area <area-identifier> range
 <prefix> advertise
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast area <area-identifier> range
 <prefix> metric <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast area <area-identifier> range
 <prefix> not-advertise
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast default-information
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast default-information originate
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast default-information originate
 always
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast default-information originate
 metric <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast default-information originate
 metric-type <value>
```

```
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast default-information originate
 route-map <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute bgp
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute bgp metric <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute bgp metric-type
 <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute bgp route-map
 <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute bgp tag <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute connected
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute connected metric
 <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute connected
 metric-type <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute connected
 route-map <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute connected tag
 <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute kernel
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute kernel metric
 <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute kernel metric-type
 <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute kernel route-map
 <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute kernel tag <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute ospf
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute ospf metric
 <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute ospf metric-type
 <value>
```

```
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute ospf route-map
 <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute ospf tag <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute rip
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute rip metric <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute rip metric-type
 <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute rip route-map
 <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute rip tag <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute static
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute static metric
 <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute static metric-type
 <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute static route-map
 <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast redistribute static tag <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast summary-address <address>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast summary-address <address>
 advertise
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast summary-address <address>
 advertise tag <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> address-family ipv4 unicast summary-address <address>
 not-advertise
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> area <area-identifier>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> area <area-identifier> nssa
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> area <area-identifier> nssa default-cost <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> area <area-identifier> nssa default-information-originate
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> area <area-identifier> nssa default-information-originate
 metric <value>
```

```
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> area <area-identifier> nssa default-information-originate
 metric-type <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> area <area-identifier> nssa no-redistribution
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> area <area-identifier> nssa no-summary
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> area <area-identifier> nssa stability-interval <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> area <area-identifier> nssa translator-role <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> area <area-identifier> range <prefix>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> area <area-identifier> range <prefix> advertise
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> area <area-identifier> range <prefix> metric <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> area <area-identifier> range <prefix> not-advertise
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> area <area-identifier> stub
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> area <area-identifier> stub default-cost <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> area <area-identifier> stub no-summary
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> area <area-identifier> virtual-link <address>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> area <area-identifier> virtual-link <address> dead-interval
 <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> area <area-identifier> virtual-link <address> fall-over bfd
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> area <area-identifier> virtual-link <address>
 hello-interval <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> area <area-identifier> virtual-link <address>
 retransmit-interval <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> area <area-identifier> virtual-link <address>
 transmit-delay <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> auto-cost
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> auto-cost reference-bandwidth <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> default-information
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> default-information originate
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> default-information originate always
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> default-information originate metric <value>
```

```
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> default-information originate metric-type <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> default-information originate route-map <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> default-metric <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> distance
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> distance global <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> distance ospfv3
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> distance ospfv3 external <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> distance ospfv3 inter-area <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> distance ospfv3 intra-area <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> distribute-list <access-list-name>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> distribute-list <access-list-name> export <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> distribute-list <access-list-name> import
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log all
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log bfd
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log events abr
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log events all
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log events asbr
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log events lsa
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log events nssa
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log events os
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log events router
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log events vlink
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log ifsm all
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log ifsm events
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log ifsm status
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log ifsm timers
```

```
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log lsa all
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log lsa flooding
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log lsa generate
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log lsa install
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log lsa maxage
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log lsa refresh
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log nfsm all
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log nfsm events
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log nfsm status
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log nfsm timers
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log nsm all
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log nsm interface
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log nsm redistribute
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log packet all
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log packet dd
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log packet detail
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log packet hello
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log packet ls-ack
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log packet ls-request
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log packet ls-update
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log packet recv
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log packet send
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log retransmission
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log rib all
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log rib interface
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log rib redistribute
```

```
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log route all
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log route ase
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log route ia
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log route install
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> log route spf
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> passive-interface <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> passive-interface-exclude <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute bgp
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute bgp metric <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute bgp metric-type <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute bgp route-map <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute bgp tag <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute connected
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute connected metric <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute connected metric-type <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute connected route-map <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute connected tag <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute kernel
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute kernel metric <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute kernel metric-type <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute kernel route-map <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute kernel tag <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute rip
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute rip metric <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute rip metric-type <value>
```

```
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute rip route-map <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute rip tag <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute static
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute static metric <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute static metric-type <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute static route-map <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> redistribute static tag <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> router-id <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> summary-address <address>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> summary-address <address> advertise
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> summary-address <address> advertise tag <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> summary-address <address> not-advertise
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> timers
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> timers spf
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> timers spf exp
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> timers spf exp max <value>
routing routing-instance <instance-name> protocols ospfv3 process
 <process-name> timers spf exp min <value>
routing routing-instance <instance-name> protocols pim accept-register list
 <value>
routing routing-instance <instance-name> protocols pim anycast-rp <address>
routing routing-instance <instance-name> protocols pim anycast-rp <address>
 anycast-rp-peer <value>
routing routing-instance <instance-name> protocols pim bsr-candidate
routing routing-instance <instance-name> protocols pim bsr-candidate
 hash-mask <value>
routing routing-instance <instance-name> protocols pim bsr-candidate
 interface <value>
routing routing-instance <instance-name> protocols pim bsr-candidate
 priority <value>
routing routing-instance <instance-name> protocols pim
 ignore-rp-set-priority
routing routing-instance <instance-name> protocols pim join-prune-timer
 <value>
routing routing-instance <instance-name> protocols pim
 legacy-register-checksum
```

```
routing routing-instance <instance-name> protocols pim
 legacy-register-checksum group-list <value>
routing routing-instance <instance-name> protocols pim log all
routing routing-instance <instance-name> protocols pim log events
routing routing-instance <instance-name> protocols pim log mfc
routing routing-instance <instance-name> protocols pim log mib
routing routing-instance <instance-name> protocols pim log msdp
routing routing-instance <instance-name> protocols pim log mtrace
routing routing-instance <instance-name> protocols pim log nexthop
routing routing-instance <instance-name> protocols pim log nsm
routing routing-instance <instance-name> protocols pim log packet all
routing routing-instance <instance-name> protocols pim log packet recv
routing routing-instance <instance-name> protocols pim log packet send
routing routing-instance <instance-name> protocols pim log state
routing routing-instance <instance-name> protocols pim log timer all
routing routing-instance <instance-name> protocols pim log timer assert all
routing routing-instance <instance-name> protocols pim log timer assert at
routing routing-instance <instance-name> protocols pim log timer bsr all
routing routing-instance <instance-name> protocols pim log timer bsr bst
routing routing-instance <instance-name> protocols pim log timer bsr crp
routing routing-instance <instance-name> protocols pim log timer hello all
routing routing-instance <instance-name> protocols pim log timer hello ht
routing routing-instance <instance-name> protocols pim log timer hello nlt
routing routing-instance <instance-name> protocols pim log timer hello tht
routing routing-instance <instance-name> protocols pim log timer joinprune
 all
routing routing-instance <instance-name> protocols pim log timer joinprune
 et
routing routing-instance <instance-name> protocols pim log timer joinprune
 jt
routing routing-instance <instance-name> protocols pim log timer joinprune
 kat
routing routing-instance <instance-name> protocols pim log timer joinprune
 ot
routing routing-instance <instance-name> protocols pim log timer joinprune
 ppt
routing routing-instance <instance-name> protocols pim log timer register
 all
routing routing-instance <instance-name> protocols pim log timer register
 rst
routing routing-instance <instance-name> protocols pim register-kat <value>
routing routing-instance <instance-name> protocols pim register-rate-limit
 <value>
routing routing-instance <instance-name> protocols pim
 register-rp-reachability
routing routing-instance <instance-name> protocols pim register-source
 address <value>
routing routing-instance <instance-name> protocols pim register-source
 interface <value>
routing routing-instance <instance-name> protocols pim
 register-suppression-timer <value>
routing routing-instance <instance-name> protocols pim rp-address <address>
```

```
routing routing-instance <instance-name> protocols pim rp-address <address>
 list <value>
routing routing-instance <instance-name> protocols pim rp-address <address>
 override
routing routing-instance <instance-name> protocols pim rp-candidate
routing routing-instance <instance-name> protocols pim rp-candidate
 interface <interface-name>
routing routing-instance <instance-name> protocols pim rp-candidate
 interface <interface-name> group-list <value>
routing routing-instance <instance-name> protocols pim rp-candidate
 interface <interface-name> interval <value>
routing routing-instance <instance-name> protocols pim rp-candidate
 interface <interface-name> priority <value>
routing routing-instance <instance-name> protocols pim spt-threshold
 infinity
routing routing-instance <instance-name> protocols pim spt-threshold
 infinity group-list <value>
routing routing-instance <instance-name> protocols pim ssm default
routing routing-instance <instance-name> protocols pim ssm range <value>
routing routing-instance <instance-name> protocols pim6 accept-register
routing routing-instance <instance-name> protocols pim6 accept-register
 list <value>
routing routing-instance <instance-name> protocols pim6 anycast-rp
 <address>
routing routing-instance <instance-name> protocols pim6 anycast-rp
 <address> anycast-rp-peer <value>
routing routing-instance <instance-name> protocols pim6 bsr-candidate
routing routing-instance <instance-name> protocols pim6 bsr-candidate
 hash-mask <value>
routing routing-instance <instance-name> protocols pim6 bsr-candidate
 interface <value>
routing routing-instance <instance-name> protocols pim6 bsr-candidate
 priority <value>
routing routing-instance <instance-name> protocols pim6
 ignore-rp-set-priority
routing routing-instance <instance-name> protocols pim6 join-prune-timer
 <value>
routing routing-instance <instance-name> protocols pim6
 legacy-register-checksum
routing routing-instance <instance-name> protocols pim6
 legacy-register-checksum group-list <value>
routing routing-instance <instance-name> protocols pim6 log all
routing routing-instance <instance-name> protocols pim6 log events
routing routing-instance <instance-name> protocols pim6 log mfc
routing routing-instance <instance-name> protocols pim6 log mib
routing routing-instance <instance-name> protocols pim6 log mtrace
routing routing-instance <instance-name> protocols pim6 log nexthop
routing routing-instance <instance-name> protocols pim6 log nsm
routing routing-instance <instance-name> protocols pim6 log packet all
routing routing-instance <instance-name> protocols pim6 log packet recv
routing routing-instance <instance-name> protocols pim6 log packet send
routing routing-instance <instance-name> protocols pim6 log state
routing routing-instance <instance-name> protocols pim6 log timer all
```

```
routing routing-instance <instance-name> protocols pim6 log timer assert
 all
routing routing-instance <instance-name> protocols pim6 log timer assert at
routing routing-instance <instance-name> protocols pim6 log timer bsr all
routing routing-instance <instance-name> protocols pim6 log timer bsr bst
routing routing-instance <instance-name> protocols pim6 log timer bsr crp
routing routing-instance <instance-name> protocols pim6 log timer hello all
routing routing-instance <instance-name> protocols pim6 log timer hello ht
routing routing-instance <instance-name> protocols pim6 log timer hello nlt
routing routing-instance <instance-name> protocols pim6 log timer hello tht
routing routing-instance <instance-name> protocols pim6 log timer joinprune
 all
routing routing-instance <instance-name> protocols pim6 log timer joinprune
 et
routing routing-instance <instance-name> protocols pim6 log timer joinprune
 jt
routing routing-instance <instance-name> protocols pim6 log timer joinprune
 kat
routing routing-instance <instance-name> protocols pim6 log timer joinprune
 ot
routing routing-instance <instance-name> protocols pim6 log timer joinprune
 ppt
routing routing-instance <instance-name> protocols pim6 log timer register
 all
routing routing-instance <instance-name> protocols pim6 log timer register
 rst
routing routing-instance <instance-name> protocols pim6 register-kat
 <value>
routing routing-instance <instance-name> protocols pim6 register-rate-limit
 <value>
routing routing-instance <instance-name> protocols pim6
 register-rp-reachability
routing routing-instance <instance-name> protocols pim6 register-source
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routing routing-instance <instance-name> protocols pim6 register-source
 interface <value>
routing routing-instance <instance-name> protocols pim6
 register-suppression-timer <value>
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routing routing-instance <instance-name> protocols pim6 rp-address
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routing routing-instance <instance-name> protocols pim6 rp-candidate
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 interface <interface-name> interval <value>
routing routing-instance <instance-name> protocols pim6 rp-candidate
 interface <interface-name> priority <value>
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routing routing-instance <instance-name> protocols pim6 spt-threshold
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 infinity group-list <value>
routing routing-instance <instance-name> protocols pim6 ssm
routing routing-instance <instance-name> protocols pim6 ssm default
routing routing-instance <instance-name> protocols pim6 ssm range <value>
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routing routing-instance <instance-name> protocols rib log events
routing routing-instance <instance-name> protocols rib log packet all
routing routing-instance <instance-name> protocols rib log packet detail
routing routing-instance <instance-name> protocols rib log packet recv
routing routing-instance <instance-name> protocols rib log packet send
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routing routing-instance <instance-name> protocols rip default-distance
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routing routing-instance <instance-name> protocols rip default-information
 originate
routing routing-instance <instance-name> protocols rip default-metric
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routing routing-instance <instance-name> protocols rip log events
routing routing-instance <instance-name> protocols rip log packet all
```

```
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routing routing-instance <instance-name> protocols rip log packet send
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 route-map <value>
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 connected metric <value>
routing routing-instance <instance-name> protocols rip redistribute
 connected route-map <value>
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routing routing-instance <instance-name> protocols rip redistribute kernel
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 route-map <value>
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routing routing-instance <instance-name> protocols rip redistribute ospf
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 route-map <value>
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routing routing-instance <instance-name> protocols rip redistribute static
 metric <value>
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 route-map <value>
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routing routing-instance <instance-name> protocols rip timers
routing routing-instance <instance-name> protocols rip timers
 garbage-collection <value>
routing routing-instance <instance-name> protocols rip timers timeout
 <value>
routing routing-instance <instance-name> protocols rip timers update
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routing routing-instance <instance-name> protocols ripng aggregate-address
 <value>
```

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 default-information
routing routing-instance <instance-name> protocols ripng
 default-information originate
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routing routing-instance <instance-name> protocols ripng distribute-list
 prefix-list out <value>
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routing routing-instance <instance-name> protocols ripng log events
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routing routing-instance <instance-name> protocols ripng log packet detail
routing routing-instance <instance-name> protocols ripng log packet recv
routing routing-instance <instance-name> protocols ripng log packet send
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routing routing-instance <instance-name> protocols ripng redistribute bgp
routing routing-instance <instance-name> protocols ripng redistribute bgp
 metric <value>
routing routing-instance <instance-name> protocols ripng redistribute bgp
 route-map <value>
routing routing-instance <instance-name> protocols ripng redistribute
 connected
routing routing-instance <instance-name> protocols ripng redistribute
 connected metric <value>
routing routing-instance <instance-name> protocols ripng redistribute
 connected route-map <value>
```

```
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 kernel
routing routing-instance <instance-name> protocols ripng redistribute
 kernel metric <value>
routing routing-instance <instance-name> protocols ripng redistribute
 kernel route-map <value>
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routing routing-instance <instance-name> protocols ripng redistribute
 ospfv3 metric <value>
routing routing-instance <instance-name> protocols ripng redistribute
 ospfv3 route-map <value>
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 static
routing routing-instance <instance-name> protocols ripng redistribute
 static metric <value>
routing routing-instance <instance-name> protocols ripng redistribute
 static route-map <value>
routing routing-instance <instance-name> protocols ripng route <value>
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routing routing-instance <instance-name> protocols ripng timers
 garbage-collection <value>
routing routing-instance <instance-name> protocols ripng timers timeout
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 hwaddr <value>
routing routing-instance <instance-name> protocols static arp <address>
 interface <value>
routing routing-instance <instance-name> protocols static interface-route
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 <prefix> description <value>
routing routing-instance <instance-name> protocols static interface-route
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routing routing-instance <instance-name> protocols static interface-route
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routing routing-instance <instance-name> protocols static interface-route
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routing routing-instance <instance-name> protocols static interface-route
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routing routing-instance <instance-name> protocols static interface-route
 <prefix> next-hop-interface <interface-name> path-monitor monitor <name>
 policy <name>
routing routing-instance <instance-name> protocols static interface-route
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 policy <name> state compliant
routing routing-instance <instance-name> protocols static interface-route
 <prefix> next-hop-interface <interface-name> path-monitor monitor <name>
 policy <name> state non-compliant
```

```
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routing routing-instance <instance-name> protocols static interface-route
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 <interface-name> path-monitor monitor <name>
routing routing-instance <instance-name> protocols static interface-route
 <prefix> next-hop-routing-instance <routing-instance> next-hop-interface
 <interface-name> path-monitor monitor <name> policy <name>
routing routing-instance <instance-name> protocols static interface-route
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 <interface-name> path-monitor monitor <name> policy <name> state compliant
routing routing-instance <instance-name> protocols static interface-route
 <prefix> next-hop-routing-instance <routing-instance> next-hop-interface
 <interface-name> path-monitor monitor <name> policy <name> state
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 <interface-name> tag <value>
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 <prefix>
routing routing-instance <instance-name> protocols static interface-route6
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routing routing-instance <instance-name> protocols static interface-route6
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routing routing-instance <instance-name> protocols static interface-route6
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routing routing-instance <instance-name> protocols static interface-route6
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 policy <name>
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 policy <name> state compliant
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 policy <name> state non-compliant
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 <prefix> next-hop-routing-instance <routing-instance> next-hop-interface
```

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routing routing-instance <instance-name> protocols static route <prefix>
 blackhole
routing routing-instance <instance-name> protocols static route <prefix>
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routing routing-instance <instance-name> protocols static route <prefix>
 blackhole distance <value>
routing routing-instance <instance-name> protocols static route <prefix>
 description <value>
routing routing-instance <instance-name> protocols static route <prefix>
 next-hop <address>
routing routing-instance <instance-name> protocols static route <prefix>
 next-hop <address> disable
routing routing-instance <instance-name> protocols static route <prefix>
 next-hop <address> distance <value>
routing routing-instance <instance-name> protocols static route <prefix>
 next-hop <address> fall-over bfd
routing routing-instance <instance-name> protocols static route <prefix>
 next-hop <address> interface <value>
routing routing-instance <instance-name> protocols static route <prefix>
 next-hop <address> path-monitor monitor <name>
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 next-hop <address> path-monitor monitor <name> policy <name> state
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routing routing-instance <instance-name> protocols static route <prefix>
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routing routing-instance <instance-name> protocols static route <prefix>
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routing routing-instance <instance-name> protocols static route <prefix>
 next-hop-routing-instance <routing-instance> next-hop <address> disable
routing routing-instance <instance-name> protocols static route <prefix>
 next-hop-routing-instance <routing-instance> next-hop <address> distance
 <value>
routing routing-instance <instance-name> protocols static route <prefix>
 next-hop-routing-instance <routing-instance> next-hop <address> interface
 <value>
routing routing-instance <instance-name> protocols static route <prefix>
 next-hop-routing-instance <routing-instance> next-hop <address>
 path-monitor monitor <name>
```

```
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 next-hop-routing-instance <routing-instance> next-hop <address>
 path-monitor monitor <name> policy <name>
routing routing-instance <instance-name> protocols static route <prefix>
 next-hop-routing-instance <routing-instance> next-hop <address>
 path-monitor monitor <name> policy <name> state compliant
routing routing-instance <instance-name> protocols static route <prefix>
 next-hop-routing-instance <routing-instance> next-hop <address>
 path-monitor monitor <name> policy <name> state non-compliant
routing routing-instance <instance-name> protocols static route <prefix>
 next-hop-routing-instance <routing-instance> next-hop <address> tag
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routing routing-instance <instance-name> protocols static route <prefix>
 unreachable distance <value>
routing routing-instance <instance-name> protocols static route <prefix>
 unreachable tag <value>
routing routing-instance <instance-name> protocols static route6 <prefix>
routing routing-instance <instance-name> protocols static route6 <prefix>
 blackhole
routing routing-instance <instance-name> protocols static route6 <prefix>
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routing routing-instance <instance-name> protocols static route6 <prefix>
 blackhole tag <value>
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 description <value>
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 next-hop <address>
routing routing-instance <instance-name> protocols static route6 <prefix>
 next-hop <address> disable
routing routing-instance <instance-name> protocols static route6 <prefix>
 next-hop <address> distance <value>
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 next-hop <address> fall-over bfd
routing routing-instance <instance-name> protocols static route6 <prefix>
 next-hop <address> interface <value>
routing routing-instance <instance-name> protocols static route6 <prefix>
 next-hop <address> path-monitor monitor <name>
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 next-hop <address> path-monitor monitor <name> policy <name>
routing routing-instance <instance-name> protocols static route6 <prefix>
 next-hop <address> path-monitor monitor <name> policy <name> state
 compliant
routing routing-instance <instance-name> protocols static route6 <prefix>
 next-hop <address> path-monitor monitor <name> policy <name> state
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routing routing-instance <instance-name> protocols static route6 <prefix>
 next-hop <address> tag <value>
routing routing-instance <instance-name> protocols static route6 <prefix>
 unreachable
routing routing-instance <instance-name> protocols static route6 <prefix>
 unreachable distance <value>
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 unreachable tag <value>
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routing routing-instance <instance-name> protocols static table
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routing routing-instance <instance-name> protocols static table
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routing routing-instance <instance-name> protocols static table
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routing routing-instance <instance-name> protocols static table
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routing routing-instance <instance-name> protocols static table
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routing routing-instance <instance-name> protocols static table
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routing routing-instance <instance-name> protocols static table
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routing routing-instance <instance-name> protocols static table
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routing routing-instance <instance-name> protocols static table
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routing routing-instance <instance-name> protocols static table
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routing routing-instance <instance-name> protocols static table
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routing routing-instance <instance-name> protocols static table
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routing routing-instance <instance-name> protocols static table
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routing routing-instance <instance-name> protocols static table
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routing routing-instance <instance-name> route-target <rt> type <value>
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routing routing-instance <instance-name> security ssh-known-hosts host
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routing routing-instance <instance-name> security ssh-known-hosts host
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routing routing-instance <instance-name> security ssh-known-hosts host
 <host-name> key <value>
routing routing-instance <instance-name> security ssh-known-hosts host
 <host-name> load-from-file <value>
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routing routing-instance <instance-name> service dhcp-relay
 listen-interface <value>
routing routing-instance <instance-name> service dhcp-relay relay-options
routing routing-instance <instance-name> service dhcp-relay relay-options
 hop-count <value>
routing routing-instance <instance-name> service dhcp-relay relay-options
 max-size <value>
routing routing-instance <instance-name> service dhcp-relay relay-options
 port <value>
routing routing-instance <instance-name> service dhcp-relay relay-options
 relay-agents-packets <value>
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routing routing-instance <instance-name> service dhcp-relay
 upstream-interface <value>
routing routing-instance <instance-name> service dhcp-server
routing routing-instance <instance-name> service dhcp-server disabled
 <value>
routing routing-instance <instance-name> service dhcp-server
 dynamic-dns-update
routing routing-instance <instance-name> service dhcp-server
 dynamic-dns-update enable <value>
```

```
routing routing-instance <instance-name> service dhcp-server
 global-parameters <value>
routing routing-instance <instance-name> service dhcp-server listento
routing routing-instance <instance-name> service dhcp-server listento
 interface <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> authoritative <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> description <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> disable
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> shared-network-parameters <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> bootfile-name
 <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> bootfile-server
 <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix>
 client-prefix-length <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> default-router
 <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> dns-server
 <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> domain-name
 <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> exclude <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> failover
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> failover
 local-address <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> failover name
 <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> failover
 peer-address <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> failover status
 <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> ip-forwarding
```

```
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> ip-forwarding
 enable <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> lease <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> ntp-server
 <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> ping-check
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> pop-server
 <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix>
 server-identifier <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> smtp-server
 <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> start <address>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> start <address>
 stop <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> static-route
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> static-route
 destination-subnet <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> static-route
 router <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix>
 subnet-parameters <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> tftp-server-name
 <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> time-offset
 <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> time-server
 <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> wins-server
 <value>
routing routing-instance <instance-name> service dhcp-server
 shared-network-name <network-name> subnet <subnet-prefix> wpad-url <value>
routing routing-instance <instance-name> service dhcp-server static-mapping
 <mapping-name>
routing routing-instance <instance-name> service dhcp-server static-mapping
 <mapping-name> disable
```

```
routing routing-instance <instance-name> service dhcp-server static-mapping
 <mapping-name> ip-address <value>
routing routing-instance <instance-name> service dhcp-server static-mapping
 <mapping-name> mac-address <value>
routing routing-instance <instance-name> service dhcp-server static-mapping
 <mapping-name> static-mapping-parameters <value>
routing routing-instance <instance-name> service dhcpv6-relay
routing routing-instance <instance-name> service dhcpv6-relay
 listen-interface <interface-name>
routing routing-instance <instance-name> service dhcpv6-relay
 listen-interface <interface-name> address <value>
routing routing-instance <instance-name> service dhcpv6-relay listen-port
 <value>
routing routing-instance <instance-name> service dhcpv6-relay max-hop-count
 <value>
routing routing-instance <instance-name> service dhcpv6-relay
 upstream-interface <interface-name>
routing routing-instance <instance-name> service dhcpv6-relay
 upstream-interface <interface-name> address <value>
routing routing-instance <instance-name> service dhcpv6-relay
 use-interface-id-option
routing routing-instance <instance-name> service dhcpv6-server
routing routing-instance <instance-name> service dhcpv6-server listento
 interface <value>
routing routing-instance <instance-name> service dhcpv6-server preference
 <value>
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name>
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name> subnet <subnet-prefix>
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name> subnet <subnet-prefix> address-range
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name> subnet <subnet-prefix> address-range
 prefix <address>
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name> subnet <subnet-prefix> address-range
 prefix <address> temporary
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name> subnet <subnet-prefix> address-range
 start <address>
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name> subnet <subnet-prefix> address-range
 start <address> stop <value>
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name> subnet <subnet-prefix> description
 <value>
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name> subnet <subnet-prefix> domain-search
 <value>
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name> subnet <subnet-prefix> lease-time
```

```
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name> subnet <subnet-prefix> lease-time
 default <value>
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name> subnet <subnet-prefix> lease-time
 maximum <value>
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name> subnet <subnet-prefix> lease-time
 minimum <value>
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name> subnet <subnet-prefix> name-server
 <value>
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name> subnet <subnet-prefix> nis-domain
 <value>
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name> subnet <subnet-prefix> nis-server
 <value>
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name> subnet <subnet-prefix> nisplus-domain
 <value>
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name> subnet <subnet-prefix> nisplus-server
 <value>
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name> subnet <subnet-prefix>
 prefix-delegation start <startip>
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name> subnet <subnet-prefix>
 prefix-delegation start <startip> prefix-length <value>
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name> subnet <subnet-prefix>
 prefix-delegation start <startip> stop <value>
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name> subnet <subnet-prefix>
 sip-server-address <value>
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name> subnet <subnet-prefix> sip-server-name
 <value>
routing routing-instance <instance-name> service dhcpv6-server
 shared-network-name <network-name> subnet <subnet-prefix> sntp-server
 <value>
routing routing-instance <instance-name> service dhcpv6-server
 static-mapping <mapping-name>
routing routing-instance <instance-name> service dhcpv6-server
 static-mapping <mapping-name> identifier <value>
routing routing-instance <instance-name> service dhcpv6-server
 static-mapping <mapping-name> ipv6-address <value>
routing routing-instance <instance-name> service dns
routing routing-instance <instance-name> service dns dynamic
routing routing-instance <instance-name> service dns dynamic interface
 <interface-name>
```

```
routing routing-instance <instance-name> service dns dynamic interface
 <interface-name> service <service-name>
routing routing-instance <instance-name> service dns dynamic interface
 <interface-name> service <service-name> host-name <value>
routing routing-instance <instance-name> service dns dynamic interface
 <interface-name> service <service-name> login <value>
routing routing-instance <instance-name> service dns dynamic interface
 <interface-name> service <service-name> password <value>
routing routing-instance <instance-name> service dns dynamic interface
 <interface-name> service <service-name> server <value>
routing routing-instance <instance-name> service dns forwarding
routing routing-instance <instance-name> service dns forwarding cache-size
 <value>
routing routing-instance <instance-name> service dns forwarding dhcp
 <value>
routing routing-instance <instance-name> service dns forwarding domain
 <domain-name>
routing routing-instance <instance-name> service dns forwarding domain
 <domain-name> server <value>
routing routing-instance <instance-name> service dns forwarding listen-on
 <value>
routing routing-instance <instance-name> service dns forwarding name-server
 <value>
routing routing-instance <instance-name> service dns forwarding system
routing routing-instance <instance-name> service ssh
routing routing-instance <instance-name> service ssh allow-root
routing routing-instance <instance-name> service ssh authentication-retries
 <value>
routing routing-instance <instance-name> service ssh
 disable-host-validation
routing routing-instance <instance-name> service ssh
 disable-password-authentication
routing routing-instance <instance-name> service ssh disable-tcp-forwarding
routing routing-instance <instance-name> service ssh key-security-strength
 <value>
routing routing-instance <instance-name> service ssh listen-address <value>
routing routing-instance <instance-name> service ssh port <value>
routing routing-instance <instance-name> service ssh timeout <value>
routing routing-instance <instance-name> service telnet
routing routing-instance <instance-name> service telnet listen-address
 <value>
routing routing-instance <instance-name> service telnet port <value>
routing routing-instance <instance-name> service twamp server
routing routing-instance <instance-name> service twamp server client-list
 <value>
routing routing-instance <instance-name> service twamp server dscp-value
 <value>
routing routing-instance <instance-name> service twamp server
 maximum-connections <value>
routing routing-instance <instance-name> service twamp server
 maximum-sessions-per-connection <value>
routing routing-instance <instance-name> service twamp server mode <value>
routing routing-instance <instance-name> service twamp server port <value>
```

```
routing routing-instance <instance-name> service twamp server
 server-inactivity-timeout <value>
routing routing-instance <instance-name> service twamp server
 test-inactivity-timeout <value>
routing routing-instance <instance-name> service twamp server user <name>
routing routing-instance <instance-name> service twamp server user <name>
 password <value>
routing routing-instance <instance-name> system alg
routing routing-instance <instance-name> system alg ftp
routing routing-instance <instance-name> system alg ftp disable
routing routing-instance <instance-name> system alg ftp port <value>
routing routing-instance <instance-name> system alg pptp
routing routing-instance <instance-name> system alg pptp disable
routing routing-instance <instance-name> system alg rpc
routing routing-instance <instance-name> system alg rpc disable
routing routing-instance <instance-name> system alg rpc program <value>
routing routing-instance <instance-name> system alg rsh disable
routing routing-instance <instance-name> system alg sip
routing routing-instance <instance-name> system alg sip disable
routing routing-instance <instance-name> system alg sip port <value>
routing routing-instance <instance-name> system alg tftp
routing routing-instance <instance-name> system alg tftp disable
routing routing-instance <instance-name> system alg tftp port <value>
routing routing-instance <instance-name> system config-management
 commit-archive
routing routing-instance <instance-name> system config-management
 commit-archive location <value>
routing routing-instance <instance-name> system domain-name <value>
routing routing-instance <instance-name> system domain-search
routing routing-instance <instance-name> system domain-search domain
 <value>
routing routing-instance <instance-name> system login radius-server
 <server-address>
routing routing-instance <instance-name> system login radius-server
 <server-address> port <value>
routing routing-instance <instance-name> system login radius-server
 <server-address> secret <value>
routing routing-instance <instance-name> system login radius-server
 <server-address> timeout <value>
routing routing-instance <instance-name> system login tacplus-server
 <server-address>
routing routing-instance <instance-name> system login tacplus-server
 <server-address> port <value>
routing routing-instance <instance-name> system login tacplus-server
 <server-address> secret <value>
routing routing-instance <instance-name> system login tacplus-server
 <server-address> source-address <value>
routing routing-instance <instance-name> system login tacplus-server
 <server-address> timeout <value>
routing routing-instance <instance-name> system name-server <value>
routing routing-instance <instance-name> system ntp
routing routing-instance <instance-name> system ntp keyid <id>
```

```
routing routing-instance <instance-name> system ntp keyid <id> digest
 <value>
routing routing-instance <instance-name> system ntp keyid <id>
 plaintext-password <value>
routing routing-instance <instance-name> system ntp server <name>
routing routing-instance <instance-name> system ntp server <name>
 address-family <value>
routing routing-instance <instance-name> system ntp server <name> keyid
 <value>
routing routing-instance <instance-name> system ntp server <name> noselect
routing routing-instance <instance-name> system ntp server <name> preempt
routing routing-instance <instance-name> system ntp server <name> prefer
routing routing-instance <instance-name> system ntp statistics
routing routing-instance <instance-name> system session timeout
routing routing-instance <instance-name> system session timeout custom
routing routing-instance <instance-name> system session timeout custom rule
 <rule-number>
routing routing-instance <instance-name> system session timeout custom rule
 <rule-number> destination
routing routing-instance <instance-name> system session timeout custom rule
 <rule-number> destination address <value>
routing routing-instance <instance-name> system session timeout custom rule
 <rule-number> destination port <value>
routing routing-instance <instance-name> system session timeout custom rule
 <rule-number> expire <value>
routing routing-instance <instance-name> system session timeout custom rule
 <rule-number> protocol <value>
routing routing-instance <instance-name> system session timeout custom rule
 <rule-number> source
routing routing-instance <instance-name> system session timeout custom rule
 <rule-number> source address <value>
routing routing-instance <instance-name> system session timeout custom rule
 <rule-number> source port <value>
routing routing-instance <instance-name> system session timeout icmp
routing routing-instance <instance-name> system session timeout icmp
 established <value>
routing routing-instance <instance-name> system session timeout icmp new
 <value>
routing routing-instance <instance-name> system session timeout other
routing routing-instance <instance-name> system session timeout other
 established <value>
routing routing-instance <instance-name> system session timeout other new
 <value>
routing routing-instance <instance-name> system session timeout tcp
routing routing-instance <instance-name> system session timeout tcp
 close-wait <value>
routing routing-instance <instance-name> system session timeout tcp closed
 <value>
routing routing-instance <instance-name> system session timeout tcp closing
 <value>
routing routing-instance <instance-name> system session timeout tcp
 established <value>
```

```
routing routing-instance <instance-name> system session timeout tcp
 fin-received <value>
routing routing-instance <instance-name> system session timeout tcp
 fin-sent <value>
routing routing-instance <instance-name> system session timeout tcp
 fin-wait <value>
routing routing-instance <instance-name> system session timeout tcp
 last-ack <value>
routing routing-instance <instance-name> system session timeout tcp
 simsyn-sent <value>
routing routing-instance <instance-name> system session timeout tcp
 syn-received <value>
routing routing-instance <instance-name> system session timeout tcp
 syn-sent <value>
routing routing-instance <instance-name> system session timeout tcp
 time-wait <value>
routing routing-instance <instance-name> system session timeout udp
routing routing-instance <instance-name> system session timeout udp
 established <value>
routing routing-instance <instance-name> system session timeout udp new
 <value>
routing routing-instance <instance-name> system static-host-mapping
routing routing-instance <instance-name> system static-host-mapping
 host-name <name>
routing routing-instance <instance-name> system static-host-mapping
 host-name <name> alias <value>
routing routing-instance <instance-name> system static-host-mapping
 host-name <name> inet <value>
routing routing-instance <instance-name> system syslog
routing routing-instance <instance-name> system syslog host <host-address>
routing routing-instance <instance-name> system syslog host <host-address>
 facility <logging-facility>
routing routing-instance <instance-name> system syslog host <host-address>
 facility <logging-facility> level <value>
routing routing-instance <instance-name> system syslog host <host-address>
 facility-override <value>
service flow-monitoring exporter <exporter-name> udp-collector
 routing-instance <value>
service sflow server-address <addr> routing-instance <value>
service snmp routing-instance <value>
service snmp trap-target <address> routing-instance <value>
service snmp v3 trap-target <address> routing-instance <value>
```

List of operational commands

```
add system image routing-instance <text> <text>
add system image routing-instance <text> <text> username <text> password
 <text>
copy file routing-instance <text> <text> to <text>
monitor ip-traffic routing-instance <text>
monitor ip-traffic routing-instance <text> interface <text>
```

```
monitor protocol bfd routing-instance <text>
monitor protocol bfd routing-instance <text> disable all
monitor protocol bfd routing-instance <text> disable event
monitor protocol bfd routing-instance <text> disable ipc-error
monitor protocol bfd routing-instance <text> disable ipc-event
monitor protocol bfd routing-instance <text> disable packet
monitor protocol bfd routing-instance <text> disable session
monitor protocol bfd routing-instance <text> enable all
monitor protocol bfd routing-instance <text> enable event
monitor protocol bfd routing-instance <text> enable ipc-error
monitor protocol bfd routing-instance <text> enable ipc-event
monitor protocol bfd routing-instance <text> enable packet
monitor protocol bfd routing-instance <text> enable session
monitor protocol bgp routing-instance <text>
monitor protocol bgp routing-instance <text> disable <text> all
monitor protocol bgp routing-instance <text> disable <text> bfd
monitor protocol bgp routing-instance <text> disable <text> dampening
monitor protocol bgp routing-instance <text> disable <text> events
monitor protocol bgp routing-instance <text> disable <text> filters
monitor protocol bgp routing-instance <text> disable <text> fsm
monitor protocol bgp routing-instance <text> disable <text> keepalives
monitor protocol bgp routing-instance <text> disable <text> msdp
monitor protocol bgp routing-instance <text> disable <text> updates
monitor protocol bgp routing-instance <text> disable all
monitor protocol bgp routing-instance <text> disable bfd
monitor protocol bgp routing-instance <text> disable dampening
monitor protocol bgp routing-instance <text> disable events
monitor protocol bgp routing-instance <text> disable filters
monitor protocol bgp routing-instance <text> disable fsm
monitor protocol bgp routing-instance <text> disable keepalives
monitor protocol bgp routing-instance <text> disable msdp
monitor protocol bgp routing-instance <text> disable updates
monitor protocol bgp routing-instance <text> enable <text> all
monitor protocol bgp routing-instance <text> enable <text> bfd
monitor protocol bgp routing-instance <text> enable <text> dampening
monitor protocol bgp routing-instance <text> enable <text> events
monitor protocol bgp routing-instance <text> enable <text> filters
monitor protocol bgp routing-instance <text> enable <text> fsm
monitor protocol bgp routing-instance <text> enable <text> keepalives
monitor protocol bgp routing-instance <text> enable <text> msdp
monitor protocol bgp routing-instance <text> enable <text> updates
monitor protocol bgp routing-instance <text> enable <text> updates in
monitor protocol bgp routing-instance <text> enable <text> updates out
monitor protocol bgp routing-instance <text> enable all
monitor protocol bgp routing-instance <text> enable bfd
monitor protocol bgp routing-instance <text> enable dampening
monitor protocol bgp routing-instance <text> enable events
monitor protocol bgp routing-instance <text> enable filters
monitor protocol bgp routing-instance <text> enable fsm
monitor protocol bgp routing-instance <text> enable keepalives
monitor protocol bgp routing-instance <text> enable msdp
monitor protocol bgp routing-instance <text> enable updates
monitor protocol bgp routing-instance <text> enable updates in
```

```
monitor protocol bgp routing-instance <text> enable updates out
monitor protocol multicast routing-instance <text>
monitor protocol multicast routing-instance <text> disable
monitor protocol multicast routing-instance <text> disable igmp
monitor protocol multicast routing-instance <text> disable ip
monitor protocol multicast routing-instance <text> disable ip event
monitor protocol multicast routing-instance <text> disable ip fib-msg
monitor protocol multicast routing-instance <text> disable ip mrib-msg
monitor protocol multicast routing-instance <text> disable ip mrt
monitor protocol multicast routing-instance <text> disable ip mtrace
monitor protocol multicast routing-instance <text> disable ip mtrace-detail
monitor protocol multicast routing-instance <text> disable ip nsm-msg
monitor protocol multicast routing-instance <text> disable ip register-msg
monitor protocol multicast routing-instance <text> disable ip stats
monitor protocol multicast routing-instance <text> disable ip vif
monitor protocol multicast routing-instance <text> disable ipv6
monitor protocol multicast routing-instance <text> disable ipv6 event
monitor protocol multicast routing-instance <text> disable ipv6 fib-msg
monitor protocol multicast routing-instance <text> disable ipv6 mrib-msg
monitor protocol multicast routing-instance <text> disable ipv6 mrt
monitor protocol multicast routing-instance <text> disable ipv6 mtrace
monitor protocol multicast routing-instance <text> disable ipv6
 mtrace-detail
monitor protocol multicast routing-instance <text> disable ipv6 nsm-msg
monitor protocol multicast routing-instance <text> disable ipv6
 register-msg
monitor protocol multicast routing-instance <text> disable ipv6 stats
monitor protocol multicast routing-instance <text> disable ipv6 vif
monitor protocol multicast routing-instance <text> disable mld
monitor protocol multicast routing-instance <text> enable
monitor protocol multicast routing-instance <text> enable igmp
monitor protocol multicast routing-instance <text> enable ip
monitor protocol multicast routing-instance <text> enable ip event
monitor protocol multicast routing-instance <text> enable ip fib-msg
monitor protocol multicast routing-instance <text> enable ip mrib-msg
monitor protocol multicast routing-instance <text> enable ip mrt
monitor protocol multicast routing-instance <text> enable ip mtrace
monitor protocol multicast routing-instance <text> enable ip mtrace-detail
monitor protocol multicast routing-instance <text> enable ip nsm-msg
monitor protocol multicast routing-instance <text> enable ip register-msg
monitor protocol multicast routing-instance <text> enable ip stats
monitor protocol multicast routing-instance <text> enable ip vif
monitor protocol multicast routing-instance <text> enable ipv6
monitor protocol multicast routing-instance <text> enable ipv6 event
monitor protocol multicast routing-instance <text> enable ipv6 fib-msg
monitor protocol multicast routing-instance <text> enable ipv6 mrib-msg
monitor protocol multicast routing-instance <text> enable ipv6 mrt
monitor protocol multicast routing-instance <text> enable ipv6 mtrace
monitor protocol multicast routing-instance <text> enable ipv6
 mtrace-detail
monitor protocol multicast routing-instance <text> enable ipv6 nsm-msg
monitor protocol multicast routing-instance <text> enable ipv6 register-msg
monitor protocol multicast routing-instance <text> enable ipv6 stats
```

```
monitor protocol multicast routing-instance <text> enable ipv6 vif
monitor protocol multicast routing-instance <text> enable mld
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 register
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 register rst
```

```
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 joinprune ppt
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 out
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```

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show ip bgp routing-instance all ipv6 unicast extcommunity-list <text>
 exact-match
show ip bgp routing-instance all ipv6 unicast filter-list <text>
show ip bgp routing-instance all ipv6 unicast neighbors
show ip bgp routing-instance all ipv6 unicast neighbors <text>
show ip bgp routing-instance all ipv6 unicast neighbors <text>
 advertised-routes
show ip bgp routing-instance all ipv6 unicast neighbors <text>
 received-routes
show ip bgp routing-instance all ipv6 unicast neighbors <text> routes
show ip bgp routing-instance all ipv6 unicast prefix-list <text>
show ip bgp routing-instance all ipv6 unicast regexp <text>
show ip bgp routing-instance all ipv6 unicast summary
show ip bgp routing-instance all neighbors
show ip bgp routing-instance all neighbors <text>
show ip bgp routing-instance all neighbors <text> received prefix-filter
show ip bgp routing-instance all neighbors <text> routes
show ip bgp routing-instance all neighbors <text> statistics
show ip bgp routing-instance all prefix-list <text>
show ip bgp routing-instance all regexp <text>
show ip bgp routing-instance all route-map <text>
show ip bgp routing-instance all summary
show ip igmp groups routing-instance <text>
show ip igmp groups routing-instance <text> detail
show ip igmp groups routing-instance <text> group-address <text>
show ip igmp groups routing-instance <text> group-address <text> detail
show ip igmp interface routing-instance <text>
show ip igmp ssm-map routing-instance <text>
show ip igmp ssm-map routing-instance <text> <text>
show ip mroute routing-instance <text>
show ip mroute routing-instance <text> count
show ip mroute routing-instance <text> dense
show ip mroute routing-instance <text> dense count
show ip mroute routing-instance <text> dense summary
```

```
show ip mroute routing-instance <text> group <text>
show ip mroute routing-instance <text> group <text> count
show ip mroute routing-instance <text> group <text> dense
show ip mroute routing-instance <text> group <text> dense count
show ip mroute routing-instance <text> group <text> dense summary
show ip mroute routing-instance <text> group <text> source <text>
show ip mroute routing-instance <text> group <text> source <text> count
show ip mroute routing-instance <text> group <text> source <text> dense
show ip mroute routing-instance <text> group <text> source <text> dense
 count
show ip mroute routing-instance <text> group <text> source <text> dense
 summary
show ip mroute routing-instance <text> group <text> source <text> sparse
show ip mroute routing-instance <text> group <text> source <text> sparse
 count
show ip mroute routing-instance <text> group <text> source <text> sparse
 summary
show ip mroute routing-instance <text> group <text> source <text> summary
show ip mroute routing-instance <text> group <text> sparse
show ip mroute routing-instance <text> group <text> sparse count
show ip mroute routing-instance <text> group <text> sparse summary
show ip mroute routing-instance <text> group <text> summary
show ip mroute routing-instance <text> source <text>
show ip mroute routing-instance <text> source <text> count
show ip mroute routing-instance <text> source <text> dense
show ip mroute routing-instance <text> source <text> dense count
show ip mroute routing-instance <text> source <text> dense summary
show ip mroute routing-instance <text> source <text> sparse
show ip mroute routing-instance <text> source <text> sparse count
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show ip mroute routing-instance <text> source <text> summary
show ip mroute routing-instance <text> sparse
show ip mroute routing-instance <text> sparse count
show ip mroute routing-instance <text> sparse summary
show ip mroute routing-instance <text> summary
show ip msdp peer routing-instance <text>
show ip msdp peer routing-instance <text> <text>
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show ip msdp sa-cache routing-instance <text> summary
show ip msdp summary routing-instance <text>
show ip multicast interface routing-instance <text>
show ip multicast mrinfo <text> routing-instance <text>
show ip multicast mrinfo <text> routing-instance <text> <text>
show ip ospf routing-instance <text> process <text>
show ip ospf routing-instance <text> process <text> border-routers
show ip ospf routing-instance <text> process <text> database
show ip ospf routing-instance <text> process <text> database adv-router
 <text>
show ip ospf routing-instance <text> process <text> database asbr-summary
show ip ospf routing-instance <text> process <text> database asbr-summary
 adv-router <text>
show ip ospf routing-instance <text> process <text> database asbr-summary
 <text>
```

```
show ip ospf routing-instance <text> process <text> database asbr-summary
 <text> adv-router <text>
show ip ospf routing-instance <text> process <text> database asbr-summary
 <text> self-originate
show ip ospf routing-instance <text> process <text> database external
show ip ospf routing-instance <text> process <text> database external
 adv-router <text>
show ip ospf routing-instance <text> process <text> database external
 <text>
show ip ospf routing-instance <text> process <text> database external
 <text> adv-router <text>
show ip ospf routing-instance <text> process <text> database external
 <text> self-originate
show ip ospf routing-instance <text> process <text> database max-age
show ip ospf routing-instance <text> process <text> database network
show ip ospf routing-instance <text> process <text> database network
 adv-router <text>
show ip ospf routing-instance <text> process <text> database network <text>
show ip ospf routing-instance <text> process <text> database network <text>
 adv-router <text>
show ip ospf routing-instance <text> process <text> database network <text>
 self-originate
show ip ospf routing-instance <text> process <text> database nssa-external
show ip ospf routing-instance <text> process <text> database nssa-external
 adv-router <text>
show ip ospf routing-instance <text> process <text> database nssa-external
 <text>
show ip ospf routing-instance <text> process <text> database nssa-external
 <text> adv-router <text>
show ip ospf routing-instance <text> process <text> database nssa-external
 <text> self-originate
show ip ospf routing-instance <text> process <text> database opaque-area
show ip ospf routing-instance <text> process <text> database opaque-area
 adv-router <text>
show ip ospf routing-instance <text> process <text> database opaque-area
 <text>
show ip ospf routing-instance <text> process <text> database opaque-area
 <text> adv-router <text>
show ip ospf routing-instance <text> process <text> database opaque-area
 <text> self-originate
show ip ospf routing-instance <text> process <text> database opaque-as
show ip ospf routing-instance <text> process <text> database opaque-as
 adv-router <text>
show ip ospf routing-instance <text> process <text> database opaque-as
 <text>
show ip ospf routing-instance <text> process <text> database opaque-as
 <text> adv-router <text>
show ip ospf routing-instance <text> process <text> database opaque-as
 <text> self-originate
show ip ospf routing-instance <text> process <text> database opaque-link
show ip ospf routing-instance <text> process <text> database opaque-link
 adv-router <text>
```

```
show ip ospf routing-instance <text> process <text> database opaque-link
 <text>
show ip ospf routing-instance <text> process <text> database opaque-link
 <text> adv-router <text>
show ip ospf routing-instance <text> process <text> database opaque-link
 <text> self-originate
show ip ospf routing-instance <text> process <text> database router
show ip ospf routing-instance <text> process <text> database router
 adv-router <text>
show ip ospf routing-instance <text> process <text> database router <text>
show ip ospf routing-instance <text> process <text> database router <text>
 adv-router <text>
show ip ospf routing-instance <text> process <text> database router <text>
 self-originate
show ip ospf routing-instance <text> process <text> database self-originate
show ip ospf routing-instance <text> process <text> database summary
show ip ospf routing-instance <text> process <text> database summary
 adv-router <text>
show ip ospf routing-instance <text> process <text> database summary
 self-originate
show ip ospf routing-instance <text> process <text> database summary <text>
show ip ospf routing-instance <text> process <text> database summary <text>
 adv-router <text>
show ip ospf routing-instance <text> process <text> database summary <text>
 self-originate
show ip ospf routing-instance <text> process <text> interface
show ip ospf routing-instance <text> process <text> interface <text>
show ip ospf routing-instance <text> process <text> neighbor
show ip ospf routing-instance <text> process <text> neighbor <text>
show ip ospf routing-instance <text> process <text> neighbor address <text>
show ip ospf routing-instance <text> process <text> neighbor detail
show ip ospf routing-instance <text> process <text> neighbor interface
 <text>
show ip ospf routing-instance <text> process <text> neighbor summary
show ip ospf routing-instance <text> process <text> opaque-area
show ip ospf routing-instance <text> process <text> opaque-as
show ip ospf routing-instance <text> process <text> opaque-link
show ip ospf routing-instance <text> process <text> route
show ip ospf routing-instance <text> process <text> virtual-links
show ip ospf routing-instance <text> process-mapping
show ip pim bsr-router routing-instance <text>
show ip pim interface routing-instance <text>
show ip pim interface routing-instance <text> detail
show ip pim local-members routing-instance <text>
show ip pim mroute routing-instance <text>
show ip pim mroute routing-instance <text> detail
show ip pim mroute routing-instance <text> group <text>
show ip pim mroute routing-instance <text> group <text> detail
show ip pim mroute routing-instance <text> group <text> source <text>
show ip pim mroute routing-instance <text> group <text> source <text>
 detail
show ip pim mroute routing-instance <text> rfc
show ip pim mroute routing-instance <text> rfc detail
```

```
show ip pim mroute routing-instance <text> rfc group <text>
show ip pim mroute routing-instance <text> rfc group <text> detail
show ip pim mroute routing-instance <text> rfc group <text> source <text>
show ip pim mroute routing-instance <text> rfc group <text> source <text>
 detail
show ip pim mroute routing-instance <text> rfc source <text>
show ip pim mroute routing-instance <text> rfc source <text> detail
show ip pim mroute routing-instance <text> source <text>
show ip pim mroute routing-instance <text> source <text> detail
show ip pim mroute routing-instance <text> summary
show ip pim neighbor routing-instance <text>
show ip pim neighbor routing-instance <text> detail
show ip pim nexthop routing-instance <text>
show ip pim rp-hash <text> routing-instance <text>
show ip pim rp-mapping routing-instance <text>
show ip rip routing-instance <text>
show ip rip routing-instance <text> status
show ip route routing-instance <text>
show ip route routing-instance <text> <text>
show ip route routing-instance <text> bgp
show ip route routing-instance <text> connected
show ip route routing-instance <text> forward
show ip route routing-instance <text> forward <text>
show ip route routing-instance <text> kernel
show ip route routing-instance <text> ospf
show ip route routing-instance <text> rip
show ip route routing-instance <text> static
show ip route routing-instance <text> summary
show ip route routing-instance <text> table <text>
show ip route routing-instance <text> variance
show ip route routing-instance <text> variance <text>
show ip route routing-instance <text> variance console
show ip rpf <text> routing-instance <text>
show ipv6 mld groups routing-instance <text>
show ipv6 mld groups routing-instance <text> detail
show ipv6 mld groups routing-instance <text> group-address <text>
show ipv6 mld groups routing-instance <text> group-address <text> detail
show ipv6 mld interface routing-instance <text>
show ipv6 mld ssm-map routing-instance <text>
show ipv6 mld ssm-map routing-instance <text> <text>
show ipv6 mroute routing-instance <text>
show ipv6 mroute routing-instance <text> count
show ipv6 mroute routing-instance <text> dense
show ipv6 mroute routing-instance <text> dense count
show ipv6 mroute routing-instance <text> dense summary
show ipv6 mroute routing-instance <text> group <text>
show ipv6 mroute routing-instance <text> group <text> count
show ipv6 mroute routing-instance <text> group <text> dense
show ipv6 mroute routing-instance <text> group <text> dense count
show ipv6 mroute routing-instance <text> group <text> dense summary
show ipv6 mroute routing-instance <text> group <text> source <text>
show ipv6 mroute routing-instance <text> group <text> source <text> count
show ipv6 mroute routing-instance <text> group <text> source <text> dense
```

```
show ipv6 mroute routing-instance <text> group <text> source <text> dense
 count
show ipv6 mroute routing-instance <text> group <text> source <text> dense
 summary
show ipv6 mroute routing-instance <text> group <text> source <text> sparse
show ipv6 mroute routing-instance <text> group <text> source <text> sparse
 count
show ipv6 mroute routing-instance <text> group <text> source <text> sparse
 summary
show ipv6 mroute routing-instance <text> group <text> source <text> summary
show ipv6 mroute routing-instance <text> group <text> sparse
show ipv6 mroute routing-instance <text> group <text> sparse count
show ipv6 mroute routing-instance <text> group <text> sparse summary
show ipv6 mroute routing-instance <text> group <text> summary
show ipv6 mroute routing-instance <text> source <text>
show ipv6 mroute routing-instance <text> source <text> count
show ipv6 mroute routing-instance <text> source <text> dense
show ipv6 mroute routing-instance <text> source <text> dense count
show ipv6 mroute routing-instance <text> source <text> dense summary
show ipv6 mroute routing-instance <text> source <text> sparse
show ipv6 mroute routing-instance <text> source <text> sparse count
show ipv6 mroute routing-instance <text> source <text> sparse summary
show ipv6 mroute routing-instance <text> source <text> summary
show ipv6 mroute routing-instance <text> sparse
show ipv6 mroute routing-instance <text> sparse count
show ipv6 mroute routing-instance <text> sparse summary
show ipv6 mroute routing-instance <text> summary
show ipv6 multicast interface routing-instance <text>
show ipv6 ospfv3 routing-instance <text> process <text>
show ipv6 ospfv3 routing-instance <text> process <text> border-routers
show ipv6 ospfv3 routing-instance <text> process <text> database
show ipv6 ospfv3 routing-instance <text> process <text> database adv-router
 <text>
show ipv6 ospfv3 routing-instance <text> process <text> database external
show ipv6 ospfv3 routing-instance <text> process <text> database external
 adv-router <text>
show ipv6 ospfv3 routing-instance <text> process <text> database external
 self-originate
show ipv6 ospfv3 routing-instance <text> process <text> database external
 <text>
show ipv6 ospfv3 routing-instance <text> process <text> database external
 <text> adv-router <text>
show ipv6 ospfv3 routing-instance <text> process <text> database external
 <text> self-originate
show ipv6 ospfv3 routing-instance <text> process <text> database grace
show ipv6 ospfv3 routing-instance <text> process <text> database grace
 adv-router <text>
show ipv6 ospfv3 routing-instance <text> process <text> database grace
 self-originate
show ipv6 ospfv3 routing-instance <text> process <text> database grace
 <text>
show ipv6 ospfv3 routing-instance <text> process <text> database grace
 <text> adv-router <text>
```

```
show ipv6 ospfv3 routing-instance <text> process <text> database grace
 <text> self-originate
show ipv6 ospfv3 routing-instance <text> process <text> database
 inter-prefix
show ipv6 ospfv3 routing-instance <text> process <text> database
 inter-prefix adv-router <text>
show ipv6 ospfv3 routing-instance <text> process <text> database
 inter-prefix self-originate
show ipv6 ospfv3 routing-instance <text> process <text> database
 inter-prefix <text>
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 inter-prefix <text> adv-router <text>
show ipv6 ospfv3 routing-instance <text> process <text> database
 inter-prefix <text> self-originate
show ipv6 ospfv3 routing-instance <text> process <text> database
 inter-router
show ipv6 ospfv3 routing-instance <text> process <text> database
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show ipv6 ospfv3 routing-instance <text> process <text> database
 inter-router self-originate
show ipv6 ospfv3 routing-instance <text> process <text> database
 inter-router <text>
show ipv6 ospfv3 routing-instance <text> process <text> database
 inter-router <text> adv-router <text>
show ipv6 ospfv3 routing-instance <text> process <text> database
 inter-router <text> self-originate
show ipv6 ospfv3 routing-instance <text> process <text> database
 intra-prefix
show ipv6 ospfv3 routing-instance <text> process <text> database
 intra-prefix adv-router <text>
show ipv6 ospfv3 routing-instance <text> process <text> database
 intra-prefix self-originate
show ipv6 ospfv3 routing-instance <text> process <text> database
 intra-prefix <text>
show ipv6 ospfv3 routing-instance <text> process <text> database
 intra-prefix <text> adv-router <text>
show ipv6 ospfv3 routing-instance <text> process <text> database
 intra-prefix <text> self-originate
show ipv6 ospfv3 routing-instance <text> process <text> database link
show ipv6 ospfv3 routing-instance <text> process <text> database link
 adv-router <text>
show ipv6 ospfv3 routing-instance <text> process <text> database link
 self-originate
show ipv6 ospfv3 routing-instance <text> process <text> database link
 <text>
show ipv6 ospfv3 routing-instance <text> process <text> database link
 <text> adv-router <text>
show ipv6 ospfv3 routing-instance <text> process <text> database link
 <text> self-originate
show ipv6 ospfv3 routing-instance <text> process <text> database max-age
show ipv6 ospfv3 routing-instance <text> process <text> database network
show ipv6 ospfv3 routing-instance <text> process <text> database network
 adv-router <text>
```

```
show ipv6 ospfv3 routing-instance <text> process <text> database network
 self-originate
show ipv6 ospfv3 routing-instance <text> process <text> database network
 <text>
show ipv6 ospfv3 routing-instance <text> process <text> database network
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show ipv6 ospfv3 routing-instance <text> process <text> database network
 <text> self-originate
show ipv6 ospfv3 routing-instance <text> process <text> database
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show ipv6 ospfv3 routing-instance <text> process <text> database
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show ipv6 ospfv3 routing-instance <text> process <text> database
 nssa-external self-originate
show ipv6 ospfv3 routing-instance <text> process <text> database
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 nssa-external <text> adv-router <text>
show ipv6 ospfv3 routing-instance <text> process <text> database
 nssa-external <text> self-originate
show ipv6 ospfv3 routing-instance <text> process <text> database router
show ipv6 ospfv3 routing-instance <text> process <text> database router
 adv-router <text>
show ipv6 ospfv3 routing-instance <text> process <text> database router
 self-originate
show ipv6 ospfv3 routing-instance <text> process <text> database router
 <text>
show ipv6 ospfv3 routing-instance <text> process <text> database router
 <text> adv-router <text>
show ipv6 ospfv3 routing-instance <text> process <text> database router
 <text> self-originate
show ipv6 ospfv3 routing-instance <text> process <text> database
 self-originate
show ipv6 ospfv3 routing-instance <text> process <text> interface
show ipv6 ospfv3 routing-instance <text> process <text> interface <text>
show ipv6 ospfv3 routing-instance <text> process <text> neighbor
show ipv6 ospfv3 routing-instance <text> process <text> neighbor detail
show ipv6 ospfv3 routing-instance <text> process <text> neighbor <text>
show ipv6 ospfv3 routing-instance <text> process <text> route
show ipv6 ospfv3 routing-instance <text> process <text> topology
show ipv6 ospfv3 routing-instance <text> process <text> topology area
 <text>
show ipv6 ospfv3 routing-instance <text> process <text> virtual-links
show ipv6 ospfv3 routing-instance <text> process-mapping
show ipv6 pim bsr-router routing-instance <text>
show ipv6 pim interface routing-instance <text>
show ipv6 pim interface routing-instance <text> detail
show ipv6 pim local-members routing-instance <text>
show ipv6 pim mroute routing-instance <text>
show ipv6 pim mroute routing-instance <text> detail
show ipv6 pim mroute routing-instance <text> group <text>
show ipv6 pim mroute routing-instance <text> group <text> detail
show ipv6 pim mroute routing-instance <text> group <text> source <text>
```

```
show ipv6 pim mroute routing-instance <text> group <text> source <text>
 detail
show ipv6 pim mroute routing-instance <text> rfc
show ipv6 pim mroute routing-instance <text> rfc detail
show ipv6 pim mroute routing-instance <text> rfc group <text>
show ipv6 pim mroute routing-instance <text> rfc group <text> detail
show ipv6 pim mroute routing-instance <text> rfc group <text> source <text>
show ipv6 pim mroute routing-instance <text> rfc group <text> source <text>
 detail
show ipv6 pim mroute routing-instance <text> rfc source <text>
show ipv6 pim mroute routing-instance <text> rfc source <text> detail
show ipv6 pim mroute routing-instance <text> source <text>
show ipv6 pim mroute routing-instance <text> source <text> detail
show ipv6 pim mroute routing-instance <text> summary
show ipv6 pim neighbor routing-instance <text>
show ipv6 pim neighbor routing-instance <text> detail
show ipv6 pim nexthop routing-instance <text>
show ipv6 pim rp-hash <text> routing-instance <text>
show ipv6 pim rp-mapping routing-instance <text>
show ipv6 ripng routing-instance <text>
show ipv6 ripng routing-instance <text> interface
show ipv6 ripng routing-instance <text> status
show ipv6 route routing-instance <text>
show ipv6 route routing-instance <text> <text>
show ipv6 route routing-instance <text> bgp
show ipv6 route routing-instance <text> connected
show ipv6 route routing-instance <text> forward
show ipv6 route routing-instance <text> forward <text>
show ipv6 route routing-instance <text> kernel
show ipv6 route routing-instance <text> ospfv3
show ipv6 route routing-instance <text> ripng
show ipv6 route routing-instance <text> static
show ipv6 route routing-instance <text> summary
show ipv6 route routing-instance <text> table <text>
show ipv6 route routing-instance <text> variance
show ipv6 route routing-instance <text> variance <text>
show ipv6 route routing-instance <text> variance console
show ipv6 rpf <text> routing-instance <text>
show monitoring protocols bfd routing-instance <text>
show monitoring protocols bgp routing-instance <text>
show monitoring protocols multicast routing-instance <text>
show monitoring protocols multicast routing-instance <text> igmp
show monitoring protocols multicast routing-instance <text> ip
show monitoring protocols multicast routing-instance <text> ipv6
show monitoring protocols multicast routing-instance <text> mld
show monitoring protocols multicast routing-instance <text> msdp
show monitoring protocols multicast routing-instance <text> pim
show monitoring protocols multicast routing-instance <text> pim6
show monitoring protocols ospf routing-instance <text> process <text>
show monitoring protocols ospfv3 routing-instance <text> process <text>
show service twamp server routing-instance <text> session all
show service twamp server routing-instance <text> session client <text>
show service twamp server routing-instance <text> session summary
```

```
show service twamp server routing-instance <text> status
show snmp routing-instance
ssh <text> routing-instance <text>
telnet <text> routing-instance <text>
traceroute <text> routing-instance <text>
twping <text> routing-instance <text>
```

Chapter 10. VRF Commands

routing-instance

Use this command to add a VRF routing instance to an operational mode command.

operational_command **routing-instance** *instance-name*

operational_command

An operational command, such as the `show` command, that comprises the command name and one or more keywords or variables, or both. Refer to the description of a specific command for the command syntax, which includes details about keywords and variables.

instance-name

A VRF routing instance in the form of an alphanumeric string. The leading character cannot be _ or -. You cannot use default as an instance name; it is reserved for the default routing instance.

Operational

When adding a VRF routing instance to an Operational mode, note the following placement of the instance:

- If the command does not have optional parameters, specify the routing instance at the end of the command.
- If the command has optional parameters, specify the routing instance after the required parameters and before the optional parameters.

The following example shows how to display the update status for all hosts that are configured for dynamic DNS updates for the default routing instance.

```
vyatta@vyatta:~$ show dns dynamic status
```

The following example shows how to display the same information for the RED routing instance.

```
vyatta@vyatta:~$ show dns dynamic status routing-instance RED
```

routing routing-instance description

Defines a description for a routing instance.

`set routing routing-instance` *instance-name* **description** *instance-description*

`delete routing routing-instance` *instance-name* **description** *instance-description*

`show routing routing-instance` *`instance-name`* **`description`** *`instance-description`*

instance-name

A VRF routing instance. Alphanumeric string. The leading character cannot be _ or -. You cannot use default as an instance name; it is reserved for the default routing instance.

instance-description

Description of the routing instance.

Configuration

```
routing {
   routing-instance {
             description
   }
}
```

Use the `set` form of this command to define a description for a routing instance.

Use the `delete` form of this command to delete a description for a routing instance.

Use the `show` form of this command to display a description for a routing instance.

routing routing-instance instance-name

Many router commands can be configured for individual VRF routing instances. Use the following structure when adding routing instances to commands.

`set routing routing-instance` *`instance-name`* `[` *`command`* `]`

`delete routing routing-instance` *`instance-name`* `[` *`command`* `]`

`show routing routing-instance` *`instance-name`* `[` *`command`* `]`

instance-name

A VRF routing instance. Alphanumeric string. The leading character cannot be _ or -. You cannot use default as an instance name; it is reserved for the default routing instance.

command

A command, which comprises the command name and one or more keywords or variables, or both. Refer to the description of a specific command for the command syntax, which includes details about keywords and variables.

Configuration

```
routing {
   routing-instance instance-name {
     command
   }
}
```

When specifying a VRF routing instance for most Configuration mode commands, add the appropriate VRF keywords and variable to follow the initial action (`set`, `delete`, or `show`) and before the other keywords and variables in the command.

The following command syntax does not specify a VRF routing instance, so the command applies to the default routing instance.

```
set service dns dynamic interface dp0p161p1
```

The following example shows the syntax for the same command with the RED routing instance added. Notice that **routing routing-instance** *instance-name* has been inserted between the basic action (`set` in the example) and the rest of the command. Most Configuration mode commands that support VRF routing instances follow this convention.

```
set routing routing-instance RED service dns dynamic interface dp0p161p1
```

routing routing-instance interface

Binds an interface to a routing instance.

`set routing routing-instance` *`instance-name`* **`interface`** *`interface-name`*

`delete routing routing-instance` *`instance-name`* **`interface`** *`interface-name`*

`show routing routing-instance` *`instance-name`* **`interface`** *`interface-name`*

instance-name

A VRF routing instance. Alphanumeric string. The leading character cannot be _ or -. You cannot use default as an instance name; it is reserved for the default routing instance.

interface-name

The name of an interface.

Configuration

```
routing {
   routing-instance instance-name {
       interface interface-name
   }
}
```

This command binds a routing instance to an interface. You can bind multiple interfaces to a single routing instance by issuing this command separately for each interface. You cannot bind a single interface to multiple routing instances.

The binding configuration is independent of the type of interface, so the interface type is not specified.

Chapter 11. Source Routes

Source routing example

This example shows how to configure a simple site using PBR on the router (R1) to route traffic from two different internal subnets to two Internet links.

In this example:

- All Internet-bound traffic from subnet 192.168.10.0/24 is routed out interface dp0p0p1.
- All Internet-bound traffic from subnet 192.168.20.0/24 is routed out interface dp0p0p2.

To configure this scenario, perform the following steps in configuration mode.

Table 17. Source routing using PBR

Step	Command
Create the SRC-ROUTE policy.	`vyatta@R1# set policy route pbr SRC-ROUTE`
Create rule 10 and specify the destination address to match In this case, any destination address will match	`vyatta@R1# set policy route pbr SRC-ROUTE rule 10 destination address 0.0.0.0/0`
Specify the address family for	`vyatta@R1# set policy route pbr SRC-ROUTE rule 10 address-family ipv4`

Table 17. Source routing using PBR (continued)

Step	Command
rule 10.	
Specify the source address to match In this case, any address on subnet 192.16 will match	`vyatta@R1# set policy route pbr SRC-ROUTE rule 10 source address 192.168.10.0/24`
Specify the accept action for rule 10.	`vyatta@R1# set policy route pbr SRC-ROUTE rule 10 action accept`
Specify that all packets that match should use alternate routing table 1.	`vyatta@R1# set policy route pbr SRC-ROUTE rule 10 table 1`
Specify the destination address to match any address.	`vyatta@R1# set policy route pbr SRC-ROUTE rule 10 destination address 0.0.0.0/0`

Table 17. Source routing using PBR (continued)

Step	Command
Specify the address family for rule 20.	`vyatta@R1# set policy route pbr SRC-ROUTE rule 20 address-family ipv4`
Specify the accept action for rule 20.	`vyatta@R1# set policy route pbr SRC-ROUTE rule 20 action accept`
Specify the destination address to match any address.	`vyatta@R1# set policy route pbr SRC-ROUTE rule 20 destination address 0.0.0.0/0`
Specify the source address to match. In this case, any address on subnet 192.168.20.0/24 will match.	`vyatta@R1# set policy route pbr SRC-ROUTE rule 20 source address 192.168.20.0/24`
Create the alternative routing ta-	`vyatta@R1# set policy route pbr SRC-ROUTE rule 20 table 2`

Table 17. Source routing using PBR (continued)

Step	Command
ble 2 and route de-fault traf-fic to the sec-ond In-ter-net con-nec-tion.	
Com-mit the change.	`vyatta@R1# commit`

Show the al-ter-nate rout-ing ta-ble con-fig-ura-tion.	`vyatta@R1# show policy`
	` policy {`
	`  route {`
	`  pbr SRC-ROUTE {`
	`  rule 10 {`
	`  action accept`
	`  address-family ipv4`
	`  destination {`
	`  address 0.0.0.0/0`
	`  }`
	`  source {`
	`  address 192.168.10.0/24`
	`  }`
	`  table 1`
	`  }`
	`  rule 20 {`
	`  action accept`
	`  address-family ipv4`
	`  destination {`
	`  address 0.0.0.0/0`
	`  }`
	`  source {`
	`  address 192.168.20.0/24`
	`  }`
	`  table 2`
	`  }`
	`  }`
	`  }`
	` }`

As-sign an ad-dress to dp0p0p1.	`vyatta@R1# set interfaces dataplane dp0p0p1 address 12.34.56.33/24`
As-sign an ad-dress to dp0p0	`vyatta@R1# set interfaces dataplane dp0p0p2 address 98.76.54.44/24`
As-sign an	`vyatta@R1# set interfaces dataplane dp0p0p3 address 192.168.10.254/24`

Table 17. Source routing using PBR (continued)

Step	Command
address to dp0p0p3.	
Assign the policy to the interface connected to subnet 192.16	`vyatta@R1# set interfaces dataplane dp0p0p3 policy route pbr SRC-ROUTE`
Assign an address to dp0p0p4.	`vyatta@R1# set interfaces dataplane dp0p0p4 address 192.168.20.254/24`
Assign the policy to the interface connected to subnet 192.16	`vyatta@R1# set interfaces dataplane dp0p0p4 policy route pbr SRC-ROUTE`
Commit the change.	`vyatta@R1# commit`

Show the data-plane interface configuration.	`vyatta@R1# show interfaces dataplane`
	`dataplane dp0p0p1 {`
	`  address 12.34.56.33/24`
	`}`
	`dataplane dp0p0p2 {`
	`  address 98.76.54.44/24`
	`}`
	`dataplane dp0p0p3 {`
	`  address 192.168.10.254/24`
	`  policy {`
	`  route SRC-ROUTE`
	`  }`
	`}`
	`dataplane dp0p0p4 {`
	`  address 192.168.20.254/24`
	`  policy {`
	`  route SRC-ROUTE`
	`  }`
	`}`

Table 17. Source routing using PBR (continued)

Step	Command

Chapter 12. IPv6

IPv6 Overview

There are two versions of the Internet Protocol (IP) in use today. Version 4 (IPv4) is the version most commonly in use. However, there are issues with IPv4, and the Internet Engineering Task Force (IETF) has designated Version 6 (IPv6) to succeed IPv4 as the next-generation protocol for use on the Internet. IPv6 has a number of advantages over IPv4. The following are four important ones:

- Large address space: An IPv4 address consists of four bytes (32 bits). IPv6 addresses consist of 16 bytes (128 bits). The increase from 32 to 128 bits results in a huge increase in the number of available addresses: 79 billion billion billion times the addresses available in the IPv4—this is about 1038 addresses, or 1030 addresses for each person on the planet. The expanded address space means that IPv6 does not face the address exhaustion problems predicted imminently for IPv4. Furthermore, the availability for so many addresses means that private address spaces are not required, and that address shortage work-arounds such as Network Address Translation (NAT) can be eliminated. With no private addresses, there need be no hidden networks or hosts, and all devices can be globally reachable. A larger address space also means that features such as multihoming and aggregation are easier to implement.
- Support for mobile devices: A special protocol, Mobile IP, is required to support mobility. Mobile IP is not automatic in IPv4, and there are several challenges involved in implementing Mobile IP on IPv4 networks. In contrast, Mobile IP was designed into IPv6 from its inception, and is a mandatory feature in a standards-compliant IPv6 protocol stack.
- Flexibility: IPv6 includes multiple levels of hierarchy in the address space. This allows for hierarchical allocation of addressing and more efficient route aggregation. It also permits new kinds of addresses not possible in IPv4, such as link- and site-scoped addressing.
- Security: Because devices can be globally reachable, end-to-end security can be employed, which is not possible on an internetwork with hidden networks and hosts.

Supported standards

The implementation of IPv6 complies with the following standards:

- RFC 2460: Internet Protocol, version 6 (IPv6) Specification
- RFC 4443: Internet Control Message Protocol (ICMPv6) for the Internet protocol version 6 (IPv6)

IPv6 addressing

IP addresses generally take the following form:

```
x:x:x:x:x:x:x:x
```

where x is a 16-bit hexadecimal number; for example:

```
2001:0DB8:0000:0000:51DA:27C0:E4C2:0124
```

Addresses are case-insensitive; for example, the following is equivalent to the example given above:

```
2001:0db8:0000:0000:51da:27c0:E4c2:0124
```

Leading zeros are optional; for example, the following is a valid IPv6 address:

```
2001:DB8:0:0:51DA:27C0:E4C2:124
```

IPv6 addresses often contain many bytes with a value of zero. Successive fields of zeros can be represented by replacing them with a double colon, as in the following:

```
2001:DB8::51DA:27C0:E4C2:124
```

Similarly the following:

```
2001:DB8::124
```

is equivalent to the following:

```
2001:DB8:0:0:0:0:0:0124
```

and this:

```
0:0:0:0:0:0:0:1
```

is equivalent to this:

```
::1
```

The replacement by the double colon may be made only once within an address, as using the double colon more than once can result in ambiguity. For example, the following:

```
2001:DB8::27C0::0124
```

is ambiguous between these three addresses:

```
2001:0DB8:0000:27C0:0000:0000:0000:0124
2001:0DB8:0000:0000:27C0:0000:0000:0124
2001:0DB8:0000:0000:0000:27C0:0000:0124
```

IPv6 addresses that are extensions of IPv4 addresses can be written in a mixed notation, where the rightmost four bytes of the IPv6 address are replaced with the four decimal octets

of the IPv4 address. In mixed notation, the four hexadecimal bytes are separated by colons and the four decimal octets are separated by dots, as in the following example:

```
2001:db8:0:1::192.168.100.51
```

which is equivalent to

```
2001:db8:0:1::c0a8:6433
```

Special addresses

Like IPv4, IPv6 has some special addresses, which are used by convention for special functions. For unicast addresses, these include the following:

The unspecified address. This address is used as a placeholder when no address is available (for example, in an initial DHCP address), or to stand for “any” address. In IPv6, the unspecified address can be represented as either of the following:

```
0:0:0:0:0:0:0:0 ::
```

The localhost (loopback) interface. The loopback interface is a software interface that represents the local device itself. In IPv4, the address 127.0.0.1 is used by convention for the loopback interface. In IPv6, the loopback interface can be represented by either of the following:

```
0:0:0:0:0:0:0:1 ::1
```

The IPv6 address architecture is quite rich, and includes types of addressing unavailable in IPv4, such as unicast and multicast scoped addresses, aggregatable global addresses, and anycast addresses. Multicast broadcast addresses do not exist in IPv6. For more information about the IPv6 address architecture, consult RFC 4291, IP Version 6 Addressing Architecture.

IPv6 autoconfiguration

IPv6 supports two mechanisms for automatically configuring devices with IP addresses: stateful and stateless. Both are supported in the router.

In stateful configuration, addressing and service information is distributed by a protocol (DHCPv6) in the same way that the Dynamic Host Configuration Protocol (DHCP) distributes information for IPv4. This information is “stateful” in that both the DHCP server and the DHCP client must maintain the addressing and service information.

Stateless configuration uses the Stateless Address Autoconfiguration (SLAAC) protocol, which is a component of the larger Neighbor Discovery (ND) protocol. SLAAC has a host component and a router component. In the host component of SLAAC, the IPv6 system constructs its own unicast global address from the system’s network prefix together with its Ethernet media access control (MAC) address. The device proposes this address to the network, without requiring approval from a server such as a DHCP server. The combination

of network prefix and MAC address is assumed to be unique. Stateless autoconfiguration is performed by default by most IPv6 systems, including the Vyatta vRouter.

In the router component of SLAAC, routers respond to Router Solicitation (RS) packets from hosts with network prefix information in the form of Router Advertisement (RA) packet. Hosts receive these advertisements and use them to form globally unique IPv6 addresses. The RS and RA packets also provide the router discovery function, allowing hosts to locate routers that are configured to serve as default routers. The Vyatta vRouter fully supports router-side SLAAC and router discovery, including all required configurable parameters. The ND protocol and the router discovery function are specified in RFC 4861. IPv6 Stateless Address Autoconfiguration is described in RFC 4862.

IPv6 forwarding

On the Vyatta vRouter, IPv6 forwarding is enabled by default. If you want to disable IPv6 forwarding, use the following command in configuration mode: set system ipv6 disable-forwarding. This command is described in Vyatta Network Operating System Basic System Configuration Guide.

IPv6 neighbor discovery

IPv6 Neighbor Discovery (ND) provides a layer 3 to layer 2 address resolution mechanism for IPv6 similar to the way that Address Resolution Protocol (ARP) provides for layer 3 to layer 2 address resolution for IPv4. ND resolution is carried out in both the data plane and the control plane; however, it is primarily carried out in the data plane. Note that ND caches in the control plane and data plane are no longer synchronized because entries in the two caches are managed independently. The data plane cache contains entries for both forwarded and locally terminated traffic. The control plane maintains cache entries only for destinations with which the local stack of the control plane communicates.

The advantages of implementing the ND protocol in the data plane are as follows:

- Avoids bandwidth issues in deployments with distributed data planes, because ND resolution can be performed locally rather than on a centralized controller.
- Improves performance because ND does not need to send all ND packets to the control plane.
- Protects against scanning DOS attacks due to resolution throttling.

Commands for IPv6

In addition to the general IPv6 information found in this chapter, information specific to major functions are in the documents for that function such as:

- Commands to enable and disable IPv6 are in *Basic System Configuration Guide*.
- Commands to configure IPv6 on a given interface are in the guide that describes the interface. For example, commands to configure IPv6 on an Ethernet interface are in *Basic System Configuration Guide*.
- Static IPv6 routing is in Static IPv6 route configuration.

- BGP-related dynamic IPv6 routing information is in *BGP Configuration Guide*.
- DHCPv6-related is in *Basic System Configuration Guide*as well as *LAN Interfaces Configuration Guide*.
- Tunneling IPv6 over IPv4 is in *Tunnels Configuration Guide*.
- Multicast routing for IPv6 is in *IGMP Configuration Guide*.

IPv6 Configuration Examples

Configure an IPv6 address on an interface

The following figure shows a simple network with two IPv6 nodes.

Figure 10. IPv6 address on an interface

IPv6 addresses are configured on data-plane interfaces in the same way that IPv4 addresses are. To configure dp0p1p3 on R1, perform the following steps in configuration mode.

Table 18. Assign an IPv6 address to dp0p1p3 on R1

Step	Command
Assign an IPv6 address to the dp0p1p3 interface.	`vyatta@R1# set interfaces dataplane dp0p1p3 address 2001:db8:2::1/64`
Commit the change.	`vyatta@R1# commit`

Verify the configuration.	`vyatta@R1# show interfaces dataplane dp0p1p3`
	` duplex auto`
	` hw-id b6:71:6b:8a:c9:3c`
	` mtu 1500`
	` speed auto`

Change to operational mode.	`vyatta@R1# exit`
	`exit`
	`vyatta@R1:~$`

Show the status of the interfaces on R1.	`vyatta@R1:~$ show interfaces`
	`Codes: S - State, L - Link, u - Up, D - Down, A - Admin Down`
	`Interface IP Address S/L Description`
	`dp0p1p1 - u/u`
	`dp0p1p2 - u/u`
	`dp0p1p3 2001:DB8:2::1/64 u/u`

Table 18. Assign an IPv6 address to dp0p1p3 on R1 (continued)

Step	Command
	dp0p1p4 - u/u lo 127.0.0.1/8 u/u lo ::1/128 u/u

To configure dp0p1p1 on R2, perform the following steps in configuration mode.

Table 19. Assign an IPv6 address to dp0p1p1 on R2

Step	Command
Assign an IPv6 address to the dp0p1p1 interface.	`vyatta@R2# set interfaces dataplane dp0p1p1 address 2001:db8:2::2/64`
Commit the change.	`vyatta@R2# commit`

Verify the configuration.	`vyatta@R2# show interfaces dataplane dp0p1p1`
	` address 2001:db8:2::2/64`
	` duplex auto`
	` hw-id 3a:26:db:4d:63:a2`
	` speed auto`

Change to operational mode.	`vyatta@R2# exit`
	`exit`
	`vyatta@R2:~$`

Show the status of the interfaces on R2.	`vyatta@R2:~$ show interfaces`
	`Codes: S - State, L - Link, u - Up, D - Down, A - Admin Down`
	`Interface IP Address S/L Description`
	`dp0p1p1 2001:DB8:2::2/64 u/u`
	`dp0p1p2 - u/u`
	`dp0p1p3 - u/u`
	`lo 127.0.0.1/8 u/u`
	`lo ::1/128 u/u`

Verify IPv6 support

A simple step to verify that IPv6 support is available is to configure the loopback interface with an IPv6 address and then ping it. To verify IPv6 support, perform the following step in operational mode.

Table 20. Confirm IPv6 support

Step	Command

Ping the loopback interface.	`vyatta@R1:~$ ping ::1`
	`PING ::1(::1)`
	`56 data bytes`
	`64 bytes from ::1: icmp_seq=1 ttl=64 time=2.13 ms`
	`64 bytes from ::1: icmp_seq=2 ttl=64 time=0.086 ms`
	`^C`
	`--- ::1 ping statistics ---`
	`2 packets transmitted, 2 received, 0% packet loss, time 1006ms`
	`rtt min/avg/max/mdev = 0.086/1.112/2.138/1.026 ms`

Display the IPv6 routing table

When an IPv6 address is added to an interface, a connected network for it appears in the routing table. To display the routing table, perform the following step in operational mode.

Table 21. Display the IPv6 routing table

Step	Command

Show the routing table.	`vyatta@R1:~$ show ipv6 route`
	`IPv6 Routing Table`
	`Codes: K - kernel route, C - connected, S - static, R - RIP, O -`
	`OSPF, IA - OSPF inter area, E1 - OSPF external type 1, E2 - OSPF external type 2, I - IS-IS, B - BGP > -`
	`selected route, * - FIB route, p - stale info`
	`Timers: Uptime`
	`C>* ::1/128 is directly connected, lo`
	`C>* 2001:db8:2::/64 is directly connected, dp0p1p3`
	`C * fe80::/64 is directly connected, dp0p1p3`
	`C * fe80::/64 is directly connected, dp0p1p2`
	`C>* fe80::/64 is directly connected, dp0p1p1`
	`K>* ff00::/8 is directly connected, dp0p1p3`

Confirm connectivity

To confirm that R1 and R2 can communicate, use the ping command. To confirm connectivity, perform the following step in operational mode.

Table 22. Confirm connectivity between R1 and R2

Step	Command

Ping R2 from R1.	`vyatta@R1:~$ ping 2001:db8:2::2`
	`PING 2001:db8:2::2(2001:db8:2::2) 56 data bytes`
	`64 bytes from 2001:db8:2::2: icmp_seq=1 ttl=64 time=6.52 ms`
	`64 bytes from 2001:db8:2::2: icmp_seq=2 ttl=64 time=0.333 ms`
	`^C`
	`--- 2001:db8:2::2 ping statistics ---`
	`2 packets transmitted, 2 received, 0% packet loss, time 1013ms`
	`rtt min/avg/max/mdev = 0.333/3.427/6.522/3.095 ms`

Display IPv6 Neighbor Discovery cache

To display a list of neighbors in the Neighbor Discovery (ND) caches in both the data plane and the controller, use the show ipv6 neighbors command. To display the ND cache in the data plane only use the `show ipv6 neighbors` command. Perform the following step in operational mode.

Table 23. Display the ND cache

Step	Command

Display the list of known neighbors in both the data plane and the controller.	`vyatta@R1:~$ show ipv6 neighbors`
	`IPv6 Address HW address Dataplane`
	`Controller Device`
	`2001:db8:2::2 52:54:0:9b:6a:3f VALID [REACHABLE]`
	`VALID [REACHABLE] dp0p1p3`
	`fe80::20c:29ff:fe4e:fcb6 52:54:0:9b:6a:3f VALID [DELAY]`
	`dp0p1p3s`

Table 23. Display the ND cache (continued)

Step	Command

Display the list of known neighbors only in the data plane.	`vyatta@R1:~$ show dataplane nd`
	`IPv6 Address HW address Flags State`
	`Device`
	`2001:db8:2::2 52:54:0:9b:6a:3f VALID REACHABLE`
	`dp0p1p3`
	`fe80::20c:29ff:fe4e:fcb6 52:54:0:9b:6a:3f VALID DELAY`
	`dp0p1p3`

Clear ND cache

To clear the Neighbor Discovery (ND) cache, use the reset ipv6 neighbors command. To clear the ND cache on interface dp0p1p3, perform the following step in operational mode.

Table 24. Clear the ND cache Step Command

Step	Command
Clear the list of known neighbors on dp0p1p3.	`vyatta@R1:~$ reset ipv6 neighbors interface dp0p1p3`

Chapter 13. List of Acronyms

Item	Description
ACL	access control list
ADSL	Asymmetric Digital Subscriber Line
AH	Authentication Header
AMI	Amazon Machine Image
API	Application Programming Interface
AS	autonomous system
ARP	Address Resolution Protocol
AWS	Amazon Web Services
BGP	Border Gateway Protocol
BIOS	Basic Input Output System
BPDU	Bridge Protocol Data Unit
CA	certificate authority
CCMP	AES in counter mode with CBC-MAC
CHAP	Challenge Handshake Authentication Protocol
CLI	command-line interface
DDNS	dynamic DNS
DHCP	Dynamic Host Configuration Protocol
DHCPv6	Dynamic Host Configuration Protocol version 6
DLCI	data-link connection identifier
DMI	desktop management interface
DMVPN	dynamic multipoint VPN
DMZ	demilitarized zone
DN	distinguished name
DNS	Domain Name System
DSCP	Differentiated Services Code Point
DSL	Digital Subscriber Line
eBGP	external BGP
EBS	Amazon Elastic Block Storage
EC2	Amazon Elastic Compute Cloud
EGP	Exterior Gateway Protocol
ECMP	equal-cost multipath
ESP	Encapsulating Security Payload
FIB	Forwarding Information Base
FTP	File Transfer Protocol

Item	Description
GRE	Generic Routing Encapsulation
HDLC	High-Level Data Link Control
I/O	Input/Output
ICMP	Internet Control Message Protocol
IDS	Intrusion Detection System
IEEE	Institute of Electrical and Electronics Engineers
IGMP	Internet Group Management Protocol
IGP	Interior Gateway Protocol
IPS	Intrusion Protection System
IKE	Internet Key Exchange
IP	Internet Protocol
IPOA	IP over ATM
IPsec	IP Security
IPv4	IP Version 4
IPv6	IP Version 6
ISAKMP	Internet Security Association and Key Management Protocol
ISM	Internet Standard Multicast
ISP	Internet Service Provider
KVM	Kernel-Based Virtual Machine
L2TP	Layer 2 Tunneling Protocol
LACP	Link Aggregation Control Protocol
LAN	local area network
LDAP	Lightweight Directory Access Protocol
LLDP	Link Layer Discovery Protocol
MAC	medium access control
mGRE	multipoint GRE
MIB	Management Information Base
MLD	Multicast Listener Discovery
MLPPP	multilink PPP
MRRU	maximum received reconstructed unit
MTU	maximum transmission unit
NAT	Network Address Translation
NBMA	Non-Broadcast Multi-Access
ND	Neighbor Discovery
NHRP	Next Hop Resolution Protocol
NIC	network interface card

Item	Description
NTP	Network Time Protocol
OSPF	Open Shortest Path First
OSPFv2	OSPF Version 2
OSPFv3	OSPF Version 3
PAM	Pluggable Authentication Module
PAP	Password Authentication Protocol
PAT	Port Address Translation
PBR	Policy Based Routing
PCI	peripheral component interconnect
PIM	Protocol Independent Multicast
PIM-DM	PIM Dense Mode
PIM-SM	PIM Sparse Mode
PKI	Public Key Infrastructure
PPP	Point-to-Point Protocol
PPPoA	PPP over ATM
PPPoE	PPP over Ethernet
PPTP	Point-to-Point Tunneling Protocol
PTMU	Path Maximum Transfer Unit
PVC	permanent virtual circuit
QoS	quality of service
RADIUS	Remote Authentication Dial-In User Service
RHEL	Red Hat Enterprise Linux
RIB	Routing Information Base
RIP	Routing Information Protocol
RIPng	RIP next generation
RP	Rendezvous Point
RPF	Reverse Path Forwarding
RSA	Rivest, Shamir, and Adleman
Rx	receive
S3	Amazon Simple Storage Service
SLAAC	Stateless Address Auto-Configuration
SNMP	Simple Network Management Protocol
SMTP	Simple Mail Transfer Protocol
SONET	Synchronous Optical Network
SPT	Shortest Path Tree
SSH	Secure Shell

Item	Description
SSID	Service Set Identifier
SSM	Source-Specific Multicast
STP	Spanning Tree Protocol
TACACS+	Terminal Access Controller Access Control System Plus
TBF	Token Bucket Filter
TCP	Transmission Control Protocol
TKIP	Temporal Key Integrity Protocol
ToS	Type of Service
TSS	TCP Maximum Segment Size
Tx	transmit
UDP	User Datagram Protocol
VHD	virtual hard disk
vif	virtual interface
VLAN	virtual LAN
VPC	Amazon virtual private cloud
VPN	virtual private network
VRRP	Virtual Router Redundancy Protocol
WAN	wide area network
WAP	wireless access point
WPA	Wired Protected Access