AOS-CX 10.11 IP Routing Guide

6300, 6400, 8320, 8325, 8360, 9300, 10000

Switch Series

a Hewlett Packard Enterprise company

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Chapter 1
About this document

This document describes features of the AOS-CX network operating system. It is intended for administrators responsible for installing, configuring, and managing Aruba switches on a network.

Applicable products

This document applies to the following products:

- Aruba 6300 Switch Series (JL658A, JL659A, JL660A, JL661A, JL662A, JL663A, JL664A, JL665A, JL666A, JL667A, JL668A, JL762A, R8S89A, R8S90A, R8S91A, R8S92A)
- Aruba 6400 Switch Series (R0X31A, R0X38B, R0X38C, R0X39B, R0X39C, R0X40B, R0X40C, R0X41A, R0X41C, R0X42A, R0X42C, R0X43A, R0X43C, R0X44A, R0X44C, R0X45A, R0X45C, R0X26A, R0X27A, JL741A)
- Aruba 8320 Switch Series (JL479A, JL579A, JL581A)
- Aruba 8325 Switch Series (JL624A, JL625A, JL626A, JL627A)
- Aruba 8360 Switch Series (JL700A, JL701A, JL702A, JL703A, JL706A, JL707A, JL708A, JL709A, JL710A, JL711A, JL700C, JL701C, JL702C, JL703C, JL706C, JL707C, JL708C, JL709C, JL710C, JL711C, JL704C, JL705C, JL719C, JL718C, JL717C, JL720C, JL722C, JL721C)
- Aruba 9300 Switch Series (R9A29A, R9A30A, R8Z96A)
- Aruba 10000 Switch Series (R8P13A, R8P14A)

Latest version available online

Updates to this document can occur after initial publication. For the latest versions of product documentation, see the links provided in Support and Other Resources.

Command syntax notation conventions

Convention	Usage
`example-text`	Identifies commands and their options and operands, code examples, filenames, pathnames, and output displayed in a command window. Items that appear like the example text in the previous column are to be entered exactly as shown and are required unless enclosed in brackets (`[ ]`).
example-text	In code and screen examples, indicates text entered by a user.
Any of the following: ■ *`<example-text>`* ■ `<example-text>` ■ *`example-text`* ■ *example-text*	Identifies a placeholder—such as a parameter or a variable—that you must substitute with an actual value in a command or in code: ■ For output formats where italic text cannot be displayed, variables are enclosed in angle brackets (`< >`). Substitute the text—including the enclosing angle brackets—with an actual value.

Convention	Usage
	■ For output formats where italic text can be displayed, variables might or might not be enclosed in angle brackets. Substitute the text including the enclosing angle brackets, if any, with an actual value.
|	Vertical bar. A logical OR that separates multiple items from which you can choose only one. Any spaces that are on either side of the vertical bar are included for readability and are not a required part of the command syntax.
{ }	Braces. Indicates that at least one of the enclosed items is required.
[ ]	Brackets. Indicates that the enclosed item or items are optional.
... or . . .	Ellipsis: ■ In code and screen examples, a vertical or horizontal ellipsis indicates an omission of information. ■ In syntax using brackets and braces, an ellipsis indicates items that can be repeated. When an item followed by ellipses is enclosed in brackets, zero or more items can be specified.

About the examples

Examples in this document are representative and might not match your particular switch or environment.

The slot and port numbers in this document are for illustration only and might be unavailable on your switch.

Understanding the CLI prompts

When illustrating the prompts in the command line interface (CLI), this document uses the generic term `switch`, instead of the host name of the switch. For example:

```
switch>
```

The CLI prompt indicates the current command context. For example:

```
switch>
```

Indicates the operator command context.

```
switch#
```

Indicates the manager command context.

`switch(`*`CONTEXT-NAME`*`)#`

Indicates the configuration context for a feature. For example:

```
switch(config-if)#
```

Identifies the `interface` context.

Variable information in CLI prompts

In certain configuration contexts, the prompt may include variable information. For example, when in the VLAN configuration context, a VLAN number appears in the prompt:

```
switch(config-vlan-100)#
```

When referring to this context, this document uses the syntax:

`switch(config-vlan-`*`<VLAN-ID>`*`)#`

Where *`<VLAN-ID>`* is a variable representing the VLAN number.

Identifying switch ports and interfaces

Physical ports on the switch and their corresponding logical software interfaces are identified using the format:
member/slot/port

On the 6300 Switch Series

- *member*: Member number of the switch in a Virtual Switching Framework (VSF) stack. Range: 1 to 10. The primary switch is always member 1. If the switch is not a member of a VSF stack, then member is 1.
- *slot*: Always 1. This is not a modular switch, so there are no slots.
- *port*: Physical number of a port on the switch.

For example, the logical interface `1/1/4` in software is associated with physical port 4 on member 1.

On the 6400 Switch Series

- *member*: Always 1. VSF is not supported on this switch.
- *slot*: Specifies physical location of a module in the switch chassis.
  - Management modules are on the front of the switch in slots 1/1 and 1/2.
  - Line modules are on the front of the switch starting in slot 1/3.
- *port*: Physical number of a port on a line module.

For example, the logical interface `1/3/4` in software is associated with physical port 4 in slot 3 on member 1.

On the 83xx, 9300, and 10000 Switch Series

- *member*: Always 1. VSF is not supported on this switch.
- *slot*: Always 1. This is not a modular switch, so there are no slots.
- *port*: Physical number of a port on the switch.

For example, the logical interface `1/1/4` in software is associated with physical port 4 on the switch.

If using breakout cables, the port designation changes to x:y, where x is the physical port and y is the lane when split to 4 x 10G or 4 x 25G. For example, the logical interface 1/1/4:2 in software is associated with lane 2 on physical port 4 in slot 1 on member 1.

Identifying modular switch components

- Power supplies are on the front of the switch behind the bezel above the management modules. Power supplies are labeled in software in the format: *member/power supply*:
  - *member*: 1.
  - *power supply*: 1 to 4.
- Fans are on the rear of the switch and are labeled in software as: *member/tray/fan*:
  - *member*: 1.
  - *tray*: 1 to 4.
  - *fan*: 1 to 4.

- Fabric modules are not labeled on the switch but are labeled in software in the format: *member/module*:
  - *member*: 1.
  - *member*: 1 or 2.
- The display module on the rear of the switch is not labeled with a member or slot number.

Virtual Routing and Forwarding (VRF) is a Layer 3 level isolation used to achieve Virtual Private Network (VPN). VRF provides overlapping IPs to present and also isolate the routing table from other VPNs in the system.

VRF is a technology that allows multiple instances of a routing table to co-exist within the same router. Because the routing instances are independent, the same or overlapping IP addresses can be used without conflicting with each other. Network functionality is improved because network paths can be segmented without requiring multiple routers.

Adding or deleting a VRF

Prerequisites

You must be in the global configuration context, as indicated by the `config` prompt.

Procedure

To configure a VRF, enter the following command.

```
vrf  <vrf-name>
```

Where *<vrf-name>* is the name of the VRF, up to 32 alphanumeric characters.

The `no` form of the command deletes the VRF and will remove all the configurations from the interfaces which are part of the deleted VRF and move those interfaces to the default VRF.

See the following examples:

```
switch(config)# vrf test
```

```
switch(config)# no vrf test
```

Related topic: vrf (command reference)

IPv4 static route addition or deletion in a VRF

Prerequisites

You must be in the global configuration context, as indicated by the `config` prompt.

Procedure

To add an IPv4 static route to a VRF, enter the following command.

```
ip route <dest-ipv4-addr>/<netmask> {<gateway-ip>|<interface>} vrf [<vrf-name>]
```

Where

<dest-ipv4-addr>/<netmask>

Specifies the route destination IP address and the network mask length for the destination.

<gateway-ip>|<interface>

Specifies the gateway as either an IP address or an interface.

<vrf-name>

Specifies the VRF name. If no *<vrf-name>* is specified the route is applied to the default VRF.

Use the `no` form of the command to remove an IPv4 static route from the VRF.

See the following example:

```
switch(config)# ip route 20.0.0.0/24 10.0.0.1 vrf test
switch(config)# ip route 20.0.0.0/24 1/1/5 vrf test
```

```
switch(config)# no ip route 20.0.0.0/24 10.0.0.1 vrf test
```

Related topic: ip route vrf (command reference)

IPv6 static route addition or deletion in a VRF

Prerequisites

You must be in the global configuration context, as indicated by the `config` prompt.

Procedure

To add an IPv6 static route to a VRF, enter the following command.

`ipv6 route <dest-ipv6-addr>/<prefix> {<gateway-ip>|<interface>} vrf [<vrf-name>]`

Where

<dest-ipv6-addr>/<prefix>

Specifies the route destination IPv6 address and the network prefix for the destination. For example, `120::/124`.

<gateway-ip>|<interface>

Specifies either the gateway as either an IPv6 address or an interface.

<vrf-name>

Specifies the VRF name. The name can be up to 32 alphanumeric characters. If no *<vrf-name>* is specified the route is applied to the default VRF.

Use the `no` form of the command to delete an IPv6 static route from a VRF.

See the following examples:

```
switch(config)# ipv6 route 120::/124 121::2 vrf test
switch(config)# ipv6 route 120::/124 1/1/9 vrf test
```

```
switch(config)# no ipv6 route 120::/124 121::2 vrf test
```

Related topics: ipv6 route vrf (command reference)

Attaching or detaching a port from a VRF

Prerequisites

You must be in the interface configuration context (`config-if`), or the VLAN interface configuration context (`config-vlan-if`), or the LAG interface configuration context (`config-lag-if`).

Procedure

To attach a port to a VRF, enter the following command in the required context.

```
vrf attach <vrf-name>
```

Where *<vrf-name>* is the name of the VRF, up to 32 alphanumeric characters.

The `no` form of the command detaches the port from the named VRF and will remove all configurations from the port and attach the port to the default VRF.

See the following examples:

```
switch(config)# interface 1/1/1
switch(config-if)# vrf attach test
```

```
switch(config)# vlan 3
switch(config-vlan)# exit
switch(config)# interface vlan 3
switch(config-if-vlan)# vrf attach test
```

Related topic: vrf attach (command reference)

Viewing VRF information

Prerequisites

These commands are in the switch context, executed at the `switch#` prompt.

Procedure

To view various aspects of VRF information, use the following commands.

- To view VRF configuration and status information:

```
show vrf <VRF-NAME>
```

- To view all configured commands including VRF configuration:

```
show running-config
```

For command details and examples, see the following:

- show vrf
- An example of the VRF information provided by the show running-config command

An example of the VRF information provided by the show running-config command

When a VRF is configured, the output of the `show running-config` command includes information about the VRF configuration.

Example

```
switch# show running-config
Current configuration:
!
!Version AOS-CX 10.0X.XXXX
!
lldp enable
timezone set utc
vrf new
vrf test
!
!
!
aaa authentication login default local
aaa authorization commands default none
!
!
!
!
vlan 1
    no shutdown
interface 1/1/1
    no shutdown
    vrf attach test
    ip address 20.0.0.2/24
    ipv6 address 120::1/124
interface 1/1/2
    no shutdown
    vrf attach new
    ip address 30.0.0.1/24
    ipv6 address 121::1/124
```

VRF commands

ip route vrf

```
ip route <DEST-IPV4-ADDR>/<MASK> [<NEXT-HOP-IP-ADDR>|<INTERFACE>|reject|nullroute]
   vrf <VRF-NAME>
no ip route <DEST-IPV4-ADDR>/<MASK> [<NEXT-HOP-IP-ADDR>|<INTERFACE>|reject|nullroute]
   vrf <VRF-NAME>
```

Description

Adds the destination IPv4 static route on the specified VRF. If no *<VRF-NAME>* is specified the route is applied to the default VRF.

The `no` form of this command removes the IPv4 static route from the VRF.

Parameter	Description
<DEST-IPV6-ADDR>	Specifies the route destination in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255.
<MASK>	Specifies the number of bits in the address mask in CIDR format (`x`), where `x` is a decimal number from 0 to 128.
<NEXT-HOP-IP-ADDR>	Specifies the next hop in IPv4 format (`x.x.x.x`), where `x` is a

Parameter	Description
	decimal number from 0 to 255.
<INTERFACE>	Specifies the next hop as an outgoing interface.
`nullroute`	Silently discards packets to the destined route.
`reject`	Discards packets to the destined route and returns an ICMP error to the sender.
`vrf` *<VRF-NAME>*	Specifies a VRF name.

Examples

```
switch(config)# ip route 20.0.0.0/8 10.20.30.44 vrf myvrf
switch(config)# ip route 20.1.2.0/24 1/1/30 vrf myvrf
switch(config)# ip route 1.2.3.4/32 nullroute vrf myvrf
switch(config)# ip route 1.2.3.4/32 reject vrf myvrf
```

```
switch(config)# no ip route 20.0.0.0/8 10.20.30.44 vrf myvrf
```

Command History

Release	Modification
10.10	Inclusive language update.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

ipv6 route gc interval

`ipv6 route-gc-interval` *<INTERVAL>*
`no ipv6 route-gc-interval`

Description

Sets the garbage collection interval timer to remove invalid or old route entries from kernel route cache.

The `no` form of this command resets the garbage collection interval timer to default (30 seconds).

Parameter	Description
<INTERVAL>	Specifies time interval in seconds. Range: 30 to 600. Default: 30.

Examples

Setting garbage collection interval timer to 300:

```
switch(config)# ipv6 route-gc-interval 300
```

Command History

Release	Modification
10.10	Command introduced

Command Information

Platforms	Command context	Authority
6300 6400 8325 8360	config	Administrators or local user group members with execution rights for this command.

ipv6 route vrf

```
ipv6 route <DEST-IPV6-ADDR>/<PREFIX> [<NEXT-HOP-IP-ADDR>|<INTERFACE>|reject|nullroute] vrf
<VRF-NAME>
no ipv6 route <DEST-IPV6-ADDR>/<PREFIX> [<NEXT-HOP-IP-ADDR>|<INTERFACE>|reject|nullroute]
vrf <VRF-NAME>
```

Description

Adds an IPv6 static route in the specified VRF. If no *<VRF-NAME>* is specified it is added to the default VRF.

The no form of this command removes an IPv6 static route from the VRF.

Parameter	Description
<DEST-IPV6-ADDR>	Specifies an IP address in IPv6 format (xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx), where x is a hexadecimal number from 0 to F.
<MASK>	Specifies the number of bits in the address mask in CIDR format (x), where x is a decimal number from 0 to 128.
<NEXT-HOP-IP-ADDR>	Specifies the next hop in IPv6 format (xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx), where x is a hexadecimal number from 0 to F.
<INTERFACE>	Specifies the next hop as an outgoing interface.

Parameter	Description
`nullroute`	Specifies that packets matching the destination prefix are silently discarded and no ICMP error notification is sent to the sender.
`reject`	Specifies that packets matching the destination prefix are discarded and an ICMP error notification is sent to the sender.
`vrf <VRF-NAME>`	Specifies the name of a VRF. Default: default.

Examples

```
switch(config)# ipv6 route 120::/124 121::2 vrf test
switch(config)# ipv6 route 121::/124 1/1/9 vrf test
switch(config)# ipv6 route 122::/124 nullroute vrf test
switch(config)# ipv6 route 123::/124 reject vrf test
```

```
switch(config)# no ipv6 route 120::/124 121::2 vrf test
```

Command History

Release	Modification
10.10	Inclusive language update.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

show ip route

`show ip route [<A.B.C.D> | <A.B.C.D/M> | all-vrfs | bgp | connected | local | ospf | static | summary | vrf <VRF-NAME>] [vsx-peer]`

Description

Displays IPv4 route tables.

Parameter	Description
<A.B.C.D>	Display longest prefix match.

Parameter	Description
<A.B.C.D/M>	Display exact route match.
all-vrfs	Display information for all VRFs.
bgp	Display bgp routes only.
connected	Display connected routes only.
local	Display local routes only.
ospf	Display ospf routes only.
static	Display static routes only.
summary	Display the aggregate count of routes per routing protocol.
vrf *<vrf-name>*	Specify a VRF by VRF name (if no *<VRF-NAME>* is specified, the default VRF is implied.
vsx-peer	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

Showing IPv4 route tables:

```
switch# show ip route

Displaying ipv4 routes selected for forwarding

'[x/y]' denotes [distance/metric]

10.0.0.0/24, vrf default
        via  vlan2,  [0/0],  connected
10.0.0.1/32, vrf default
        via  vlan2,  [0/0],  local
10.100.11.0/24, vrf default
        via  vlan1,  [0/0],  connected
10.100.11.82/32, vrf default
        via  vlan1,  [0/0],  local
20.0.0.0/24, vrf default
        via  10.0.0.2,  [1/0],  static
20.0.1.0/24, vrf default
        via  10.0.0.2,  [1/0],  static
20.0.2.0/24, vrf default
        via  vlan1,  [1/0],  static
20.0.4.0/24, vrf default
        nullroute,  [1/0],  static
20.0.5.0/24, vrf default
        reject route,  [1/0],  static
```

Showing IPv4 route tables for the test VRF:

```
switch# show ip route vrf test

Displaying ipv4 routes selected for forwarding

'[x/y]' denotes [distance/metric]

30.0.0.0/24,  1 (nullroute) next-hops
        via  30.0.0.2,  [0/0],  connected
90.0.0.0/24,  1 unicast next-hops
        via  30.0.0.1,  [1/0],  static
90.0.1.0/24,  1 unicast next-hops
        via  1/1/2,  [1/0],  static
90.0.3.0/24, nullroute, 1, [1/0], static
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show ipv6 route

`show ipv6 route [<X.X.X.X> | <X.X.X.X/M> | all-vrfs | bgp | connected | local | ospf | static | summary | vrf <vrf-name>] [vsx-peer]`

Description

Displays IPv6 route tables.

Parameter	Description
<X.X.X.X>	Display exact route match.
<X.X.X.X/M>	Display exact route match.
`all-vrfs`	Display information for all VRFs.
`bgp`	Display bgp routes only.
`connected`	Display connected routes only.
`local`	Display local routes only.

Parameter	Description
ospf	Display ospf routes only.
static	Display static routes only.
summary	Display the aggregate count of routes per routing protocol.
vrf *<vrf-name>*	Specify a VRF by VRF name (if no *<VRF-NAME>* is specified, the default VRF is implied.
vsx-peer	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Example

Showing IPv6 route tables:

```
switch# show ipv6 route

Displaying ipv6 routes selected for forwarding

'[x/y]' denotes [distance/metric]

1000::/64, vrf default
        via  vlan2,  [0/0],  connected
1000::1/128, vrf default
        via  vlan2,  [0/0],  local
2000::/64, vrf default
        via  vlan2,  [1/0],  static
2001::/64, vrf default
        via  1000::2,  [1/0],  static
3000:2301::/64, vrf default
        nullroute,  [1/0],  static
4000:2301::/64, vrf default
        reject route,  [1/0],  static
```

Command History

Release	Modification
10.10	Inclusive language update.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

Platforms	Command context	Authority
9300 10000		

show vrf

```
show vrf <VRF-NAME>
show vrf
```

Description

Displays the status and attached interfaces for the specified VRF instance.

The `show vrf` command shows this information for all the VRFs.

Parameter	Description
<VRF-NAME>	Specifies the VRF name. Length: Up to 32 alphanumeric characters.

Examples

Showing VRF information for the test VRF:

```
switch# show vrf test
VRF Configuration:
------------------
VRF Name   : test
        Interfaces              Status
        ----------------------------
        1/1/29                    up
        1/1/30                    up
```

Showing VRF information for all VRFs:

```
switch# show vrf
VRF Configuration:
------------------
VRF Name   : default
        Interfaces              Status
        ----------------------------

VRF Name   : red
        Interfaces              Status
        ----------------------------
        1/1/32                    up

VRF Name   : test
        Interfaces              Status
        ----------------------------
        1/1/29                    up
        1/1/30                    up
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

vrf

```
vrf <VRF-NAME>
no vrf <VRF-NAME>
```

Description

Creates a VRF instance named *<VRF-NAME>* and then enters its context. Use `default` for *<VRF-NAME>* to enter the default VRF configure context.

Except for the default VRF, the `no` form of the command deletes the named VRF instance and any IP configuration for interfaces or SVI linked to default VRF. The default VRF cannot be deleted and a warning is given if attempted. To erase the Route-Distinguisher and Route-Targets, enter the default VRF context and delete them manually one by one.

Parameter	Description
<VRF-NAME>	Specifies the VRF name. Range: Up to 32 alphanumeric characters. The `mgmt` VRF cannot be used.

Examples

Creating the VRF named **cust_A** and then entering its context:

```
switch(config)# vrf cust_A
```

Entering the **default** VRF context:

```
switch(config)# vrf default
```

Deleting the VRF named **test**:

```
switch(config)# no vrf test
```

Command History

Release	Modification
10.09	Added default VRF information.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

vrf attach

```
vrf attach <VRF-NAME>
no vrf attach <VRF-NAME>
```

Description

Attaches the interface to the VRF with the name *<VRF-NAME>*. The command can be entered in several different command contexts.

The `no` form of the command detaches the interface from the named VRF and will remove all configurations from the interface and attach the interface to the default VRF. A warning message is displayed that prompts you whether to proceed: `All Layer 3 configurations associated with the VRF will be deleted. Continue (y/n)?`

Parameter	Description
<VRF-NAME>	Specifies the VRF name. Required. Length: Up to 32 alphanumeric characters.

Examples

```
switch(config)# interface 1/1/29
switch(config-if)# vrf attach test
```

```
switch(config)# vlan 3
switch(config-vlan)# exit
switch(config)# interface vlan 3
switch(config-if-vlan)# vrf attach test
```

```
switch(config)# vrf test
switch(config)# interface lag 3
switch(config-lag-if)# no shutdown
switch(config-lag-if)# vrf attach test
```

```
switch(config)# interface 1/1/29
switch(config-if)# no vrf attach test
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if config-if-vlan config-lag-if config-gre-if	Administrators or local user group members with execution rights for this command.

A loopback interface is a virtual interface supporting IPv4/IPv6 address configuration. The loopback interface can be considered stable because once created, it remains up. The loopback interface can then be configured with an address to use as a reference or identifier independent of the physical interfaces.

- **Device identification**: As long as the router is operational, the state of the loopback interface is always up. Even if only one link to the router is active, the loopback interface can be reached. This functionality makes it possible to identify an active device in the network using the IP address configured on the loopback interface.
- **Routing**: Since the loopback interface is always active, a routing session (such as a BGP session) can continue on an alternate path even if the outbound interface fails. In OSPF, a loopback interface address is advertised as an interface route into the network. This functionality increases reliability by allowing traffic to take alternate paths if there is a link failure. In OSPF and BGP, the router ID can be set to the loopback address to avoid reassignment of the router ID when physical interfaces are added or removed.
- **Device management**: Loopback interface is always reachable and can be used for sending and receiving management information such as logs and SNMP traps without interruption.

Loopback commands

interface loopback

```
interface loopback <INSTANCE>
no interface loopback <INSTANCE>
```

Description

Creates a loopback interface and enters loopback configuration mode.

The `no` form of this command deletes a loopback interface.

Parameter	Description
<INSTANCE>	Selects the loopback interface ID. Range: 0 to 255

Examples

```
switch(config)# interface loopback 1
switch(config-loopback-if)#
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	`config`	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

ip address

```
ip address <IPV4-ADDR/MASK> [secondary]
no ip address <IPV4-ADDR/MASK> [secondary]
```

Description

Sets the IPv4 address for a loopback interface.

The `no` form of this command reverses the set of the IPv4 address for a loopback interface.

Parameter	Description
<IPV4-ADDR>	Specifies an IP address in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255.
<MASK>	Specifies the number of bits in the address mask in CIDR format (`x`), where `x` is a decimal number from 0 to 128.
secondary	Indicates that the IPv4 address is a secondary address.

Examples

```
switch(config)# interface loopback 1
switch(config-loopback-if)# ip address 16.93.50.2/24
switch(config-loopback-if)# ip address 20.1.1.1/24 secondary
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	`config`	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

ipv6 address

```
ipv6 address <IPV6-ADDR/MASK>
```

Description

Sets the IPv6 address for a loopback interface.

Parameter	Description
<IPV6-ADDR>	Specifies an IP address in IPv6 format (`xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx`), where `x` is a hexadecimal number from 0 to F.
<MASK>	Specifies the number of bits in the address mask in CIDR format (`x`), where `x` is a decimal number from 0 to 128.

Examples

```
switch(config)# interface loopback 1
switch(config-loopback-if)# ipv6 address fd00:5708::f02d:4df6/64
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	`config`	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

vrf attach

```
vrf attach <VRF-NAME>
no vrf attach <VRF-NAME>
```

Description

Attaches a non-default VRF to a loopback.

The `no` form of this command deletes a non-default VRF from a loopback and reattaches the default VRF.

Parameter	Description
<VRF-NAME>	Specifies the name of the non-default VRF to be attached/deleted to/from a loopback.

Examples

```
switch(config)# interface loopback 1
switch(config-loopback-if)#vrf attach test
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show interface loopback

```
show interface loopback [brief | instance <ID>] [vsx-peer]
```

Description

This command displays the configuration and status of loopback interfaces.

Parameter	Description
brief	Displays brief information about all configured loopback interfaces.
instance *<ID>*	Displays the configuration and status of a loopback interface ID. Range: 1-255
vsx-peer	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

```
switch# show interface loopback

 Interface loopback1 is up
 IPv4 address 192.168.1.1/24

 Interface loopback2 is up
 IPv4 address 182.168.1.1/24
```

```
switch# show interface loopback brief

------------------------------------------------------------------------
Loopback      IP Address                                  Status
Interface
------------------------------------------------------------------------
```

```
loopback1   10.1.1.1/24                                          up
loopback1   1111:2222:3333:4444::6666/128                        up
```

```
switch# show interface loopback 1
 Interface loopback1 is up
 IPv4 address 192.168.1.1/24
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

Static routes are manually configured. If the network topology is simple enough, you can use static routes for the network's routing requirements. The proper configuration and usage of static routes can improve network performance and ensure bandwidth for important network applications.

The disadvantage of using static routes is that they cannot adapt to network topology changes. If a fault or topological change occurs in the network, the relevant routes will be unreachable and a network administrator must modify the static routes manually.

Default route

Without a default route, a packet that does not match any routing entries is discarded and an ICMP destination-unreachable packet is sent to the source. A default route is used to forward packets that do not match any routing entry.

The network administrator can configure a default route with the destination as 0.0.0.0 and the mask as 0. The router forwards any packet whose destination address fails to match any entry in the routing table to the next hop of the default static route.

Recursive static routes

A recursive static route is a route for which the next hop is learned from another routing look up (for example, dynamic protocol or from another another static route). For example, the following commands create an unsupported recursive static route:

- `ip route 99.0.0.0/24 30.0.0.2` - Main static route with gateway 30.0.0.2.
- `ip route 30.0.0.0/24 20.0.0.2` - Static route to reach the nexthop of the previously configured route.

Configuration concepts

Before configuring a static route, you must understand the following concepts:

- **Destination address and mask:** In the `ip route` command, an IPv4 address is in dotted-decimal format. A mask can be in the form of mask length - the number of consecutive 1s in the mask.
- **Output interface and next hop address:** When configuring a static route, specify the output interface or next hop address. The next hop address cannot be a local interface IP address or the route configuration will not take effect.
  - 

    Note: On the 6300 and 6400 switch series and the 8360 switch series, static routes can be configured with L3 interfaces like route-only-ports, L3 lags, SVIs, hydra-ports and sub-interfaces as nexthop.

- **Other attributes**: You can configure different priorities and administrative distance for different static routes to make route management policies more flexible. For example, specifying the same priority for

different routes to the same destination enables load sharing, but specifying different priorities for these routes enables route backup.

Configuration example procedure

Before configuring a static route, complete the following tasks:

- Configure the physical parameters for related interfaces.
- Configure the link-layer attributes for related interfaces.
- Configure the IP addresses for related interfaces.

The number of IPv4 and IPv6 static routes that can be configured is limited to 16K combined.

For the 6300 and 6400 Switch Series, the number of route prefixes can be stored in the routing table, depending on the prefix mask length (data set) being used (for example, /8, /16, /24, etc.). These switches do not support IPv6 addresses with prefixes greater than 64, and for prefixes between 65 and 127 will be software-forwarded.

Basic static route configuration example

The IP addresses and masks of the switches and hosts are displayed here. Static routes are required for interconnection between any two hosts.

Procedure

1. Configure IP addresses for interfaces (details not shown).
2. Configure static routes.
   a. Configure a default route on Switch A.
   ```
   6300# config
   6300(config)#
   <SwitchA> config
   [SwitchA] ip route 0.0.0.0/0 1.1.4.2
   ```
   b. Configure two static routes on Switch B.
   ```
   <SwitchB> config
   [SwitchB] ip route 1.1.2.0/24 1.1.4.1
   [SwitchB] ip route 1.1.3.0/24 1.1.5.6
   ```
   c. Configure a default route on Switch C.
   ```
   6300# config
   6300(config)#
   [SwitchC] ip route 0.0.0.0/0 1.1.5.5
   ```
3. Configure the hosts. The default gateways for hosts A, B, and C are `1.1.2.3`, `1.1.6.1`, and `1.1.3.1`. The configuration procedure is not shown.
4. Display the configuration.
   a. Display the IP routing table of Switch A.
   b. Display the IP routing table of Switch B.
   c. Use the `ping` command on Host B to check the reachability of Host A, assuming Windows XP runs on the two hosts.
   ```
   C:\Documents and Settings\Administrator>ping 1.1.2.2
   Pinging 1.1.2.2 with 32 bytes of data:
   Reply from 1.1.2.2: bytes=32 time=1ms TTL=255
   Reply from 1.1.2.2: bytes=32 time=1ms TTL=255
   Reply from 1.1.2.2: bytes=32 time=1ms TTL=255
   Reply from 1.1.2.2: bytes=32 time=1ms TTL=255
   15
   ```

```
Ping statistics for 1.1.2.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 1ms, Maximum = 1ms, Average = 1ms
```

d. Use the traceroute command on Host B to check the reachability of Host A.

```
8320# traceroute
traceroute  Trace the IPv4 route to a device on the network
traceroute6 Trace the IPv6 route to a device on the network
8320# traceroute
A.B.C.D Enter IPv4 address of the device to traceroute
WORD  Enter host name oo fthe device to traceroute
8320# traceroute
```

Static routing commands

ip route

```
ip route <DEST-IPV4-ADDR>/<NETMASK> {<NEXTHOP-ADDR> | <NEXTHOP-PORT-LAG-VLAN> | reject |
   nullroute}
no ip route <DEST-IPV4-ADDR>/<NETMASK> {<NEXTHOP-ADDR> | <NEXTHOP-PORT-LAG-VLAN> | reject |
   nullroute}
```

Description

Adds an IPv4 static route on the default VRF.

The `no` form of this command deletes a IPv4 static route.

You can configure a maximum of 32 next hops per route.

Parameter	Description
<DEST-IPV4-ADDR>/<NETMASK>	Specifies the IPv4 route destination.
<NEXTHOP-ADDR>	Specifies the next hop address for reaching the destination in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255.
<NEXTHOP-PORT-LAG-VLAN>	Specifies the next hop as an outgoing interface.
`nullroute`	Specifies that packets matching the destination route are silently discarded and no ICMP error notification is sent to the sender.
`reject`	Specifies that packets matching the destination route are discarded and an ICMP error notification is sent to the sender.

Examples

On the 6400 Switch Series, interface identification differs.

```
switch(config)# ip route 10.0.0.0/24 nullroute
switch(config)# ip route 10.0.1.0/24 reject
switch(config)# ip route 10.0.2.0/24 20.0.0.2
switch(config)# ip route 10.0.3.0/24 1/1/1
switch(config)# ip route 10.0.3.0/24 1/1/1.110
```

Command History

Release	Modification
10.10	Inclusive language update.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	`config`	Administrators or local user group members with execution rights for this command.

ip route bfd

```
ip route <DEST-IPV4-ADDR>/<NETMASK> [<NEXT-HOP-IP-ADDR> | <INTERFACE>] [bfd]
no ip route <DEST-IPV4-ADDR>/<NETMASK> [<NEXT-HOP-IP-ADDR> | <INTERFACE>] [bfd]
```

Description

Enables or disables BFD on the specified static route. To disable BFD, issue the command without the `bfd` option.

Parameter	Description
<DEST-IPV4-ADDR>	Specifies a route destination in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255.
<NETMASK>	Specifies the number of bits in the address mask in CIDR format (`x`), where `x` is a decimal number from 0 to 128.
<NEXT-HOP-IP-ADDR>	Specifies the next hop address for reaching the destination in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255.
<INTERFACE>	Specifies the next hop as an outgoing interface.
`bfd`	Enables BFD on the static route. Omit this parameter to disable BFD.

Examples

On the 6400 Switch Series, interface identification differs.

Enabling BFD on a static route:

```
switch(config)# interface 1/1/1
switch(config-if)# ip address 20.1.1.2/24
switch(config-if)# no shutdown
switch(config-if)# routing
switch(config-if)# exit
switch(config)# ip route 192.0.0.0/8 20.1.1.1 bfd
```

Disabling BFD on a static route:

```
switch(config)# ip route 192.0.0.0/8 20.1.1.1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Administrators or local user group members with execution rights for this command.

ip route distance

```
ip route <DEST-IPV4-ADDR>/<NETMASK> [<NEXT-HOP-IP-ADDR>|<INTERFACE>] distance <VALUE>
no ip route <DEST-IPV4-ADDR>/<NETMASK> [<NEXT-HOP-IP-ADDR>|<INTERFACE>] distance <VALUE>
```

Description

Configures the administrative distance for the IPv4 static route.

The no form of this command deletes the static route.

Parameter	Description
<DEST-IPV4-ADDR>>	Specifies an IP address in IPv4 format (x.x.x.x), where x is a decimal number from 0 to 255.
<MASK>	Specifies the number of bits in the address mask in CIDR format (x), where x is a decimal number from 0 to 32.
<NEXT-HOP-IP-ADDR>	Specifies the next hop IPv4 address in IPv4 format (x.x.x.x), where x is a decimal number from 0 to 255.
<INTERFACE>	Specifies the next hop as an outgoing interface.
distance *<VALUE>*	Specifies the administrative distance to associate with this static route. Default: 1. Range: 1-255.

Examples

```
switch(config)# ip route 10.0.2.0/24 20.0.0.2 distance 4
switch(config)# ip route 10.0.3.0/24 1/1/1 distance 6
```

```
switch(config)# no ip route 10.0.3.0/24 1/1/1 distance 6
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Administrators or local user group members with execution rights for this command.

ip route tag

```
ip route <DEST-IPV4-ADDR>/<NETMASK> {<NEXTHOP-ADDR> | <NEXTHOP-PORT-LAG-VLAN> | reject |
   nullroute} [tag] <1-4294967295>
no ip route <DEST-IPV4-ADDR>/<NETMASK> {<NEXTHOP-ADDR> | <NEXTHOP-PORT-LAG-VLAN> | reject |
   nullroute} [tag] <1-4294967295>
```

Description

Configures tag for IPv4 static route.

The `no` form of this command deletes tag for IPv4 static route.

Parameter	Description
<DEST-IPV4-ADDR>/<NETMASK>	Specifies the IPv4 route destination.
<NEXTHOP-ADDR>	Specifies the next hop address for reaching the destination in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255.
<NEXTHOP-PORT-LAG-VLAN>	Specifies the next hop as an outgoing interface.
`reject`	Specifies that packets matching the destination route are discarded and an ICMP error notification is sent to the sender.
`nullroute`	Specifies that packets matching the destination route are silently discarded and no ICMP error notification is sent to the sender.
`tag`	Specifies and assigns tag for the route.

Examples

```
switch(config)# ip route 10.1.1.1/32 20.1.1.2 tag 10
switch(config)# ip route 10.1.1.5/32 1/1/1 tag 20
```

```
switch(config)# no ip route 10.1.1.1/32 20.1.1.2 tag 10
switch(config)# no route 10.1.1.5/32 1/1/1 tag 20
```

Command History

Release	Modification
10.10	Inclusive language update.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	`config`	Administrators or local user group members with execution rights for this command.

ip route vrf

```
ip route <DEST-IPV4-ADDR>/<MASK> [<NEXT-HOP-IP-ADDR>|<INTERFACE>|reject|nullroute]
   vrf <VRF-NAME>
no ip route <DEST-IPV4-ADDR>/<MASK> [<NEXT-HOP-IP-ADDR>|<INTERFACE>|reject|nullroute]
   vrf <VRF-NAME>
```

Description

Adds the destination IPv4 static route on the specified VRF. If no *<VRF-NAME>* is specified the route is applied to the default VRF.

The `no` form of this command removes the IPv4 static route from the VRF.

Parameter	Description
<DEST-IPV6-ADDR>	Specifies the route destination in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255.
<MASK>	Specifies the number of bits in the address mask in CIDR format (`x`), where `x` is a decimal number from 0 to 128.
<NEXT-HOP-IP-ADDR>	Specifies the next hop in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255.
<INTERFACE>	Specifies the next hop as an outgoing interface.
`nullroute`	Silently discards packets to the destined route.
`reject`	Discards packets to the destined route and returns an ICMP error to the sender.
`vrf` *<VRF-NAME>*	Specifies a VRF name.

Examples

```
switch(config)# ip route 20.0.0.0/8 10.20.30.44 vrf myvrf
switch(config)# ip route 20.1.2.0/24 1/1/30 vrf myvrf
switch(config)# ip route 1.2.3.4/32 nullroute vrf myvrf
switch(config)# ip route 1.2.3.4/32 reject vrf myvrf
```

```
switch(config)# no ip route 20.0.0.0/8 10.20.30.44 vrf myvrf
```

Command History

Release	Modification
10.10	Inclusive language update.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Administrators or local user group members with execution rights for this command.

ipv6 route

```
ipv6 route <DEST-IPV6-ADDR>/<NETMASK> {<NEXTHOP-ADDR> | <NEXTHOP-PORT-LAG-VLAN> | reject |
   nullroute}
no ipv6 route <DEST-IPV6-ADDR>/<NETMASK> {<NEXTHOP-ADDR> | <NEXTHOP-PORT-LAG-VLAN> |
   reject | nullroute}
```

Description

Adds an IPv6 static route.

The no form of this command deletes an IPv6 static route on the default VRF.

Parameter	Description
<DEST-IPV6-ADDR>	Specifies the route destination in IPv6 format (xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx), where x is a hexadecimal number from 0 to F.
<NETMASK>	Specifies the number of bits in the address mask in CIDR format (x), where x is a decimal number from 0 to 128.
<NEXTHOP-ADDR>	Specifies the next hop in IPv6 format (xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx), where x is a hexadecimal number from 0 to F.
<NEXTHOP-PORT-LAG-VLAN>	Specifies the next hop as an outgoing interface.
reject	Specifies that packets matching the destination route are discarded and an ICMP error notification is sent to the sender.
nullroute	Specifies that packets matching the destination route are silently discarded and no ICMP error notification is sent to the sender.

Usage

On access switch series, IPv6 address with prefixes 65-127 will not be configured in the ASIC route table and will be software routed. These prefixes are recommended for transit network use only. Routing performance to local destination addresses on this network may be impacted.

Examples

On the 6400 Switch Series, interface identification differs.

```
switch(config)# ipv6 route 120::/124 nullroute
switch(config)# ipv6 route 121::/124 nullroute
switch(config)# ipv6 route 122::/124 1/1/1
switch(config)# ipv6 route 122::/124 1/1/1.110
```

```
switch(config)# no ipv6 route 122::/124 1/1/1.110
```

Command History

Release	Modification
10.10	Inclusive language update.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	`config`	Administrators or local user group members with execution rights for this command.

ipv6 route distance

`ipv6 route <DEST-IPV6-ADDR>/<MASK> [<NEXT-HOP-IP-ADDR>|<INTERFACE>] distance <VALUE>`
`no ipv6 route <DEST-IPV6-ADDR>/<MASK> [<NEXT-HOP-IP-ADDR>|<INTERFACE>] distance <VALUE>`

Description

Configures the administrative distance for the IPv6 static route

The `no` form of this command deletes the static route.

Parameter	Description
<DEST-IPV6-ADDR>	Specifies the route destination address in IPv6 format (`xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx`), where `x` is a hexadecimal number from 0 to F.
<MASK>	Specifies the number of bits in the address mask in CIDR format (`x`), where `x` is a decimal number from 0 to 128.
<NEXT-HOP-IP-ADDR>	Specifies the next hop in IPv6 format (`xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx`), where `x` is a

Parameter	Description
	hexadecimal number from 0 to F.
<INTERFACE>	Specifies the next hop as an outgoing interface.
`distance` *<VALUE>*	Specifies the administrative distance to associate with this static route. Range: 1 to 255. Default: 1.

Examples

On the 6400 Switch Series, interface identification differs.

```
switch(config)# ipv6 route 122::/124 1/1/1 distance 5
switch(config)# ipv6 route 123::/124 120::1 distance 6
```

```
switch(config)# no ipv6 route 123::/124 120::1 distance 6
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	`config`	Administrators or local user group members with execution rights for this command.

ipv6 route tag

```
ipv6 route <DEST-IPV6-ADDR>/<NETMASK> {<NEXTHOP-ADDR> | <NEXTHOP-PORT-LAG-VLAN> | reject |
   nullroute} [tag] <1-4294967295>
no ipv6 route <DEST-IPV6-ADDR>/<NETMASK> {<NEXTHOP-ADDR> | <NEXTHOP-PORT-LAG-VLAN> |
   reject | nullroute} [tag] <1-4294967295>
```

Description

Configures tag for IPv6 static route.

Parameter	Description
<DEST-IPV6-ADDR>	Specifies the route destination in IPv6 format (`xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx`), where `x` is a hexadecimal number from 0 to F.
<NETMASK>	Specifies the number of bits in the address mask in CIDR format (`x`), where `x` is a decimal number from 0 to 128.
<NEXTHOP-ADDR>	Specifies the next hop in IPv6 format

Parameter	Description
	(`xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx`), where `x` is a hexadecimal number from 0 to F.
<NEXTHOP-PORT-LAG-VLAN>	Specifies the next hop as an outgoing interface.
`reject`	Specifies that packets matching the destination route are discarded and an ICMP error notification is sent to the sender.
`nullroute`	Specifies that packets matching the destination route are silently discarded and no ICMP error notification is sent to the sender.
`tag`	Specifies and assigns tag for the route.

Examples

```
switch(config)# ipv6 route 3001::1/128 1/1/1 tag 10
switch(config)# ipv6 route 3002::1/128 1000::2 tag 20
```

```
switch(config)# no ipv6 route 3001::1/128 1/1/1 tag 10
switch(config)# no ipv6 route 3002::1/128 1000::2 tag 20
```

Command History

Release	Modification
10.10	Inclusive language update.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

show ipv4 rib

`show ip rib <FILTER> [vrf <VRF-NAME>]`

Description

Shows the IPv4 Routing Information Base (RIB) of VRF with name (`<VRF-NAME>`). If VRF name is not specified, default VRF routes are displayed.

Parameter	Description
<FILTER>	Selects filter, see Usage section.
`vrf <VRF-NAME>`	Specifies the VRF name.

Usage

There are sub-options available within this command:

- **A.B.C.D:** Shows longest prefix match.
- **A.B.C.D/M:** Shows exact route match.
- **all-vrfs:** Shows all VRF information.
- **bgp:** Shows BGP routes only.
- **connected:** Shows connected routes only.
- **local:** Shows local routes only.
- **ospf:** Shows OSPF routes only.
- **rip:** Shows RIP routes only.
- **static:** Shows static routes only.
- **summary:** Shows aggregate count of routes per routing protocol.
- **vrf:** Specifies the VRF name.
- **selected:** Shows routes selected for forwarding only.
- **non-selected:** Shows routes not selected for forwarding only.

Examples

Showing IPv4 routes in RIB:

```
Origin Codes: R - RIP, O - OSPFv2, B - BGP
              C - connected, S - static
Type Codes:   E - External BGP, I - Internal BGP, IA - OSPF inter area
              E1 - OSPF external type 1, E2 - OSPF external type 2
* indicates selected for forwarding

VRF: default

Prefix          Nexthop      Interface   VRF       Origin/ Distance/ Age
                                                     Type    Metric
-------------------------------------------------------------------------------
*10.0.0.0/30    -            1/1/1       -         S       [20/0]     0d:10h:01m:41s
*10.0.1.0/30    -            1/1/1       -         B/I     [200/0]    2d:20h:01m:42s
*10.1.64.0/18   -            loopback2   -         C       [0/0]      -
*10.2.64.0/18   10.0.0.3     lag1        -         O/E1    [110/25]   1d:05h:03m:43s
*10.2.64.0/18   20.10.0.1    vlan100     -         O/E1    [110/25]   0d:05h:03m:43s
*20.1.2.3/32    2.2.2.2      1/1/4       vrf_red   B/E     [20/0]     2d:10h:01m:45s
*30.1.3.0/24    -            reject      -         S       [1/0]      33d:10h:01m:43s
*50.10.13.0/24  -            reject      -         S       [1/0]      12d:10h:01m:44s
*61.1.1.2/32    4.4.4.4      1/1/5       -         B/I     [200/0]    1d:11h:01m:45s
*62.1.1.3/32    5.5.5.5      1/1/6       -         B/I     [200/0]    0d:12h:01m:45s
*193.0.0.2/32   50.0.0.2      1/1/2       -         S       [1/0]      0d:04h:01m:43s
 193.0.0.2/32   56.0.0.3      1/1/3       -         O/E1    [110/25]   0d:04h:03m:43s

Total Route Count : 13
```

Showing IPv4 exact route match in RIB:

```
show ip rib 10.0.0.0/30

VRF : default

Prefix          : 10.0.0.0/30           VRF(egress)        :  -
Nexthop         :  -                    Interface          :  1/1/1
Origin          : Connected             Type               :  -
Distance        : 0                     Metric             :  0
Age             : -                     Tag                :  0
Selected        : Yes                   Recursive Nexthop  :  No
```

Showing IPv4 RIB summary:

```
show ip rib summary

IPv4 RIB Table Summary

VRF name :      default
  Protocol      RIB Routes
--------------- -------------
connected      1010
local          1011
static         4
ospfv2         509
bgp            9014
selected       10008
non-selected   1518
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	Operator (>) or Manager (#)	Administrators or local user group members with execution rights for this command.

show ipv6 rib

`show ipv6 rib <FILTER> [vrf <VRF-NAME>]`

Description

Shows the IPv6 Routing Information Base (RIB) of VRF with name (`<VRF-NAME>`). If VRF name is not specified, default VRF routes are displayed.

Parameter	Description
<FILTER>	Selects filter, see usage section.
`vrf` *<VRF-NAME>*	Shows routes in the VRF and specifies VRF name.

Usage

There are sub-options available within this command:

- **X:X: :X:X:** Shows longest prefix match.
- **X:X: :X:X/M:** Shows exact route match.
- **all-vrfs:** Shows all VRF information.
- **bgp:** Shows BGP routes only.
- **connected:** Shows connected routes only.
- **local:** Shows local routes only.
- **ospf:** Shows OSPF routes only.
- **rip:** Shows RIP routes only.
- **static:** Shows static routes only.
- **summary:** Shows aggregate count of routes per routing protocol.
- **vrf:** Specifies the VRF name.
- **selected:** Shows routes selected for forwarding only.
- **non-selected:** Shows routes not selected for forwarding only.

Examples

Showing IPv6 routes in RIB:

```
Origin Codes: R - RIPng, O - OSPFv3, B - BGP
              C - connected, S - static
Type Codes:   E - External BGP, I - Internal BGP, IA - OSPF inter area
              E1 - OSPF external type 1, E2 - OSPF external type 2
* indicates selected for forwarding

VRF: default

Prefix               Nexthop     Interface  VRF    Origin/ Distance/ Age
                                                      Type    Metric
-------------------------------------------------------------------------------
*1000::/64           -           1/1/1      -      C       [0/0]     -
*1000::8/128         -           1/1/1      -      L       [0/0]     -
*1001:db8::/32       1000::10    1/1/1      -      B/I     [200/0]   1d:20h:01m:42s
*2000::/64           fe80::3182  vlan100    -      S       [1/0]     2d:05h:03m:43s
 2000::/64           fe80::1241  1/1/1      -      O/E1    [110/25]  0d:05h:03m:43s
*2000::2000:0:0:0/67 fe80::1111  lag1       Green  B/E     [20/0]    1d:10h:01m:45s
*3001::0/64          -           vlan100    -      C       [0/0]     -
*3001::1/128         -           vlan100    -      L       [0/0]     -
*6101::0/64          -           nullroute  -      S       [1/0]     12d:10h:01m:43s

Total Route Count : 9
```

Showing IPv6 exact route match in RIB:

```
show ipv6 rib 2000::2000:0:0:0

VRF : default

Prefix           : 2000::2000:0:0:0/67          VRF(egress)        :  Green
Nexthop          : fe80::1111                   Interface          :  lag1
Origin           : BGP                          Type               :  External
Distance         : 20                           Metric             :  0
Age              : 1d:10h:01m:45s               Tag                :  20
Selected         : Yes                          Recursive Nexthop  :  Yes
```

Showing IPv6 RIB summary:

```
show ipv6 rib summary

IPv6 RIB Table Summary

VRF name :  default
  Protocol      RIB Routes
-------------- -------------
connected      1009
local          1010
static         3
ospfv3         508
bgp            1013

selected       10004
non-selected   1527
```

Command History

Release	Modification
10.10	Inclusive language update.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	Operator (>) or Manager (#)	Administrators or local user group members with execution rights for this command.

ipv6 route vrf

```
ipv6 route <DEST-IPV6-ADDR>/<PREFIX> [<NEXT-HOP-IP-ADDR>|<INTERFACE>|reject|nullroute] vrf
<VRF-NAME>
no ipv6 route <DEST-IPV6-ADDR>/<PREFIX> [<NEXT-HOP-IP-ADDR>|<INTERFACE>|reject|nullroute]
vrf <VRF-NAME>
```

Description

Adds an IPv6 static route in the specified VRF. If no *<VRF-NAME>* is specified it is added to the default VRF.

The `no` form of this command removes an IPv6 static route from the VRF.

Parameter	Description
<DEST-IPV6-ADDR>	Specifies an IP address in IPv6 format (`xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx`), where `x` is a hexadecimal number from 0 to F.
<MASK>	Specifies the number of bits in the address mask in CIDR format (`x`), where `x` is a decimal number from 0 to 128.
<NEXT-HOP-IP-ADDR>	Specifies the next hop in IPv6 format (`xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx`), where `x` is a hexadecimal number from 0 to F.
<INTERFACE>	Specifies the next hop as an outgoing interface.
`nullroute`	Specifies that packets matching the destination prefix are silently discarded and no ICMP error notification is sent to the sender.
`reject`	Specifies that packets matching the destination prefix are discarded and an ICMP error notification is sent to the sender.
`vrf` *<VRF-NAME>*	Specifies the name of a VRF. Default: default.

Examples

```
switch(config)# ipv6 route 120::/124 121::2 vrf test
switch(config)# ipv6 route 121::/124 1/1/9 vrf test
switch(config)# ipv6 route 122::/124 nullroute vrf test
switch(config)# ipv6 route 123::/124 reject vrf test
```

```
switch(config)# no ipv6 route 120::/124 121::2 vrf test
```

Command History

Release	Modification
10.10	Inclusive language update.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

show ip route

```
show ip route [<A.B.C.D> | <A.B.C.D/M> | all-vrfs | bgp | connected | local | ospf | static
| summary | vrf <VRF-NAME>] [vsx-peer]
```

Description

Displays IPv4 route tables.

Parameter	Description
<A.B.C.D>	Display longest prefix match.
<A.B.C.D/M>	Display exact route match.
all-vrfs	Display information for all VRFs.
bgp	Display bgp routes only.
connected	Display connected routes only.
local	Display local routes only.
ospf	Display ospf routes only.
static	Display static routes only.
summary	Display the aggregate count of routes per routing protocol.
vrf *<vrf-name>*	Specify a VRF by VRF name (if no *<VRF-NAME>* is specified, the default VRF is implied.
vsx-peer	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

Showing IPv4 route tables:

```
switch# show ip route

Displaying ipv4 routes selected for forwarding

'[x/y]' denotes [distance/metric]

10.0.0.0/24, vrf default
        via  vlan2,  [0/0],  connected
10.0.0.1/32, vrf default
        via  vlan2,  [0/0],  local
10.100.11.0/24, vrf default
        via  vlan1,  [0/0],  connected
10.100.11.82/32, vrf default
        via  vlan1,  [0/0],  local
20.0.0.0/24, vrf default
        via  10.0.0.2,  [1/0],  static
20.0.1.0/24, vrf default
        via  10.0.0.2,  [1/0],  static
```

```
20.0.2.0/24, vrf default
        via  vlan1,  [1/0],  static
20.0.4.0/24, vrf default
        nullroute,  [1/0],  static
20.0.5.0/24, vrf default
        reject route,  [1/0],  static
```

Showing IPv4 route tables for the test VRF:

```
switch# show ip route vrf test

Displaying ipv4 routes selected for forwarding

'[x/y]' denotes [distance/metric]

30.0.0.0/24,  1 (nullroute) next-hops
        via  30.0.0.2,  [0/0],  connected
90.0.0.0/24,  1 unicast next-hops
        via  30.0.0.1,  [1/0],  static
90.0.1.0/24,  1 unicast next-hops
        via  1/1/2,  [1/0],  static
90.0.3.0/24, nullroute, 1, [1/0], static
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show ipv6 route

`show ipv6 route [<X.X.X.X> | <X.X.X.X/M> | all-vrfs | bgp | connected | local | ospf | static | summary | vrf <vrf-name>] [vsx-peer]`

Description

Displays IPv6 route tables.

Parameter	Description
<X.X.X.X>	Display exact route match.

Parameter	Description
<X.X.X.X/M>	Display exact route match.
all-vrfs	Display information for all VRFs.
bgp	Display bgp routes only.
connected	Display connected routes only.
local	Display local routes only.
ospf	Display ospf routes only.
static	Display static routes only.
summary	Display the aggregate count of routes per routing protocol.
vrf *<vrf-name>*	Specify a VRF by VRF name (if no *<VRF-NAME>* is specified, the default VRF is implied.
vsx-peer	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Example

Showing IPv6 route tables:

```
switch# show ipv6 route

Displaying ipv6 routes selected for forwarding

'[x/y]' denotes [distance/metric]

1000::/64, vrf default
        via  vlan2,  [0/0],  connected
1000::1/128, vrf default
        via  vlan2,  [0/0],  local
2000::/64, vrf default
        via  vlan2,  [1/0],  static
2001::/64, vrf default
        via  1000::2,  [1/0],  static
3000:2301::/64, vrf default
        nullroute,  [1/0],  static
4000:2301::/64, vrf default
        reject route,  [1/0],  static
```

Command History

Release	Modification
10.10	Inclusive language update.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

Chapter 5
Open Shortest Path First version 2 (OSPFv2)

Open Shortest Path First version 2 (OSPFv2) is a routing protocol described in RFC2328. It is a Link State-based IGP (Interior Gateway Protocol) routing protocol applied to routers grouped into OSPF areas identified by the routing configuration on each routing switch. It is widely used in medium to large-sized enterprise networks.

Overview

The characteristics of OSPFv2 are:

- Provides a loop-free topology using SPF algorithm.
- Allows hierarchical routing using area 0 (backbone area) as the top of the hierarchy.
- Supports load balancing with equal cost routes for the same destination.
- OSPFv2 is a classless protocol and allows for a hierarchical design with VLSM (Variable Length Subnet Masking) and route summarization.
- Provides authentication of routing messages.
- Scales easily using the concept of OSPF areas.
- Provides fast convergence with triggered, incremental updates via LSAs.

Some OSPFv2 configuration is done in the global configuration context, others in the router ospf context, or in the interface configuration context, or in the vlink context. OSPFv2 can be configured on L3 ports, VLAN interfaces, LAG interfaces, and loopback interfaces. All such configurations work in the mentioned interfaces context. OSPFv2 mandates the associated interface to be a routed interface.

Supported features

- OSPFv2 neighbor adjacency, Hello protocol, multiple areas, Inter-area routing
- AS external routes, stub areas, totally stubby areas, NSSA, ABR, ASBR
- Designated Router/Backup Designated Router
- Point-to-point interfaces/broadcast interfaces
- Virtual Links
- Bidirectional Forwarding Detection (BFD) - refer to the *High Availability Guide* for additional information
- Equal-cost multipath
- Null authentication, Simple password authentication, MD5 authentication
- Area range aggregation - Type-3/Type-7
- External route aggregation - Type-5 LSAs
- Graceful Restart - un-planned, restart interval, Graceful Restart Helper
- Stub router advertisement
- SPF throttling
- LSA Throttling
- SPF throttling

- Configuration of interface parameters such as priority, cost, hello-interval, dead-interval, retransmit-interval, transit-delay, etc.
- Configuration of virtual link parameters such as hello-interval, dead-interval, retransmit-interval, transit-delay, etc.
- Route redistribution
- Passive interfaces
- Multi VRF support with each VRF having up to eight OSPF process instances
- Congestion control (prioritizing hello packets, inactivity timer reset, and adjacency throttling)

How OSPFv2 protocol works

The protocol uses Link State Advertisements (LSAs) transmitted by each router to update neighboring routers regarding its interfaces and the routes available through those interfaces. Each routing switch in an area also maintains a link-state database (LSDB) that describes the area topology. (All routers in a given OSPF area have identical LSDBs.) The routing switches used to connect areas to each other flood summary link LSAs and external link LSAs to neighboring OSPF areas to update them regarding available routes. Through this means, each OSPF router determines the shortest path between itself and a desired destination router in the same OSPF domain (Autonomous System (AS)).

OSPFv2 concepts

The following sections describe OSPFv2 Link-State types, router types, and area types.

OSPFv2 Link-state advertisement (LSA) types

OSPFv2 sends routing information in Link-State Advertisements (LSAs). The switches support the following types of LSAs.

- **Router LSA—Type-1 LSA.** Describes the states of the router interfaces to an area, and is flooded throughout a single area only.
- **Network LSA—Type-2 LSA.** Describes the list of routers connected to the network, and is flooded throughout a single area only.
- **Summary LSA—Type-3 LSA.** Describes the route to networks in another OSPF area of the same Autonomous System (AS). Propagated through backbone area to other areas.
- **ASBR summary LSA—Type-4 LSA.** Describes the route to an ASBR in an OSPF normal or backbone area of the same AS. Propagated through backbone area to other areas.
- **AS external LSA—Type-5 LSA.** Describes the route to a destination in another AS (external route.) Originated by ASBR in normal or backbone areas of an AS and propagates through backbone area to other normal areas.
- **NSSA LSA—Type-7 LSA.** Describes the route to a destination in another AS (external route.) Originated by ASBR in NSSA. ABR converts type-7 LSAs to type-5 LSAs for injection into the backbone area.

OSPFv2 router types

The following router types are supported

Internal routers

Internal OSPFv2 routers belong to only one area. Internal routers flood type-1 LSAs to all routers in the same area and maintain identical LSDBs.

Area border routers (ABRs)

Area border routers have membership in multiple areas. ABRs are used to connect the various areas in an AS to the backbone area for that AS. Multiple ABRs can be used to connect a given area to the backbone, and a given ABR can belong to multiple areas other than the backbone.

An ABR maintains a separate LSDB for each area to which it belongs. (All routers within the same area have identical LSDBs.) The ABR is responsible for flooding summary LSAs between its border areas. You can reduce summary LSA flooding by configuring area ranges. An area range enables you to assign an aggregate address to a range of IP addresses. This aggregate address is advertised instead of all the individual addresses it represents.

Autonomous system boundary router (ASBR)

Autonomous system boundary routers run multiple interior gateway protocols and serve as a gateway to other autonomous systems operating with interior gateway protocols. The ASBR imports and translates different protocol routes into OSPF through redistribution. ASBRs can be used in backbone areas, normal areas, and NSSAs, but not in stub areas.

Designated routers (DRs)

In an OSPF network having two or more routers, one router is elected to serve as the DR and another router to act as the Backup Designated Router (BDR). All other routers in the area forward their routing information to the DR and BDR, and the DR forwards this information to all routers in the network. This action minimizes the amount of repetitive information that is forwarded on the network by eliminating the need for each individual router in the area to forward its routing information to all other routers in the network. If the area includes multiple networks, each network elects its own DR and BDR.

In an OSPF network with no DR and no BDR, the neighboring router with the highest priority is elected the DR, and the router with the next highest priority is elected the BDR. If the DR goes off-line, the BDR automatically becomes the DR, and the router with the next highest priority then becomes the new BDR. If multiple routing switches on the same OSPF network are declaring themselves DRs, both priority and router ID are used to select the DR and BDRs.

Priority is configurable using the `ip ospf priority` command at the interface level. If two neighbors share the same priority, the router with the highest router ID is elected as the DR. The router with the next highest router ID is elected as the BDR.

OSPFv2 area types

OSPFv2 is built upon a hierarchy of network areas. All areas for a given OSPF domain reside in the same AS. An AS is defined as a number of contiguous networks that share the same interior gateway routing protocol.

An AS can be divided into multiple areas. Each area represents a collection of contiguous networks and hosts, and the topology of a given area is not known by the internal routers in any other area. Areas define the boundaries to which types 1 and 2 LSAs are broadcast, which limits the amount of LSA flooding that occurs within the AS and also helps to control the size of the LSDBs maintained in OSPF routers. An area is represented in OSPF by either an IP address or a number. Area types include: Backbone, Normal, Not-so-stubby (NSSA), and stub.

Backbone area

Every AS must have one (and only one) backbone area (identified as area 0 or 0.0.0.0.) The ABRs of all other areas in the same AS connect to the backbone area, either physically through an ABR or through a configured virtual link. The backbone is a transit area that carries the type-3 summary LSAs, type-5 AS external link LSAs and routed traffic between non-backbone areas, as well as the type-1 and type-2 LSAs and routed traffic internal to the area. ASBRs are allowed in backbone areas.

Normal area

Normal area connects to the backbone area through one or more ABRs (physically or through a virtual link) and supports type-3 summary LSAs and type-5 external link LSAs to and from the backbone area. ASBRs are allowed in normal areas.

Stub area

Stub area connects to the AS backbone through one or more ABRs. It does not allow an internal ASBR, and does not allow external (type 5) LSAs. A stub area supports these actions:

- Advertise the area summary routes to the backbone area.
- Advertise summary routes from other areas.
- Use the default summary (type-3) route to advertise both of the following:
  - Summary routes to other areas in the AS
  - External routes to other ASs

You can configure the stub area ABR to do the following:

- Suppress advertising from some or all area summarized internal routes into the backbone area.
- Suppress LSA traffic from other areas in the AS by replacing type-3 summary LSAs and the default external route from the backbone area with the default summary route (0.0.0.0/0.)

Virtual links are not allowed for stub areas.

Not-so-stubby (NSSA) area

NSSA area connects to the backbone area through one or more ABRs. NSSAs are intended for use where an ASBR exists in an area where you want to control the following:

- Advertising the ASBR external route paths to the backbone area
- Allowing LSAs from the backbone area to advertise in the NSSA:
  - Summary routes (type-3 LSAs) from other areas
  - External routes (type-5 LSAs) from other areas as a default external route (type-7 LSAs)

Virtual links are not allowed for NSSAs.

OSPFv2 configuration task list

Tasks at a glance

- Configuring OSPF on the routing switch
- Assigning the routing switch to an OSPF area
- Setting OSPF network for the area
- Creating an OSPF virtual link for an area
- Configuring external route redistribution and control
- Configuring area ranges on an ABR to reduce advertisements to the backbone
- Influencing route choice by changing the administrative distance
- Configuring graceful restart of OSPF routing
- Configuring OSPF interface settings
- Configuring OSPF interface authentication

- Configuring OSPF virtual link settings
- Configuring OSPF authentication on a virtual link
- Configuring all OSPF interfaces as passive
- Viewing OSPFv2 information
- Clearing OSPF statistics on a switch

Configuring OSPF on the routing switch

Create the OSPF instance and enter the OSPF router configuration context. From this, you can proceed with other OSPF configuration tasks.

Prerequisites

- You must be in the global configuration context, as indicated by the `switch(config)#` prompt to create the OSPF instance and enter the OSPF router configuration context.
- To configure a router ID, create OSPF network areas, or adjust other global OSPF configuration items, you must be in the router configuration context, as indicated by the `switch(config-router)#` prompt.

Procedure

1. Create the OSPF instance and enter the OSPF router configuration context using the following command. For command details, see router ospf.

   `router ospf <PROCESS-ID> [vrf <VRF-NAME>]`

   For example, the following command creates OSPF instance 1.

   ```
   switch(config)# router ospf 1
   switch(config-ospf-1)#
   ```

2. Configure a global router ID using the following command. For command details, see router-id .

   `router-id <ROUTER-ADDRESS>`

   For example, the following command sets the router ID to 1.1.1.1.

   ```
   switch(config-ospf-1)# router-id 1.1.1.1
   ```

3. Optionally, if the OSPF process was disabled (it is enabled by default), enable the OSPF process using the following command.

   `enable`

   For command details, see enable . (Refer to disable for disabling the OSPF process).

Assigning the routing switch to an OSPF area

Create a Normal, Stub, or Not So Stubby (NSSA) area.

Prerequisites

You must be in the router configuration context, as indicated by the `switch(config-router)#` prompt.

Procedure

Create an OSPF area for the routing switch using one of the following commands:

- Create a normal area using the following command: `area <area-id>`. For command details, see area (ospf).
- Create a stub area using the following command: `area <area-id> stub`. For command details, see area stub .
- Create a Not-So-Stubby-Area using the command: `area <area-id> nssa`. For command details, see area nssa .

For example, the following command creates a normal area with an area identifier of 10.1.1.1. Area identifier could alternatively be entered in decimal format such as 1.

```
switch(config-ospf-1)# area 10.1.1.1
```

Setting OSPF network for the area

After you define an OSPF area, you can assign one or more networks to it. The OSPF protocol will run on the interface with the configured IPv4 address. The interfaces which have an IP address configured in this network or in a subset of this network, will participate in the OSPF protocol.

Prerequisites

You must be in the interface configuration context, as indicated by the `switch(config-if)#` prompt.

Procedure

1. Set an OSPF network for the area using the following command. For command details, see ip ospf area.
   `ip ospf <PROCESS-ID> area <AREA-ID>`
   For example, use the following command to assign interface 1/1/1 to OSPF area 1. The area can alternatively be entered as an IPv4 address.

   ```
   switch(config)# interface 1/1/1
   switch(config-if)# ip ospf 1 area 1
   ```

2. Optionally, you can disable OSPF on the interface using the following command. For command details, see ip ospf shutdown.
   `ip ospf shutdown`

   ```
   switch(config)# interface 1/1/1
   switch(config-if)# ip ospf shutdown
   ```

Creating an OSPF virtual link for an area

Create an OSPF virtual link with remote ABR (if not created already) and enter the vlink context.

Prerequisites

You must be in the router configuration context, as indicated by the `switch(config-router)#` prompt.

Procedure

Create an OSPF virtual link using the following command. For command details, see area virtual-link .

```
area  <area-id> virtual-link <router-id>
```

For example, the following command creates a virtual link in area 100.

```
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)#
```

Configuring external route redistribution and control

Configuring route redistribution for OSPFv2 establishes the routing switch as an ASBR for importing and translating different protocol routes into OSPFv2. When you configure redistribution for OSPFv2, you can specify that routes external to the OSPFv2 domain are imported as OSPFv2 routes.

1. Enable route redistribution using the `redistribute` command.

   ```
   redistribute {bgp | connected | local loopback | static | rip | ospf <PROCESS-ID>}
                [route-map <ROUTE-MAP-NAME>]
   ```

   For example, setting redistribution of connected routes as OSPFv2 routes:

   ```
   switch(config-ospf-1)# redistribute connected
   ```

   If a route map is specified, then only the routes that pass the match clause specified in the route map are redistributed to OSPFv2. For example, setting redistribution of local loopback routes, that only match the routes specified by the route map:

   ```
   switch(config-ospf-1)# redistribute local loopback route-map local_routes
   ```

2. Optionally, modify the default metric for redistribution using the `default-metric` command.

   ```
   default-metric <METRIC-VALUE>
   ```

   For example, setting the default metric for redistribution to 37.

   ```
   switch(config-ospf-1)# default-metric 37
   ```

3. Optionally, set the cost of default-summary LSAs using the area command.

   ```
   area <AREA-ID> default-metric <COST>
   ```

   For example, setting the cost of default summary LSAs to 2.

   ```
   switch (config-ospf-1)# area 1 default-metric 2
   ```

4. Optionally, use the `max-metric router-lsa` command to set the protocol to advertise a maximum metric so that other routers do not prefer this router as an intermediate hop in their shortest path first (SPF) calculations.

   ```
   max-metric router-lsa [on-startup [<ADVERT-TIME>]]
   ```

   For example, setting advertise max-metric router-lsa on startup.

   ```
   switch(config-ospf-1)# max-metric router-lsa on-startup 3000
   ```

5. Optionally set the maximum number of ECMP routes that OSPFv2 can support using the `maximum-paths` command.
   `maximum-paths <MAX-VALUE>`
   For example, setting the maximum number of ECMP routes to 8.

```
switch(config-ospf-1)# maximum-paths 8
```

Configuring area ranges on an ABR to reduce advertisements to the backbone

You can configure area ranges to reduce inter-area advertisements by summarizing a range of IP addresses into a single route advertisement. This action prevents an ABR from advertising specific networks or subnets to the backbone area.

Prerequisites

You must be in the router configuration context, as indicated by the `switch(config-router)#` prompt.

Procedure

Summarize inter-area or NSSA paths using the following command. For command details, see area range .
`area <area-id> range <ip-prefix> type {inter-area | nssa} [no-advertise]`
For example, use the following command to summarize routes matching the area range 172.77.114.0/24 using inter-area as the type of address aggregation.

```
switch(config-ospf-1)# area 1 range 172.77.114.0/24 type inter-area
```

In another example, use the following command to specify DoNotAdvertise status for routes matching the area range 172.77.114.0/24. Use nssa as the type of address aggregation.

```
switch(config-ospf-1)# area 1 range 172.77.114.0/24 type nssa no-advertise
```

Influencing route choice by changing the administrative distance

The administrative distance value can be left in its default configuration setting (110) unless a change is needed to improve OSPF performance for a specific network configuration.

Prerequisites

You must be in the router configuration context, as indicated by the `switch(config-router)#` prompt.

Procedure

Reconfigure the administrative distance using the following command. For command details, see distance command.
`distance <distance>`
For example, use the following command to set administrative distance to 100.

```
switch(config-ospf-1)# distance 100
```

Configuring graceful restart of OSPF routing

OSPF routing can be gracefully restarted on the switch without losing packets that are in transit. OSPF neighbors are informed that the router is completing a graceful restart, which allows for maintenance on the switch without interrupting traffic in the network. There is no effect on the saved switch configuration.

Prerequisites

Graceful restart is only applicable to the 6300-VSF and 6400 switches.

You must be in the router configuration context, as indicated by the `switch(config-router)#` prompt.

Procedure

Enable graceful restart of OSPF routing using the following command. For command details, see graceful-restart .

```
graceful-restart {restart-interval <seconds> | helper}
```

For example, the following command specifies 50 seconds as the maximum interval another router will wait for this router to gracefully restart.

```
switch(config-ospf-1)# graceful-restart restart-interval 50
```

Configuring OSPF interface settings

You can optionally adjust the following OSPF interface settings.

Prerequisites

You must be in the interface configuration context, as indicated by the `switch(config-if)#` prompt.

Procedure

1. Set the interface cost using the following command. For command details, see ip ospf cost.
   ```
   ip ospf cost <interface-cost>
   ```
   For example, the following command sets the cost associated with interface 1/1/1 to 100.

   ```
   switch(config)# interface 1/1/1
   switch(config-if)# ip ospf cost 100
   ```

2. Set the time interval between OSPF hello packets for the OSPF interface using the following command. For command details, see ip ospf hello-interval.
   ```
   ip ospf hello-interval  <seconds>
   ```
3. Set the interval after which a neighbor is declared dead if no hello packet is received on the OSPF interface using the following command. For command details, see ip ospf dead-interval.
   ```
   ip ospf dead-interval <seconds>
   ```
4. Set the time between retransmitting lost link state advertisements for the OSPF interface using the following command. For command details, see ip ospf retransmit-interval.

```
ip ospf retransmit-interval  <seconds>
```

5. Sets the transit delay in link state transmission for the OSPF interface using the following command. For command details, see ip ospf transit-delay.
```
ip ospf transit-delay <seconds>
```
6. Set the OSPF network type for the interface. For command details, see ip ospf network.
```
ip ospf network {broadcast|point-to-point}
```
7. Set the OSPF priority on the interface using the following command. For command details, see ip ospf priority.
```
ip ospf priority <number-value>
```
8. Set the OSPF interface as OSPF passive interface. The interface participates in OSPF but does not send or receive packets on that interface. For command details, see ip ospf passive.
```
ip ospf passive
```

Configuring OSPF interface authentication

Configure authentication on the interface. Only one method of authentication can be active on an interface at a time. If one method is already configured on an interface, configuring an alternative method on the same interface automatically overwrites the first method used.

Prerequisites

You must be in the interface configuration context, as indicated by the `switch(config-if)#` prompt.

Procedure

1. Set the authentication type that will be used for authentication with the neighbor router using the following command. For command details, see ip ospf authentication.

```
ip ospf authentication {message-digest | simple-text | null | keychain}
```

For example, the following command sets the authentication type to simple-text.

```
switch(config-if)# ip ospf authentication simple-text
```

2. For simple-text authentication, set the password using the following command. For command details, see ip ospf authentication-key.

```
ip ospf authentication-key <PASSWORD>
```

For example:

```
switch(config-if)# ip ospf authentication-key secure
```

3. For MD5 authentication, set the password using the following command. For command details, see ip ospf message-digest-key md5.

```
ip ospf message-digest-key {Key ID} md5 {ciphertext | plaintext}  <KEY>
```

For example:

```
switch(config-if)# ip ospf message-digest-key 1 md5 ciphertext 100
```

Configuring OSPF virtual link settings

The OSPF interface parameters for this process are automatically set to their default values for virtual links. You can optionally adjust the following OSPF virtual link settings.

Prerequisites

You must be in the router vlink configuration context, as indicated by the `switch(config-router-vlink)#` prompt.

1. Set the time interval between OSPF hello packets for the OSPF virtual links using the following command. For command details, see hello-interval.

```
hello-interval <SECONDS>
```

For example:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-ospf-1)# hello-interval 30
```

2. Set the interval which a neighbor is declared dead if no hello packet is received on the OSPF virtual links. Use the following command. For command details, see dead-interval.

```
dead-interval <SECONDS>
```

3. Set the time between retransmitting lost link state advertisements for the OSPF virtual links using the following command. For command details, see retransmit-interval.

```
retransmit-interval <SECONDS>
```

4. Sets the transit delay in Link state transmission for the OSPF virtual links using the following command. For command details, see transit-delay

```
transit-delay <SECONDS>
```

Configuring OSPF authentication on a virtual link

Set the OSPF virtual-link authentication type that will be used for authentication with the remote ABR when the command is used in the vlink context.

OSPF supports the same methods of authentication for virtual links as it does for interfaces in an area. In the default configuration, OSPF authentication is disabled. Only one method of authentication can be active on a virtual link at a time. If one method is configured on a virtual link, configuring the alternative method on the same link automatically replaces the first method. Both ends of a virtual link must use the same authentication method and related credentials.

Prerequisites

You must be in the router vlink configuration context, as indicated by the `switch(config-router-vlink)#` prompt.

Procedure

1. Set the OSPF virtual-link authentication type using the following command. For command details, see authentication.

```
authentication {message-digest | simple-text | null}
```

For example, the following command sets virtual-link authentication type to simple-text.

```
switch(config-router-vlink)# authentication simple-text
```

2. For simple-text authentication, set the password using the following command. For command details, see authentication-key.

```
authentication-key <password>
```

For example:

```
switch(config-router-vlink)# authentication-key plaintext secure
```

3. For MD5 authentication, set the password using the following command. For command details, see message-digest-key md5.

```
message-digest-key md5 <key>
```

For example:

```
switch(config-router-vlink)# message-digest-key 1 md5 plaintext secure
```

Configuring all OSPF interfaces as passive

OSPF sends LSAs to all other routers in the same AS. To limit the flooding of LSAs throughout the AS, you can configure OSPF to be passive.

Prerequisites

You must be in the router configuration context, as indicated by the `switch(config-router)#` prompt.

Procedure

Configure all OSPF interfaces as passive using the following command. For command details, see passive-interface default.

```
passive-interface default
```

```
switch(config-ospf-1)# passive-interface default
```

Configuring SPF throttling timers

SPF calculation is throttled with default timer values (start-time 200ms, hold-time 1000ms, max-wait-time 5000ms). You can throttle SPF calculation by configuring non-default timers to improve performance of a specific network configuration.

Prerequisites

You must be in the router configuration context, as indicated by the `switch(config-router)#` prompt.

Procedure

Reconfigure SPF throttling timers using the following command. For command details, see timers throttle spf.

```
timers throttle spf start-time <milliseconds> hold-time <milliseconds> max-wait-time <milliseconds>
```

For example, use the following command to set start-time to 500ms, hold-time to 3000ms and max-wait-time to 9000ms:

```
switch(config-ospf-1)# timers throttle spf start-time 500 hold-time
3000 max-wait-time 9000
```

Viewing OSPFv2 information

Use these show commands from the Manager context, as indicated by the `switch#` prompt.

To view OSPFv2 information, use the following commands. For command details and examples, click the links.

- To view general OSPF, area, state and configuration information use: show ip ospf.
- To view OSPF routing table entries for Area Border Router (ABR) and Autonomous System Border Router (ASBR) use: show ip ospf border-routers.
- To view OSPF link state database summary for different OSPF LSAs (Link State Advertisement) use: show ip ospf lsdb.

Many different parameters are available with this command to display information for a particular LSA.

- To view information about OSPF-enabled interfaces use: show ip ospf interface.
- To view information about OSPF neighbors use: show ip ospf neighbors.
- To view OSPF routing table information use: show ip ospf routes.
- To view OSPF statistics use: show ip ospf statistics.
- To view OSPF statistics for the OSPF-enabled interfaces use show ip ospf statistics interface.
- To view the current state and parameters of the OSPF virtual-links use show ip ospf virtual-links.

Clearing OSPF statistics on a switch

Clear OSPF event statics using the following command. For command details, see clear ip ospf statistics .

`clear ip ospf [<PROCESS-ID>] statistics [interface [<INTERFACE-NAME>]] [all-vrfs | vrf <VRF-NAME>]`

For example, the following command clears OSPF event statistics from interface 1/1/1.

```
switch(config-router)# clear ip ospf statistics interface 1/1/1
```

An example of the OSPFv2 information in the show running-config command

When OSPFv2 is configured, the output of the `show running-config` command includes OSPFv2 information.

For example:

```
switch# show running-config
Current configuration:
!
!Version AOS-CX 10.0X.XXXX
!
lldp enable
timezone set utc
vrf red
```

```
mgmt
led base-loc_fdc on
led base-loc on
led base-hlth_fdc fast_blink
led base-pwr_fdc on
!
!
!
!
!
!
aaa authentication login default local
aaa authorization commands default none
!
!
!
!
router ospf 1 vrf vrf_default
    area 0.0.0.0
    area 0.0.0.1
    area 0.0.0.1 virtual-link 55.4.4.4
        hello-interval 15
        dead-interval 60
router ospf 1 vrf red
    area 0.0.0.4
    area 0.0.0.5
    area 0.0.0.5 range 10.1.0.0/16 type inter-area
vlan 1
    no shutdown
interface lag 44
    no shutdown
    ip address 33.1.1.1/24
    ip ospf 1 area 0.0.0.0
    ip ospf hello-interval 22
interface 1/1/1
    no shutdown
    ip address 33.44.1.1/24
    ip ospf 1 area 0.0.0.0
    ip ospf passive
    ip ospf dead-interval 88
    ip ospf transit-delay 44
    ip ospf priority 88
    ip ospf cost 8
    ip ospf network point-to-point
    ip ospf authentication simple-text
    ip ospf authentication-key kkk
    ip ospf shutdown
interface 1/1/2
interface loopback 2
    ip address 55.55.55.55/32
    ip ospf 1 area 0.0.0.0
```

OSPFv2 commands

active-backbone

```
active-backbone stub-default-route
no active-backbone stub-default-route
```

Description

This command enables the router to send a default route to stub areas if there is an active loopback link in the backbone area. The configuration is not required if backbone area has neighbors or passive interfaces configured. By default active backbone detection is enabled.

Examples

```
switch(config)# router ospf 1
switch(config-ospf-1)# active-backbone stub-default-route
```

```
switch(config)# no active-backbone stub-default-route
```

Command History

Release	Modification
10.10.1000	Command Introduced

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospf-*<PROCESS-ID>* config-ospfv3-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

area (ospf)

```
area <AREA-ID>
no area <AREA-ID>
```

Description

Creates a normal area, with *<AREA-ID>* set if not present. If the area is already present and it is not a normal area, then this command changes the area type to normal.

The no form of this command deletes the area with the *<AREA-ID>* specified. Area can be of any type (nssa, nssa no-summary, stub, stub no-summary, and default normal area).

Parameter	Description
<AREA-ID>	Specifies the area ID in one of the following formats. OSPF area identifier in IPv4 format (x.x.x.x), where x is a decimal number from 0 to 255. OSPF area identifier in decimal format. Range: 0 to 4294967295.

Examples

Creating a normal area:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 1
switch(config-ospf-1)# area 10.1.1.1
Switch(config-ospf-1)# show running-config current-context router ospf 1
       router-id 1.1.1.1
       area 0.0.0.0
       area 0.0.0.1
       area 0.0.0.2 stub
       area 0.0.0.3 nssa
```

Deleting an area:

```
switch(config)# router ospf 1
switch(config-ospf-1)# no area 1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospf-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

area default-metric

```
area <AERA-ID> default-metric <COST>
no area <AREA-ID> default-metric
```

Description

Sets the cost of the default route announced to NSSA or stub areas.

The no form of this command resets the cost of the default route announced to NSSA or stub areas, to the default value of 1.

Parameter	Description
<AREA-ID>	Specifies area ID in one of the following formats. OSPF area identifier in IPv4 format (x.x.x.x), where x is a decimal number from 0 to 255. OSPF area identifier in decimal format. Range: 0 to 4294967295.
default-metric *<COST>*	Sets the cost of default-summary LSAs announced to NSSA or stub

Parameter	Description
	areas, to the specified value. Default cost: 1. Range: 0 to 16777215.

Examples

Setting cost for default LSA summary:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 1 default-metric 2
switch(config-ospf-1)# area 0.0.0.1 default-metric 2
```

Setting cost for default LSA summary to default:

```
switch(config)# router ospf 1
switch(config-ospf-1)# no area 1 default-metric
switch(config-ospf-1)# no area 0.0.0.1 default-metric
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospf-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

area nssa

```
area <AREA-ID> nssa [no-summary]
no area <AREA-ID> nssa [no-summary]
```

Description

Creates the NSSA area (Not So Stubby Area) with *<AREA-ID>* if not present. If area is present and not NSSA area, this command changes the area type to NSSA area. If `no-summary` is used, area type will be NSSA No-Summary.

The `no` form of this command unsets the area type as NSSA. That is, the configured area will be changed to default normal area. The `no area` *<AREA-ID>* `nssa no-summary` command enables sending inter-area routes into NSSA, but will not unset the area as NSSA.

Parameter	Description
<AREA-ID>	Specifies the area ID in one of the following formats. OSPF area identifier in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255. OSPF area identifier in decimal format. Range: 0 to 4294967295.
`nssa [no-summary]`	Specifies Not So Stubby Area (NSSA) area type. If area is present and not NSSA area, parameter changes the area type to NSSA area. If `no-summary` is specified, area type will be NSSA No-Summary, which means do not inject inter-area routes into NSSA.

Examples

Creating an NSSA area:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 1 nssa
switch(config-ospf-1)# area 1 nssa no-summary
```

Unsetting the area as NSSA

```
switch(config)# router ospf 1
switch(config-ospf-1)# no area 1 nssa
switch(config-ospf-1)# no area 1 nssa no-summary
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-ospf-<PROCESS-ID>`	Administrators or local user group members with execution rights for this command.

area range

```
area <AREA-ID> range <IP-PREFIX> type {inter-area | nssa} [no-advertise]
no area <AREA-ID> range <IP-PREFIX> type {inter-area | nssa} [no-advertise]
```

Description

Summarizes the routes with the matching address or masks. This command only works for border routers.

The `no` form of this command removes route summarization for the configured IPv4 prefix address on the ABR. When using the `no` form of the command with the `no-advertise` option, enables advertising this range to other areas.

Parameter	Description
<AREA-ID>	Specifies the area ID in one of the following formats. OSPF area identifier in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255. OSPF area identifier in decimal format. Range: 0 to 4294967295.
`range` *<IP-PREFIX>*	Specifies summarizing routes matching the area range prefix/mask.
`type {inter-area | nssa}`	Specifies the type this address aggregation applies to as either inter-area range prefix or NSSA range prefix.
`no-advertise`	Specifies the address range status as `DoNotAdvertise` (do not advertise this range to other areas).

Examples

Summarizing inter-area or NSSA paths:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 1
switch(config-ospf-1)# area 2 nssa
switch(config-ospf-1)# area 1 range 192.77.114.0/24 type inter-area
switch(config-ospf-1)# area 2 range 192.77.114.0/24 type nssa
switch(config-ospf-1)# area 2 range 192.77.114.0/24 type nssa no-advertise
```

Removing summarization:

```
switch(config)# router ospf 1
switch(config-ospf-1)# no area 1 range 192.77.114.0/24 type inter-area
switch(config-ospf-1)# no area 2 range 192.77.114.0/24 type nssa
switch(config-ospf-1)# no area 2 range 192.77.114.0/24 type nssa no-advertise
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325	`config-ospf-`*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

Platforms	Command context	Authority
8360 9300 10000		

area stub

```
area <AREA-ID> stub [no-summary]
no area <AREA-ID> stub [no-summary]
```

Description

Creates the stub area with *<AREA-ID>* if not present. If the area is already present and it is not a normal stub area, then this command changes the stub area type to normal. If the `no-summary` parameter is used, area type will be stub No-Summary.

The `no` form of this command unsets the area as a stub type. That is, the configured area will be changed to a default normal area. The `no area <AREA-ID> stub no_summary` command enables sending inter-area routes into the stub area, but will not unset the area as stub.

ABR does not inject the default route in a Totally Stubby Area with loopback in Area 0.0.0.0. As a workaround, configure a passive interface or active neighbors in the backbone area.

Parameter	Description
<AREA-ID>	Specifies the area ID in one of the following formats. OSPF area identifier in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255. OSPF area identifier in decimal format. Range: 0 to 4294967295.
`stub [no-summary]`	Specifies the stub area type. If the area is already present and it is not a stub area, this parameter changes the area type to stub. If `no-summary` is specified, area type will be stub No-Summary (totally stubby area), which means do not inject summary link advertisements into stub areas.

Examples

Creating a STUB area:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 1 stub
switch(config-ospf-1)# area 1 stub no-summary
```

Unsetting the area type as stub:

```
switch(config)# router ospf 1
switch(config-ospf-1) # no area 1 stub
switch(config-ospf-1) # no area 1 sub no-summary
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospf-<*PROCESS-ID*>	Administrators or local user group members with execution rights for this command.

area virtual-link

```
area <AREA-ID> virtual-link <ROUTER-ID>
no area <AREA-ID> virtual-link <ROUTER-ID>
```

Description

Creates an OSPF virtual link with a remote ABR and enters the vlink context.

The `no` form of this command deletes an OSPF virtual link with the specified router ID of the remote ABR. If no *<ROUTER-ID>* is specified, the `no` form of the command sets the virtual link to the default settings.

Parameter	Description
<AREA-ID>	Specifies the area ID in one of the following formats. OSPF area identifier in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255. OSPF area identifier in decimal format. Range: 0 to 4294967295.
`virtual-link` *<ROUTER-ID>*	Configures a virtual link with the specified router ID of the remote ABR.

Examples

Configuring OSPF virtual links:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)#
```

Deleting OSPF virtual links:

```
switch(config)# router ospf 1
switch(config-ospf-1)# no area 100 virtual-link 100.0.1.1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospf-<*PROCESS-ID*>	Administrators or local user group members with execution rights for this command.

authentication

```
authentication {hmac-sha-1 | hmac-sha-256 | hmac-sha-384 | hmac-sha-512 | message-digest |
simple-text | null | keychain}
no authentication
```

Description

Sets the OSPF virtual-link authentication type that will be used for authentication with the remote ABR.

Choose one of the authentication types from the following parameters.

The `no` form of this command unconfigures the virtual-link authentication type used and sets it to Null authentication.

Parameter	Description
`hmac-sha-1`	Sets the authentication type as SHA-1.
`hmac-sha-256`	Sets the authentication type as SHA-256.
`hmac-sha-384`	Sets the authentication type as SHA-384.
`hmac-sha-512`	Sets the authentication type as SHA-512.
`message-digest`	Sets the authentication type to message-digest.
`simple-text`	Sets the authentication type to simple-text.
`null`	Sets the authentication type to null.
`keychain`	Sets authentication type to use the key chain.

Examples

Setting OSPF virtual links authentication type:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)# authentication simple-text
```

Deleting OSPF virtual links authentication type:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)# no authentication
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-router-vlink	Administrators or local user group members with execution rights for this command.

authentication-key

```
authentication-key [{ciphertext | plaintext} <PASSWORD>]
no authentication-key
```

Description

Sets the OSPF virtual-link authentication password that is used for simple-text authentication. If the password is given in ciphertext, it will be decrypted and applied to the protocol.

The no form of this command deletes the virtual-link authentication password that is used for simple-text authentication.

Parameter	Description
{ciphertext | plaintext}	Selects the password format.
<PASSWORD>	Specifies the password.

When the password is not provided on the command line, plaintext password prompting occurs upon pressing Enter. The entered password characters are masked with asterisks.

Examples

Setting the OSPF virtual link simple-text authentication password in plaintext format:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
```

```
switch(config-router-vlink)# authentication-key plaintext F82#450b
```

Setting the OSPF virtual link simple-text authentication with a prompted plaintext password:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)# authentication-key
Enter the authentication key: ********
Re-Enter the authentication key: ********
```

Setting the OSPF virtual link simple-text authentication password in ciphertext format:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)# authentication-key ciphertext AQaAz05...RmH+4pg=
```

Deleting the OSPF virtual link simple-text authentication password:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)# no authentication-key
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-router-vlink	Administrators or local user group members with execution rights for this command.

clear ip ospf neighbors

```
clear ip ospf [<PROCESS-ID>] neighbor [<NEIGHBOR>] [interface [<INTERFACE-NAME>]]
[all-vrfs | vrf <VRF-NAME>]
```

Description

Resets the neighbor and clears the OSPF neighbor information.

Parameter	Description
<PROCESS-ID>	Specifies the OSPFv2 process ID to clear the statistics for the particular OSPFv2 process. Range: 1 to 63.
<NEIGHBOR>	Specifies the router ID of a neighbor.
<INTERFACE-NAME>	Specifies the OSPFv2 statistics to clear for the specified interface.
`all-vrfs`	Select to clear the OSPFv2 statistics for all VRFs.
`vrf` *<VRF-NAME>*	Specifies the name of a VRF.

Example

Clearing the OSPFv2 neighbor information:

```
switch# clear ipv6 ospfv3 1 neighbor
switch# clear ip ospf 1 neighbor 3.3.3.3
switch# clear ip ospf 1 neighbor interface 1/1/1
switch# clear ip ospf neighbor 5.5.5.5 vrf red
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

clear ip ospf statistics

`clear ip ospf [`*<PROCESS-ID>*`] statistics [interface [`*<INTERFACE-NAME>*`]] [all-vrfs | vrf` *<VRF-NAME>*`]`

Description

Clear the OSPF event statistics.

Parameter	Description
<PROCESS-ID>	OSPF process ID. Clear the statistics for the particular OSPF process. Range: 1 to 63.

Parameter	Description
<INTERFACE-NAME>	Clear the OSPF statistics for the specified interface.
`all-vrfs`	Optionally select to clear the OSPF statistics for all VRFs.
`vrf <VRF-NAME>`	Optionally select to clear the OSPF statistics for a particular VRF. If the VRF is not specified, information for the default VRF is cleared.

Examples

Clearing the OSPF event statistics:

```
switch# clear ip ospf statistics
switch# clear ip ospf statistics interface 1/1/1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

dead-interval

```
dead-interval <INTERVAL>
no dead-interval
```

Description

Sets the interval after which a neighbor is declared dead if no hello packet comes in for virtual links.

The `no` form of this command sets the dead interval to default for virtual links. The default value is 40 seconds (generally four times the hello packet interval).

For proper operation, set the dead interval must be longer than the hello interval.

Parameter	Description
<INTERVAL>	Specifies the time interval for the dead interval, in seconds. Range: 1 to 65535. Default: 40.

Examples

Setting the OSPv2F virtual links dead interval:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)# dead-interval 30
```

Setting the OSPFv2 virtual links dead interval to default:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)# no dead-interval
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-router-vlink`	Administrators or local user group members with execution rights for this command.

default-information originate

```
default-information originate [metric <METRIC-VALUE>]
no default-information originate [metric <METRIC-VALUE>]
```

Description

Configures OSPF to advertise the default route (0.0.0.0/0) to its neighbors if it is present in the routing table. Optionally, the metric value can be set for default route ::/0. The default value is 1.

The `no` form of this command disables advertisement of the default route.

Parameter	Description
`metric <METRIC-VALUE>`	Specifies the OSPF metric value for the default route. Optional. Default: 1.

Examples

Setting advertisement of the default route:

```
switch(config)# router ospf 1
switch(config-ospf-1)# default-information originate
```

Disabling advertisement of the default route:

```
switch(config)# router ospf 1
switch(config-ospf-1)# no default-information originate
```

Setting advertisement of the default route and specifying an optional metric value of 20:

```
switch(config)# router ospf 1
switch(config-ospfv3-1)# default-information originate
switch(config-ospfv3-1)# default-information originate metric 20
```

Disabling advertisement of the default route and setting metric to the default value:

```
switch(config)# router ospf 1
switch(config-ospf-1)# no default-information originate metric
```

Command History

Release	Modification
10.09	Added parameter: metric <*METRIC-VALUE*>
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospf-<*PROCESS-ID*>	Administrators or local user group members with execution rights for this command.

default-information originate always

```
default-information originate always [metric <METRIC-VALUE>]
no default-information originate always [metric <METRIC-VALUE>]
```

Description

Configures OSPF to advertise the default route (0.0.0.0/0) to its neighbors, regardless if it is present in the routing table or not. Optionally, metric can be set for default route 0.0.0.0/0. The default value is 1.

The no form of this command disables advertisement of the default route.

Parameter	Description
metric <METRIC-VALUE>	Specifies the OSPF metric value for the default route. Default: 1.

Examples

Setting advertisement of the default route:

```
switch(config)# router ospf 1
switch(config-ospf-1)# default-information originate always
```

Disabling advertisement of the default route:

```
switch(config)# router ospf 1
switch(config-ospf-1)# no default-information originate always
```

Setting advertisement of the default route with metric set to 20:

```
switch(config)# router ospf 1
switch(config-ospf-1)# default-information originate always metric 20
```

Disabling advertisement of the default route and setting the metric to the default value:

```
switch(config)# router ospf 1
switch(config-ospf-1)# no default-information originate always metric
```

Command History

Release	Modification
10.09	Added parameter: metric <*METRIC-VALUE*>
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospf-<*PROCESS-ID*>	Administrators or local user group members with execution rights for this command.

default-metric

```
default-metric <METRIC-VALUE>
no default-metric
```

Description

Sets the default metric for redistributed routes in the OSPF.

The `no` form of this command sets the default metric to be used for redistributed routes into OSPF to the default of 25.

Parameter	Description
<METRIC-VALUE>	Specifies the default metric value to use for redistributed routes. Default: 25. Range: 0-1677214.

Examples

Setting default metric for redistributed routes:

```
switch(config)# router ospf 1
switch(config-ospf-1)# default-metric 37
```

Setting default metric for redistributed routes to the default:

```
switch(config)# router ospf 1
switch(config-ospf-1)# no default-metric
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-ospf-`*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

disable

`disable`

Description

Disables the OSPF process.

This command does not remove the OSPF configurations.

Examples

Disabling OSPF process:

```
switch(config)# router ospf 1
switch(config-ospf-1)# disable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospf-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

distance

```
distance [<DISTANCE-VAL> | intra-area [<DISTANCE-VAL>] | inter-area [<DISTANCE-VAL>] |
external [<DISTANCE-VAL>]]
no distance [intra-area | inter-area | external]
```

Description

Defines an administrative distance for OSPF. Administrative distance is used as a criteria to select the best route when multiple routes are present from different routing protocols.

The no form of this command sets the OSPF administrative distance to the default of 110. Optionally, administrative distance can be set to default for the specific OSPF route type: intra-area, inter-area, or external type-5 and type-7 routes.

An administrative distance configuration change in one OSPF process is applied to all the processes within a VRF.

Parameter	Description
<DISTANCE-VAL>	Specifies the OSPF administrative distance. Range: 1 to 255. Default: 110.
intra-area	Specifies the OSPF distance for intra-area routes.
inter-area	Specifies the OSPF distance for inter-area routes.
external	Specifies the OSPF distance for external type 5 and type 7 routes.

Usage

Within a given OSPF process, intra-area routes are always given precedence even when distances are configured for inter-area or external type routes.

Examples

Setting OSPF administrative distance:

```
switch(config)# router ospf 1
switch(config-ospf-1)# distance 100
switch(config-ospf-1)# distance intra-area 24 external 55 inter-area 66
switch(config-ospf-1)# distance intra-area 24 external 55
switch(config-ospf-1)# distance external 55
```

Setting OSPF administrative distance to the default:

```
switch(config)# router ospf 1
switch(config-ospf-1)# no distance
switch(config-ospf-1)# no distance external
switch(config-ospf-1)# no distance inter-area
switch(config-ospf-1)# no distance intra-area
```

Command History

Release	Modification
10.09	Added parameters: intra-area, inter-area, external
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospf-<*PROCESS-ID*>	Administrators or local user group members with execution rights for this command.

enable

`enable`

Description

Enables the OSPF process, if disabled. By default the OSPF process is enabled.

Examples

Enabling OSPF process:

```
switch(config)# router ospf 1
switch(config-ospf-1)# enable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospf-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

graceful-restart

```
graceful-restart {restart-interval <SECONDS> | helper}
no graceful-restart {restart-interval | helper}
```

Description

Configures graceful restart parameters for OSPF.

The no form of this command sets the restart interval to the default interval of 120 seconds or disables the helper mode, depending on the parameter specified.

Parameter	Description
restart-interval *<SECONDS>*	Specifies the time another router should wait for this router to gracefully restart and selects the maximum interval (in seconds) that another router should wait. Default: 120 seconds. Range: 5-1800.
helper	Specifies that the router will participate in the graceful restart of a neighbor router.

Examples

Enabling OSPF nonstop forwarding:

```
switch(config)# router ospf 1
switch(config-ospf-1)# graceful-restart restart-interval 50
switch(config-ospf-1)# graceful-restart helper
```

Setting restart-interval to default, disable helper mode:

```
switch(config)# router ospf 1
switch(config-ospf-1)# no graceful-restart restart-interval
switch(config-ospf-1)# no graceful-restart helper
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospf-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

hello-interval

```
hello-interval <INTERVAL>
no hello-interval
```

Description

Sets the time interval between OSPF hello packets for virtual links.

The no form of this command sets the hello interval to the default value of 10 seconds for virtual links.

For proper operation, the hello interval must be shorter than the dead interval.

Parameter	Description
<INTERVAL>	Specifies the time interval for the hello interval, in seconds. Range: 1 to 65535. Default: 10.

Examples

Setting the OSPF virtual links hello interval:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)# hello-interval 30
```

Setting the OSPF virtual links hello interval to default:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)# no hello-interval
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-router-vlink	Administrators or local user group members with execution rights for this command.

ip ospf area

```
ip ospf <PROCESS-ID> area <AREA-ID>
no ip ospf <PROCESS-ID> area <AREA-ID>
```

Description

Runs the OSPF protocol on the interface with the configured IPv4 address for the area specified. The interfaces which have an IP address configured in this network or in a subset of this network, will participate in the OSPF protocol.

To move an interface to a new area, unmap the existing area and then associate a new area with the interface.

The no form of this command disables OSPF on the interface and removes the interface from the area. Interfaces which have an IP address configured on the network or in a subset of the network, stop participating in the OSPF protocol.

Parameter	Description
<PROCESS-ID>	Specifies the OSPF process Id. Range: 1 to 63.
<AREA-ID>	Specifies the OSPF area ID in one of the following formats. Area identifier in IPv4 format (x.x.x.x), where x is a decimal number from 0 to 255. Area identifier in decimal format. Range: 0 to 4294967295.

Examples

Setting OSPF network for the area:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ip ospf 1 area 1
switch(config-if-vlan)# ip ospf 1 area 0.0.0.1
```

Disabling OSPF network for the area:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# no ip ospf 1 area 1
switch(config-if-vlan)# no ip ospf 1 area 0.0.0.1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if config-if-vlan	Administrators or local user group members with execution rights for this command.

ip ospf authentication

```
ip ospf authentication {message-digest | simple-text | null | keychain | hmac-sha-1 | hmac-sha-256 | hmac-sha-384 | hmac-sha-512}
no ip ospf authentication
```

Description

Sets the authentication type that will be used for authentication with the neighbor router.

The `no` form of this command deletes the authentication type used for a particular authentication with the neighbor router and sets to null authentication.

Parameter	Description
message-digest	Sets authentication type as message-digest.
simple-text	Sets authentication type as simple-text.
null	Sets authentication type as null.
keychain	Sets the authentication type to use the key chain.
hmac-sha-1	Sets the authentication type to SHA-1.

Parameter	Description
`hmac-sha-256`	Sets the authentication type to SHA-256.
`hmac-sha-384`	Sets the authentication type to SHA-384.
`hmac-sha-512`	Sets the authentication type to SHA-512.

Examples

Setting OSPF authentication type on the interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ip ospf authentication simple-text
```

Deleting OSPF authentication type on the interface and sets it to null:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# no ip ospf authentication
```

Setting OSPF authentication type to SHA-384 on the interface:

```
switch(config)# interface vlan 5
switch(config-if-vlan)# ip ospf authentication hmac-sha-384
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority

6300
6400
8320
8325
8360
9300
10000
	`config-if`
	`config-if-vlan`
	`config-lag-if`
		Administrators or local user group members with execution rights for this command.

ip ospf authentication-key

```
ip ospf authentication-key [{ciphertext | plaintext} <PASSWORD>]
no ip ospf authentication-key
```

Description

Sets the authentication password used for simple-text authentication. If the password is given in ciphertext it will be decrypted and applied to the protocol.

The `no` form of this command deletes the authentication password used for simple-text authentication.

Parameter	Description
`{ciphertext | plaintext}`	Selects the password format.
<PASSWORD>	Specifies the password.

When the password is not provided on the command line, plaintext password prompting occurs upon pressing Enter. The entered password characters are masked with asterisks.

Examples

Setting the OSPF simple-text authentication password in plaintext format:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ip ospf authentication-key plaintext F82#450b
```

Setting the OSPF simple-text authentication password with a prompted plaintext password:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ip ospf authentication-key
Enter the authentication key: ********
Re-Enter the authentication key: ********
```

Setting the OSPF simple-text authentication password in ciphertext format:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ip ospf authentication-key ciphertext AQBaZ...ecopg=
```

Deleting the OSPF simple-text authentication password:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# no ip ospf authentication-key
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-if` `config-if-vlan`	Administrators or local user group members with execution rights for this command.

ip ospf cost

```
ip ospf cost <INTERFACE-COST>
no ip ospf cost
```

Description

Sets the cost (metric) associated with a particular interface. The interface cost is used as a parameter to calculate the best routes.

The `no` form of this command sets the cost (metric) associated with a particular interface to the default cost 1.

Parameter	Description
<INTERFACE-COST>	Specifies the interface cost value. Range: 1 to 65535. Default: 1.

Examples

Setting OSPF interface cost

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ip ospf cost 100
```

Setting the OSPF interface cost to default

```
switch(config)# interface vlan 1
switch(config-if-vlan)# no ip ospf cost
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-if` `config-if-vlan`	Administrators or local user group members with execution rights for this command.

ip ospf dead-interval

```
ip ospf dead-interval <INTERVAL>
no ip ospf dead-interval
```

Description

Sets the interval after which a neighbor is declared dead if no hello packet is received on the OSPF interface.

The no form of this command sets the interval after which a neighbor is declared dead, to the default for the OSPF interface. The default value is 40 seconds (generally 4 times the hello packet interval).

Parameter	Description
<INTERVAL>	Specifies the time interval for the dead interval, in seconds. Range: 1 to 65535. Default: 40.

Examples

Setting OSPF dead interval on the interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ip ospf dead-interval 30
```

Setting OSPF dead interval to default on the interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# no ip ospf dead-interval
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if config-if-vlan	Administrators or local user group members with execution rights for this command.

ip ospf hello-interval

```
ip ospf hello-interval <INTERVAL>
no ip ospf hello-interval
```

Description

Sets the time interval between OSPF hello packets for the OSPF interface.

The no form of this command sets the time interval OSPF hello packets to the default of 10 seconds for the OSPF interface.

Parameter	Description
<INTERVAL>	Specifies the time interval for the hello interval, in seconds. Range: 1 to 65535. Default: 10.

Examples

Setting OSPF hello interval on the interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ip ospf hello-interval 30
```

Setting OSPF hello interval to the default on the interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# no ip ospf hello-interval
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if config-if-vlan	Administrators or local user group members with execution rights for this command.

ip ospf keychain

```
ip ospf keychain <KEYCHAIN-NAME>
no ip ospf keychain
```

Description

Sets the key chain for md5 authentication. A key chain configures rotating keys for packet authenticating, reducing the risk of keys being compromised.

The no form of this command deletes the key chain used for md5 authentication.

Parameter	Description
<KEYCHAIN-NAME>	Name of key chain to be used for md5 authentication.

Examples

Setting OSPFv2 key chain authentication:

```
switch(config)# interface 1/1/1
switch(config-if)# ip ospf keychain ospf_keys
```

Deleting OSPFv2 key chain authentication:

```
switch(config)# interface 1/1/1
switch(config-if)# no ip ospf keychain
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if	Administrators or local user group members with execution rights for this command.

ip ospf message-digest-key md5

```
ip ospf message-digest-key <KEY-ID> md5 [{ciphertext | plaintext} <KEY>]
no ip ospf message-digest-key <KEY-ID>
```

Description

Sets the md5 message digest authentication key. If the md5 key is given in ciphertext, it will be decrypted and applied to the protocol.

The no form of this command deletes the md5 authentication key.

Parameter	Description
<KEY-ID>	Specifies the md5 key ID. Range: 1 to 255.
{ciphertext | plaintext}	Selects the md5 key format.
<KEY>	Specifies the md5 authentication key.

When the authentication key is not provided on the command line, plaintext key prompting occurs upon pressing Enter. The entered key characters are masked with asterisks.

Examples

Setting the md5 key in plaintext format:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ip ospf message-digest-key 1 md5 plaintext F82#450b
```

Setting the md5 key with a prompted plaintext key:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ip ospf message-digest-key 1 md5
Enter the MD5 authentication key: ********
Re-Enter the MD5 authentication key: ********
```

Setting the md5 key in ciphertext format:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ip ospf message-digest-key 1 md5 ciphertext AQt6e...7qEa4=
```

Deleting the md5 key:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# no ip ospf message-digest-key 1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if config-if-vlan	Administrators or local user group members with execution rights for this command.

ip ospf network

```
ip ospf network {broadcast | point-to-point}
no ip ospf network
```

Description

Configures the OSPF network type for the interface. Choose one of the following parameters as the interface network type.

The no form of this command sets the network type for the interface to the system default which is broadcast network.

Parameter	Description
broadcast	Specifies the OSPF network type as a broadcast multi-access network.
point-to-point	Specifies the OSPF network type as a point-to-point network.

Examples

Setting OSPF network type for the interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ip ospf network broadcast
switch(config-if-vlan)# ip ospf network point-to-point
```

Disabling OSPF network type for the interface to system default of broadcast network:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# no ip ospf network
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if config-if-vlan	Administrators or local user group members with execution rights for this command.

ip ospf passive

```
ip ospf passive
no ip ospf passive
```

Description

Configures the interface as an OSPF passive interface. With this setting, the interface participates in OSPF but does not send or receive packets on that interface.

The no form of this command resets the interface as active. With this setting, the interface starts sending and receiving OSPF packets.

Examples

Setting the interface as OSPF passive interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ip ospf passive
```

Setting the interface as OSPF active interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# no ip ospf passive
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if config-if-vlan	Administrators or local user group members with execution rights for this command.

ip ospf priority

```
ip ospf priority <PRIORITY-VALUE>
no ip ospf priority
```

Description

Sets the OSPF priority for the interface. The larger the numeric value of the priority, the higher the chances for it to become the designated router. Setting a priority of zero makes the router ineligible to become a designated router or back up designated router.

The no form of this command sets the OSPF priority for the interface to the default of 1.

Parameter	Description
<PRIORITY-VALUE>	Specifies the OSPF priority value. Range: 0 to 255. Default: 1.

Examples

Setting OSPF priority for the interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ip ospf priority 50
```

Disabling OSPF priority for the interface to default:

```
switch(config)# interface vlan1
switch(config-if-vlan)# no ip ospf priority
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-if` `config-if-vlan`	Administrators or local user group members with execution rights for this command.

ip ospf retransmit-interval

```
ip ospf retransmit-interval <INTERVAL>
no ip ospf retransmit-interval
```

Description

Sets the time between retransmitting lost link state advertisements for the OSPF interface.

The `no` form of this command sets the time between retransmitting lost link state advertisements to the default of 5 seconds for the OSPF interface.

Parameter	Description
<INTERVAL>	Specifies the retransmit interval, in seconds. Range: 1 to 3600. Default: 5.

Examples

Setting OSPF retransmit interval on the interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ip ospf retransmit-interval 30
```

Setting OSPF retransmit interval to the default on the interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# no ip ospf retransmit-interval
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if config-if-vlan	Administrators or local user group members with execution rights for this command.

ip ospf sha-key sha

```
ip ospf sha-key <KEY-ID> sha [{ciphertext | plaintext} <KEY>]
no ip ospf sha-key <KEY-ID>
```

Description

Sets the SHA (secure hash authentication) key for the selected interface. If the SHA key is given in ciphertext, it will be decrypted and applied to the protocol. This command accepts a key of up to 64 characters irrespective of the SHA version configured on the interface. OSPF will internally pad zeros to the key to obtain a 64-byte key. For all types of SHA, key length is adjusted to 64 bytes.

The `no` form of this command deletes the SHA authentication key.

Parameter	Description
<KEY-ID>	Specifies the SHA key ID. Range: 1 to 255.
{ciphertext | plaintext}	Selects the SHA key format.
<KEY>	Specifies the SHA authentication key.

When the authentication key is not provided on the command line, plaintext key prompting occurs upon pressing Enter. The entered key characters are masked with asterisks.

Examples

Setting the SHA authentication key in plaintext format:

```
switch(config)# interface 1/1/1
switch(config-if)# ip ospf sha-key 1 sha plaintext F82#450b
```

Setting the SHA authentication key in prompted plaintext format:

```
switch(config)# interface 1/1/1
switch(config-if)# ip ospf sha-key 1 sha
Enter the SHA authentication key: ********
Re-Enter the SHA authentication key: ********
```

Setting the SHA authentication key in ciphertext format:

```
switch(config)# interface 1/1/1
```

```
switch(config-if)# ip ospf sha-key 1 sha ciphertext AQapu...C2K47A=
```

Deleting the SHA authentication key:

```
switch(config)# interface 1/1/1
switch(config-if)# no ip ospf sha-key 1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if config-if-vlan config-lag-if	Administrators or local user group members with execution rights for this command.

ip ospf shutdown

```
ip ospf shutdown
no ip ospf shutdown
```

Description

Disables OSPF on the interface. The interface state changes to Down. It does not remove the interface from the OSPF area. To remove the interface, use the command `no ip ospf area`.

The `no` form of this command re-enables OSPF on the interface

Examples

Disabling OSPF on the interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ip ospf shutdown
```

Re-enabling OSPF on the interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# no ip ospf shutdown
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-if` `config-if-vlan`	Administrators or local user group members with execution rights for this command.

ip ospf transit-delay

```
ip ospf transit-delay <DELAY>
no ip ospf transit-delay
```

Description

Sets the time delay in link state transmission for the OSPF interface.

The `no` form of this command sets the delay in link state transmission to the default of 1 second for the OSPF interface.

Parameter	Description
<DELAY>	Specifies the transit delay in seconds. Range: 1 to 3600. Default: 1.

Examples

Setting OSPF transit delay on the interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ip ospf transit-delay 30
```

Setting OSPF transit delay to the default on the interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# no ip ospf transit-delay
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-if` `config-if-vlan`	Administrators or local user group members with execution rights for this command.

keychain

```
keychain <KEYCHAIN-NAME>
no keychain
```

Description

Sets the key chain for md5 authentication. A key chain configures rotating keys for packet authenticating, reducing the risk of keys being compromised.

The `no` form of this command deletes the key chain used for md5 authentication.

Parameter	Description
<KEYCHAIN-NAME>	Name of key chain to be used for md5 authentication.

Examples

Setting OSPF virtual link key chain authentication:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)# keychain ospf_keys
```

Deleting OSPF virtual link key chain authentication:

```
switch# configure terminal
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link  100.0.1.1
switch(config-router-vlink)# no keychain
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400	`config-router-vlink`	Administrators or local user group members with execution rights for this command.

Platforms	Command context	Authority
8320 8325 8360 9300 10000		

max-metric router-lsa

```
max-metric router-lsa [on-startup [<ADVERT-TIME>]]
no max-metric router-lsa [on-startup]
```

Description

Sets the protocol to advertise a maximum metric so that other routers do not prefer this router as an intermediate hop in their shortest path first (SPF) calculations. If the on-startup parameter is used, the router is configured to advertise a maximum metric at startup for the time mentioned in seconds or for a default value of 600 seconds.

The `no` form of this command advertises the normal cost metrics instead of advertising the maximized cost metric. This setting causes the router to be considered in traffic forwarding.

Parameter	Description
`on-startup <ADVERT-TIME>`	Specifies the time in seconds to advertise self as stub-router on startup. If no time is specified, the default time of 600 seconds is used. Range: 5 to 86400. Default: 600.

Examples

Setting to maximize the cost metrics for Router LSA:

```
switch(config)# router ospf 1
switch(config-ospf-1)# max-metric router-lsa
switch(config-ospf-1)# max-metric router-lsa on-startup
switch(config-ospf-1)# max-metric router-lsa on-startup 3000
```

Setting to advertise the normal cost metrics instead of advertising the maximized cost metric:

```
switch(config)# router ospf 1
switch(config-ospf-1)# no max-metric router-lsa
switch(config-ospf-1)# no max-metric router-lsa on-startup
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospf-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

maximum-paths

```
maximum-paths <MAX-VALUE>
no maximum-paths
```

Description

Sets the maximum number of ECMP routes that OSPF can support.

The no form of this command sets the maximum number of ECMP routes that OSPF can support to the default value of 4.

Parameter	Description
<MAX-VALUE>	Specifies the maximum number of ECMP routes. Range: 1 to 32. Default: 4.

Examples

Setting maximum number of ECMP routes:

```
switch(config)# router ospf 1
switch(config-ospf-1)# maximum-paths 32
```

Setting maximum number of ECMP routes to the default of 4:

```
switch(config)# router ospf 1
switch(config-ospf-1)# no maximum-paths
```

Command History

Release	Modification
10.10	Increased upper limit of range of <*MAX-VALUE*> parameter to 32.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400	config-ospf-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

Platforms	Command context	Authority
8320 8325 8360 9300 10000		

message-digest-key md5

```
message-digest-key <KEY-ID> md5 [{ciphertext | plaintext} <KEY>]
no message-digest-key <KEY-ID>
```

Description

Sets the virtual link md5 message digest authentication key. If the md5 key is given in ciphertext, it will be decrypted and applied to the protocol.

The `no` form of this command deletes the virtual link md5 authentication key.

Parameter	Description
<KEY-ID>	Specifies the virtual link md5 key ID. Range: 1 to 255.
`{ciphertext | plaintext}`	Selects the virtual link md5 key format.
<KEY>	Specifies the virtual link md5 authentication key.

When the authentication key is not provided on the command line, plaintext key prompting occurs upon pressing Enter. The entered key characters are masked with asterisks.

Examples

Setting virtual link md5 authentication key in plaintext format:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)# message-digest-key 1 md5 plaintext F82#450b
```

Setting the virtual link md5 authentication key in prompted plaintext format:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)# message-digest-key 1 md5
Enter the MD5 authentication key: ********
Re-Enter the MD5 authentication key: ********
```

Setting the virtual link md5 authentication key in ciphertext format:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)# message-digest-key 1 md5 ciphertext AQapu...C2K47A=
```

Deleting the virtual link md5 authentication password:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)# no message-digest-key 1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-router-vlink`	Administrators or local user group members with execution rights for this command.

passive-interface default

```
passive-interface default
no passive-interface
```

Description

Configures all OSPF interfaces as passive.

The `no` form of this command sets all OSPF interfaces as active.

Examples

Setting OSPF-enabled interfaces as passive:

```
switch(config)# router ospf 1
switch(config-ospf-1)# passive-interface default
```

Setting OSPF-enabled interfaces as active:

```
switch(config)# router ospf 1
switch(config-ospf-1)# no passive-interface
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-ospf-<PROCESS-ID>`	Administrators or local user group members with execution rights for this command.

redistribute

```
redistribute {bgp | connected | local loopback | static | rip | ospf <PROCESS-ID>}
             [route-map <ROUTE-MAP-NAME>]
no redistribute {bgp | connected | local loopback | static | rip | ospf <PROCESS-ID>}
                [route-map <ROUTE-MAP-NAME>]
```

Description

Redistributes routes originating from other protocols, or from another OSPFv2 process, to the current OSPFv2 process.

if a route map is specified, then only the routes that pass the match clause specified in the route map are redistributed to OSPFv2. Configuration is not allowed if the referenced route map has not yet been configured.

If you try to redistribute routes from an OSPFv2 process which is not created, you are prompted to allow the OSPFv2 process to be auto-created before proceeding with redistribution. If you confirm at the prompt, the OSPFv2 process is created with defaults and redistribution configuration applied. If you deny at the prompt, redistribution configuration is skipped.

If command `route-redistribute active-routes-only` has been issued, only the routes from other protocols which are selected for forwarding are considered for redistribution into OSPFv2.

The `no` form of this command disables redistribution of routes to the current OSPFv2 process.

Parameter	Description
`bgp`	Specifies redistributing BGP (Border Gateway Protocol) routes.
`connected`	Specifies redistributing connected (directly attached subnet or host).
`local loopback`	Specifies redistributing local routes of the loopback interface.
`static`	Specifies redistributing static routes.
`rip`	Specifies redistributing RIP routes.
`ospf <PROCESS-ID>`	Specifies redistributing routes from the specified OSPFv2 process ID. Range: 1 to 63.
`route-map <ROUTE-MAP-NAME>`	Specifies redistribution filtering by route map. To create a route map, use command `route-map`.

Examples

Redistributing routes to OSPFv2:

```
switch(config)# router ospf 1
switch(config-ospf-1)# redistribute bgp
switch(config-ospf-1)# redistribute bgp route-map BGP_routes
switch(config-ospf-1)# redistribute connected
switch(config-ospf-1)# redistribute connected route-map connected_routes
switch(config-ospf-1)# redistribute local loopback
switch(config-ospf-1)# redistribute local loopback route-map local_routes
switch(config-ospf-1)# redistribute static
switch(config-ospf-1)# redistribute static route-map static_networks
switch(config-ospf-1)# redistribute rip
switch(config-ospf-1)# redistribute rip route-map rip-routes
switch(config-ospf-1)# redistribute ospf 2
```

Disabling redistributing routes to OSPFv2:

```
switch(config)# router ospf 1
switch(config-ospf-1)# no redistribute bgp
switch(config-ospf-1)# no redistribute bgp route-map BGP_routes
switch(config-ospf-1)# no redistribute connected
switch(config-ospf-1)# no redistribute connected route-map connected_routes
switch(config-ospf-1)# no redistribute local loopback
switch(config-ospf-1)# no redistribute local loopback route-map local_routes
switch(config-ospf-1)# no redistribute static
switch(config-ospf-1)# no redistribute static route-map static_networks
switch(config-ospf-1)# no redistribute rip
switch(config-ospf-1)# no redistribute rip route-map rip-routes
switch(config-ospf-1)# no redistribute ospf 2
```

Command History

Release	Modification
10.08	Added `route-map` support for supported redistribute source-protocols. Updated information and examples.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-ospf-<PROCESS-ID>`	Administrators or local user group members with execution rights for this command.

reference-bandwidth

`reference-bandwidth <BANDWIDTH>`
`no reference-bandwidth`

Description

Sets the reference bandwidth for OSPFv2. If the OSPFv2 interface cost is not explicitly set. then the cost of all the OSPFv2 interfaces is recalculated based on the reference bandwidth and link speed of the interface.

For VLAN interfaces the link speed value is taken as 1 Gbps (if the OSPFv2 interface cost is not explicitly set).

The `no` form of this command sets the reference bandwidth for OSPF to the default of 100000 Mbps.

Parameter	Description
<BANDWIDTH>	Specifies the reference bandwidth used to calculate the cost of an interface in Mbps. Range: 1 to 4000000. Default: 100000.

Examples

Setting the reference bandwidth:

```
switch(config)# router ospf 1
switch(config-ospf-1)# reference-bandwidth 40000
```

Setting the reference bandwidth to the default value:

```
switch(config)# router ospf 1
switch(config-ospf-1)# no reference-bandwidth
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-ospf-<PROCESS-ID>`	Administrators or local user group members with execution rights for this command.

retransmit-interval

```
retransmit-interval <INTERVAL>
no retransmit-interval
```

Description

Sets the time between retransmitting lost link state advertisements for virtual links.

The `no` form of this command sets the time between retransmitting lost link state advertisements to the default of 5 seconds for virtual links.

Parameter	Description
<INTERVAL>	Specifies the retransmit interval in seconds. Range: 1 to 3600. Default: 5.

Examples

Setting OSPFv2 virtual links retransmit interval:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)# retransmit-interval 30
```

Setting OSPFv2 virtual links retransmit interval to default:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)# no retransmit-interval
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-router-vlink`	Administrators or local user group members with execution rights for this command.

rfc1583-compatibility

```
rfc1583-compatibility
no rfc1583-compatibility
```

Description

Enables OSPF compatibility with RFC1583 (backward compatibility). If RFC1583 compatibility is enabled, then the route cost calculation follows a different method.

The `no` form of this command disables OSPF compatibility with RFC1583 (backward compatibility). By default the RFC1583 compatibility is disabled.

Examples

Enabling OSPF RFC1583 compatibility:

```
switch(config)# router ospf 1
switch(config-ospf-1)# rfc1583-compatibility
```

Disabling OSPF RFC1583 compatibility:

```
switch(config)# router ospf 1
switch(config-ospf-1)# no rfc1583-compatibility
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospf-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

router ospf

```
router ospf <PROCESS-ID> [vrf <VRF-NAME>]
no router ospf <PROCESS-ID> [vrf <VRF-NAME>]
```

Description

Creates an OSPF process (if not created already) on a VRF, and switches to the OSPF router instance context. Up to eight OSPF processes are supported per VRF.

The `no` form of this command removes the OSPF instance.

Parameter	Description
<PROCESS-ID>	Specifies an OSPF process ID. Range: 1 to 63.
`vrf` *<VRF-NAME>*	Specifies a VRF name for the OSPF process. Default: default.

Examples

```
switch(config)# router ospf 1
switch(config-ospf-1)#
```

```
switch(config)# router ospf 1 vrf vrf_red
```

```
switch(config)# no router ospf 1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Administrators or local user group members with execution rights for this command.

router-id

```
router-id <ROUTER-ADDR>
no router-id
```

Description

Sets an ID for the router in an IPv4 address format.

The no form of this command unconfigures the router-id for the instance and sets the router-id to the default as follows: the router-id is selected dynamically as equal to the highest loopback address on the router, or the highest active interface if there are no loopback addresses. If no IP address is configured on any interfaces on the router, OSPF will not form an adjacency.

Parameter	Description
<ROUTER-ADDR>	Specifies the Router ID in IPv4 format (x.x.x.x), where x is a decimal number from 0 to 255.

Examples

Setting router-id in the OSPF context:

```
switch(config)# router ospf 1
switch(config-ospf-1)# router-id 1.1.1.1
```

Unconfiguring router-id:

```
switch(config)# router ospf 1
switch(config-ospf-1)# no router-id
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospf-<*PROCESS-ID*>	Administrators or local user group members with execution rights for this command.

sha-key sha

```
sha-key <KEY-ID> sha [{ciphertext | plaintext} <KEY>]
no sha-key <KEY-ID>
```

Description

Sets the SHA (secure hash authentication) key for the selected virtual link. If the SHA key is given in ciphertext, it will be decrypted and applied to the protocol. This command accepts a key of up to 64 characters irrespective of the SHA version configured on virtual link. OSPF will internally pad zeros to the key to obtain a 64-byte key. For all types of SHA, key length is adjusted to 64 bytes.

The `no` form of this command deletes the virtual link SHA authentication key.

Parameter	Description
<KEY-ID>	Specifies the virtual link SHA key ID. Range: 1 to 255.
{ciphertext | plaintext}	Selects the virtual link SHA key format.
<KEY>	Specifies the virtual link SHA authentication key.

When the authentication key is not provided on the command line, plaintext key prompting occurs upon pressing Enter. The entered key characters are masked with asterisks.

Examples

Setting virtual link SHA authentication key in plaintext format:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)# sha-key 1 sha plaintext F82#450b
```

Setting the virtual link SHA authentication key in prompted plaintext format:

```
switch(config)# router ospf 1
```

```
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)# sha-key 1 sha
Enter the SHA authentication key: ********
Re-Enter the SHA authentication key: ********
```

Setting the virtual link SHA authentication key in ciphertext format:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)# sha-key 1 sha ciphertext AQapu...C2K47A=
```

Deleting the virtual link SHA authentication key:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)# no sha-key 1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-router-vlink	Administrators or local user group members with execution rights for this command.

show ip ospf

`show ip ospf [<PROCESS-ID>] [all-vrfs | vrf <VRF-NAME>] [vsx-peer]`

Description

Displays general OSPF, area, state, and configuration information.

Parameter	Description
<PROCESS-ID>	Enter an OSPF process ID to display general OSPF information for a particular OSPF process. Range: 1 to 63.
all-vrfs	Optionally select to display general OSPF information for all VRFs.
vrf *<VRF-NAME>*	Specifies the name of a VRF. Default: default.

Parameter	Description
vsx-peer	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

Showing general OSPF configurations:

```
switch# show ip ospf 1
Routing Process 1 with ID : 1.1.1.1 VRF default
-----------------------------------------------

OSPFv2 Protocol is enabled
Graceful-restart is configured
Restart Interval: 120, State: inactive
Last Graceful Restart Exit Status: none
Area Border: false
AS Border: false
SPF: Start Time: 200ms, Hold Time: 1000ms, Max Wait Time: 5000ms
LSA: Start Time: 5000ms, Hold Time: 0ms, Max Wait Time: 0ms
LSA Arrival: 1000ms
Maximum Paths to Destination: 4
Number of external LSAs 0, checksum sum 0
Summary address:
  prefix 20.1.1.0/24 advertise tag 10
Number of areas is 2, 2 normal, 0 stub, 0 NSSA
Number of active areas is 1, 1 normal, 0 stub, 0 NSSA
BFD is disabled
Reference Bandwidth: 100000 Mbps
Area (0.0.0.0) (Active)
  Interfaces in this Area: 1 Active Interfaces: 1
  Passive Interfaces: 0 Loopback Interfaces: 0
  SPF calculation has run 7 times
  Area ranges:
  Number of LSAs: 3, checksum sum 75093
Area (0.0.0.1) (Inactive)
  Interfaces in this Area: 0 Active Interfaces: 0
  Passive Interfaces: 0 Loopback Interfaces: 0
  SPF calculation has run 2 times
  Area ranges:
    ip-prefix 20.1.1.1/24, inter-area, advertise
  Number of LSAs: 0, checksum sum 0
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300	Operator (>) or Manager	Operators or Administrators or local user group members with

Platforms	Command context	Authority
6400 8320 8325 8360 9300 10000	(#)	execution rights for this command. Operators can execute this command from the operator context (>) only.

show ip ospf border-routers

```
show ip ospf [<PROCESS-ID>]
     border-routers [all-vrfs | vrf <VRF-NAME>] [vsx-peer]
```

Description

Displays the OSPF routing table entries for Area Border Router (ABR) and Autonomous System Border Router (ASBR).

Parameter	Description
<PROCESS-ID>	Enter an OSPF process ID to display general OSPF information for a particular OSPF process. Range: 1 to 63.
`all-vrfs`	Optionally select to display general OSPF information for all VRFs.
`vrf <VRF-NAME>`	Specifies the name of a VRF. Default: default.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

Showing OSPF border routers information:

```
switch# show ip ospf border-routers
OSPF Process ID 1 VRF default Internal Routing Table
-----------------------------------------------------

Codes: i - Intra-area route, I - Inter-area route

i 2.2.2.2 [10], ABR, Area 0.0.0.0, SPF 15 via
    10.1.1.2, Interface 1/1/1
i 2.2.2.2 [10], ABR, Area 0.0.0.1, SPF 15 via
    11.1.1.12, Interface 1/1/2
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show ip ospf interface

```
show ip ospf [<PROCESS-ID>] interface [<interface-name>] [brief]
[all-vrfs | vrf <VRF-NAME>]  [vsx-peer]
```

Description

Displays general OSPF, area, state, and configuration information.

Parameter	Description
<PROCESS-ID>	Enter an OSPF process ID to display general OSPF information for a particular OSPF process. Range: 1 to 63.
<interface-name>]	Specify the name of an OSPF interface.
`brief`	Include this parameter to display a brief overview of the following OSPF configuration information. ■ Interface: OSPF interface name. ■ Area: OSPF area ID. ■ Cost: The metric OSPF uses to judge a path's feasibility, calculated as (reference bandwidth / interface bandwidth). ■ State: Indicates if the interface is a designated router (`Dr`) or a backup designated router (`Backup-dr`). ■ Status: Indicates if the interface is `up` or `down`. ■ Flags: P - Passive A - Active.
`all-vrfs`	Optionally select to display general OSPF information for all VRFs.
`vrf` *<VRF-NAME>*	Specifies the name of a VRF. Default: default.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

Showing general OSPF configuration settings for the default VRF:

```
switch (config-if)# show ip ospf 1
VRF : default                              Process  : 1
-------------------------------------------------------

RouterID               : 20.0.0.1            OSPFv2                 : Enabled
SPF Start Interval     : 200   ms
```

```
SPF Hold Interval      : 1000  ms          SPF Max Wait Interval  : 5000  ms
LSA Start Time         : 5000  ms          LSA Hold Time          : 0     ms
LSA Max Wait Time      : 0     ms          LSA Arrival            : 1000  ms
External LSAs          : 0                 Checksum Sum           : 0
ECMP                   : 4                 Reference Bandwidth    : 100000 Mbps
Area Border            : false             AS Border              : false
GR Status              : Enabled           GR Interval            : 120 sec
GR State               : inactive          GR Exit Status         : none
GR Helper              : Enabled           GR Strict LSA Check    : Enabled
GR Ignore Lost I/F     : Disabled
Summary address:

Area      Total     Active
------------------------------
Normal     1         1
Stub       0         0
NSSA       0         0

Area  : 0.0.0.0
----------------
Area Type              : Normal        Status               : Active
Total Interfaces       : 1             Active Interfaces    : 1
Passive Interfaces     : 0             Loopback Interfaces  : 0
SPF Calculation Count  : 4
Area ranges     :
Number of LSAs         : 3             Checksum Sum         : 82420
```

Showing OSPF configuration settings for all interfaces:

```
switch(config)# show ip ospf interface
Codes: DR - Designated router  BDR - Backup Designated router

Interface 1/1/1 is up, line protocol is up
-------------------------------------------

VRF                 : default                       Process             : 1
IP Address          : 20.0.0.1/24                   Area                : 0.0.0.0
Status              : Up                            Network Type        :
Broadcast
Hello Interval      : 10    sec                     Dead Interval       : 40
sec
Transit Delay       : 1     sec                     Retransmit Interval : 5
sec
Link Speed          : 1000 Mbps
Cost Configured     : NA                            Cost Calculated     : 100
State/Type          : DR                            Router Priority     : 1
DR                  : 20.0.0.1                      BDR                 : 20.0.0.2
Link LSAs           : 0                             Checksum Sum        : 0
Authentication      : No                            Passive             : No
```

Command History

Release	Modification
10.09	Output of the `show ip ospf interface` command includes flags to indicate whether the interface is in passive or active mode.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show ip ospf lsdb

```
show ip ospf [<PROCESS-ID>] lsdb  [all-vrfs | vrf <VRF-NAME>]
     [area <AREA-ID>] [lsid <LINK-STATE-ID>]
     [adv-router {<ROUTER-ID> | self}] [vsx-peer]
show ip ospf [<PROCESS-ID>] lsdb  [all-vrfs | vrf <VRF-NAME>]
     asbr-summary [area <AREA-ID>] [lsid <LINK-STATE-ID>]
     [adv-router {<router-id> | self}] [vsx-peer]
show ip ospf [<PROCESS-ID>] lsdb  [all-vrfs | vrf <VRF-NAME>]
     external [lsid <LINK-STATE-ID>] [adv-router {<ROUTER-ID> | self}] [vsx-peer]
show ip ospf [<PROCESS-ID>] lsdb  [all-vrfs | vrf <VRF-NAME>]
     router [area <AREA-ID>] [lsid <LINK-STATE-ID>]
     [adv-router {<ROUTER-ID> | self}] [vsx-peer]
show ip ospf [<PROCESS-ID>] lsdb  [all-vrfs | vrf <VRF-NAME>]
     network [area <AREA-ID>] [lsid <LINK-STATE-ID>]
     [adv-router {<ROUTER-ID> | self}] [vsx-peer]
show ip ospf [<PROCESS-ID>] lsdb  [all-vrfs | vrf <VRF-NAME>]
     summary [area <AREA-ID>] [lsid <LINK-STATE-ID>]
     [adv-router {<ROUTER-ID> | self}] [vsx-peer]
show ip ospf [<PROCESS-ID>] lsdb  [all-vrfs | vrf <VRF-NAME>]
     nssa-external [area <AREA-ID>] [lsid <LINK-STATE-ID>]
     [adv-router {<ROUTER-ID> | self}] [vsx-peer]
show ip ospf [<PROCESS-ID>] lsdb  [all-vrfs | vrf <VRF-NAME>]
     database-summary [vsx-peer]
```

Description

Shows the OSPF link state database summary for different OSPF LSAs (Link State Advertisement). Use the parameters to get information for a particular LSA.

Parameter	Description
<PROCESS-ID>	Enter an OSPF process ID to display general OSPF information for a particular OSPF process. Range: 1 to 63.
`all-vrfs`	Optionally select to display general OSPF information for all VRFs.
`vrf` *<VRF-NAME>*	Specifies the name of a VRF. Default: default. Optionally select one of the following parameters to filter the link state database information. `asbr-summary`. Displays ASBR summary link states (LSA type 4). `external`. Displays external link states (LSA type 5). The external parameter does not take the area <AREA-ID> parameter. `router`. Displays router LSAs (LSA type 1). `network`. Displays network LSAs (LSA type 2). `summary`. Displays network-summary link states (LSA type 3).

Parameter	Description
	`nssa-external`. Displays NSSA external link states (LSA type 7).
`database-summary`	Select to display the count of each type of LSA and each area in the database.
`area <AREA-ID>`	Select to display information filtered for the specified area in one of the following formats. OSPF area identifier in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255. OSPF area identifier in decimal format. Value: 0 to 4294967295.
`lsid <LINK-STATE-ID>`	Select to display information filtered by link state identifier specified in IPv4 address format (A.B.C.D).
`adv-router {<ROUTER-ID> | self}`	Select to display link states for a particular advertising router. Specify either a Router ID of the advertising router or specify `self` to show self-originated link states.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

Showing OSPF link state database (LSDB) general information:

```
switch# show ip ospf lsdb
OSPF Router with ID (50.50.50.50) (Process ID 1 VRF default)
================================================================

Router Link State Advertisements (Area 0.0.0.0)
-----------------------------------------------

LSID            ADV Router      Age     Seq#        Checksum    Link Count
-------------------------------------------------------------------------
40.40.40.40     40.40.40.40     930     0x80000004  0x2ea1      3
50.50.50.50     50.50.50.50     935     0x80000002  0x8b52      1
60.60.60.60     60.60.60.60     943     0x800003c5  0x9854      2

Network Link State Advertisements (Area 0.0.0.0)
------------------------------------------------

LSID            ADV Router      Age     Seq#        Checksum
-------------------------------------------------------------
209.165.201.3   60.60.60.60     944     0x80000001  0x7179
192.0.2.1       50.50.50.50     935     0x80000001  0x516a

Inter-area Summary Link State Advertisements (Area 0.0.0.0)
-----------------------------------------------------------

LSID            ADV Router      Age     Seq#        Checksum
-------------------------------------------------------------
209.165.201.1   40.40.40.40     929     0x80000001  0x2498
209.165.201.1   50.50.50.50     928     0x80000001  0x5b2f
209.165.201.1   60.60.60.60     1265    0x800003c3  0xf49b
```

```
192.0.2.0       40.40.40.40     943     0x80000001  0x53f3
192.0.2.0       50.50.50.50     935     0x80000001  0x26f8
192.0.2.0       60.60.60.60     930     0x80000001  0x7b51
```

Showing ASBR summary link states:

```
switch# show ip ospf lsdb asbr-summary
OSPF Router with ID (2.2.2.1) (Process ID 1 VRF default)
============================================================

ASBR Summary Link State Advertisements (Area 0.0.0.0)
------------------------------------------------------

LSID            ADV Router      Age     Seq#            Checksum
-------------------------------------------------------------------
209.165.201.3   60.60.60.60     944     0x80000001      0x7179
192.0.2.1       50.50.50.50     935     0x80000001      0x516a
```

Showing external link states:

```
switch# show ip ospf lsdb external
OSPF Router with ID (2.2.2.1) (Process ID 1 VRF default)
============================================================

AS External Link State Advertisements
-------------------------------------

LSID            ADV Router      Age     Seq#            Checksum
-------------------------------------------------------------------
209.165.201.3   60.60.60.60     944     0x80000001      0x7179
192.0.2.1       50.50.50.50     935     0x80000001      0x516a
```

Showing database summary:

```
switch# show ip ospf lsdb database-summary
OSPF Router with ID (10.1.1.1) (Process ID 1 VRF default)
============================================================

Area 0.0.0.0 database summary
------------------------------

LSA Type              Count
--------------------------
Router                2
Network               1
Inter-area Summary    1
ASBR Summary          0
NSSA External         0
Subtotal              4

Process 1 database summary
--------------------------

LSA Type              Count
--------------------------
Router                2
Network               1
```

```
Inter-area Summary   1
ASBR Summary         0
NSSA External        0
AS External          0
Total                4
```

Showing router LSAs:

```
switch# show ip ospf lsdb router
OSPF Router with ID (2.2.2.1) (Process ID 1 VRF default)
=========================================================

Router Link State Advertisements (Area 0.0.0.0)
-----------------------------------------------

LSID            ADV Router      Age         Seq#       Checksum Link Count
-------------------------------------------------------------------------
1.1.1.2         1.1.1.2         15          0x80000004 0xf526    1
2.2.2.1         2.2.2.1         14          0x80000005 0x6c5e    2
2.2.2.2         2.2.2.2         104         0x80000004 0xf51a    1
```

Showing network LSAs:

```
switch# show ip ospf lsdb network
OSPF Router with ID (2.2.2.1) (Process ID 1 VRF default)
=========================================================

Network Link State Advertisements (Area 0.0.0.0)
------------------------------------------------

LSID            ADV Router      Age         Seq#       Checksum
-----------------------------------------------------------------
1.1.1.2         1.1.1.2         141         0x80000001 0xc55e
2.2.2.2         2.2.2.2         230         0x80000001 0xa179
```

Showing network-summary link states:

```
sswitch# show ip ospf lsdb summary
OSPF Router with ID (2.2.2.1) (Process ID 1 VRF default)
=========================================================

Inter-area Summary Link State Advertisements (Area 0.0.0.0)
-----------------------------------------------------------

LSID            ADV Router      Age         Seq#       Checksum
-----------------------------------------------------------------
1.1.1.0         2.2.2.1         133         0x80000002 0xa089

Inter-area Summary Link State Advertisements (Area 0.0.0.1)
-----------------------------------------------------------

LSID            ADV Router      Age         Seq#       Checksum
-----------------------------------------------------------------
2.2.2.0         2.2.2.1         133         0x80000002 0x7caa
```

Showing NSSA external link states:

```
switch(config-ospf-1)# show ip ospf lsdb nssa-external
OSPF Router with ID (2.2.2.1) (Process ID 1 VRF default)
==========================================================

NSSA External Link State Advertisements (Area 0.0.0.1)
------------------------------------------------------

LSID            ADV Router      Age         Seq#       Checksum
-----------------------------------------------------------------
8.8.8.0         1.1.1.2         162         0x80000003 0xc7b2
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show ip ospf neighbors

```
show ip ospf [<PROCESS-ID>] neighbors [<NEIGHBOR-ID>]
     [interface <INTERFACE-NAME>] [detail | summary]
     [all-vrfs | vrf <VRF-NAME>] [vsx-peer]
```

Description

Displays information about OSPF neighbors.

Parameter	Description
<PROCESS-ID>	Enter an OSPF process ID to display OSPF neighbor information for the particular OSPF process. Range: 1 to 63.
`neighbors` *<NEIGHBOR-ID>*	Select to display information about a particular neighbor, specified in IPv4 format (A.B.C.D).
`interface` *<INTERFACE-NAME>*	Select to display neighbor information only for the specified interface.
`detail`	Select to display detailed information for all the neighbors.
`summary`	Select to display summary information for the neighbors.
`all-vrfs`	Select to display neighbor information for all VRFs.

Parameter	Description
`vrf <VRF-NAME>`	Specify the name of a VRF. Default: default.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

Showing OSPF neighbors information for the default VRF:

```
switch# show ip ospf neighbors
OSPF Process ID 1 VRF default
================================

Total Number of Neighbors: 1

Neighbor ID      Priority  State             Nbr Address       Interface
-------------------------------------------------------------------------
2.2.2.2          1         FULL/DR           10.1.1.2           1/1/1
```

Showing OSPF neighbors information for VRF red:

```
switch# show ip ospf neighbors vrf red
OSPF Process ID 1 VRF red
============================

Total Number of Neighbors: 1

Neighbor ID      Priority  State             Nbr Address       Interface
-------------------------------------------------------------------------
1.1.1.1          1         FULL/BDR          10.1.1.1           1/1/1
```

Showing OSPF neighbors information for a specific neighbor:

```
switch# show ip ospf neighbors 2.2.2.2
Neighbor 2.2.2.2, interface address 10.1.1.2
-----------------------------------------
Process ID 1 VRF default, in area 0.0.0.0 via interface 1/1/1
Neighbor priority is 1, State is FULL
Options is 0x42
Dead timer due in 00:00:32
Time since last state change 00h:19m:17s
```

Showing OSPF neighbors information for a specific neighbor and interface:

```
switch# show ip ospf neighbors 2.2.2.2 interface 1/1/1
Neighbor 2.2.2.2, interface address 10.1.1.2
-----------------------------------------
Process ID 1 VRF default, in area 0.0.0.0 via interface 1/1/1
Neighbor priority is 1, State is FULL
DR is 10.1.1.2, BDR is 10.1.1.1
Options is 0x42
```

```
Dead timer due in 00:00:38
Retransmission queue length 0
Time since last state change 00h:22m:21s
```

Showing detail information for OSPF neighbors:

```
switch# show ip ospf neighbors detail
Neighbor 2.2.2.2, interface address 10.1.1.2
------------------------------------------
Process ID 1 VRF default, in area 0.0.0.0 via interface 1/1/1
Neighbor priority is 1, State is FULL
DR is 10.1.1.2, BDR is 10.1.1.1
Options is 0x42
Dead timer due in 00:00:38
Retransmission queue length 0
Time since last state change 00h:22m:21s
```

Showing summary information for OSPF neighbors in default VRF:

```
switch# show ip ospf neighbors summary
OSPF Process ID 1 VRF default, Neighbor Summary
================================================

Interface  Down Attempt Init TwoWay ExStart Exchange Loading Full  Total
-------------------------------------------------------------------------
1/1/1      0    0       0    0      0       0        0       1     1
1/1/2      0    0       0    0      0       0        0       0     0
Total      0    0       0    0      0       0        0       1     1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show ip ospf routes

```
show ip ospf [<PROCESS-ID>] routes
     [<IPV4-ADDR>/<MASK>] [all-vrfs | vrf <VRF-NAME>] [vsx-peer]
```

Description

Displays OSPF routing table information.

Parameter	Description
<PROCESS-ID>	Enter an OSPF process ID to display OSPF neighbor information for the particular OSPF process. Range: 1 to 63.
<IPV4-ADDR>	Specify an IP address in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255. .
<MASK>	Specifies the number of bits in the address mask in CIDR format (`x`), where `x` is a decimal number from 0 to 32.
`all-vrfs`	Select to display neighbor information for all VRFs.
`vrf` *<VRF-NAME>*	Specify the name of a VRF. Default: default.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

Showing OSPF routing table information:

```
switch# show ip ospf routes
Codes: i - Intra-area route, I - Inter-area route
       E1 - External type-1, E2 - External type-2

OSPF Process ID 1 VRF default, Routing Table
----------------------------------------

Total Number of Routes : 2

10.1.1.0/24         (i) area: 0.0.0.0
     directly attached to interface 1/1/1, cost 1 distance 110
20.1.1.0/24         (I)
     via 10.1.1.2 interface 1/1/1, cost 2 distance 110
```

Showing OSPF routing table information for a specific subnet:

```
switch# show ip ospf routes 10.1.1.0/2
Codes: i - Intra-area route, I - Inter-area route
       E1 - External type-1, E2 - External type-2

OSPF Process ID 1 VRF default, Routing Table for prefixes 10.1.1.0/24
----------------------------------------------------------------------

Total Number of Routes : 1

10.1.1.0/24         (i) area: 0.0.0.0
     directly attached to interface 1/1/1, cost 1 distance 110
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show ip ospf statistics

```
show ip ospf [<PROCESS-ID>] statistics [all-vrfs | vrf <VRF-NAME>] [vsx-peer]
```

Description

Displays OSPF statistics.

Parameter	Description
<PROCESS-ID>	Enter an OSPF process ID to display OSPF neighbor information for the particular OSPF process. Range: 1 to 63.
`all-vrfs`	Select to display OSPF statistics information for all VRFs.
`vrf` *<VRF-NAME>*	Specify the name of a VRF. Default: default.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

Showing OSPF statistics:

```
switch# show ip ospf statistics
OSPF Process ID 1 VRF default, Statistics (cleared 1h 16m 24s ago)
------------------------------------------------------------

Unknown Interface Drops         : 0
Unknown Virtual Interface Drops : 0
Bad Instance ID Drops           : 0
Bad IP Header Length Drops      : 0
Wrong OSPF Version Drops        : 0
Bad Source IP Drops             : 0
Resource Failure Drops          : 0
Bad Header Length Drops         : 0
Total Drops                     : 0
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show ip ospf statistics interface

```
show ip ospf [<PROCESS-ID>] statistics interface [<INTERFACE-NAME>]
     [all-vrfs | vrf <VRF-NAME>] [vsx-peer]
```

Description

Displays OSPF statistics for the OSPF-enabled interfaces.

Parameter	Description
<PROCESS-ID>	Enter an OSPF process ID to display OSPF-enabled interface statistics information on the specified OSPF process. Range: 1 to 63.
<INTERFACE-NAME>	Select to display information only for the specified interface.
`all-vrfs`	Select to display OSPF-enabled interface statistics information for all VRFs.
`vrf` *<VRF-NAME>*	Specify the name of a VRF. Default: default.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

Showing OSPF-enabled interfaces information:

```
switch# show ip ospf statistics interface 1/1/1
OSPF Process ID 1 VRF default, interface 1/1/1 statistics (cleared 0h 30m 28s ago)
================================================================================

Tx Hello Packets      : 101              Rx Hello Packets       : 99
Tx Hello Bytes        : 101              Rx Hello Bytes         : 99
Tx DD Packets         : 101              Rx DD Packets          : 99
Tx DD Bytes           : 101              Rx DD Bytes            : 99
Tx LS Request Packets : 101              Rx LS Requests Packets : 99
```

```
Tx LS Request Bytes   : 101              Rx LS Request Bytes    : 99
Tx LS Update Packets  : 101              Rx LS Update Packets   : 99
Tx LS Update Bytes    : 101              Rx LS Update Bytes     : 99
Tx LS Ack Packets     : 101              Rx LS Ack Packets      : 99
Tx LS Ack Bytes       : 101              Rx LS Ack Bytes        : 99

Total Number of State Changes : 8
Number of LSAs                : 29
LSA Checksum Sum              : 2345
Total Transmit Failures       : 29
Total OSPF Packets Discarded  : 999

Reason                                  Packets Dropped
-------------------------------------------------------
Invalid type                            19
Invalid length                          9
Invalid checksum                        0
Invalid version                         23
Bad or unknown source                   67
Area mismatch                           1
Self-originated                         19
Duplicate router ID                     9
Interface standby                       0
Total Hello packets dropped             60
  Network Mask mismatch                 10
  Hello interval mismatch               10
  Dead interval mismatch                10
  Options mismatch                      10
  MTU mismatch                          10
  Neighbor ignored                      10
Authentication errors                   12
  Type mismatch                         6
  Authentication failures               6
Wrong protocol                          0
Resource failures                       0
Bad LSA length                          0
Others                                  0

Total LSAs Ignored : 176
Bad Type           : 10
Bad Length         : 56
Invalid Data       : 55
Invalid Checksum   : 55
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

Platforms	Command context	Authority
9300 10000		

show ip ospf virtual-links

```
show ip ospf [<PROCESS-ID>] virtual-links [brief] [all-vrfs | vrf <VRF-NAME>] [vsx-peer]
```

Description

Displays the current state and parameters of the OSPF virtual links.

Parameter	Description
<PROCESS-ID>	Enter an OSPF process ID to display information on the OSPF virtual links for the particular OSPF process. Range: 1 to 63.
`brief`	Select to display brief overview information for the OSPF virtual links.
`all-vrfs`	Select to display OSPF virtual links information for all VRFs.
`vrf` *<VRF-NAME>*	Specify the name of a VRF. Default: default.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

Showing OSPF virtual links information:

```
switch# show ip ospf virtual-links
Virtual link to router 40.40.40.40 is up
----------------------------------------

Process ID 21 VRF default, Transit area 0.0.0.1
Transit delay 1 sec
Timer Intervals: hello 10, dead 40, retransmit 5
No authentication
Number of Link LSAs: 0, checksum sum 0
4 state changes
```

Showing brief overview information for OSPF virtual links:

```
switch# show ip ospf virtual-links brief
OSPF Process ID 1 VRF default
==============================

Total Number of Virtual Links: 1

Remote Router    Transit Area      Status
----------------------------------------
2.2.2.2          0.0.0.1           down
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

summary-address

```
summary-address  <IPV4-ADDR>/<MASK> [no-advertise | tag <TAG-VALUE>]
no summary-address <prefix/length> [no-advertise | tag <tag-value>
```

Description

Summarizes the external routes with the matching address and mask. When advertising this route, its metric is set to the lowest cost path from among the routes that were summarized.

The `no` form of this command disables route summarization.

This command only works for an ASBR (Autonomous System Boundary Router).

Parameter	Description
<IPV4-ADDR>	Specifies an IP address in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255.
<MASK>	Specifies the number of bits in the address mask in CIDR format (`x`), where `x` is a decimal number from 0 to 32.
`no-advertise`	Do not advertise the aggregate route. Suppress routes that match the specified prefix/mask pair.
`tag` *<TAG-VALUE>*	Specify the tag for the aggregate route. The summary prefix will be advertised along with the tag value in External LSAs. Range: 0 to 4294967295

Examples

Setting OSPF route summarization:

```
switch(config)# router ospf 1
switch(config-ospf-1)# summary-address 10.1.0.0/16
```

Disabling route summarization:

```
switch(config)# router ospf 1
switch(config-ospf-1)# no summary-address 10.1.0.0/16
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospf-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

timers lsa-arrival

```
timers lsa-arrival <DELAY>
no timers lsa-arrival
```

Description

Configures the minimum delay between receiving the same LSA from a peer. The same LSA is an LSA that contains the same LSA ID number, LSA type, and advertising router ID. If an instance of the same LSA arrives sooner before the delay expires, the LSA is dropped. Generally, the LSA arrival timer should be set to a value less than or equal to the start-time value for the command `timers throttle lsa start` on the neighbor.

The `no` form of this command sets the LSA timers to default values.

Parameter	Description
<DELAY>	Specifies the delay in milliseconds. Range: 0 to 600000. Default: 1000.

Examples

Setting the LSA arrival timer:

```
switch(config)# router ospf 1
switch(config-ospf-1)# timers lsa-arrival 10
```

Setting the LSA arrival timer to default:

```
switch(config)# router ospf 1
switch(config-ospf-1)# no timers lsa-arrival
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-ospf-<PROCESS-ID>`	Administrators or local user group members with execution rights for this command.

timers throttle lsa

`timers throttle lsa start-time <START-TIME> hold-time <HOLD-TIME> max-wait-time <WAIT-TIME>`
`no timers throttle lsa`

Description

Configures the timers for LSA generation.

The `no` form of this command sets the LSA timers to default values.

Parameter	Description
`start-time <START-TIME>`	Specifies the initial wait time in milliseconds after which LSAs are generated. When set to 0, the LSAs are generated without any delay. Range: 0 to 600000. Default: 5000.
`hold-time <HOLD-TIME>`	Specifies the amount of time, in milliseconds, between regeneration of an LSA. The hold time doubles each time the same LSA must be regenerated, until `max-wait-time` is reached. When set to 0, LSA regeneration time is not increased. Range: 0 to 600000. Default: 0.
`max-wait-time <WAIT-TIME>`	Specifies the maximum wait time, in milliseconds, for regeneration of the same LSA. When set to 0, LSA regeneration time is not increased. Range: 0 to 600000. Default: 0.

Examples

Setting the LSA timers:

```
switch(config)# router ospf 1
switch(config-ospf-1)# timers throttle lsa start-time 100 hold-time 1000 max-wait-
time 10000
```

Setting LSA timers to default values:

```
switch(config)# router ospf 1
switch(config-ospf-1)# no timers throttle lsa
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospf-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

timers throttle spf

```
timers throttle spf start-time <START-TIME> hold-time <HOLD-TINME>
max-wait-time <WAIT-TIME>
no timers throttle spf
```

Description

Configures timers for SPF calculation. There are three timers:

- `start-time` Is the initial delay before an SPF calculation is started. Default is 200 milliseconds.
- `hold-time` Is the progressive backoff time to wait before next scheduled SPF calculation. Default is 1000 milliseconds. If a route change event occurs during this period, the value doubles until it reaches the *max-wait-time*.
- `max-wait-time` Is the maximum time to wait before the next scheduled SPF calculation. Default is 5000 milliseconds. This is used to limit the SPF hold timer and also defines the time to be considered for which the OSPF LSDB has to be stable, after which the SPF throttle mechanism is reset.

The `no` form of this command sets all the configured non-default timers to default value.

Parameter	Description
<START-TIME>	Time in milliseconds to set timer for initial SPF delay. Default: 200.
<HOLD-TINME>	Time in milliseconds to set the minimum hold time between two consecutive SPF calculations. Default: 1000.
<WAIT-TIME>	Time in milliseconds to set the maximum wait time between two consecutive SPF calculations. Default: 5000.

Examples

Setting non-default timer values for SPF throttling:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# timers throttling spf start-time 500 hold-time 3000 max-
wait-time 9000
Switch(config-ospfv3-1)# show running-config current-context
router ospfv3 1
               area 0.0.0.0
               area 0.0.0.1
               area 0.0.0.2 nssa no-summary
               area 0.0.0.3 stub
```

Setting default timer values for SPF throttling after configuring non-default values:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no timers throttling spf
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospfv3-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

transit-delay

```
transit-delay <SECONDS>
no transit-delay
```

Description

Sets the time delay in Link state transmission for virtual links.

The no form of this command sets the delay in Link state transmission to the default of 1 second for virtual links.

Parameter	Description
<SECONDS>	Specifies the time delay for the transit delay, in seconds. Default: 1 second. Range: 1-3600.

Examples

Setting OSPFv2 virtual links transit delay:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)# transit-delay 30
```

Setting OSPFv2 virtual links transit delay to default:

```
switch(config)# router ospf 1
switch(config-ospf-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink)# no transit-delay
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-router-vlink	Administrators or local user group members with execution rights for this command.

trap-enable

```
trap-enable
no trap-enable
```

Description

Enables the notification of the events to be sent as traps to the SNMP management stations for OSPF.

The no form of this command disables the notification of the events to be sent as traps to the SNMP management stations for OSPF.

Examples

Enabling sending notification of events as traps:

```
switch(config)# router ospf 1
switch(config-ospf-1)# trap-enable
```

Disabling sending notification of events as traps:

```
switch(config)# router ospf 1
switch(config-ospf-1)# no trap-enable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-ospf-<PROCESS-ID>`	Administrators or local user group members with execution rights for this command.

Chapter 6
Open Shortest Path First version 3 (OSPFv3)

OSPFv3 is the IPv6 implementation of Open Shortest Path First protocol (OSPFv2 is the IPv4 implementation of this protocol). OSPFv3 is a routing protocol which is described in RFC5340 entitled OSPF for IPv6. It is a link-state based IGP (Interior Gateway Protocol) routing protocol. It is widely used with medium to large-sized enterprise networks.

Overview

The characteristics of OSPFv3 are:

- Provides a loop-free topology using SPF algorithm.
- Allows hierarchical routing using area 0 (backbone area) as the top of the hierarchy.
- Supports load balancing with equal cost routes for same destination.
- OSPFv3 is a classless protocol and allows for a hierarchical design with VLSM (Variable Length Subnet Masking) and route summarization.
- Scales enterprise size network easily with area concept.
- Provides fast convergence with triggered, incremental updates through Link State Advertisements (LSAs).

Some OSPFv3 configuration is done in the configuration context, others in the OSPFv3 router context, or in the interface context. OSPFv3 can be configured on routed ports, VLAN interfaces, LAG interfaces, and loopback interfaces. All such configurations work in the mentioned interfaces context. OSPFv3 mandates the associated interface to be routing interface.

The switch supports congestion control (prioritizing hello packets, inactivity timer reset, and adjacency throttling).

Supported features

- OSPFv3 neighbor adjacency, Hello protocol, multiple areas, Inter-area routing
- AS external routes, stub areas, totally stubby areas, NSSA, ABR, ASBR
- Designated Router/Backup Designated Router
- Point-to-point interfaces/broadcast interfaces
- Virtual Links
- Bidirectional Forwarding Detection (BFD) - refer to the *High Availability Guide* for additional information
- Equal-cost multipath
- Null authentication, Simple password authentication, MD5 authentication
- Area range aggregation - Type-3/Type-7
- External route aggregation - Type-5 LSAs
- Graceful Restart - un-planned, restart interval, Graceful Restart Helper
- Stub router advertisement
- SPF throttling
- LSA Throttling
- SPF throttling

- Graceful Restart - un-planned, restart interval, Graceful Restart Helper
- Stub router advertisement
- Configuration of interface parameters such as priority, cost, hello-interval, dead-interval, retransmit-interval, transit-delay, etc.
- Configuration of virtual link parameters such as hello-interval, dead-interval, retransmit-interval, transit-delay, etc.
- Route redistribution
- Passive interfaces
- Multi VRF support with each VRF having up to eight OSPF process instances
- Congestion control (prioritizing hello packets, inactivity timer reset, and adjacency throttling)

How OSPFv3 protocol works

OSPFv3 protocol

The protocol uses Link State Advertisements (LSAs) transmitted by each router to update neighboring routers regarding its interfaces and the routes available through those interfaces. Each routing switch in an area also maintains a link-state database (LSDB) that describes the area topology. (All routers in a given OSPF area have identical LSDBs.) The routing switches used to connect areas to each other flood summary link LSAs and external link LSAs to neighboring OSPF areas to update them regarding available routes. Through this means, each OSPF router determines the shortest path between itself and a desired destination router in the same OSPF domain (Autonomous System (AS)).

OSPFv3 concepts

OSPFv3 is a link-state routing protocol applied to IPv6 routers grouped into OSPFv3 areas identified by the IPv6 routing configuration on each routing switch. Each OSPFv3 area includes one or more networks. OSPFv3 routers use hello packets and LSAs to maintain OSPFv3 operation across networks within an area and between areas within an OSPFv3 domain.

OSPFv3 uses hello packets to initiate and preserve relationships between neighboring routers on the same interface.

OSPFv3 Link-state advertisement (LSA) types

OSPFv3 uses LSAs transmitted by each router to update neighboring routers regarding its interfaces and the routes available through those interfaces.

Each routing switch in an area also maintains an LSDB that describes the area topology. (All routers in a given OSPFv3 area have identical LSDBs, and each router uses the LSDB to build its own shortest-path tree.)

The routing switches used to connect areas to each other flood inter-area-prefix-LSAs, inter-area-router-LSAs, and AS-external-LSAs to backbone area to update it regarding available routes. Each OSPFv3 router determines the shortest path between itself and a desired destination router in the same OSPFv3 domain (AS). Routed traffic in an OSPFv3 AS is classified as one of the following:

- Intra-area traffic
- Inter-area traffic
- External traffic

The routing switches support the LSAs listed in the following table.

Link-state type	Description	Use	Flood scope
0x2001	Router-LSA	Describes the state of each active interface on a router for Area a given area. (Excludes loopback interfaces and interfaces that have not achieved full adjacency.)	Area
0x2002	Network-LSA	Describes the OSPFv3 routers in a given network.	Area
0x2003	Inter-area-prefix-LSA	Describes the route to a prefix in another OSPFv3 area of Area the same AS. (Excludes prefixes for link-local addresses.) Propagated through backbone area to other areas.	Area
0x2004	Inter-area-router-LSA	Describes the route to an ASBR in another OSPFv3 normal area (including the backbone area) of the same AS. Propagated through backbone area to other areas. (Excludes any ASBR in the same area as the router sending the LSA.)	Area
0x4005	AS-external-LSA	Describes the route to a destination prefix in another AS (external route). (Excludes prefixes for link-local addresses.) Originated by ASBR in normal or backbone areas of an AS and propagates through backbone area to other normal areas. Does not flood over virtual links and is not summarized in virtual links. For injection into an NSSA, an NSSA ABR generates a type-7-default-LSA advertising the default route (::/0).	AS
0x2007	NSSA-LSA	Describes the route to a destination in another AS (external route). Originated by ASBR in NSSA. ABR translates type-7 LSAs to AS-external-LSAs for injection into the backbone area.	NSSA

Link-state type	Description	Use	Flood scope
0x0008	Link-LSA	For other routers on the same VLAN interface (except virtual links), describes the router link-local address and any other IPv6 prefixes reachable on the VLAN. Link LSAs are not flooded over virtual links.	Link-local
0x2009	Intra-area-prefix-LSA	Generated on transit links within an area by the DR operating on those links. Also, every OSPFv3 router generates this LSA to refer to stub and loopback prefixes on the router.	Area

OSPFv3 area types

OSPFv3 is built upon a hierarchy of network areas. All areas for a given OSPFv3 domain reside in the same AS. An AS is defined as a number of contiguous networks that share an interior gateway routing protocol.

An AS can be divided into multiple areas, including the backbone (area 0). Because each area represents a collection of contiguous networks and hosts, the topology of a given area is not known by the internal routers in any other area. Areas define the boundaries to which router-LSAs and network-LSAs are broadcast. This functionality limits the amount of LSA flooding that occurs within the AS. It also helps to control the size of the link-state databases (LSDBs) maintained in OSPFv3 routers.

An area is represented in OSPFv3 by either a 32-bit dotted-decimal address or a number. Area types include: Backbone, Normal, Not-so-stubby (NSSA), and Stub.

Backbone area

Every AS must have one (and only one) backbone area (identified as area 0 or 0.0.0.0.) The ABRs of all other areas in the same AS connect to the backbone area, either physically through an ABR or through a configured, virtual link. The backbone is a special type of area and serves as a transit area for carrying the inter-area-prefix-LSAs, AS-external-LSAs, and routed traffic between non-backbone areas, as well as the router-LSAs, network-LSAs, and routed traffic internal to the area. ASBRs are allowed in backbone areas.

Normal area

A normal area allows inter-area-prefix-LSAs and AS-external-LSAs to and from the backbone area. A normal area connects to the AS backbone area through one or more ABRs (physically or through a virtual link) and allows router-LSAs and network LSAs within this area. ASBRs are allowed in normal areas.

Stub area

Stub area connects to the AS backbone through one or more ABRs. It does not allow an internal ASBR, and does not allow AS-external-LSAs. A stub area supports these actions:

- Advertise the area summary routes to the backbone area.
- Advertise inter-area routes from other areas.
- Use the inter-area-prefix-LSA default route to advertise routes to an ASBR and to other areas.

You can configure the stub area ABR to do the following:

- Suppress advertising on the area's summarized internal routes into the backbone area.
- Suppress LSA traffic from other areas in the AS by replacing inter-area-prefix-LSAs and the default external route from the backbone area with the default summary route (::/0.). This area is called totally stubby area.

Virtual links are not allowed for stub areas.

Not-so-stubby (NSSA) area

An NSSA area connects to the backbone area through one or more ABRs. NSSAs are used where an ASBR exists in an area where you want to:

- Block injection of external routes from other areas of the AS.
- Advertise type-7-LSA external routes (learned from the ASBR) to the backbone area as AS-external-LSAs.

NSSAs also support the following:

- Advertise inter-area-prefix-LSAs from the backbone area into the NSSA. (If no-summary is enabled, the NSSA ABR suppresses these LSAs from the backbone and, instead, injects the default route into the NSSA.)
- Advertise NSSA inter-area-prefix-LSAs to the backbone area.

Virtual links are not allowed for NSSAs.

OSPFv3 router types

Internal routers

Internal OSPFv3 routers belong to only one area. Internal routers flood router-LSAs to all routers in the same area and maintain identical LSDBs.

Area border routers (ABRs)

Area border routers have membership in multiple areas. ABRs are used to connect the various areas in an AS to the backbone area for that AS. Multiple ABRs can be used to connect a given area to the backbone, and a given ABR can belong to multiple areas other than the backbone.

An ABR maintains a separate LSDB for each area to which it belongs. (All routers within the same area have identical LSDBs.) The ABR is responsible for flooding inter-area-prefix-LSAs and inter-area router LSAs between its border areas.

You can reduce summary LSA flooding by configuring area ranges. An area range enables you to assign an aggregate address to a range of IPv6 addresses. This aggregate address is advertised instead of all the individual addresses it represents. You can assign up to eight ranges in an OSPFv3 area.

Autonomous system boundary router (ASBR)

Autonomous system boundary routers run one or more interior gateway protocols and serve as a gateway to other autonomous systems operating with interior gateway protocols. The ASBR imports and translates different protocol routes into OSPFv3 through redistribution. ASBRs can be used in backbone areas, normal areas, and NSSAs, but not in stub areas.

Designated routers (DRs)

In an OSPFv3 network having two or more routers, one router is elected to serve as the designated router (DR) and another router to act as the backup designated router (BDR). All other routers in the same network

segment forward their routing information to the DR and BDR, and the DR forwards this information to all routers in the network. This functionality minimizes the amount of repetitive information that is forwarded on the network by eliminating the need for each individual router in the area to forward its routing information to all other routers in the network. If the area includes multiple networks, each network elects its own DR and BDR.

In an OSPFv3 network with no DR and no BDR, the neighboring router with the highest priority is elected the DR and the router with the next highest priority is elected the BDR. If the DR goes off-line, the BDR automatically becomes the DR, and the router with the next highest priority then becomes the new BDR. If multiple routing switches on the same OSPFv3 network are declaring themselves DRs, both priority and router ID are used to select the DR and BDR.

Priority is configurable using the `ipv6 ospfv3 priority` command at the interface level. You can use this command to help bias one router as the DR. If two neighbors share the same priority, the router with the highest router ID is designated the DR. The router with the next highest router ID is designated the BDR. Routers retain DR/BDR states throughout the period for which the adjacency is up and running.

OSPFv3 configuration task list

Tasks at a glance

- Configuring OSPFv3 on the routing switch
- Assigning the routing switch to an OSPF area
- Setting OSPFv3 network for the area
- Configuring external route redistribution and control
- Configuring area ranges on an ABR to reduce advertisements to the backbone
- Influencing route choice by changing the administrative distance
- Configuring graceful restart
- Configuring OSPFv3 virtual link settings
- Configuring OSPFv3 interface settings
- Configuring BFD for OSPFv3
- Configuring all OSPFv3 interfaces as passive
- Viewing OSPFv3 information
- Clearing OSPFv3 statistics on a switch

Configuring OSPFv3 on the routing switch

Prerequisites

- You must be in the global configuration context, as indicated by the `switch(config)#` prompt to create the OSPFv3 instance and enter the OSPFv3 configuration context.
- To configure a router ID, and other OSPFv3 configuration you must be in the OSPFv3 router configuration context, as indicated by the `switch(config-ospfv3-1 )#` prompt.

Create the OSPFv3 instance and enter the OSPFv3 configuration context. From this context, you can proceed with other OSPFv3 configuration.

Procedure

1. Create the OSPFv3 instance and enter the OSPFv3 configuration context using the following command. For command details, see router ospfv3.
   `router ospfv3 <PROCESS-ID> [vrf <VRF-NAME>]`
   For example, the following command creates OSPF instance 1.

   ```
   switch(config)# router ospfv3 1
   switch(config-ospfv3-1)#
   ```

2. Configure a global router ID using the following command. For command details, see router-id .
   `router-id <ROUTER-ADDRESSW>`
   For example, the following command sets the router ID to 1.1.1.1.

   ```
   switch(config-ospfv3-1)# router-id 1.1.1.1
   ```

3. Optionally, if the OSPFv3 process was disabled (it is enabled by default), enable the OSPFv3 process using the following command.
   `enable`
   For command details, see enable . (Refer to disable for disabling the OSPFv3 process).

Creating an OSPFv3 area

Prerequisites

You must be in the OSPFv3 router configuration context.

Create a Normal, Stub, or Not So Stubby (NSSA) area.

Procedure

Create an OSPFv3 area for the routing switch using one of the following commands:

- Create a Normal area using the following command: `area <area-id>`. For command details, see area .
- Create a Stub area using the following command: `area <area-id> stub`. For command details, see area stub .
- Create a Not So Stubby Area using the command: `area <area-id> nssa`.

For example, the following command creates a normal area with an area identifier of 10.1.1.1. Area identifier could alternatively be entered in decimal format such as 1.

```
switch(config-ospfv3-1)# area 1.1.1.1
```

Section	Owner-Group
Important Information	NTL/Dev

Products Supported (Define New HW Platforms)	PLM
Compatibility/interoperability	NTL/Dev
Transceiver Support	PLM
Enhancements and new features	PLM
Upgrade	NTL
Fixes (Defects)	
Define CFDs to include	PMO
Define IFDs to include	NTL
Issues & Workarounds	
Define IFDs to include	NTL

Setting OSPFv3 network for the area

Prerequisites

Routing must be enabled on the interface where you are planning to enable OSPFv3.

You must be in the interface configuration context, as indicated by the `switch(config-if)#` prompt.

After you define an OSPFv3 area, you can assign one or more networks to it. The OSPFv3 protocol will run on the interface with the configured link-local ipv6 address. The interfaces that have an IPv6 address configured in this network or in a subset of this network will participate in the OSPFv3 protocol.

Procedure

1. Set an OSPFv3 network for the area using the following command. For command details, see ipv6 ospfv3 area.

   `ipv6 ospfv3 <PROCESS-ID> area <AREA-ID>`

   For example, use the following command to assign interface 1/1/1 to OSPFv3 area 1. The area can alternatively be entered in IO address format.

   ```
   switch(config)# interface 1/1/1
   switch(config-if)# ipv6 ospfv3 1 area 1
   ```

2. Optionally, you can disable OSPFv3 on the interface using the following command. For command details, see ipv6 ospfv3 area.

   `ipv6 ospfv3 shutdown`

   ```
   switch(config)# interface 1/1/1
   switch(config-if)# ipv6 ospfv3 shutdown
   ```

Configuring external route redistribution and control

Configuring route redistribution for OSPFv3 establishes the routing switch as an ASBR for importing and translating different protocol routes from other IGP domains into an OSPFv3 domain. When you configure redistribution for OSPFv3, you can specify that routes external to the OSPFv3 domain are imported as OSPFv3 routes.

1. Enable route redistribution using the `redistribute` command.
   ```
   redistribute {bgp | connected | local loopback | static | ripng | ospf <PROCESS-ID>}
                [route-map <ROUTE-MAP-NAME>]
   ```
   For example, setting redistribution of connected routes as OSPFv3 routes:

   ```
   switch(config-ospfv3-1)# redistribute connected
   ```

   If a route map is specified, then only the routes that pass the match clause specified in the route map are redistributed to OSPFv3. For example, setting redistribution of local loopback routes, that only match the routes specified by the route map:

   ```
   switch(config-ospf-1)# redistribute local loopback route-map local_routes
   ```

2. Optionally, modify the default metric for redistribution using the `default-metric` command.
   ```
   default-metric <METRIC-VALUE>
   ```
   For example, setting the default metric for redistribution to 37.

   ```
   switch(config-ospfv3-1)# default-metric 37
   ```

3. Optionally, set the cost of default-summary LSAs using the area command.
   ```
   area <AREA-ID> default-metric <COST>
   ```
   For example, setting the cost of default summary LSAs to 2.

   ```
   switch (config-ospfv3-1)# area 1 default-metric 2
   ```

4. Optionally, use the `max-metric router-lsa` command to set the protocol to advertise a maximum metric so that other routers do not prefer this router as an intermediate hop in their shortest path first (SPF) calculations.
   ```
   max-metric router-lsa [on-startup [<ADVERT-TIME>]]
   ```
   For example, setting advertise max-metric router-lsa on startup.

   ```
   switch(config-ospfv3-1)# max-metric router-lsa on-startup 3000
   ```

5. Optionally set the maximum number of ECMP routes that OSPFv3 can support using the `maximum-paths` command.
   ```
   maximum-paths <MAX-VALUE>
   ```
   For example, setting the maximum number of ECMP routes to 8.

   ```
   switch(config-ospfv3-1)# maximum-paths 8
   ```

Configuring area ranges on an ABR to reduce advertisements to the backbone

You can configure area ranges to reduce inter-area advertisements by summarizing a range of IP addresses into a single route advertisement. This action prevents an ABR from advertising specific networks or subnets to the backbone area.

Prerequisites

You must be in the router configuration context, as indicated by the `switch(config-ospfv3)#` prompt.

Procedure

Summarize inter-area or NSSA paths using the following command. For command details, see area range .

`area <area-id> range <ip-prefix> type {inter-area | nssa} [no-advertise]`

For example, use the following command to summarize routes matching the area range 172.77.114.0/24 using inter-area as the type of address aggregation.

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 1 range fd00::/64 type inter-area
```

In another example, use the following command to specify DoNotAdvertise status for routes matching the area range fd00::/64. Use nssa as the type of address aggregation.

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 1 range fd00::/64 type inter-area no-advertise
```

Influencing route choice by changing the administrative distance

Prerequisites

You must be in the OSPFv3 router configuration context, as indicated by the `switch(config-ospfv3-1)#` prompt.

The administrative distance is used to influence the selection of routes learned by different protocols.

Procedure

Reconfigure the administrative distance using the following command. For command details, see distance .

`distance <distance>`

For example, use the following command to set administrative distance to 100.

```
switch(config-ospfv3-1)# distance 100
```

Configuring graceful restart

Prerequisites

Graceful restart is only applicable to the 6300-VSF and 6400, not for 832x switches.

You must be in the OSPFv3 router configuration context, as indicated by the `switch(config-ospfv3-1)#` prompt.

OSPFv3 routing can be gracefully restarted on switches without losing packets that are in transit. There is no effect on the saved switch configuration.

Procedure

Configure graceful restart of using the following command. For command details, see graceful-restart .

`graceful-restart [restart-interval <seconds> | helper]`

For example, the following command specifies 50 seconds as the maximum interval another router will wait for this router to gracefully restart.

```
switch(config-ospfv3-1)# graceful-restart restart-interval 50
```

Configuring OSPFv3 virtual link settings

You must be in the router vlink configuration context, as indicated by the `switch(config-router-vlink)#` prompt.

The OSPF interface parameters for this process are automatically set to their default values for virtual links. You can optionally adjust the following OSPF virtual link settings.

1. Set the time interval between OSPF hello packets for the OSPF virtual links using the following command. For command details, see hello-interval .

   `hello-interval <seconds>`

   For example:

   ```
   switch(config)# router ospfv3 1
   switch(config-ospfv3-1)# area 100 virtual-link 100.0.1.1
   switch(config-router-vlink)# hello-interval 30
   ```

2. Set the interval after which a neighbor is declared dead if no hello packet is received on the OSPF virtual links. Use the following command. For command details, see dead-interval

   `dead-interval <seconds>`
3. Set the time between retransmitting lost link state advertisements for the OSPF virtual links using the following command. For command details, see retransmit-interval.

   `retransmit-interval <seconds>`
4. Sets the transit delay in Link state transmission for the OSPF virtual links using the following command. For command details, see transit-delay.

   `transit-delay <seconds>`

Configuring OSPFv3 interface settings

Prerequisites

You must be in the interface configuration context, as indicated by the `switch(config-if)#` prompt.

You can optionally adjust the following OSPFv3 interface settings.

1. Set the interface cost using the following command. For command details, see ipv6 ospfv3 cost.

   `ipv6 ospfv3 cost <interface-cost>`

For example, the following command sets the cost associated with interface 1/1/1 to 100.

```
switch(config)# interface 1/1/1
switch(config-if)# ipv6 ospfv3 cost 100
```

2. Set the time interval between OSPFv3 hello packets for the OSPFv3 interface using the following command. For command details, see ipv6 ospfv3 hello-interval.
   `ipv6 ospfv3 hello-interval <seconds>`
3. Set the interval after which a neighbor is declared dead if no hello packet is received on the OSPFv3 interface using the following command. For command details, see ipv6 ospfv3 dead-interval.
   `ipv6 ospfv3 dead-interval <seconds>`
4. Set the time between re-transmitting lost link state advertisements for the OSPFv3 interface using the following command. For command details, see ipv6 ospfv3 retransmit-interval.
   `ipv6 ospfv3 retransmit-interval <seconds>`
5. Sets the time delay in Link state transmission for the OSPFv3 interface using the following command. For command details, see ipv6 ospfv3 transit-delay.
   `ipv6 ospfv3 transit-delay <seconds>`
6. Set the OSPFv3 network type for the interface. For command details, see ipv6 ospfv3 network.
   `ipv6 ospfv3 network {broadcast|point-to-point}`
7. Set the OSPFv3 priority on the interface using the following command. For command details, see ipv6 ospfv3 priority.
   `ipv6 ospfv3 priority <number-value>`
8. Set the OSPFv3 interface as OSPFv3 passive interface. With this setting the interface participates in OSPFv3 but does not send or receive packets on that interface. For command details, see ipv6 ospfv3 passive.
   `ipv6 ospfv3 passive`

Configuring BFD for OSPFv3

Enabling BFD Support for OSPFv3 over IPv6 enables OSPFv3 to register with Bidirectional Forwarding Detection (BFD) to receive forwarding path detection failure messages. You can either configure BFD for OSPFv3 globally on all interfaces or configure it selectively on one or more interfaces. BFD creates a session in asynchronous mode as soon as the switch reaches the 2-Way state with a neighbor. Once the session is established BFD will commence sending echos for path failure detection.

There are two methods for enabling BFD for OSPFv3:

1. Enable BFD for all interfaces enabled for OSPFv3 by using the BFD all-interfaces command in router configuration mode
2. Enable BFD for a subset of interfaces that have OSPFv3 enabled by using the IPv6 ospfv3 BFD command in interface configuration mode

OSPFv3 needs to be enabled prior to enabling BFD on one or more interfaces.

Examples

Enable BFD on all OSPFv3 Interfaces

```
switch(config)# router ospfv3 1
```

```
                        switch(config-ospfv3-1)# bfd all-interfaces
```

Disable BFD on all OSPFv3 Interfaces

```
switch(config)# router ospfv3 1
                        switch(config-ospfv3-1)# no bfd all-interfaces
```

Enable BFD on a single OSPFv3 interface

```
switch(config)# interface 1/1/1
                        switch(config-if)# ipv6 ospfv3 bfd
```

Disable BFD on a single OSPFv3 interface

```
switch(config)# interface 1/1/1
                        switch(config-if)# ipv6 ospfv3 bfd disable
```

Set BFD as default on an OSPFv3 interface

```
switch(config)# interface 1/1/1
                        switch(config-if)# no ipv6 ospfv3 bfd
```

Configuring all OSPFv3 interfaces as passive

Prerequisites

You must be in the OSPFv3 router configuration context, as indicated by the `switch(config-ospfv3-1)#` prompt.

OSPFv3 sends LSAs to all other routers in the same AS. To limit the flooding of LSAs throughout the AS, you can configure OSPFv3 to be passive.

Procedure

Configure all OSPFv3 interfaces as passive using the following command. For command details, see passive-interface default.

`passive-interface default`

```
switch(config-ospfv3-1)# passive-interface default
```

Configuring SPF throttling timers

SPF calculation is throttled with default timer values (start-time 200ms, hold-time 1000ms, max-wait-time 5000ms). You can throttle SPF calculation by configuring non-default timers to improve performance of a specific network configuration.

Prerequisites

You must be in the router configuration context, as indicated by the `switch(config-router)#` prompt.

Procedure

Reconfigure SPF throttling timers using the following command. For command details, see timers throttle spf.

```
timers throttle spf start-time <milliseconds> hold-time <milliseconds> max-wait-time
<milliseconds>
```

For example, use the following command to set start-time to 500ms, hold-time to 3000ms and max-wait-time to 9000ms:

```
switch(config-ospf-1)# timers throttle spf start-time 500 hold-time
3000 max-wait-time 9000
```

Viewing OSPFv3 information

Prerequisites

Use these show commands from the Manager context, as indicated by the `switch#` prompt.

Procedure

To view OSPFv3 information, use the following commands. For command details and examples, click the links.

- To view general OSPFv3, area, state and configuration information use: show ipv6 ospfv3.
- To view information about OSPFv3 interfaces use: show ipv6 ospfv3 interface.
- To view information about OSPFv3 neighbors use: show ipv6 ospfv3 neighbors .
- To view OSPFv3 routing table information use: show ipv6 ospfv3 routes.
- To view OSPFv3 statistics for the OSPFv3 interfaces use show ipv6 ospfv3 statistics interface.

Clearing OSPFv3 statistics on a switch

Clear OSPFv3 event statics using the following command. For command details, see clear ipv6 ospfv3 statistics

```
clear ipv6 ospfv3 [<PROCESS-ID>] statistics [interface [<INTERFACE-NAME>]] [all-vrfs | vrf
<VRF-NAME>]
```

For example, the following command clears OSPFv3 event statistics from interface 1/1/1.

```
switch# clear ipv6 ospfv3 statistics interface 1/1/1
```

OSPFv3 commands

active-backbone

```
active-backbone stub-default-route
no active-backbone stub-default-route
```

Description

This command enables the router to send a default route to stub areas if there is an active loopback link in the backbone area. The configuration is not required if backbone area has neighbors or passive interfaces configured. By default active backbone detection is enabled.

Examples

```
switch(config)# router ospf 1
switch(config-ospf-1)# active-backbone stub-default-route
```

```
switch(config)# no active-backbone stub-default-route
```

Command History

Release	Modification
10.10.1000	Command Introduced

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospf-*<PROCESS-ID>* config-ospfv3-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

area

```
area <AREA-ID>
no area <AREA-ID>
```

Description

Creates a normal area with <AREA-ID> set if not present. If area is present and is not the normal area, this command changes the area type to normal area.

The no form of this command deletes the area with the <AREA-ID> specified. The area can be of any type (stub, stub no-summary, and default normal area).

Parameter	Description
<AREA-ID>	Specifies the area ID is one of the following formats. OSPF area identifier in IPv4 format (x.x.x.x), where x is a decimal number from 0 to 255. OSPF area identifier in decimal format. Range: 0 to 4294967295.

Examples

Creating a normal area:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 1
switch(config-ospfv3-1)# area 1.1.1.1
```

Deleting an area:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no area 1
switch(config-ospfv3-1)# no area 1.1.1.1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospfv3-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

area authentication ipsec

```
area <AREA-ID> authentication ipsec spi <SPI-INDEX> <AUTH-TYPE> [<KEY-TYPE> <AUTH-KEY>]
no area <AREA-ID> authentication
```

Description

Configures IPsec AH authentication for the specified area. OSPFv3 interfaces which have IPsec configured at the interface context will not use area level IPsec.

The `no` form of this command removes IPsec AH authentication for the specified area.

IPsec is not supported for 6in6 tunnel interfaces.

Parameter	Description
<AREA-ID>	Specifies the area ID is one of the following formats. OSPF area identifier in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255. OSPF area identifier in decimal format. Range: 0 to 4294967295.
`spi` *<SPI-INDEX>*	Specifies the Security Parameters Index (SPI) to use. The SPI is an identification tag carried in the IPsec AH header. It enables the receiving OSPF process to select and use the Security Association (SA) from the SA table. The SPI must be unique on the switch. Range: 256 to 4294967295.
<AUTH-TYPE>	Specifies the authentication type: `md5` or `sha1`.

Parameter	Description
<KEY-TYPE>	Specifies the key type to use: `plaintext` (unencrypted), `hex-string` (encrypted) or `ciphertext` (encrypted).
<AUTH-KEY>	Specifies the authentication key.

When the authentication key is not provided on the command line, plaintext key prompting occurs upon pressing Enter. The entered key characters are masked with asterisks.

Examples

Setting area 0 to use IPsec authentication with a provided plaintext authentication key:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 0 authentication ipsec spi 256 sha1 plaintext F82#450
```

Setting area 5 to use IPsec authentication with a prompted plaintext authentication key:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 5 authentication ipsec spi 256 sha1
Enter the IPsec authentication key: ********
Re-Enter the IPsec authentication key: ********
```

Removing IPsec authentication from area 1:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no area 1 authentication
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospfv3-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

area encryption ipsec

```
area <AREA-ID> encryption ipsec spi <SPI-INDEX> <AUTH-TYPE>
    [<KEY-TYPE> <AUTH-KEY> <ENCR-TYPE> [<KEY-TYPE> <ENCR-KEY>]]
```

```
no area <AREA-ID> encryption
```

Description

Configures IPsec ESP with the authentication and encryption algorithm types and keys for the specified area. OSPFv3 interfaces with IPsec configured at the interface context will not use area level IPsec ESP configuration.

The `no` form of this command removes IPsec ESP from the specified area.

IPsec is not supported for 6in6 tunnel interfaces.

Parameter	Description
<AREA-ID>	Specifies the area ID is one of the following formats. OSPF area identifier in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255. OSPF area identifier in decimal format. Range: 0 to 4294967295.
`spi` *<SPI-INDEX>*	Specifies the Security Parameters Index (SPI) to use. The SPI is an identification tag carried in the IPsec AH header. It enables the receiving OSPF process to select and use the Security Association (SA) from the SA table. The SPI must be unique on the switch. Range: 256 to 4294967295.
<AUTH-TYPE>	Specifies the authentication type: `md5` or `sha1`.
<KEY-TYPE>	Specifies the key type to use: `plaintext` (unencrypted), `hex-string` (encrypted) or `ciphertext` (encrypted).
<AUTH-KEY>	Specifies the authentication key.
<ENCR-TYPE>	Specifies the encryption type: `des`, `3des`, `aes`, or `null`. **NOTE:** Encryption type `aes` is considered to be AES128, AES192 or AES256 based on key length.
<ENCR-KEY>	Specifies the encryption key.

When the authentication key is not provided on the command line, plaintext authentication key prompting occurs upon pressing Enter, followed by encryption type prompting, and finally plaintext encryption key prompting. The entered key characters are masked with asterisks.

When the authentication key and encryption type are provided on the command line but the encryption key is not provided, plaintext encryption key prompting occurs upon pressing Enter. The entered key characters are masked with asterisks.

Examples

Setting area 0 to use IPSec ESP with provided authentication and encryption keys:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 0 encryption ipsec spi 256 md5 plaintext F824eva
                          des plaintext F82#450b
```

Setting area 5 to use IPSec ESP with prompted authentication and encryption keys:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 5 encryption ipsec spi 256 md5
Enter the IPsec authentication key: ********
Re-Enter the IPsec authentication key: ********

Enter the IPsec encryption type (3des/aes/des/null)? des

Enter the IPsec encryption key: ********
Re-Enter the IPsec encryption key: ********
```

Setting area 2 to use IPsec ESP with provided authentication password and encryption type but a prompted encryption key:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)#  area 2 encryption ipsec spi 256 md5 plaintext F82# des
Enter the IPsec encryption key: ********
Re-Enter the IPsec encryption key: ********
```

Setting area 0 to use IPSec ESP with provided plaintext authentication key and null encryption:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 0 encryption ipsec spi 256 md5 plaintext axtw null
```

Removing IPSec ESP from area 0:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no area 0 encryption
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospfv3-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

area nssa

```
area <AREA-ID> nssa [no-summary]
no area <AREA-ID> nssa [no-summary]
```

Description

Creates the NSSA area (Not So Stubby Area) with *<AREA-ID>* if not present. If area is present and not NSSA area, this command changes the area type to NSSA area. If `no-summary` is used, area type will be NSSA No-Summary.

The `no` form of this command clears the NSSA area type. That is, the configured area will be changed to default normal area. The `no area <AREA-ID> nssa no-summary` command enables sending inter-area routes into NSSA, but will not unset the area as NSSA.

Parameter	Description
<AREA-ID>	Specifies the area ID is one of the following formats. OSPF area identifier in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255. OSPF area identifier in decimal format. Range: 0 to 4294967295.
`nssa [no-summary]`	Specifies Not So Stubby Area (NSSA) area type. If area is present and not NSSA area, parameter changes the area type to NSSA area. If `no-summary` is specified, area type will be NSSA No-Summary, which means do not inject inter-area routes into NSSA.

Examples

Creating an NSSA area for OSPFv3:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 1 nssa
switch(config-ospfv3-1)# area 1 nssa no-summary
```

Clearing the NSSA area for OSPFv3:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no area 1 nssa
switch(config-ospfv3-1)# no area 1 nssa no-summary
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400	`config-ospfv3-`*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

Platforms	Command context	Authority
8320 8325 8360 9300 10000		

area range

```
area <AREA-ID> range <IP-PREFIX> type {inter-area | nssa} [no-advertise]
no area <AREA-ID> range <IP-PREFIX> type {inter-area | nssa} [no-advertise]
```

Description

Summarizes the routes with the matching address or masks for OSPFv3. This command only works for border routers.

The `no` form of this command unsets the route summarization for the configured IPv4 prefix address on the ABR. When using the `no` form of the command with the `no-advertise` option, enables advertising this range to other areas.

Parameter	Description
<AREA-ID>	Specifies the area ID is one of the following formats. OSPF area identifier in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255. OSPF area identifier in decimal format. Range: 0 to 4294967295.
`range` *<IP-PREFIX>*	Specifies summarizing routes matching the area range prefix/mask.
`type {inter-area | nssa}`	Specifies the type this address aggregation applies to as either inter-area range prefix or NSSA range prefix.
`no-advertise`	Specifies the address range status as `DoNotAdvertise` (do not advertise this range to other areas).

Examples

Summarizing inter-area or NSSA paths on OSPFv3:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 1 range fd00::/64 type inter-area
switch(config-ospfv3-1)# area 1 range fd00::/64 type nssa
switch(config-ospfv3-1)# area 1 range fd00::/64 type inter-area no-advertise
```

Unsetting summarization on OSPFv3:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no area 1 range fd00::/64 type inter-area
switch(config-ospfv3-1)# no area 1 range fd00::/64 type nssa
switch(config-ospfv3-1)# no area 1 range fd00::/64 type inter-area no-advertise
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-ospfv3-<PROCESS-ID>`	Administrators or local user group members with execution rights for this command.

area stub

```
area <AREA-ID> stub [no-summary]
no area <AREA-ID> stub [no-summary]
```

Description

Creates the stub area with `<AREA-ID>` if not present. If area is present and is not the stub area, this command changes the area type to stub area. If `no-summary` is used, area type will be totally stubby area.

The `no` form of this command unsets the area type as stub. The configured area will be changed to the default normal area. The `no area <AREA-ID> stub no-summary` command will start sending Area Border Router (ABR) summary link advertisements into the stub area, but will not unset the stub area.

ABR does not inject the default route in a Totally Stubby Area with loopback in Area 0.0.0.0. As a workaround, configure a passive interface or active neighbors in the backbone area.

Parameter	Description
<AREA-ID>	Specifies the area ID is one of the following formats. OSPF area identifier in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255. OSPF area identifier in decimal format. Range: 0 to 4294967295.
`stub [no-summary]`	Specifies stub area type. If area is present and not stub area, this parameter changes the area type to stub area. If `no-summary` is specified, area type will be totally stubby area, which means do not inject interarea routes into stub.

Examples

Creating a stub area:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 1 stub
switch(config-ospfv3-1)# area 1 stub no-summary
```

Unsetting the stub area type:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1) # no area 1 stub
switch(config-ospfv3-1) # no area 1 sub no-summary
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospfv3-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

area virtual-link

```
area <AREA-ID> virtual-link <ROUTER-ID>
no area <AREA-ID> virtual-link <ROUTER-ID>
```

Description

Creates an OSPF virtual link with remote ABR (if not created already) and enters the vlink context.

The `no` form of this command deletes an OSPF virtual link with the specified router ID of the remote ABR. If no *<ROUTER-ID>* is specified, the `no` form of the command sets the virtual link to the default settings.

Parameter	Description
<AREA-ID>	Specifies the area ID is one of the following formats. OSPF area identifier in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255. OSPF area identifier in decimal format. Range: 0 to 4294967295.
`virtual-link` *<ROUTER-ID>*	Configures a virtual link with the specified router ID of the remote ABR.

Examples

Configuring OSPF virtual links:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 100 virtual-link 100.0.1.1
```

Deleting OSPF virtual links:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no area 100 virtual-link 100.0.1.1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospfv3-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

area default-metric

```
area <AREA-ID> default-metric <METRIC>
no area <AREA-ID> default-metric
```

Description

Sets the cost of default-summary LSAs announced to the stub/nssa areas.

The no form of this command resets the cost of the default-summary LSAs announced to stub/nssa areas to the default of 1.

Parameter	Description
<AREA-ID>	Specifies the area ID is one of the following formats. OSPF area identifier in IPv4 format (x.x.x.x), where x is a decimal number from 0 to 255. OSPF area identifier in decimal format. Range: 0 to 4294967295.
default-metric *<METRIC>*	Specifies the default metric of default-summary LSAs announced to the stub/nssa areas, to the specified value. Default: 1. Range: 0 to 16777215.

Examples

Setting cost for default LSA summary:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 1 default-metric 2
switch(config-ospfv3-1)# area 1.1.1.1 default-metric 2
```

Setting cost for default LSA summary to default:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no area 1 default-metric
switch(config-ospfv3-1)# no area 0.0.0.1 default-metric
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospfv3-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

authentication ipsec

```
authentication ipsec spi <SPI-INDEX> <AUTH-TYPE> [<KEY-TYPE> <AUTH-KEY>]
no authentication
```

Description

Configures IPsec AH authentication for the selected Vlink.

The `no` form of this command removes IPsec AH authentication for the selected Vlink.

Parameter	Description
`spi` *<SPI-INDEX>*	Specifies the Security Parameters Index (SPI) to use. The SPI is an identification tag carried in the IPsec AH header. It enables the receiving OSPF process to select and use the Security Association (SA) from the SA table. The SPI must be unique on the switch. Range: 256 to 4294967295.
<AUTH-TYPE>	Specifies the authentication type: `md5` or `sha1`.
<KEY-TYPE>	Specifies the key type to use: `plaintext` (unencrypted), `hex-string` (encrypted) or `ciphertext` (encrypted).
<AUTH-KEY>	Specifies the authentication key.

When the authentication key is not provided on the command line, plaintext key prompting occurs upon pressing Enter. The entered key characters are masked with asterisks.

Examples

Setting area 1 to use IPsec AH authentication for Vlink with provided plaintext key:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 1
switch(config-ospfv3-1)# area 1 virtual-link 3.3.3.3
switch (config-router-vlink6)# authentication ipsec spi 256 sha1 plaintext F82#450
```

Setting area 1 to use IPsec AH authentication for Vlink with prompted plaintext key:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 1
switch(config-ospfv3-1)# area 1 virtual-link 3.3.3.3
switch (config-router-vlink6)# authentication ipsec spi 256 sha1
Enter the IPsec authentication key: ********
Re-Enter the IPsec authentication key: *******
```

Removing IPsec AH authentication for Vlink on area 1:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 1 virtual-link 3.3.3.3
switch(config-router-vlink6)# no authentication
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-router-vlink	Administrators or local user group members with execution rights for this command.

clear ipv6 ospfv3 neighbors

```
clear ipv6 ospfv3 [<PROCESS-ID>] neighbor [<NEIGHBOR>] [interface [<INTERFACE-NAME>]]
[all-vrfs | vrf <VRF-NAME>]
```

Description

Resets the neighbor and clears the OSPF neighbor information.

Parameter	Description
<PROCESS-ID>	Specifies the OSPFv3 process ID to clear the statistics for the particular OSPFv3 process. Range: 1 to 63.

Parameter	Description
<NEIGHBOR>	Specifies the router ID of a neighbor.
<INTERFACE-NAME>	Specifies the OSPFv3 statistics to clear for the specified interface.
all-vrfs	Select to clear the OSPFv3 statistics for all VRFs.
vrf *<VRF-NAME>*	Specifies the name of a VRF.

Example

Clearing the OSPFv3 neighbor information:

```
switch# clear ipv6 ospfv3 1 neighbor
switch#  clear ipv6 ospfv3 1 neighbor 3.3.3.3
switch#  clear ipv6 ospfv3 1 neighbor interface 1/1/1
switch#  clear ipv6 ospfv3 neighbor 5.5.5.5 vrf red
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

clear ipv6 ospfv3 statistics

```
clear ipv6 ospfv3 [<PROCESS-ID>] statistics [interface [<INTERFACE-NAME>]]
[all-vrfs | vrf <VRF-NAME>]
```

Description

Clears the OSPFv3 event statistics.

Parameter	Description
<PROCESS-ID>	Specifies the OSPFv3 process ID to clear the statistics for the particular OSPFv3 process. Range: 1 to 63.
<INTERFACE-NAME>	Specifies the OSPFv3 statistics to clear for the specified interface.
all-vrfs	Select to clear the OSPFv3 statistics for all VRFs.

Parameter	Description
`vrf <VRF-NAME>`	Specifies the name of a VRF.

Example

Clearing the OSPFv3 event statistics:

```
switch# clear ipv6 ospfv3 statistics
switch# clear ipv6 ospfv3 statistics interface 1/1/1
switch# clear ipv6 ospfv3 statistics interface 1/1/1 vrf vrf_red
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

dead-interval

```
dead-interval <INTERVAL>
no dead-interval
```

Description

Sets the interval after which a neighbor is declared dead if no hello packet comes in for virtual links.

The `no` form of this command sets the dead interval to default for virtual links. The default value is 40 seconds (generally four times the hello packet interval).

Parameter	Description
<INTERVAL>	Specifies the time interval for the dead interval, in seconds. Range: 1 to 65535. Default: 40.

Examples

Setting OSPFv3 virtual links dead interval:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink6)# dead-interval 30
```

Setting OSPFv3 virtual links dead interval to default:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink6)# no dead-interval
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-router-vlink	Administrators or local user group members with execution rights for this command.

default-metric

```
default-metric <METRIC-VALUE>
no default-metric
```

Description

Sets the default metric for redistributed routes in the OSPFv3.

The no form of this command sets the default metric to be used for redistributed routes into OSPFv3 to the default of 25.

Parameter	Description
<METRIC-VALUE>	Specifies the default metric value to use for redistributed routes. Range: 1 to 1677214. Default: 25.

Examples

Setting default metric for redistributed routes:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# default-metric 36
```

Setting default metric for redistributed routes to the default:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no default-metric
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-ospfv3-<PROCESS-ID>`	Administrators or local user group members with execution rights for this command.

disable

```
disable
```

Description

Disables the OSPFv3 process. By default OSPFv3 process is enabled.

This command does not remove the OSPFv3 configurations.

Example

Disabling OSPFv3 process:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# disable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-ospfv3-<PROCESS-ID>`	Administrators or local user group members with execution rights for this command.

distance

```
distance [<DISTANCE-VAL> | intra-area [<DISTANCE-VAL>] | inter-area [<DISTANCE-VAL>] |
external [<DISTANCE-VAL>]]
```

```
no distance [<DISTANCE-VAL> | intra-area [<DISTANCE-VAL>] | inter-area [<DISTANCE-VAL>] |
external [<DISTANCE-VAL>]]
```

Description

Defines an administrative distance for OSPFv3. Administrative distance is used as a criteria to select the best route when the same route is learned by multiple routing protocols.

The `no` form of this command sets the OSPFv3 administrative distance to the default value of 110. Optionally, administrative distance can be set to default for the specific OSPF route type: intra-area, inter-area, or external type-5 and type-7 routes.

An administrative distance configuration change in one OSPF process is applied to all the processes within a VRF.

Parameter	Description
<DISTANCE-VAL>	Specifies the OSPFv3 administrative distance. Range: 1 to 255. Default: 110.
`intra-area`	Specifies the OSPFv3 distance for intra-area routes.
`inter-area`	Specifies the OSPFv3 distance for inter-area routes.
`external`	Specifies the OSPFv3 distance for external type 5 and type 7 routes.

Usage

Within a given OSPF process, intra-area routes are always given precedence even when distances are configured for inter-area or external type routes.

Examples

Setting OSPFv3 administrative distance:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# distance 100
switch(config-ospfv3-1)# distance intra-area 24 external 55 inter-area 66
switch(config-ospfv3-1)# distance intra-area 24 external 55
switch(config-ospfv3-1)# distance external 55
```

Setting OSPFv3 administrative distance to the default:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no distance
switch(config-ospfv3-1)# no distance external
switch(config-ospfv3-1)# no distance intra-area
switch(config-ospfv3-1)# no distance inter-area
```

Command History

Release	Modification
10.09	Added parameters: intra-area, inter-area, external
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospfv3-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

enable

enable

Description

Enables OSPFv3 process when disabled. By default OSPFv3 process is enabled.

Example

Enabling OSPFv3 process:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# enable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospfv3-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

encryption ipsec

encryption ipsec spi *<SPI-INDEX>* *<AUTH-TYPE>* [*<KEY-TYPE>* *<AUTH-KEY>*
<ENCR-TYPE> [*<KEY-TYPE>* *<ENCR-KEY>*]]
no encryption

Description

Configures IPSec ESP authentication and encryption for the selected Vlink.

The no form of this command removes IPSec ESP authentication and encryption for the selected Vlink.

Parameter	Description
`spi` *<SPI-INDEX>*	Specifies the Security Parameters Index (SPI) to use. The SPI is an identification tag carried in the IPsec AH header. It enables the receiving OSPF process to select and use the Security Association (SA) from the SA table. The SPI must be unique on the switch. Range: 256 to 4294967295.
<AUTH-TYPE>	Specifies the authentication type: `md5` or `sha1`.
<KEY-TYPE>	Specifies the key type to use: `plaintext` (unencrypted), `hex-string` (encrypted) or `ciphertext` (encrypted).
<AUTH-KEY>	Specifies the authentication key.
<ENCR-TYPE>	Specifies the encryption type: `des`, `3des`, `aes`, or `null`. **NOTE:** Encryption type `aes` is considered to be AES128, AES192, or AES256 based on key length.
<ENCR-KEY>	Specifies the encryption key.

When the authentication key is not provided on the command line, plaintext authentication key prompting occurs upon pressing Enter, followed by encryption type prompting, and finally plaintext encryption key prompting. The entered key characters are masked with asterisks.

When the authentication key and encryption type are provided on the command line but the encryption key is not provided, plaintext encryption key prompting occurs upon pressing Enter. The entered key characters are masked with asterisks.

Examples

Setting area 1 to use IPSec ESP authentication and encryption for Vlink with provided plaintext keys:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 1
switch(config-ospfv3-1)# area 1 virtual-link 3.3.3.3
switch(config-router-vlink6)# encryption ipsec spi 256 md5 plaintext F82#
                              des plaintext Plane#88
```

Setting area 1 to use IPSec ESP authentication and encryption for Vlink with prompted plaintext keys and encryption type:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 1
switch(config-ospfv3-1)# area 1 virtual-link 3.3.3.3
switch(config-router-vlink6)# encryption ipsec spi 256 md5
Enter the IPsec authentication key: ********
Re-Enter the IPsec authentication key: *******

Enter the IPsec encryption type (3des/aes/des/null)? des
```

```
Enter the IPsec encryption key: ********
Re-Enter the IPsec encryption key: ********
```

Setting area 1 to use IPSec ESP authentication and encryption for Vlink provided plaintext authentication key and encryption type but prompted plaintext encryption key:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 1
switch(config-ospfv3-1)# area 1 virtual-link 3.3.3.3
switch(config-router-vlink6)# encryption ipsec spi 256 md5 plaintext Fx des
Enter the IPsec encryption key: ********
Re-Enter the IPsec encryption key: ********
```

Setting area 1 to use IPSec ESP authentication for Vlink with a provided plaintext authentication key and null encryption:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 1
switch(config-ospfv3-1)# area 1 virtual-link 3.3.3.3
switch(config-router-vlink6)# encryption ipsec spi 256 md5 plaintext Fx null
```

Removing IPSec ESP authentication and encryption for Vlink on area 1:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 1 virtual-link 3.3.3.3
switch(config-router-vlink6)# no encryption
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-router-vlink`	Administrators or local user group members with execution rights for this command.

default-information originate

```
default-information originate [metric <METRIC-VALUE>]
no default-information originate [metric <METRIC-VALUE>]
```

Description

Configures OSPFv3 to advertise the default route (::/0) to its neighbors if it is present in the routing table. Optionally, the metric value can be set for default route ::/0. The default value is 1.

The `no` form of this command disables advertisement of the default route.

Parameter	Description
metric <METRIC-VALUE>	Specifies the OSPF metric value for the default route. Optional. Default: 1.

Examples

Setting advertisement of the default route:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# default-information originate
```

Disabling advertisement of the default route:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no default-information originate
```

Setting advertisement of the default route and specifying an optional metric value of 20:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# default-information originate
switch(config-ospfv3-1)# default-information originate metric 20
```

Disabling advertisement of the default route and setting metric to the default value:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no default-information originate metric
```

Command History

Release	Modification
10.09	Added parameter: metric <*METRIC-VALUE*>
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360	config-ospf-<*PROCESS-ID*>	Administrators or local user group members with execution rights for this command.

Platforms	Command context	Authority
9300 10000		

default-information originate always

```
default-information originate always [metric <METRIC-VALUE>]
no default-information originate always [metric <METRIC-VALUE>]
```

Description

Configures OSPFv3 to advertise the default route (::/0) to its neighbors, regardless if it is present in the routing table or not. Optionally, metric can be set for default route ::/0. The default value is 1.

The `no` form of this command disables advertisement of the default route.

Parameter	Description
metric <METRIC-VALUE>	Specifies the OSPFv3 metric value for the default route. Default: 1.

Examples

Setting advertisement of the default route:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# default-information originate always
```

Disabling advertisement of the default route:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no default-information originate always
```

Setting advertisement of the default route with metric set to 20:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# default-information originate always metric 20
```

Disabling advertisement of the default route and setting the metric to the default value:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no default-information originate always metric
```

Command History

Release	Modification
10.09	Added parameter: metric *<METRIC-VALUE>*
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospf-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

graceful-restart

```
graceful-restart {restart-interval <INTERVAL> | helper | strict-lsa-check}
no graceful-restart {restart-interval | helper | strict-lsa-check}
```

Description

Configures graceful restart for OSPFv3. By default graceful restart is enabled on the OSPFv3 router.

The `no` form of this command sets the restart interval to the default of 120 seconds or disables helper mode depending on the specified parameters.

Parameter	Description
`restart-interval` *<INTERVAL>*	Specifies the time another router waits for this router to gracefully restart and selects the maximum time to wait in seconds. Range: 5 to 1800. Default: 120.
`helper`	Specifies that the router will participate in the graceful restart of a neighbor router.
`strict-lsa-check`	Enable strict LSA checking when acting as a restart helper for a restarting peer.

Examples

Enabling OSPF graceful restart:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# graceful-restart restart-interval 40
switch(config-ospfv3-1)# graceful-restart helper
switch(config-ospfv3-1)# graceful-restart strict-lsa-check
```

Setting the restart interval to default, disabling helper mode, and strict LSA checking:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no graceful-restart restart-interval
switch(config-ospfv3-1)# no graceful-restart helper
switch(config-ospfv3-1)# no graceful-restart strict-lsa-check
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-ospfv3-<PROCESS-ID>`	Administrators or local user group members with execution rights for this command.

hello-interval

```
hello-interval <INTERVAL>
no hello-interval
```

For proper operation, the hello interval must be shorter than the dead interval.

Description

Sets the time interval between OSPF hello packets for virtual links.

The `no` form of this command sets the hello interval to the default value of 10 seconds for virtual links.

Parameter	Description
<INTERVAL>	Specifies the time interval for the hello interval, in seconds. Range: 1 to 65535. Default: 10.

Examples

Setting OSPF virtual links hello interval:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink6)# hello-interval 30
```

Setting OSPF virtual links hello interval to default:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink6)# no hello-interval
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-router-vlink	Administrators or local user group members with execution rights for this command.

ipv6 ospfv3 area

```
ipv6 ospfv3 <PROCESS-ID> area <AREA-ID>
no ipv6 ospfv3 <PROCESS-ID> area <area-id>
```

Description

Runs the OSPFv3 protocol on the interface for the area specified.

To move an interface to a new area, unmap the existing area and then associate a new area with the interface.

The no form of this command disables OSPF on the interface and removes the interface from the area. Interfaces which have an IP address configured on the network or in a subset of the network, stop participating in the OSPF protocol

Parameter	Description
<AREA-ID>	Specifies the area ID is one of the following formats. Area ID in IPv4 format (x.x.x.x), where x is a decimal number from 0 to 255. Area ID as a decimal value. Range: 0-4294967295.
<PROCESS-ID>	Specifies the OSPFv3 process ID. Range: 1 to 63.

Examples

Setting OSPFv3 network for the area:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ipv6 ospfv3 1 area 1
switch(config-if-vlan)# ipv6 ospfv3 1 area 0.0.0.1
```

Disabling OSPFv3 network for the area:

```
switch(config)# interface 1/1/1
switch(config-if-vlan)# no ipv6 ospfv3 1 area 1
switch(config-if-vlan)# no ipv6 ospfv3 1 area 0.0.0.1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-if` `config-if-vlan`	Administrators or local user group members with execution rights for this command.

ipv6 ospfv3 authentication null

`ipv6 ospfv3 authentication null`

Description

Configures null authentication on an interface which disables IPsec authentication.

Examples

Disabling IPsec on interface VLAN **1**:

```
switch(config)# interface van 1
switch(config-if-vlan)# ipv6 ospfv3 authentication null
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-if` `config-if-vlan`	Administrators or local user group members with execution rights for this command.

ipv6 ospfv3 authentication ipsec

`ipv6 ospfv3 authentication ipsec spi <SPI-INDEX> <AUTH-TYPE> [<KEY-TYPE> <AUTH-KEY>]`
`no ipv6 ospfv3 authentication`

Description

Configures IPSec AH authentication. OSPFv3 interfaces that have IPsec configured at the interface context will not use area level IPsec.

The `no` form of this command removes IPsec AH authentication for the specified area.

Parameter	Description
`spi <SPI-INDEX>`	Specifies the Security Parameters Index (SPI) to use. The SPI is an identification tag carried in the IPsec AH header. It enables the receiving OSPF process to select and use the Security Association (SA) from the SA table. The SPI must be unique on the switch. Range: 256 to 4294967295.
<AUTH-TYPE>	Specifies the authentication type: `md5` or `sha1`.
<KEY-TYPE>	Specifies the key type to use: `plaintext` (unencrypted), `hex-string` (encrypted) or `ciphertext` (encrypted).
<AUTH-KEY>	Specifies the authentication key.

When the authentication key is not provided on the command line, plaintext key prompting occurs upon pressing Enter. The entered key characters are masked with asterisks.

Examples

Setting interface VLAN **1** to use IPsec authentication with a provided plaintext authentication key:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ipv6 ospfv3 authentication ipsec spi 256 md5 plaintext F82#
```

Setting interface VLAN **4** to use IPsec authentication with a prompted plaintext authentication key:

```
switch(config)# interface vlan 4
switch(config-if-vlan)# ipv6 ospfv3 authentication ipsec spi 256 md5
Enter the IPsec authentication key: ********
Re-Enter the IPsec authentication key: ********
```

Removing IPsec authentication from interface VLAN **1**:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# no ipv6 ospfv3 authentication
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320	`config-if` `config-if-vlan`	Administrators or local user group members with execution rights for this command.

Platforms	Command context	Authority
8325 8360 9300 10000		

ipv6 ospfv3 cost

```
ipv6 ospfv3 cost <INTERFACE-COST>
no ipv6 ospfv3 cost
```

Description

Sets the cost (metric) associated with a particular interface. The interface cost is used as a parameter to calculate the best routes.

The `no` form of this command sets the cost (metric) associated with a particular interface to the default of 1.

Parameter	Description
<INTERFACE-COST>	Specifies the interface cost value. Range: 1to 65535. Default: 1.

Examples

Setting OSPFv3 interface cost:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ipv6 ospfv3 cost 100
```

Setting the OSPFv3 interface cost to default:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# no ipv6 ospfv3 cost
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-if` `config-if-vlan`	Administrators or local user group members with execution rights for this command.

ipv6 ospfv3 dead-interval

```
ipv6 ospfv3 dead-interval <INTERVAL>
no ipv6 ospfv3 dead-interval
```

Description

Sets the interval after a neighbor is declared dead when no hello packet is received on the OSPFv3 interface.

The `no` form of this command sets the interval after which a neighbor is declared dead, to the default for the OSPFv3 interface. The default value is 40 seconds (generally four times the hello packet interval).

Parameter	Description
<INTERVAL>	Specifies the time interval for the dead interval, in seconds. Range: 1 to 65535. Default: 40.

Examples

Setting OSPFv3 dead interval on the interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ipv6 ospfv3 dead-interval 30
```

Setting OSPFv3 dead interval to default on the interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# no ipv6 ospfv3 dead-interval
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if-vlan	Administrators or local user group members with execution rights for this command.

ipv6 ospfv3 encryption ipsec

```
ipv6 ospfv3 encryption ipsec spi <SPI-INDEX> <AUTH-TYPE>
    [<KEY-TYPE> <AUTH-KEY> <ENCR-TYPE> [<KEY-TYPE> <ENCR-KEY>]]
no ipv6 ospfv3 encryption
```

Description

Configures IPsec ESP authentication. OSPFv3 interfaces that have IPsec configured at the interface context will not use area level IPsec ESP.

The `no` form of this command removes IPsec ESP for the specified area.

Parameter	Description
`spi` *<SPI-INDEX>*	Specifies the Security Parameters Index (SPI) to use. The SPI is an identification tag carried in the IPsec AH header. It enables the receiving OSPF process to select and use the Security Association (SA) from the SA table. The SPI must be unique on the switch. Range: 256 to 4294967295.
<AUTH-TYPE>	Specifies the authentication type: `md5` or `sha1`.
<KEY-TYPE>	Specifies the key type to use: `plaintext` (unencrypted), `hex-string` (encrypted) or `ciphertext` (encrypted).
<AUTH-KEY>	Specifies the authentication key.
<ENCR-TYPE>	Specifies the encryption type: `des`, `3des`, `aes`, or `null`. **NOTE:** Encryption type `aes` is considered to be AES128, AES192, or AES256 based on key length.
<ENCR-KEY>	Specifies the encryption key.

When the authentication key is not provided on the command line, plaintext authentication key prompting occurs upon pressing Enter, followed by encryption type prompting, and finally plaintext encryption key prompting. The entered key characters are masked with asterisks.

When the authentication key and encryption type are provided on the command line but the encryption key is not provided, plaintext encryption key prompting occurs upon pressing Enter. The entered key characters are masked with asterisks.

Examples

Setting interface VLAN **1** to use IPsec ESP with provided authentication and encryption keys:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ipv6 ospfv3 encryption ipsec spi 256 sha1 plaintext F82
                        des plaintext F82#450b
```

Setting interface VLAN **3** to use IPsec ESP with prompted authentication and encryption keys:

```
switch(config)# interface vlan 3
switch(config-if-vlan)# ipv6 ospfv3 encryption ipsec spi 256 sha1
Enter the IPsec authentication key: ********
Re-Enter the IPsec authentication key: ********

Enter the IPsec encryption type (3des/aes/des/null)? des
```

```
Enter the IPsec encryption key: ********
Re-Enter the IPsec encryption key: ********
```

Setting interface VLAN **4** to use IPsec ESP with provided authentication password and encryption type but a prompted encryption key:

```
switch(config)# interface vlan 4
switch(config-if-vlan)# ipv6 ospfv3 encryption ipsec spi 256 sha1 plaintext F82 des
Enter the IPsec encryption key: ********
Re-Enter the IPsec encryption key: ********
```

Setting interface VLAN **1** to use IPSec ESP with provided plaintext authentication key and null encryption:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ipv6 ospfv3 encryption ipsec spi 256 sha1 plaintext F82 null
```

Removing IPsec from interface VLAN **1**:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# no ipv6 ospfv3 encryption
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-if` `config-if-vlan`	Administrators or local user group members with execution rights for this command.

ipv6 ospfv3 encryption null

`ipv6 ospfv3 encryption null`

Description

Configures NULL ESP on an interface which disables IPsec ESP.

Examples

Disable IPsec ESP on interface VLAN *1*:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ipv6 ospfv3 encryption null
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if config-if-vlan	Administrators or local user group members with execution rights for this command.

ipv6 ospfv3 hello-interval

```
ipv6 ospfv3 hello-interval <INTERVAL>
no ipv6 ospfv3 hello-interval
```

Description

Sets the time interval between OSPFv3 hello packets for the OSPFv3 interface.

The no form of this command sets the time interval between OSPFv3 hello packets to the default for the OSPFv3 interface of 10 seconds.

Parameter	Description
<INTERVAL>	Specifies the time interval between hello packets, in seconds. Range: 1 to 65535. Default: 10.

Examples

Setting OSPFv3 hello interval on the interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ipv6 ospfv3 hello-interval 30
```

Setting OSPFv3 hello interval to default on the interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# no ipv6 ospfv3 hello-interval
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if config-if-vlan	Administrators or local user group members with execution rights for this command.

ipv6 ospfv3 network

```
ipv6 ospfv3 network {broadcast|point-to-point}
no ipv6 ospfv3 network
```

Description

Configures the network type for the interface. By default the network type is broadcast network.

The no form of this command sets the network type for the interface to the system default of broadcast network.

Parameter	Description
broadcast	Specifies the OSPFv3 network type as a broadcast multiaccess network.
point-to-point	Specifies the OSPFv3 network type as a point-to-point network.

Examples

Setting OSPFv3 network type for the interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ipv6 ospfv3 network broadcast
switch(config-if-vlan)# ipv6 ospfv3 network point-to-point
```

Disabling OSPFv3 network type for the interface to system default of broadcast network:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# no ipv6 ospfv3 network
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-if` `config-if-vlan`	Administrators or local user group members with execution rights for this command.

ipv6 ospfv3 passive

```
ipv6 ospfv3 passive
no ipv6 ospfv3 passive
```

Description

Configures the interface as an OSPFv3 passive interface. With this setting, the interface participates in the OSPF, but does not send or receive OSPF packets on that interface.

The `no` form of this command resets the interface as active. With this setting, the interface starts sending and receiving OSPF packets.

Examples

Setting the interface as OSPFv3 passive interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ipv6 ospfv3 passive
```

Setting the interface as OSPFv3 active interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# no ipv6 ospfv3 passive
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-if` `config-if-vlan`	Administrators or local user group members with execution rights for this command.

ipv6 ospfv3 priority

```
ipv6 ospfv3 priority <number-value>
no ipv6 ospfv3 priority
```

Description

Sets the OSPFv3 priority for the interface. The larger the numeric value of the priority, the higher the chance it will become the designated router. Setting a priority of 0 makes the router ineligible to become a designated router or back up designated router.

The `no` form of this command sets the OSPFv3 priority for the interface to the default of 1.

Parameter	Description
<number-value>	Specifies the OSPFv3 priority value. Default: 1. Range: 0 to 255.

Examples

Setting the OSPFv3 priority for the interface:

```
switch(config)# interface vlan /1
switch(config-if-vlan)# ipv6 ospfv3 priority 50
```

Setting the OSPFv3 priority for the interface to the default of 1:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# no ipv6 ospfv3 priority
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if config-if-vlan	Administrators or local user group members with execution rights for this command.

ipv6 ospfv3 retransmit-interval

```
ipv6 ospfv3 retransmit-interval <INTERVAL>
no ipv6 ospfv3 retransmit-interval
```

Description

Sets the time between retransmitting lost link state advertisements for the OSPFv3 interface.

The `no` form of this command sets the time between retransmitting lost link state advertisements to the default 5 seconds.

Parameter	Description
<INTERVAL>	Specifies the time interval for the retransmit interval, in seconds. Range: 1 to 3600. Default: 5

Examples

Setting OSPFv3 retransmit interval on the interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ipv6 ospfv3 retransmit-interval 30
```

Setting OSPFv3 retransmit interval to the default on the interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# no ipv6 ospfv3 retransmit-interval
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-if` `config-if-vlan`	Administrators or local user group members with execution rights for this command.

ipv6 ospfv3 shutdown

```
ipv6 ospfv3 shutdown
no ipv6 ospfv3 shutdown
```

Description

Disables OSPFv3 on the interface. The interface state changes to Down. It does not remove the interface from the OSPF area. To remove the interface, use the command `no ip ospf area`.

The `no` form of this command re-enables OSPFv3 on the interface.

Examples

Disabling OSPFv3 on the interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ipv6 ospfv3 shutdown
```

Re-enabling OSPFv3 on the interface:

```
switch(config)# interface vlan 1
switch(config-if-vlan)# no ipv6 ospfv3 shutdown
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if config-if-vlan	Administrators or local user group members with execution rights for this command.

ipv6 ospfv3 transit-delay

```
ipv6 ospfv3 transit-delay <DELAY>
no ipv6 ospfv3 transit-delay
```

Description

Sets the time delay in Link state transmission for the OSPFv3 interface.

The no form of this command sets the transit delay in Link state transmission to the default of 1 second.

Parameter	Description
<DELAY>	Specifies the time delay for the transit delay, in seconds. Range: 1 to 3600. Default: 1.

Examples

Setting OSPFv3 transit delay on the interface

```
switch(config)# interface vlan 1
switch(config-if-vlan)# ipv6 ospfv3 transit-delay 30
```

Setting OSPFv3 transit delay to default on the interface

```
switch(config)# interface vlan 1
switch(config-if-vlan)# no ipv6 ospfv3 transit-delay
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if config-if-vlan	Administrators or local user group members with execution rights for this command.

maximum-paths

```
maximum-paths <MAXIMUM>
no maximum-paths
```

Description

Sets the maximum number of ECMP routes that OSPFv3 can support.

The no form of this command sets the maximum number of ECMP routes that OSPFv3 can support to the default value of 4.

Parameter	Description
<MAXIMUM>	Specifies the maximum number of ECMP routes. Range: 1 to 32. Default: 4.

Examples

Setting maximum number of parallel routes:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# maximum-paths 32
```

Setting maximum number of parallel paths to the default value of 4:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no maximum-paths
```

Command History

Release	Modification
10.10	Increased upper limit of range of <*MAXIMUM*> parameter to 32.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospfv3-<*PROCESS-ID*>	Administrators or local user group members with execution rights for this command.

max-metric router-lsa

```
max-metric router-lsa [on-startup <INTERVAL>]
no max-metric router-lsa [on-startup]
```

Description

Sets the protocol to advertise a maximum metric so that other routers do not prefer the router as an intermediate hop in their shortest path first (SPF) calculations. If the on-startup parameter is used, the router is configured to advertise a maximum metric at startup. That is, for the time specified in seconds, or the default value of 600 seconds.

To disable advertisement of the maximum metric, use the `no` form of the command.

The `no` form of this command advertises the normal cost metrics instead of advertising the maximized cost metric. This setting causes the router to be considered in traffic forwarding.

Parameter	Description
on-startup <*INTERVAL*>	Automatically advertises the stub Router-LSA (or maximize the router-LSA cost metric) for a specified time interval upon OSPFv3 startup. Specifies the time in seconds. Range: 5 to 86400. Default: 600.

Examples

Setting to maximize the cost metrics for Router LSA:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# max-metric router-lsa
switch(config-ospfv3-1)# max-metric router-lsa on-startup 3000
```

Setting to advertise the normal cost metrics instead of advertising the maximized cost metric:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no max-metric router-lsa
switch(config-ospfv3-1)# no max-metric router-lsa on-startup
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-ospfv3-<PROCESS-ID>`	Administrators or local user group members with execution rights for this command.

passive-interface default

```
passive-interface default
no passive-interface default
```

Description

Sets all OSPFv3 interfaces as passive.

The `no` form of this command sets all the OSPFv3 interfaces as active.

Examples

Setting OSPFv3-enabled interfaces as passive:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# passive-interface default
```

Setting OSPFv3-enabled interfaces as active:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no passive-interface default
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400	`config-ospfv3-<PROCESS-ID>`	Administrators or local user group members with execution rights for this command.

Platforms	Command context	Authority
8320 8325 8360 9300 10000		

redistribute

```
redistribute {bgp | connected | local loopback | static | ripng | ospf <PROCESS-ID>}
             [route-map <ROUTE-MAP-NAME>]
no redistribute {bgp | connected | local loopback | static | ripng | ospf <PROCESS-ID>}
                [route-map <ROUTE-MAP-NAME>]
```

Description

Redistributes routes originating from other protocols, or from another OSPFv3 process, to the current OSPFv3 process.

if a route map is specified, then only the routes that pass the match clause specified in the route map are redistributed to OSPFv3. Configuration is not allowed if the referenced route map has not yet been configured.

If you try to redistribute routes from an OSPFv3 process which is not created, you are prompted to allow the OSPFv3 process to be auto-created before proceeding with redistribution. If you confirm at the prompt, the OSPFv3 process is created with defaults and redistribution configuration applied. If you deny at the prompt, redistribution configuration is skipped.

If command `route-redistribute active-routes-only` has been issued, only the routes from other protocols which are selected for forwarding are considered for redistribution into OSPFv3.

The `no` form of this command disables redistribution of routes to the current OSPFv3 process.

Parameter	Description
`bgp`	Specifies redistributing BGP (Border Gateway Protocol) routes.
`connected`	Specifies redistributing connected (directly attached subnet or host).
`local loopback`	Specifies redistributing local routes of the loopback interface.
`static`	Specifies redistributing static routes.
`ripng`	Specifies redistributing RIPng routes.
`ospf <PROCESS-ID>`	Specifies redistributing routes from the specified OSPFv3 process ID. Range: 1 to 63.
`route-map <ROUTE-MAP-NAME>`	Specifies redistribution filtering by route map. To create a route map, use command `route-map`.

Examples

Redistributing routes to OSPFv3:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# redistribute bgp
switch(config-ospfv3-1)# redistribute bgp route-map BGP_routes
switch(config-ospfv3-1)# redistribute connected
switch(config-ospfv3-1)# redistribute connected route-map connected_routes
switch(config-ospfv3-1)# redistribute local loopback
switch(config-ospfv3-1)# redistribute local loopback route-map local_routes
switch(config-ospfv3-1)# redistribute static
switch(config-ospfv3-1)# redistribute static route-map static_networks
switch(config-ospfv3-1)# redistribute ripng
switch(config-ospfv3-1)# redistribute ripng route-map rip-routes
switch(config-ospfv3-1)# redistribute ospf 2
```

Disabling redistributing routes to OSPFv3:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no redistribute bgp
switch(config-ospfv3-1)# no redistribute bgp route-map BGP_routes
switch(config-ospfv3-1)# no redistribute connected
switch(config-ospfv3-1)# no redistribute connected route-map connected_routes
switch(config-ospfv3-1)# no redistribute local loopback
switch(config-ospfv3-1)# no redistribute local loopback route-map local_routes
switch(config-ospfv3-1)# no redistribute static
switch(config-ospfv3-1)# no redistribute static route-map static_networks
switch(config-ospfv3-1)# no redistribute ripng
switch(config-ospfv3-1)# no redistribute ripng route-map rip-routes
switch(config-ospfv3-1)# no redistribute ospf 2
```

Command History

Release	Modification
10.08	Added `route-map` support for supported redistribute source-protocols. Updated information and examples.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-ospfv3-<PROCESS-ID>`	Administrators or local user group members with execution rights for this command.

reference-bandwidth

`reference-bandwidth <BANDWIDTH>`
`no reference-bandwidth`

Description

Sets the reference bandwidth for OSPFv3. If the OSPFv3 interface cost is not explicitly set, then the cost of all the OSPFv3 interfaces is recalculated based on the reference bandwidth and link speed of the interface.

For VLAN interfaces the calculated link speed value is 1 Gbps (if the OSPFv3 interface cost is not explicitly set).

The `no` form of this command sets the reference bandwidth for OSPF to the default of 100000 Mbps.

Parameter	Description
<BANDWIDTH>	Specifies the reference bandwidth used to calculate the cost of an interface in Mbps. Range: 1 to 4000000. Default: 100000.

Examples

Setting the reference bandwidth:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# reference-bandwidth 40000
```

Setting the reference bandwidth to the default value:

```
switch(config)# routerv3 ospf 1
switch(config-ospfv3-1)# no reference-bandwidth
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospfv3-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

retransmit-interval

```
retransmit-interval <INTERVAL>
no retransmit-interval
```

Description

Sets the time between retransmitting lost link state advertisements for virtual links.

The `no` form of this command sets the time between retransmitting lost link state advertisements to the default of 5 seconds for virtual links.

Parameter	Description
<INTERVAL>	Specifies the time interval for the retransmit interval, in seconds. Range: 1 to 3600. Default: 5.

Examples

Setting OSPFv3 virtual links retransmit interval:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink6)# retransmit-interval 30
```

Setting OSPFv3 virtual links retransmit interval to default:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink6)# no retransmit-interval
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-router-vlink	Administrators or local user group members with execution rights for this command.

router-id

```
router-id <ROUTER-ADDRESS>
no router-id
```

Description

Sets an ID for the router in an IPv4 address format.

The no form of this command unconfigures the router-id for the instance and sets the router-id to the default. The router-id is changed to the dynamically selected router-id. The default router-id 0.0.0.0 updates to the routing stack that triggers to auto-elect a router-id based on the highest IP address of loopback interface, or the highest IP address of interfaces.

Parameter	Description
<ROUTER-ADDRESS>	Specifies the router address in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255.

Examples

Setting router-id in the OSPFv3 context:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1) # router-id 1.1.1.1
```

Unconfiguring router-id:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no router-id
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-ospfv3-`*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

router ospfv3

`router ospfv3` *<PROCESS-ID>* `[vrf` *<VRF-NAME>*`]`
`no router ospfv3` *<PROCESS-ID>* `[vrf` *<VRF-NAME>*`]`

Description

Creates the OSPFv3 process (if not created already) and enters the router OSPFv3 instance context. Optionally if specified, you can specify a named VRF, or the default VRF if the <*vrf-name*> is not specified. Only one OSPFv3 process is allowed per VRF.

The `no` form of this command removes the OSPFv3 instance. If a VRF is specified, it removes the OSPF instance from the named VRF, or the default VRF if the <*var-name*> is not specified.

Parameter	Description
<PROCESS-ID>	Specifies an OSPFv3 process ID. Length: 1 to 63.
`vrf` *<VRF-NAME>*	Specifies the name of a VRF. Default: default.

Examples

Entering the router OSPFv3 instance:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)#
```

Setting the router OSPFv3 VRF instance:

```
switch(config)# router ospfv3 1 vrf vrf_red
```

Removing the router OSPFv3 instance:

```
switch#(config)# no router ospfv3 1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Administrators or local user group members with execution rights for this command.

show ipv6 ospfv3

`show ipv6 ospfv3 [<PROCESS-ID>] [all-vrfs | vrf <VRF-NAME>] [vsx-peer]`

Description

Shows OSPFv3 information including area, state, and configuration information.

Parameter	Description
<PROCESS-ID>	Specifies an OSPFv3 process ID optionally to show OSPFv3 information for a particular OSPFv3 process. Range: 1 to 63.
`all-vrfs`	Select to show OSPFv3 information for all VRFs.
`vrf` *<VRF-NAME>*	Specifies the name of a VRF. Default: default.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Example

Showing general OSPFv3 configurations:

```
switch# show ipv6 ospfv3 1
Routing Process 1 with ID: 1.1.1.1 VRF default
-----------------------------------------------

OSPFv3 Protocol is enabled
Graceful-restart is configured
Restart Interval: 120, State: inactive
Last Graceful Restart Exit Status: none
Area Border: false
AS Border: false
SPF: Start Time: 200ms, Hold Time: 1000ms, Max Wait Time: 5000ms
LSA: Start Time: 5000ms, Hold Time: 0ms, Max Wait Time: 0ms
LSA Arrival: 1000ms
Maximum Paths to Destination: 4
Number of External LSAs 0, checksum sum 0
Summary address:
  prefix fd00::0/64 advertise tag 10
Number of areas is: 2, 2 normal, 0 stub, 0 NSSA
Number of active areas is: 1, 1 normal, 0 stub, 0 NSSA
Reference Bandwidth: 100000 Mbps
Area (0.0.0.0) (Active)
  Interfaces in this Area: 1 Active Interfaces: 1
  Passive Interfaces: 0 Loopback Interfaces: 0
  SPF calculation has run 9 times
  Number of LSAs: 4, checksum sum 195745
Area (0.0.0.1) (Inactive)
  Interfaces in this Area: 0 Active Interfaces: 0
  Passive Interfaces: 0 Loopback Interfaces: 0
  SPF calculation has run 8 times
  Area ranges:
    fd00::1/64, inter-area, advertise
  Number of LSAs: 0, checksum sum 0
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show ipv6 ospfv3 border-routers

`show ipv6 ospfv3 [<PROCESS-ID>] border-routers [all-vrfs | vrf <VRF-NAME>] [vsx-peer]`

Description

Shows the OSPFv3 routing table entries for Area Border Router (ABR) and Autonomous System Border Router (ASBR).

Parameter	Description
<PROCESS-ID>	Specifies an OSPFv3 process ID to show the OSPFv3 routing table entries for ABR and ASBR for the particular OSPFv3 process. Range: 1-63.
`all-vrfs`	Select to show OSPFv3 border router information for all VRFs.
`vrf` *<VRF-NAME>*	Specifies the name of a VRF. Default: default.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Example

On the 6400 Switch Series, interface identification differs.

Showing OSPFv3 border routers information for default VRF:

```
switch# show ipv6 ospfv3 border-routers
OSPFv3 Process ID 1 VRF default, Internal Routing Table
------------------------------------------------------------
Codes: i - Intra-area route, I - Inter-area route
i 2.2.2.2 [10], ABR, Area 0.0.0.0, SPF 17 via
        fe80::98f2:b301:2c68:1d48, Interface 1/1/1
i 2.2.2.2 [10], ABR, Area 0.0.0.1, SPF 17 via
        fe80::98f2:b301:3068:1d48, Interface 1/1/2
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show ipv6 ospfv3 interface

```
show ipv6 ospfv3 [<PROCESS-ID>] interface [<INTERFACE-NAME>] [brief]
[all-vrfs | vrf <VRF-NAME>] [vsx-peer]
```

Description

Shows information about OSPFv3 enabled interfaces.

Parameter	Description
<PROCESS-ID>	Specifies an OSPFv3 process ID optionally to show the OSPFv3 enabled interfaces for the particular OSPFv3 process. Range: 1-63.
<INTERFACE-NAME>	Selects to show information only for the specified OSPFv3-enabled interface.
`brief`	Include this parameter to display a brief overview of the following OSPF configuration information. ■ Interface: OSPF interface name. ■ Area: OSPF area ID. ■ Cost: The metric OSPF uses to judge a path's feasibility, calculated as (reference bandwidth / interface bandwidth). ■ State: Indicates if the interface is a designated router (`Dr`) or a backup designated router (`Backup-dr`). ■ Status: Indicates if the interface is `up` or `down`. ■ Flags: P - Passive A - Active.
`all-vrfs`	Select to show OSPF-enabled interface information for all VRFs.
`vrf` *<VRF-NAME>*	Specifies the name of a VRF. Default: default.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

On the 6400 Switch Series, interface identification differs.

Showing OSPFv3 information for all interfaces in default VRF:

```
switch# show ipv6 ospfv3 interface
Codes: DR - Designated router  BDR - Backup Designated router

Interface 1/3/10 is Up, Line Protocol is Up
-------------------------------------------
VRF                  : default                          Process              : 1
IPv6 address         : fe80::9020:c203:280a:e800        Area                 :
0.0.0.0
Status               : Up                               Network Type         :
Broadcast
Hello Interval       : 10    sec                        Dead Interval        : 40
sec
Transit Delay        : 1     sec                        Retransmit Interval  : 5
sec
BFD                  : Disabled                         Link Speed           : 1000
Mbps
Cost Configured      : NA                               Cost Calculated      : 100
State/Type           : DR                               Router Priority      : 2
DR                   : 1.1.1.1                          BDR                  :
2.2.2.2
```

```
Link LSAs            : 2                                Checksum Sum         : 39245
Authentication       : no                               Passive              : No

Codes: DR - Designated router  BDR - Backup Designated router

Interface 1/3/11 is Up, Line Protocol is Up
-------------------------------------------
VRF                  : default                          Process              : 1
IPv6 address         : fe80::9020:c203:2c0a:e800        Area                 :
0.0.0.1
Status               : Up                               Network Type         :
Broadcast
Hello Interval       : 10    sec                        Dead Interval        : 40
sec
Transit Delay        : 1     sec                        Retransmit Interval  : 5
sec
BFD                  : Disabled                         Link Speed           : 1000
Mbps
Cost Configured      : NA                               Cost Calculated      : 100
State/Type           : BDR                              Router Priority      : 1
DR                   : 3.3.3.3                          BDR                  :
1.1.1.1
Link LSAs            : 2                                Checksum Sum         : 83119
Authentication       : no                               Passive              : No
```

Showing overview information for OSPFv3 enabled interfaces for all VRFs in brief:

```
switch# show ipv6 ospfv3 interface brief all-vrfs
VRF : default                          Process : 1
=================================================

Total Number of Interfaces: 2

Flags: P - Passive  A - Active


Interface     Area               Cost      State              Status      Flags
-------------------------------------------------------------------------------
1/3/10        0.0.0.0            100       DR                 Up          A
1/3/11        0.0.0.1            100       BDR                Up          A
```

Showing overview information for OSPFv3 enabled interfaces for all VRFs:

```
6200(config)# show ipv6 ospfv3 interface br all-vrfs
VRF : default                          Process : 1
=================================================

Total Number of Interfaces: 1

Flags: P - Passive  A - Active


Interface     Area               Cost      State              Status      Flags
-------------------------------------------------------------------------------
1/1/1         0.0.0.0            100       BDR                Up          A
```

Command History

Release	Modification
10.09	Output of the `show ipv6 ospfv3 interface` command includes flags to indicate whether the interface is in passive or active mode.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show ipv6 ospfv3 neighbors

```
show ipv6 ospfv3 [<PROCESS-ID>] neighbors [<NEIGHBOR-ID>]
     [interface <INTERFACE-NAME>] [detail | summary]
     [all-vrfs | vrf <VRF-NAME>] [vsx-peer]
```

Description

Shows information about OSPFv3 neighbors.

Parameter	Description
<PROCESS-ID>	Specifies an OSPFv3 process ID to show OSPFv3 neighbor information for the particular OSPFv3 process. Range: 1-63.
`neighbors` *<NEIGHBOR-ID>*	Shows information about a particular neighbor, specified in IPv4 format (A.B.C.D).
`interface` *<INTERFACE-NAME>*	Shows neighbor information only for the specified interface.
`detail`	Shows detailed information for the neighbors.
`summary`	Shows summary information for the neighbors.
`all-vrfs`	Shows neighbor information for all VRFs.
`vrf` *<VRF-NAME>*	Specifies the name of a VRF. Default: default.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

On the 6400 Switch Series, interface identification differs.

Showing OSPFv3 neighbors information:

```
switch# show ipv6 ospfv3 neighbors
OSPFv3 Process ID 1 VRF default
================================

Total Number of Neighbors: 1

Neighbor ID      Priority  State             Interface
-----------------------------------------------------
2.2.2.2          1         FULL/BDR          1/1/1
  Neighbor address fe80::98f2:b301:2c68:1d48
```

Showing OSPFv3 neighbors information for a specific neighbor:

```
switch# show ipv6 ospfv3 neighbors 2.2.2.2
Neighbor 2.2.2.2, Interface address fe80::98f2:b301:2c68:1d48
-------------------------------------------------------------
Process ID 1 VRF default, in Area 0.0.0.0 via Interface 1/1/1
    Neighbor priority is 1, State is FULL
    Options is 0x13
    Dead Timer due in 00:00:38
    Time since last state change 00h:20m:26s
```

Showing detail OSPFv3 neighbors information for a specific neighbor:

```
switch# show ipv6 ospfv3 neighbors 2.2.2.2 detail
Neighbor 2.2.2.2, Interface address fe80::98f2:b301:2c68:1d48
-------------------------------------------------------------
Process ID 1 VRF default, in Area 0.0.0.0 via Interface 1/1/1
    Neighbor priority is 1, State is FULL
    DR is 1.1.1.1, BDR is 2.2.2.2
    Options is 0x13
    Dead Timer due in 00:00:36
    Retransmission Queue Length 0
    Time since last state change 00h:20m:38s
```

Showing OSPFv3 neighbors information for interface **1/1/1**:

```
switch# show ipv6 ospfv3 neighbors 2.2.2.2 interface 1/1/1
Neighbor 2.2.2.2, Interface address fe80::98f2:b301:2c68:1d48
-------------------------------------------------------------
Process ID 1 VRF default, in Area 0.0.0.0 via Interface 1/1/1
    Neighbor priority is 1, State is FULL
    Options is 0x13
    Dead Timer due in 00:00:32
    Time since last state change 00h:20m:52s
```

Showing summary OSPFv3 neighbors information for a specific neighbor for all VRFs:

```
switch# show ipv6 ospfv3 neighbors 3.3.3.3 summary all-vrfs
Interface  Down Attempt Init TwoWay ExStart Exchange Loading Full  Total
-------------------------------------------------------------------------
1/1/1      0    0       0    0      0       0        0       1     1
```

```
1/1/2       0    0       0    0       0       0        0       0     0
Total       0    0       0    0       0       0        0       1     1
```

Showing OSPFv3 neighbors information for VRF red:

```
switch# show ipv6 ospfv3 neighbors vrf red
OSPFv3 Process ID 1 VRF red
============================

Total Number of Neighbors: 1

Neighbor ID      Priority  State             Interface
-------------------------------------------------------
1.1.1.1          1         FULL/BDR          1/1/1
  Neighbor address fe80::800:901:42c:7ddd
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show ipv6 ospfv3 routes

```
show ipv6 ospfv3 [<PROCESS-ID>] routes [<PREFIX/LENGTH>]
     [all-vrfs | vrf <VRF-NAME>] [vsx-peer]
```

Description

Shows the OSPFv3 routing table information.

Parameter	Description
<PROCESS-ID>	Specifies an OSPFv3 process ID that shows information from the OSPFv3 routing table for the particular OSPFv3 process. Range: 1-63.
<PREFIX/LENGTH>	Specifies the IPv6 destination prefix showing information about a particular destination prefix. For example, 2010:bd9::/32.
`all-vrfs`	Select to show OSPFv3 routing table information for all VRFs.

Parameter	Description
`vrf <VRF-NAME>`	Specifies the name of a VRF. Default: default.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

On the 6400 Switch Series, interface identification differs.

Showing OSPFv3 routing table information:

```
switch# show ipv6 ospfv3 routes
Codes: i - Intra-area route, I - Inter-area route
       E1 - External type-1, E2 - External type-2

OSPFv3 Process ID 1 VRF default, Routing Table
----------------------------------------------

Total Number of OSPFv3 Routes : 2

111::/64           (i) area:0.0.0.0
     directly attached to interface 1/1/1, cost 1 distance 110
fd00::/64          (i) area:0.0.0.1
     directly attached to interface vlan10, cost 1 distance 110
```

Showing OSPFv3 routing table information for VRF red:

```
switch# show ipv6 ospfv3 routes vrf red

Codes: i - Intra-area route, I - Inter-area route
       E1 - External type-1, E2 - External type-2

OSPFv3 Process ID 2 VRF red, Routing Table
------------------------------------------

Total Number of OSPFv3 Routes : 1

222::/64           (i) area:0.0.0.1
     directly attached to interface 1/1/2, cost 1 distance 110
```

Showing OSPFv3 routing table information for destination prefix fd00::/64:

```
switch# show ipv6 ospfv3 1 routes fd00::/64
Codes: i - Intra-area route, I - Inter-area route
       E1 - External type-1, E2 - External type-2

OSPFv3 Process ID 1 VRF default, Routing Table for prefixes fd00::/64
----------------------------------------------------------------------

Total Number of OSPFv3 Routes : 1

fd00::/64          (i) area:0.0.0.1
     directly attached to interface vlan10, cost 1 distance 110
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show ipv6 ospfv3 statistics

```
show ipv6 ospfv3 [<PROCESS-ID>] statistics
     [all-vrfs | vrf <VRF-NAME>] [vsx-peer]
```

Description

Shows OSPFv3 statistics.

Parameter	Description
<PROCESS-ID>	Specifies an OSPFv3 process ID that shows information on the OSPFv3 SPF statistics for the particular OSPFv3 process. Range: 1-63.
`all-vrfs`	Select to show OSPFv3 SPF statistics information for all VRFs.
`vrf` *<VRF-NAME>*	Specifies the name of a VRF. Default: default.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

Showing OSPFv3 statistics information:

```
switch# show ipv6 ospfv3 statistics
OSPFv3 Process ID 1 VRF default, Statistics (cleared 3h 2m 21s ago)
------------------------------------------------------------------

Unknown Interface Drops          : 0
Unknown Virtual Interface Drops  : 0
Bad IPv6 Header Length Drops     : 0
Wrong OSPFv3 Version Drops       : 0
Bad Source IPv6 Drops            : 0
Resource Failure Drops           : 0
```

```
Bad Header Length Drops         : 0
Total Drops                     : 0
```

Showing OSPFv3 statistics information for VRF red:

```
switch# show ipv6 ospfv3 2 statistics vrf red

OSPFv3 Process ID 2 VRF red, Statistics (cleared 3h 2m 30s ago)
-----------------------------------------------------------------

Unknown Interface Drops         : 0
Unknown Virtual Interface Drops : 0
Bad IPv6 Header Length Drops    : 0
Wrong OSPFv3 Version Drops      : 0
Bad Source IPv6 Drops           : 0
Resource Failure Drops          : 0
Bad Header Length Drops         : 0
Total Drops                     : 0
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show ipv6 ospfv3 statistics interface

```
show ipv6 ospfv3 [<PROCESS-ID>] statistics interface [<INTERFACE-NAME>]
     [all-vrfs | vrf <VRF-NAME>] [vsx-peer]
```

Description

Shows the OSPFv3 statistics for the OSPFv3-enabled interfaces.

Parameter	Description
<PROCESS-ID>	Specifies an OSPFv3 process ID to show OSPF-enabled interface statistics information on the specified OSPFv3 process. Range: 1 to 63.
<INTERFACE-NAME>	Selects to show information only for the specified interface.

Parameter	Description
`all-vrfs`	Select to show OSPF-enabled interface statistics information for all VRFs.
`vrf <VRF-NAME>`	Specifies the name of a VRF. Default: default.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Example

Showing OSPFv3-enabled interfaces information for interface 1/1/1:

```
switch# show ipv6 ospfv3 statistics interface all-vrfs
OSPFv3 Process ID 1 VRF default, Interface vlan2000 Statistics  (cleared 0h 2m 52s
ago)

================================================================================
==

Tx Hello packets      : 0                Rx Hello packets      : 0
Tx Hello bytes        : 0                Rx Hello bytes        : 0
Tx DD packets         : 0                Rx DD packets         : 0
Tx DD bytes           : 0                Rx DD bytes           : 0
Tx LS request packets : 0                Rx LS request packets : 0
Tx LS request bytes   : 0                Rx LS request bytes   : 0
Tx LS update packets  : 0                Rx LS update packets  : 0
Tx LS update bytes    : 0                Rx LS update bytes    : 0
Tx LS ack packets     : 0                Rx LS ack packets     : 0
Tx LS ack bytes       : 0                Rx LS ack bytes       : 0

Total IPsec packets processed : 0
Total IPsec bytes processed   : 0
Total Number of State Changes : 0
Number of LSAs                : 0
LSA Checksum Sum              : 0

Total OSPFv3 Packets Discarded: 0
---------------------------------

Reason                          Packets Dropped
------------------------------------------------
Invalid Type                    0
Invalid Length                  0
Invalid Version                 0
Bad or Unknown Source           0
Area Mismatch                   0
Self-originated                 0
Duplicate Router ID             0
Interface Standby               0
Total Hello Packets Dropped     0
  Hello Interval Mismatch       0
  Dead Interval Mismatch        0
  Options Mismatch              0
  MTU Mismatch                  0
  Neighbor Ignored              0
Resource Failures               0
```

```
Bad LSA Length                  0
Others                          0
IPsec Authentication Errors     0
IPsec ESP Errors                0

Total LSAs Ignored : 0
----------------------
Bad Type           : 0
Bad Length         : 0
Invalid Data       : 0
Invalid Checksum   : 0
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show ipv6 ospfv3 virtual-links

```
show ipv6 ospfv3 [<PROCESS-ID>] virtual-links [brief]
[all-vrfs | vrf <vrf-name>] [vsx-peer]
```

Description

Displays the current state and parameters of the OSPFv3 virtual links.

Parameter	Description
<PROCESS-ID>	Enter an OSPFv3 process ID to display information on the OSPFv3 virtual links for the particular OSPFv3 process. Range: 1 to 63.
`brief`	Select to display brief overview information for the OSPFv3 virtual links.
`all-vrfs`	Select to display OSPFv3 virtual links information for all VRFs.
`vrf` *<VRF-NAME>*	Specifies the name of a VRF. Default: default.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

Show OSPFv3 virtual links information:

```
switch# show ipv6 ospfv3 virtual-links
Virtual link to router 4.4.4.4 is down
--------------------------------------

Process ID 1 VRF default, Transit area 0.0.0.1
Transit delay 1 sec
Timer Intervals: hello 10, dead 40, retransmit 5
Number of Link LSAs: 0, checksum sum 0
0 state changes
AH Authentication: MD5, SPI: 256
```

Show brief overview information for OSPFv3 virtual links:

```
switch# show ospfv3 virtual-links brief
OSPFv3 Process ID 1 VRF default
================================

Total Number of Virtual Links: 1

Remote Router    Transit Area      Status
-----------------------------------------
4.4.4.4          0.0.0.1           down
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

summary-address

```
summary-address  <IPV6-ADDR>/<MASK> [no-advertise | tag <TAG-VALUE>]
no summary-address <prefix/length> [no-advertise | tag <tag-value>
```

Description

Summarizes the external routes with the matching address and mask. When advertising this route, its metric is set to the lowest cost path from among the routes that were summarized.

The `no` form of this command disables route summarization.

This command only works for an ASBR (Autonomous System Boundary Router).

Parameter	Description
<IPV6-ADDR>	Specifies an IP address in IPv6 format (xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx), where x is a hexadecimal number from 0 to F.
<MASK>	Specifies the number of bits in the address mask in CIDR format (x), where x is a decimal number from 0 to 128.
no-advertise	Do not advertise the aggregate route. Suppress routes that match the specified prefix/mask pair.
tag *<TAG-VALUE>*	Specify the tag for the aggregate route. The summary prefix will be advertised along with the tag value in External LSAs. Range: 0 to 4294967295

Examples

Setting OSPF route summarization:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# summary-address 2001:DB8::1/32
```

Disabling route summarization:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no summary-address 2001:DB8::1/32
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospfv3-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

timers lsa-arrival

```
timers lsa-arrival <DELAY>
no timers lsa-arrival
```

Description

Configures the minimum delay between receiving the same LSA from a peer. The same LSA is an LSA that contains the same LSA ID number, LSA type, and advertising router ID. If an instance of the same LSA

arrives sooner before the delay expires, the LSA is dropped. Generally, the LSA arrival timer should be set to a value less than or equal to the start-time value for the command `timers throttle lsa start` on the neighbor.

The `no` form of this command sets the LSA timers to default values.

Parameter	Description
<DELAY>	Specifies the delay in milliseconds. Range: 0 to 600000. Default: 1000.

Examples

Setting the LSA arrival timer:

```
switch(config)# router ospf 1
switch(config-ospfv3-1)# timers lsa-arrival 10
```

Setting the LSA arrival timer to default:

```
switch(config)# router ospf 1
switch(config-ospfv3-1)# no timers lsa-arrival
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospfv3-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

timers throttle lsa

`timers throttle lsa start-time <START-TIME> hold-time <HOLD-TIME> max-wait-time <WAIT-TIME>`
`no timers throttle lsa`

Description

Configures the timers for LSA generation.

The `no` form of this command sets the LSA timers to default values.

Parameter	Description
`start-time <START-TIME>`	Specifies the initial wait time in milliseconds after which LSAs are generated. When set to 0, the LSAs are generated without any delay. Range: 0 to 600000. Default: 5000.
`hold-time <HOLD-TIME>`	Specifies the amount of time, in milliseconds, between regeneration of an LSA. The hold time doubles each time the same LSA must be regenerated, until `max-wait-time` is reached. When set to 0, LSA regeneration time is not increased. Range: 0 to 600000. Default: 0.
`max-wait-time <WAIT-TIME>`	Specifies the maximum wait time, in milliseconds, for regeneration of the same LSA. When set to 0, LSA regeneration time is not increased. Range: 0 to 600000. Default: 0.

Examples

Setting the LSA timers:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# timers throttle lsa start-time 100 hold-time 1000 max-wait-time 10000
```

Setting LSA timers to default values:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no timers throttle lsa
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-ospfv3-<PROCESS-ID>`	Administrators or local user group members with execution rights for this command.

timers throttle spf

`timers throttle spf start-time <START-TIME> hold-time <HOLD-TINME> max-wait-time <WAIT-TIME>`
`no timers throttle spf`

Description

Configures timers for SPF calculation. There are three timers:

- `start-time` Is the initial delay before an SPF calculation is started. Default is 200 milliseconds.
- `hold-time` Is the progressive backoff time to wait before next scheduled SPF calculation. Default is 1000 milliseconds. If a route change event occurs during this period, the value doubles until it reaches the *max-wait-time*.
- `max-wait-time` Is the maximum time to wait before the next scheduled SPF calculation. Default is 5000 milliseconds. This is used to limit the SPF hold timer and also defines the time to be considered for which the OSPF LSDB has to be stable, after which the SPF throttle mechanism is reset.

The `no` form of this command sets all the configured non-default timers to default value.

Parameter	Description
<START-TIME>	Time in milliseconds to set timer for initial SPF delay. Default: 200.
<HOLD-TINME>	Time in milliseconds to set the minimum hold time between two consecutive SPF calculations. Default: 1000.
<WAIT-TIME>	Time in milliseconds to set the maximum wait time between two consecutive SPF calculations. Default: 5000.

Examples

Setting non-default timer values for SPF throttling:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# timers throttling spf start-time 500 hold-time 3000 max-
wait-time 9000
Switch(config-ospfv3-1)# show running-config current-context
router ospfv3 1
               area 0.0.0.0
               area 0.0.0.1
               area 0.0.0.2 nssa no-summary
               area 0.0.0.3 stub
```

Setting default timer values for SPF throttling after configuring non-default values:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no timers throttling spf
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-ospfv3-*<PROCESS-ID>*	Administrators or local user group members with execution rights for this command.

transit-delay

```
transit-delay <DELAY>
no transit-delay
```

Description

Sets the time delay in Link state transmission for virtual links.

The no form of this command sets the delay in Link state transmission to the default of 1 second for virtual links.

Parameter	Description
<DELAY>	Specifies the time delay for the transit delay, in seconds. Range: 1 to 3600. Default: 1.

Examples

Setting OSPFv3 virtual links transit delay:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink6)# transit-delay 30
```

Setting OSPFv3 virtual links transit delay to default:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# area 100 virtual-link 100.0.1.1
switch(config-router-vlink6)# no transit-delay
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400	config-router-vlink	Administrators or local user group members with execution rights for this command.

Platforms	Command context	Authority
8320 8325 8360 9300 10000		

trap-enable

```
trap-enable
no trap-enable
```

Description

Enables the notification of the events to be sent as traps to the SNMP management stations for OSPFv3.

The `no` form of this command disables the notification of the events to be sent as traps to the SNMP management stations for OSPFv3.

Examples

Enabling sending notification of events as traps:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# trap-enable
```

Disabling sending notification of events as traps:

```
switch(config)# router ospfv3 1
switch(config-ospfv3-1)# no trap-enable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-ospfv3-<PROCESS-ID>`	Administrators or local user group members with execution rights for this command.

Chapter 7
Border Gateway Protocol (BGP)

BGPv4 (RFC 4271) is an interdomain path-vector routing protocol that runs over TCP on port 179. It provides a reliable loop-free routing between different Autonomous Systems (ASs). BGP routers (called speakers) form peerings (also known as neighbor relationships) with other BGP peers. These peerings can either be internal (iBGP: within the same AS) or external, (eBGP: connecting two different ASs).

Overview

The characteristics of BGP are:

- Controls route propagation and the selection of optimal routes, rather than route discovery and calculation. This makes BGP different from interior gateway protocols (IGP) such as OSPF and RIP.
- Uses TCP to enhance reliability.
- Supports CIDR.
- Reduces bandwidth consumption by advertising only incremental updates, which allows advertising large amounts of routing information on the Internet.
- Eliminates routing loops by adding AS path information to BGP routes.
- Provides policies to implement flexible route filtering and selection.
- Provides scalability.

BGP views an autonomous system as a collection of routes under the control of a single organization, using one or more IGPs to route packets within the AS. The IGP could also be an iBGP within the AS and could use BGP as the only routing protocol.

Autonomous system numbers

Organizations requiring connectivity to the Internet must obtain an Autonomous System Number (ASN). ASNs were originally 2 bytes (16 bit), providing 65,535 ASNs. ASNs 64,512-65,534 are private ASNs within the 16-bit ASN range.

BGP sessions

A BGP session refers to the established adjacency between two BGP routers. BGP sessions are always point-to-point and are categorized into two types:

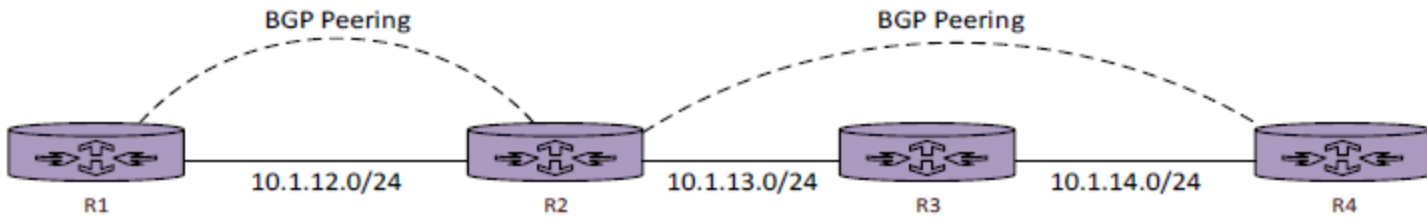
- **Internal BGP (IBGP)**: Sessions established with an IBGP router that are in the same AS. IBGP prefixes are assigned an administrative distance (AD) of 200 upon installing into the router routing information base (RIB).
- **External BGP (EBGP)**: Sessions established with a BGP router that are in a different AS. EBGP prefixes are assigned an AD of 20 upon installing into the router RIB.

Inter-router communication

BGP does not use hello packets to discover neighbors like IGP protocols and cannot discover neighbors dynamically. BGP was designed as an inter-autonomous routing protocol, implying neighbor adjacencies will not change frequently and are manually configured. BGP neighbors are defined by an IP address.

BGP uses TCP port 179 to communicate with other routers. While BGP can form neighbor adjacencies that are directly connected, it can also form adjacencies that are multiple hops away. Multihop sessions require that the router use an underlying route installed in RIB to establish the TCP session with a remote endpoint.

In the following scenario, R1 is able to establish a direct BGP session with R2. In addition, R2 is able to form a BGP session with R4, even though it passes through R3.



BGP messages

BGP communication uses four message types, as shown in the following table:

Type	Name	Functional Overview
1	OPEN	Sets up and establishes BGP adjacency
2	UPDATE	Advertises, updates, or withdraw routes
3	NOTIFICATION	Indicates and error condition to a BGP neighbor
4	KEEPALIVE	Ensures that BGP neighbors are still alive

BGP neighbor states

BGP forms a TCP session with neighbor routers called peers. The BGP sessions may report in the following states:

State	Listen for TCP	Initiate TCP	TCP Up	Open Sent	Open Received	Neighbor Up
Idle	No					
Connect	Yes					
Active	Yes	Yes				
Open sent	Yes	Yes	Yes	Yes		
Open confirm	Yes	Yes	Yes	Yes	Yes	
Established	Yes	Yes	Yes	Yes	Yes	Yes

Injecting routes/prefixes into the BGP table

The BGP Routing Information Base (RIB) holds the network layer reachability information (NLRI) learned by BGP, as well as the associated path attributes (PAs). An NLRI is simply an IP prefix and prefix length.

A BGP router adds entries to its local BGP table by using the `network` command. The router receives the prefixes through an Update message from a neighbor or by redistributing from another routing protocol.

The network command instructs BGP protocol to perform the following steps:

- Look for a route in the current IP routing table that matches the parameters of the `network` command. If the IP route exists, put the equivalent NLRI into the local BGP table.
- With this logic, connected routes, static routes, or IGP routes can be taken from the IP routing table and placed into the BGP table for later advertisement.

The BGP `redistribute` command can redistribute static, connected, and IGP learned routes.

Path attributes

BGP attaches path attributes (PAs) associated with each network path. The PAs provide BGP with granularity and control of routing policies within BGP. The BGP prefix PAs are classified as follows:

- Well-known mandatory
- Well-known discretionary
- Optional transitive
- Optional non-transitive

Per RFC 4271, well-known attributes must be recognized by all BGP implementations. Well-known mandatory attributes must be included with every prefix advertisement, while well-known discretionary attributes may or may not be included.

Optional attributes do not have to be recognized by all BGP implementations. Optional attributes can be set to be transitive and stay with the route advertisement from AS to AS. Other PAs are nontransitive and cannot be shared from AS to AS. BGP PAs are summarized in the following table.

Path Attribute	Description	Characteristics
AS_PATH	Lists ASNs through which the route has been advertised.	Well-known mandatory
NEXT_HOP	Lists the next-hop IP address used to reach an NLRI.	Well-known mandatory
LOCAL_PREF	Used to communicate a BGP router degree of preference for an advertised route. Used only in updates between internal BGP peers.	Well-known discretionary
MULTI_EXIT_DISc	Known as the MED, used to influence incoming traffic only in EBGP updates. Allows an AS to inform another AS of its preferred ingress point.	Optional non-transitive
AGGREGATOR	Lists the RouterId and ASN of the router that created the summary NLRI and indicates where the Aggregation occurred.	Optional transitive
ATOMIC_AGGREGATOR	Tags a summary NLRI as being a summary and indicates that a loss of path information has occurred.	Well-known discretionary
ORIGIN	Describes where the route was imported into BGP; i (IGP), e (EGP), or ? (incomplete information).	Well-known mandatory
COMMUNITY	Identifies a destination as a member of some community of destinations that share one or more common properties. Used to simplify policy enforcement.	Optional transitive
ORIGINATOR_ID	Used by route reflectors (RRs) to denote the router-id of the iBGP neighbor that injected the NLRI into the AS	Optional non-transitive
CLUSTER_LIST	Used by route reflectors (RRs) to list a sequence of route reflection cluster IDs through which the route has passed in order to prevent loops.	Optional non-transitive
MP_REACH_NLRI	Carries the set of reachable destinations together with the next hop information to be used for forwarding to these destinations.	Optional non-transitive
MP_UNREACH_NLRI	Used to withdraw unreachable routes.	Optional non-transitive

BGP best-path calculation

When a BGP router learns multiple routes to the same NLRI, it must choose a single best route. The following list defines the BGP route selection decision process.

1. **Highest administrative weight**: Administrative weight can be assigned to each NLRI locally on a router and the value cannot be communicated to another router. A higher value indicates a better route.
2. **Highest LOCAL_PREF PA**: This attribute can be set on a router inside an AS and distributed inside the AS. A higher value indicates a better route.

3. **Locally injected routed**: Pick the route injected into BGP locally using the network command `redistribution`.
4. **Shortest AS_PATH length**: A shorter AS_PATH indicates a better route. This attribute counts each ASN in the AS_SEQUENCE as one.
5. **Origin PA**: IGP (I) routes are preferred over EGP (E) routes, which are in turn preferred over incomplete (?) routes.
6. **Smallest Multi-Exit Discriminator (MED) PA**: A smaller value indicates a better route.
7. **Neighbor Type**: External BGP (eBGP) routes are better than internal BGP (iBGP) routes.
8. **IGP metric for reaching the NEXT_HOP**: When comparing IGP metrics for each NLRIs NEXT_HOP, a smaller value indicates a better route.
9. **Keep the oldest eBGP route**: If the routes being compared are eBGP and one is the best path, retain the existing best path. This action reduces eBGP route flaps.
10. **Choose the smallest neighbor router ID**: Use the route with the smallest next-hop router router-id. Only perform this step if bgp bestpath compare-routerid is configured.
11. **Smallest neighbor ID**: The local router has at least two neighbor relationships with a single other router. For this case, the router prefers the route advertised by the lowest neighbor ID.

Loop prevention

BGP is a path vector routing protocol and does not contain a complete topology of the link state routing protocols.

The BGP attribute AS_PATH is a mandatory attribute and includes a complete listing of all ASNs that the prefix advertisement has traversed from its source AS. AS_PATH is used as a loop prevention mechanism in the BGP protocol. If a BGP router receives a prefix advertisement with its AS listed in the AS_PATH, it discards the prefix because the router thinks the advertisement forms a loop.

Route policies

Route policy is a method that defines how routes are accepted on a router and how routes are advertised. Filtering of routes within BGP is accomplished with route maps, prefix lists, aspath lists, or community lists.

Resetting BGP sessions

When a BGP router configuration is changed, it is often necessary to reset the connections to the affected neighbors in order for the change to take effect. The user must reset the BGP connection for all:

- Changes to BGP related route maps, prefix lists, aspath lists, and community-lists
- Changes to the BGP-related timer specification
- Changes to BGP-related weights

BGP supports two methods of clearing a BGP session:

- A hard reset, which tears down the BGP session, removes BGP routes from the peer, and is the most disruptive.
- A soft reset, which invalidates the BGP cache and requests a full advertisement from its BGP peer.

Initiate a hard or soft reset with the `clear bgp` commands. Clear sessions with all BGP neighbors by using an asterisk `*` instead of the peer IP address.

When a BGP route policy changes, the BGP table must be processed again to notify neighbors. If the BGP session supports route refresh capability, the peer refreshes the prefixes to the requesting router, allowing the inbound policy to process using the new policy changes. The route refresh capability is negotiated when the session is established.

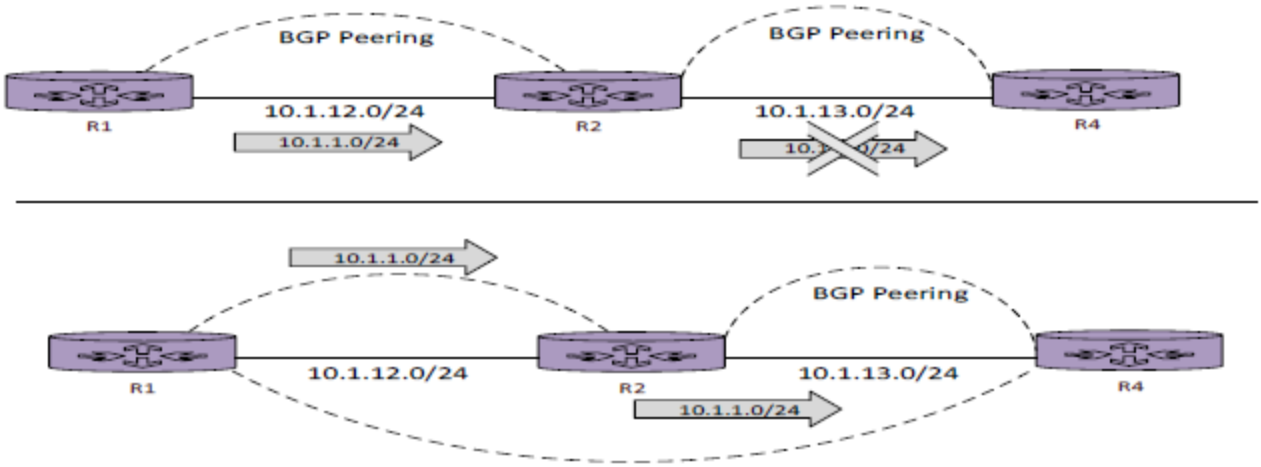
If the BGP session does not support route refresh, use inbound soft reconfiguration so that updates to inbound route policies can be applied without performing a hard reset.

- Inbound soft reconfiguration does not purge the Adj- RIB-In table after routes process into the Loc-RIB table.
- The Adj-RIB-In table maintains the raw unedited routes received from neighbors and allows the inbound route policies to be processed again.
- Enabling this feature can consume a significant amount of memory because the Adj-RIB-In table stays in memory.

IBGP full mesh requirement

BGP uses the AS_PATH as a loop detection and prevention mechanism because the ASN is prepended when advertising to an EBGP neighbor. IBGP peers do not prepend their ASN to the AS_PATH because the NLRIs would fail the validity check and would not install the prefix in the IP routing table.

No other method exists to detect loops with IBGP sessions. RFC 4271 prohibits the advertisement of an NLRI received from one IBGP peer to another. RFC 4271 states that all BGP routers within a single AS must be fully meshed to provide a complete loop-free routing table and prevent traffic null holing.



In the figure above, R1, R2, and R3 are all within AS65100.

- R1 has an IBGP session with R2 and R2 has an IBGP session with R3.
- R1 advertises the 10.1.1.0/24 prefix to R2, which is processed and inserted into the R2 BGP table.
- R2 does not advertise the 10.1.1.0/24 NLRI to R3 because it received the prefix from an IBGP peer.
- To resolve this issue, R1 must form a multi-hop IBGP session so that R3 can receive the 10.1.1.0/24 prefix directly from R1.

Route reflectors

The inability of BGP to advertise a prefix learned from one IBGP peer to another can lead to scalability issues within an AS. The formula n(n-1)/2 provides the number of sessions required where n represents the number of routers. A full mesh topology of 10 routers requires 45 sessions. IBGP scalability becomes an issue for large networks.

RFC 1966 specifies that IBGP peering can be configured so that it reflects routes to another IBGP peer. The router reflecting route is known as a route reflector (RR) and the router receiving reflected routes is a route reflector client. Three basic rules apply to route reflectors and route reflection

1. If an RR receives an NLRI from a non-RR client, the RR advertises the NLRI to an RR client. It does not advertise the NLRI to a nonroute reflector client.
2. If an RR receives an NLRI from an RR client, it advertises the NLRI to RR and non-RR clients. Even the RR client that sent the advertisement receives a copy of the route, but it discards the NLRI.
3. If an RR receives a route from an EBGP peer, it advertises the route to RR and non-RR clients.

Loop prevention in route reflectors

Removing the full mesh requirement in an IBGP topology introduces the potential for routing loops. RFC 1966 introduces two other BGP route reflector-specific attributes to prevent loops.

ORIGINATOR_ID is an optional non-transitive BGP attribute created by the first route reflector. This attribute sets the value to the router-id of the router that injected/advertised the route into the AS. If a router receives an NLRI with its router-id in the Originator attribute, the NLRI is discarded.

CLUSTER_LIST is a non-transitive BGP attribute updated by the route reflector. This attribute is appended by the route reflector with its cluster-id. By default this ID is the BGP router-id. The cluster-id can be set with BGP configuration command `bgp cluster-id` **`<cluster-id>`**. If a router receives an NLRI with its cluster-id in the cluster list attribute, the NLRI is discarded.

BGP peer groups

Peer groups can be used to assign common policies and attributes such as an AS number or source-interface for multiple neighbors. A peer group is relevant only to the router on which it is active and is not communicated to router peers. A BGP neighbor can belong to only one peer group. Peer-group activate is not supported in the current release. Peers under the peer groups must be activated individually under the address families.

BGP communities

BGP communities provide additional capability for tagging routes and modifying BGP routing policy on upstream and downstream routers. They can be appended, removed, or modified on each attribute as the route travels from router to router.

BGP communities are an optional transitive BGP attribute that can traverse from autonomous system to autonomous system. A BGP community is a 32-bit number that can be included with a route. It can be displayed as two 16-bit numbers (0-65535):(0-65535).

Aggregate routes

Aggregating routes conserves router resources and accelerates best patch calculation by reducing the size of the table. The two methods for BGP route aggregation are:

- **Static**: Create a static reject route for the prefix and advertise the network through a `network` command. The disadvantage of this method is that the summary route will always be advertised even if the networks are not available.
- **Dynamic**: Configure an aggregation network range using the `aggregate-address` command. When viable routes that match the network range enter the BGP table, an aggregate route is created. On the

originating router, a reject route for the aggregated prefix is automatically created by BGP as a loop-prevention mechanism.

BGP Graceful-Restart and high availability

The BGP Graceful-Restart (GR) feature allows a BGP speaker to express its ability to preserve forwarding state during:

- BGP protocol (or daemon) restart
- Management Module (MM) switchover

BGP GR is enabled by default and announces GR capability in the BGP OPEN message to peers. BGP initiates the graceful-restart process when an MM switchover occurs and also acts as a GR-aware device.

A GR-aware device, also known as GR helper mode, is notified that the peer router is transitioning and takes appropriate actions based on configuration or default timers.

When a BGP restart happens on the peer router or when MM switchover occurs, the routes currently held in the forwarding table are marked as stale. Thus the forwarding state is preserved as the control plane and the forwarding plane operates independently.

On the restarting peer on which the switchover occurred, BGP on the newly active MM starts to establish sessions with all configured peers. BGP on the nonrestarting side sees new connection requests coming in while BGP is in an established state. Such an event is an indication for the nonrestarting peer that the peer has restarted. At this point, the restarting peer sends the GR capability with Restart bit set to 1 and Forwarding State bit set to 1.

The nonrestarting peer:

- Cleans up old BGP sessions and marks all the routes in the BGP table that are received from the restarting peer as stale
- Purges all stale routes after the Restart Time expires (if the restarting peer never re-establishes the BGP session)
- Sends an initial routing table update, followed by an End-of-RIB (EoR)

The restarting peer:

- Delays best-path calculation until after receiving EoR from all peers
- Generates updates for its peers and sends the EoR marker after the initial table is sent

The nonrestarting peers:

- Receive the routing updates from the restarting peer
- Remove stale marking for any refreshed route
- Purge any remaining stale routes after EoR is received from the restarting peer or the stale path timer expires

Basic BGP configuration

A BGP session between routers is configured as follows:

1. Create the BGP routing instance and specify the local AS number with the global command `router bgp` **`as-number`**.

2. Specify a neighbor and the neighbor AS number with the `neighbor` **`ip-address`** `remote-as` **`as-number`** command.
3. Activate the neighbor under the address-family to exchange address-family specific information (capability advertisement, NLRIs etc.).

Address families

MP-BGP adds support for Address families and Sub Address families in addition to IPv4 Unicast which was supported by base BGP (RFC 4271). The 10.02 release supports IPv4 Unicast and IPv6 Unicast address families. Use the `address-family {<ipv4> | <ipv6>} unicast` commands to enter the address-family configuration mode and execute address-family specific configurations.

Scale limits

- Maximum neighbors supported across all VRFs: 256
- Maximum equal cost paths supported: 8
- Maximum route reflector clients allowed across all VRFs: 256
- Maximum BGP routes supported: 256,000
- Maximum routes accepted from a BGP peer: 256,000
- Maximum peer groups allowed across all VRFs: 50
- Maximum AS numbers in as-path attribute: 32
- Maximum as-path entries in a single aspath-list: 128
- Maximum aspath-lists: 128
- Maximum community entries in a single community-list: 128
- Maximum community-lists: 256
- Maximum prefix entries in a single prefix-list: 128
- Maximum prefix-lists: 256
- Maximum route map entries in a single route-map: 128
- Maximum route-maps: 256

BGP commands

address-family

```
address-family {{ipv4 | ipv6} unicast | l2vpn evpn}
no address-family {{ipv4 | ipv6} unicast | l2vpn evpn}
```

Description

Specifies address family to use and changes to the configuration context for the specified family:

- `config-bgp-ipv4-uc` for IPv4 unicast
- `config-bgp-ipv6-uc` for IPv6 unicast
- `config-bgp-l2vpn-evpn` for L2VPN EVPN

The `no` form of this command removes the specified address family configuration.

Parameter	Description
`ipv4`	Selects the IPv4 address family.
`ipv6`	Selects the IPv6 address family.
`unicast`	Specifies unicast addresses.
`l2vpn evpn`	Selects the L2VPN EVPN address family. Route maps with the `match vni` clause can be used with L2VPN EVPN neighbors only.

Example

Setting the address family to IPv4 unicast.

```
switch(config-bgp)# address-family ipv4 unicast
switch(config-bgp-ipv4-uc)#
```

Setting the address family to L2VPN EVPN.

```
switch(config-bgp)# address-family l2vpn evpn
switch(config-bgp-l2vpn-evpn)#
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp`	Administrators or local user group members with execution rights for this command.

aggregate-address

```
aggregate-address <IP-ADDR>/<MASK> [as-set] [summary-only]
        [suppress-map <MAP-NAME>] [advertise-map <MAP-NAME>]
        [attribute-map <MAP-NAME>]

no aggregate-address <IP-ADDR>/<MASK> [as-set] [summary-only]
        [suppress-map <MAP-NAME>] [advertise-map <MAP-NAME>]
        [attribute-map <MAP-NAME>]
```

Description

Creates an aggregate address entry in the BGP routing table.

The no form of this command removes the specified aggregate address entry.

Parameter	Description
<ADDRESS>	Specifies an aggregate address in IPv4 format (x.x.x.x), where x is a decimal number from 0 to 255, or IPv6 format (xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx), where x is a hexadecimal number from 0 to F.
<MASK>	Specifies the number of bits in the address mask in CIDR format (x), where x is a decimal number from 0 to 128.
as-set	The AS_PATH attribute advertised for this route will contain an AS_SET consisting of all AS numbers contained in all paths that are being summarized.
summary-only	Creates the aggregate route but also suppresses advertisements of more-specific routes to all neighbors.
suppress-map *<MAP-NAME>*	Specifies an aggregate route for creation, but suppresses the advertisement of the created route. Match clauses of route maps can be used to suppress some more-specific routes of the aggregate selectively, and leave others unsuppressed. IP prefix lists and as_path lists match clauses are supported.
advertise-map *<MAP-NAME>*	Specifies routes that will be used to build attributes of the aggregate route, such as AS_SET or community.
attribute-map *<MAP-NAME>*	Specifies that the attributes of the aggregate route can be changed.

Examples

```
switch(config-bgp-ipv4-uc)# aggregate-address 10.0.0.0/8
switch(config-bgp-ipv4-uc)# no aggregate-address 10.0.0.0/8
```

```
switch(config-bgp-ipv6-uc)# aggregate-address 2001:0db8:85a3::8a2e:0370:7334/24
switch(config-bgp-ipv6-uc)# no aggregate-address 2001:0db8:85a3::8a2e:0370:7334/24
```

```
switch(config-bgp-ipv4-uc)# aggregate-address 10.0.0.0/8 as-set summary-only
switch(config-bgp-ipv4-uc)# aggregate-address 10.0.0.0/8 attribute-map RMap
```

```
switch(config-bgp-ipv6-uc)# aggregate-address 2001:0db8:85a3::8a2e:0370:7334/24 as-
set summary-only
switch(config-bgp-ipv6-uc)# aggregate-address 2001:0db8:85a3::8a2e:0370:7334/24
attribute-map RMap
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp-ipv4-uc` `config-bgp-ipv6-uc`	Administrators or local user group members with execution rights for this command.

bgp always-compare-med

```
bgp always-compare-med
no bgp always-compare-med
```

Description

Enables comparison of the Multi Exit Discriminator (MED) for paths from neighbors in different autonomous systems. Any changes in BGP configuration are applied by restarting the current BGP sessions on the VRFs.

The `no` form of this command sets comparison of MED to the default setting (disabled).

Usage

- MED is one of the parameters that is considered when selecting the best path among many alternative paths. The path with a lower MED is preferred over a path with a higher MED.
- During the best-path selection process, MED comparison is done only among paths from the same autonomous system. Use the command `bgp always-compare-med` to change this behavior by enforcing MED comparison between all paths, regardless of the autonomous system from which the paths are received.

Examples

```
switch(config-bgp)# bgp always-compare-med
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)?
```

```
switch(config-bgp)# no bgp always-compare-med
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)?
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp	Administrators or local user group members with execution rights for this command.

bgp asnotation dotted

```
bgp asnotation dotted
no bgp asnotation dotted
```

Description

Specifies that Autonomous System (AS) numbers greater than 65535 be shown in dotted integer format for all show commands, including running-configuration.

The no form of this command restores the default format of non-dotted, simple integer.

Example

```
switch(config-bgp)# bgp asnotation dotted
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp	Administrators or local user group members with execution rights for this command.

bgp asnotation dotted-plus

```
bgp asnotation dotted-plus
no bgp asnotation dotted-plus
```

Description

Specifies that all Autonomous System (AS) numbers be shown in dotted integer format for all show commands, including running-configuration.

The no form of this command restores the default format of non-dotted, simple integer.

Example

```
switch(config-bgp)# bgp asnotation dotted-plus
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp	Administrators or local user group members with execution rights for this command.

bgp bestpath as-path ignore

```
bgp bestpath as-path ignore
no bgp bestpath as-path ignore
```

Description

Configures BGP to avoid considering the autonomous system (AS) path during best path route selection. By default, the AS-path is considered during BGP best path selection.

Any changes in BGP configuration are applied by restarting the current BGP sessions on the VRFs.

The no form of this command restores default behavior which configures BGP to consider the AS-path during route selection.

Examples

```
switch(config-bgp)# bgp bestpath as-path ignore
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)?
```

```
switch(config-bgp)# no bgp bestpath as-path ignore
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)?
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp	Administrators or local user group members with execution rights for this command.

bgp bestpath as-path multipath-relax

```
bgp bestpath as-path multipath-relax
no bgp bestpath as-path multipath-relax
```

Description

Configures Border Gateway Protocol (BGP) to treat two BGP routes as equal cost even if their AS-paths differ, as long as their AS-path lengths and other relevant attributes are the same. This allows routes with different AS-paths to be programmed into the forwarding table as equal cost multipath routes.

Any changes in BGP configuration are applied by restarting the current BGP sessions on the VRFs.

The `no` form of this command restores the default behavior which configures BGP to treat two BGP routes as different costs when their AS-paths differ.

Examples

```
switch(config-bgp)# bgp bestpath as-path multipath-relax
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)?
```

```
switch(config-bgp)# no bgp bestpath as-path multipath-relax
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)?
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp	Administrators or local user group members with execution rights for this command.

bgp bestpath compare-routerid

```
bgp bestpath compare-routerid
no bgp bestpath compare-routerid
```

Description

Configures a BGP routing process to compare identical routes received from different external peers during the best path selection process and selects the route with the lowest router ID as the best path. Defaults to disabled.

Any changes in BGP configuration are applied by restarting the current BGP sessions in the VRFs.

The `no` form of this command returns the BGP routing process to the default operation. By default, BGP selects the route that was received first when two routes with identical attributes are received.

Examples

```
switch(config-bgp)# bgp bestpath compare-routerid
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)?
```

```
switch(config-bgp)# no bgp bestpath compare-routerid
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)?
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp`	Administrators or local user group members with execution rights for this command.

bgp bestpath med confed

```
bgp bestpath med confed
no bgp bestpath med confed
```

Description

Compares the identical routes received from the different confederation peers and selects the route with the lowest Multi Exit Discriminator (MED) value as the best path. This behavior is disabled by default.

The `no` form of this command prevents the routing process from considering the MED value.

The selection of other attributes like `as-multi-path relax` and `as-path ignore` will not affect the behavior of this command within a confederation.

Examples

Selecting the route with lowest MED value:

```
switch(config-bgp)#  bgp bestpath med confed
All active BGP sessions in the VRF %s will be restarted.
Do you want to continue (y/n)?
```

Preventing the routing process from selecting the MED value:

```
switch(config-bgp)# no bgp bestpath med confed
All active BGP sessions in the VRF %s will be restarted.
Do you want to continue (y/n)?
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp`	Administrators or local user group members with execution rights for this command.

bgp bestpath med missing-as-worst

```
bgp bestpath med missing-as-worst
no bgp bestpath med missing-as-worst
```

Description

Configures a BGP routing process to assign a value of infinity (max possible) to routes that are missing the Multi Exit Discriminator (MED) attribute. The path without a MED value is the least desirable path. Any changes in BGP configuration are applied by restarting the current BGP sessions in the VRFs.

The `no` form of this command restores default behavior. The default behavior assigns a value of 0 to the missing MED.

Examples

```
switch(config-bgp)# bgp bestpath med missing-as-worst
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)?
```

```
switch(config-bgp)# no bgp bestpath med missing-as-worst
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)?
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp	Administrators or local user group members with execution rights for this command.

bgp cluster id

```
bgp cluster-id {<IPV4-ADDR> | <ID>}
no bgp cluster-id {<IPV4-ADDR> | <ID>}
```

Description

Specifies the cluster ID when the BGP router is used as a route-reflector. The cluster ID default is the router ID. Any changes in BGP configuration are applied by restarting the current BGP sessions on the VRFs.

The `no` form of this command sets the cluster ID to the default value, which is the router ID.

Parameter	Description
<IPV4-ADDR>	Specifies an IP address in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255. You can remove leading zeros. For example, the address `192.169.005.100` becomes `192.168.5.100`.
<ID>	Specifies the cluster ID as 32-bit number. Range: 1 to 4294967295.

Examples

```
switch(config-bgp)# bgp cluster-id 2.2.2.2
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)?
```

```
switch(config-bgp)# no bgp cluster-id 2.2.2.2
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)?
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp	Administrators or local user group members with execution rights for this command.

bgp confederation

```
 bgp confederation <AS-NUMBER>
no bgp confederation<AS-NUMBER>
```

Description

Configures a BGP confederation with the confederation identifier. The group of Autonomous Systems (ASs) will be presented as a single autonomous system with the confederation identifier as the AS number.

The no form of the command deletes the BGP confederation identifier.

Parameter	Description
<AS-NUMBER>	Sets the identifier for the confederation. Range:1-4294967295.

Examples

Configuring the BGP confederation with the AS number:

```
switch(config-bgp)# bgp confederation 100
```

Deleting BGP confederation identifier:

```
switch(config-bgp)# no bgp confederation 100
This will delete BGP confederation identifier on this device.
Do you want to continue (y/n)?
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp`	Administrators or local user group members with execution rights for this command.

bgp confederation peers

`bgp confederation peers <AS NUMBER>`
`no bgp bgp confederation peers <AS NUMBER>`

Description

Configures BGP confederation peers with both same and different sub-autonomous system to establish an eBGP membership. You can configure a list of AS numbers separated by spaces.

The `no` form of this command disables the peer session and deletes the peer information.

Parameter	Description
<AS NUMBER>	Specifies the autonomous system numbers to establish an eBGP membership. Range: 64512-65535.

Examples

Configuring peers with ASNs:

```
switch(config-bgp)# bgp confederation peers 64512 64513
```

Disabling peers and deleting the peer information:

```
switch(config-bgp)# no bgp confederation peers 64512
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp	Administrators or local user group members with execution rights for this command.

bgp dampening

```
bgp dampening {{half-life <HALF-TIME> reuse <LOW-THRESHOLD> suppress <HI-THRESHOLD> max-
suppress-time <MAX-TIME>}
| route-map <NAME>}
```

Description

Enables route flap dampening which reduces the propagation of unstable routes in the network.

Parameter	Description
half-life *<HALF-TIME>*	Specifies the half-life time in minutes. When the time expires, the penalty on a route gets reduced exponentially to half its current value. Default: 15.
reuse *<LOW-THRESHOLD>*	Specifies the lower threshold of penalty. On a suppressed route, when the penalty on a route falls below this value, the route is unsuppressed. Default: 750.
suppress *<HI-THRESHOLD>*	Specifies the upper threshold of penalty. When the penalty on a flapping route exceeds this value, the route is suppressed. Default: 2000.
max-suppress-time *<MAX-TIME>*	Specifies the maximum time to keep a route suppressed in minutes. Once this timer expires, the route is unsuppressed. Default: 60.
route-map *<NAME>*	Specifies the name of a route map.

These parameters can be configured at the router level for specific address families or the same parameters can be configured under a route map which can be applied to dampening command.

Usage

The dampening algorithm assigns a penalty of 1000 to a flapping route every time the route gets withdrawn. The penalty values accumulate on the route every time it flaps. However, the penalty decays and is reduced to half its value by the half-life time.

This feature is not applicable on IBGP routes.

Example

```
switch(config)# router bgp 1
switch(config-bgp)# address-family ipv4 unicast
```

```
switch(config-bgp-ipv4-uc)# bgp dampening

switch(config-bgp-ipv4-uc)# bgp dampening route-map abc

switch(config-bgp-ipv4-uc)# bgp dampening route-map xyz

switch(config-bgp-ipv4-uc)# bgp dampening half-life 10 reuse 100 suppress 250 max-
suppress-time 45
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp-ipv4-uc	Administrators or local user group members with execution rights for this command.

bgp default local-preference

```
bgp default local-preference <NUMBER>
no bgp default local-preference
```

Description

Default local preference value for BGP learned routes. Any changes in BGP configuration are applied by restarting the current BGP sessions on the VRFs.

The no form of this command sets the local preference to the default value of 100.

Parameter	Description
<NUMBER>	Specifies the local preference value. Range: 0 to 4294967295. Default: 100.

Examples

```
switch(config-bgp)# bgp default local-preference 20
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)?
```

```
switch(config-bgp)# no bgp default local-preference
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)?
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp	Administrators or local user group members with execution rights for this command.

bgp deterministic-med

```
bgp deterministic-med
no bgp deterministic-med
```

Description

Enables comparison of the Multi-Exit Discriminator (MED) attribute when selecting routes advertised by different peers in the same autonomous system. Any changes in BGP configuration are applied by restarting the current BGP sessions on the VRFs.

The no form of this command sets MED comparison to the default setting of disabled.

Examples

```
switch(config-bgp)# bgp deterministic-med
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)?
```

```
switch(config-bgp)# no bgp deterministic-med
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)?
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp	Administrators or local user group members with execution rights for this command.

bgp fast-external-fallover

```
bgp fast-external-fallover
no bgp fast-external-fallover
```

Description

Sets the switch to reset the BGP sessions of any directly adjacent external peers when the connected link goes down. It is enabled by default.

The no form of this command restores the default behavior where BGP waits until the hold time expires before closing sessions.

Examples

```
switch(config-bgp)# bgp fast-external-fallover
switch(config-bgp)# no bgp fast-external-fallover
```

Command History

Release	Modification
10.08	The default behavior has been changed from disabled to enabled state. **NOTE:** When upgrading, the feature will remain in the state it was (disabled or enabled) in the earlier release.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp	Administrators or local user group members with execution rights for this command.

bgp graceful-restart restart-time

```
bgp graceful-restart restart-time <DELAY>
no bgp graceful-restart restart-time
```

Description

Sets the graceful restart timer which determines how long the switch waits for a graceful-restart capable neighbor to re-establish BGP peering. Any changes in BGP configuration are applied by restarting the current BGP sessions on the VRFs.

The `no` form of this command resets to the default value of 120 seconds.

Parameter	Description
<DELAY>	Graceful restart timer delay in seconds. Range: 1 to 3600. Default: 1500.

Usage

- Graceful restart functionality is enabled by default, and there is no command to disable the functionality at the protocol level.
- However, the graceful-restart functionality can be disabled globally using the command `router graceful-restart`.

Examples

```
switch(config-bgp)# bgp graceful-restart restart-time 150
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)?
```

```
switch(config-bgp)# no bgp graceful-restart restart-time
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)?
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp`	Administrators or local user group members with execution rights for this command.

bgp graceful-restart stalepath-time

```
bgp graceful-restart stalepath-time <TIME>
```

```
no bgp graceful-restart stalepath-time
```

Description

Sets the stale path timer. This timer determines how long BGP keeps stale routes from the restarting BGP peer. Any changes in BGP configuration are applied by restarting the current BGP sessions on the VRFs.

The `no` form of this command resets to the stale path timer to the default of 300 seconds.

Parameter	Description
<TIME>	Specifies the stale path timer in seconds. Range: 1 to 3600. Default: 300.

Examples

```
switch(config-bgp)# bgp graceful-restart stalepath-time 300
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)?
```

```
switch(config-bgp)# no bgp graceful-restart stalepath-time
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)?
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp`	Administrators or local user group members with execution rights for this command.

bgp log-neighbor-changes

```
bgp log-neighbor-changes
no bgp log-neighbor-changes
```

Description

Enables logging of BGP neighbor session state changes.

The `no` form of this command disables logging of changes in BGP neighbor adjacencies.

Examples

```
switch(config-bgp)# bgp log-neighbor-changes
switch(config-bgp)# no bgp log-neighbor-changes
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp	Administrators or local user group members with execution rights for this command.

bgp maxas-limit

```
bgp maxas-limit <LENGTH>
no bgp maxas-limit
```

Description

Specifies the maximum size of AS paths in update messages. Routes with AS paths greater than the specified length are discarded.

The no form of this command sets the limit to the default of 32.

Parameter	Description
<LENGTH>	Specifies the number of AS segments. Length: 1 to 32 characters. Default: 32.

Example

```
switch(config-bgp)# bgp maxas-limit 20
switch(config-bgp)# no bgp maxas-limit
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp`	Administrators or local user group members with execution rights for this command.

bgp router-id

```
bgp router-id <ROUTER-ID>
no bgp router-id <ROUTER-ID>
```

Description

Configures a fixed router ID for the BGP peer process running on the router. Any changes in BGP configuration are applied by restarting the current BGP sessions on the VRFs.

The `no` form of this command removes the fixed router ID from the running configuration and restores the default router ID selection.

Parameter	Description
<ROUTER-ID>	Specifies the router ID in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255. If router-id is changed, then all the active BGP peer sessions go down and restart with the newly configured router-id.

Usage

BGP determines the router ID as follows:

1. The address configured with the command `bgp router-id`.
2. The highest IP address on all the loopback interfaces.
3. The highest IP address on any interface.

Examples

```
switch(config-bgp)# bgp router-id 1.1.1.1
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)?
```

```
switch(config-bgp)# no bgp router-id 1.1.1.1
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)?
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp`	Administrators or local user group members with execution rights for this command.

clear bgp

```
clear bgp [vrf <VRF-NAME>][ipv4 unicast | ipv6 unicast | l2vpn evpn | all]
     {* | <NEIGHBOR-IP-ADDR>} [soft in]
```

Description

Resets BGP peer sessions. Sends a route refresh request when you have specified `soft in`. Optionally, you can specify reset for a specific VRF.

Parameter	Description
`ipv4 unicast`	Specifies the IPv4 address family.
`ipv6 unicast`	Specifies the IPv6 address family.
`l2vpn evpn`	Selects the L2VPN EVPN address family
`vrf` *`<VRF-NAME>`*	Specifies a VRF name.
`all`	Specifies all VRFs and address families.
`*` | *`<NEIGHBOR-IP-ADDRESS>`*	Specifies a neighbor IP address for which peer sessions are to be reset, or `*` to reset all sessions.
`soft in`	Send a route refresh request.

Examples

```
add descriptions for all examples
switch# clear bgp all *
switch# clear bgp ipv4 unicast 192.168.12.1 soft in
```

```
switch# clear bgp l2vpn evpn * soft in
switch# clear bgp l2vpn evpn 9.0.0.2 soft in
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

disable|enable

```
disable | enable
```

Description

This command disables or enables the BGP instance while retaining the configuration. Disable and enable of the BGP instance may result in a change of the router ID.

By default the BGP instance is enabled.

Examples

```
switch(config)# router bgp 100
switch(config-bgp)# disable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp	Administrators or local user group members with execution rights for this command.

distance bgp

```
distance bgp <EXTERNAL> <INTERNAL>
no distance bgp <EXTERNAL> <INTERNAL>
```

Description

Configures the administrative distance for BGP.

The no form of this command restores the default settings, 20 for eBGP and 200 for iBGP,

Parameter	Description
<EXTERNAL>	Specifies the administrative distance for eBGP routes. Range: 1 to 255. Default: 20.
<INTERNAL>	Specifies the administrative distance for iBGP routes. Range: 1 to 255. Default: 200.

Example

```
switch(config-bgp-ipv4-uc)# distance bgp 100 150
switch(config-bgp-ipv4-uc)# no distance bgp 100 150
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp-ipv4-uc config-bgp-ipv6-uc	Administrators or local user group members with execution rights for this command.

maximum-paths

```
maximum-paths <MAXPATHS>
no maximum-paths <MAXPATHS>
```

Description

Configures the maximum number of paths that BGP adds to the route table for equal-cost multipath (ECMP) load balancing for routes learned from both internal and external BGP. Any changes in BGP configuration are applied by restarting the current BGP sessions on the VRFs.

The no form of this command restores the default setting of 4.

Parameter	Description
<MAXPATHS>	Specifies the maximum number of paths. Range: 1 to 32. Default: 4.

Examples

```
switch(config)# router bgp 1
switch(config-bgp)# maximum-paths 32
```

```
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)? y
```

```
switch(config-bgp)# no maximum-paths
All current BGP sessions in VRF default will be restarted.
Do you want to continue (y/n)? y
```

Command History

Release	Modification
10.10	Increased upper limit of range of <*MAXPATHS*> parameter to 32.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp`	Administrators or local user group members with execution rights for this command.

neighbor activate

```
neighbor <IP-ADDR> activate
no neighbor <IP-ADDR> activate
```

Description

This command enables the address-family capability and exchange of information specific to an address family with a BGP neighbor.

The `no` form of this command removes the address-family capability and disables the exchange of routes for the specified address-family with the BGP neighbor.

Parameter	Description
<IP-ADDR>	Specifies an IP address in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255, or IPv6 format (`xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx`), where `x` is a hexadecimal number from 0 to F.

Examples

```
switch(config-bgp-ipv4-uc)# neighbor 1.1.1.1 activate
switch(config-bgp-ipv4-uc)# no neighbor 1.1.1.1 activate
```

```
switch(config-bgp-l2vpn-evpn)# neighbor 1.1.1.1 activate
switch(config-bgp-l2vpn-evpn)# no neighbor 1.1.1.1 activate
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp-ipv4-uc config-bgp-ipv6-uc config-bgp-l2vpn-evpn	Administrators or local user group members with execution rights for this command.

neighbor advertisement-interval

```
neighbor {<IP-ADDRESS>|<PEER-GROUP-NAME>} advertisement-interval <INTERVAL>
no neighbor {<IP-ADDRESS>|<PEER-GROUP-NAME>} advertisement-interval
```

Description

Sets the advertisement interval, which defines the length of time between transmission of BGP routing updates.

The `no` form of this command restores the default value. Default values are 30 seconds for external BGP peer and 5 seconds for internal BGP peer.

Parameter	Description
<IP-ADDR>	Specifies an IP address in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255, or IPv6 format (`xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx`), where `x` is a hexadecimal number from 0 to F.
<PEER-GROUP-NAME>	Specifies a Peer-Group.
<INTERVAL>	Specifies the advertisement interval in seconds. Range: 0 to 600. Default: 30 for external BGP peer and 5 for internal BGP peer.

Examples

```
switch(config-bgp-ipv4-uc)# neighbor 1.1.1.1 advertisement-interval 20
switch(config-bgp-ipv4-uc)# no neighbor 1.1.1.1 advertisement-interval
```

```
switch(config-bgp-ipv4-uc)# neighbor pg advertisement-interval 50
```

```
switch(config-bgp-ipv4-uc)# no neighbor pg advertisement-interval
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp-ipv4-uc config-bgp-ipv6-uc	Administrators or local user group members with execution rights for this command.

neighbor add-paths

```
neighbor {<IP-ADDR>|<PEER-GROUP-NAME>} add-paths {send | recv | both}
no neighbor {<IP-ADDR>|<PEER-GROUP-NAME>} add-paths {send | recv | both}
```

Description

Enables additional path capability for BGP as described in RFC 7911. This allows BGP peer to send, receive, or send and receive multiple paths for the same address prefix without the subsequent advertisements implicitly replacing any previous paths. The additional path includes the first (N-1) best paths, which means that the total paths for an address prefix received by a BGP speaker will include the best path and the additional paths determined by its BGP peer.

With additional path feature, each path is identified by a path identifier in addition to the address prefix. To use this command, the backup path of BGP next-hop must be different than the primary path.

The `no` form of this command disables the additional path feature.

Parameter	Description
<IP-ADDR>	Specifies an IP address.
<PEER-GROUP-NAME>	Specifies a peer group.
add-paths {send | recv | both}	Configures the additional paths in one of the following ways: `send`—Enables the neighbor to send the additional paths. `recv`—Enables the neighbor to receive the additional paths. `both`—Enables the neighbor to send and receive the additional paths.

Examples

Enabling BGP neighbor to send the additional paths:

```
switch(config)# router bgp 100
switch(config-bgp)# address-family ipv4 unicast
switch(config-bgp-ipv4-uc)# neighbor 1.1.1.1 add-paths send
```

Disabling BGP neighbor to send the additional paths:

```
switch(config)# router bgp 100
switch(config-bgp)# address-family ipv4 unicast
switch(config-bgp-ipv4-uc)# no neighbor 1.1.1.1 add-paths send
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp-ipv4-uc config-bgp-ipv6-uc	Administrators or local user group members with execution rights for this command.

neighbor add-paths advertise-best

```
neighbor {<IP-ADDR>|<PEER-GROUP-NAME>} add-paths advertise-best <2-4>
no neighbor {<IP-ADDR>|<PEER-GROUP-NAME>} add-paths advertise-best <2-4>
```

Description

Controls the number of best BGP Paths to be advertised by a BGP speaker to a BGP peer. When enabled, it allows BGP speaker to advertise more than one best paths for the same address prefix. The total paths for an address prefix will include the best path and the additional paths.

The `no` form of this command removes the advertise best path configuration.

Parameter	Description
<IP-ADDR>	Specifies an IP address.
<PEER-GROUP-NAME>	Specifies a peer group.
`advertise-best` *<2-4>*	Specifies the number of best BGP paths to be advertised to a BGP Peer. Range: 2 to 4. Default: 2.

Examples

Setting the number of best paths to send to the neighbor:

```
switch(config)# router bgp 100
switch(config-bgp)# address-family ipv4 unicast
switch(config-bgp-ipv4-uc)# neighbor 1.1.1.1 add-paths advertise-best 3
```

Removing the advertise best path configuration:

```
switch(config)# router bgp 100
switch(config-bgp)# address-family ipv4 unicast
switch(config-bgp-ipv4-uc)# no neighbor 1.1.1.1 add-paths advertise-best 3
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp-ipv4-uc config-bgp-ipv6-uc	Administrators or local user group members with execution rights for this command.

neighbor allowas-in

```
neighbor {<IP-ADDRESS> |<LIMIT>
no neighbor {<IP-ADDRESS> |<LIMIT>
```

Description

Specifies the number of times that the AS path of a received route can contain the AS number of the recipient BGP speaker and still be accepted. When this configuration is applied to a peer-group, all the neighbors that are part of the peer-group inherit this setting.

The `no` form of this command restores the default setting, which is to reject as a loop any route where the path contains the speaker AS number.

Parameter	Description
<IP-ADDRESS>	Specifies the neighbor IP address in the IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255, or in the IPv6 format (`xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx`), where `x` is a hexadecimal number from 0 to F. **NOTE:** IPv6 MP-BGP peering must not be used for L2VPN EVPN address family, because VXLAN tunnel interface does not support IPv6 addresses.

Parameter	Description
<PEER-GROUP-NAME>	Specifies a peer group.
<LIMIT>	Specifies the number of times that the AS path of a received route can contain the AS number of the recipient BGP. Range: 1 to 10.

Examples

```
switch(config-bgp-ipv4-uc)# neighbor 1.1.1.1 allowas-in 5
switch(config-bgp-ipv4-uc)# no neighbor 1.1.1.1 allowas-in
```

```
switch(config-bgp-ipv6-uc)# neighbor 2001:0db8:85a3::8a2e:0370:7334 allowas-in 5
switch(config-bgp-ipv6-uc)# no neighbor 2001:0db8:85a3::8a2e:0370:7334 allowas-in
```

```
switch(config-bgp-ipv4-uc)# neighbor PG allowas-in 5
switch(config-bgp-ipv4-uc)# no neighbor PG allowas-in
```

```
switch(config-bgp-l2vpn-evpn)# neighbor 1.1.1.1 allowas-in 5
switch(config-bgp-l2vpn-evpn)# no neighbor 1.1.1.1 allowas-in
```

```
switch(config-bgp-l2vpn-evpn)# neighbor PG allowas-in 5
switch(config-bgp-l2vpn-evpn)# no neighbor PG allowas-in
```

```
switch(config-bgp-l2vpn-evpn)# neighbor 2001:0db8:85a3::8a2e:0370:7334 allowas-in 5
switch(config-bgp-l2vpn-evpn)# no neighbor 2001:0db8:85a3::8a2e:0370:7334 allowas-in
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp-ipv4-uc config-bgp-ipv6-uc config-bgp-l2vpn-evpn	Administrators or local user group members with execution rights for this command.

neighbor ao

```
neighbor {<IP-ADDR>|<PEER-GROUP-NAME>} ao <keychain-name>
   accept-ao-mismatch
```

```
include-tcp-options
no ...
```

Description

Enables TCP Authentication Option (TCP-AO) authentication on a TCP connection between two BGP neighbors. To disable this function, use the **no** form of this command.

Parameter	Description
<IP-ADDRESS>	Specifies an IP address.
<PEER-GROUP-NAME>	Specifies a peer group.
<keychain-name>	Name of the keychain for the neighbor. The keychain allows keys to be configured with different valid lifetimes. This mechanism provides a way for a set of keys to be rotated and hence protect against long-lived-key attacks. At any given time only one key is selected as active-key and keys are valid for a duration of the defined send-lifetime. If the send-lifetime and the accept-lifetimes are not configured for the key, the key is considered to be valid for infinite lifetime. When multiple keys are configured, its recommended that keys overlap in their send-lifetimes so that the key rollover occurs at the start of the next key's send-lifetime. This allows for a continuous key usage by TCP-AO.
accept-ao-mismatch	Accept incoming TCP segments without TCP-AO option. If enabled, the device will accept a connection from the peer *even if the received TCP packets do not contain the TCP-AO option*.
include-tcp-options	Include the TCP header options for MAC calculation. Note that enabling this setting will immediately reset the neighbor session. This setting is disabled by default.
no ...	Negates any configured parameter.

Usage

TCP-AO authentication can not be used with the neighbor password feature. When TCP-AO is applied to a peer-group, all the neighbors in peer-group will inherit the peer-group configuration unless there is a configuration specific to an individual neighbor. If a peer-group is configured with the neighbor password feature but the neighbors that belong to that peer-group are configured with TCP-AO, the TCP-AO configuration will be rejected. Similarly, If a peer-group is configured to use TCP-AO authentication, the neighbors that belong to that peer-group will reject the neighbor password.

The neighbor connection must be reset using the **clear ip bgp** command for the TCP-AO configuration to take effect.

The TCP-AO feature takes a keychain as a parameter. The key will not be valid until a Recv-D, Send-ID, and send lifetime is configured. The supported cryptographic algorithms for TCP-AO are:

- HMAC-SHA-1-96 based on [RFC2104] and [FIPS-180-3]
- AES-128-CMAC-96 based on [NIST-SP800-38B][FIPS197]

Examples

```
switch(config)# keychain bgpkeys
switch(config-keychain)# key 1
switch(config-keychain-key)# send-lifetime start-time 10:10:10 10/25/2022 duration
infinite
switch(config-keychain-key)# accept-lifetime start-time 10:10:10 10/25/2022 duration
infinite
switch(config-keychain-key)# send-id 10
switch(config-keychain-key)# recv-id 10
switch(config-keychain-key)# cryptographic-algorithm aes-cmac-128
switch(config-keychain-key)# key-string plaintext qwer
switch(config)# router bgp 1
switch(config-bgp)# neighbor 1.1.1.1 ao bgpkeys
switch(config-bgp)# no neighbor 1.1.1.1 ao accept-ao-mismatch
switch(config-bgp)# no neighbor 1.1.1.1 ao include-tcp-option
```

Command History

Release	Modification
10.11 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp`	Administrators or local user group members with execution rights for this command.

neighbor capability orf prefix-list

```
neighbor <IP-ADDRESS> capability orf prefix-list {send | receive | both}
no neighbor <IP-ADDRESS> capability orf prefix-list {send | receive | both}
```

Description

Enables the Outbound Route filtering (ORF) capability with the neighbor in one of the three available modes. The available modes are send, receive, and both. The ORF capability is executed based on prefix list only.

The Outbound Route Filtering (ORF) capability provides a mechanism for a BGP speaker to send a set of Outbound Route Filters (ORFs) that can be used by its BGP peer to filter its outbound routing updates to the speaker. This is a filtering method used to reduce the computation on the router receiving the route.

The `no` form of this command disables the ORF capability.

Parameter	Description
<IP-ADDRESS>	Specifies an IP address.
`capability orf prefix-list {send | receive | both}`	Enables ORF prefix list capability with the neighbor in one of the following modes: `send` - Enables the ORF prefix list capability in send mode.

Parameter	Description
	`receive` - Enables the ORF prefix list capability in receive mode. `both`- Enables the ORF prefix list capability in both send and receive mode.

Examples

Enabling the ORF prefix list capability in both send and receive mode:

```
switch(config-bgp-ipv4-uc)# neighbor 1.1.1.1 capability orf prefix-list both
```

Enabling the ORF prefix list capability in send mode:

```
switch(config-bgp-ipv4-uc)# neighbor 1.1.1.1 capability orf prefix-list send
```

Disabling the ORF prefix list capability in both send and receive mode: :

```
switch(config-bgp-ipv4-uc)# no neighbor 1.1.1.1 capability orf prefix-list both
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp-ipv4-uc` `config-bgp-ipv6-uc`	Administrators or local user group members with execution rights for this command.

neighbor default-originate

`neighbor {<IP-ADDR>|<PEER-GROUP-NAME>} default-originate [route-map <MAP-NAME>]`
`no neighbor {<IP-ADDRESS>|<PEER-GROUP-NAME>} default-originate [route-map <MAP-NAME>]`

Description

Enables the local router to send the default route 0.0.0.0 to a neighbor. The neighbor can then use this route to reach the router when all other routes are unavailable. Use the `route-map` option to configure the route map to modify the default route attributes.

The `no` form of this command disables this feature.

Parameter	Description
<IP-ADDR>	Specifies an IP address in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255, or IPv6 format (`xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx`), where `x` is a hexadecimal number from 0 to F.
<PEER-GROUP-NAME>	Specifies a peer group.
<MAP-NAME>	Sets the route map to modify the default route attributes.

Examples

```
switch(config-bgp-ipv4-uc)# neighbor 1.1.1.1 default-orginate
switch(config-bgp-ipv4-uc)# no neighbor 1.1.1.1 default-originate
```

```
switch(config-bgp-ipv4-uc)# neighbor PG default-originate
switch(config-bgp-ipv4-uc)# no neighbor PG default-originate
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp-ipv4-uc` `config-bgp-ipv6-uc`	Administrators or local user group members with execution rights for this command.

neighbor ebgp-multihop

`neighbor {<IP-ADDR> | <PEER-GROUP-NAME>} ebgp-multihop <HOP-COUNT>`
`no neighbor {<IP-ADDRESS> |<HOP-COUNT>`

Description

Enables BGP to establish a session with external peers residing on networks that are not directly connected. By default, BGP can only establish sessions with external BGP peers that are directly connected.

The neighbor connection must be reset using `clear bgp` to allow this configuration to take effect.

The `no` form of this command disables the peer ebgp-multihop feature.

Parameter	Description
<IP-ADDR>	Specifies an IP address.
<PEER-GROUP-NAME>	Specifies a peer group.
ebgp-multihop *<HOP-COUNT>*	Specifies the maximum number of hops to reach the peer.

Examples

Enabling BGP to establish connection with external peers residing on networks that are not directly connected:

```
switch(config-bgp)# neighbor 1.1.1.1 ebgp-multihop 5
switch(config-bgp)# no neighbor 1.1.1.1 ebgp-multihop
```

Disabling BGP to establish connection with external peers residing on networks that are not directly connected:

```
switch(config-bgp)# neighbor pg ebgp-multihop 5
switch(config-bgp)# no neighbor pg ebgp-multihop
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp	Administrators or local user group members with execution rights for this command.

neighbor fall-over

```
neighbor {<IP-ADDR>|<PEER-GROUP-NAME>} fall-over
no neighbor {<IP-ADDR>|<PEER-GROUP-NAME>} fall-over
```

Description

Enables BGP fast peering session deactivation. When neighbor fall-over is configured, the BGP process monitors the RIB and if the route to peer is not present in the routing table, it immediately deactivates the peer session without waiting for the hold down timer. It is disabled by default.

The no form of this command disables this feature.

Parameter	Description
<IP-ADDR>	Specifies an IP address.
<PEER-GROUP-NAME>	Specifies a peer group.

Usage

Neighbor fall-over does not track connected or static routes to peers. However, this is not an issue when IBGP peering is using a loopback interface. To force a fall-over for connected and static routes, use the command `neighbor fall-over bfd`.

Examples

```
switch(config-bgp)# neighbor 1.1.1.1 fall-over
switch(config-bgp)# no neighbor 1.1.1.1 fall-over
```

```
switch(config-bgp)# neighbor PG fall-over
switch(config-bgp)# no neighbor PG fall-over
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp`	Administrators or local user group members with execution rights for this command.

neighbor fall-over bfd

`neighbor {<IPV4-ADDR>|<IPV6-ADDR>|<PEER-GROUP-NAME>} fall-over bfd`
`no neighbor {<IPV4-ADDR>|<IPV6-ADDR>|<PEER-GROUP-NAME>} fall-over bfd`

Description

Enables BGP to register with BFD to receive fast peering session deactivation messages from BFD. You can either configure BFD support for BGP per neighbor or peer-group.

The `no` form of this command disables BGP for BFD.

Multihop BFD is not supported for BGP.

BFD over BGP using IPv6 is not supported on 8320, 8325, and 9300 switch series.

Parameter	Description
<IPV4-ADDR>	Specifies the neighbor address in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255.
<IPV6-ADDR>	Specifies the neighbor address in IPv6 format (`xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx`), where `x` is a hexadecimal number from 0 to F. This parameter applies only to 6300 and 6400 switch series.
<PEER-GROUP-NAME>	Specifies a peer group.

Examples

Enabling BFD for BGP neighbor with IPv4 address:

```
switch(config-bgp)# neighbor 1.1.1.1 fall-over bfd
```

Enabling BFD for BGP neighbor with IPv6 address (applies only to 6300 and 6400 switch series):

```
switch(config-bgp)# neighbor 1000::1 fall-over bfd
```

Enabling BFD for peer group:

```
switch(config-bgp)# neighbor PG fall-over bfd
```

Disabling BFD for BGP per neighbor IPv4 address:

```
switch(config-bgp)# neighbor 1.1.1.1 fall-over bfd
```

Disabling BFD for BGP per neighbor with IPv6 address (applies only to 6300 and 6400 switch series):

```
switch(config-bgp)# no neighbor 1000::1 fall-over bfd
```

Disabling BFD for peer group:

```
switch(config-bgp)# no neighbor PG fall-over bfd
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp	Administrators or local user group members with execution rights for this command.

neighbor graceful-shutdown

```
neighbor {<IP-ADDR> | <PEER-GROUP-NAME>} graceful-shutdown
     [ local-preference <LOCAL-PREF>
     | <CONFIG-DELAY>
     |<LOCAL-PREF> ]

no neighbor {<IP-ADDR> | <PEER-GROUP-NAME>} graceful-shutdown
     [ local-preference <LOCAL-PREF>
     | <CONFIG-DELAY>
     |<LOCAL-PREF> ]
```

Description

Configures the wait time before shutting down the BGP neighbor session, and can also configure the local preference value to be advertised before graceful shutdown.

The `no` form of this command sets the wait time to the default value of 180 seconds and the local-preference value to the default of 0.

Parameter	Description
<IP-ADDR>	Specifies an IP address in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255, or IPv6 format (`xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx`), where `x` is a hexadecimal number from 0 to F.
<PEER-GROUP-NAME>	Specifies a peer group.
`local-preference`*<LOCAL-PREF>*	Specifies the local preference value for exporting the iBGP routes during a graceful shutdown. The lower the value, the lower the local preference. A value of 0 indicates that the route is the least preferred. Range: 0 to 4294967295. Default: 0.
<CONFIG-DELAY>	Specifies the time to wait before shutting down the neighbor in seconds. Range: 10 to 1200. Default: 180.

Usage

If the graceful shutdown timer has already started and the administrator configures a command that triggers a session restart, traffic loss can occur if the graceful shutdown delay is not sufficient for the BGP peers to converge to a new route.

On each Autonomous System Boundary Router (ASBR) supporting the graceful shutdown receiver procedure, an inbound BGP route policy must be applied on all EBGP sessions of the ASBR.

The policy must match the GSHUT community and lower the precedence of the route by changing the route attributes.

The Graceful-Shutdown feature does not work for reflected routes because the route reflector (RR) does not modify local-preference attribute. The routes, originated by the RR, carry the GSHUT local-preference value. As per the RFC 4456, when an RR reflects a route, it should not modify the following path attributes:

- NEXT-HOP
- AS-PATH
- LOCAL-PREF
- MED

Their modification could potentially result in routing loops. In this situation, apply on the RR an inbound BGP route policy, meeting the following conditions:

- Match the graceful-shutdown community.
- Set the local preference attributes of the paths tagged with the graceful-shutdown community to a lower value than other routes to the same destination.

Examples

Setting the wait time delay:

```
switch(config-bgp)# neighbor 1.1.1.1 graceful-shutdown 10
```

Setting the local-preference value:

```
switch(config-bgp)# neighbor 1.1.1.1 graceful-shutdown local-preference 100
```

Setting the wait time delay and local-preference value:

```
switch(config-bgp)# neighbor 1.1.1.1 graceful-shutdown 10 local-preference 100
```

Setting the wait time delay to the default of 180 seconds:

```
switch(config-bgp)# no neighbor 1.1.1.1 graceful-shutdown 10
```

Setting the local-preference value to default of 0:

```
switch(config-bgp)# no neighbor 1.1.1.1 graceful-shutdown local-preference 100
```

Setting the wait time delay and local-preference value to defaults:

```
switch(config-bgp)# no neighbor 1.1.1.1 graceful-shutdown 10 local-preference 100
```

Complete deletion:

```
switch(config-bgp)# no neighbor 1.1.1.1 graceful-shutdown
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp	Administrators or local user group members with execution rights for this command.

neighbor invalid-attribute all accept

```
neighbor {<IP-ADDR>|<PEER-GROUP-NAME>} invalid-attribute all accept
no neighbor {<IP-ADDR>|<PEER-GROUP-NAME>} invalid-attribute all accept
```

Description

Accept BGP routes with invalid attributes. If this option is not enabled, then the BGP session will flap if an invalid attribute is received, as per RFC-4271. This is enabled by default, and invalid attributes are ingnored.

The `no` form of this command disables this feature.

Parameter	Description
<IP-ADDR>	Specifies an IPv4 or IPv6 address.
<PEER-GROUP-NAME>	Specifies a peer group.

Examples

The following command prevents invalid attributes from being accepted, allowing the BGP session to flap if an invalid attribute is received.

```
switch(config-bgp)# no neighbor 1:1::1:1 invalid-attribute all accept
```

Command History

Release	Modification
10.11	Command introduced.

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp`	Administrators or local user group members with execution rights for this command.

neighbor listen ip-range

```
neighbor <PEER-GROUP-NAME> listen ip-range <IP-ADDR>/<MASK> {as-range <AS-RANGE> | limit <LIMIT>}
no neighbor <PEER-GROUP-NAME> listen ip-range <IP-ADDR>/<MASK> {as-range <AS-RANGE> | limit <LIMIT>}
```

Description

Configures BGP dynamic neighbors as ranges of remote addresses with associated peer groups.

The `no` form of this command restores default behavior.

- Each range of remote addresses is configured as a remote address prefix.
- Any BGP peer with a remote address that matches the remote address prefix becomes a member of the associated peer group.

Parameter	Description
<PEER-GROUP-NAME>	Specifies peer group.
<IP-ADDR>/<MASK>	Specifies subnet range.
<AS-RANGE>	Specifies AS number as a range in integer or dotted format.
<LIMIT>	Specifies maximum number of peers. Range: 1 to 256.

Restrictions

- Dynamic peers are always passive. Outbound connections to dynamic peers are not supported.
- Dynamic BGP peering is only compatible with peer-groups
- Disabling partial AS range is not supported. The exact value that is configured must be used.
  - When disabling AS range, CLI must use the same AS range that was used when first configured. For example, if AS range "1-4" is configured, when disabling, "1-4" must be used ("1,2,3,4" is not supported).

Configuring overlapping peer ranges with different remote address prefix lengths is not recommended. Peer range configuration is recommended when peer ranges do not overlap.

Usage

- All supported address-families are activated on a dynamic peer for negotiation by default.
- If an incoming connection matches multiple peer range entries, the entry with the longest remote address prefix is selected.
- AS ranges are used to match remote AS presented by connecting peers. Remote AS matching with ASes or AS ranges in this list will be accepted.
  - AS range only applies to dynamic peers.
- The limit option is used to set the maximum number of dynamic BGP peers within the peer range. The default is 512 if no limit is set.
  - If the limit is reached, BGP rejects incoming connections from new dynamic BGP peers until BGP session termination causes the number of dynamic BGP peers to fall below the limit.
  - If the limit is reduced below the current number of dynamic BGP peers, BGP will reject incoming connections from new dynamic BGP peers until the number of dynamic BGP peers falls below the new limit. BGP will not terminate existing BGP sessions with dynamic BGP peers in this case. If an existing BGP session gets terminated, that session will not re-establish until the number of BGP sessions falls below the limit.
- After dynamic peer is configured, additional configuration is required on the peer-group as a whole. Individual member groups are incompatible. For example, the neighbor shutdown command can be executed on a peer-group, but not on individual members of the peer-group.
- When a peer is configured as dynamic and is in an established state, a shutdown is required before reconfiguring as static.
- Connect-retry interval is recommended to be configured with a smaller value than the default value on the active peer.
- When a set of valid and invalid AS values are issued (separated by commas), only the valid values are accepted.
- When the AS range parameter is not explicitly configured in dynamic bgp peering, iBGP session comes up, eBGP session does not. If there are no configured remote AS or AS list entries, DC-BGP assumes that any peer is an iBGP peer.

Examples

```
switch(config-bgp)# neighbor pg listen ip-range 192.168.0.0/16
```

```
switch(config-bgp)# no neighbor pg listen ip-range 192.168.0.0/16
```

Command History

Release	Modification
10.11	Command introduced

Command Information

Platforms	Command context	Authority
6300 6400	config-bgp	Administrators or local user group members with execution rights for this command.

Platforms	Command context	Authority
8320 8325 8360 9300 10000		

neighbor local-as

```
neighbor {<IP-ADDR>|<PEER-GROUP-NAME>} local-as <AS-NUMBER>
no neighbor {<IP-ADDR>|<PEER-GROUP-NAME>} local-as
```

Description

Configures an alternate local AS number that can be used to establish a session with a peer, allowing a router to appear to be a member of a second autonomous system (AS), and its real AS.

Local AS allows two autonomous systems to merge without modifying peering arrangements. This command is valid only for external peers.

The `no` form of this command restores the default, which is for a peering session to be established using the primary AS (primary AS is the AS number specified at the time of neighbor creation using the command `neighbor remote-as`).

Parameter	Description
<IP-ADDR>	Specifies an IP address.
<PEER-GROUP-NAME>	Specifies a peer group.
`local-as` *<AS-NUMBER>*	Specifies a 4-byte AS number in asplain format (z), or asdot format (x.y), where z is a number from 1 to 4294967295 and x and y are 16-bit numbers.

Examples

```
switch(config-bgp)# neighbor 1.1.1.1 local-as 200
switch(config-bgp)# no neighbor 1.1.1.1 local-as
```

```
switch(config-bgp)# neighbor pg local-as 200
switch(config-bgp)# no neighbor pg local-as
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp	Administrators or local user group members with execution rights for this command.

neighbor maximum-prefix

```
neighbor {<IP-ADDR>|<PEER-GROUP-NAME>}
        maximum-prefix <MAXIMUM> [threshold <THRESHOLD>]
        [restart <INTERVAL>] [warning-only]
no neighbor {<IP-ADDR>|<PEER-GROUP-NAME>} maximum-prefix
```

Description

Sets the maximum number of prefixes that can be received from a neighbor.

By default, the device accepts 128,000 prefixes from a BGP neighbor with a threshold value of 75%. A warning message is generated when the number of prefixes per neighbor reaches 75% of default prefix limit. Another warning message is generated when the default prefix limit is reached.

The session is re-established only if the number of routes received from the BGP peer does not exceed the configured prefix limit. When the restart timer is configured, sessions are automatically re-established when the timer expires.

The `no` form of this command disables the maximum number of prefixes limit.

Parameter	Description
<IP-ADDRESS>	Specifies the IP address of the neighbor in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255, or IPv6 format (`xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx`), where `x` is a hexadecimal number from 0 to F.
<PEER-GROUP-NAME>	Specifies a Peer-Group.
maximum-prefix *<MAXIMUM>*	Specifies the maximum number of prefixes allowed from the specified neighbor. Range: 1 to 128000. Default: 128000.
threshold *<THRESHOLD>*	Specifies at what percentage of `MAXIMUM` a warning message is generated. Range: 1 to 100. Default: 75. For example, if `MAXIMUM` is set to 1000 and threshold is 70, the router generates a warning message when the number of BGP learned routes from the neighbor exceeds 70 percent of 1000 (700) routes.
restart *<INTERVAL>*	Specifies interval in seconds for restarting the BGP connection when the prefix limit is exceeded. Range: 30 to 65535.
warning-only	Specifies generating and logging a warning message without disconnecting the BGP session when the prefix limit is exceeded.

Examples

Setting the prefix limit to 1000 prefixes:

```
switch(config-bgp-ipv4-uc)# neighbor 10.0.0.1 maximum-prefix 1000
```

Enabling logging of a warning message when more than 1000 prefixes are received:

```
switch(config-bgp-ipv4-uc)# neighbor 10.0.0.1 maximum-prefix 1000 warning-only
```

Setting the prefix limit to 1000 prefixes and enabling logging of a warning message when 500 prefixes are received:

```
switch(config-bgp-ipv4-uc)# neighbor 10.0.0.1 maximum-prefix 1000 threshold 50
```

Setting the prefix limit to 1000 prefixes and enabling logging of a warning message when 500 prefixes are received and a second warning when the prefix limit is exceeded without disconnecting the session:

```
switch(config-bgp-ipv4-uc)# neighbor 10.0.0.1 maximum-prefix 1000 threshold 50
warning-only
```

Removing the threshold value:

```
switch(config-bgp-ipv4-uc)# no neighbor 10.0.0.1 maximum-prefix 1000 threshold 50
```

Disabling the maximum-prefix feature:

```
switch(config-bgp-ipv4-uc)# no neighbor 10.0.0.1 maximum-prefix
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp-ipv4-uc config-bgp-ipv6-uc	Administrators or local user group members with execution rights for this command.

neighbor next-hop-self

```
neighbor {<IP-ADDR>|<PEER-GROUP-NAME>} next-hop-self
no neighbor {<IP-ADDR>|<PEER-GROUP-NAME>} next-hop-self
```

Description

Configures the router as the next hop for a BGP-speaking neighbor or peer group, and enables BGP to send itself as the next hop for advertised routes.

The `no` form of this command resets the peer next-hop-self status to default. The next hop is generated based on the IP.

Parameter	Description
<IP-ADDR>	Specifies the neighbor's IP address in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255, or IPv6 format (`xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx`), where `x` is a hexadecimal number from 0 to F.
<PEER-GROUP-NAME>	Specifies a peer group.
`all`	Applies the configuration to all route-reflector clients.

Usage

- An administrator uses this command to make a BGP speaker fill its address when advertising routes to a BGP peer.
- This command is useful in non-meshed networks where BGP neighbors may not have direct access to all other neighbors on the same IP subnet.
- While advertising routes to eBGP peers, the next-hop is set to self IP by default. The default behavior can be changed by configuring next-hop-unchanged.
- While advertising routes to iBGP peers, the next-hop is kept unchanged by default. The default behavior can be changed by configuring next-hop-self.

BGP L2VPN EVPN context:

- The next-hop-self command under l2vpn-evpn address-family, in addition to replacing the next-hop IP of EVPN routes with self IP, replaces the routers-mac extended community of EVPN routes with self MAC.

Examples

BGP IPv4 UC context:

Setting and resetting the router as the next hop self for neighbor 1.1.1.1:

```
switch(config-bgp-ipv4-uc)# neighbor 1.1.1.1 next-hop-self
switch(config-bgp-ipv4-uc)# no neighbor 1.1.1.1 next-hop-self
```

Setting and resetting the router as the next hop self for its peer group:

```
switch(config-bgp-ipv4-uc)# neighbor pg next-hop-self
switch(config-bgp-ipv4-uc)# no neighbor pg next-hop-self
```

BGP L2VPN EVPN context:

Supported only on the 8325 Switch Series

Setting and resetting the router as the next hop self for neighbor 1.1.1.1:

```
switch(config-bgp-l2vpn-evpn)# neighbor 1.1.1.1 next-hop-self
switch(config-bgp-l2vpn-evpn)# no neighbor 1.1.1.1 next-hop-self
```

Setting and resetting the router as the next hop self for its peer group:

```
switch(config-bgp-l2vpn-evpn)# neighbor pg next-hop-self
switch(config-bgp-l2vpn-evpn)# no neighbor pg next-hop-self
```

Command History

Release	Modification
10.9	Added support for BGP L2VPN EVPN address family.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority

6300
6400
8320
8325
8360
9300
10000
	`config-bgp-ipv4-uc`
	`config-bgp-ipv6-uc`
	`config-bgp-l2vpn-evpn`
		Administrators or local user group members with execution rights for this command.

neighbor next-hop-unchanged

`neighbor <IP-ADDRESS> next-hop-unchanged`
`no neighbor <IP-ADDRESS> next-hop-unchanged`

Description

Enables the neighbor to preserve next-hop while advertising routes to eBGP peers, in the L2VPN EVPN address-family.

The `no` form of this command resets the peer next-hop-unchanged status to default.

Parameter	Description
<IP-ADDRESS>	Specifies the neighbor IP address in the IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255, or in the IPv6 format (`xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx`), where `x` is a hexadecimal number from 0 to F. **NOTE:** IPv6 MP-BGP peering must not be used for L2VPN EVPN address family, because VXLAN tunnel interface does not support IPv6 addresses.

Examples

```
switch(config-bgp-l2vpn-evpn)# neighbor 1.1.1.1 next-hop-unchanged
```

```
switch(config-bgp-l2vpn-evpn)# neighbor 2001:0db8:85a3::8a2e:0370:7334 next-hop-
unchanged
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp-l2vpn-evpn`	Administrators or local user group members with execution rights for this command.

neighbor orf prefix-list in

```
neighbor <IP-ADDRESS> orf-prefix-list <PREFIX-LIST-NAME> in
no neighbor <IP-ADDRESS> orf-prefix-list <PREFIX-LIST-NAME> in
```

Description

Applies an inbound prefix list filter to filter the distribution of BGP neighbor information.

The `no` form of this command restores the default behavior of not applying the prefix list filter.

This command must be used only along with the ORF capability to take effect.

Parameter	Description
<IP-ADDRESS>	Specifies an IP address.
`orf-prefix-list` *PREFIX-LIST-NAME>*	Sends the prefix list name to be filtered.

Usage

To use this command, the following conditions must be met:

- If route-map inbound is also applied on multiple neighbors along with ORF, then the route-map name must be common on all the neighbors.
- If route-map inbound is also applied on an IPv6 AF BGP neighbor, then the route-map sequence number with value 1 cannot be used.

Examples

Applying the inbound prefix list filter:

```
switch(config-bgp-ipv4-uc)# neighbor 1.1.1.1 orf-prefix-list ABC in
```

Removing the inbound prefix list filter:

```
switch(config-bgp-ipv4-uc)# no neighbor 1.1.1.1 orf-prefix-list ABC in
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp-ipv4-uc` `config-bgp-ipv6-uc`	Administrators or local user group members with execution rights for this command.

neighbor passive

```
neighbor {<IP-ADDR>|<PEER-GROUP-NAME>} passive
no neighbor {<IP-ADDR>|<PEER-GROUP-NAME>} passive
```

Description

Configures a specific neighbor, or all neighbors in a peer-group, as passive, which means that they will not initiate the TCP session.

The neighbor connection must be reset using `clear ip bgp` for this setting to take effect.

The `no` form of this command enables the neighbor to initiate the TCP session.

Parameter	Description
<IP-ADDRESS>	Specifies an IP address.
<PEER-GROUP-NAME>	Specifies a peer group.

Examples

```
switch(config-bgp)# neighbor 1.1.1.1 passive
switch(config-bgp)# no neighbor 1.1.1.1 passive
```

```
switch(config-bgp)# neighbor pg passive
switch(config-bgp)# no neighbor pg passive
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp	Administrators or local user group members with execution rights for this command.

neighbor password

```
neighbor {<IP-ADDR>|<PEER-GROUP-NAME>}
         password [{ciphertext | plaintext} <PASSWORD>]
no neighbor {<IP-ADDR>|<PEER-GROUP-NAME>}
            password [ciphertext <PASSWORD>]
```

Description

Enables message digest5 (MD5) authentication on a TCP connection between two BGP neighbors. When the password is applied to a peer-group, all the neighbors that are part of peer-group inherit the configured setting.

The neighbor connection must be reset using `clear ip bgp <NEIGHBOR-IP-ADDR>` to allow this configuration to take effect.

The `no` form of this command removes the neighbor password.

Parameter	Description
<IP-ADDR>	Specifies an IP address.
<PEER-GROUP-NAME>	Specifies a Peer-Group.
{ciphertext | plaintext}	Selects the password format.
<PASSWORD>	Specifies the password.

When the password is not provided on the command line, plaintext password prompting occurs upon pressing Enter. The entered password characters are masked with asterisks.

Examples

Enabling message digest5 (MD5) authentication for a neighbor with a provided plaintext password:

```
switch(config-bgp)# neighbor 1.1.1.1 password plaintext doubt_Plane#93
```

Enabling message digest5 (MD5) authentication for a neighbor with a prompted plaintext password:

```
switch(config-bgp)# neighbor 1.1.1.5 password
Enter the neighbor password: *************
Re-Enter the neighbor password: *************
```

Enabling message digest5 (MD5) authentication for a peer group with a provided plaintext password:

```
switch(config-bgp)# neighbor pg_3 password plaintext doubt_Plane#93
```

Disabling message digest5 (MD5) authentication for a neighbor:

```
switch(config-bgp)# no neighbor 1.1.1.5 password
```

Disabling message digest5 (MD5) authentication for a peer group:

```
switch(config-bgp)# no neighbor pg_3 password
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp	Administrators or local user group members with execution rights for this command.

neighbor port

```
neighbor {<IP-ADDR>|<PEER-GROUP-NAME>} port <NUMBER>
no neighbor {<IP-ADDR>|<PEER-GROUP-NAME>} port
```

Description

Sets a custom TCP port on which to communicate with the BGP neighbor.

When this configuration is applied for peer-group, all the neighbors that are part of peer-group will inherit this setting. Though the neighbor inherits the configuration from the peer-group, the neighbor-specific command, if configured, takes precedence.

This setting only takes effect after a hard reset of the session.

The `no` form of this command allows a random TCP port to be selected for the communication with the BGP neighbor.

Parameter	Description
<IP-ADDRESS>	Specifies an IP address.
<PEER-GROUP-NAME>	Specifies a peer group.
`port` *<NUMBER>*	Specifies a TCP port number. Range: 0 to 65535.

Examples

```
switch(config-bgp)# neighbor 1.1.1.1 port 1500
switch(config-bgp)# no neighbor 1.1.1.1 port
```

```
switch(config-bgp)# neighbor PG port 1500
switch(config-bgp)# no neighbor PG port
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp`	Administrators or local user group members with execution rights for this command.

neighbor remote-as

`neighbor {`*<IP-ADDR>*`|`*<PEER-GROUP-NAME>*`} remote-as` *<AS-NUMBER>*
`no neighbor {`*<IP-ADDR>*`|`*<PEER-GROUP-NAME>*`} remote-as` *<AS-NUMBER>*

Description

Creates a peer, initiates the connection to the peer, and adds an entry to the BGP neighbor table. Specifies a neighbor with an autonomous system (AS) number that identifies the neighbor as internal to the local autonomous system. Otherwise, the neighbor is considered as external. By default, neighbors that are defined using this command, exchange only unicast address prefixes.

The `no` form of this command disables the peer session and deletes the peer information.

Parameter	Description
<IP-ADDR>	Speciies an IP address.
<PEER-GROUP-NAME>	Specifies a peer group.
`remote-as` *<AS-NUMBER>*	Specifies a 4-byte AS number in asplain format (z), or asdot format (x.y), where z is a number from 1 to 4294967295 and x and y are 16-bit numbers in the range 0 to 65535.

Usage

The configured peer AS number is compared with the AS number received in the open message and a peer session is initiated only if both the AS numbers match.

Examples

```
switch(config-bgp)# neighbor 1.1.1.1 remote-as 1
switch(config-bgp)# no neighbor 1.1.1.1 remote-as 1
```

```
switch(config-bgp)# neighbor pg remote-as 1
switch(config-bgp)# no neighbor pg remote-as 1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp`	Administrators or local user group members with execution rights for this command.

neighbor remove-private-AS

`neighbor {<IP-ADDRESS>|<PEER-GROUP-NAME>} remove-private-AS`
`no neighbor {<IP-ADDRESS>|<PEER-GROUP-NAME>} remove-private-AS`

Description

This command forces the BGP neighbor to drop the private AS numbers. When the outbound update contains a sequence of private AS numbers, this sequence is dropped. If the command is configured for peer-group, then all the neighbors that are part of peer-group will remove the private-AS before sending the BGP update message.

The `no` form of this command allows the private-AS number to be carried in BGP update message.

The neighbor connection must be reset using `clear ip bgp neighbor-ip-address` to allow this configuration to take effect.

Parameter	Description
<IP-ADDRESS>	Specifies an IP address.
<PEER-GROUP-NAME>	Specifies a peer group.

Examples

```
switch(config-bgp)# neighbor 1.1.1.1 remove-private-AS
switch(config-bgp)# no neighbor 1.1.1.1 remove-private-AS
```

```
switch(config-bgp)# neighbor PG remove-private-AS
switch(config-bgp)# no neighbor PG remove-private-AS
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp`	Administrators or local user group members with execution rights for this command.

neighbor route-map

```
neighbor {<IP-ADDRESS>|<PEER-GROUP-NAME>} route-map <MAP-NAME> {in|out}
no neighbor {<IP-ADDRESS>|<PEER-GROUP-NAME>} route-map <MAP-NAME> {in|out}
```

Description

This command applies a route map to incoming or outgoing routes. It configures the route map for modifying the default attributes of the route.

When both peer group and neighbor configuration have route maps associated, then the following configuration applies:

- For outbound route maps, peer group configuration will override the configuration of the neighbor.
- For inbound route maps, neighbor configuration will override the peer group configuration.

The `no` form of this command removes a route map.

Parameter	Description
<IP-ADDRESS>	Specifies an IP address.
<PEER-GROUP-NAME>	Specifies a peer group.
<MAP-NAME>	Specifies the name of the route map.
`in|out`	Sets the route map policy to apply to either the received routes from the neighbor (`in`) or the advertised routes to the neighbor (`out`).

Examples

```
switch(config-bgp-ipv4-uc)# neighbor 1.1.1.1 route-map HPE in
switch(config-bgp-ipv4-uc)# no neighbor 1.1.1.1 route-map HPE in
```

```
switch(config-bgp-ipv4-uc)# neighbor PG route-map HPE in
switch(config-bgp-ipv4-uc)# no neighbor PG route-map HPE in
```

```
switch(config)# route-map Rmap permit seq 10
switch(config-route-map-Rmap-10)# match metric 100
switch(config-route-map-bgp-10)# router bgp 100
switch(config-bgp-ipv4-uc)# neighbor 1.1.1.1 remote-as 100
switch(config-bgp-ipv4-uc)# neighbor 1.1.1.1 route-map Rmap out
```

Configuring inbound route maps in L2VPN EVPN address family.

```
switch(config)# router bgp 100
switch(config-bgp)# neighbor 2.1.1.1 remote-as 100
switch(config-bgp)# neighbor 2.1.1.1 update-source loopback 1
switch(config-bgp)# address-family l2vpn evpn
switch(config-bgp-l2vpn-evpn)# neighbor 2.1.1.1 activate
switch(config-bgp-l2vpn-evpn)# neighbor 2.1.1.1 route-map Rmap in
switch(config-bgp-l2vpn-evpn)# neighbor 2.1.1.1 send-community extended
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp-ipv4-uc config-bgp-ipv6-uc config-bgp-l2vpn-evpn	Administrators or local user group members with execution rights for this command.

neighbor route-reflector-client

```
neighbor {<IP-ADDRESS>|<PEER-GROUP-NAME>} route-reflector-client
no neighbor {<IP-ADDRESS>|<PEER-GROUP-NAME>} route-reflector-client
```

Description

This command configures the router as a BGP route reflector and the specified peer as its client. The `no` form of this command disables this function.

Parameter	Description
<IP-ADDRESS>	Specifies the neighbor IP address in the IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255, or in the IPv6 format (`xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx`), where `x` is a hexadecimal number from 0 to F. **NOTE:** Pv6 MP-BGP peering must not be used for L2VPN EVPN address family, because VXLAN tunnel interface does not support IPv6 addresses.
<PEER-GROUP-NAME>	Specifies a peer group.

Examples

```
switch(config-bgp-ipv4-uc)# neighbor 1.1.1.1 route-reflector-client
switch(config-bgp-ipv4-uc)# no neighbor 1.1.1.1 route-reflector-client
```

```
switch(config-bgp-ipv4-uc)# neighbor PG route-reflector-client
switch(config-bgp-ipv4-uc)# no neighbor PG route-reflector-client
```

```
switch(config-bgp-l2vpn-evpn)# neighbor 1.1.1.1 route-reflector-client
switch(config-bgp-l2vpn-evpn)# no neighbor 1.1.1.1 route-reflector-client
```

```
switch(config-bgp-l2vpn-evpn)# neighbor PG route-reflector-client
switch(config-bgp-l2vpn-evpn)# no neighbor PG route-reflector-client
```

```
switch(config-bgp-l2vpn-evpn)# neighbor 2001:0db8:85a3::8a2e:0370:7334 route-
```

```
reflector-client
switch(config-bgp-l2vpn-evpn)# no neighbor 2001:0db8:85a3::8a2e:0370:7334 route-
reflector-client
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority

6300
6400
8320
8325
8360
9300
10000
	`config-bgp-ipv4-uc`
	`config-bgp-ipv6-uc`
	`config-bgp-l2vpn-evpn`
		Administrators or local user group members with execution rights for this command.

neighbor send-community

`neighbor {<IP-ADDRESS>|<PEER-GROUP-NAME>} send-community [standard | extended]`
`no neighbor {<IP-ADDRESS>|<PEER-GROUP-NAME>} send-community [standard | extended]`

Description

This command allows community values to be sent to a specific neighbor. When this command is configured for the peer-group, then all the neighbors that are part of peer-group will send the community values to the peers. The parameters `standard` and `extended` send only the respective community numbers. When the command is issued without either of these parameters, both standard and extended communities will be sent to the neighbor.

The `no` form of this command will not allow the neighbor to send community values to the specific neighbors that are part of peer-group.

Parameter	Description
<IP-ADDRESS>	Specifies the neighbor IP address in the IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255, or in the IPv6 format (`xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx`), where `x` is a hexadecimal number from 0 to F. **NOTE:** IPv6 MP-BGP peering must not be used for L2VPN EVPN address family, because VXLAN tunnel interface does not support IPv6 addresses.
<PEER-GROUP-NAME>	Specifies a peer group.

Examples

```
switch(config-bgp-ipv4-uc)# neighbor 1.1.1.1 send-community standard
switch(config-bgp-ipv4-uc)# no neighbor 1.1.1.1 send-community standard
```

```
switch(config-bgp-ipv4-uc)# neighbor 1.1.1.1 send-community extended
switch(config-bgp-ipv4-uc)# no neighbor 1.1.1.1 send-community
```

```
switch(config-bgp-ipv4-uc)# neighbor PG send-community standard
switch(config-bgp-ipv4-uc)# no neighbor PG send-community standard
```

```
switch(config-bgp-ipv4-uc)# neighbor PG send-community extended
switch(config-bgp-ipv4-uc)# no neighbor PG send-community
```

```
switch(config-bgp-l2vpn-evpn)# neighbor 1.1.1.1 send-community standard
switch(config-bgp-l2vpn-evpn)# no neighbor 1.1.1.1 send-community standard
```

```
switch(config-bgp-l2vpn-evpn)# neighbor 1.1.1.1 send-community extended
switch(config-bgp-l2vpn-evpn)# no neighbor 1.1.1.1 send-community
```

```
switch(config-bgp-l2vpn-evpn)# neighbor PG send-community standard
switch(config-bgp-l2vpn-evpn)# no neighbor PG send-community standard
```

```
switch(config-bgp-l2vpn-evpn)# neighbor PG send-community extended
switch(config-bgp-l2vpn-evpn)# no neighbor PG send-community
```

```
switch(config-bgp-l2vpn-evpn)# neighbor 2001:0db8:85a3::8a2e:0370:7334 send-
community extended
switch(config-bgp-l2vpn-evpn)# no neighbor 2001:0db8:85a3::8a2e:0370:7334 send-
community
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp-ipv4-uc config-bgp-ipv6-uc config-bgp-l2vpn-evpn	Administrators or local user group members with execution rights for this command.

neighbor shutdown

```
neighbor {<IP-ADDRESS>|<PEER-GROUP-NAME>} shutdown
no neighbor {<IP-ADDRESS>|<PEER-GROUP-NAME>} shutdown
```

Description

This command disables the peer session, terminates any active session for the specified neighbor or peer group, and removes all associated routing information. This action can cause the sudden termination of many peering sessions.

The `no` form of this command enables the peer session for the specified neighbor.

Parameter	Description
<IP-ADDRESS>	Specifies an IP address.
<PEER-GROUP-NAME>	Specifies a peer group.

Usage

Sessions are gracefully shut down when graceful-shutdown is enabled. Enter the `neighbor graceful-shutdown` command to enable graceful-shutdown. If graceful-shutdown is configured without delay or local-preference, the default values are used.

Examples

```
switch(config-bgp)# neighbor 1.1.1.1 shutdown
switch(config-bgp)# no neighbor 1.1.1.1 shutdown
```

```
switch(config-bgp)# neighbor pg shutdown
switch(config-bgp)# no neighbor pg shutdown
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp`	Administrators or local user group members with execution rights for this command.

neighbor soft-reconfiguration inbound

```
neighbor {<IP-ADDRESS>|<PEER-GROUP-NAME>} soft-reconfiguration inbound
no neighbor {<IP-ADDRESS>|<PEER-GROUP-NAME>} soft-reconfiguration inbound
```

Description

This command enables you to generate inbound updates from a neighbor and change and activate BGP policies without clearing the BGP session. Changes in BGP policies require the BGP session to be cleared which can have a large negative impact on network operations.

The `no` form of this command disables this setting.

Parameter	Description
<IP-ADDRESS>	Specifies an IP address.
<PEER-GROUP-NAME>	Specifies a peer group.

Usage

- To perform inbound soft reconfiguration, the BGP speaker must store all received route updates, regardless of the current inbound policy.
- When inbound soft reconfiguration is enabled, the stored updates are processed by the new policy configuration to create new inbound updates.

Examples

```
switch(config-bgp-ipv4-uc)# neighbor 1.1.1.1 soft-reconfiguration inbound
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp-ipv4-uc` `config-bgp-ipv6-uc`	Administrators or local user group members with execution rights for this command.

neighbor timers

```
neighbor {<IP-ADDRESS>|<PEER-GROUP-NAME>} timers <KEEPALIVE> <HOLDTIME>
no neighbor {<IP-ADDRESS>|<PEER-GROUP-NAME>} timers <KEEPALIVE> <HOLDTIME>
```

Description

This command sets the timers for a specific BGP neighbor or peer group. When the timer is applied to peer-group then all the neighbors that are part of peer-group will inherit the value configured.

The neighbor connection must be reset using `clear ip bgp <NEIGHBOR-IP-ADDRESS>` to allow this configuration to take effect.

The `no` form of this command clears the timers for a specific BGP neighbor or peer group.

Parameter	Description
<IP-ADDRESS>	Specifies an IP address.
<PEER-GROUP-NAME>	Specifies a peer group.
<KEEPALIVE>	Specifies the Keep-Alive timer value for the neighbor. Default: 60 seconds. Range: 0-65535.
<HOLDTIME>	Specifies the Hold-timer value. Default: 180 seconds. Range: 0-65535.

Examples

```
switch(config-bgp)# neighbor 1.1.1.1 timers 120 360
switch(config-bgp)# no neighbor 1.1.1.1 timers
```

```
switch(config-bgp)# neighbor pg timers 120 360
switch(config-bgp)# no neighbor pg timers
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp	Administrators or local user group members with execution rights for this command.

neighbor ttl-security-hops

```
neighbor {<IP-ADDRESS> | <PEER-GROUP-NAME>} ttl-security-hops <HOP-COUNT>
no neighbor {<IP-ADDRESS> | <PEER-GROUP-NAME>} ttl-security-hops <HOP-COUNT>
```

Description

This command enables BGP to establish connection with external peers residing on networks that are not directly connected. By enabling this feature, the received TTL from a BGP peer is compared with the difference "255 - *hop-count*". BGP messages coming with a TTL less than this value are not accepted. BGP peering will not be established if the TTL in the session establishment is received with a lower value. Also, by enabling this feature the router will send BGP packets with TTL value of 255 to the neighbor. For a neighbor,

either TTL security or `ebgp-multihop` can be configured, not both together. If there are multiple paths to reach the node, then the hop count should be configured considering the longest route.

The `no` form of this command disables the peer ttl-security-hop feature.

Parameter	Description
<IP-ADDRESS>	Specifies an IP address.
<PEER-GROUP-NAME>	Specifies a peer group.
<HOP-COUNT>	Specifies the hop count to reach the neighbor for the eBGP session. Range: 1-255.

Examples

```
switch(config-bgp)# neighbor 1.1.1.1 ttl-security-hops 10
switch(config-bgp)# no neighbor 1.1.1.1 ttl-security-hops
```

```
switch(config-bgp)# neighbor pg ttl-security-hops 5
switch(config-bgp)# no neighbor pg ttl-security-hops
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp`	Administrators or local user group members with execution rights for this command.

neighbor update-source

```
neighbor {<IP-ADDRESS>|<PEER-GROUP-NAME>}
     update-source {<IPv4>|<IPv6> | loopback <NUMBER>}
no neighbor {<IP-ADDRESS>|<PEER-GROUP-NAME>}
     update-source [<IPv4>|<IPv6> | loopback <NUMBER>]
```

Description

This command specifies the source address to reach the neighbor.

An iBGP connection can occur as long as there is a TCP/IP path between the routers. If multiple paths exist between the iBGP routers, using a loopback interface as the neighbor address can add stability to the network. With this command, stability can be achieved by providing the loopback interface address as the source address of the TCP/IP session.

The no form of this command negates the route updates of the neighbor.

Parameter	Description
<IP-ADDRESS>	Specifies an IP address.
<PEER-GROUP-NAME>	Specifies a peer group.
<IPV4>	Specifies an interface by IPv4 address.
<IPV6>	Specifies an interface by IPv6 address.
loopback *<NUMBER>*	Specifies a loopback interface number.

Examples

```
switch(config-bgp)# neighbor 1.1.1.1 update-source loopback 1
switch(config-bgp)# no neighbor 1.1.1.1 update-source
```

```
switch(config-bgp)# neighbor PG update-source loopback 1
switch(config-bgp)# no neighbor PG update-source
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp	Administrators or local user group members with execution rights for this command.

neighbor weight

```
neighbor {<IP-ADDRESS>|<PEER-GROUP-NAME>} weight <WEIGHT-VALUE>
no neighbor {<IP-ADDRESS>|<PEER-GROUP-NAME>} weight <WEIGHT-VALUE>
```

Description

This command assigns a weight to a neighbor connection. When the weight is applied to a peer-group then all the neighbors that are part of the peer-group will inherit the value configured.

The no form of this command removes a weight assignment.

Parameter	Description
<IP-ADDRESS>	Specifies an IP address.
<PEER-GROUP-NAME>	Specifies a peer group.
<WEIGHT-VALUE>	Specifies the weigh to be associated with the routes received from the neighbor. Range: 0-65535.

Examples

```
switch(config-bgp)# neighbor 1.1.1.1 weight 500
switch(config-bgp)# no neighbor 1.1.1.1 weight
```

```
switch(config-bgp)# neighbor pg weight 600
switch(config-bgp)# no neighbor pg weight
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp	Administrators or local user group members with execution rights for this command.

network

```
network {[<IPV4/MASK> | <IPV6/MASK>]} [route-map <ROUTE-MAP-NAME>]
no network {[<IPV4/MASK> | <IPV6/MASK>]} [route-map <ROUTE-MAP-NAME>]
```

Description

This command specifies the networks to be advertised by the Border Gateway Protocol (BGP) routing processes.

The `no` form of this command removes an entry from the routing table.

Parameter	Description
<IPV4/MASK>	Specifies the IPv4 network with mask. For example: 1.1.1.1/24
<IPV6/MASK>	Specifies the IPv6 network with mask. For example: 2001:0db8:85a3::8a2e:0370:7334/24

Parameter	Description
`route-map <ROUTE-MAP-NAME>`	Optional parameter. Specifies a route map to apply to the prefixes advertised by this specific network statement.

Usage

- This command is used to advertise prefixes currently installed in the routing table into the BGP table.
- Use the `route-map` keyword to apply the specified route map to network advertisements. The mask length as configured in the network statement must match the mask length of prefixes in the routing table.

Examples

```
switch(config-bgp-ipv4-uc)# network 11.11.11.0/24
switch(config-bgp-ipv4-uc)# no network 11.11.11.0/24
```

```
switch(config-bgp-ipv6-uc)# network 2001:0db8:85a3::8a2e:0370:7334/24
switch(config-bgp-ipv6-uc)# no network 2001:0db8:85a3::8a2e:0370:7334/24
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp-ipv4-uc` `config-bgp-ipv6-uc`	Administrators or local user group members with execution rights for this command.

redistribute

```
redistribute {connected|ospf|static|local loopback} [route-map <ROUTE-MAP-NAME>]
no redistribute {connected|ospf|static|local loopback} [route-map <ROUTE-MAP-NAME>]
```

Description

This command specifies routes to import into BGP. This command causes routes from the specified protocol to be considered for redistribution into BGP.

The `no` form of this command specifies no redistribution into BGP.

Parameter	Description
`{connected|ospf|static|local loopback}`	Specifies a redistribution protocol name. `connected`: Redistributes directly attached networks (directly attached to the subnet or host). `ospf`: Redistributes Open Shortest Path First (OSPFv2) routes. `static`: Redistributes statically configured routes. `local loopback`: Performs the following functions: Redistributes local routes on loopback interfaces. For EVPN enabled VRFs, it advertises the IP address of loopback interfaces as a EVPN Type-5 prefix route.
`route-map <ROUTE-MAP-NAME>`	Optional. Specifies a route map to match for redistribution.

Usage

- If a route map is specified, then routes that pass the match clause specified in the route map will be imported into the BGP peer Routing Information Base (RIB).
- Route-maps must be configured prior to being referenced in redistribution statements.
- Redistribute connected is required to redistribute connected subnet even if redistribute local loopback is already configured.

Examples

Redistribute directly attached networks:

```
switch(config-bgp-ipv4-uc)# redistribute connected
switch(config-bgp-ipv4-uc)# no redistribute connected
```

Redistributing local routes on loopback interfaces:

```
switch(config-bgp-ipv4-uc)# redistribute local loopback
switch(config-bgp-ipv4-uc)# no redistribute local loopback
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-bgp-ipv4-uc` `config-bgp-ipv6-uc`	Administrators or local user group members with execution rights for this command.

router bgp

```
router bgp <AS-NUMBER>
no router bgp <AS-NUMBER>
```

Description

This command configures the BGP instance on the router, configures the AS (Autonomous System) the router belongs to, and enters into the BGP router configuration mode. Only a single BGP AS number can be assigned for the entire system.

The `no` form of the command deletes the BGP instance from the router.

Parameter	Description
AS-NUMBER	Specifies a 4-byte AS number in the range 1-4294967295 in integer format or from 0.1-65535.65535 in dotted format.

Examples

Configuring the BGP instance with the AS number:

```
switch(config)# router bgp 100
```

Deleting BGP configurations:

```
switch(config)# no router bgp 100
This will delete all BGP configurations on this device.
Continue (y/n)?
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Administrators or local user group members with execution rights for this command.

show bgp

```
show bgp [vrf <VRF-NAME>] {ipv4 unicast | ipv6 unicast
     | all } [vsx-peer]
show bgp l2vpn evpn
```

Description

This command shows entries in the BGP routing table.

Parameter	Description
`ipv4`	Selects the IPv4 address family.
`ipv6`	Selects the IPv6 address family.
`unicast`	The subaddress family identifier.
`vrf <VRF-NAME>`	Select to display information by VRFs by specifying the VRF name.
`all`	Select to display the BGP summary information for all VRFs and address-families.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.
`l2vpn evpn`	Shows the information for L2VPN EVPN address family. This parameter only applies to 8325 Series switches.

Examples

Showing BGP routing table information for VRF 1 IPv4 unicast:

```
switch# show bgp vrf v1 ipv4 unicast
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, e external S Stale, R Removed, a additional-paths
Origin codes: i - IGP, e - EGP, ? - incomplete

VRF : v1
Local Router-ID 9.0.0.1

    Network            Nexthop         Metric     LocPrf     Weight Path
--------------------------------------------------------------------------
*>e 9.0.0.0/24         9.0.0.2         0          100        0      65534.65535 3.4
18.54934 3574.8570 5.6 ?
*>e 100.0.0.0/24       9.0.0.2         0          100        0      200 ?
*>e 100.0.1.0/24       9.0.0.2         0          100        0      200 ?
*>e 100.0.2.0/24       9.0.0.2         0          100        0      200 ?
*>e 100.0.3.0/24       9.0.0.2         0          100        0      200 ?
*ae 100.0.3.0/24       9.0.0.3         0          100        0      200 ?
Total number of entries 6
```

Showing BGP routing table information for L2VPN EVPN:

```
switch# show bgp l2vpn evpn

Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, e external S Stale, R Removed
Origin codes: i - IGP, e - EGP, ? - incomplete
EVPN Route-Type 2 prefix: [2]:[ESI]:[EthTag]:[MAC]:[OrigIP]
EVPN Route-Type 3 prefix: [3]:[EthTag]:[OrigIP]

VRF : default
Router-ID not configured
```

```
     Network                                                    Nexthop
Metric LocPrf Weight Path
-------------------------------------------------------------------------------------------
--------------------
Route Distinguisher: 10.1.1.54:32967    (L2VNI 30000)
*>   [2]:[0]:[0]:[00:06:f6:3f:e3:c1]:[]                        1.1.1.20        0
 100    32768  i
*>   [2]:[0]:[0]:[8c:60:4f:f2:f5:41]:[]                        1.1.1.10        0
 100    0      i
*>   [3]:[0]:[1.1.1.1]                                         0.0.0.0         0
 100    0      ?
Total number of entries 3
```

BGP routing information for a network that includes both IPv4 and IPv6 addresses.

```
switch# show bgp l2vpn evpn vtep 1920:1680:1:1::4 vni 1001001
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
i internal, e external S Stale, R Removed, a additional-paths
Origin codes: i - IGP, e - EGP, ? - incomplete
EVPN Route-Type 2 prefix: [2]:[ESI]:[EthTag]:[MAC]:[OrigIP]
EVPN Route-Type 3 prefix: [3]:[EthTag]:[OrigIP]
EVPN Route-Type 5 prefix: [5]:[ESI]:[EthTag]:[IPAddrLen]:[IPAddr]
VRF : default
Local Router-ID 192.168.1.1
Network                                                Nexthop         Metric
LocPrf    Weight   Path
-------------------------------------------------------------------------------------------
-------------------------
Route Distinguisher: 192.168.1.4:1001      (L2VNI 1001001)
*>i [2]:[0]:[0]:[00:aa:bb:cc:11:01]:[100.1.1.1]            1920:1680:1:1::4
0          100        0       ?
* i [2]:[0]:[0]:[00:aa:bb:cc:11:01]:[100.1.1.1]            1920:1680:1:1::4
0          100        0       ?
*>i [2]:[0]:[0]:[00:aa:bb:cc:11:01]:[1000:1:1:1::1]        1920:1680:1:1::4
0          100        0       ?
* i [2]:[0]:[0]:[00:aa:bb:cc:11:01]:[1000:1:1:1::1]        1920:1680:1:1::4
0          100        0       ?
*>i [2]:[0]:[0]:[00:aa:bb:cc:11:01]:[fe80:0:1::1]          1920:1680:1:1::4
0          100        0       ?
* i [2]:[0]:[0]:[00:aa:bb:cc:11:01]:[fe80:0:1::1]          1920:1680:1:1::4
0          100        0       ?
*>i [3]:[0]:[1920:1680:1:1::4]                             1920:1680:1:1::4
0          100        0       ?
* i [3]:[0]:[1920:1680:1:1::4]                             1920:1680:1:1::4
0          100        0       ?
Total number of entries 8
```

```
switch# show bgp l2vpn evpn neighbors 1920:1680:1:1::8
Codes: ^ Inherited from peer-group, * Dynamic Neighbor
VRF : default
BGP Neighbor 1920:1680:1:1::8 (Internal)
Description         : RR peer-group^
Peer-group          : RRv6
Remote Router Id    : 192.168.1.8        Local Router Id    : 192.168.1.1
Remote AS           : 65001              Local AS           : 65001
Remote Port         : 42423              Local Port         : 179
State               : Established        Admin Status       : Up
Conn. Established   : 5                  Conn. Dropped      : 4
```

```
Passive             : No                Update-Source      : loopback0^
Cfg. Hold Time      : 180               Cfg. Keep Alive    : 60
Neg. Hold Time      : 180               Neg. Keep Alive    : 60
Up/Down Time        : 06h:46m:13s       Connect-Retry Time : 120
Local-AS Prepend    : No                Alt. Local-AS      : 0
BFD                 : Disabled
Password            :
Last Err Sent       : No Error
Last SubErr Sent    : No Error
Last Err Rcvd       : No Error
Last SubErr Rcvd    : No Error
Graceful-Restart    : Enabled           Gr. Restart Time   : 120
Gr. Stalepath Time  : 300               Remove Private-AS  : No
TTL                 : 255               Local Cluster-ID   :
Weight              : 0                 Fall-over          : No
Confederation-Peers : No
Message statistics        Sent     Rcvd
------------------      -----    -----
Open                         8        7
Notification                 3        1
Updates                  20730    91332
Keepalives                1153      952
Route Refresh                0        0
Total                    21894    92292
Capability                        Advertised      Received
---------------------------       -----------     ----------
Route Refresh                     Yes             Yes
Graceful Restart                  Yes             Yes
Add-Path                          No              No
Four Octet ASN                    Yes             Yes
Address family IPv4 Unicast       No              No
Address family IPv6 Unicast       No              No
Address family VPNv4 Unicast      No              No
Address family L2VPN EVPN         Yes             Yes
Address Family : L2VPN EVPN
-----------------------------
Rt. Reflect. Client : No                Send Community    : extended^
Allow-AS in         : 0                 Advt. Interval    : 30
Max. Prefix         : 64000             Soft Reconfig In  :
Nexthop-Self        :                   Default-Originate :
Cfg. Add-Path       :
Neg. Add-Path       :
Routemap In         :
Routemap Out        :
ORF type            : Prefix-list
ORF capability      :
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this

Platforms	Command context	Authority
8320 8325 8360 9300 10000		command from the operator context (>) only.

show bgp <PREFIX>

```
show bgp [vrf <VRF-NAME>] {ipv4 unicast <A.B.C.D/M> |
     ipv6 unicast <X::Y/M>} [vsx-peer]
show bgp l2vpn evpn [RD-[ROUTE_TYPE]:[ESI]:[EthTag]:[MAC]:[OrigIP] |
                     RD-[ROUTE_TYPE]:[EthTag]:[OrigIP] |
                     RD-[ROUTE_TYPE]:[ESI]:[EthTag]:[IPAddrLen]:[IPAddr]]
```

Description

This command displays entries in the BGP routing table that are part of the specified network. For EVPN Route-type 2 with MAC only prefix as an input, displays all the prefixes containing the specific MAC address (MAC route, MAC/IP route, Host route).

Parameter	Description
`vrf <VRF-NAME>`	Shows the information for a specified VRF.
`ipv4 unicast <A.B.C.D/M>`	Shows the information for an IPv4 unicast family with an IP prefix (network/length such as 35.0.0.0/8) in the BGP routing table to display.
`ipv6 unicast <X::Y/M>`	Shows the information for an IPv6 unicast family an IPv6 prefix in the BGP routing table to display.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.
`l2vpn evpn`	Shows the information for L2VPN EVPN address family.
`RD-[ROUTE_TYPE]:[ESI]:` `[EthTag]:[MAC]:[OrigIP]`	EVPN Route-Type 2 prefix.
`RD-[ROUTE_TYPE]:[EthTag]:[OrigIP]`	EVPN Route-Type 3 prefix.
`RD-[ROUTE_TYPE]:[ESI]:` `[EthTag]:[IPAddrLen]:[IPAddr]`	EVPN Route-Type 5 prefix.

Examples

Showing the entries in the BGP routing table that are part of an IPv4 unicast network

```
switch# show bgp ipv4 unicast 10.0.0.0/16

VRF : default
BGP Local AS 2          BGP Router-ID 1.1.1.2
```

```
   Network           : 10.0.0.0/16               Nexthop            : 1.1.1.1
   Peer              : 1.1.1.1                   Origin             : IGP
   Metric            : 0                         Local Pref         : 100
   Weight            : 0                         Calc. Local Pref   : 100
   Best              : Yes                       Valid              : Yes
   Type              : external                  Stale              : No
   Originator ID     : 0.0.0.0                   Path ID            : 0
   Aggregator ID     :
   Aggregator AS     :
   Atomic Aggregate  :
   RFD Flaps         : 0                         RFD Penalty        : 0

   AS-Path           : 1
   Cluster List      :
   Communities       :
50:100,50:101,50:102,50:103,50:104,50:105,50:106,50:107,50:108,50:109,50:110,50:1
   Extd. Communities :
```

Showing the entries in the BGP routing table that are part of L2VPN EVPN

```
switch# show bgp l2vpn evpn vni 30000
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, e external S Stale, R Removed
Origin codes: i - IGP, e - EGP, ? - incomplete
EVPN Route-Type 2 prefix: [2]:[ESI]:[EthTag]:[MAC]:[OrigIP]
EVPN Route-Type 3 prefix: [3]:[EthTag]:[OrigIP]

VRF : default
Router-ID not configured

     Network                                                Nexthop
Metric LocPrf Weight Path
--------------------------------------------------------------------------------
--------------------
Route Distinguisher: 10.1.1.54:32967    (L2VNI 30000)
*>   [2]:[0]:[0]:[00:06:f6:3f:e3:c1]:[]                    1.1.1.20        0
 100    32768  i
*>   [2]:[0]:[0]:[8c:60:4f:f2:f5:41]:[]                    1.1.1.10        0
 100    0      i
*>   [3]:[0]:[1.1.1.1]                                     0.0.0.0         0
 100    0      ?
Total number of entries 3
```

Showing the entries in the BGP routing table for EVPN route-type 2

```
switch# show bgp l2vpn evpn 2:2-[2]:[0]:[0]:[00:50:56:96:6d:6f]:[20.20.1.10]
VRF : default
BGP Local AS 1           BGP Router-id 3.3.3.3
Network           : 2:2-[2]:[0]:[0]:[00:50:56:96:6d:6f]:[20.20.1.10]
Nexthop           : 1.1.1.1
vni               : 2                         vni_type           : L2VNI
Peer              : 2.2.2.2                   Origin             : incomplete
Metric            : 0                         Local Pref         : 100
Weight            : 0                         Calc. Local Pref   : 100
Best              : Yes                       Valid              : Yes
Type              : internal                  Stale              : No
Originator ID     : 1.1.1.1                   Aggregator ID      :
Aggregator AS     :
Atomic Aggregate  :
```

```
AS-Path           :
Cluster List      :
Communities       :
Ext-Communities   : RT: 2:2 RT: 10:10 Router MAC: 00:00:00:00:00:11
Network           : 2:2-[2]:[0]:[0]:[00:50:56:96:6d:6f]:[20.20.1.10]
Nexthop           : 1.1.1.1
vni               : 10000                    vni_type            : L3VNI
Peer              : 2.2.2.2                  Origin              : incomplete
Metric            : 0                        Local Pref          : 100
Weight            : 0                        Calc. Local Pref    : 100
Best              : Yes                      Valid               : Yes
Type              : internal                 Stale               : No
Originator ID     : 1.1.1.1                  Aggregator ID       :
Aggregator AS     :
Atomic Aggregate  :
AS-Path           :
Cluster List      :
Communities       :
Ext-Communities   : RT: 2:2 RT: 10:10 Router MAC: 00:00:00:00:00:11
```

Command History

Release	Modification
10.08	Added l2vpn evpn route types
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show bgp community

`show bgp [{ipv4 | ipv6 | ipv4 {vrf <VRF-NAME>}} unicast] community [<VALUE> | <TYPE>] [vsx-peer]`

Description

This command shows routes that belong to BGP communities. Optionally you can specify displaying information by a specific community or by VRF.

Parameter	Description
`ipv4`	Shows the information for an IPv4 address family.
`ipv6`	Shows the information for an IPv6 address family.

Parameter	Description
`unicast`	Shows the information for a subaddress family identifier.
`ipv4 vrf <VRF-NAME>`	Shows the information for a specified VRF.
<VALUE>	Shows the information for a community number. Specify the information in `aa:nn` format.

<TYPE>	Shows a specified community type. Select the following well-known communities, as well as others:
	`internet`
	Advertise the prefix to all BGP neighbors.
	`local-as`
	Do not advertise the prefix outside the sub-AS.
	`no-advertise`
	Do not advertise the prefix to any BGP neighbors.
	`no-export`
	Do not advertise the prefix to any eBGP neighbors.

`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

Showing information for routes that belong to all BGP communities:

```
switch# show bgp ipv4 unicast community
Status codes: s suppressed, d damped, h history, * valid, &gt; best, = multipath,i
internal, e external S Stale, R Removed, a additional-pathsVRF : defaultLocal
Router-ID 9.0.0.1
Network                Nexthop         Metric     LocPrf     Weight Path
-------------------------------------------------------------------------
*&gt;e 9.0.0.0/24      9.0.0.2         0          100        0      200 ?
*&gt;e 100.0.0.0/24    9.0.0.2         0          100        0      200 ?
*&gt;e 100.0.1.0/24    9.0.0.2         0          100        0      200 ?
*&gt;e 100.0.2.0/24    9.0.0.2         0          100        0      200 ?
*&gt;e 100.0.3.0/24    9.0.0.2         0          100        0      200 ?
*ae 100.0.3.0/24       9.0.0.3         0          100        0      200 ?
                       Total number of entries 6
```

Showing information for routes that belong to the 200:20 BGP community number:

```
switch# show bgp ipv4 unicast community 200:20
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
i internal, e external S Stale, R RemovedOrigin codes: i - IGP, e - EGP, ? -
incomplete
VRF : defaultLocal Router-ID 9.0.0.1

Network             Nexthop         Metric     LocPrf     Weight Path
-------------------------------------------------------------------------
*>e 9.0.0.0/24      9.0.0.2         0          100        0      200 ?
*>e 100.0.0.0/24    9.0.0.2         0          100        0      200 ?
*>e 100.0.1.0/24    9.0.0.2         0          100        0      200 ?
*>e 100.0.2.0/24    9.0.0.2         0          100        0      200 ?
```

```
*>e 100.0.3.0/24    9.0.0.2        0          100        0      200 ?
*ae 100.0.3.0/24    9.0.0.3        0          100        0      200 ?
                       Total number of entries 6
```

Showing information for routes that belong to the Internet BGP community type:

```
switch# show bgp ipv4 unicast community internet
Status codes: s suppressed, d damped, h history, * valid, &gt; best, = multipath,
i internal, e external S Stale, R Removed, a additional-paths
Origin codes: i - IGP, e - EGP, ? - incomplete
VRF : default
Local Router-ID 9.0.0.1
Network                Nexthop        Metric     LocPrf     Weight Path
-------------------------------------------------------------------------
*&gt;e 9.0.0.0/24      9.0.0.2        0          100        0      200 ?
*&gt;e 100.0.0.0/24    9.0.0.2        0          100        0      200 ?
*&gt;e 100.0.1.0/24    9.0.0.2        0          100        0      200 ?
*&gt;e 100.0.2.0/24    9.0.0.2        0          100        0      200 ?
*&gt;e 100.0.3.0/24    9.0.0.2        0          100        0      200 ?
*ae 100.0.3.0/24       9.0.0.3        0          100        0      200 ?
Total number of entries 6
```

Showing information for routes that belong to the local-as BGP community type:

```
switch# show bgp ipv4 unicast community local-as
Status codes: s suppressed, d damped, h history, * valid, &gt; best, = multipath,
i internal, e external S Stale, R Removed, a additional-paths
Origin codes: i - IGP, e - EGP, ? - incomplete
VRF : default


Local Router-ID 9.0.0.1
Network                Nexthop        Metric     LocPrf     Weight Path
-------------------------------------------------------------------------
*&gt;e 9.0.0.0/24      9.0.0.2        0          100        0      200 ?
*&gt;e 100.0.0.0/24    9.0.0.2        0          100        0      200 ?
*&gt;e 100.0.1.0/24    9.0.0.2        0          100        0      200 ?
*&gt;e 100.0.2.0/24    9.0.0.2        0          100        0      200 ?
*&gt;e 100.0.3.0/24    9.0.0.2        0          100        0      200 ?
*ae 100.0.3.0/24       9.0.0.3        0          100        0      200 ?
                       Total number of entries 6
```

Showing information for routes that belong to the no-advertise BGP community type:

```
switch# show bgp ipv4 unicast community no-advertise
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
i internal, e external S Stale, R Removed, a additional-pathsOrigin codes: i - IGP,
e - EGP, ? - incomplete

VRF : default
Local Router-ID 9.0.0.1
Network            Nexthop        Metric     LocPrf     Weight Path
-------------------------------------------------------------------------
*>e 9.0.0.0/24         9.0.0.2        0          100        0      200 ?
*>e 100.0.0.0/24       9.0.0.2        0          100        0      200 ?
*>e 100.0.1.0/24       9.0.0.2        0          100        0      200 ?
*>e 100.0.2.0/24       9.0.0.2        0          100        0      200 ?
```

```
*>e 100.0.3.0/24       9.0.0.2        0          100        0      200 ?
*ae 100.0.3.0/24       9.0.0.2        0          100        0      200 ?
                       Total number of entries 6
```

Showing information for routes that belong to the no-export BGP community type:

```
switch# show bgp ipv4 unicast community no-export
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,i
internal, e external S Stale, R Removed, a additional-pathsOrigin codes: i - IGP, e
- EGP, ? - incomplete

VRF : default
Local Router-ID 9.0.0.1

Network            Nexthop        Metric     LocPrf     Weight Path
--------------------------------------------------------------------------
*>e 9.0.0.0/24         9.0.0.2        0          100        0      200 ?
*>e 100.0.0.0/24       9.0.0.2        0          100        0      200 ?
*>e 100.0.1.0/24       9.0.0.2        0          100        0      200 ?
*>e 100.0.2.0/24       9.0.0.2        0          100        0      200 ?
*>e 100.0.3.0/24       9.0.0.2        0          100        0      200 ?
*ae 100.0.3.0/24       9.0.0.3        0          100        0      200 ?
                       Total number of entries 6
```

Showing information for routes that belong to the gshut BGP community type:

```
switch# show bgp ipv4 unicast community gshut
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
i internal, e external S Stale, R RemovedOrigin codes: i - IGP, e - EGP, ? -
incomplete

VRF : default
Local Router-ID 1.1.1.2

Network            Nexthop         Metric     LocPrf     Weight Path
--------------------------------------------------------------------------
*>e 1.1.1.0/24         10.1.1.2        0          0          0       2 i
Total number of entries 1

switch#
switch# show bgp ipv6 unicast community gshut

Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,i
internal, e external S Stale, R Removed
Origin codes: i - IGP, e - EGP, ? - incomplete

VRF : default
Local Router-ID 1.1.1.2

Network            Nexthop         Metric     LocPrf     Weight Path
--------------------------------------------------------------------------
*>e 1::/64             10::2
fe80::98f2:b300:1368:e882
                              0          0          0       2 i
                       Total number of entries 1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show bgp flap-statistics

```
show bgp {vrf <VRF_NAME> | all-vrf} [{ipv4 unicast | ipv6 unicast | all}] flap-statistics
```

Description

Displays all the flapped and suppressed routes.

Usage

Status of the route with dampening enabled:

- If the route is available, the history flag is unset.
- If route has been flapping, is not suppressed and is withdrawn; the state of the route is `h`
- If route is currently available but is suppressed due to dampening, the state of the route is `d`
- If the route is unsuppressed and currently withdrawn, the state of the route is `h`

Examples

Showing all the flapped and suppressed routes:

```
switch# show bgp all
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, e external S Stale, R Removed, a additional-paths
Origin codes: i - IGP, e - EGP, ? - incomplete

VRF : default
Local Router-ID 1.1.1.1

Address-family : IPv4 Unicast
----------------------------
    Network            Nexthop         Metric     LocPrf     Weight Path
*>i 2.2.2.0/24         2.2.2.2         0          100        0       ?
*>i 11.1.1.0/24        2.2.2.2         0          100        0       ?
*ai 11.1.1.0/24        2.2.2.3         0          100        0       ?
Total number of entries 3

Address-family : IPv6 Unicast
----------------------------
    Network            Nexthop         Metric     LocPrf     Weight Path
Total number of entries 0
```

```
switch# show bgp ipv4 unicast flap-statistics
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, e external S Stale, R Removed, a additional-paths
Origin codes: i - IGP, e - EGP, ? - incomplete

VRF : default
Local Router-ID 20.0.0.1

    Network            Nexthop         Flaps         Reuse      Path
*>e 2.2.2.0/24         20.0.0.2        1          00h:00m:00s   300 ?
 de 3.3.3.0/24         20.0.0.2        2          00h:29m:31s   300 ?
Total number of entries 2
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Administrators or local user group members with execution rights for this command.

show bgp neighbor advertised-routes

```
show bgp [vrf <VRF-NAME>] {ipv4 unicast | ipv6 unicast
      | l2vpn evpn | all} neighbors <IP-ADDRESS>
      advertised-routes [vsx-peer]
show bgp l2vpn evpn neighbors <IP-ADDRESS> advertised-routes
```

Description

Shows all routes that have been advertised to the specified neighbor.

Parameter	Description
`vrf <VRF-NAME>`	Shows the information for a specified VRF.
`ipv4 unicast`	Shows the information for an IPv4 unicast address family.
`ipv6 unicast`	Shows the information for an IPv6 unicast address family.
`l2vpn evpn`	Shows the information for L2VPN EVPN address family.
`all`	Shows the information for all address families and subaddress families.

Parameter	Description
vsx-peer	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.
<IP-ADDRESS>	Shows the information for a neighbor IP address.

Examples

Showing routes that have been advertised to the specified IPv4 unicast neighbor:

```
switch# show bgp ipv4 unicast neighbors 9.0.0.1 advertised-routes
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, e external S Stale, R Removed
Origin codes: i - IGP, e - EGP, ? - incomplete

VRF : default
Local Router-ID 9.0.0.2

    Network            Nexthop         Metric     LocPrf     Weight Path
-------------------------------------------------------------------------
*>e 9.0.0.0/24         9.0.0.2         0          0          0      200 65534.65535
3.4 18.54934 3574.8570 5.6 ?
*>e 100.0.0.0/24       9.0.0.2         0          0          0      200 ?
*>e 100.0.1.0/24       9.0.0.2         0          0          0      200 ?
*>e 100.0.2.0/24       9.0.0.2         0          0          0      200 ?
*>e 100.0.3.0/24       9.0.0.2         0          0          0      200 ?
Total number of entries 5
```

Showing routes that have been advertised to the specified L2VPN EVPN neighbor:

```
switch# show bgp l2vpn evpn neighbor 9.0.0.1 advertised-routes
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, e external S Stale, R Removed
Origin codes: i - IGP, e - EGP, ? - incomplete
EVPN Route-Type 2 prefix: [2]:[ESI]:[EthTag]:[MAC]:[OrigIP]
EVPN Route-Type 3 prefix: [3]:[EthTag]:[OrigIP]

VRF : default
Local Router-ID 9.0.0.2

     Network                                                Nexthop         Metric LocPrf
Weight Path
-------------------------------------------------------------------------------------------
--------------------
Route Distinguisher: 10.1.1.54:32967    (L2VNI 30000)
*>   [2]:[0]:[0]:[00:06:f6:3f:e3:c1]:[]                    1.1.1.20        0      100
32768  i
*>   [2]:[0]:[0]:[8c:60:4f:f2:f5:41]:[]                    1.1.1.10        0      100
0      i
Total number of entries 2
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show bgp neighbor paths

```
show bgp [vrf <VRF-NAME>] {ipv4 unicast | ipv6 unicast
     | all} neighbors <IP-ADDRESS> paths [vsx-peer]
show bgp l2vpn evpn neighbors <IP-ADDRESS> paths
```

Description

Shows autonomous system paths learned from the specified neighbor.

Parameter	Description
`vrf <VRF-NAME>`	Shows the information for a specified VRF.
`ipv4 unicast`	Shows the information for an IPv4 unicast address family.
`ipv6 unicast`	Shows the information for an IPv6 unicast address family.
`all`	Shows the information for all address families and subaddress families.
`<IP-ADDRESS>`	Shows the information for a neighbor IP address.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.
`l2vpn evpn`	Shows the information for L2VPN EVPN address family. This parameter applies only to 8325 series switches.

Examples

Showing autonomous system paths learned from the specified IPv4 unicast neighbor:

```
switch# show bgp ipv4 unicast neighbors 192.168.12.2 paths
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, e external S Stale, R Removed
VRF : default
Local Router-ID 9.0.0.1

    Network            Nexthop          Path
-------------------------------------------------
*>e 9.0.0.0/24         9.0.0.2          200 65534.65535 3.4 18.54934 3574.8570 5.6
*>e 100.0.0.0/24       9.0.0.2          200
*>e 100.0.1.0/24       9.0.0.2          200
```

```
*>e 100.0.2.0/24       9.0.0.2          200
*>e 100.0.3.0/24       9.0.0.2          200
Total number of entries 5
```

Showing autonomous system paths learned from the specified L2VPN EVPN neighbor:

```
switch# show bgp l2vpn evpn neighbors 192.168.12.1 paths

Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, e external S Stale, R Removed
Origin codes: i - IGP, e - EGP, ? - incomplete
EVPN Route-Type 2 prefix: [2]:[ESI]:[EthTag]:[MAC]:[OrigIP]
EVPN Route-Type 3 prefix: [3]:[EthTag]:[OrigIP]

VRF : default
Local Router-ID 9.0.0.2

     Network                                                Nexthop         Path
-------------------------------------------------------------------------------------
Route Distinguisher: 10.1.1.54:32967    (L2VNI 30000)
*>   [2]:[0]:[0]:[00:06:f6:3f:e3:c1]:[]                   1.1.1.20         100
*>   [2]:[0]:[0]:[8c:60:4f:f2:f5:41]:[]                   1.1.1.10         100
Total number of entries 2
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show bgp neighbor received orf-prefix-list

`show bgp [vrf <VRF-NAME>]{ipv4 unicast | ipv6 unicast | all} neighbors <IP-ADDRESS> received orf-prefix-list`

Description

Shows all the prefix list received from the specified neighbor.

Parameter	Description
`vrf <VRF-NAME>`	Shows the information for a specified VRF.

Parameter	Description
`ipv4 unicast`	Shows the information for an IPv4 unicast address family.
`ipv6 unicast`	Shows the information for an IPv6 unicast address family.
`all`	Shows the information for all address families and subaddress families.
<IP-ADDRESS>	Shows the information for a neighbor IP address.

Examples

Showing received prefix list from the specified neighbor:

```
switch# show bgp ipv4 unicast neighbors A.B.C.D received orf-prefix-list
Address family: IPv4 Unicast

  ip prefix-list 10.0.0.200: 4 entries

     seq 10 permit 28.119.16.0/24

     seq 15 deny 28.119.19.0/24

     seq 20 permit 28.119.17.0/24

  Address family: IPv6 Unicast

  ip prefix-list 10.0.0.200: 4 entries

       seq 30 permit 2000::/64

       seq 35 deny 3000::/64

       seq 40 permit 4000:0/64
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show bgp neighbor received-routes

```
show bgp [vrf <VRF-NAME>] {ipv4 unicast | ipv6 unicast
     | all} neighbors <IP-ADDRESS> received-routes [vsx-peer]
show bgp l2vpn evpn neighbors <IP-ADDRESS> received-routes
```

Description

Shows received routes from the specified neighbor.

Parameter	Description
`vrf <VRF-NAME>`	Shows the information for a specified VRF.
`ipv4 unicast`	Shows the information for an IPv4 unicast address family.
`ipv6 unicast`	Shows the information for an IPv6 unicast address family.
`all`	Shows the information for all address families and subaddress families.
`<IP-ADDRESS>`	Shows the information for a neighbor IP address.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.
`l2vpn evpn`	Shows the information for L2VPN EVPN address family. This parameter only applies to 8325 Series switches.

Examples

Showing received routes from the specified IPv4 unicast neighbor:

```
switch# show bgp ipv4 unicast neighbors 192.168.12.1 received-routes
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, e external S Stale, R Removed, a additional-paths
Origin codes: i - IGP, e - EGP, ? - incomplete

VRF : default
Local Router-ID 9.0.0.2

    Network            Nexthop         Metric     LocPrf     Weight Path
------------------------------------------------------------------------
*>e 9.0.0.0/24         9.0.0.2         0          0          0      200 65534.65535
3.4 18.54934 3574.8570 5.6 ?
*>e 100.0.0.0/24       9.0.0.2         0          0          0      200 ?
*>e 100.0.1.0/24       9.0.0.2         0          0          0      200 ?
*>e 100.0.2.0/24       9.0.0.2         0          0          0      200 ?
*>e 100.0.3.0/24       9.0.0.2         0          0          0      200 ?
*ae 100.0.3.0/24       9.0.0.2         0          0          0      200 ?
Total number of entries 6
```

Showing received routes from the specified L2VPN EVPN neighbor:

```
switch# show bgp l2vpn evpn neighbors 192.168.12.1 received-routes

Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, e external S Stale, R Removed
Origin codes: i - IGP, e - EGP, ? - incomplete
```

```
EVPN Route-Type 2 prefix: [2]:[ESI]:[EthTag]:[MAC]:[OrigIP]
EVPN Route-Type 3 prefix: [3]:[EthTag]:[OrigIP]

VRF : default
Local Router-ID 9.0.0.2

     Network                                                Nexthop         Metric LocPrf
Weight Path
------------------------------------------------------------------------------------------
--------------------
Route Distinguisher: 10.1.1.54:32967    (L2VNI 30000)
*>   [2]:[0]:[0]:[00:06:f6:3f:e3:c1]:[]                    1.1.1.20        0      100
32768  i
*>   [2]:[0]:[0]:[8c:60:4f:f2:f5:41]:[]                    1.1.1.10        0      100
0      i
Total number of entries 2
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show bgp neighbor routes

```
show bgp [vrf <VRF-NAME>] {ipv4 unicast | ipv6 unicast
     | all} neighbors <IP-ADDRESS> routes [vsx-peer]
show bgp l2vpn evpn neighbors <IP-ADDRESS>
```

Description

This command shows routes that are received and accepted from the specified neighbor.

Parameter	Description
`vrf <VRF-NAME>`	Shows the information for a specified VRF.
`ipv4 unicast`	Shows the information for an IPv4 unicast address family.
`ipv6 unicast`	Shows the information for an IPv6 unicast address family.
`all`	Shows the information for all address families and subaddress families.

Parameter	Description
<IP-ADDRESS>	Shows the information for a neighbor IP address.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.
`l2vpn evpn`	Shows the information for L2VPN EVPN address family. This parameter only applies to 8325 Series switches.

Examples

Showing all routes that are received and accepted from the specified neighbor:

```
switch# show bgp ipv4 unicast neighbors 9.0.0.2 routes
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, e external S Stale, R Removed, a additional-paths
Origin codes: i - IGP, e - EGP, ? - incomplete

VRF : default
Local Router-ID 9.0.0.1

    Network            Nexthop         Metric     LocPrf     Weight Path
--------------------------------------------------------------------------
*>e 9.0.0.0/24         9.0.0.2         0          100        0      200 65534.65535
3.4 18.54934 3574.8570 5.6 ?
*>e 100.0.0.0/24       9.0.0.2         0          100        0      200 ?
*>e 100.0.1.0/24       9.0.0.2         0          100        0      200 ?
*>e 100.0.2.0/24       9.0.0.2         0          100        0      200 ?
*>e 100.0.3.0/24       9.0.0.2         0          100        0      200 ?
*ae 100.0.3.0/24       9.0.0.3         0          100        0      200 ?
Total number of entries 6
```

Showing 12 VPN EVPN routes that are received and accepted from the specified neighbor:

```
switch# show bgp l2vpn evpn neighbor 9.0.0.2 routes

Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, e external S Stale, R Removed, a additional-paths
Origin codes: i - IGP, e - EGP, ? - incomplete
EVPN Route-Type 2 prefix: [2]:[ESI]:[EthTag]:[MAC]:[OrigIP]
EVPN Route-Type 3 prefix: [3]:[EthTag]:[OrigIP]

VRF            : default
Local Router-id: 9.0.0.1

   Network            Nexthop         Metric     LocPrf     Weight Path
--------------------------------------------------------------------------
*>e 9.0.0.0/24         9.0.0.2         0          0          0      200 65534.65535
3.4 18.54934 3574.8570 5.6 ?
*>e 100.0.0.0/24       9.0.0.2         0          0          0      200 ?
*>e 100.0.1.0/24       9.0.0.2         0          0          0      200 ?
*>e 100.0.2.0/24       9.0.0.2         0          0          0      200 ?
*>e 100.0.3.0/24       9.0.0.2         0          0          0      200 ?
*ae 100.0.3.0/24       9.0.0.3         0          100        0      200 ?
Total number of entries 6
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show bgp neighbors

```
show bgp [vrf <VRF-NAME>] {ipv4 unicast | ipv6 unicast | all}
     neighbors [vsx-peer]
show bgp l2vpn evpn neighbors
```

Description

This command shows information about BGP and TCP connections to neighbors. If neighbors are member of a peer-group, the command shows the configured values inherited from the peer-group. The configured values are postfixed with a caret (^) for inherited values.

Parameter	Description
`vrf <VRF-NAME>`	Shows the information for a specified VRF.
`ipv4 unicast`	Shows the information for an IPv4 unicast address family.
`ipv6 unicast`	Shows the information for an IPv6 unicast address family.
`all`	Shows the information for all address families and subaddress families.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.
`l2vpn evpn`	Shows the information for L2VPN EVPN address family.

Examples

Showing all information about BGP and TCP connections to neighbors:

```
switch# show bgp all neighbors
Codes: ^ Inherited from peer-group, * Dynamic Neighbor
VRF : default

BGP Neighbor 10.1.1.2 (Internal)
    Description         :
```

```
Peer-group          :

Remote Router Id    : 10.1.1.2          Local Router Id    : 1.0.0.1
Remote AS           : 1                 Local AS           : 1
Remote Port         : 0                 Local Port         : 0
State               : Idle              Admin Status       : Up
Conn. Established   : 0                 Conn. Dropped      : 0
Passive             : No                Update-Source      :
Cfg. Hold Time      : 180               Cfg. Keep Alive    : 60
Neg. Hold Time      : 0                 Neg. Keep Alive    : 0
Up/Down Time        : 00h:00m:00s       Alt. Local-AS      : 0
Local-AS Prepend    : No
BFD                 : Disabled
Ignore-Leading-AS   : No
TCP AO Keychain     : kc1
TCP AO Current Key  : 10
Send-ID             : 218               Recv-ID            : 218
Include TCP Options : yes               Accept AO Mismatch : yes
Last Err Sent       : No Error
Last SubErr Sent    : No Error
Last Err Rcvd       : No Error
Last SubErr Rcvd    : No Error

Graceful-Restart    : Enabled           Gr. Restart Time   : 120
Gr. Stalepath Time  : 150               Remove Private-AS  : No
TTL                 : 255               Local Cluster-ID   :
Weight              : 0                 Fall-over          : No

Message statistics       Sent     Rcvd
------------------       -----    -----
Open                        0        0
Notification                0        0
Updates                     0        0
Keepalives                  0        0
Route Refresh               0        0
Total                       0        0

Capability                          Advertised      Received
----------                          ----------      ----------
Route Refresh                       Yes             No
Graceful Restart                    Yes             No
Four Octet ASN                      Yes             No
Address family IPv4 Unicast         Yes             No
Address family IPv6 Unicast         No              No
Address family L2VPN EVPN           No              No
Address Family : IPv4 Unicast
------------------------------

Rt. Reflect. Client : No                Send Community    :
Allow-AS in         : 0                 Advt. Interval    : 30
Max. Prefix         : 64000             Soft Reconfig In  :
Nexthop-Self        :                   Default-Originate :

Routemap In         :
Routemap Out        :
Address Family : IPv6 Unicast
------------------------------
Address Family : L2VPN EVPN
------------------------------
```

Showing information about L2VPN EVPN connections to neighbors:

```
switch# show bgp l2vpn evpn neighbors
Codes: ^ Inherited from peer-group, * Dynamic Neighbor

VRF : default

BGP Neighbor 10.1.1.2 (Internal)
    Description         :
    Peer-group          :

    Remote Router Id    : 10.1.1.2          Local Router Id    : 10.1.1.1
    Remote AS           : 1                 Local AS           : 1
    Remote Port         : 179               Local Port         : 56008
    State               : Established       Admin Status       : Up
    Conn. Established   : 1                 Conn. Dropped      : 0
    Passive             : No                Update-Source      :
    Cfg. Hold Time      : 180               Cfg. Keep Alive    : 60
    Neg. Hold Time      : 180               Neg. Keep Alive    : 60
    Up/Down Time        : 00m:01w:03d       Alt. Local-AS      : 0
    Local-AS Prepend    : No
    BFD                 : Disabled
    Password            :
    Last Err Sent       : No Error
    Last SubErr Sent    : No Error
    Last Err Rcvd       : No Error
    Last SubErr Rcvd    : No Error

    Graceful-Restart    : Enabled           Gr. Restart Time   : 120
    Gr. Stalepath Time  : 150               Remove Private-AS  : No
    TTL                 : 255               Local Cluster-ID   :
    Weight              : 0                 Fall-over          : No

    Message statistics       Sent     Rcvd
    -------------------      -----    -----
    Open                        1        1
    Notification                0        0
    Updates                     3        2
    Keepalives              17995    18009
    Route Refresh               0        0
    Total                   17999    18012

    Capability                          Advertised      Received
    ----------                          ----------      ----------
    Route Refresh                       Yes             Yes
    Graceful Restart                    Yes             Yes
    Four Octet ASN                      Yes             Yes
    Address family IPv4 Unicast         Yes             Yes
    Address family IPv6 Unicast         Yes             Yes
    Address family L2VPN EVPN           Yes             Yes

    Address Family : L2VPN EVPN
    ---------------------------

    Rt. Reflect. Client : No                Send Community    : extended
    Allow-AS in         : 0                 Advt. Interval    : 30
    Max. Prefix         : 32768             Soft Reconfig In  :
    Nexthop-Self        :                   Default-Originate :

    Routemap In         :
    Routemap Out        :
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show bgp paths

```
show bgp [vrf <VRF-NAME>] {ipv4 unicast | ipv6 unicast | all}
     paths [vsx-peer]
show bgp l2vpn evpn paths
```

Description

Shows received BGP path information in the database.

Parameter	Description
`vrf <VRF-NAME>`	Shows the information for a specified VRF.
`ipv4 unicast`	Shows the information for an IPv4 unicast address family.
`ipv6 unicast`	Shows the information for an IPv6 unicast address family.
`all`	Shows the information for all address families and subaddress families.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.
`l2vpn evpn`	Shows the information for L2VPN EVPN address family.

Examples

Showing received BGP path information from the specified IPv4 unicast neighbor:

```
switch# show bgp ipv4 unicast paths
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, e external S Stale, R Removed, a additional-paths
VRF : default
Local Router-ID 9.0.0.1

    Network            Nexthop           PathID      Path
-------------------------------------------------------------
```

```
*>e 9.0.0.0/24          9.0.0.2          0           200 65534.65535 3.4 18.54934
3574.8570 5.6
*>e 100.0.0.0/24        9.0.0.2          0           200
*>e 100.0.1.0/24        9.0.0.2          0           200
*>e 100.0.2.0/24        9.0.0.2          0           200
*>e 100.0.3.0/24        9.0.0.2          10          200
*ae  100.0.3.0/24       9.0.0.3          5           200
Total number of entries 6
```

Showing received BGP path information from the specified L2VPN EVPN neighbor:

```
switch# show bgp l2vpn evpn paths

Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, e external S Stale, R Removed
Origin codes: i - IGP, e - EGP, ? - incomplete
EVPN Route-Type 2 prefix: [2]:[ESI]:[EthTag]:[MAC]:[OrigIP]
EVPN Route-Type 3 prefix: [3]:[EthTag]:[OrigIP]

VRF : default
Local Router-ID 9.0.0.2

     Network                                                Nexthop         Path
--------------------------------------------------------------------------------
Route Distinguisher: 10.1.1.54:32967    (L2VNI 30000)
*>   [2]:[0]:[0]:[00:06:f6:3f:e3:c1]:[]                    1.1.1.20          100
*>   [2]:[0]:[0]:[8c:60:4f:f2:f5:41]:[]                    1.1.1.10          100
Total number of entries 2
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show bgp peer-group summary

```
show bgp [vrf <VRF-NAME>] {ipv4 unicast |
     ipv6 unicast | all} peer-group <PEER-GROUP-NAME>
     summary [vsx-peer]
show bgp l2vpn evpn peer-group <PEER-GROUP-NAME> summary
```

Description

This command shows the peer-group information in the database.

Parameter	Description
`vrf <VRF-NAME>`	Shows the information for a specified VRF.
`ipv4 unicast`	Shows the information for an IPv4 unicast address family.
`ipv6 unicast`	Shows the information for an IPv6 unicast address family.
`all`	Shows the information for all address families and subaddress families.
<PEER-GROUP-NAME>	Shows the information for the BGP peer-group for the BGP instance.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.
`l2vpn evpn`	Shows the information for L2VPN EVPN address family. This parameter only applies to 8325, 9300, and 8360 series switches.

Examples

Showing the information from IPv4 unicast address families in `pg_name1` peer-group:

```
switch# show bgp ipv4 unicast peer-group pg_name1 summary
Codes: * Dynamic Neighbor
VRF : default
BGP Peer-Group Summary
======================
 Local AS               : 1           BGP Router Identifier  : 2.2.2.2
 Peers                  : 1           Dynamic Peer Count     : 3
 Cfg. Hold Time         : 180         Cfg. Keep Alive        : 60

 Neighbor        Remote-AS MsgRcvd MsgSent Up/Down Time State       AdminStatus
 10.0.0.1        1         8       10      00h:00m:58s  Established Up
*10.1.1.5        11        15      14      00h:10m:24s  Established Up
```

Showing the information from all address families in `pg_name1` peer-group:

```
switch# show bgp all unicast peer-group pg_name1 summary
Codes: * Dynamic Neighbor
VRF : default
BGP Peer-Group Summary
======================
 Local AS               : 1           BGP Router Identifier  : 2.2.2.2
 Peers                  : 1           Dynamic Peer Count     : 3
 Cfg. Hold Time         : 180         Cfg. Keep Alive        : 60
 Confederation Id       : 0
For address family: IPv4 Unicast
 Neighbor        Remote-AS MsgRcvd MsgSent Up/Down Time State       AdminStatus
 10.0.0.1        1         8       10      00h:00m:58s  Established Up
*10.1.1.5        11        15      14      00h:10m:24s  Established Up
For address family: IPv6 Unicast
 Neighbor        Remote-AS MsgRcvd MsgSent Up/Down Time State       AdminStatus
  1001::1002     11        12      12      00h:00m:07s  Established Up
  2001::2002     11        12      12      00h:00m:07s  Established Up
For address family: L2VPN EVPN
```

```
 Neighbor        Remote-AS MsgRcvd MsgSent Up/Down Time State       AdminStatus
  10.0.0.1        1         8       10      00h:00m:58s  Established Up
  10.1.1.6        11        15      14      00h:10m:24s  Established Up
```

Showing the information from L2VPN EVPN address families in `pg_name1` peer-group:

```
switch# show bgp l2vpn evpn peer-group pg_name1 summary
VRF : default
BGP Peer-Group Summary
======================
 Local AS               : 1           BGP Router Identifier  : 2.2.2.2
 Peers                  : 1           Dynamic Peer Count     : 3
 Cfg. Hold Time         : 180         Cfg. Keep Alive        : 60
 Confederation Id       : 0


 Neighbor        Remote-AS MsgRcvd MsgSent Up/Down Time State       AdminStatus
 10.0.0.1        1         8       10      00h:00m:58s  Established Up
*10.1.1.6        11        15      14      00h:10m:24s  Established Up
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show bgp summary

```
show bgp [vrf <VRF-NAME>] {ipv4 unicast | ipv6 unicast | all}
     summary [vsx-peer]
show bgp l2vpn evpn summary
```

Description

This command shows a summary of the status of Border Gateway Protocol (BGP) connections.

Parameter	Description
`ipv4 unicast`	Selects to display the BGP summary information for the IPv4 subaddress family identifier.
`ipv6 unicast`	Selects to display the BGP summary information for the IPv6

Parameter	Description
	subaddress family identifier.
`all`	Selects to display the BGP summary information for all VRFs and address-families.
`vrf <VRF-NAME>`	Selects to display information by VRFs by specifying the VRF name.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.
`l2vpn evpn`	Shows the information for L2VPN EVPN address family. This parameter only applies to 8325, 9300, and 8360 series switches.

Examples

Showing BGP summary information for all address-families:

```
switch(config-bgp)# show bgp all summary
Codes: * Dynamic Neighbor
VRF : default
BGP Summary
 Local AS               : 100          BGP Router Identifier  : 9.0.0.1
 Peers                  : 1            Log Neighbor Changes   : No
 Cfg. Hold Time         : 180          Cfg. Keep Alive        : 60
 Confederation Id       : 0

Address-family : IPv4 Unicast
-----------------------------
 Neighbor        Remote-AS MsgRcvd MsgSent Up/Down Time State       AdminStatus
 9.0.0.2         200       25      23      00h:17m:50s  Established Up
*10.1.1.5        11        26      24      00h:20m:26s  Established Up


Address-family : IPv6 Unicast
-----------------------------
 Neighbor        Remote-AS MsgRcvd MsgSent Up/Down Time State       AdminStatus
*2001::2002      11        3       3       00h:00m:14s  Established Up
 9000::2         200       25      23      00h:17m:50s  Established Up


Address-family : VPNv4 Unicast
-----------------------------
 Neighbor        Remote-AS MsgRcvd MsgSent Up/Down Time State       AdminStatus
 1.1.1.1         100       207     208     02h:54m:18s  Established Up
*3.3.3.4         11        26      24      00h:20m:26s  Established Up

Address-family : L2VPN EVPN
-----------------------------
 Neighbor        Remote-AS MsgRcvd MsgSent Up/Down Time State       AdminStatus
 10.0.0.2        200       25      23      00h:17m:50s  Established Up
*10.1.1.6        11        26      24      00h:20m:26s  Established Up
VRF : v1
BGP Summary
 Local AS               : 100          BGP Router Identifier  : 9.0.0.1
 Peers                  : 1            Log Neighbor Changes   : No
 Cfg. Hold Time         : 180          Cfg. Keep Alive        : 60
```

```
Address-family : IPv4 Unicast
------------------------------
 Neighbor        Remote-AS MsgRcvd MsgSent Up/Down Time State       AdminStatus
*4.4.4.4         11        26      24      00h:20m:26s  Established Up
 9.0.0.2         200       25      23      00h:17m:50s  Established Up

Address-family : IPv6 Unicast
------------------------------
 Neighbor        Remote-AS MsgRcvd MsgSent Up/Down Time State       AdminStatus
*3001::3002      11        3       3       00h:00m:14s  Established Up
 9000::2         200       25      23      00h:17m:50s  Established Up
```

Showing BGP summary information for a specific VRF for IPv4 unicast network:

```
switch(config-bgp)# show bgp ipv4 unicast vrf v1 summary
Codes: * Dynamic Neighbor
VRF : v1
BGP Summary
 Local AS               : 100          BGP Router Identifier  : 9.0.0.1
 Peers                  : 1            Log Neighbor Changes   : No
 Cfg. Hold Time         : 180          Cfg. Keep Alive        : 60

 Neighbor        Remote-AS MsgRcvd MsgSent Up/Down Time State       AdminStatus
 9.0.0.2         200       25      23      00h:17m:50s  Established Up
*10.1.1.5        11        26      24      00h:20m:26s  Established Up
```

Showing BGP summary information for L2VPN EVPN:

```
switch(config-bgp)# do show bgp l2vpn evpn summary
Codes: * Dynamic Neighbor
VRF : default
BGP Summary
 Local AS               : 100          BGP Router Identifier  : 9.0.0.1
 Peers                  : 1            Log Neighbor Changes   : No
 Cfg. Hold Time         : 180          Cfg. Keep Alive        : 60

 Neighbor        Remote-AS MsgRcvd MsgSent Up/Down Time State       AdminStatus
 10.0.0.2        200       25      23      00h:17m:50s  Established Up
 10.1.1.6        11        26      24      00h:20m:26s  Established Up
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

Platforms	Command context	Authority
9300 10000		

show bgp l2vpn evpn vni route-type

`show bgp l2vpn evpn vni <VNI-Value> route-type <ROUTE-TYPE-Value>`

Description

Shows the BGP L2VPN information for the particular EVPN VNI and routes type.

Parameter	Description
<VNI-Value>	Specifies the VNI.
<ROUTE-TYPE-Value>	Specifies the routes filtered by NLRI route type.

Examples

Showing BGP L2VPN information for the particular EVPN VNI and route type:

```
switch# show bgp l2vpn evpn vni 30000 route-type 5
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, e external S Stale, R Removed
Origin codes: i - IGP, e - EGP, ? - incomplete
EVPN Route-Type 5 prefix: [5]:[ESI]:[EthTag]:[IPAddrLen]:[IPAddr]

VRF : default
Router-ID not configured

     Network                                                Nexthop
Metric LocPrf Weight Path
------------------------------------------------------------------------------------------
--------------------
Route Distinguisher: 1:100              (L3VNI 10000)
*>i [5]:[0]:[0]:[24]:[32.32.32.0]                          3.3.3.3         0
 100    0      ?
*>  [5]:[0]:[0]:[24]:[52.52.52.0]                          1.1.1.1         0
 100    0      ?
*>i [5]:[0]:[0]:[64]:[aaa::]                               3.3.3.3         0
 100    0      ?

Total number of entries 3
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Administrators or local user group members with execution rights for this command.

show bgp l2vpn evpn vtep

```
show bgp l2vpn evpn vtep <IP-address>
```

Description

Shows the BGP L2VPN information for the particular EVPN VTEP IP address.

Parameter	Description
<IP-address>	Specifies the VTEP IP address.

Examples

Showing BGP L2VPN information for the particular EVPN VTEP IP:

```
switch# show bgp l2vpn evpn vtep 1.1.1.1
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, e external S Stale, R Removed
Origin codes: i - IGP, e - EGP, ? - incomplete

EVPN Route-Type 2 prefix: [2]:[ESI]:[EthTag]:[MAC]:[OrigIP]
EVPN Route-Type 3 prefix: [3]:[EthTag]:[OrigIP]
EVPN Route-Type 5 prefix: [5]:[ESI]:[EthTag]:[IPAddrLen]:[IPAddr]
VRF : default
Local Router-ID 2.2.2.2

     Network                                                Nexthop         Metric
 LocPrf    Weight   Path
------------------------------------------------------------------------------------------
------------------------
Route Distinguisher: 1.1.1.1:2            (L2VNI 2)
*>i [2]:[0]:[0]:[00:00:00:00:00:33]:[10.1.1.10]            1.1.1.1         0
 100        0       ?
*>i [2]:[0]:[0]:[00:00:00:00:00:33]:[1000::10]             1.1.1.1         0
 100        0       ?
*>i [2]:[0]:[0]:[00:50:56:96:15:1c]:[10.1.1.1]             1.1.1.1         0
 100        0       ?
*>i [2]:[0]:[0]:[00:50:56:96:15:1c]:[]                     1.1.1.1         0
 100        0       ?
*>i [3]:[0]:[1.1.1.1]                                      1.1.1.1         0
 100        0       ?

Route Distinguisher: 1.1.1.1:2            (L3VNI 10000)
*>i [2]:[0]:[0]:[00:00:00:00:00:33]:[10.1.1.10]            1.1.1.1         0
 100        0       ?
*>i [2]:[0]:[0]:[00:00:00:00:00:33]:[1000::10]             1.1.1.1         0
 100        0       ?
*>i [2]:[0]:[0]:[00:50:56:96:15:1c]:[10.1.1.1]             1.1.1.1         0
```

```
 100         0       ?
*>i [2]:[0]:[0]:[00:50:56:96:15:1c]:[]                    1.1.1.1         0
 100         0       ?

Route Distinguisher: 1:100                (L3VNI 10000)
*>i [5]:[0]:[0]:[24]:[10.1.1.0]                          1.1.1.1         0
 100         0       ?
*>i [5]:[0]:[0]:[64]:[1000::]                            1.1.1.1         0
 100         0       ?
Total number of entries 11
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Administrators or local user group members with execution rights for this command.

show bgp l2vpn evpn vtep route-type

`show bgp l2vpn evpn vtep <IP-address> route-type <ROUTE-TYPE-Value>`

Description

Shows the BGP L2VPN information for the particular EVPN VTEP IP address and routes type.

Parameter	Description
<IP-address>	Specifies the VTEP IP address.
<ROUTE-TYPE-Value>	Specifies the routes filtered by NLRI route type.

Examples

Showing BGP L2VPN information for the particular EVPN VTEP and route type:

```
switch# show bgp l2vpn evpn vtep 1.1.1.1 route-type 5
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, e external S Stale, R Removed
Origin codes: i - IGP, e - EGP, ? - incomplete
EVPN Route-Type 5 prefix: [5]:[ESI]:[EthTag]:[IPAddrLen]:[IPAddr]

VRF : default
Router-ID not configured
```

```
     Network                                                 Nexthop
Metric LocPrf Weight Path
-------------------------------------------------------------------------------------
--------------------
Route Distinguisher: 1:100              (L3VNI 10000)
*>i [5]:[0]:[0]:[24]:[32.32.32.0]                           1.1.1.1         0
 100    0      ?
*>  [5]:[0]:[0]:[24]:[52.52.52.0]                           1.1.1.1         0
 100    0      ?
*>i [5]:[0]:[0]:[64]:[aaa::]                                1.1.1.1         0
 100    0      ?

Total number of entries 3
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Administrators or local user group members with execution rights for this command.

show bgp l2vpn evpn vtep vni

`show bgp l2vpn evpn vtep <IP-address> vni <VNI-Value>`

Description

Shows the BGP L2VPN information for the particular EVPN VTEP IP address and VNI.

Parameter	Description
<IP-address>	Specifies the VTEP IP address.
<VNI-Value>	Specifies the VNI.

Examples

Showing BGP L2VPN information for the particular EVPN VTEP IP and VNI:

```
switch# show bgp l2vpn evpn vtep 1.1.1.1 vni 10000
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, e external S Stale, R Removed
Origin codes: i - IGP, e - EGP, ? - incomplete
```

```
EVPN Route-Type 2 prefix: [2]:[ESI]:[EthTag]:[MAC]:[OrigIP]
EVPN Route-Type 3 prefix: [3]:[EthTag]:[OrigIP]
EVPN Route-Type 5 prefix: [5]:[ESI]:[EthTag]:[IPAddrLen]:[IPAddr]
VRF : default
Local Router-ID 2.2.2.2

     Network                                                Nexthop         Metric
 LocPrf    Weight   Path
-------------------------------------------------------------------------------------
-------------------------
Route Distinguisher: 1.1.1.1:2            (L3VNI 10000)
*>i [2]:[0]:[0]:[00:00:00:00:00:33]:[10.1.1.10]            1.1.1.1         0
 100        0       ?
*>i [2]:[0]:[0]:[00:00:00:00:00:33]:[1000::10]             1.1.1.1         0
 100        0       ?
*>i [2]:[0]:[0]:[00:50:56:96:15:1c]:[10.1.1.1]             1.1.1.1         0
 100        0       ?
*>i [2]:[0]:[0]:[00:50:56:96:15:1c]:[]                     1.1.1.1         0
 100        0       ?

Route Distinguisher: 1:100                (L3VNI 10000)
*>i [5]:[0]:[0]:[24]:[10.1.1.0]                            1.1.1.1         0
 100        0       ?
*>i [5]:[0]:[0]:[64]:[1000::]                              1.1.1.1         0
 100        0       ?
Total number of entries 6
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Administrators or local user group members with execution rights for this command.

show bgp l2vpn evpn vtep vni route-type

`show bgp l2vpn evpn vtep <VTEP-ID> vni <VNI-Value> route-type <ROUTE-TYPE-Value>`

Description

Shows the BGP L2VPN information for the particular EVPN VTEP, VNI, and router type.

Parameter	Description
<VTEP-ID>	Specifies the VTEP.
<VNI-Value>	Specifies the VNI.
<ROUTE-TYPE-Value>	Specifies the router type.

Examples

Showing BGP L2VPN information for the particular EVPN VTEP, route type, and VNI:

```
switch# show bgp l2vpn evpn vtep 1.1.1.1 vni 10000 route-type 2
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, e external S Stale, R Removed
Origin codes: i - IGP, e - EGP, ? - incomplete

EVPN Route-Type 2 prefix: [2]:[ESI]:[EthTag]:[MAC]:[OrigIP]
EVPN Route-Type 3 prefix: [3]:[EthTag]:[OrigIP]
EVPN Route-Type 5 prefix: [5]:[ESI]:[EthTag]:[IPAddrLen]:[IPAddr]
VRF : default
Local Router-ID 2.2.2.2

     Network                                                Nexthop         Metric
 LocPrf    Weight   Path
------------------------------------------------------------------------------------
-------------------------
Route Distinguisher: 1.1.1.1:2            (L3VNI 10000)
*>i [2]:[0]:[0]:[00:50:56:96:7d:03]:[10.1.1.1]             1.1.1.1         0
 100        0       ?
*>i [2]:[0]:[0]:[00:50:56:96:7d:03]:[]                     1.1.1.1         0
 100        0       ?

Total number of entries 3
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Administrators or local user group members with execution rights for this command.

show running-config bgp

```
show running-config bgp [vsx-peer]
```

Description

This command shows all configured BGP commands.

Parameter	Description
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

EVPN only applies to 8325, 8360, 9300, 6300 and 6400 series switches.

```
switch# show running-config bgp
router bgp 65534.65535
    bgp asnotation dotted
    network 2.2.2.0/24
    neighbor 1.1.1.2 remote-as 65533.65535
    address-family ipv4 unicast
      neighbor 1.1.1.2 activate
      neighbor 1.1.1.2 route-map A out
      vrf v1
    address-family l2vpn evpn
      neighbor 1.1.1.2 activate
      neighbor 1.1.1.2 send-community extended
    exit-address-family
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

timers bgp

```
timers bgp <KEEPALIVE> <HOLDTIME>
no timers bgp <KEEPALIVE> <HOLDTIME>
```

Description

The command adjusts BGP network timers.

The `no` form of this command resets the BGP timers to defaults of 60 seconds for the keepalive timer and 180 seconds for the holdtime timer.

Parameter	Description
<KEEPALIVE>	Sets the value for keepalive timer. Default: 60 seconds. Range: 0-65535.
<HOLDTIME>	Sets the value for holdtime timer. Default: 180 seconds. Range: 0-65535.

Usage

- The keepalive timer is the number of seconds a BGP peer waits for a keep-alive message from a BGP peer before deciding the connection is down.

The holdtime timer is the number of seconds a BGP peer waits after not receiving a keepalive, update, or notification message before declaring that a connection with BGP peer is down.

- When a session is started, BGP negotiates holdtime with the neighbor, and selects the smaller value. The keepalive timer is then set based on the negotiated holdtime and the configured keepalive time.

Examples

```
switch(config-bgp)# timers bgp 100 150
switch(config-bgp)# no timers bgp
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-bgp	Administrators or local user group members with execution rights for this command.

vrf

```
vrf <VRF-NAME>
no vrf <VRF-NAME>
```

Description

Creates a VRF instance named *<VRF-NAME>* and then enters its context. Use `default` for *<VRF-NAME>* to enter the default VRF configure context.

Except for the default VRF, the `no` form of the command deletes the named VRF instance and any IP configuration for interfaces or SVI linked to default VRF. The default VRF cannot be deleted and a warning is given if attempted. To erase the Route-Distinguisher and Route-Targets, enter the default VRF context and delete them manually one by one.

Parameter	Description
<VRF-NAME>	Specifies the VRF name. Range: Up to 32 alphanumeric characters. The `mgmt` VRF cannot be used.

Examples

Creating the VRF named **cust_A** and then entering its context:

```
switch(config)# vrf cust_A
```

Entering the **default** VRF context:

```
switch(config)# vrf default
```

Deleting the VRF named **test**:

```
switch(config)# no vrf test
```

Command History

Release	Modification
10.09	Added default VRF information.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

Overview

Route policies control routing paths by filtering and modifying routing information using route maps. Routing policies can filter advertised, received, and redistributed routes. They can also modify attributes for specific routes.

Configuring a route policy is two-step process:

1. Configure filters based on route attributes, such as destination address and the advertising router address.
2. Create a route map and apply filters to it.

Route maps

Route maps can be used for route redistribution. Route map entries consist of a list of match and set criteria. Match criteria specify match conditions for incoming routes. Set criteria specify the action taken if match criteria are met.

Users can configure multiple entries in the same route map. These entries contain the same route map name and are differentiated by a sequence number. A sequence number will automatically be assigned if user does not provide one.

Create a route map with one or more route map entries arranged by the sequence number under a unique route map name. The route map entry has the following parameters:

- Sequence number
- Permission (permit or deny)
- Match criteria
- Set changes

By default, a route map processes routes starting from the lowest sequence number to the highest. Other filtering mechanisms include Prefix List, AS Path List, and Community List.

Match criteria

You can use a variety of criteria to match a route in a route map. Some criteria, such as BGP community lists and AS-Path Lists, are applicable only to a specific routing protocol. Other criteria, such as the Prefix lists, can be used for any route.

When a routing protocol processes a route through a route map, it compares the route to each of the configured match statements. If the route or packet matches the configured criteria, the routing protocol processes it based on the permit or deny configuration for that match entry in the route map.

The match categories and parameters are as follows:

- **BGP parameters**: Match based on AS-path Lists, Community Lists, or Origin code.
- **Prefix lists**: Match based on an address or range of addresses.
- **Other parameters**: Match based on an IP next-hop address or metric.

Set changes

Once a route matches an entry in a route map, the route can be changed based on one or more configured set statements.

Set changes are as follows:

- **BGP parameters**: Change the AS-path, community, local preference, origin, or weight attributes.
- **Metrics**: Change the route metric.
- **Other parameters**: Change the forwarding address or the IP next-hop address.

IP prefix lists

Use prefix lists to permit or deny an address or range of addresses. Filtering by a prefix list involves matching the prefixes of routes with the prefixes listed in the prefix list. An implicit deny is assumed if a prefix does not match any entries in a prefix list. Prefix lists can be configured for both IPv4 and IPv6 addresses.

Users can configure multiple entries in a prefix list and permit or deny the prefixes that match the entry. Each entry has an associated sequence number.

AS-path lists for BGP

Use AS-path lists to filter inbound or outbound BGP route updates. If the route update contains an AS-path attribute that matches an entry in the AS-path list, the router processes the route based on the configured permit or deny condition.

Configure multiple AS-path entries in an AS-path list by using the same AS-path list name. The router processes the first matching entry. You can also configure an AS-path list to compare the AS numbers against a regular expression.

Community lists for BGP

Filter BGP route updates based on the BGP community attribute by using community lists in a route map. Match the community attribute based on a community list and set the community attribute using a route map.

A community list contains one or more community attributes. If a user configures more than one community attribute in the same community list entry, the BGP route must match all listed community attributes to be considered a match.

Configure multiple community attributes as individual entries in the community list by using the same community list name. The router processes the first community attribute that matches the BGP route, using the permit or deny configuration for that entry.

Configure community attributes in the community list in one of the following formats:

- A named community attribute, such as Internet or no-export.
- In aa:nn format.

Route flap dampening

To maintain scalability of a routed internet, it is necessary to reduce the amount of change in routing state propagated by BGP in order to limit processing requirements. The primary contributors of processing load resulting from BGP updates are the BGP decision process and adding and removing forwarding entries.

A route flap occurs when the state of a route changes from up to down or down to up. When a route state changes, the route tables of the devices that support the route also change. Route flap dampening prevents BGP from selecting unstable routes. If an EBGP peer goes down after you configure this feature, routes coming from the peer are dampened but not deleted.

This feature applies to EBGP routes but not IBGP routes.

Route redistribution and route maps

Use route maps to control the redistribution of routes between routing domains. Route maps match on the attributes of the routes to redistribute routes that pass the match criteria. The route map can also modify the route attributes using set changes.

The router matches redistributed routes against each route map entry.

- If there are multiple match statements, the route must pass all match criteria.
- If a route passes the match criteria defined in a route map entry, actions defined in the entry are executed.
- If the route does not match the criteria, the router compares the route against subsequent route map entries.

Route processing continues until a match is made or the route is processed by all entries in the route map with no match. If the router processes the route against all entries in a route map with no match, the router accepts the route (inbound route maps) or forwards it (outbound route maps).

Route policy and route map commands

This section describes general and filtering commands, as well as match, set and show commands for configuring route policies and route maps.

General or filtering commands

ip aspath-list

```
ip aspath-list <ASPATH-LIST-NAME> [seq <SEQ>] {permit | deny} <REGEXP>
no ip aspath-list <ASPATH-LIST-NAME> [seq <SEQ>] {permit | deny} <REGEXP>
```

Description

Configures an AS Path list to match a specific AS path. AS Path lists are named lists of regular expression rules. They are used to match AS Path attributes in the routes for inclusion in or exclusion from route policies. The sequence number is optional and is autogenerated whenever it is not explicitly mentioned. All AS Path list rules with the same name are grouped together.

The `no` form of this command removes the AS Path list configuration.

Parameter	Description
<ASPATH-LIST-NAME>	Specifies the name of the AS Path list.
seq *<SEQ>*	Specifies the order of reference of the regular expression rules.
{permit | deny}	Specifies whether the route is available for further processing when there is a match.
<REGEXP>	Specifies the regular expression to match the AS Path. Standard regular expression wildcards are supported. The _ character can be used to match the AS Path boundary.

Examples

Configuring an AS Path list with sequence numbering:

```
switch(config)# ip aspath-list ASLst seq 5 permit _4*
```

Configuring a prefix list without sequence numbering:

```
switch(config)# ip aspath-list ASLst permit _4*
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Administrators or local user group members with execution rights for this command.

ip community-list

```
ip community-list standard <COMM-LIST-NAME> <DESCRIPTION> [seq <SEQ>] {permit | deny}
<COMMUNITY-NUMBER>
no ip community-list standard <COMM-LIST-NAME> <DESCRIPTION> [seq <SEQ>] {permit | deny}
<COMMUNITY-NUMBER>
```

Description

Configures a community list to match a specific community number attribute. Community-list is a named list of regular expressions. They are used to match the community number attributes in the routes for inclusion in, or exclusion from route policies. The sequence number is optional and is autogenerated whenever it is not explicitly mentioned. All community-list rules with the same name are grouped.

The no form of this command removes the community list configuration.

Parameter	Description
<COMM-LIST-NAME>	Specifies the name of the community list that matches community number of a route.
<DESCRIPTION>	Specifies the description of the community list. Maximum character limit is 80.
seq *<SEQ>*	Specifies the order of reference of the regular expression rules.
{permit | deny}	Specifies whether the route is available for further processing when there is a match.
<COMMUNITY-NUMBER>	Specifies the community number. The community number must be in AA: NN format or from the list of well-known community.

Examples

Configuring a community list with sequence numbering:

```
switch(config)# ip community-list standard CommLst seq 5 permit 101:41
```

Configuring a community list without sequence numbering:

```
switch(config)# ip community-list standard CommLst no-export permit
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Administrators or local user group members with execution rights for this command.

ip prefix-list

```
ip prefix-list <PREFIX-LIST-NAME> [seq <SEQ>] <IP-PREFIX/MASK> [ge <0-32>] [le <0-32>]
no ip prefix-list <PREFIX-LIST-NAME> [seq <SEQ>] <IP-PREFIX/MASK> [ge <0-32>] [le <0-32>]
```

Description

Configures a prefix list to match a set of prefixes. Prefix lists are named lists of route prefixes. They are used to match routes for inclusion in or exclusion from route policies. The sequence number determines the

order of matching. The matches are performed starting from the lowest sequence number to the highest sequence number until there is a match. The sequence number is however optional and is autogenerated whenever it is not explicitly mentioned. All prefixes with the same prefix list name are grouped.

The autogenerated sequence number is derived by adding 10 to the highest sequence number available. This technique makes it possible to insert new prefix list sequence number in between.

The `ge` and `le` parameters are used to combine prefixes with a range of network mask. For example, `172.131.0.0/16 ge 16 le 24` will match all prefixes within the 172.131.0.0/16 network that have a mask greater than or equal to 16 bits and less than or equal to 24 bits in length. For instance, 172.131.1.0/18 would match, because its length is between 16 and 24 but 172.0.0.0/8 or 172.131.1.128/25 would not match.

The `no` form of this command removes the prefix list configuration. Prefix-list commands which generate sequence numbers must explicity use sequence numbers in the `no` form.

Parameter	Description
<PREFIX-LIST-NAME>	Specifies the name of the prefix list.
`seq` *<SEQ>*	Specifies the order of reference of the prefix rules.
`{permit | deny}`	Specifies whether the route is available for further processing when there is a match.
IP-PREFIX/MASK>	Specifies the IP prefix or mask.
`ge` *<0-32>*	Specifies the minimum prefix length to be matched.
`le` *<0-32>*	Specifies the maximum prefix length to be matched.

Examples

Configuring a prefix list with sequence numbering:

```
switch(config)# ip prefix-list PFXLST seq 5 permit 4.0.0.0/8 ge 9 le 12
```

Configuring a prefix list without sequence numbering:

```
switch(config)# ip prefix-list PSXLST permit 5.0.0.0/8
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400	`config`	Administrators or local user group members with execution rights for this command.

Platforms	Command context	Authority
8320 8325 8360 9300 10000		

ipv6 prefix-list

```
ipv6 prefix-list <PREFIX-LIST-NAME> [seq <SEQ>] <IPV6-PREFIX/MASK> [ge <0-128>] [le <0-128>]
no ipv6 prefix-list <PREFIX-LIST-NAME> [seq <SEQ>] {ip | ipv6} <IPV6-PREFIX/MASK> [ge <0-128>] [le <0-128>]
```

Description

Configures a prefix list to match a set of prefixes. Prefix lists are named lists of route prefixes. They are used to match routes for inclusion in or exclusion from route policies. The sequence number determines the order of matching. The matches are performed starting from the lowest sequence number to the highest sequence number until there is a match. The sequence number is however optional and is autogenerated whenever it is not explicitly mentioned. All prefixes with the same prefix list name are grouped.

The autogenerated sequence number is derived by adding 10 to the highest sequence number available. This technique makes it possible to insert new prefix list sequence number in between.

The `ge` and `le` parameters are used to combine prefixes with a range of network mask. For example, `2000::/64 ge 65 le 70` will match all prefixes within the 2000::/64 network that have a mask greater than or equal to 65 bits and less than or equal to 70 bits in length.

The `no` form of this command removes the prefix list configuration. Prefix-list commands which generate sequence numbers must explicity use sequence numbers in the `no` form.

Parameter	Description
<PREFIX-LIST-NAME>	Specifies the name of the prefix list.
`seq` *<SEQ>*	Specifies the order of reference of the prefix rules.
`{permit | deny}`	Specifies whether the route is available for further processing when there is a match.
IP-PREFIX/MASK>	Specifies the IP prefix or mask.
`ge` *<0-128>*	Specifies the minimum prefix length to be matched.
`le` *<0-128>*	Specifies the maximum prefix length to be matched.

Examples

Configuring a prefix list with sequence numbering:

```
switch(config)# ipv6 prefix-list PFXLST seq 10 permit 2000::64 ge 65 le 70
```

Configuring a prefix list without sequence numbering:

```
switch(config)# ipv6 prefix-list PSXLST permit 2000::1/128
```

Removing the configuring of a prefix list:

```
switch(config)# no ipv6 prefix-list P2 seq 10 permit any
```

Removing the configuring of a prefix list:

```
switch(config)# no ipv6 prefix-list P1 seq 10
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Administrators or local user group members with execution rights for this command.

route-map

```
route-map <NAME> {permit | deny} seq <NUMBER>
no route-map <NAME> {permit | deny} seq <NUMBER>
```

Description

Configures a route map entry with the given name and action by taking the CLI in the route map context. All route map entries with the same name belong to the same route map. The route map entry rules are processed in order by sequence number, until a match is found.

The `no` form of this command removes the route map entry configuration.

Parameter	Description
<NAME>	Specifies the name of the route map. Required.
{permit | deny}	Specifies whether the route is available for further processing when there is a match. Required.
<NUMBER>	Specifies the sequence number of the entry. Required.

Examples

Configuring a route map entry:

```
switch(config)# route-map GlobalMap permit seq 10
```

Removing a route map entry configuration:

```
switch(config)# no route-map GlobalMap permit seq 10
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

continue

```
continue <SEQUENCE NUMBER>
no continue
```

Description

Allows you to execute additional entries in a route map. The sequence number specifies the route-map entry's sequence number that will be executed next if the existing entry's match clause is successful.

If a successful match occurs and continue command exists, the route map saves the set value first and then jumps to the specified route map entry.

Set clauses are saved during the match clause evaluation and are executed only after the route map evaluation is completed. The set clauses are executed in the order in which they were configured.

Set clauses can be accumulative or additive as `set as-path prepend` or it can be absolute as `set metric`. For set commands that configures an accumulative value, subsequent values are added in order in which they were configured. For set commands that configures an absolute value, The values from the last instance will be applied.

The `no` form of this command removes the route map continue configuration.

If the specified route-map sequence entry does not exist, route-map processing will be terminated at the current sequence number if its clause is matched. The continue sequence number must be higher than the current route map sequence number for this command to take effect.

Parameter	Description
<SEQUENCE NUMBER>	Specifies the value of the route map entry to be executed next after a successful match clause.

Examples

Configuring a route map to continue to execute an additional entry:

```
switch(config)# route-map GlobalMap permit 10
switch(config-route-map-GlobalMap-10)# continue 40
```

Removing a route map continue configuration:

```
switch(config)# route-map GlobalMap permit seq 10
switch(config-route-map-GlobalMap-10)# no continue 40
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Administrators or local user group members with execution rights for this command.

Match commands

match aspath-list

```
match aspath-list <ASPATH-LIST-NAME>
no match aspath-list <ASPATH-LIST-NAME>
```

Description

Matches the AS path attribute of the route with one or more regular expressions in the AS path list.

The no form of this command restores the default behavior of not matching the AS path attribute of the route.

Parameter	Description
<ASPATH-LIST-NAME>	Specifies the name of the AS path list to match the AS path attribute of the route.

Example

Configuring a match clause in the route map to match the AS path list:

```
switch(config)# ip aspath-list ASLst permit 1001
switch(config)# route-map GlobalMap permit seq 11
switch(config-route-map-GlobalMap-11)# match aspath-list ASLst
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-route-map	Administrators or local user group members with execution rights for this command.

match community-list

```
match community-list <COMMUNITY-LIST-NAME> [exact-match]
no match community-list <COMMUNITY-LIST-NAME> [exact-match]
```

Description

Matches the community number attribute of the route with one, or more regular expressions in the community-list.

The no form of this command restores the default behavior of not matching the community number attribute of the route.

Parameter	Description
<COMMUNITY-LIST-NAME>	Specifies the name of the community-list to match the community number attribute of the route.
[exact-match]	Indicates that the community number attribute must match exactly with the expressions in the community-list. However, the order of the communities in the community-list is of no significance.

Example

Configuring a match clause in the route map to match the community list:

```
switch(config)# ip community-list standard CommLst 101:41 permit 12:201
switch(config)# route-map GlobalMap permit seq 11
switch(config-route-map-GlobalMap-11)# match community-list CommLst
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-route-map`	Administrators or local user group members with execution rights for this command.

match interface

```
match interface <INTERFACE-NAME>
no match interface <INTERFACE-NAME>
```

Description

Matches the outgoing interface value of the route with the value configured in the match clause.

The `no` form of this command restores the default behavior of not matching the outgoing interface value of the route.

Parameter	Description
<INTERFACE-NAME>	Specifies the value to be matched with the outgoing interface of the route entry.

Example

Configuring a match clause in the route map to match the outgoing interface of the route:

```
switch(config)# route-map GlobalMap permit seq 11
switch(config-route-map-GlobalMap-11)# match interface  1/1/1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320	`config-route-map`	Administrators or local user group members with execution rights for this command.

Platforms	Command context	Authority
8325 8360 9300 10000		

match ip address prefix-list

```
match ip address prefix-list <PREFIX-LIST-NAME>
no match ip address prefix-list <PREFIX-LIST-NAME>
```

Description

Matches the destination IP address prefix of the routes with one or more addresses in the prefix list.

The `no` form of this command restores the default behavior of not matching the destination IP address prefix of the routes to their default value.

Parameter	Description
<PREFIX-LIST-NAME>	Specifies the name of the prefix list to be matched with the network address of the route.

Example

Configuring a prefix list and a match clause in route map to match the prefix list:

```
switch(config)# ip prefix-list PfxLst permit 4.0.0.0/8
switch(config)# route-map GlobalMap permit seq 11
switch(config-route-map-GlobalMap-11)# match ip address prefix-list PfxLst
```

When the IP prefix list with prefix and mask-length of *0.0.0.0/0* is used, the route matches default-route *0.0.0.0/0* as well as any other route. This behavior would be changed to match only the default-route in the next release.

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-route-map	Administrators or local user group members with execution rights for this command.

match ip next-hop

```
match {ip | ipv6} next-hop {<ADDRESS> | prefix-list <PREFIX-LIST-NAME>}
no match {ip | ipv6} next-hop [<ADDRESS> | prefix-list <PREFIX-LIST-NAME>]
```

Description

Matches the next-hop address of the route with the configured address in the match clause.

The `no` form of this command restores the default behavior of not matching the next-hop address of the route.

Parameter	Description
<ADDRESS>	Specifies the IPv4 address to match with the next-hop address of the route.
`prefix-list` *<PREFIX-LIST-NAME>*	Specifies the name of the IP prefix list to be matched with the next-hop address of the route.

Example

Configuring a match clause in the route map to match the next-hop address of the route:

```
switch(config)# route-map GlobalMap permit seq 11
switch(config-route-map-GlobalMap-11)# match ip next-hop 1.1.1.2
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-route-map`	Administrators or local user group members with execution rights for this command.

match ip route-source

```
match ip route-source prefix-list <PREFIX-LIST-NAME>
no match ip route-source prefix-list <PREFIX-LIST-NAME>
```

Description

Matches the IP address of the source of the route using IP prefix lists.

The `no` form of this command restores the default behavior of not matching the IP address of the route.

Parameter	Description
<PREFIX-LIST-NAME>	Specifies the name of the prefix list to match the IP address of the source of the route.

Example

Configuring a match clause in the route map to match the source of the route:

```
switch(config)# ip prefix-list RouterLst 4.4.4.4/32
switch(config)# route-map GlobalMap permit seq 11
switch(config-route-map-GlobalMap-11)# match ip route-source prefix-list RouterLst
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-route-map	Administrators or local user group members with execution rights for this command.

match local-preference

```
match local-preference <VALUE>
no match local-preference <VALUE>
```

Description

Matches the local preference value of the route with the value configured in the match clause.

The no form of this command restores the default behavior of not matching the local preference value of the route.

Parameter	Description
<VALUE>	Specifies the value to be matched with the route entry local preference in the range of 1 to 4294967295.

Example

Configuring a match clause in the route map to match the local preference of the route:

```
switch(config)# route-map GlobalMap permit seq 11
switch(config-route-map-GlobalMap-11)# match local-preference 100
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-route-map`	Administrators or local user group members with execution rights for this command.

match metric

```
match metric <VALUE>
no match metric <VALUE>
```

Description

Matches the MED value of the route with the value configured in the match clause.

The `no` form of this command restores the default behavior of not matching the MED value of the route.

Parameter	Description
<VALUE>	Specifies the value to be matched with the route entry MED.

Example

Configuring a match clause in the route map to match the metric of the route:

```
switch(config)# route-map GlobalMap permit seq 11
switch(config-route-map-GlobalMap-11)# match metric 10
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320	`config-route-map`	Administrators or local user group members with execution rights for this command.

Platforms	Command context	Authority
8325 8360 9300 10000		

match origin

```
match origin {igp | egp | incomplete}
no match origin [igp | egp | incomplete]
```

Description

Matches the route origin attribute of the route with route configured in the match clause.

The `no` form of this command restores the default behavior of not matching the route origin attribute of the route.

Parameter	Description
`{igp | egp | incomplete}`	Specifies if the route origin attribute is matched with a match clause which originated as IGP, EGP, or has unknown origin. The unknown origin is typically redistributed from another routing protocol.

Example

Configuring a match clause in the route map to match the origin:

```
switch(config)# route-map GlobalMap permit seq 11
switch(config-route-map-GlobalMap-11)# match origin igp
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-route-map`	Administrators or local user group members with execution rights for this command.

match route-type

```
match route-type external {type-1 | type-2}
no match route-type external [type-1 | type-2]
```

Description

Matches the metric-type value of the OSPF external route with the value configured in the match clause.

The `no` form of this command restores the default behavior of not matching the metric-type value of the OSPF external route.

Parameter	Description
`{type-1 | type-2}`	Specifies the *type-1* or *type-2* OSPF value to be matched with the external route.

Example

Configuring a match clause in the route map to match the metric-type value of the OSPF external route:

```
switch(config)# route-map GlobalMap permit seq 11
switch(config-route-map-GlobalMap-11)# match route-type external type-1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-route-map`	Administrators or local user group members with execution rights for this command.

match source-protocol

```
match source-protocol {bgp | connected | ospf | static}
no match source-protocol [bgp | connected | ospf | static]
```

Description

Matches the source routing protocol value of the route with the value configured in the match clause.

The `no` form of this command restores the default behavior of not matching the source routing protocol value of the route.

Parameter	Description
`{bgp | connected | ospf | static}`	Specifies the *bgp*, *connected*, *ospf*, or *static* value to be matched with the route entry source protocol.

Example

Configuring a match clause in the route map to match the source protocol route:

```
switch(config)# route-map GlobalMap permit seq 11
switch(config-route-map-GlobalMap-11)# match source-protocol ospf
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-route-map	Administrators or local user group members with execution rights for this command.

match tag

```
match tag <value>
no match tag <value>
```

Description

Matches the tag value of the route with the one configured in the match clause. Applies to static routes that will be redistributed to ospfv2 and ospfv3 protocols.

The no form of this command removes the tag value of the route.

Parameter	Description
value	Numeric value to match with the route tag. Required.

Example

Configuring a match clause in route-map to match the tag value of the route:

```
switch(config)# route-map GlobalMap permit 11
switch(config-route-map)# match tag 20
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-route-map	Administrators or local user group members with execution rights for this command.

match vni

```
match vni <value>
no match vni <value>
```

Description

Matches the VNI value of the route with the one configured in the `match` clause. Applies to matching L2VNIs or L3VNIs. Use the `continue` clause if both L2VNI and L3VNI are to be matched. Route maps with the `match vni` clause can be used with L2VPN EVPN neighbors only.

The `no` form of this command removes the match for the VNI value of the route.

Parameter	Description
<value>	Numeric value to match with the route tag. Required. Range: 1 to 16777214

Example

Configuring a match clause in route map to match the VNI value of the route:

```
switch(config)# route-map GlobalMap permit 11
switch(config-route-map)# match vni 10000
```

Configuring a match clause in route map to match both L2VNI and L3VNI in a single route map:

```
switch(config)# route-map GlobalMap permit 11
switch(config-route-map)# match vni 10000
switch(config-route-map)# continue 12
switch(config)# route-map GlobalMap permit 12
switch(config-route-map)# match vni 10
```

The following example is different from the one above, as it configures a match clause in route map to match any one of the two VNIs:

```
switch(config)# route-map GlobalMap permit 10
switch(config-route-map)# match vni 10000
switch(config)# route-map GlobalMap permit 20
switch(config-route-map)# match vni 10
switch(config)# route-map GlobalMap deny 30
```

Command History

Release	Modification
10.09	Command introduced

Command Information

Platforms	Command context	Authority
6300 6400 8325 8360 9300 10000	`config-route-map`	Administrators or local user group members with execution rights for this command.

Set commands

set as-path exclude

```
set as-path exclude <AS>
no set as-path exclude <AS>
```

Description

Removes all occurrences of the configured AS Path from the AS Path attribute of the route.

The `no` form of this command restores the default behavior of not modifying the AS Path attribute list.

Parameter	Description
<AS>	Specifies the AS number to be removed from the AS Path attribute of the route.

Example

Configuring a set clause in the route map to remove the AS from the AS Path attribute of the route:

```
switch(config)# route-map GlobalMap permit seq 11
switch(config-route-map-GlobalMap-11)# set as-path exclude 1001
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320	`config-route-map`	Administrators or local user group members with execution rights for this command.

Platforms	Command context	Authority
8325 8360 9300 10000		

set as-path prepend

```
set as-path prepend <AS> <AS>...
no set as-path prepend <AS> <AS>...
```

Description

Prepends the list of the configured AS numbers to the AS Path attribute of the routes. To ensure that the AS path conforms to standards, the local AS is prepended after this command is executed.

The `no` form of this command restores the default behavior of not modifying the AS Path attribute list.

Parameter	Description
<AS> <AS>...	Specifies the AS numbers to be prepended from the AS Path attribute of the route.

Example

Configuring a set clause in the route map to prepend the AS from the AS Path attribute of the route:

```
switch(config)# route-map GlobalMap permit seq 11
switch(config-route-map-GlobalMap-11)# set as-path prepend 1
switch(config-route-map-GlobalMap-11)# no set as-path prepend 102
```

The `no` form of the command deletes the entire list of AS-Path prepend configuration regardless of the parameter list. In this example, the `no` form command would result in deletion of all the three AS numbers that were earlier configured.

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-route-map`	Administrators or local user group members with execution rights for this command.

set community

```
set community {<AA:NN> | internet | no-export | no-advertise | local-as} [additive | delete]
no set community [<AA:NN> | internet | no-export | no-advertise | local-as] [additive |
delete]
```

Description

Modifies the community number attribute of the route with the value configured in the set clause.

The `no` form of this command restores the default behavior of not modifying the community number attribute of the route.

Parameter	Description
`{<AA:NN> | internet | no-export | no-advertise | local-as}`	Selects the value to be set as the community number attribute of the route in the `AA:NN` format (quotation marks required when multiple communities are listed, for example: `set community "65001:100 65001:200"`) or as a known community name `internet`, `no-export`, `no-advertise`, and `local-as`.
`[additive]`	Specifies that the specified community number is added to the existing community number attribute of the route.
`[delete]`	Specifies that the specified community number is removed from the existing community number attribute of the route.

Example

Configuring a set clause in the route map to modify the community number attribute of the route:

```
switch(config)# route-map GlobalMap permit seq 11
switch(config-route-map-GlobalMap-11)# no set community 11:101
switch(config-route-map-GlobalMap-11)# set community no-advertise
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-route-map`	Administrators or local user group members with execution rights for this command.

set dampening

```
set dampening {half-life <VALUE> reuse <VALUE> suppress <VALUE> max-suppress-time <VALUE>}
no set dampening
```

Description

Sets parameters of route flap dampening feature.

Parameter	Description
`half-life`	Time to reduce the penalty to half.
`reuse`	Lower threshold of penalty.
`suppress`	Upper threshold of penalty.
`max-suppress-time`	Max time to keep route suppressed.

Example

```
switch(config-route-map-abc-20)# set dampening half-life 5 reuse 50 suppress 125
max-suppress-time 255

switch(config-route-map-abc-20)# no set dampening half-life 5 reuse 50 suppress 125
max-suppress-time 255

switch(config-route-map-abc-20)# set dampening

switch(config-route-map-abc-20)# no set dampening
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-route-map`	Administrators or local user group members with execution rights for this command.

set extcommunity

```
set extcommunity "[rt <VALUE> | evpn-mac <MAC-ADDRESS>]"
no set extcommunity [rt | evpn-mac]
```

Description

Sets the extended community number attribute for a route matching the route map.

The `no` form of this command ... .

Parameter	Description
<VALUE>	Sets the extended community number attribute. Specify the information in asn:nn format.
<MAC-ADDRESS>	Specifies MAC address.

Usage

- Multiple community numbers can be configured within the double quotes.
- 2-byte and 4-byte ASN values are supported in the global administrator component of the extended community attribute.
- 4-byte ASN values must be within the range of 1-4294967295.
- 4-byte ASN values do not support dotted notation.
- Extended communities are only supported on route targets.

Examples

Configuring a set clause in a route-map to modify the community number attribute of the route:

```
switch(config)# route-map abc permit seq 10
switch(config-route-map-abc-10)# set extcommunity rt "1:1 2:2"
```

Configuring a set clause in a route-map to modify the router mac:

```
switch(config)# route-map abc permit seq 1
switch(config-route-map-abc-1)# set extcommunity evpn-mac 00:01:01:90:90:01
```

Command History

Release	Modification
10.10	Command introduced

Command Information

Platforms	Command context	Authority
6400 8325 8360	config-route-map-abc-10	Administrators or local user group members with execution rights for this command.

set ip nexthop

```
set {ip | ipv6} nexthop {global} <IP-ADDR>
no set {ip | ipv6} nexthop {global} <IP-ADDR>
```

Description

Sets the IP address of the next-hop of the route with the value configured in the set clause.

The no form of this command restores the default behavior of not modifying the IP address of the next-hop of the route.

Parameter	Description
<IP-ADDR>	Specifies the IPv4 address to be set as the next-hop address of the route.

Example

Configuring a set clause in the route map to modify the next-hop address of the route entry:

```
switch(config)# route-map GlobalMap permit seq 11
switch(config-route-map-GlobalMap-11)# set ip nexthop 1.1.1.2
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-route-map	Administrators or local user group members with execution rights for this command.

set ipv6 nexthop global

```
set ipv6 nexthop global <IP-ADDRESS>
no set ip nexthop global <IP-ADDRESS>
```

Description

Sets the IPv6 address of the nexthop of the routes with the IPv6 address configured in the set clause.

The no form of this command removes this configuration.

Parameter	Description
<IP-ADDRESS>	Specifies the IPv6 address of the nexthop router.

Examples

Configuring a set clause in route-map to modify the nexthop address of route entry:

```
switch(config)# route-map GlobalMap premit 11
switch(config-route-map)# set ipv6 nexthop global 1.1.1.2
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8325 8360	`config`	Administrators or local user group members with execution rights for this command.

set local-preference

```
set local-preference <VALUE>
no set local-preference <VALUE>
```

Description

Modifies the local-preference attribute of the route entry with the value configured in the set clause.

The `no` form of this command restores the default behavior of not modifying the local-preference attribute of the route entry.

Parameter	Description
<VALUE>	Specifies the value to be set as the local-preference attribute of the route entry. Range: 0 to 4294967295.

Example

Configuring a set clause in the route map to modify the metric value of the route:

```
switch(config)# route-map GlobalMap permit seq 11
switch(config-route-map-GlobalMap-11)# set local-preference 100
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-route-map`	Administrators or local user group members with execution rights for this command.

set metric

```
set metric <VALUE>
no set metric <VALUE>
```

Description

Modifies the metric value of the route with the value configured in the set clause.

The `no` form of this command restores the default behavior of not modifying the metric value of the route.

Parameter	Description
<VALUE>	Specifies the value to be set as the metric value of the route. Range: 0 to 4294967295.

Example

Configuring a set clause in the route map to modify the metric value of the route:

```
switch(config)# route-map GlobalMap permit seq 11
switch(config-route-map-GlobalMap-11)# set metric 10
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-route-map`	Administrators or local user group members with execution rights for this command.

set origin

```
set origin [igp | egp | incomplete]
no set origin [igp | egp | incomplete]
```

Description

Modifies the route origin attribute of the route update with the value configured in the set clause.

The `no` form of this command restores the default behavior of not modifying the route origin attribute of the route.

Parameter	Description
`{igp | egp | incomplete}`	Selects the route update originated to IGP, EGP, or incomplete.

Parameter	Description
	When incomplete is selected, the route update origin is set to unknown.

Example

Configuring a set clause in the route map to modify the origin attribute of the route:

```
switch(config)# route-map GlobalMap permit seq 11
switch(config-route-map-GlobalMap-11)# set origin igp
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-route-map	Administrators or local user group members with execution rights for this command.

set tag

```
set tag <value>
[no] set tag <value>
```

Description

Modifies the tag value of the route with the one configured in the set clause. Applicable to static routes that will be redistributed to ospfv2 and ospfv3 protocols.

The no form of this command removes the set clause tag value.

Parameter	Description
value	Numeric value to change the route entry tag. Range: 0-4294967295. Required.

Example

Configuring a set clause in route-map to modify the tag value of the route:

```
switch(config)# route-map GlobalMap permit 11
switch(config-route-map)# set tag 10
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-route-map`	Administrators or local user group members with execution rights for this command.

set weight

```
set weight <VALUE>
no set weight <VALUE>
```

Description

Modifies the weight attribute of the route with the value configured in the set clause.

The `no` form of this command restores the default behavior of not modifying the weight attribute of the route.

Parameter	Description
<VALUE>	Specifies the value to be set as the weight attribute of the route. Range: 0 to 65535.

Example

Configuring a set clause in the route map to modify the metric value of the route:

```
switch(config)# route-map GlobalMap permit seq 11
switch(config-route-map-GlobalMap=11)# set weight 100
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320	`config-route-map`	Administrators or local user group members with execution rights for this command.

Platforms	Command context	Authority
8325 8360 9300 10000		

Show commands

show ip aspath-list

```
show ip aspath-list [<NAME>] [vsx-peer]
```

Description

Shows the configuration details of the AS path list.

Parameter	Description
<NAME>	Specifies name of the AS path list.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Example

Showing the IP AS path list configuration information:

```
switch# show ip aspath-list
ip aspath-list ASLst
    seq 10 permit 22 33
    seq 20 deny 44
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Manager (#)	Administrators or local user group members with execution rights for this command.

show ip community-list

```
show ip community-list [<NAME>] [vsx-peer]
```

Description

Shows the configuration details of the community-list.

Parameter	Description
<NAME>	Specifies name of the community-list.
vsx-peer	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Example

Showing the community list configuration information:

```
switch# show ip community-list
ip community-list standard CommLst
    seq 10 permit 11:101
    seq 20 deny 12:201
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Manager (#)	Administrators or local user group members with execution rights for this command.

show ip prefix-list

```
show ip prefix-list [<NAME>] [vsx-peer]
```

Description

Shows the configuration details of the IP prefix lists.

Parameter	Description
<NAME>	Specifies name of the IP prefix lists.

Parameter	Description
vsx-peer	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Example

Showing the IP prefix list configuration information:

```
switch# show ip prefix-list
ip prefix-list PfxLst: 2 entries
   seq 10 permit 3.0.0.0/8 ge 8 le 8
   seq 20 deny 4.0.0.0/8 ge 8 le 8
```

```
switch# show ipv6 prefix-list
ipv6 prefix-list x: 1 entries
                      seq     10 permit 2011::/64ge 64le 64
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Manager (#)	Administrators or local user group members with execution rights for this command.

show route-map

```
show route-map [<NAME>] [vsx-peer]
```

Description

Shows the configuration details of the route map.

Parameter	Description
<NAME>	Specifies name of the route map.
vsx-peer	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the

Parameter	Description
	VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Example

Showing the route map configuration information:

```
switch# show route-map
Route map: InternetFilter
   Seq 10, permit,
     Match :
       origin : egp
       metric : 123
     Set :
       community : 23:34
       metric : 3
       as_path_exclude : 123
       local_preference : 3456
       origin : igp
       weight : 25
   Seq 20, permit,
     Match :
       origin : egp
       metric : 456
     Set :
       community : 44:44
       metric : 5
       as_path_prepend : 444
       local_preference : 66
       origin : igp
       weight : 250

Route map: LocalFilter
   Seq 10, permit,
       origin : egp
       metric : 10
                                                    ip next-hop address         : 2.2.2.3
       local-preference            : 20
       route-type                  : external_type1
       source-protocol             : static
       prefix-list                 : PfxLst
       aspath-list                 : ASLst
       community-list              : CommLst
       ip next-hop prefix-list     : PfxLst
       ip route-source prefix-list : PfxLst
     Set :
       community : 22:33
       metric : 25
       as_path prepend : 65535 65534
                                                    ip next-hop address : 2.2.2.4
       local_preference : 30
       origin : igp
       weight : 30
       dampening                   : half-life = 5, reuse = 50, suppress = 125, max-
suppress-time = 15
```

All the match clauses are grouped. All the set clauses are grouped.

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Manager (#)	Administrators or local user group members with execution rights for this command.

Equal Cost Multipath (ECMP) allows a router to load balance traffic destined to some network that is reachable through multiple equal cost route nexthops. ECMP functionality is dependent on L3 routing being enabled on the router.

Overview

The nexthop chosen out of the ECMP group of nexthops for a given packet is typically determined by its header information, usually by hashing source and destination IP addresses as well as potentially source and destination L4 ports. The hashing algorithm used is dependent on the type of switch in use as well as whether the packet is flowing through the slow-path or fast-path.

By default all of the following fields are enabled and utilized for the load balancing decision.

- L3 Destination IP address
- L3 Source IP address
- L4 Destination port
- L4 Source port

ECMP support is NOT dependent on address family. The ECMP feature applies to both IPv4 and IPv6 traffic flowing through the router.

If two different routing protocols are (mis)configured to use the same Administrative Distance, then they have the opportunity to create ECMP groups together.

ECMP commands

show ip ecmp

```
show ip ecmp [vsx-peer]
```

Description

Displays the Equal Cost Multipath (ECMP) configuration.

Parameter	Description
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

```
switch# show ip ecmp

ECMP Configuration
--------------------

 ECMP Status        : Enabled

ECMP Load Balancing by
------------------------
 Source IP          : Enabled
 Destination IP     : Enabled
 Source Port        : Enabled
 Destination Port   : Enabled
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

Chapter 10
Virtual Router Redundancy Protocol (VRRP)

This section describes how to configure and verify VRRP configuration and operational states.

- All VRRP configurations work in VRRP context.
- VRRP can be configured on physical ports, VLAN interfaces, and LAG interfaces.
- VRRP mandates the associated interface to be routing interface.

Overview

In many networks, edge devices are configured to send packets to a statically configured default router. If this router becomes unavailable, devices that use it as a first-hop router become isolated from the network.

VRRP uses dynamic failover to ensure the availability of an end node default router. The IP address used as the default route is assigned to a virtual router (VR). The VR includes:

- An Active router assigned to forward traffic designated for the virtual route
- One or more prioritized Standby routers (If a Standby is forwarding traffic for the VR, it has replaced the Owner as the Active router.)

This redundancy provides a backup for gateway IP addresses (first-hop routers). If a VR Active router becomes unavailable, the traffic it supports will be transferred to a Standby router without major delays or operator intervention. This operation can eliminate single-point-of-failure problems and provide dynamic failover (and failback) support. As long as one physical router in a VR configuration is available, IP addresses assigned to the VR are always available. Edge devices can send packets to these IP addresses without interruption.

Advantages to using VRRP include:

- Minimizing failover time and bandwidth overhead if a primary router becomes unavailable
- Minimizing service disruptions during a failover
- Providing backup for a load-balanced routing solution
- Avoiding the need to make configuration changes in the end nodes if a gateway router fails
- Eliminating the need for router discovery protocols to support failover operation

Terminology

Owner router: The Owner router is automatically configured with the highest VRRP router priority in the VR (255). It operates as the Active router for the VR unless it becomes unavailable to the network. All Virtual Router members can be configured so virtual IP is not the same as physical (or real) IP. Such virtual address can be called pure virtual IP address.

Active router: The Owner or Standby router that is the physical forwarding agent for routed traffic using the VR as a gateway. There can be only one router operating as the Active for a network. If the router configured as the Owner for a VR is available to the network, it will also be the Active. If the Owner fails or loses availability to the network, the highest-priority Standby becomes the Active.

Standby: A router configured in a VR as a Standby to the Owner/Active for the same VR. There must be a minimum of one Standby in a VR to support VRRP operation if the Owner/Active fails. Every Standby is created with a configurable priority (default: 100). This priority determines the precedence for becoming the Active of the VR if the Owner or another Standby operating as Active becomes unavailable.

When the current Active router is no longer available, the Standby router with highest priority will become the current Active. When a router with higher priority becomes available, it is switched to Active. The user can override this behavior by disabling preemption mode.

Virtual Router (VR): Consists of one Owner/Active router and one or more Standby routers that belong to the same network. The Owner is the router that owns any IP addresses associated with the VR. The VR has one virtual IP address (multiple virtual IP addresses for multinetted interfaces) that correspond to a real IP address on the Owner. A VR includes the following:

- A VR identification (VRID) configured on all VRRP routers in the same network. For a multinetted interface, the VRID is configured on all routers in the same subnet.
- The same VIP configured on each instance of the same VR.
- The status of either Owner or Standby configured on each instance of the same VR. There can be one Owner and one or more Standbys configured on each VR.
- The priority level configured on each instance of the VR. On the Owner router, the highest priority setting of 255 is automatically fixed. On Standbys, the default priority setting is 100 and configurable.
- A VR MAC address that is not configurable.

Virtual IP address (VIP): The VIP associated with a VR must be a real IP address already configured in the associated interface on the Owner router.

- If the VIP is an IPv6 address, a link-local address must be configured before adding a global IPv6 address.
- The Owner and all Standby routers belonging to the VR have this IP address configured in their VRID contexts as the VIP.
- A subnetted interface allows multiple VIPs. If there are fewer IP addresses in an interface and a user wants VRRP support on multiple subnets, configure a separate VR instance for each IP address in the interface.

VRID: The identifier for a VR configured on an interface. A VRID can be used for only one VR in any interface on a router. It can be used again for a different VR in a different interface.

VRRP operation

VRRP supports router redundancy through a prioritized election process among routers configured as members of the same virtual router (VR).

A VR includes two or more member routers configured with:

- A virtual IP address that is also configured as a real IP address on one of the routers
- A virtual router MAC address

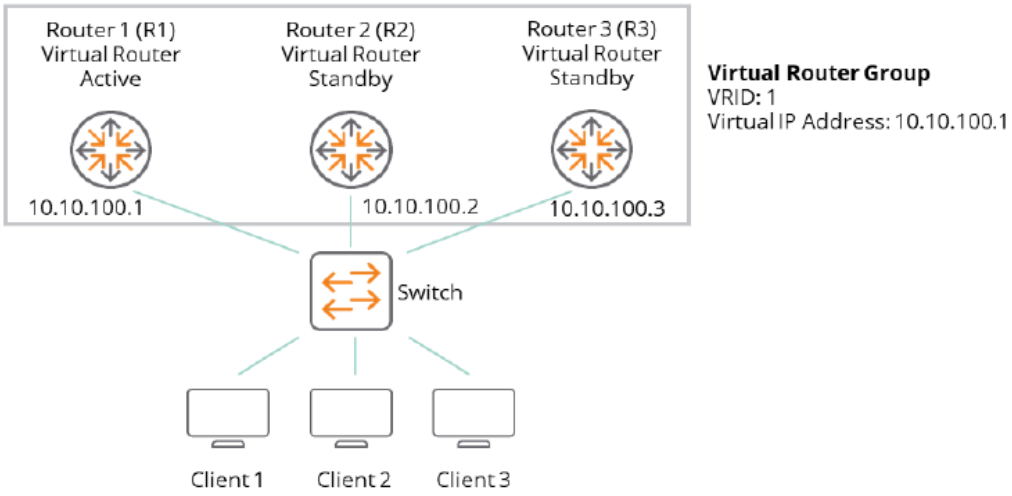
The router that owns the IP address is configured to operate as the Owner of the VR for traffic-forwarding purposes. By default, this router has the highest VRRP priority in the VR. Any other routers in the VR have a lower priority and are configured to operate as Standbys if the Owner router becomes unavailable.

The Owner normally operates as the Active for a VR. If the Owner becomes unavailable, a failover to a Standby router belonging to the same VR occurs. This Standby becomes the Active. If the Owner recovers, a failback occurs, and Active status reverts to the Owner.

- Using more than one Standby provides additional redundancy. If the Owner and the highest-priority Standby fail, another lower-priority Standby can take over as Active.
- In a VRRP owner scenario, duplicate address detection (DAD) should be disabled for VRRP to work.

The image shown here depicts a basic VLAN topology. In this example, Routers 1, 2 and 3 form a VRRP group. The IP address of the group is the same address configured for the SVI interface of R1 (10.10.100.1).

Figure 1 *Basic VLAN Topology*



Because the virtual IP address uses the IP address of the SVI interface of Router R1, Router R1 is the Active (also known as IP address Owner).

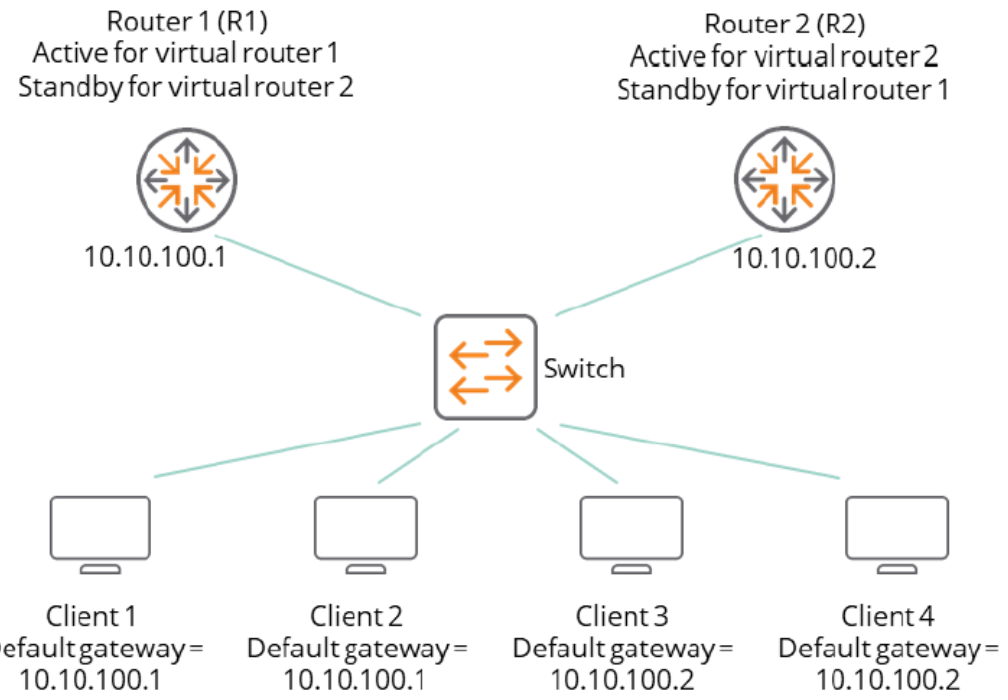
- As the Active, R1 owns the virtual IP address of the VRRP group and forwards packets sent to this IP address.
- Clients 1 through 3 are configured with the default gateway IP address of 10.10.100.1.
- Routers R2 and R3 function as Standbys. If the Active fails, the Standby router with highest priority becomes the Active and takes over the virtual IP address to provide uninterrupted service for the clients connected to the L2 Switch. When Router R1 recovers, it becomes the Active router again.

Multiple VRRP groups

A user can configure multiple VRRP groups on a router (or L3) interface (Physical, LAG, or SVI interfaces). In a topology in which multiple VRRP groups are configured on a router interface, the interface can act as an Active for one VRRP group and a Standby for one or more other VRRP groups.

This image displays a topology in which VRRP is configured so that Routers R1 and R2 share the traffic to and from clients 1 through 4. Routers R1 and R2 act as Standbys to each other if either router fails.

Figure 1 *Routers share the traffic to and from clients 1 through 4.*



This topology contains two virtual IP addresses for two VRRP groups that overlap. For VRRP group 1, Router R1 is the owner of IP address 10.10.100.1 and is the Active. Router R2 is the Standby to Router R1. Clients 1 and 2 are configured with the default gateway IP address of 10.10.100.1.

For VRRP group 2, Router R2 is the owner of IP address 10.10.100.2 and is the Active. Router R1 is the Standby to Router R2. Clients 3 and 4 are configured with the default gateway IP address of 10.0.0.2.

VRRP priority

In a Standby router VR configuration, the virtual router priority defaults to 100. The priority for the configured Owner is automatically set to the highest value of 255.

In a VR in which there are two or more Standby routers, priority settings can be reconfigured to define the order in which Standbys will be reassigned as Active if a failover occurs.

VRRP preemption

In a Standby router VR configuration, the virtual router priority defaults to 100. The priority for the configured Owner is automatically set to the highest value of 255.

When multiple Standby routers exist in a VR:

- If the current Active fails and the highest-priority Standby is not available, VRRP selects the next-highest priority Standby to operate as Active.
- If the highest-priority Standby later becomes available, it preempts the lower-priority Standby and takes over the Active function.

To remove this preemptive ability on a VR, disable it with the `no preempt` command.

Preemption applies only to VRRP routers configured as Standbys.

Virtual Router MAC address

When a Virtual Router (VR) instance is configured, the protocol automatically assigns a MAC address based on the standard MAC prefix for VRRP packets plus the VRID number (as described in RFC 3768). The first five octets form the standard MAC prefix for VRRP and the last octet is the configured VRID. For example: `00-00-5E-00-01-<VRid>`

VRRP and ARP

The current Active for a VR responds to ARP requests for the virtual IP addresses with the VR-assigned MAC address. The virtual MAC address is also used as source MAC address for periodic advertisements sent by the current Active.

The VRRP router responds to ARP requests for non-virtual IP addresses with the system MAC address. Non-virtual IP addresses are not configured as virtual IP addresses for any VR on the interface.

VRRP and MCLAG

Users can enable VRRP on SVI interfaces (or Layer 3 VLANs) that have multi-chassis lag (MCLAG) ports as member ports. MCLAG allows links that are physically connected to two different AOS-CX devices to appear as a single lag port.

A router performs a Layer 3 route table lookup and Layer 3 forwarding when the destination MAC in the Ethernet frame matches its own MAC address (or virtual MAC address when the router is acting as a VRRP Active). Otherwise the packets are switched.

In a topology with MCLAG and VRRP enabled, an MCLAG switch acting as a VRRP Standby could receive IP packets with the virtual MAC address as the destination MAC. In this scenario, the MCLAG switch acting as a VRRP Standby switches the traffic to the peer (or VRRP Active) using inter-switch-link and the peer (VRRP Active) performs the Layer 3 forwarding.

VRRP tracking

VRRP supports object tracking. This functionality allows monitoring of the state of a configured object. The state determines the priority of the VRRP router in a VRRP group. A track object can be created using the `track <OBJECT-ID>` command and the object can be associated with an interface. A change in interface state will then affect the priority of a VRRP group.

High availability

VRRP supports high availability through stateful restarts and stateful switchovers.

- A stateful restart occurs when the VRRP process (or daemon) fails and is restarted.
- A stateful switchover occurs when the active management module (AMM) switches to the standby management module (SMM).

VRRP and Neighbor Discovery for IPv6

Neighbor Discovery (ND) is the IPv6 equivalent of the IPv4 ARP for layer 2 address resolution. It uses IPv6 ICMP messages to do the following:

- Determine the link-layer address of neighbors
- Verify that a neighbor is reachable
- Track neighbor (local) routers

Neighbor Discovery enables functions such as:

- Router and neighbor solicitations and discovery
- Detecting address changes for devices
- Identifying a replacement for a router or router path that has become unavailable
- Duplicate address detection (DAD)
- Router Advertisement processing
- Neighbor reachability
- Resolution of destination addresses
- Changes to link-layer addresses

An instance of Neighbor Discovery is triggered on a device when a new or changed IPv6 address is detected. VRRPv3 provides a faster failover to a Standby router by not using standard ND procedures. A failover to a Standby router can occur in approximately three seconds without any interaction with hosts and a minimum of VRRPv3 traffic.

Duplicate address detection (DAD)

Duplicate address detection verifies that a configured unicast IPv6 address is unique before it is assigned to an interface. When the Owner router fails, the Standby VRRP router assumes the Active role. When the Owner router becomes operational, DAD will fail because a Standby VRRP router is in the Active role that responds to the DAD request. To avoid this, on virtual routers that are in Owner mode (priority = 255) DAD needs to be disabled for the interface on which the Owner VR is configured.

Guidelines and limitations

- VRRP must be enabled at the global level using the `router vrrp enable` command. It must also be enabled at the interface level at which you configure VRRP.
- A maximum of 8 IPv4 and 8 IPv6 VRRP groups are supported on an interface.
- A maximum of 256 VRRP groups is supported on a router. The groups can be IPv4 or IPv6.
- Supported virtual router identification (VRID) range is 1-255.
- Proxy-ARP and Active-Gateway are not supported in conjunction with VRRP.

VRRP commands

address

```
address <IP-ADDR> [ primary | secondary ]
no address <IP-ADDR> [ primary | secondary ]
```

Description

Configures a primary or secondary IPv4 or IPv6 address for the VRRP group. To use secondary IP addresses in a VRRP group, you must first configure a primary IP address on the same group. A maximum of 16 IP addresses per IPv4 VRRP group and 8 IPv6 addresses per IPv6 VRRP group are supported.

Do not configure an IPv4 VRRP group using addresses from the /30, /31, and /32 subnets of the interface IP address.

16 Virtual IP addresses per IPv4 VR and 8 Virtual IP addresses per IPv6 VR are supported.

The total number of VIPs supported by a switch is:

- 1024 VIPs for IPv4 VRs
- 512 VIPs for IPv6 VRs

The `no` form of this command deletes a primary or secondary IPv4 or IPv6 address from the VRRP group.

Parameter	Description
<IP-ADDR>	Configures the IPv4 or IPv6 address.
`primary`	Configures a primary address.
`secondary`	Configures a secondary address.

Examples

```
switch(config)# interface 1/1/1
switch(config-if)# vrrp 1 address-family ipv4
switch(config-if-vrrp)# address 10.0.0.1 primary


switch(config)# interface 1/1/1
switch(config-if)# vrrp 1 address-family ipv6
switch(config-if-vrrp)# address fe80::1 primary


switch(config)# interface 1/1/1
switch(config-if)# vrrp 1 address-family ipv4
switch(config-if-vrrp)# no address 10.0.0.1 primary


switch(config)# interface 1/1/1
switch(config-if)# vrrp 1 address-family ipv6
switch(config-if-vrrp)# no address fe80::1 primary
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300	`config`	Administrators or local user group members with execution rights

Platforms	Command context	Authority
6400 8320 8325 8360 9300 10000		for this command.

authentication

```
authentication {text | md5} [{plaintext | ciphertext} <KEY>]
no authentication
```

Description

This command enables authentication mode and the authentication key for VRRP groups on an interface. VRRP members or routers of the same VRRP group must use the same authentication mode and authentication key.

The no form of this command disables authentication mode and the authentication key for VRRP groups on an interface.

IPv4 VRRPv3 and IPv6 VRRPv3 do not support VRRP packet authentication. Authentication mode and key configuration take effect only in VRRPv2 (IPv4 only - RFC2338).

In VRRPv3, authentication mode and authentication key settings do not take effect because VRRP Authentication was removed from RFC5798.

VRRP provides the following authentication modes as described in RFC2338:

Simple authentication

The sender fills an authentication key into the VRRP packet and the receiver compares the received authentication key with its local authentication key.

If the two authentication keys match, the received VRRP packet is legitimate. Otherwise, the received packet is illegitimate and is discarded.

Authentication key text is sent in the clear and can be seen in a packet trace. This makes MD5 authentication more secure than text.

MD5 authentication

The sender computes a digest for the packet that will be sent using the authentication key and MD5 algorithm, and saves the result in the VRRP packet.

The receiver performs the same operation with the authentication key and MD5 algorithm, and compares the result with the content in the authentication header. If the results match, the received VRRP packet is legitimate. Otherwise, the received packet is illegitimate and is discarded.

Parameter	Description
`text`	Configures the simple authentication type.
`md5`	Configures the MD5 (message-digest) authentication type.
`plaintext`	Specifies that the key is provided as plaintext.

Parameter	Description
ciphertext	Specifies that the key is provided as ciphertext.
<KEY>	Specifies the key in the chosen format.

When the key is not provided on the command line, plaintext key prompting occurs upon pressing Enter. The entered key characters are masked with asterisks.

Examples

Enabling VRRP authentication using MD5 with a provided plaintext key:

```
switch(config)# interface 1/1/1
switch(config-if)# vrrp 1 address-family ipv4
switch(config-if-vrrp)# version 2
switch(config-if-vrrp)# authentication md5 plaintext testvrrpkey
```

Enabling VRRP authentication using MD5 with a prompted plaintext key:

```
switch(config)# interface 1/1/1
switch(config-if)# vrrp 1 address-family ipv4
switch(config-if-vrrp)# version 2
switch(config-if-vrrp)# authentication md5
Enter the authentication key: *************
Re-Enter the authentication key: *************
```

Enabling VRRP authentication using MD5 with a provided ciphertext key:

```
switch(config)# interface 1/1/1
switch(config-if)# vrrp 1 address-family ipv4
switch(config-if-vrrp)# version 2
switch(config-if-vrrp)# authentication md5 ciphertext AQBapfciFZ/P...biBAAAAOjc0a8=
```

Disabling VRRP authentication:

```
switch(config)# interface 1/1/1
switch(config-if)# vrrp 1 address-family ipv4
switch(config-if-vrrp)# version 2
switch(config-if-vrrp)# no authentication
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if-vrrp	Administrators or local user group members with execution rights for this command.

bfd *<IPV4-ADDR>*

```
bfd <IPV4-ADDR>
no bfd <IPV4-ADDR>
```

Description

Enables BFD under VRRP for the specified IP address. BFD is asynchronous and echo mode is supported.

The `no` form of this command disables BFD under VRRP for the specified IP address.

Parameter	Description
<IPV4-ADDR>	Specifies the address on which to enable BFD in IPv4 format (`x.x.x.x`), where `x` is a decimal number from 0 to 255.

Examples

On the 6400 Switch Series, interface identification differs.

Enabling BFD on the address **10.0.0.1** on VRRP **1**:

```
switch(config)# interface 1/1/1
switch(config-if)# routing
switch(config-if)# vrrp 1 address-family ipv4
switch(config-if-vrrp)# bfd 10.0.0.1
```

Disabling BFD on the address **10.0.0.1** on VRRP **1**:

```
switch(config)# interface 1/1/1
switch(config-if)# routing
switch(config-if)# vrrp 1 address-family ipv4
switch(config-if-vrrp)# no bfd 10.0.0.1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if-vrrp	Administrators or local user group members with execution rights for this command.

preempt

```
preempt
no preempt
```

Description

Enables the preempt option. The default value is enabled. In default mode, a Standby router with a higher priority than another Standby that is operating as Active will take over the Active function.

Applies to VRRP Standby routers only and is used to minimize network disruption caused by unnecessary preemption of the Active operation among Standby routers.

The `no` form of this command disables the preempt option, thus preventing the higher-priority Standby from taking over the Active operation from a lower-priority Standby. This command does not prevent an owner router from resuming the Active function after recovering from being unavailable.

Examples

```
switch(config)# interface 1/1/1
switch(config-if)# vrrp 1 address-family ipv4
switch(config-if-vrrp)# preempt
```

```
switch(config)# interface 1/1/1
switch(config-if)# vrrp 1 address-family ipv4
switch(config-if-vrrp)# no preempt
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Administrators or local user group members with execution rights for this command.

preempt delay minimum

```
preempt delay minimum <DELAY-IN-SECONDS>
no preempt delay minimum <DELAY-IN-SECONDS>
```

Description

Sets the time in seconds (1-3600) that the router will wait before taking control of the virtual IP and starting to route packets.

The `no` form of this command sets the preempt delay for the VRRP group to the default preempt delay of 0 seconds.

The VRRP Preempt Delay Timer (PDT) allows admin users to configure a period of time before the VR takes control of the virtual IP address. It does not transition to the Active state until the timer period expires.

The timer value configured should be long enough to allow upper layer protocol to converge. The PDT is applied during initialization and down/up events of the router.

Parameter	Description
<DELAY-IN-SECONDS>	Selects the time in seconds (1-3600). Default is 0 seconds.

Examples

```
switch(config)# interface 1/1/1
switch(config-if)# vrrp 1 address-family ipv4
switch(config-if-vrrp)# preempt delay minimum 30

switch(config)# interface 1/1/1
switch(config-if)# vrrp 1 address-family ipv4
switch(config-if-vrrp)# no preempt delay
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

priority

```
priority <1-254>
no priority
```

Description

Sets the priority for the VRRP group.

The `no` form of this command sets the priority for the VRRP group as default priority.

- The default value for non-Owner virtual routers is 100.
- The default value for Owner virtual router is 255, which cannot be changed.

Examples

```
switch(config)# interface 1/1/1
switch(config-if)# vrrp 1 address-family ipv4
switch(config-if-vrrp)# priority 150
```

```
switch(config)# interface 1/1/1
switch(config-if)# vrrp 1 address-family ipv4
switch(config-if-vrrp)# no priority
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

router vrrp {enable | disable}

```
router vrrp {enable | disable}
no router vrrp {enable | disable}
```

Description

Enables or disables VRRP protocol globally. You must globally enable the VRRP feature for VRRP virtual router.

`no router vrrp enable` disables VRRP protocol globally but does not remove all VRRP configurations.

`no router vrrp disable` enables VRRP protocol globally.

Example

Enabling VRRP protocol globally:

```
switch(config)# router vrrp enable
```

Disable VRRP protocol globally:

```
switch(config)# router vrrp disable
```

Disable VRRP protocol globally:

```
switch(config)# no router vrrp enable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Administrators or local user group members with execution rights for this command.

no router vrrp

```
no router vrrp
```

Description

Removes VRRP configuration and VRRP global protocol. If `auto-confirm` is enabled or VRRP is not configured on any interface, this command will not ask for user confirmation.

Examples

Removing VRRP configuration:

```
switch(config)# no router vrrp
All VRRP configuration will be deleted.
Do you want to continue (y/n)?
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Administrators or local user group members with execution rights for this command.

show track

```
show track [brief | <OBJECT-ID>]
```

Description

Shows all or specific track object information.

Parameter	Description
brief	Displays brief information about all or specific track objects
<OBJECT-ID>	Displays information about a specified track object (1-128)

Examples

```
switch# show track
Track 1
  interface 1/1/1
  Interface is DOWN
```

```
switch# show track brief
Track  Interface       State

1      1/1/1           Down
2      None            Down
3      1/1/2           Up
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360	Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

Platforms	Command context	Authority
9300 10000		

show track brief

```
show track brief
```

Description

Shows brief information for all track objects.

Examples

Showing brief information for all track objects:

```
switch# show track brief
Track   Interface       State

1       1/1/1           Down
2       None            Down
3       1/1/2           Up
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show vrrp

```
show vrrp [brief | detail | interface <INTERFACE-NAME> | interface <LAG-NAME> | interface
<VLAN-NAME> | ipv4 | ipv6 | statistics | statistics interface <INTERFACE-NAME> | statistics
interface <LAG-NAME> | statistics interface <VLAN-NAME>]
[vsx-peer]
```

Description

Shows all VRRP virtual routers information.

Parameter	Description
`brief`	Displays brief output of all VRRP virtual routers Keywords used in displayed information: Grp: VRRP virtual router group ID. A-F: Address Family. Pri: Priority. Time: Uptime of VRRP virtual router since it moved out of INIT state. Pre: Preempt mode (Y is enabled, N if not enabled).
`detail`	Displays detailed output of all VRRP virtual routers
`interface <INTERFACE-NAME>`	Displays VRRP information for a specific interface
`interface <LAG-NAME>`	Displays VRRP information for a specific LAG interface
`interface <VLAN-NAME>`	Displays VRRP information for a specific VLAN interface
`ipv4`	Displays IPv4 address family
`ipv6`	Displays IPv6 address family
`statistics`	Displays VRRP statistics information for all interfaces
`statistics interface <INTERFACE-NAME>`	Displays VRRP statistics information for a specific interface
`statistics interface <LAG-NAME>`	Displays VRRP statistics information for a specific LAG interface
`statistics interface <VLAN-NAME>`	Displays VRRP statistics information for a specific VLAN interface
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

```
switch# show vrrp
VRRP is enabled

Interface 1/1/1 - Group 1 - Address-Family IPv4
  State is ACTIVE
  State duration 56 mins 57.826 secs
  Virtual IP address is 10.0.0.1
  Virtual MAC address is 00:00:5e:00:01:01
  Advertisement interval is 1000 msec
  Preemption enabled
  Priority is 100
  Active Router is 10.0.0.2 (local), priority is 100
  Active Advertisement interval is 1000 msec
  Active Down interval is unknown
  Tracked object ID is 1, and state Down

Interface 1/1/2 - Group 1 - Address-Family IPv4
  State is INIT (Interface Down)
```

```
  State duration 45 mins 28.313 secs
  Virtual IP address is no address
  Virtual MAC address is 00:00:5e:00:01:01
  Advertisement interval is 1000 msec
  Preemption enabled
  Priority is 100
  Active Router is unknown, priority is unknown
  Active Advertisement interval is unknown
  Active Down interval is unknown

Interface 1/1/2 - Group 1 - Address-Family IPv6
  State is INIT (Group Disabled)
  State duration 20 mins 19.794 secs
  Virtual IP address is no address
  Virtual secondary IP addresses:
    2201:13::110:4
  Virtual MAC address is 00:00:5e:00:02:01
  Advertisement interval is 1000 msec
  Preemption enabled
  Priority is 100
  Active Router is unknown, priority is unknown
  Active Advertisement interval is unknown
  Active Down interval is unknown
```

```
switch# show vrrp brief

VRRP is enabled

 Interface   Grp  A-F   Pri   Time Owner Pre State   Active addr/Group addr
  1/1/1       1   IPv4  100    0    N    Y   ACTIVE  10.0.0.2(local) 10.0.0.1
  1/1/2       1   IPv4  100    0    N    Y   INIT    AF-UNDEFINED no address
  1/1/2       1   IPv6  100    0    N    Y   INIT    AF-UNDEFINED no address
```

```
switch# show vrrp detail
VRRP is enabled

Interface 1/1/1 - VRRPv2 Statistics
   Invalid group ID packets received : 0
   Invalid version packets received : 0
   Invalid checksum packets received : 0

Interface 1/1/1 - VRRPv3 Statistics
   Invalid group ID packets received : 0
   Invalid version packets received : 0
   Invalid checksum packets received : 0

Interface 1/1/1 - Group 1 - Address-Family IPv4
  State is ACTIVE
  State duration 1 mins 35.486 secs
  Virtual IP address is 10.0.0.1
  Virtual MAC address is 00:00:5e:00:01:01
  Advertisement interval is 1000 msec
  Version 3
  Preemption enabled
  Priority is 100
  Active Router is 10.0.0.2 (local), priority is 100
  Active Advertisement interval is 1000 msec
  Active Down interval is unknown
  Tracked object ID is 1, and state Down
  VRRPv3 Advertisements: sent 3931 (errors 0) - rcvd 0
```

```
  VRRPv2 Advertisements: sent 0 (errors 0) - rcvd 0
  Group Discarded Packets: 3537
    IP address Owner conflicts: 0
    IP address configuration mismatch : 3537
    Advert Interval errors : 0
    Adverts received in Init state: 0
    Invalid group other reason: 0
  Group State transition:
    Init to active: 0
    Init to standby: 2 (Last change Mon Jun 16 11:19:36.316 UTC)
    Standby to active: 2 (Last change Mon Jun 16 11:19:39.926 UTC)
    Active to standby: 0
    Active to init: 1 (Last change Mon Jun 16 11:17:49.978 UTC)
    Standby to init: 0

Interface 1/1/2 - VRRPv2 Statistics
   Invalid group ID packets received : 0
   Invalid version packets received : 0
   Invalid checksum packets received : 0

Interface 1/1/2 - VRRPv3 Statistics
   Invalid group ID packets received : 0
   Invalid version packets received : 0
   Invalid checksum packets received : 0

Interface 1/1/2 - Group 1 - Address-Family IPv4
  State is INIT (Interface Down)
  State duration 49 mins 23.507 secs
  Virtual IP address is no address
  Virtual MAC address is 00:00:5e:00:01:01
  Advertisement interval is 1000 msec
  Version 3
  Preemption enabled
  Priority is 100
  Active Router is unknown, priority is unknown
  Active Advertisement interval is unknown
  Active Down interval is unknown
  VRRPv3 Advertisements: sent 0 (errors 0) - rcvd 0
  VRRPv2 Advertisements: sent 0 (errors 0) - rcvd 0
  Group Discarded Packets: 0
    IP address Owner conflicts: 0
    IP address configuration mismatch : 0
    Advert Interval errors: 0
    Adverts received in Init state: 0
    Invalid group other reason: 0
  Group State transition:
    Init to active: 0
    Init to standby: 0
    Standby to active: 0
    Active to standby: 0
    Active to init: 0
    Standby to init: 0

Interface 1/1/2 - Group 1 - Address-Family IPv6
  State is INIT (Interface Down)
  State duration 24 mins 14.988 secs
  Virtual IP address is no address
  Virtual secondary IP addresses:
    2201:13::110:4
  Virtual MAC address is 00:00:5e:00:02:01
  Advertisement interval is 1000 msec
  Preemption enabled
```

```
  Priority is 100
  Active Router is unknown, priority is unknown
  Active Advertisement interval is unknown
  Active Down interval is unknown
  VRRPv3 Advertisements: sent 0 (errors 0) - rcvd 0
  VRRPv2 Advertisements: sent 0 (errors 0) - rcvd 0
  Group Discarded Packets: 0
    VRRPv2 incompatibility: 0
    IP address Owner conflicts: 0
    IP address configuration mismatch : 0
    Advert Interval errors : 0
    Adverts received in Init state: 0
    Invalid group other reason: 0
  Group State transition:
    Init to active: 0
    Init to standby: 0
    Standby to active: 0
    Active to standby: 0
    Active to init: 0
    Standby to init: 0
```

```
switch# show vrrp interface 1/1/1
VRRP is enabled

Interface 1/1/1 - Group 1 - Address-Family IPv4
  State is ACTIVE
  State duration 11 mins 21.617 secs
  Virtual IP address is 10.0.0.1
  Virtual MAC address is 00:00:5e:00:01:01
  Advertisement interval is 1000 msec
  Version 3
  Preemption enabled
  Priority is 100
  Active Router is 10.0.0.2 (local), priority is 100
  Active Advertisement interval is 1000 msec
  Active Down interval is unknown
```

```
switch# show vrrp interface lag10
VRRP is enabled

Interface lag10 - Group 1 - Address-Family IPv4
  State is ACTIVE
  State duration 11 mins 21.617 secs
  Virtual IP address is 10.0.0.1
  Virtual MAC address is 00:00:5e:00:01:01
  Advertisement interval is 1000 msec
  Version 3
  Preemption enabled
  Priority is 100
  Active Router is 10.0.0.2 (local), priority is 100
  Active Advertisement interval is 1000 msec
  Active Down interval is unknown
```

```
switch# show vrrp interface vlan100
VRRP is enabled

Interface vlan100 - Group 1 - Address-Family IPv4
  State is ACTIVE
```

```
  State duration 11 mins 21.617 secs
  Virtual IP address is 10.0.0.1
  Virtual MAC address is 00:00:5e:00:01:01
  Advertisement interval is 1000 msec
  Version 3
  Preemption enabled
  Priority is 100
  Active Router is 10.0.0.2 (local), priority is 100
  Active Advertisement interval is 1000 msec
  Active Down interval is unknown
```

```
switch# show vrrp statistics

VRRP is enabled

Interface 1/1/1 - VRRPv2 Statistics
   Invalid group ID packets received : 0
   Invalid version packets received : 0
   Invalid checksum packets received : 0

Interface 1/1/1 - VRRPv3 Statistics
   Invalid group ID packets received : 0
   Invalid version packets received : 0
   Invalid checksum packets received : 0

VRRP Statistics for interface 1/1/1 - Group 1 - Address-Family IPv4
  State is ACTIVE
  State duration 6 mins 55.006 secs
  VRRPv3 Advertisements: sent 4288 (errors 0) - rcvd 0
  VRRPv2 Advertisements: sent 0 (errors 0) - rcvd 0
  Group Discarded Packets: 3856
    IP address Owner conflicts: 0
    IP address configuration mismatch : 0
    Advert Interval errors : 0
    Adverts received in Init state: 0
    Invalid group other reason: 0
  Group State transition:
    Init to active: 0
    Init to standby: 2 (Last change Mon Jun 16 11:19:36.316 UTC)
    Standby to active: 2 (Last change Mon Jun 16 11:19:39.926 UTC)
    Active to standby: 0
    Active to init: 1 (Last change Mon Jun 16 11:17:49.978 UTC)
    Standby to init: 0

Interface 1/1/2 - VRRPv2 Statistics
   Invalid group ID packets received : 0
   Invalid version packets received : 0
   Invalid checksum packets received : 0

Interface 1/1/2 - VRRPv3 Statistics
   Invalid group ID packets received : 0
   Invalid version packets received : 0
   Invalid checksum packets received : 0

VRRP Statistics for Interface 1/1/2 - Group 1 - Address-Family IPv4
  State is INIT (No Primary Group Address)
  State duration 54 mins 43.027 secs
  VRRPv3 Advertisements: sent 0 (errors 0) - rcvd 0
  VRRPv2 Advertisements: sent 0 (errors 0) - rcvd 0
  Group Discarded Packets: 0
    IP address Owner conflicts: 0
```

```
    Invalid address count: 0
    IP address configuration mismatch : 0
    Advert Interval errors : 0
    Adverts received in Init state: 0
    Invalid group other reason: 0
  Group State transition:
    Init to active: 0
    Init to standby: 0
    Standby to active: 0
    Active to standby: 0
    Active to init: 0
    Standby to init: 0

VRRP Statistics for Interface 1/1/2 - Group 1 - Address-Family IPv6
  State is INIT (Interface Down)
  State duration 29 mins 34.508 secs
  VRRPv3 Advertisements: sent 0 (errors 0) - rcvd 0
  VRRPv2 Advertisements: sent 0 (errors 0) - rcvd 0
  Group Discarded Packets: 0
    IP address Owner conflicts: 0
    IP address configuration mismatch : 0
    Advert Interval errors: 0
    Adverts received in Init state: 0
    Invalid group other reason: 0
  Group State transition:
    Init to active: 0
    Init to standby: 0
    Standby to active: 0
    Active to standby: 0
    Active to init: 0
    Standby to init: 0
```

```
switch# show vrrp statistics interface 1/1/1

VRRP is enabled

Interface 1/1/1 - VRRPv2 Statistics
   Invalid group ID packets received : 0
   Invalid version packets received : 0
   Invalid checksum packets received : 0

Interface 1/1/1 - VRRPv3 Statistics
   Invalid group ID packets received : 0
   Invalid version packets received : 0
   Invalid checksum packets received : 0

VRRP Statistics for interface 1/1/1 - Group 1 - Address-Family IPv4
  State is ACTIVE
  State duration 6 mins 55.006 secs
  VRRPv3 Advertisements: sent 4288 (errors 0) - rcvd 0
  VRRPv2 Advertisements: sent 0 (errors 0) - rcvd 0
  Group Discarded Packets: 3856
    IP address Owner conflicts: 0
    IP address configuration mismatch : 0
    Advert Interval errors : 0
    Adverts received in Init state: 0
    Invalid group other reason: 0
  Group State transition:
    Init to active: 0
    Init to standby: 2 (Last change Mon Jun 16 11:19:36.316 UTC)
    Standby to active: 2 (Last change Mon Jun 16 11:19:39.926 UTC)
```

```
    Active to standby: 0
    Active to init: 1 (Last change Mon Jun 16 11:17:49.978 UTC)
    Standby to init: 0
```

```
switch# show vrrp statistics interface lag10

VRRP is enabled

Interface lag10 - VRRPv2 Statistics
   Invalid group ID packets received : 0
   Invalid version packets received : 0
   Invalid checksum packets received : 0

Interface lag10 - VRRPv3 Statistics
   Invalid group ID packets received : 0
   Invalid version packets received : 0
   Invalid checksum packets received : 0

VRRP Statistics for interface lag10 - Group 1 - Address-Family IPv4
  State is ACTIVE
  State duration 6 mins 55.006 secs
  VRRPv3 Advertisements: sent 4288 (errors 0) - rcvd 0
  VRRPv2 Advertisements: sent 0 (errors 0) - rcvd 0
  Group Discarded Packets: 3856
    IP address Owner conflicts: 0
    IP address configuration mismatch : 0
    Advert Interval errors : 0
    Adverts received in Init state: 0
    Invalid group other reason: 0
  Group State transition:
    Init to active: 0
    Init to standby: 2 (Last change Mon Jun 16 11:19:36.316 UTC)
    Standby to active: 2 (Last change Mon Jun 16 11:19:39.926 UTC)
    Active to standby: 0
    Active to init: 1 (Last change Mon Jun 16 11:17:49.978 UTC)
    Standby to init: 0
```

```
switch# show vrrp statistics interface vlan100

VRRP is enabled

Interface vlan100 - VRRPv2 Statistics
   Invalid group ID packets received : 0
   Invalid version packets received : 0
   Invalid checksum packets received : 0

Interface vlan100 - VRRPv3 Statistics
   Invalid group ID packets received : 0
   Invalid version packets received : 0
   Invalid checksum packets received : 0

VRRP Statistics for interface vlan100 - Group 1 - Address-Family IPv4
  State is ACTIVE
  State duration 6 mins 55.006 secs
  VRRPv3 Advertisements: sent 4288 (errors 0) - rcvd 0
  VRRPv2 Advertisements: sent 0 (errors 0) - rcvd 0
  Group Discarded Packets: 3856
    IP address Owner conflicts: 0
    IP address configuration mismatch : 0
    Advert Interval errors : 0
```

```
    Adverts received in Init state: 0
    Invalid group other reason: 0
  Group State transition:
    Init to active: 0
    Init to standby: 2 (Last change Mon Jun 16 11:19:36.316 UTC)
    Standby to active: 2 (Last change Mon Jun 16 11:19:39.926 UTC)
    Active to standby: 0
    Active to init: 1 (Last change Mon Jun 16 11:17:49.978 UTC)
    Standby to init: 0
```

Command History

Release	Modification
10.08	Updated command output for inclusive language
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

shutdown

```
shutdown
no shutdown
```

Description

Disables VRRP group operation.

The no form of this command enables VRRP group operation.

Examples

Disabling VRRP group operation:

```
switch(config)# interface 1/1/1
switch(config-if)# vrrp 1 address-family ipv4
switch(config-if-vrrp)# shutdown

switch(config)# interface 1/1/1
switch(config-if)# vrrp 1 address-family ipv4
switch(config-if-vrrp)# no shutdown
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

timers advertise

```
timers advertise <ADVERTISE-IN-MILLISECONDS>
no timers advertise
```

Description

Sets the advertisement interval in ms (100-40950). The default value is 1000. Advertisement interval can be configured in multiples of 1,000 ms.

The `no` form of this command sets the advertisement interval in ms to the default value of 1000.

This release does not support sub-second timer for VRRPv3.

Examples

Setting the advertisement interval in ms to 2000:

```
switch(config)# interface 1/1/1
switch(config-if)# vrrp 1 address-family ipv4
switch(config-if-vrrp)# timers advertise 2000
```

Setting the advertisement interval in ms to the default value of 1000:

```
switch(config)# interface 1/1/1
switch(config-if)# vrrp 1 address-family ipv4
switch(config-if-vrrp)# no timers advertise
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Administrators or local user group members with execution rights for this command.

track (VRRP group)

```
track <OBJECT-ID>
no track <OBJECT-ID>
```

Description

Sets the track object ID (1-128) for the group. The track object is first configured globally for the interface and then attached to the VRRP virtual router.

The track object must not track the same interface for which a VRRP group is configured.

The no form of this command removes the track object ID from the group.

Examples

Setting the track object ID for the group:

```
switch(config)# interface 1/1/1
switch(config-if)# vrrp 1 address-family ipv4
switch(config-if-vrrp)# track 1
```

Removing the track object ID from the group:

```
switch(config)# interface 1/1/1
switch(config-if)# vrrp 1 address-family ipv4
switch(config-if-vrrp)# no track 1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360	config	Administrators or local user group members with execution rights for this command.

Platforms	Command context	Authority
9300 10000		

track (VRRP virtual router)

```
track <OBJECT-ID>
no track <OBJECT-ID>
```

Description

Configures a track object that can be associated with an interface. A change in interface state will then affect the priority of a VRRP group. By default, no interface is associated to a track object, so state is down.

The `no` form of this command deletes a tracked object for an interface. If it is not associated with a VRRP virtual router, a track object cannot be deleted.

Track cannot be configured by using port with no routing.

When all tracked interfaces go down on a virtual router, priority is automatically set to zero instead of its configured value. Owner virtual routers always use a default priority of 255.

Parameter	Description
<OBJECT-ID>	Specify the track object ID value. Range: 1 to 128.

Examples

Configuring a tracked object:

```
switch(config)# track 1
```

Deleting a tracked object:

```
switch(config)# no track 1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325	config	Administrators or local user group members with execution rights for this command.

Platforms	Command context	Authority
8360 9300 10000		

track by

```
track by <OBJECT-ID>
no track by <OBJECT-ID>
```

Description

Specifies an interface to be tracked when changes in the state of the interface affect the priority of a VRRP group. Once track is associated with an interface, the track state reflects the interface forwarding state.

The `no` form of this command removes an interface from tracking, affecting VRRP states of any interfaces associated with VRRP groups.

The VLAN interface 1 is always tracked.

Parameter	Description
<OBJECT-ID>	Specifies the track object ID value. Range: 1 to 128.

Example

Specifying an interface to be tracked:

```
switch (config)# interface 1/1/1
switch (config-if)# track by 1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

version

```
version <VERSION-NUMBER>
```

Description

Sets the protocol version for the VRRP group. Version change is allowed only for the IPv4 address-family. The default value is 2, which supports IPv4 with minimum 1 second advertisement interval. Value 3 supports IPv4 and IPv6 with minimum 1 second advertisement interval.

Parameter	Description
<VERSION-NUMBER>	Specifies the VRRP protocol version. Possible values: 2 or 3. The default value is 2, which supports IPv4 with a minimum 1 second advertisement interval.

Example

Setting the protocol version for the VRRP group to 3:

```
switch(config)# interface 1/1/1
switch(config-if)# vrrp 1 address-family ipv4
switch(config-if-vrrp)# version 3
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Administrators or local user group members with execution rights for this command.

vrrp

```
vrrp <VRID> address-family {ipv4  | ipv6}
no vrrp <VRID> address-family {ipv4  | ipv6}
```

Description

Creates a VRRP group and establishes VRRP group configuration context.

- A maximum of 16 VRRP groups, including both IPv4 and IPv6, are supported on an interface.
- A maximum of 256 VRRP groups is supported on a router. The groups can be IPv4 or IPv6 as per first come first serve basis.

The no form of this command deletes a VRRP group.

Parameter	Description
<VRID>	Selects the VRRP router ID value. Range: 1 to 255.
`address-family [IPv4 | IPv6]`	Specifies which address family to use, IPv4 or IPv6.

Examples

```
switch(config)# interface 1/1/1
switch(config-if)# vrrp 1 address-family ipv4
switch(config-if-vrrp)#

switch(config-if-vrrp)# no vrrp 1 address-family ipv4
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

Virtual Routing and Forwarding (VRF) allows a physical router to be partitioned into multiple Virtual Router Forwarding instances. The control and data plane are isolated in each VRF. This isolation keeps the traffic from crossing VRFs, and therefore multiple routing tables can coexist within the same physical L3 switch/router.

Route leaking allows for routes to leak (be distributed), across multiple VRFs in a controlled manner. Two methods to leak routes from one VRF to another are:

- Using static routes.
- Using Multiprotocol BGP (MP-BGP) (dynamic route leaking using route-targets).

Troubleshooting IVRL

If the RADIUS server configuration is not in the same VRF as the actual server, then the client authentication can fail because the server times out.In the following configuration, the RADIUS server configuration is in **VRF ADMIN** and the IP is reachable on **VRF USER**. This configuration can cause port-access client authentication to fail due to a server timeout error.

```
radius-server host 10.1.1.20 key ciphertext
AQBapYuQcBB2A0RVgSPc/7H5lfSBrt8rwbNhTouCxjeE4L8SCQAAAGZ3ykq9PEswPA== tracking enable
vrf ADMIN
radius-server host 10.1.1.21 key ciphertext
AQBapYuQcBB2A0RVgSPc/7H5lfSBrt8rwbNhTouCxjeE4L8SCQAAAGZ3ykq9PEswPA== tracking enable
vrf ADMIN
interface 1/3/47
  no shutdown
  routing
  vrf attach USER
  ip address 10.10.100.1/30
ip route 10.1.1.0/24 10.10.100.2 vrf USER
```

Best practices is to either have the RADIUS server configuration in the VRF to which the server is connected, or to leak the connected route to the VRF with the RADIUS server configuration.

This example resolves the issue in the previous configuration by leaking route to the VRF **VRF ADMIN.**

```
p route 10.10.100.0/30 1/1/1 vrf ADMIN"
```

Static VRF route leaking

Static VRF route leaking between two VRFs is allowed using an IP route configuration command. To accomplish the route leak:

- The routes being leaked to other VRFs must be present in the source VRF.
- When a route leak has been accomplished and is therefore present in the source VRF, that route can then be leaked to other VRFs.

Dynamic VRF route leaking

Dynamic VRF route leaking is allowed between two or more VRFs. Dynamic VRF is configured using export and import route-targets. Multiprotocol BGP (MP-BGP) is used to leak routes between the VRFs. To configure MP-BGP, a separate address-family must be configured within BGP for each VRF, and simply redistribute routes (OSPF, static or connected) within that VRF for the routes to be leaked.

Dynamic VRF route leak restrictions and limitations

- The maximum number of route targets supported in each VRF, including in the default VRF context, is 256.
- The maximum number of supported dynamic leaked routes per system is 16K.
- Multicast route leaking is not supported.
- Route filtering on leaked routes cannot be performed, when BGP is used as routing protocol.
- On the same switch, more than one level of Inter-VRF route leaking, or cascaded IVRL, is not supported. For example, VRF1 to VRF2 with the default being the intermediate VRF.
- The EVPN address family is not supported under the default VRF.
- The mgmt VRF cannot be used for VRF rout leaking.
- Extended Community cannot be sent to the neighbors with the prefix.

Procedure to leak routes between VRFs

1. Enter the VRF context (if the named VRF does not exist, it is created).
2. Configure the route distinguisher (RD) for each VRF.
3. Configure the appropriate address-family for each VRF.
4. Configure the BGP route targets.
5. Associate the VRFs with the interfaces.
6. Configure IP addresses on the interface.
7. Enable the required IGP protocol (for example, OSPF) on the VRF.
8. Configure multiprotocol BGP.
9. Redistribute the routes (OSPF, static or connected routes) to be leaked into BGP.
   Multiprotocol BGP (MP-BGP) will be used to leak routes between VRFs. To configure MP-BGP, you must configure a separate address-family within BGP for each VRF, and simply redistribute routes (OSPF, static or connected) within that VRF for the routes to be leaked.

Troubleshooting inter-VRF route leaking

If the RADIUS server configuration is not in the same VRF as the actual server, client authentication can fail because the server times out. In the following example configuration, the RADIUS server configuration is in **VRF ADMIN** and the IP is reachable on **VRF USER**. This configuration can cause port-access client authentication to fail due to a server timeout error.

```
radius-server host 10.1.1.20 key ciphertext
AQBapYuQcBB2A0RVgSPc/7H5lfSBrt8rwbNhTouCxjeE4L8SCQAAAGZ3ykq9PEswPA== tracking enable
vrf ADMIN
radius-server host 10.1.1.21 key ciphertext
AQBapYuQcBB2A0RVgSPc/7H5lfSBrt8rwbNhTouCxjeE4L8SCQAAAGZ3ykq9PEswPA== tracking enable
vrf ADMIN
interface 1/3/47
  no shutdown
  routing
  vrf attach USER
  ip address 10.10.100.1/30
ip route 10.1.1.0/24 10.10.100.2 vrf USER
```

Best practices is to either have the RADIUS server configuration in the VRF to which the server is connected, or to leak the connected route to the VRF with the RADIUS server configuration.

This example resolves the issue in the previous configuration by leaking the route to the VRF **VRF ADMIN.**

```
ip route 10.10.100.0/30 1/1/1 vrf ADMIN"
```

IVRF commands

address-family

```
address-family [<AFI> | <SAFI>] [ipv4 | ipv6] [unicast]
[no] address-family <AFI> | <SAFI>
```

Description

Initializes the appropriate address-family and enters address-family configuration mode for IPv4 or IPv6. The unicast option is available to configure the subaddress family identifier.

The `no` form of the command removes the association of the specified address-family. The address-family specific routes that are leaked from this VRF will be withdrawn.

Parameter	Description
`AFI`	Required: Specifies address family identifier.
`SAFI`	Required: Specifies subaddress family identifier.|
`ipv4`	Optional: IPv4 address family
`ipv6`	Optional: IPv6 address family
`unicast`	The subaddress family identifier. When the unicast option is used, the command context changes to `config-vrf-af-ipv4-uc#`.

Examples

Address family command for IPv4 unicast:

```
switch(config-vrf)#address-family ipv4 unicast
```

```
switch(config-vrf)#no address-family ipv4 unicast
```

Address family command for IPv6 unicast:

```
switch(config-vrf)#address-family ipv6 unicast
switch(config-vrf)#no address-family ipv6 unicast
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-vrf	Administrators or local user group members with execution rights for this command.

ip|ipv6 vrf

`[ip|ipv6] route <PREFIX> <SRC-VRF-LOCAL-IFACE><SRC-VRF-NEXTHOP-IP> vrf <DST-VRF-NAME>`
`no [ip|ipv6] route <PREFIX> <SRC-VRF-LOCAL-IFACE><SRC-VRF-NEXTHOP-IP> vrf <DST-VRF-NAME>`

Description

The IP/IPv6 route command sets the subnet mask, the reachable network interface, the next-hop IP for the reachable network, and the VRF route leak destination.

Parameter	Description
<PREFIX>	The subnet mask (prefix of the network).
<SRC-VRF-LOCAL-IFACE>	The interface which is reachable by the network.
<SRC-VRF-NEXTHOP-IP>	The next-hop IP for the reachable network.
<DST-VRF-NAME>	The VRF route leak destination.

Examples

Using the command, leak the named route Blue VRF, using prefix 100.0.0.0/24 which is reachable by the next-hop IP 20.0.0.1 on the interface 1/1/1 from VRF Red:

```
switch(config)# ip route 100.0.0.0/24 1/1/1 20.0.0.1 vrf blue
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

ipv6 route source interface

```
ipv6 route <IPv6 ADDR/MEMBER><IPv6 ADDR> source  <INTERFACE>
 [<DISTANCE> | <VRF INSTANCE-NAME>]
no ipv6 route
```

Description

Creates a route leak between the source VRF and destination VRF. Using the static method, the route must first be added to the destination VRF. The route is added to the local interface of the source VRF with a next-hop interface. The existing IPv6 route command takes the source interface only when next-hop IP is link-local. To support VRF route leaking for global IPv6 unicast addresses, the command takes next-hop interface information along with next-hop IP regardless of next-hop IP is link-local or not.

- Users must provide both the next-hop IP and the interface information to leak the global unicast IPv6 network routes (route that is not directly reachable).
- The next-hop IP information is not required to leak connected global unicast IPv6 routes (route that is directly reachable).

The `[no]` form of command deletes the static VRF leaked route.

Parameter	Description
`<IPv6 ADDR/MEMBER>`	Required: IPv6 IP-Address route destination.
`<IPv6 ADDR>`	Required: IPv6 route destination
`<INTERFACE>`	Required: The outgoing interface. Use the format `member/slot/port` (for example, `1/3/1`).
`<DISTANCE>`	Optional: administrative distance of static route
`<VRF INSTANCE-NAME>`	Optional: VRF instance

Options

`nullroute`

Discard packets to the destined route silently.

`reject`

Discard packets to the destined route and return ICMP error to the sender.

Examples

Configures a route leak between the source VRF and destination VRF:

```
switch(config)# show runn
Current configuration:
!
vrf blue
      vrf green
vrf red
      !

vlan 1
               interface 1/1/1
               no shutdown
                      vrf attach red
        ip address 2000::1/64
                      interface 1/1/2
                      no shutdown
                      vrf attach green
               ip address 3000::1/64
               interface 1/1/3
                      no shutdown
               vrf attach blue
               ip address 4000::1/64


      switch(config)# ipv6 route 5000::0/64 3000::2 source 1/1/2 vrf red
switch(config)# ipv6 route 6000::0/64 3000::3 source 1/1/2 vrf blue


      switch(config)# show runn
Current configuration:
!
vrf blue
      vrf green
vrf red
      !

vlan 1
               interface 1/1/1
               no shutdown
                      vrf attach red
               ip address 2000::1/64
                      interface 1/1/2
                      no shutdown
                      vrf attach green
               ip address 3000::1/64
               interface 1/1/3
                      no shutdown
               vrf attach blue
        ip address 4000::1/64

        ipv6 route 5000::0/64 3000::2 source 1/1/2 vrf red
  ipv6 route 6000::0/64 3000::3 source 1/1/2 vrf blue

              switch(config)# no ipv6 route 5000::0/64 3000::2 source 1/1/2 vrf red
               switch(config)# no ipv6 route 6000::0/64 3000::3 source 1/1/2 vrf blue

      switch(config)# show runn
Current configuration:
```

```
!
      vrf blue
      vrf green
vrf red
      !

      vlan 1
                              interface 1/1/1
                              no shutdown
               vrf attach red
                              ip address 2000::1/64
                      interface 1/1/2
                      no shutdown
                       vrf attach green
                 ip address 3000::1/64
                       interface 1/1/3
                      no shutdown
                      vrf attach blue
                      ip address 4000::1/64
```

Command History

Release	Modification
10.10	Inclusive language update.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

ip route interface

```
ip route <IPv4 ADDR/MEMBER> interface <IPv4 ADDR>
 [<DISTANCE> | <VRF INSTANCE-NAME>]
no ip route
```

Description

Creates a route leak between the SRC-VRF and DST-VRF. Using the static method, the route must first be added to the destination VRF. The route is added to the local interface of the source VRF with a next-hop interface. The existing IP route command can then take either the next-hop IP or the next-hop interface.

- `INTERFACE` refers to the outgoing interface in an m/s/p format
- Users must provide both the next-hop IP and the interface information to leak network routes.
- The next-hop IP information is not required to leak connected routes.

The `[no]` form of command deletes the static VRF leaked route.

Parameter	Description
<IPv4 ADDR/MEMBER>	Required: IPv4 IP-Address route destination.
<IPv4 ADDR>	Required: IPv4 route destination
<DISTANCE>	Optional: administrative distance of static route
<VRF INSTANCE-NAME>	Optional: VRF instance

Options

`nullroute`

Discard packets to the destined route silently.

`reject`

Discard packets to the destined route and return ICMP error to the sender.

Example

Configures a route leak between the SRC-VRF and DST-VRF:

```
switch(config)# show runn
Current configuration:
!
vrf blue
      vrf green
vrf red
      !

vlan 1
       interface 1/1/1
       no shutdown
              vrf attach red
       ip address 10.0.0.1/24
              interface 1/1/2
              no shutdown
              vrf attach green
       ip address 20.0.0.1/24
       interface 1/1/3
              no shutdown
       vrf attach blue
       ip address 40.0.0.1/24

      switch(config)# ip route A.B.C.D/M IPv4 route destination
      switch(config)# ip route A.B.C.D/M IPv4 route destination
      switch(config)# ip route 30.0.0.0/24 A.B.C.D Nexthop IPv4 address
      switch(config)# ip route 30.0.0.0/24 1/1/2 A.B.C.D Nexthop IPv4 address
      switch(config)# ip route 30.0.0.0/24 20.0.0.2 vrf green
      switch(config)# ip route 30.0.0.0/24 1/1/2 20.0.0.2 vrf red
      switch(config)# ip route 50.0.0.0/24 1/1/2 20.0.0.2 vrf blue
      switch(config)# ip route 50.0.0.0/24 20.0.0.2 vrf green
      switch(config)# ip route 60.0.0.0/24 1/1/2 vrf red

      switch(config)# show runn
Current configuration:
!
vrf blue
      vrf green
vrf red
      !
```

```
vlan 1
       interface 1/1/1
       no shutdown
              vrf attach red
       ip address 10.0.0.1/24
              interface 1/1/2
              no shutdown
              vrf attach green
       ip address 20.0.0.1/24
       interface 1/1/3
              no shutdown
       vrf attach blue
       ip address 40.0.0.1/24
       ip route 30.0.0.0/24 1/1/2 20.0.0.2 vrf red
       ip route 50.0.0.0/24 1/1/2 20.0.0.3 vrf blue
       ip route 60.0.0.0/24 1/1/2 vrf red


      switch(config)# no ip route 30.0.0.0/24 1/1/2 20.0.0.2 vrf red
      switch(config)# no ip route 50.0.0.0/24 1/1/2 20.0.0.3 vrf blue
      switch(config)# no ip route 60.0.0.0/24 1/1/2 vrf red

      switch(config)# show runn
Current configuration:
!
      vrf blue
      vrf green
vrf red
      !

      vlan 1
      interface 1/1/1
      no shutdown
      vrf attach red
      ip address 10.0.0.1/24
      interface 1/1/2
      no shutdown
      vrf attach green
      ip address 20.0.0.1/24
      interface 1/1/3
      no shutdown
      vrf attach blue
      ip address 40.0.0.1/24
```

Command History

Release	Modification
10.10	Inclusive language update.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300	`config`	Administrators or local user group members with execution rights

Platforms	Command context	Authority
6400 8320 8325 8360 9300 10000		for this command.

rd

```
rd <AS-NUMBER:NN>
no rd <AS-NUMBER:NN>
```

Description

Configures VRF table with specified route-distinguisher value. An RD ensures uniqueness of a route between multiple VRFs.

The no form of the command will delete RD from a specified VRF table. The VRF instance goes down when RD is deleted. All routes that are exported or leaked from the deleted VRF will be withdrawn.

Parameter	Description
<AS-NUMBER:NN>	Required: Enter an AS number and an arbitrary number.

Examples

Configures VRF for RD with an AS number 100:1.

```
switch(config-vrf)# rd 100:1
```

Deletes the RD from the specified VRF.

```
switch(config-vrf)# no rd
```

Deletes the RD and AS number from the specified VRF.

```
switch(config-vrf)# no rd 100:1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300	`config-vrf`	Administrators or local user group members with execution rights

Platforms	Command context	Authority
6400 8320 8325 8360 9300 10000		for this command.

redistribute

```
redistribute <protocol> [route-map <route-map-name>]
[no] redistribute <protocol> [route-map <route-map-name>]
```

Description

Specifies the protocol routes to redistribute to BGP VRF context. Any routes existing in the BGP VRF context are leaked as a VPNv4 or VPNv6 prefixes to other VRFs based on BGP route-targets.

The `no` form of this command removes the protocol.

Parameter	Description
`redistribute`	Required: redistributes routes from another routing protocol.
`connected`	Optional: redistribute directly attached networks.
`ospfv3`	Optional: redistributes OSPFv2 routes.
`static`	Optional: redistributes static routes.
`route-map`	Optional: applies route map policy for redistribution.

Examples

The following is an example of redistributing OSPFv2 routes to a BGP `vrf cust_a` instance by creating a router BGP instance for `cust_a`.

1. Creating the router BGP instance for `cust_a`.

```
switch(config)# router bgp 1
switch(config-router) # vrf cust_a
```

2. Redistributing the router to BGP.

```
switch(config-router-bgp)# redistribute ospf
```

The following is an example of redistributing OSPFv3 routes to a BGP `vrf cust_a` instance by creating a router BGP instance for `cust_a`.

1. Creating the router BGP instance for `cust_a`

```
switch(config)# router bgp 100
```

```
switch(config-router)# vrf cust_a
```

2. Configuring the address family IPv6 unicast to the router

```
switch(config-router-bgp)# address-family ipv6 unicast
```

3. Redistributing the router to OSPFv3

```
switch(config-router-ipv6-uc)# redistribute ospfv3
```

4. Redistributing the router configured with `ipv6-af-us` to OSPFv3

```
switch(config-router-bgp-vrf-ipv6-af-uc)# redistribute ospfv3
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

route-target

```
route-target [import | export | both] <AS-NUMBER:NN>
no route-target [import | export | both] <AS-NUMBER:NN>
```

Description

BGP route targets are extended BGP communities that identify the VPNv4 or VPNv6 routes that are associated with a VRF. This command specifies the route targets used on the import or export of the routes to other VRFs. Multiple route targets can be associated with a VRF.

The `no` form of the command removes the association.

Parameter	Description
`import`	Specifies the RTs imported to the VRF. Import or export or both required Literal Specifies the route-target type.

Parameter	Description
`export`	Specifies the RT on VPNv4 or VPNv6 prefixes that are leaked to other VRFs.
`both`	Specifies the RT for both export and import types.
<AS-NUMBER:NN>	Specifies an AS number and an arbitrary number for the RT value.

Examples

Configuring route targets for several VRFs.

```
switch(config)# vrf default
switch(config-vrf)# rd 192.168.2.1:0
switch(config-vrf)# address-family ipv4 unicast
switch(config-vrf-ipv4-af-uc)# route-target export 65001:0
switch(config-vrf-ipv4-af-uc)# route-target import 65001:1
switch(config-vrf-ipv4-af-uc)# route-target import 65001:2
switch(config-vrf-ipv4-af-uc)# exit-address-family
switch(config-vrf)# exit
switch(config)# vrf VRF1
switch(config-vrf)# rd 192.168.2.1:1
switch(config-vrf)# address-family ipv4 unicast
switch(config-vrf-ipv4-af-uc)# route-target export 65001:1
switch(config-vrf-ipv4-af-uc)# route-target import 65001:0
switch(config-vrf-ipv4-af-uc)# exit-address-family
switch(config-vrf)# exit
switch(config)# vrf VRF2
switch(config-vrf)# rd 192.168.2.1:2
switch(config-vrf)# address-family ipv4 unicast
switch(config-vrf-ipv4-af-uc)# route-target export 65001:2
switch(config-vrf-ipv4-af-uc)# route-target import 65001:0
switch(config-vrf-ipv4-af-uc)# exit-address-family
switch(config-vrf)# exit
```

Configuring the route target for export. Removing the configuration for export.

```
switch(config-vrf-ipv4-af-uc)# route-target export 100:1

switch(config-vrf-ipv4-af-uc)# no route-target export 100:1
```

Configuring the route target for import. Removing the configuration for import.

```
switch(config-vrf-ipv4-af-uc)# route-target import 100:2

switch(config-vrf-ipv4-af-uc)# no route-target import 100:2
```

Configuring the route target for both import and export. Removing the configuration for import and export.

```
switch(config-vrf-ipv4-af-uc)# route-target both 100:3

switch(config-vrf-ipv4-af-uc)# no route-target both 100:3
```

Command History

Release	Modification
10.09	Added a new example.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Manager (#)	Administrators or local user group members with execution rights for this command.

router bgp

```
router bgp <AS-NUMBER>
no router bgp <AS-NUMBER>
```

Description

This command configures the BGP instance on the router, configures the AS (Autonomous System) the router belongs to, and enters into the BGP router configuration mode. Only a single BGP AS number can be assigned for the entire system.

The `no` form of the command deletes the BGP instance from the router.

Parameter	Description
AS-NUMBER	Specifies a 4-byte AS number in the range 1-4294967295 in integer format or from 0.1-65535.65535 in dotted format.

Examples

Configuring the BGP instance with the AS number:

```
switch(config)# router bgp 100
```

Deleting BGP configurations:

```
switch(config)# no router bgp 100
This will delete all BGP configurations on this device.
Continue (y/n)?
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

router bgp vrf

```
router bgp <AS-NUMBER> [vrf <VRF-NAME>]
[no] router bgp <AS-NUMBER> [vrf <VRF-NAME>]
```

Description

This command configures VRF for the BGP instance.

The `no` form of this command removes the configuration.

Parameter	Description
AS-NUMBER	Specifies a 4-byte AS number in the range 1-4294967295 in integer format or from 0.1-65535.65535 in dotted format.
<VRF-NAME>	String VRF name for the VRF.

Usage

- Use the command `vrf vrf-name` within the router BGP context.
- `address-family {ipv4 | ipv6}` nodes are only supported within the VRF context.
- `address-family {ipv4 | ipv6}` nodes are required to redistribute the OSPF static/connected IPv4 or IPv6 routes.

Examples

Configure the VRF for customer A, on the BGP instance 100:

```
switch(config)# router bgp 100
switch(config)# vrf cust_a
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

show bgp vpn unicast

`show bgp [vrf <VRF-NAME>][{ipv4 unicast | ipv6 unicast| ipv4 unicast| all unicast}] [vsx-peer]`

Description

Shows the BGP-VPN per VRF routes with additional route information like RD and extended community route targets.

Displays the BGP neighbor information for the specified VRF.

By default the default_vrf BGP instance information is displayed if the VRF is not specified.

Parameter	Description
`unicast`	Selects the subaddress family identifier
`all`	Displays VPNv4 address family routes for all VRFs
`vrf`	Displays VPNv4 address-family routes for specified VRF
`vpn-addr-family`	Required: Literal Select the VPNv4 or VPNv6 address family
`vrf-name`	Required: Literal or string. Specify `all` or *`vrf-name`*.
`vsx-peer`	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

Required use of *`vpn-addr-family`*:

```
switch# show bgp <vpn-addr-family> unicast {all | [vrf <vrf-name> | A.B.C.D/M}
```

Show BGP VRF ipv4 unicast routes for vrf-name

```
switch# show bgp vrf Red ipv4 unicast
       Status codes: s suppressed, d damped, h history, * valid, > best, = multipath
       i internal, e external, S Stale, R Removed
       Origin codes: i - IGP, e - EGP, ? - incomplete

  VRF: Red
```

```
  Local Router-ID 172.16.3.1

  Network           Nexthop       Metric  LocPrf  Weight Path
  Route Distinguisher: 65000:1
  *> 172.16.0.0/24  0.0.0.0       0       100     32768      ?
  *> 172.16.1.0/24  0.0.0.0       0       100     32768      ?
  *> 172.16.2.0/24  172.16.0.2    0       100     32768      ?
  *> 172.16.3.0/24  172.16.0.3    0       100     32768      ?

  Total number of entries 4
```

```
switch# show bgp vrf Green ipv4 unicast
       Status codes: s suppressed, d damped, h history, * valid, > best, = multipath
       i internal, e external, S Stale, R Removed
       Origin codes: i - IGP, e - EGP, ? - incomplete

               VRF: Green
  Local Router-ID 172.17.2.1

  Network           Nexthop       Metric  LocPrf  Weight Path
  Route Distinguisher: 65000:2
  *> 172.17.0.0/24  0.0.0.0       0       100     32768      ?
  *> 172.17.1.0/30  0.0.0.0       0       100     32768      ?
  *> 172.17.2.0/24  172.17.0.2    0       100     32768      ?

  Total number of entries 3
```

```
switch# show bgp vrf Blue ipv4 unicast
       Status codes: s suppressed, d damped, h history, * valid, > best, = multipath
       i internal, e external, S Stale, R Removed
       Origin codes: i - IGP, e - EGP, ? - incomplete

  VRF: Blue
  Local Router-ID 172.18.3.1

               Network           Nexthop       Metric  LocPrf  Weight Path
  Route Distinguisher: 65000:3
  *> 172.18.0.0/24  0.0.0.0       0       100     32768      ?
  *> 172.18.1.0/30  0.0.0.0       0       100     32768      ?
  *> 172.18.3.0/24  172.18.0.3    0       100     32768      ?

  Total number of entries 3
```

```
switch# show bgp vrf Shared ipv4 unicast
       Status codes: s suppressed, d damped, h history, * valid, > best, = multipath
       i internal, e external, S Stale, R Removed
       Origin codes: i - IGP, e - EGP, ? - incomplete

  VRF: Shared
  Local Router-ID 192.168.99.1

               Network             Nexthop       Metric  LocPrf  Weight Path
  Route Distinguisher: 65000:99
  *> 192.168.99.0/24  0.0.0.0       0       100     32768      ?
```

```
  Total number of entries 1
```

Show BGP VRF ipv6 unicast routes for vrf-name:

```
switch# show bgp vrf Red ipv6 unicast
       Status codes: s suppressed, d damped, h history, * valid, > best, = multipath
       i internal, e external, S Stale, R Removed
       Origin codes: i - IGP, e - EGP, ? - incomplete

  VRF: Red
  Local Router-ID 172.16.3.1

  Network           Nexthop       Metric  LocPrf  Weight Path
  Route Distinguisher: 65000:1
  *  2001:100:1:1000:/56
        2001:100:1:1000::72a     0       0       200      ?
  *> 2001:100:1:1000::/56
          ::                     0       100     32768    ?
  *  2001:100:1:2000::/56
        ::FFFF:200.10.10.1 0     0       100     32768    ?

  Total number of entries 3
```

Show BGP VRF routes for all vrfs and all address-families:

```
switch# show bgp all-vrf all
       Status codes: s suppressed, d damped, h history, * valid, > best, = multipath
       i internal, e external, S Stale, R Removed
       Origin codes: i - IGP, e - EGP, ? - incomplete

  VRF: Blue
  Local Router-ID 172.18.3.1

  Address-family: IPv4 Unicast
              ------------------------------
  Network           Nexthop       Metric  LocPrf  Weight Path
  *> 172.18.0.0/24  0.0.0.0       0       100     32768    ?
  *> 172.18.1.0/30  0.0.0.0       0       100     32768    ?
  *> 172.18.3.0/24  172.18.0.3    0       100     32768    ?

  Total number of entries 3

  Address-family: IPv6 Unicast
              ------------------------------
  Network           Nexthop       Metric  LocPrf  Weight Path

  Toatl number of entries 0

  VRF: Green
  Local Router-ID 172.17.2.1

  Address-family: IPv4 Unicast
              ------------------------------
  Network           Nexthop       Metric  LocPrf  Weight Path
  *> 172.17.0.0/24  0.0.0.0       0       100     32768    ?
  *> 172.17.1.0/30  0.0.0.0       0       100     32768    ?
  *> 172.17.2.0/24  172.17.0.2    0       100     32768    ?
```

```
Total number of entries 3

Address-family: IPv6 Unicast
              ----------------------------
Network           Nexthop       Metric  LocPrf  Weight Path

Total number of entries 0

VRF: Red
Local Router-ID 172.16.3.1

Address-family: IPv4 Unicast
              ----------------------------
Network           Nexthop       Metric  LocPrf  Weight Path
*> 172.16.0.0/24  0.0.0.0       0       100     32768    ?
*> 172.16.1.0/24  0.0.0.0       0       100     32768    ?
*> 172.16.2.0/24  172.16.0.2    0       100     32768    ?
*> 172.16.3.0/24  172.16.0.3    0       100     32768    ?

Total number of entries 4

Address-family: IPv6 Unicast
              ----------------------------
Network           Nexthop       Metric  LocPrf  Weight Path
*  2001:100:1:1000::/56
       2001:100:1:1000::72a     0       0       200      ?
*> 2001:100:1:1000::/56
         ::                     0       100     32768    ?
*  2001:100:1:2000::/56
       ::FFFF:200.10.10.1 0     0       100     32768    ?

Total number of entries 3

VRF: Shared
Local Router-ID 192.168.99.1

Address-family: IPv4 Unicast
              ----------------------------
Network             Nexthop       Metric  LocPrf  Weight Path
*> 192.168.99.0/24  0.0.0.0       0       100     32768    ?

Total number of entries 1

Address-family: IPv6 Unicast
              ----------------------------
Network           Nexthop       Metric  LocPrf  Weight Path

Total number of entries 0
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show bgp info vrf

```
show bgp info vrf <vrf-name> [vsx-peer]
```

Description

Displays BGP route-targets information for specified VRF.

Parameter	Description
info	Display BGP RT information.
vrf-name	Required string VRF name for the vrf.
vsx-peer	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Example

Show BGP VRF information.

```
switch# show bgp info vrf red
 VRF : red
       VRF RD : 100:1

       Address-family IPv4 unicast info
       Redistribution : ospf
       Export RT list : 100:1 100:2
       Import RT list : 100:3

       Address-family IPv6 unicast info
       Redistribution : connected
 Export RT list : 100:11 100:12
 Import RT list : 100:15
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show ip route vrf

```
show ip route vrf <vrf-name> [vsx-peer]
```

Description

Shows route information for specified VRF.

Parameter	Description
vrf-name	Required: string VRF name for the VRF.
vsx-peer	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Example

```
switch# show ip route vrf green

       Displaying ipv4 routes selected for forwarding
        '[x/y]' denotes [distance/metric]
               10.0.0.0/24, vrf green
                via 20.0.0.1[vrf red], [1/0], static
                30.0.0.0/24, vrf green
                via 1/1/2, [0/0], connected
   30.0.0.2/32, vrf green
                via 1/1/2, [0/0], local
                60.0.0.0/24, vrf green
                via 1/1/1[vrf red], [1/0], static
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300	Operator (>) or Manager	Operators or Administrators or local user group members with

Platforms	Command context	Authority
6400 8320 8325 8360 9300 10000	(#)	execution rights for this command. Operators can execute this command from the operator context (>) only.

show ipv6 route vrf

```
show ipv6 route vrf <VRF-NAME> [vsx-peer]
```

Description

Shows the route information for specified VRF.

Parameter	Description
<VRF-NAME>	Required: String VRF name for the VRF.
vsx-peer	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

Displaying ipv6 routes selected for forwarding:

```
switch# show ipv6 route vrf red
  '[x/y]' denotes [distance/metric]
                1000::/64, vrf red
                via 1/1/1[vrf green], [0/0], connected
                1000::1/128, vrf red
                via 1/1/1[vrf green], [0/0], local
                3005::/64, vrf red
                via 1000::2[vrf green], [2/0], static
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

Platforms	Command context	Authority
9300 10000		

vrf

```
vrf <VRF-NAME>
no vrf <VRF-NAME>
```

Description

Creates a VRF instance named *<VRF-NAME>* and then enters its context. Use `default` for *<VRF-NAME>* to enter the default VRF configure context.

Except for the default VRF, the `no` form of the command deletes the named VRF instance and any IP configuration for interfaces or SVI linked to default VRF. The default VRF cannot be deleted and a warning is given if attempted. To erase the Route-Distinguisher and Route-Targets, enter the default VRF context and delete them manually one by one.

Parameter	Description
<VRF-NAME>	Specifies the VRF name. Range: Up to 32 alphanumeric characters. The `mgmt` VRF cannot be used.

Examples

Creating the VRF named **cust_A** and then entering its context:

```
switch(config)# vrf cust_A
```

Entering the **default** VRF context:

```
switch(config)# vrf default
```

Deleting the VRF named **test**:

```
switch(config)# no vrf test
```

Command History

Release	Modification
10.09	Added default VRF information.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

Policy Based routing (PBR) lets you manipulate the path of a packet based on the various attributes of the packet. Packets that can be manipulated by PBR are packets that are already routing through the system at Layer 3, with a destination IP address that is on a network other than the packet ingress Layer 3 interface. PBR is an extension of the existing classifier policy system where traffic to be manipulated is matched by a classifier **class**, and policy **actions** to be executed on the matching traffic. Matching traffic with the same destination can be routed over different paths so that different types of traffic, such as VoIP or traffic with special security requirements, can be better managed.

PBR's ability to influence a packet path is limited to the current router in that the next router to which the traffic is redirected makes an independent decision on where to forward traffic to next, if anywhere. Packets not matched by a PBR policy entry are not affected and take routes specified in the system route table.

PBR actions

- **interface null:** equivalent to the policy **drop** policing action. Any packets matching the class criteria for that policy entry will be dropped and not routed any further.
- **interface tunnel:** allows for specifying a GRE, 6in4 or 6in6 tunnel as the outbound interface for all matching packets. The tunnel must exist before configuring. Packets sent into the tunnel interface egress at the router at the endpoint of the tunnel. If the tunnel is misconfigured or down the traffic may be lost.
- **nexthop:** allows for overriding the routing table's longest prefix match next-hop router for matching packets. If no such routing table entry exists for matching packets, (default or not) this action still affects matching packets.
- **default-nexthop:** allows for specifying a next-hop router for matching packets when there is no longest prefix match for those packets in the routing table. Such a default-nexthop overrides a system default route if already configured and also applies if there is no system default route.

- Next-hop and default-nexthop facilitate routing matching packets where they otherwise might not be, due to the absence of routing table entries.
- Unlike next-hop, default-nexthop only applies if there is no destination lookup match in the main routing table for matching packets.

PBR policy action and action list

Entries in a policy use a class to specify the criteria on what packets to match and a set of one or more policy actions to take on the matching packets such as dscp or mirror.

PBR is configured for use as another such policy action in a policy entry by using the `pbr` keyword followed by the name of a user configured PBR action list. This list may contain up to eight PBR action entries which

are listed according to priority by sequence number. The PBR actions section lists the different action entry choices.

In a given action list applied to an interface, zero entries may be available (that is, reachable). Of the entries that are available, only one can be active for that action list in a given VRF. Due to real-time changes in the network operating environment, list entry availability can change at any moment. At any given time, the highest priority available entry in the list is selected as the active PBR action for that list. If the active entry becomes unavailable, the next highest available entry is automatically selected and replaces that now-unavailable entry as the active entry. If a higher priority entry (other than the current active entry) becomes available, this entry is selected and replaces the current active entry, as the new active entry (even though that current entry is still available). If no entries are available or the only available entry becomes unavailable, routing occurs based on the routing table and is not influenced by PBR.

The **interface null** action is always considered available. If there are no higher priority PBR actions available, it will be selected as the active entry when configured in a PBR action list, and applied to an interface.

PBR action list maximum entries

There is a limit of eight entries per action list and a limit of 512 unique entries across the entire system. This value restricts the sum of all unique next-hops, default-nexthops, tunnel interfaces, and null interfaces applied to all Layer 3 interfaces across all VRFs. A given set of entries that are unique in one VRF count against this limit if the set is applied in another VRF.

For example, a given next-hop specified in an action list applied to an interface counts against the limit once. If that same next-hop address is entered in a different action list and applied to another interface in the same VRF, this next-hop is not unique in the VRF and does not affect the limit further. If one of those action lists (that specify the address) is applied to an interface in a different VRF, the entry will affect the limit since addresses are unique to each VRF.

Another example is if two PBR action lists with eight unique next-hop entries (for a total of 16 unique next-hops) are configured as PBR actions in a policy. If that policy is applied to 32 route-only ports (each of which is in a different VRF), the entry supply will be exhausted.

- The specified capabilities and capacities limit for a unique VRF is 33.

IP versions in an action list

Configuring PBR actions of different IP versions in the same PBR action list is not supported. This limitation applies to the next-hop and default-nexthop actions specifically. If an action of one IP version is already configured, configuring an action with a different IP version in the same action list will be blocked. This limitation applies regardless of whether the action list is part of a policy, applied to an interface or whether any of the entries are selected or not.

Furthermore, use cases similar to the following are not supported:

- Applying a PBR action list with entries of one IP version (for example IPv4 next-hop) to an interface of the other IP version (for example a route-only port with an IPv6 address only).
- Creating a policy entry with a class of one IP version and a PBR action list with entries of the other IP version.

Configuration mismatches while not prevented are not supported and behavior is not defined. At best, traffic will not reach its intended destination.

Specifying valid next-hop and default-nexthop addresses

PBR does not support remote routers as next-hop or default-next-hop routers (a.k.a recursive). PBR only supports routers that are on a directly connected network. During configuration you may specify any IPv4 or IPv6 address as a next-hop or default-nexthop, however only those addresses reachable through a directly connected network will be installed as the active PBR entry.

If a specified address is reachable from the router, it must be on a directly connected subnet or it will not become active.

Hardware path PBR versus software path PBR

Traffic to be routed that cannot be handled by the switching ASIC (for example IPv4 packets with IP options), is handled by the switch operating system kernel routing software.

The characteristics of network usage determine the proportion of traffic handled by software path PBR relative to the hardware path. Under normal conditions, software path PBR is likely to range from a fraction of a percent of all traffic to almost none.

Packets with IP options are sent to the hardware ASIC as well as the CPU. Since the software path PBR actions are applied to the packets in the CPU, a default entry is programmed in the hardware to take no action on those packets. This hardware entry count can be seen in diagnostics with the command `diag-dump policy basic`.

Hardware versus software path for default-nexthop action

When a policy containing an entry with PBR is applied to an interface and the active action for that entry action list is 'default-nexthop', packets that match the class criteria and have no explicit route table hit (that is, no destination address longest prefix match, a.k.a 'route-miss'), they are forwarded to the specified active PBR default-nexthop. This is true for packets that follow the hardware and software paths through the switch.

There is a difference between PBR hardware and software path behavior when a route table hit occurs for class-matched packets (when the policy entry is a PBR default-nexthop).

Hardware path match criteria for a PBR policy entry with default-nexthop is extended to include the route table miss along with the class qualifiers, resulting in a **policy entry hit** for that policy entry. Conversely when there is a route table hit, the result is a policy entry miss in hardware path. When a policy entry miss occurs, policy processing moves on to the next entry in the policy and takes whatever action is specified, if any exist. This can include a different PBR routing action including interface null or no PBR action at all, for example.

In software path, the class match criteria is the only criteria required to achieve a policy entry hit. When that occurs, policy processing will stop. When there is a class match and a route table hit (with PBR action default-nexthop), the packet is forwarded according to that route table entry, not the PBR default-nexthop entry, nor is it influenced by any subsequent policy entries.

This difference in behavior is due to a limitation in the software path matching and routing engine, relative to hardware.

Table 1: *default-nexthop behaviors*

Routing packet	System route miss	System route hit
Hardware	Take PBR default-nexthop route.	Policy entry miss, continue policy processing with next entry, if present. No further matches result in system default route being used, if present.
Software	Take PBR default-nexthop route.	Policy entry hit is overridden by system route hit. System route entry used, policy processing stops.

Software path and system default route

AOS-CX default behavior (for packets with destination networks that lack entries in the system route table with a reachable next-hop address), sends packets to the system CPU for special handling, if any are specified (for example, sending an ICMP unreachable reply message).

A side effect of this CPU routing is that it has higher priority than an applied PBR next-hop action. Even though a policy is applied with an entry that matches the traffic and specifies a PBR next-hop action which is reachable, the traffic will still be routed to the system CPU (due to the absence of a reachable next-hop in the system route table), and not through the desired PBR hardware path. With traffic routing to the system CPU, it will be properly routed by PBR software path, but it will also be rate limited by the control plane policing feature. Loss can occur at higher traffic rates.

The workaround for this issue is to create a default next-hop route in the system with a reachable next-hop router/host. This will result in a route hit, or reachable next-hop detected for the traffic with no further need to route traffic to the CPU. The PBR hardware path next-hop action will then occur, as desired.

PBR and VRFs

A given physical router can be partitioned into multiple virtual routers. All frontplane ports and logical interfaces are initially in the default VRF. Any subset of frontplane ports or logical interfaces can be selectively moved into a user configured VRF, to establish a routing topology that is different from the default VRF.

Policies with PBR actions can be applied to interfaces in any VRF, and PBR action lists can be used in different policies across different VRFs. The effect of applying the same Policies/PBR action lists across different VRFs depends on the IP networks and interfaces configured in the different VRFs. For example, an action list that specifies actions of 'nexthop 1.1.1.10' and 'interface tunnel gre_10' could be used as the PBR action parameter for an entry in policy_1 and also in policy_2. If policy_1 is applied to an interface in VRF 'red', which has an interface in subnet 1.1.1.0/24 but no GRE tunnel named 'gre_10', then only the 'nexthop' action will be relevant to VRF 'red'. If policy_2 (which contains the same action list), is applied to an interface in VRF 'blue' (which lacks the 1.1.1.0/24 subnet configured but does have a tunnel named 'gre_10'), then only that interface tunnel action will apply in that VRF.

- It is possible to configure the same subnet in different VRFs, however named tunnel interfaces can only exist in one, so in the example of a common action list, the 'next-hop' action could be relevant to both VRFs, but the 'interface tunnel' action may only be relevant to one. If VRFs are part of the router configuration, be mindful of them when creating and applying policies with PBR action lists and their entries.
- VRF Route Leaking is not supported in the current release of PBR (10.4).
- Show commands can only reference default VRF.

PBR, ECMP, and routing protocols

When a policy with PBR actions is applied to an interface, the highest priority action from the action list is applied to matching traffic on that interface and overrides any static, ECMP or dynamically installed routes in the system.

PBR, VSX, and VLAN ACLs

Multichassis Link Aggregation Group (MCLAG) with VSX is a high-availability feature where a switch containing LAG members is connected to multiple switches to allow for node-level redundancy on that link. If one of the other switches goes down the LAG remains up and can continue to carry all the LAG traffic, bandwidth permitting.

A LAG (and an MCLAG) can be a member of a VLAN and a Layer 3 VSI (virtual switch interface), which can be created for that VLAN for the purposes of routing a policy with Layer 3 specific actions (that is, PBR), which can therefore be applied to that interface to influence routing decisions for matching Layer 3 packets on the MCLAG; like any other route-only port or VSI. Under such a configuration, it is likely that it is desirable to use VLAN ACLs applied to the VLAN the MCLAG is a member of.

There is a limit with this particular combination when the VLAN ACL specifies both IPv4 and IPv6 entries and the PBR policy has entries with IPv4 and IPv6 classes. This configuration will exhaust the switching ASIC resources and will fail to apply. To achieve a similar configuration, you may use port ACLs for IPv4 traffic (applying the ACL to all ports individually in the VLAN) while preserving the rest of the configuration.

PBR software path, VSX, and VRRP

Due to the dynamic nature of the VSX and VRRP protocols, applying a policy with PBR to VSX or VRRP Layer 3 kernel interfaces and then making further changes to those protocols may not result in expected behavior. Apply policies with PBR to VSX and VRRP Layer 3 interfaces after all changes have been made. If further changes are necessary the policy should be removed first and reapplied when configuration updates are complete.

PBR and next-hop router reachability

When a policy with PBR actions is applied to an interface, all next-hop and default-nexthop entries in the associated action list are continuously monitored for reachability. Probing occurs every 5 seconds for each such entry and guarantees that the reaction to the loss of reachability, or detection of the new reachability of any such entry will be approximately 5 seconds.

For example, if there are two reachable next-hops in an applied action list and the active next-hop (highest priority by lowest sequence number) entry becomes unreachable (loss of link or next-hop power event for

example), the switch over to the lower priority next-hop will occur within approximately 5 seconds. If there is only one nexthop/default-nexthop entry and no entries of any other type in the action list, routing decisions will return to the system routing table.

Conversely if an applied action list with a single unreachable next-hop becomes reachable, the switch back to routing to that next-hop will occur when reachability of the next-hop on the network is achieved. On an action list with multiple next-hops (where the active next-hop is not the highest priority entry); once the next-hop with the higher priority becomes available, the now reachable next-hop will promote to active once new reachability on the network is achieved.

PBR and VXLAN

PBR supports configuring remote hosts as nexthops that are learned over a Virtual eXtensible LAN (VXLAN) Tunnel. When PBR is configured on a VTEP device, irrespective of the VXLAN configuration (Static VXLAN or VXLAN with BGP EVPN), remote hosts whose MAC/ARP entries are learned by the VTEP device can be configured as nexthops.

PBR and subinterfaces

Certain types of Layer 3 physical interfaces (ROP, L3 LAG, Split interface) can be divided into multiple logical Layer 3 interfaces for sending and receiving data, tagged with different 802.1Q VLAN IDs.

Policies with PBR actions cannot be applied to the parent physical interface of subinterfaces but may be applied to the subinterfaces themselves.

It is not necessary to configure VLANs on the switch before specifying them as subinterface encapsulation IDs.

Example

Creating a subinterface on a route-only port specifying an 802.1Q VLAN encapsulation ID and applying a policy with PBR action to the subinterface:

```
switch(config)# interface 1/1/1
switch(config-if)# routing
switch(config-if)# no shutdown
switch(config-if)# exit

switch(config)# interface 1/1/1.100
switch(config-subif)# encapsulation dot1Q 100
switch(config-subif)# ip address 100.1.1.1/24
switch(config-subif)# apply policy p1 routed-in
switch(config-subif)# exit
```

CLI errors

Table 1: *Error messages and triggering events*

Message	Event
`Failed to create action list`	A PBR action list create operation was unable to create the OVSDB row.

Message	Event
`PBR action list '%s' doesn't exist`	A PBR action list update or delete operation was unable to locate the list OVSDB row. OR A PBR action list entry create, update, or delete operation was unable to locate its parent action list OVSDB row.
`Unable to automatically set sequence number`	The automatically generated sequence number for a new PBR action list entry is higher than the maximum permitted sequence number.
`Unable to add PBR action list entry`	A PBR action list entry create failed to create an entry row in OVSDB.
`Configuration of IPv4 and IPv6 addresses in the same PBR action list is not supported`	An attempt to create both IPv4 and IPv6 addresses in the same action list was made.
`Invalid sequence number`	A PBR action list entry delete did not specify the entry sequence number.
`Cannot add entry because its automatic sequence number would exceed the maximum`	The automatic sequence number exceeded the maximum.
`Action list entry does not exist`	A PBR action list entry delete could not locate the OVSDB entry row.
`Action list name required`	A PBR action list delete was passed an invalid list name.
`Invalid action list name length`	A PBR action list name was longer than the permitted length.

Backup nexthop groups

In a network with thousands of routers exchanging millions of routes, many routes are reachable via more than one nexthop. It is not uncommon to see multiple routes reachable via the same list of nexthops. Given the large scale of routes, it is desirable to restore traffic after a failure in a time period that does not depend on the number of routes.

BGP routing protocol supports Prefix Independent Convergence (PIC). BGP PIC creates and stores a backup or secondary path in the routing information base (RIB). When a failure is detected, the backup path immediately takes over enabling fast convergence.

- Primary and secondary nexthop pair are referred to as *backup nexthop group*.
- By defining a *static backup nexthop* group, the user is not dependent on protocol based PIC and instead is relying on manual configuration to achieve faster convergence for a large number of routes.

PBR commands

apply policy

```
apply policy <POLICY-NAME> routed-in
no apply policy <POLICY-NAME> routed-in
```

Description

Applies a classifier policy containing a PBR action to an interface. A policy with PBR actions is only applicable to L3/routing interfaces.

The `no` form of this command removes a classifier policy containing a PBR action from an interface.

`config-if`

Parameter	Description
<POLICY-NAME>	Specifies name of the policy.

Restrictions

- Only Layer 3 interfaces are valid for PBR policy application, and only in the routed inbound direction.
- If a policy with an 'interface tunnel' PBR action is applied on a Layer 3 interface in VRF 'A', and that interface tunnel is a member of VRF 'B', the interface tunnel is considered down/unavailable in this policy application in VRF 'A'.

Usage

To use route-only ports (ROPs) as Layer 3 interfaces, an internal VLAN range must be configured first. A policy with PBR actions can be applied to ROPs.

Example

On the 6400 Switch Series, interface identification differs.

Applying a policy to an interface:

```
switch(config)# interface 1/1/10
switch(config-if)# routing
switch(config-if)# apply policy pbr_policy routed-in
switch(config-if)# exit
```

Applying a policy to a subinterface, inbound direction:

```
switch(config)# interface 1/1/1.0
switch(config-if)# apply policy my_policy in
switch(config-if)# exit
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if	Administrators or local user group members with execution rights for this command.

pbr-action-list

```
pbr-action-list <ACTION-LIST-NAME>

    [<SEQUENCE-NUMBER>]
      {nexthop | default-nexthop} <NEXT-HOP-IP-ADDR>
       interface {null | <TUNNEL-NAME>}

    no [<SEQUENCE-NUMBER>]
      {nexthop | default-nexthop} <IP-ADDR>
       interface {null | <TUNNEL-NAME>}

no pbr-action-list <ACTION-LIST-NAME>
```

Description

Creates a PBR action list or modifies its entries.

The `no` form of this command can be used to delete an action list or an individual action list entry.

Parameter	Description
<ACTION-LIST-NAME>	Specifies the action list name. An action list name can be 1 to 64 alphanumeric characters.
<SEQUENCE-NUMBER>	Specifies list entry sequence number. Range: 1-4294967295 {nexthop | default-nexthop} Selects a regular next-hop (`nexthop`) or a default next-hop (`default-nexthop`). These parameters specify the address of a next-hop router to forward traffic matched by a class under different conditions.
`nexthop`	Sets the next hop for routing the packet.
`default-nexthop`	Sets the next hop for routing the packet when there is no explicit route for its destination.
<NEXTHOP-IP-ADDR>	Specifies IPv4 or IPv6 address of the next-hop router.
`interface {null |` *<TUNNEL-NAME>*	Selects the type of keyword interface: `null` or the tunnel interface name.
`interface null`	Selects keyword interface: `null`.
`null`	Specifies to drop matching traffic.
<TUNNEL-NAME>	Specifies an IP tunnel interface name through which to forward the matching traffic.

Restrictions

The reachability of the next-hop routers/tunnel interfaces in the list is not guaranteed. Such reachability can change at any time due to the dynamic nature of the network environment.

Usage

Each action list may contain up to eight entries of four different entry types:

- `interface null`
- `interface tunnel`
- `nexthop`
- `default-nexthop`

List entries have a unique sequence number which, if not user specified, are automatically assigned beginning at 10 and continuing at intervals of 10 for each subsequent new list entry, for example 20, 30, and 40. Sequence numbers of any value can be specified manually, a different interval may be set, and new entries can be added to (or removed from) any location in the list at any time.

Specifying an existing sequence number causes the existing list entry to be replaced by the new details. The list entry with the lowest sequence number has the highest priority entry in the list. The sequence numbers may be renumbered with the pbr-action-list resequence command.

Only one next-hop router or interface from the list is used per packet matched. This router or interface is defined as the highest priority list entry that is reachable or available at the time of the traffic match. If the highest priority list entry next-hop router or tunnel interface is reachable - that list entry is chosen, the search is stopped, and the traffic is forwarded to the next-hop router or interface for the entry. If the highest priority list entry next-hop router or tunnel interface is not reachable, the next highest priority list entry reachability is determined and used if reachable, otherwise the process continues down the list. If none of the routers in the list are reachable, the packet may be dropped (through the null interface entry if configured) or forwarded according to a system route table entry.

An action list that contains a next-hop of one IP version cannot also contain an entry of another IP version. For example, an action list must contain only IPv4 or IPv6 next-hop addresses or tunnel interfaces.

Examples

The list name is included in the context prompt for easy current-list identification. Any list name over 10 characters will be truncated at 10 characters and terminated with the tilde character (~) to indicate a reduced list name display. This reduction affects the prompt display of the list name only:

```
switch(config)# pbr-action-list eighteenchars
switch(config-pbr-action-list-eighteench~)#
```

The following example creates an action list with two IPv4 next-hops, a default IPv4 next-hop, and a null interface. The example uses default sequence numbering for its list entries.

```
switch(config)# pbr-action-list test1
switch(config-pbr-action-list-test1)# nexthop 1.1.1.1
switch(config-pbr-action-list-test1)# nexthop 2.2.2.2
switch(config-pbr-action-list-test1)# default-nexthop 9.9.9.9
switch(config-pbr-action-list-test1)# interface null
switch(config-pbr-action-list-test1)# end
```

```
switch(config)# show pbr-action-list test1


           Name
  Sequence Type                            Address/Interface
-------------------------------------------------------------------
           test1
       10  nexthop                          1.1.1.1
       20  nexthop                          2.2.2.2
       30  default-nexthop                  9.9.9.9
       40  interface                        null
```

The following example creates an action list with an IPv4 next-hop and a tunnel interface with manual sequence numbers for its entries.

```
switch(config)# pbr-action-list test2
switch(config-pbr-action-list-test2)# 6 ip default-nexthop 4.4.4.4
switch(config-pbr-action-list-test2)# 1 interface tunnel10
switch(config-pbr-action-list-test2)# end

switch(config)# show pbr-action-list test2

           Name
  Sequence Type                            Address/Interface
-------------------------------------------------------------------
           test2
        1  interface                        tunnel10
        6  default-nexthop                  4.4.4.4
```

The following example creates an action list with two IPv4 tunnel interfaces, with default sequence numbering.

```
switch(config)# pbr-action-list test3
switch(config-pbr-action-list-test3)# interface tunnel10
switch(config-pbr-action-list-test3)# interface tunnel15
switch(config-pbr-action-list-test3)# end

switch(config)# show pbr-action-list test3

           Name
  Sequence Type                            Address/Interface
-------------------------------------------------------------------
           test3
       10  interface                        tunnel10
       20  interface                        tunnel15
```

The following example creates an action list with two IPv6 next-hops and the null interface, with manual sequence numbers.

```
switch(config)# pbr-action-list test4
switch(config-pbr-action-list-test4)# 5 nexthop 2000:abcd::cccc:dddd
switch(config-pbr-action-list-test4)# 6 nexthop 1000:abcd::1234:5678
switch(config-pbr-action-list-test4)# 7 interface null
switch(config-pbr-action-list-test4)# end

switch(config)# show pbr-action-list test4
```

```
           Name
  Sequence Type                              Address/Interface
-------------------------------------------------------------------
           test4
         5 nexthop                            2000:abcd::cccc:dddd
         6 nexthop                            1000:abcd::1234:5678
         7 interface                          null
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config` The `pbr-action-list` *<ACTION-LIST-NAME>* command takes you into the `config-pbr-action-list-`*<ACTION-LIST-NAME>* context where you modify entries for a PBR action list.	Administrators or local user group members with execution rights for this command.

pbr-action-list copy

`pbr-action-list` *<ACTION-LIST-NAME>* `copy` *<DESTINATION-ACTION-LIST-NAME>*

Description

Copies an existing PBR action list.

Parameter	Description
<ACTION-LIST-NAME>	Specifies the action list name to be copied.
<DESTINATION-ACTION-LIST-NAME>	Specifies the name of the copied action list. A destination action list name can be 1 to 64 alphanumeric characters.

Examples

The following example copies test4 action list to test 5.

```
switch(config)# show pbr-action-list test4

           Name
  Sequence Type                              Address/Interface
-------------------------------------------------------------------
           test4
         5 nexthop                            2000:abcd::cccc:dddd
```

```
        6  nexthop                          1000:abcd::1234:5678
        7  interface                        null

switch(config)# pbr-action-list test4 copy test5
switch(config-pbr-action-list-test4)# show pbr-action-list test5

           Name
  Sequence Type                             Address/Interface
-------------------------------------------------------------------
           test4
        1  nexthop                          2000.abcd::cccc.dddd
       11  nexthop                          1000.abcd::1234.5678
       21  interface                        null
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

pbr-action-list resequence

`pbr-action-list` *`<ACTION-LIST-NAME>`* `resequence` *`<STARTING-SEQUENCE-NUMBER>`* *`<INCREMENT>`*

Description

Renumbers the entries in an action list. The list entry with the lowest sequence number has the highest priority entry in the list.

Parameter	Description
`<ACTION-LIST-NAME>`	Specifies the action list name to have its entries resequenced.
`<STARTING-SEQUENCE-NUMBER>`	Specifies the starting sequence number. Range: 1-4294967295
`<INCREMENT>`	Specifies the increment of the resequencing. Range: 1-4294967295

Examples

The following command shows how a PBR action list is resequenced. In the following example, an action list named `test4` is resequenced so that instead of its entries starting at 5 and being numbered sequentially, its entries start now at 1 and they are numbered in increments of 10:

```
switch(config)# show pbr-action-list test4

           Name
  Sequence Type                              Address/Interface
-------------------------------------------------------------------
           test4
         5 nexthop                            2000.abcd::cccc.dddd
         6 nexthop                            1000.abcd::1234.5678
         7 interface                          null

switch(config)# pbr-action-list test4 resequence 1 10

           Name
  Sequence Type                              Address/Interface
-------------------------------------------------------------------
           test4
         1 nexthop                            2000.abcd::cccc.dddd
        11 nexthop                            1000.abcd::1234.5678
        21 interface                          null
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Administrators or local user group members with execution rights for this command.

pbr-action-list reset

pbr-action-list *<ACTION-LIST-NAME>* reset

Description

Resets a specified PBR action list to its last successful configuration.

Parameter	Description
<ACTION-LIST-NAME>	Specifies the action list name to be reset.

Examples

```
switch(config)# pbr-action-list test reset
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Administrators or local user group members with execution rights for this command.

policy

```
policy <POLICY-NAME>

    [<SEQUENCE-NUMBER>]
      class {ip|ipv6|mac} <CLASS-NAME>
      action {<REMARK-ACTIONS> | <POLICE-ACTIONS> | <OTHER-ACTIONS>}
      [{<REMARK-ACTIONS> | <POLICE-ACTIONS> | <OTHER-ACTIONS>}]

    [<SEQUENCE-NUMBER>]
    comment ...

no policy <POLICY-NAME>
```

Description

Creates, modifies, or deletes a classifier policy. A policy contains one or more policy entries ordered and prioritized by sequence numbers. Each entry has an IPv4/IPv6/MAC class and one or more policy actions associated with it. An applied policy processes a packet sequentially against policy entries in the list until the last entry in the list has been evaluated or the packet matches an entry. If a match occurs the related entry, actions are taken.

The `no` form of this command is used to delete a policy or an individual policy entry.

Parameter	Description
<POLICY-NAME>	Specifies the name of the policy.
<SEQUENCE-NUMBER>	Specifies a sequence number for the policy entry. Optional. Range: 1 to 4294967295.
`comment`	Stores the remaining entered text as a policy entry comment.
`class {ip|ipv6|mac} <CLASS-NAME>`	Specifies a type of class, `ip` for IPv4, `ipv6` for IPv6 and `mac` for a MAC policy. And specifies a class name.
<REMARK-ACTIONS>	Remark actions can be any of the following options: `{pbr <ACTION-LIST> | pcp <PRIORITY> | ip-precedence <IP-PRECEDENCE-VALUE> | dscp <DSCP-VALUE> | local-priority <LOCAL-PRIORITY-VALUE>}` where:

Parameter	Description
	pbr *<ACTION-LIST>* Specifies the PBR action list to be used. pcp *<PCP-VALUE>* Specifies Priority Code Point (PCP) value. Range: 0 to 7. ip-precedence *<IP-PRECEDENCE-VALUE>* Specifies the numeric IP precedence value. Range: 0 to 7. dscp *<DSCP-VALUE>* Specifies a Differentiated Services Code Point (DSCP) value. Enter either a numeric value (0 to 63) or a keyword as follows: `AF11` - DSCP 10 (Assured Forwarding Class 1, low drop probability) `AF12` - DSCP 12 (Assured Forwarding Class 1, medium drop probability) `AF13` - DSCP 14 (Assured Forwarding Class 1, high drop probability) `AF21` - DSCP 18 (Assured Forwarding Class 2, low drop probability) `AF22` - DSCP 20 (Assured Forwarding Class 2, medium drop probability) `AF23` - DSCP 22 (Assured Forwarding Class 2, high drop probability) `AF31` - DSCP 26 (Assured Forwarding Class 3, low drop probability) `AF32` - DSCP 28 (Assured Forwarding Class 3, medium drop probability) `AF33` - DSCP 30 (Assured Forwarding Class 3, high drop probability) `AF41` - DSCP 34 (Assured Forwarding Class 4, low drop probability) `AF42` - DSCP 36 (Assured Forwarding Class 4, medium drop probability) `AF43` - DSCP 38 (Assured Forwarding Class 4, high drop probability) `CS0` - DSCP 0 (Class Selector 0: Default) `CS1` - DSCP 8 (Class Selector 1: Scavenger) `CS2` - DSCP 16 (Class Selector 2: OAM) `CS3` - DSCP 24 (Class Selector 3: Signaling) `CS4` - DSCP 32 (Class Selector 4: Real time) `CS5` - DSCP 40 (Class Selector 5: Broadcast video) `CS6` - DSCP 48 (Class Selector 6: Network control) `CS7` - DSCP 56 (Class Selector 7) `EF` - DSCP 46 (Expedited Forwarding) `local-priority` *<LOCAL-PRIORITY-VALUE>* Specifies a local priority value. Range: 0 to 7.
<POLICE-ACTIONS>	Police actions can be the following `{cir` *<RATE-BPS>* `cbs` *<BYTES>* `exceed}` where: `cir` *<RATE-BPS>* Specifies a Committed Information Rate value in Kilobits per second. Range: 1 to 4294967295.

Parameter	Description
	`cbs` *<BYTES>* Specifies a Committed Burst Size value in bytes. Range: 1 to 4294967295. `exceed` Specifies action to take on packets that exceed the rate limit.
<OTHER-ACTIONS>	Other actions can be the following: `drop` Specifies drop traffic.

Restrictions

MAC classes are not applicable to policies containing PBR actions. Applying such policies to an interface are blocked.

Usage

- For Policy Based Routing, the policy action keyword is `pbr` which itself takes the name of a PBR action list as a parameter.
- A policy entry that contains a PBR action can contain other action types as well.
- An applied policy processes a packet sequentially against policy entries in the list until the last policy entry in the list has been evaluated or the packet matches an entry.
- Entering an existing `<POLICY-NAME>` value will cause the existing policy to be modified, with any new *<SEQUENCE-NUMBER>* value creating an additional policy entry, and any existing *<SEQUENCE-NUMBER>* value replacing the existing policy entry with the same sequence number.
- If no sequence number is specified, a new policy entry is appended to the end of the entry list with a sequence number equal to the highest policy entry currently in the list plus 10.

Examples

Create a policy with two PBR actions:

```
switch(config)# policy pbr_policy
switch (config-policy)# 10 class ip v4_class action pbr action_list1
switch (config-policy)# 20 class ipv6 v6_class action pbr action_list2
switch (config-policy)# exit
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400	`config` The `policy` command	Administrators or local user group members with execution rights for this command.

Platforms	Command context	Authority
8320 8325 8360 9300 10000	takes you into the `config-policy` context where you enter the policy entries.	

show pbr

`show pbr {interface <INTERFACE-NAME>|vrf <VRF-NAME>|summary}`

Description

Shows a detailed view of Policy Based Routing (PBR) in the system.

Parameter	Description
<VRF-NAME>	Specifies name of a VRF.
<INTERFACE-NAME>	Specifies an interface. Format: `member/slot/port`.

Usage

Show commands can only reference the default VRF.

Examples

Showing PBR summary information when there is no active next-hop in the system:

```
switch# show pbr summary
VRF      Port    Policy    PBR      Seq  Type       Nexthop
-------------------------------------------------------------------------
No active PBR nexthop found
-------------------------------------------------------------------------
```

Showing PBR summary information when there are active next-hops in the system:

```
switch# show pbr summary

VRF      Port    Policy    PBR      Seq  Type       Nexthop
-------------------------------------------------------------------------
default  1/1/1   policy_1  pbr_1    10   nexthop    1.1.1.1 (active)
         1/1/2   policy_2  pbr_2    20   nexthop    5.5.5.5 (active)
-------------------------------------------------------------------------
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show pbr-action-list

`show pbr-action-list [<ACTION-LIST-NAME>] [commands] [configuration] [vsx-peer]`

Description

Shows the current PBR action list configuration. Action list entries are displayed in ascending order of their sequence number.

Parameter	Description
<ACTION-LIST-NAME>	Specifies the PBR action list name.
`commands`	Formats output as CLI commands.
`configuration`	Displays user-specified configuration.
`vsx-peer`	Displays VSX peer switch information.

Restrictions

If an action list entry is modified to an invalid value (for example through the REST interface), this command will indicate a mismatch for that action entry when run. In this event, use the `pbr-action-list <NAME> reset` command to restore it to the previous valid value.

Usage

- This command does not indicate whether the action list is configured in a policy or applied to an interface. Use the `show pbr` command for PBR status involving action lists.
- A single action list is shown by specifying its name or you can show all action lists by omitting a name argument.
- Using the additional commands keyword, you can change the tabulated output to a configuration style output for single or all list display.

Examples

Create two PBR action lists then run `show pbr-action-list` to display all configured action lists in the default configuration mode:

```
switch(config)# pbr-action-list v4_pbr
switch(config-pbr-action-list-v4_pbr)# 1 nexthop 1.1.1.1
switch(config-pbr-action-list-v4_pbr)# 5 default-nexthop 2.2.2.2
switch(config-pbr-action-list-v4_pbr)# 10 interface null
switch(config-pbr-action-list-v4_pbr)# exit
switch(config)#
```

```
switch(config)# pbr-action-list v6_pbr
switch(config-pbr-action-list-v6_pbr)# 20 nexthop 2000:abcd::cccc:dddd
switch(config-pbr-action-list-v6_pbr)# 40 default-nexthop 1000:abcd::1234:5678
switch(config-pbr-action-list-v6_pbr)# 60 interface null
switch(config-pbr-action-list-v6_pbr)# exit
switch#

switch# show pbr-action-list
          Name
          Additional PBR-Action-List Parameters
Sequence     Type               Nexthop
-------------------------------------------------------------------------------------
---
             v4_pbr
1            nexthop            1.1.1.1
5            default-nexthop    2.2.2.2
10           interface          null

             v6_pbr
20           nexthop            2000:abcd::cccc:dddd
40           default-nexthop    1000:abcd::1234:5678
60           interface          null
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show running-config current-context

`show running-config current-context`

Description

Displays the configuration of the PBR action list in the current configuration context, in commands mode.

Parameter	Description
`running-config`	Shows configuration currently running on switch.
`current-context`	Limits display to current config context only, in commands mode.

Usage

Useful for reexamining entries previously entered into the action list after its entries have scrolled off the terminal due to other output or upon reentering the context of an existing action list.

Examples

Creating two PBR action lists and running `show running-configuration curent-context` to display the action list configuration in commands mode:

```
switch(config)# pbr-action-list v4_pbr
switch(config-pbr-action-list-v4_pbr)# 1 nexthop 1.1.1.1
switch(config-pbr-action-list-v4_pbr)# 5 default-nexthop 2.2.2.2
switch(config-pbr-action-list-v4_pbr)# 10 interface null
switch(config-pbr-action-list-v4_pbr)# exit
switch(config)#
switch(config)# pbr-action-list v6_pbr
switch(config-pbr-action-list-v6_pbr)# 20 nexthop 2000:abcd::cccc:dddd
switch(config-pbr-action-list-v6_pbr)# 40 default-nexthop 1000:abcd::1234:5678
switch(config-pbr-action-list-v6_pbr)# 60 interface null
switch(config-pbr-action-list-v6_pbr)#
switch(config-pbr-action-list-v6_pbr)# show running-config current-context
pbr-action-list v6_pbr
    20 nexthop 2000:abcd::cccc:dddd
    40 default-nexthop 1000:abcd::1234:5678
    60 interface null
```

Switching context back to the first actionl ist and running the same command:

```
switch(config-pbr-action-list-v6_pbr)# pbr-action-list v4_pbr
switch(config-pbr-action-list-v4_pbr)#
switch(config-pbr-action-list-v4_pbr)# show running-config current-context
pbr-action-list v4_pbr
    1 nexthop 1.1.1.1
    5 default-nexthop 2.2.2.2
    10 interface null
```

Removing action list entry number 5 and running the command again:

```
switch(config-pbr-action-list-v4_pbr)# no 5
switch(config-pbr-action-list-v4_pbr)# show running-config current-context
pbr-action-list v4_pbr
    1 nexthop 1.1.1.1
    10 interface null
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300	`config`	Administrators or local user group members with execution rights

Platforms	Command context	Authority
6400 8320 8325 8360 9300 10000		for this command.

Chapter 13
IP Directed Broadcast

IP Directed Broadcast is a feature by which remote administration tasks such as backups and wake-on-LAN (WOL) application can be achieved by sending directed broadcast packets for hosts/servers residing on a different subnet. The datagram is routed by normal mechanisms until it reaches a gateway attached to the destination hardware network, at which point it is broadcast. This class of broadcasting is also known as 'directed broadcasting'. IP Directed Broadcast packets are Layer 3 subnet broadcasts.

For example, for the broadcast IP address 192.168.1.255, the corresponding egress interface Subnet IP would be 192.168.1.x/24. Classless subnetting (CIDR) is also supported. For example, for the broadcast IP address 10.10.15.255, the broadcast address for the corresponding interface IP would be 10.10.15.x/21.

IP Directed Broadcast is supported on Route Only Port (ROP), Switched Virtual Interface (SVI), Layer 3 Link Aggregation Group (L3LAG) and Virtual Extensible Lan (VxLAN) interfaces, but is disabled by default. The feature is supported for the associated interface addresses for both the primary and secondary addresses. IP directed broadcast can be enabled on all the configured L3 interfaces. It is only supported for IPv4 addresses.

- VxLAN is only supported on the 6300, 6400 and 8360 Switch Series.
- VxLAN interfaces require IP Directed Broadcast to be enabled on a Switched Virtual Interface associated with the VxLAN interface.
- IP Directed Broadcast is not supported with Dynamic VRF Route Leak.

For more information on this feature, see the related video on the Aruba AirHeads Broadcasting Channel.

IP Directed Broadcast configuration example

The following are sample topology diagrams for an IP Directed Broadcast configuration. Figure 1 shows when the egress interface is an SVI, while figure 2 shows the diagram when the egress interface is an ROP.

Figure 1 *SVI: IP Directed Broadcast*

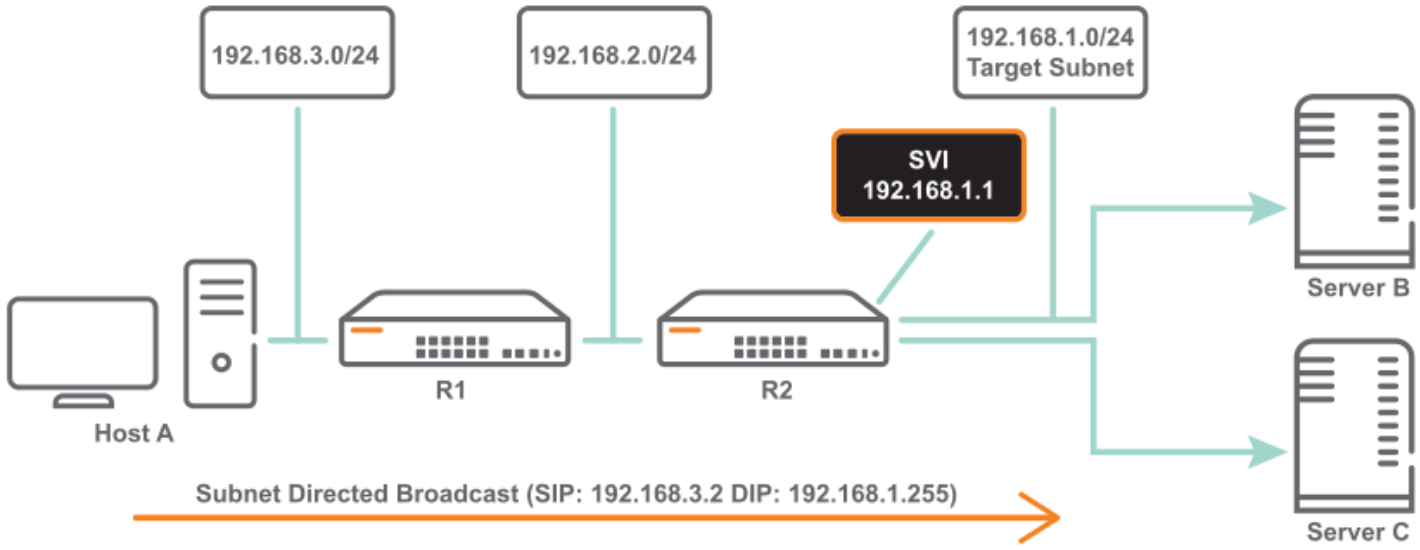
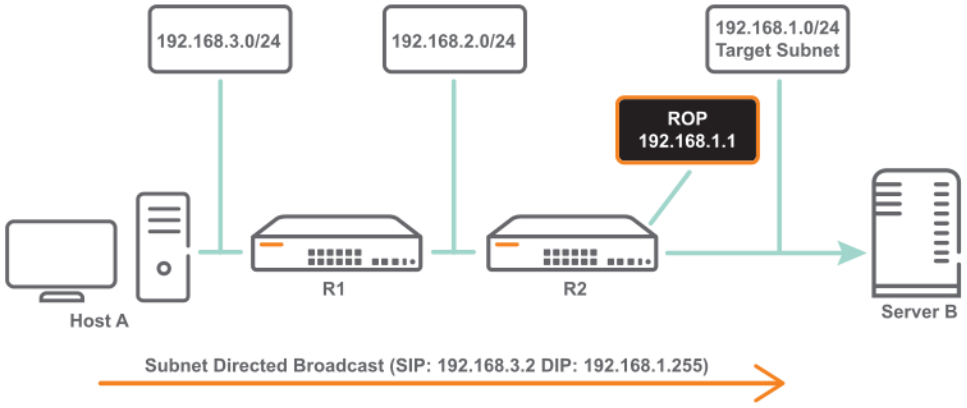


Figure 2 *ROP: IP Directed Broadcast*



Intermediate routers forward IP Directed Broadcast packets as Unicast. The IP directed broadcast packet is broadcast or flood in the target subnet (DA MAC: All 0xFFs) only after the last hop router.

Host A in subnet 192.168.3.0/24 wants to inject a IP Directed Broadcast (192.168.1.255) packet into Target Subnet 192.168.1.0/24. Router R1 forwards the IP Datagram with DIP 192.168.1.255 as a regular Unicast Datagram. Router R2 then floods the IP Datagram over egress ROP, SVI or VxLAN interface with Destination MAC as all 0xFFs.

At Ingress, Port Based ACLs (PACL) and VLAN Based ACLs (VACL) can be used to restrict/allow IP Directed Broadcast traffic. Existing Port based ACLs (PACL) can be used to allow or disallow certain IP Directed Broadcast Traffic.

An ACL can be configured using the `access-list ip <ACL-NAME>` command and then applied using the `apply access-list ip <ACL-NAME>` command as shown in the following output.

```
switch(config)# access-list ip ipdbacl

switch(config)# interface 1/1/1
switch(config-if)# apply access-list ipdbacl
  in    Inbound (ingress) traffic
```

```
  out   Outbound (egress) traffic

switch(config-if)# int lag 10
switch(config-lag-if)# apply access-list ipdbacl
  in    Inbound (ingress) traffic
  out   Outbound (egress) traffic
```

The following is an example of the `show running-config` command on an ROP interface.

```
switch(config)# interface 1/1/1
    no shutdown
    ip address 192.168.1.1/24
    ip directed-broadcast
```

The following is an example of the `show running-config` command on an SVI interface.

```
switch(config)# vlan 10
interface vlan10
    no shutdown
    ip address 192.168.1.1/24
    ip directed-broadcast
```

The following is an example of the `show running-config` command on an L3LAG interface.

```
switch(config)# interface lag 3
    no shutdown
    ip address 192.168.1.1/24
    ip directed-broadcast
```

Note: Currently egress ACL is supported only on ROP and LAG interfaces, and not on an SVI interface.

IP Directed Broadcast commands

copy support-file feature

`copy support-file feature l3`

Description

Captures support logs to debug any IP Directed Broadcast issues.

IP Directed Broadcast is not supported on subinterfaces on 6300, 6400, 8325, 8360 and 10000 Switch series.

Examples

Capturing the support logs into a local file:

```
switch# copy support-file feature l3 sftp
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Manager (#)	Administrators or local user group members with execution rights for this command.

ip directed-broadcast

```
ip directed-broadcast
no ip directed-broadcast
```

Description

Turns on IP Directed Broadcast for the specified interface. The no form of this command turns it off. This command is disabled by default.

IP Directed Broadcast is not supported on subinterfaces on 6300, 6400, 8325, 8360 and 10000 Switch series.

Examples

Enabling and disabling IP Directed Broadcast on an physical interface:

```
switch(config)# interface 1/1/1
switch(config-if)# ip directed-broadcast
switch(config-if)# no ip directed-broadcast
```

Enabling and disabling IP Directed Broadcast on a VLAN interface:

```
switch(config)# interface vlan 100
switch(config-if-vlan)# ip directed-broadcast
switch(config-if-vlan)# no ip directed-broadcast
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show arp

```
show arp
```

Description

Shows IP directed broadcast verification.

IP Directed Broadcast is not supported on subinterfaces on 6300, 6400, 8325, 8360 and 10000 Switch series.

Examples

Showing IP directed broadcast verification:

```
switch# show arp
IPv4 Address     MAC                Port         Physical Port          State
--------------------------------------------------------------------------------
1.1.1.255        FF:FF:FF:FF:FF:FF  1/1/1        1/1/1                  permanent
3.1.1.255        FF:FF:FF:FF:FF:FF  vlan10                              permanent


Total Number Of ARP Entries Listed: 2.
--------------------------------------------------------------------------------
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show ip interface

```
show ip interface <INTERFACE-NAME>
```

Description

Displays the status of IP Directed Broadcast on the specified interface along with other interface related attributes.

Parameter	Description
<INTERFACE-NAME>	Specifies the interface to use as a source for displaying the status of the IP Directed Broadcast.

Examples

Displaying the IP Directed Broadcast status on the specified interface:

```
switch# show ip interface vlan30


Interface vlan30 is up
 Admin state is up
 Hardware: Ethernet, MAC Address: 94:f1:28:21:63:00
 IP MTU 1500
 IP Directed Broadcast is Enabled
 IPv4 address 192.168.3.1/24
 L3 Counters: Rx Disabled, Tx Disabled

 Statistics                      RX                  TX                Total
 ------------ -------------------- -------------------- --------------------
 L3 Packets                       0                    0                   0
 L3 Bytes                         0                    0                   0
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show ip directed-broadcast

```
show ip directed-broadcast
```

Description

Displays the summary of the interfaces on which IP Directed Broadcast is enabled.

Examples

On the 6400 Switch Series, interface identification differs.

Displaying the summary of the interfaces on which IP Directed Broadcast is enabled:

```
switch# show ip directed-broadcast

 IPv4 Directed Broadcast Configuration

 Interface       Status
 ----------     --------
 1/1/1           Enabled
 vlan10          Enabled
 vlan30          Enabled
```

Displaying IP Directed Broadcast Host entries installed in Neighbor cache:

```
switch# show arp state permanent
IPv4 Address     MAC                Port         Physical Port    State
--------------------------------------------------------------------------------
52.1.1.255       FF:FF:FF:FF:FF:FF  1/1/1        1/1/1            permanent
40.0.0.255       FF:FF:FF:FF:FF:FF  vlan20       vlan20           permanent
Total Number Of ARP Entries Listed- 2.
--------------------------------------------------------------------------------
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

IP Neighbor Flood is only supported on the Aruba 6300, 6400, 8320, 8325, 8360, 9300 and 10000 Switch Series.

When a port goes down, L3 traffic to a neighbor will get dropped until the MAC address is learned on the new port. Source MAC learning could take a while, and this learning could be dependent on traffic being successfully delivered to the client.

An example is when wireless clients are connected through access points balanced across several wireless controllers connected to AOS-CX switches. Traffic to clients is dropped when the port connecting the controller and switch goes down.

The port can go down when the wireless controller goes down and reboots. Access points are adopted by other controllers on the network to avoid traffic drop for the wireless clients, but the back-end data plane requires handling. During such failover conditions in scaled setups, MAC learning could take a while, and significant traffic loss can occur. The solution is to flood traffic on the VLAN so that traffic reaches the hosts. Once neighbors are relearned over a new port on the same VLAN, the switch will stop flooding.

IP Neighbor Flood is supported on SVIs. It is disabled by default.

IP Neighbor Flood commands

ip neighbor-flood

```
ip neighbor-flood
```

Description

Enables VLAN flooding for the specified VLAN interface when a neighbor link goes down.

The `no` form of this command disables VLAN flooding for the specified VLAN interface.

Examples

Enabling IP Neighbor Flood on a VLAN interface:

```
switch(config)# interface vlan 3
switch(config-if-vlan)# ip neighbor-flood
```

Disabling IP Neighbor Flood on a VLAN interface.

```
switch(config)# interface vlan 3
switch(config-if-vlan)# no ip neighbor-flood
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-if-vlan`	Administrators or local user group members with execution rights for this command.

show ip interface

```
show ip interface <IFNAME>
```

Description

Displays the status of IP Neighbor Flood on the specified interface along with other interface-related attributes.

Parameter	Description
<IFNAME>	Specifies the interface name (for example, `vlan30`). Optional.

Examples

```
switch# show ip interface vlan30

Interface vlan30 is up
 Admin state is up
 Hardware: Ethernet, MAC Address: 94:f1:28:21:63:00
 IP MTU 1500
 IP Neighbor Flood is Enabled
 IPv4 address 192.168.3.1/24
 L3 Counters: Rx Disabled, Tx Disabled
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300	Operator (>) or Manager	Operators or Administrators or local user group members with

Platforms	Command context	Authority
6400 8320 8325 8360 9300 10000	(#)	execution rights for this command. Operators can execute this command from the operator context (>) only.

show ip neighbor-flood

```
show ip neighbor-flood
```

Description

Displays the interfaces on which IP Neighbor Flood is enabled.

Examples

```
switch# show ip neighbor-flood

 IP Neighbor Flood Configuration

 Interface       Status
 ---------       -------
 vlan10          Enabled
 vlan30          Enabled
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show running-config

```
show running-config
```

Description

Displays the current running configuration.

Examples

```
switch# show running-config
interface vlan10
    ip neighbor-flood
interface vlan30
    ip neighbor-flood
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

This chapter provides details for configuring and verifying the functions of a key chain. Key chain configurations are spread across `config` context, `keychain` context, and `keychain-key` context.

A key chain provides seamless authentication-key rollover. When authentication method is enabled, using key chain allows OSPF to overcome static key configuration to change the key periodically. Using key chain also reduces risks of keys being guessed by configuring rotating keys.

A key chain must be used by an application like OSPF that communicates by using the keys with its peers.

Key chain commands

accept-lifetime

```
accept-lifetime [start-time <time> <month>/<day>/<year>] {duration {<seconds> | infinite} |
end-time <time> <month>/<day>/<year>}
```

Description

Configures the duration for which the key is valid for receiving packets.

The `no` form of this command configures the key packet receiving duration to the default value of an infinite time.

Parameter	Description
`start-time`	Time at which the key chain lifetime starts. Required. Format: HH:MM:SS
`end-time`	Time at which the key chain lifetime expires. Required. Format: HH:MM:SS
`day`	Day of the month. Required. Range: 1-31.
`month`	Month of the year. Required.
`year`	Year. Required. Range: 2020-2050
`duration`	Time in seconds. Optional. Range: 1-2147483646.
`infinite`	Specifies infinite time for the key. Optional.

Examples

Configuring the duration for which the key is valid for receiving packets:

```
switch# configure terminal
switch(config)# keychain ospf_keys
```

```
switch(config-keychain)# key 1
switch(config-keychain-key)# accept-lifetime start-time 10:10:10 10/25/2020 end-time
10:10:10 11/25/2020
switch(config-keychain-key)# accept-lifetime start-time 10:10:10 10/25/2020 duration
1000
switch(config-keychain-key)# accept-lifetime start-time 10:10:10 10/25/2020 duration
infinite
switch(config-keychain-key)# accept-lifetime end-time 10:10:10 11/25/2020
switch(config-keychain-key)# accept-lifetime duration 1000
switch(config-keychain-key)# accept-lifetime duration infinite
```

Configuring the key packet receiving duration to the default value of an infinite time:

```
switch# configure terminal
switch(config)# keychain ospf_keys
switch(config-keychain)# key 1
switch(config-keychain-key)# no accept-lifetime
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	`config-keychain-key`	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

cryptographic-algorithm

```
recv-id cryptographic-algorithm {aes-cmac-128 |hmac-sha-1 | hmac-sha-256 | hmac-sha-384 |
hmac-sha-512 | md5}
no cryptographic-algorithm
```

Description

Configures the recv-id cryptographic algorithm for the key. The key will not be valid until the receive ID, the send ID, and send lifetime is configured for TCP-AO, Choose one of the authentication algorithms from the following parameters. The `no` form of this command configures the default cryptographic algorithm for a key, md5.

TCP Authentication Option (TCP-AO) authentication supports only the *aes-cmac-128* and *hmac-sha-1* algorithms. If you are configuring TCP-AO, you must select one of these options.

Parameter	Description
`aes-cmac-128`	Sets the authentication algorithm for the key to AES-CMAC-128. This parameter is only supported for TCP-AO.

Parameter	Description
`hmac-sha-1`	Sets the authentication algorithm for the key to SHA-1. This parameter is also supported for TCP-AO.
`hmac-sha-256`	Sets the authentication algorithm for the key to SHA-256.
`hmac-sha-384`	Sets the authentication algorithm for the key to SHA-384.
`hmac-sha-512`	Sets the authentication algorithm for the key to SHA-512.
`md5`	Sets the authentication algorithm for the key to md5. Maximum length of the key string supported: 16 bytes (`config-if` context), 64 bytes (`config-keychain-key` context).

Examples

Set the authentication algorithm for the key to SHA-384:

```
switch(config)# keychain ospf_keys
switch(config-keychain)# key 1
switch(config-keychain-key)# recv-id cryptographic-algorithm hmac-sha-384
```

Set the authentication algorithm to the default, md5:

```
switch(config)# keychain ospf_keys
switch(config-keychain)# key 1
switch(config-keychain-key)# no recv-id cryptographic-algorithm
```

Command History

Release	Modification
10.11	The **aes-cmac-128** parameter is introduced.
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-keychain-key`	Administrators or local user group members with execution rights for this command.

key

`key <KEY-ID>`

Description

Creates the key for a key chain and enters the key chain key context. A maximum of 64 keys can be configured per key chain.

The `no` form of this command deletes the key from the key chain.

Parameter	Description
<KEY-ID>	ID of the key. Required. Range: 1-255.

Examples

Creating a key for a key chain:

```
switch# configure terminal
switch(config)# keychain ospf_keys
switch(config-keychain)# key 1
```

Deleting a key from a key chain:

```
switch# configure terminal
switch(config)# keychain ospf_keys
switch(config-keychain)# no key 1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	`config-keychain`	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

keychain

`keychain` *<KEYCHAIN-NAME>*

Description

Creates the key chain and enters the key chain context. A maximum of 64 key chains can be configured in the system.

The `no` form of this command removes the key chain if it is not used by any subscribers.

Parameter	Description
<KEYCHAIN-NAME>	Name of the key chain. Required.

Examples

Creating a key chain:

```
switch# configure terminal
switch(config)# keychain ospf_keys
```

Removing a key chain:

```
switch# configure terminal
switch(config)# keychain ospf_keys
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	config	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

key-string

`key-string [{ciphertext | plaintext} <PASSWORD>]`

Description

Sets the key password. The password is internally stored in encrypted form. The key is not valid until its password has been set.

The `no` form of this command deletes the password used for the key.

Parameter	Description
`ciphertext`	Specifies that the key password is provided as ciphertext.
`plaintext`	Specifies that the key password is provided as plaintext.
<PASSWORD>	Specifies the key password.

When the key password is not provided on the command line, plaintext password prompting occurs upon pressing Enter. The entered password characters are masked with asterisks.

Examples

Setting the key password with plaintext:

```
switch(config)# keychain ospf_keys
switch(config-keychain)# key 1
switch(config-keychain-key)# key-string plaintext F82#450bHP
```

Setting the key password with plaintext prompting:

```
switch(config)# keychain ospf_keys
switch(config-keychain)# key 1
switch(config-keychain-key)# key-string
Enter the key password: *************
Re-Enter the key password: *************
```

Setting the key password with ciphertext:

```
switch(config)# keychain ospf_keys
switch(config-keychain)# key 1
switch(config-keychain-key)# key-string ciphertext AQBpfciFZ/P...biAAAOjc0a8=
```

Deleting the password for the key:

```
switch(config)# keychain ospf_keys
switch(config-keychain)# key 1
switch(config-keychain-key)# no key-string
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	`config-keychain-key`	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

name

`name` *<KEY-NAME>*
`no name` *<KEY-NAME>*

Description

Configures a name for a numbered key in a key chain.

The `no` form of this command removes the name of the key.

Parameter	Description
<KEY-NAME>	Specifies the name of the key in alphanumeric characters. Range: 1-64.

Examples

Creating a name for a key in a key chain called **abcdef123456**:

```
switch# configure terminal
switch(config)# keychain macsec_keys
switch(config-keychain)# key 1
switch(config-keychain-key)# name abcdef123456
```

Removing the name of the key named **abcdef123456**:

```
switch# configure terminal
switch(config)# keychain macsec_keys
switch(config-keychain)# key 1
switch(config-keychain-key)# no name abcdef123456
```

Command History

Release	Modification
10.11	Command added.

Command Information

Platforms	Command context	Authority
All platforms	`config-keychain-key`	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

recv-id

`recv-id <0-255>`

Description

Configures the receive ID for a keychain key. The receive ID has to be unique across keys in the keychain.

The `no` form of this command configures removes the recv-id value. The receive ID can not be changed for an active key of a keychain which is associated with BGP neighbor.

Parameter	Description
`<0-255>`	Set the receive ID corresponding to the keychain key. Supported values are 0-255.

Examples

Configuring the receive ID for the keychain key.

```
switch# configure terminal
switch(config)# keychain ospf_keys
switch(config-keychain)# key 1
switch(config-keychain-key)# recv-id 1
```

Command History

Release	Modification
10.11	Command introduced.

Command Information

Platforms	Command context	Authority
All platforms	`config-keychain-key`	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

send-id

```
send-id <0-255>
```

Description

Configures the send ID for a keychain key. The send ID has to be unique across keys in the keychain.

The `no` form of this command configures removes the send-id value. The send id can not be changed for an active key of a keychain which is associated with BGP neighbor.

Parameter	Description
`<0-255>`	Set the send IDcorresponding to the keychain key. Supported values are 0-255.

Examples

Configuring the send ID for the keychain key.

```
switch# configure terminal
switch(config)# keychain ospf_keys
switch(config-keychain)# key 1
switch(config-keychain-key)# send-id 218
```

Command History

Release	Modification
10.11	Command introduced.

Command Information

Platforms	Command context	Authority
All platforms	`config-keychain-key`	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

send-lifetime

```
send-lifetime [start-time <time> <month>/<day>/<year>] {duration {<seconds> | infinite} |
end-time <time> <month>/<day>/<year>}
```

Description

Configures the duration for which the key is valid for sending packets.

The `no` form of this command configures the key packet sending duration to the default value of an infinite time.

Parameter	Description
`start-time`	Time at which the key chain lifetime starts. Required. Format: HH:MM:SS
`end-time`	Time at which the key chain lifetime expires. Required. Format: HH:MM:SS
`day`	Day of the month. Required. Range: 1-31.
`month`	Month of the year. Required.
`year`	Year. Required. Range: 2020-2050
`duration`	Time in seconds. Optional. Range: 1-2147483646.
`infinite`	Specifies infinite time for the key. Optional.

Examples

Configuring the duration for which the key is valid for sending packets:

```
switch# configure terminal
switch(config)# keychain ospf_keys
switch(config-keychain)# key 1
switch(config-keychain-key)# send-lifetime start-time 10:10:10 10/25/2020 end-time
10:10:10 11/25/2020
switch(config-keychain-key)# send-lifetime start-time 10:10:10 10/25/2020 duration
1000
switch(config-keychain-key)# send-lifetime start-time 10:10:10 10/25/2020 duration
infinite
switch(config-keychain-key)# send-lifetime end-time 10:10:10 11/25/2020
switch(config-keychain-key)# send-lifetime duration 1000
switch(config-keychain-key)# send-lifetime duration infinite
```

Configuring the key packet sending duration to the default value of an infinite time:

```
switch# configure terminal
switch(config)# keychain ospf_keys
switch(config-keychain)# key 1
switch(config-keychain-key)# no send-lifetime
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	`config-keychain-key`	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show capacities keychain

`show capacities keychain`

Description

Shows the maximum number of key chains and keys configurable in a key chain.

Example

```
switch# show capacities keychain

System Capacities: Filter Keychain
Capacities Name
                 Value
-------------------------------------------------------------------------------------------
-----------------------
Maximum number of keychains supported in the system
                  64
Maximum number of Keys supported in a single Keychain
                  64
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	Operator (>)	Administrators or local user group members with execution rights for this command.

show keychain

`show keychain [<KEYCHAIN-NAME>]`

Description

Shows information about configured and active keys of a named key chain or (if `keychain-name` is not specified) all configured key chains.

Parameter	Description
<KEYCHAIN-NAME>	Name of the key chain. Optional.

Example

```
switch# show keychain
Keychain Name : macsec_keys
  Number of Keys      : 1
  Active Send Key ID  :
  Active Recv Key IDs :

  Key ID : 1
    Key name          : abcdef123456
    Key string        : AQBapYa+0qQDzcakbB1TopeX0AMYDDWDW015orkH5mY3qJDaBAAAADASiBQ=
    Send Key Validity : 00:00:00 01/01/2020 to Infinite
    Recv Key Validity : 00:00:00 01/01/2020 to Infinite

Keychain Name : ospf_keys
  Number of Keys      : 2
  Active Send Key ID  : 7
  Active Recv Key IDs : 7, 200

  Key ID              : 7
    Key name          : -
    Key string        : AQBapZ1OHiO9W3JwRqnjtLfbV73BPLS1S6TGVg+Lzl7N4e5eBAAAAPWaPBE=
    Crypto-Algorithm  : sha256
    Send Key Validity : 00:00:01 10/1/2020 to 23:59:01 10/1/2021
    Recv Key Validity : 00:00:01 10/1/2020 to infinite
  Key ID              : 200
    Key name          : -
    Key string        : AQBapZ1OHiO9W3JwRqnjtLfbV73BPLS1S6TGVg+Lzl7N4e5eBAAAAPWaPBE=
    Crypto-Algorithm  : sha512
    Send Key Validity : 00:00:01 10/1/2020 to 23:59:01 10/1/2021
    Recv Key Validity : 00:00:01 10/1/2020 to 23:59:01 10/1/2021

Keychain Name : bgp_keys
  Number of Keys      : 2
  Active Send Key ID  : 7
  Active Recv Key IDs : 7

  Key ID              : 7
    Key name          : -
    Key string        : AQBapZ1OHiO9W3JwRqnjtLfbV73BPLS1S6TGVg+Lzl7N4e5eBAAAAPWaPBE=
    Crypto-Algorithm  : md5
    Send Key Validity : 00:00:01 10/26/2020 to 23:59:01 10/1/2021
    Recv Key Validity : 00:00:01 10/22/2020 to infinite
  Key ID              : 8
    Key name          : -
    Key string        : AQBapZ1OHiO9W3JwRqnjtLfbV73BPLS1S6TGVg+Lzl7N4e5eBAAAAPWaPBE=
    Crypto-Algorithm  : sha384
    Send Key Validity : 00:00:01 10/1/2021 to 23:59:01 10/1/2021
    Recv Key Validity : 00:00:01 10/1/2021 to 23:59:01 10/1/2021
```
```
Keychain Name : ospf_keys
  Number of Keys      : 2
  Active Send Key ID  : 7
  Active Recv Key IDs : 7, 200

  Key ID              : 7
    Key name          : -
    Key string        : AQBapZ1OHiO9W3JwRqnjtLfbV73BPLS1S6TGVg+Lzl7N4e5eBAAAAPWaPBE=
    Crypto-Algorithm  : sha256
    Send Key Validity : 00:00:01 10/1/2020 to 23:59:01 10/1/2021
    Recv Key Validity : 00:00:01 10/1/2020 to infinite
  Key ID              : 200
```

```
    Key name          : -
    Key string        : AQBapZ1OHiO9W3JwRqnjtLfbV73BPLS1S6TGVg+Lzl7N4e5eBAAAAPWaPBE=
    Crypto-Algorithm  : sha512
    Send Key Validity : 00:00:01 10/1/2020 to 23:59:01 10/1/2021
    Recv Key Validity : 00:00:01 10/1/2020 to 23:59:01 10/1/2021
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	Operator (>)	Administrators or local user group members with execution rights for this command.

show running-config keychain

```
show runnning-config keychain
```

Description

Shows the configurations for key chain protocol.

Example

```
switch# show running-config keychain
keychain ospf_keys
  key 1
    key-string ciphertext
AQBapZ1OHiO9W3JwRqnjtLfbV73BPLS1S6TGVg+Lzl7N4e5eBAAAAPWaPBE=
    cryptographic-algorithm md5
    accept-lifetime start-time 10:10:10 10/25/2020 end-time 10:10:10 11/25/2020
    send-lifetime start-time 10:10:10 10/25/2020 end-time 10:10:10 11/25/2020
  key 45
    key-string ciphertext
AQBapZ1OHiO9W3JwRqnjtLfbV73BPLS1S6TGVg+Lzl7N4e5eBAAAAPWaPBE=
    accept-lifetime start-time 10:10:10 10/25/2020 end-time 10:10:10 11/25/2020
  key 33
keychain macsec_keys
  key 1
    name abcdef123456
    key-string ciphertext
AQBapYa+0qQDzcakbB1TopeX0AMYDDWDW015orkH5mY3qJDaBAAAADASiBQ=
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	Operator (>)	Administrators or local user group members with execution rights for this command.

IP Client Tracker is only supported on the Aruba 6x00 Switch Series.

The client IP address tracking feature will learn and update the IP addresses of the access devices and clients connected to the switch. It can track addresses of directly connected clients, as well as clients connected to a downstream device such as a wireless access point.

IP Client tracker can be enabled for user-based tunneling (UBT) clients to learn the IP addresses on the required VLANs and interfaces.

Enabling IP Client Tracker based on UBT modes:

- If the UBT mode is Local VLAN, enable IP Client tracker for the UBT client VLAN defined using the `ubt-client-vlan` command.
- If the UBT mode is VLAN extend, enable IP Client tracker for the UBT client VLAN defined under role.

IP Client Tracker commands

client track ip

`client track ip`

Description

Enables client IP address tracking on the switch. The default is disabled on global and VLAN levels.

Admin users can enable client IP address tracking at the VLAN level.

Tracking enabling will take effect only if the client IP address tracking is enabled at system and VLAN level.

The `no` form of the command disables client IP address tracking. If tracking is disabled at switch level, it will be stopped even if it is enabled at VLAN or port level.

Example

Enable client IP address tracking at switch level:

```
switch(config)# client track ip
```

Enable client IP address tracking on VLAN 100:

```
switch(config)# vlan 100
switch(config-vlan-100)# client track ip
Enable client IP address tracking on VLANs 10 to 100:
switch(config)# vlan 10-100
switch(config-vlan-<10-100>)# client track ip
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8360 9300 10000	config	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

client track ip { enable | disable | auto }

```
client track ip { enable | disable | auto }
```

Description

Enables client IP address tracking on the specified set of interfaces. Tracking will take effect only if client IP address tracking is enabled at both the system level and for the VLAN to which the port belongs. Default: auto.

The no form of the command disables client IP address tracking on the specified set of interfaces.

Parameter	Description
enable	Specifies that all client IP addresses will be tracked in the port.
disable	Specifies that client IP addresses will not be tracked in the port.
auto	Specifies the following: For LLDP devices: Only the specified client IP address will be tracked in the port and other client IP addresses will not be tracked. For non-LLDP devices: All client IP addresses will be tracked in the port.

Example

Enable client IP address tracking on interface 1/1/1:

```
switch(config)# interface 1/1/1
switch(config-if)# client track ip enable
```

Enable client IP address tracking on interfaces 1/1/1 to 1/1/5:

```
switch(config)# interface 1/1/1-1/1/5
switch(config-if-<1/1/1-1/1/5>)# client track ip enable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

client track ip client-limit

```
client track ip client-limit <CLIENT-LIMIT>
```

Description

Configures the maximum number of clients to be tracked on the specified set of interfaces.

The no form of the command resets the client limit to the default value. Default values vary according to switch model:

- 6300: 2048
- 6400: 4096

Parameter	Description
CLIENT-LIMIT	Specifies the maximum number of clients tracked on a port. Required. Range: 1-2048 (6300) 1-4096 (6400). Default: 2048 (6300) 4096 (6400)..

Example

Configure the maximum number of clients to be tracked on interface 1/1/5:

```
switch(config)# interface 1/1/5
switch(config-if)# client track ip client-limit 32
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

client track ip update-interval

```
client track ip update-interval <INTERVAL>
```

Description

Configures how often client IP addresses are updated.

The no form of the command resets the update interval to the default of 1800 seconds.

Parameter	Description
INTERVAL	Specifies the update interval in seconds. Required. Range: 60-28000. Default: 1800.

Example

Configure the update interval for an interface:

```
switch(config)# interface 1/1/1
switch(config-if)# client track ip update-interval 600
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

client track ip update-method probe

```
client track ip update-method probe
```

Description

Enables probing the client to update the IP address.

The probe is sent to all clients on the tracking list that have an IP address in the following scenarios:

1. IP packets are not received from the clients during the IP address update cycle.
2. There is no IP packet from a learned IP address. In this case, a probe will be sent for the IP address to confirm if it is still owned by that client.

The `no` form of the command disables probing.

Example

Disable probing to update the client IP address:

```
switch(config)# no client track ip update-method probe
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show capacities

```
show capacities
```

Description

Shows the capacities configured on the switch.

Example

```
switch# show capacities

System Capacities:
Capacities Name                                                                  Value
--------------------------------------------------------------------------------------
Maximum number of Access Control Entries configurable in a system              14336
Maximum number of Access Control Lists configurable in a system                 1024
Maximum number of class entries configurable in a system                        1024
Maximum number of classes configurable in a system                               512
Maximum number of entries in an Access Control List                             1024
Maximum number of entries in a class                                            1024
```

```
Maximum number of entries in a policy                                        1024
Maximum number of classifier policies configurable in a system                512
Maximum number of policy entries configurable in a system                    1024
Maximum number of clients supported for tracking the IP address in the system  128

switch# show capacities client-track-ip-client-limit

System Capacities: Filter Client Track IP Client Limit
Capacities Name                                                              Value
-------------------------------------------------------------------------------------
Maximum number of clients supported for tracking the IP address in the system
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>)	Administrators or local user group members with execution rights for this command.

show client ip { count | port | vlan }

```
show client ip { count | port | vlan }
```

Description

Shows number of client IP addresses or information about client IP addresses tracked on ports and VLANs.

Parameter	Description
count	Displays number of clients tracked.
port	Displays client IP addresses tracked on the ports.
vlan	Displays client IP addresses tracked on the VLANs.

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>)	Administrators or local user group members with execution rights for this command.

Routing Information protocol (RIP, RIPv2, RIPng) is a distance-vector routing protocol that uses hop count as a routing metric. It is useful in small networks. RIP can be configured on L3 ports, LAG, VLAN and Loopback interfaces. All configurations work in the interface context and require the associated interface to be routing interface.

- **RIP/RIPv2:** IPv4 implementation of Routing Information protocol defined in RFC 2453.
- **RIPng:** IPv6 implementation of Routing Information protocol defined in RFC 2080.

Overview

RIP characteristics:

- Prevents routing loops by adding a limit to the number of hops allowed in a path from source to destination.
- Allows a maximum of 15 hops which limits the size of the network that RIP can support.
- Uses broadcast UDP data packets to exchange routing information.
- RIPv2 is a classless protocol that supports variable-length subnet mask (VLSM), classless inter-domain routing (CIDR) and route summarization.
- RIPng uses ipsec for message authentication.

RIP limitations:

- RIPv1 is not supported.
- Only poison reverse is supported for loop prevention.

RIPv2 (IPv4) commands

Configuration commands

router rip

```
router rip <PROCESS-ID> [vrf <VRF-NAME>]
no router rip <PROCESS-ID> [vrf <VRF-NAME>]
```

Description

Creates RIP process if not already created and enters the `router rip <PROCESS-ID>` context for the VRF mentioned. If no VRF is mentioned, a default is used. Only one RIP process is allowed per VRF.

The `no` form of this command deletes the RIP instance for the VRF. If no VRF is mentioned the default is deleted.

Parameter	Description
<PROCESS-ID>	Specifies name of the RIP process ID. Range: 1-63.
vrf <VRF-NAME>	Specifies VRF name.

Examples

Creating RIP process and naming the VRF:

```
switch(config)# router rip 2 vrf red
```

Deleting RIP process:

```
switch(config)# no router rip 2 vrf red
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Administrators or local user group members with execution rights for this command.

Interface commands

ip rip

```
ip rip <PROCESS-ID> {all-ip | ip-address}
no ip rip <PROCESS-ID> {all-ip | ip-address}
```

Description

Enables RIP process on an interface.

The no form of this command deletes the RIP process from an interface.

Parameter	Description
ip rip *<PROCESS-ID>*	Specifies RIP process ID. Range: 1-63.
all-ip	Specifies RIP for all IP addresses configured on the interface.
ip-address	Specifies IP address for RIP on the interface.

Usage

- If an IP address is removed from an interface configured with RIP, all RIP configurations will be removed from the interface.
- If `ip rip 1 all-ip` is configured and a new IP address is added to the interface, RIP configurations will not be applicable for the newly added IP address.

Examples

Configuring RIP for all IP addresses configured on the interface:

```
switch(config)# interface 1/1/1
switch(config-if)# ip rip 1 all-ip
```

Deleting RIP for all IP addresses configured on the interface:

```
switch(config)# interface 1/1/1
switch(config-if)# no ip rip 1 all-ip
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-if`	Administrators or local user group members with execution rights for this command.

ip rip all-ip enable

```
ip rip all-ip enable
no ip rip all-ip enable
```

Description

Enables RIP process for all RIP enabled IP addresses configured on interface.

The `no` form of this command disables RIP process on the interface.

Usage

- Default settings allow an interface to receive RIP packets.
- If an IP address is removed from an interface configured with RIP, all RIP configurations will be removed from the interface.

Examples

Enabling RIP process for all RIP enabled IP addresses on interface:

```
switch(config)# interface 1/1/1
switch(config-if)# ip rip all-ip enable
```

Disabling RIP process on interface:

```
switch(config)# interface 1/1/1
switch(config-if)# no ip rip all-ip enable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if	Administrators or local user group members with execution rights for this command.

ip rip all-ip disable

```
ip rip all-ip disable
no ip rip all-ip disable
```

Description

Disables RIP process for all RIP enabled IP addresses configured on the interface.

The no form of this command enables RIP process for all RIP enabled IP addresses configured on the interface.

Usage

- Default settings allow an interface to receive RIP packets.
- If an IP address is removed from an interface configured with RIP, all RIP configurations will be removed from the interface.

Examples

Disabling RIP process for all RIP enabled IP addresses on interface:

```
switch(config)# interface 1/1/1
switch(config-if)# ip rip all-ip enable
```

Enabling RIP process for all RIP enabled IP addresses on interface:

```
switch(config)# interface 1/1/1
switch(config-if)# no ip rip all-ip enable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if	Administrators or local user group members with execution rights for this command.

ip rip all-ip send disable

```
ip rip all-ip send disable
no ip rip all-ip send disable
```

Description

Disables interface from sending RIP packets for all RIP enabled IP addresses.

The no form of this command enables interface to send RIP packets for all RIP enabled IP addresses.

Usage

- Default settings allow an interface to send RIP packets.
- If an IP address is removed from an interface configured with RIP, all RIP configurations will be removed from the interface.

Examples

Disabling interface from sending RIP packets for all RIP enabled IP addresses on interface:

```
switch(config)# interface 1/1/1
switch(config-if)# ip rip all-ip send disable
```

Enabling interface to send RIP packets for all RIP enabled IP addresses on interface:

```
switch(config)# interface 1/1/1
switch(config-if)# no ip rip all-ip send disable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if	Administrators or local user group members with execution rights for this command.

ip rip all-ip receive disable

```
ip rip all-ip receive disable
no ip rip all-ip receive disable
```

Description

Disables interface from receiving RIP packets for all enabled IP addresses.

The no form of this command enables interface to receive RIP packets for all RIP enabled IP addresses.

Usage

- Default settings allow an interface to receive RIP packets.
- If an IP address is removed from an interface configured with RIP, all RIP configurations will be removed from the interface.

Examples

Disabling interface from receiving RIP packets for all RIP enabled IP addresses on interface:

```
switch(config)# interface 1/1/1
switch(config-if)# ip rip all-ip receive disable
```

Enabling interface to receive RIP packets for all RIP enabled IP addresses on interface:

```
switch(config)# interface 1/1/1
switch(config-if)# no ip rip all-ip receive disable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if	Administrators or local user group members with execution rights for this command.

Routing commands

enable

```
enable
no enable
```

Description

Enables RIP process if disabled. By default RIP process is enabled.

The `no` form of this command disables the RIP process.

Examples

Enabling RIP process when disabled:

```
switch(config)# router rip 1
switch(config-rip-1)# enable
```

Disabling RIP process when enabled:

```
switch(config)# router rip 1
switch(config-rip-1)# no enable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Administrators or local user group members with execution rights for this command.

disable

```
disable
```

```
no disable
```

Description

Disables RIP process.

The `no` form of this command enables the RIP process.

Examples

Disabling RIP process:

```
switch(config)# router rip 1
switch(config-rip-1)# disable
```

Enabling RIP process:

```
switch(config)# router rip 1
switch(config-rip-1)# no disable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

distance

```
distance <DISTANCE>
no distance
```

Description

Configures administrative distance for RIP. Administrative distance is used as criteria to select the best route when multiple protocols have the same route.

The `no` form of this command sets the RIP administrative distance to the default. Default: 120.

Parameter	Description
<DISTANCE>	Specifies RIP administrative distance. Range: 1 to 255.

Examples

Configuring administrative distance for RIP:

```
switch(config)# router rip 1
switch(config-rip-1)# distance 100
```

Setting administrative distance for RIP to default values:

```
switch(config)# router rip 1
switch(config-rip-1)# no distance
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Administrators or local user group members with execution rights for this command.

maximum-paths

```
maximum-paths <MAX-VALUE>
no maximum-paths
```

Description

Sets the maximum number of ECMP routes that RIP can support.

The no form of this command sets the maximum number of ECMP routes to the default value of 4.

Parameter	Description
<MAX-VALUE>	Sets the number of RIP ECMP routes. Range: 1-8.

Examples

Setting maximum number of RIP ECMP routes:

```
switch(config)# router rip 1
switch (config-rip-1)# maximum-paths 8
```

Setting maximum number of RIP ECMP routes to default:

```
switch(config)# router rip 1
switch (config-rip-1)# no maximum-paths
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

redistribute

```
redistribute {bgp | connected | ospf <PROCESS-ID> | static}
no redistribute {bgp | connected | ospf <PROCESS-ID> | static}
```

Description

Redistributes routes originating from other protocols into RIP.

The `no` form of this command disables redistribution of routes originating from other protocols into RIP.

Parameter	Description
`bgp`	Specifies BGP routes to redistribute into RIP.
`connected`	Specifies connected routes (directly attached subnet or host) to redistribute into RIP.
`ospf <PROCESS-ID>`	Specifies OSPF route to redistribute into RIP.
`static`	Specifies static route to redistribute into RIP.

Examples

Redistributing BGP routes into RIP:

```
switch(config)# router rip 1
switch(config-rip-1)# redistribute bgp
```

Disabling BGP routes that originate from other protocols and redistribute into RIP:

```
switch(config)# router rip 1
switch(config-rip-1)# no redistribute bgp
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Administrators or local user group members with execution rights for this command.

timers update

```
timers update <INTERVAL> timeout <DURATION> garbage-collection <PERIOD>
no timers
```

Description

Configures RIP timers with specific values.

The no form of this command sets all RIP timers to default values.

Parameter	Description
timers update <INTERVAL>	Specifies frequency at which RIP sends updates to all of its peers. Range: 1 to 2147484. Default: 30.
timeout <DURATION>	Specifies timeout duration from the point of the last refresh after a route is received from a peer timeout and is marked as expired. Range: 1 to 255. Default: 180.
garbage-collection <PERIOD>	Specifies amount of time route remains in routing table after route expiration. Range: 1 to 255. Default: 120.

Examples

Configuring RIP timers with specific values:

```
switch(config)# router rip 1
switch(config-rip-1)# timers update 40 timeout 200 garbage-collection 150
```

Configuring RIP timers with default values:

```
switch(config)# router rip 1
switch(config-rip-1)# no timers
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

RIPv2 clear commands

clear ip rip statistics

`clear ip rip [<PROCESS-ID>] statistics [all-vrfs | vrf <VRF-NAME>]`

Description

Clears RIP event statistics.

Parameter	Description
<PROCESS-ID>	Specifies RIP process ID. Range: 1-63
`all-vrfs`	Clears statistics for all VRFs.
`vrf`	Selects VRF to clear statistics for.
<VRF-NAME>	Specifies VRF name.

Examples

Clearing RIP event statistics:

```
switch# clear ip rip statistics
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Administrators or local user group members with execution rights for this command.

RIPv2 interface commands

enable

```
enable
no enable
```

Description

Enables RIP process for RIP enabled IP address configured on interface.

The `no` form of this command disables RIP process on interface.

Usage

- Default settings allow an interface to receive RIP packets.
- If an IP address is removed from an interface configured with RIP, all RIP configurations will be removed from the interface.

Examples

Enabling RIP process for RIP enabled IP address:

```
switch(config)# interface 1/1/1
switch(config-if)# ip rip 1 10.1.1.1
switch(config-if-rip)# enable
```

Disabling RIP process on interface:

```
switch(config)# interface 1/1/1
switch(config-if)# ip rip 1 10.1.1.1
switch(config-if-rip)# no enable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if	Administrators or local user group members with execution rights for this command.

disable

```
disable
no disable
```

Description

Disables RIP process for RIP enabled IP addresses configured on interface.

The no form of this command enables RIP process on interface.

Examples

Disabling RIP process for RIP enabled IP addresses configured on interface:

```
switch(config)# interface 1/1/1
switch(config-if)# ip rip 1 10.1.1.1
switch(config-if-rip)# disable
```

Enabling RIP process on interface:

```
switch(config)# interface 1/1/1
switch(config-if)# ip rip 1 10.1.1.1
switch(config-if-rip)# no disable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if	Administrators or local user group members with execution rights for this command.

send disable

```
send disable
```

```
no send disable
```

Description

Disables an interface from sending RIP packets for a specific IP address.

The `no` form of this command enables interface for sending RIP packets for a specific IP address.

Usage

- Default settings allow an interface to send and receive RIP packets.
- If an IP address is removed from an interface configured with RIP, all RIP configurations will be removed from the interface.

Examples

Disabling interface from sending RIP packets for a specific IP address :

```
switch(config)# interface 1/1/1
switch(config-if)# ip rip 1 10.1.1.1
switch(config-if-rip)# send disable
```

Enabling interface to send RIP packets for a specific IP address:

```
switch(config)# interface 1/1/1
switch(config-if)# ip rip 1 10.1.1.1
switch(config-if-rip)# no send disable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-if`	Administrators or local user group members with execution rights for this command.

receive disable

```
receive disable
no receive disable
```

Description

Disables interface from receiving RIP packets for a specific IP address.

The `no` form of this command enables interface for receiving RIP packets for a specific IP address.

Usage

- Default settings allow an interface to receive RIP packets.
- If an IP address is removed from an interface configured with RIP, all RIP configurations will be removed from the interface.

Examples

Disabling interface from receiving RIP packets for a specific IP address:

```
switch(config)# interface 1/1/1
switch(config-if)# ip rip 1 10.1.1.1
switch(config-if-rip)# receive disable
```

Enabling interface for receiving RIP packets for a specific IP address:

```
switch(config)# interface 1/1/1
switch(config-if)# ip rip 1 10.1.1.1
switch(config-if-rip)# no receive disable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if	Administrators or local user group members with execution rights for this command.

RIPv2 show commands

show capacities rip

```
show capacities rip
```

Description

Displays maximum number of RIP interfaces, routes and process.

Examples

Displaying maximum number of RIP interfaces, routes and process:

```
switch# show capacities rip

System Capacities: Filter RIP
Capacities Name                                                                  Value
--------------------------------------------------------------------------------------
Maximum number of RIP interfaces configurable in the system                      32
Maximum number of RIP processes supported across each VRF                        1
Maximum number of routes in RIP supported across all VRFs                        2540
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Auditors or Administrators or local user group members with execution rights for this command. Auditors can execute this command from the auditor context (auditor>) only.

show capacities-status rip

```
show capacities-status rip
```

Description

Displays number of RIP interfaces, routes and process configured in the system.

Examples

Displaying number of RIP interfaces, routes and process:

```
switch# show capacities-status rip

System Capacities Status: Filter RIP
Capacities Name                                          Value Maximum
-----------------------------------------------------------------------
Number of RIP interfaces configured in the system            0      32
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Auditors or Administrators or local user group members with execution rights for this command. Auditors can execute this command from the auditor context (auditor>) only.

show ip rip

```
show ip rip [<PROCESS-ID>] [all-vrfs | vrf <VRF-NAME>]
```

Description

Displays general RIP configuration.

Parameter	Description
<PROCESS-ID>	Specifies RIP process ID. Range: 1-63.
`all vrfs`	Displays general RIP information for all VRFs.
`vrf`	Selects VRF to display general RIP information for.
<VRF-NAME>	Specifies VRF name.

Usage

- Parameters display general RIP information for a specific RIP process.
- Parameters display general RIP information for a specific or all VRFs.
- If a VRF is not mentioned, information for the default VRF is displayed.

Examples

Displaying general RIP configuration for all VRFs:

```
switch# show ip rip 34 all-vrfs
VRF : Default                         Process-ID : 34
------------------------------------------------------------------------
RIP Version             : RIPv2     Protocol Status : Enabled
Update Time             : 60  sec   Timeout Time    : 240 sec
Garbage Collection Time : 250 sec   ECMP            : 6
Distance                : 100       Redistribution  : static,
                                                      ospf 1

VRF : vrf_1                           Process-ID : 34
------------------------------------------------------------------------
RIP Version             : RIPv2     Protocol Status : Enabled
Update Time             : 30  sec   Timeout Time    : 180 sec
Garbage Collection Time : 120 sec   ECMP            : 4
Distance                : 120       Redistribution  : None
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Auditors or Administrators or local user group members with execution rights for this command. Auditors can execute this command from the auditor context (auditor>) only.

show ip rip interface

```
show ip rip [<PROCESS-ID>] interface [<INTERFACE-NAME>] [brief] [all-vrfs | vrf <VRF-NAME>]
```

Description

Displays information about RIP enabled interfaces.

Parameter	Description
<PROCESS-ID>	Specifies RIP process ID. Range: 1-63.
<INTERFACE-NAME>	Specifies interface.
`brief`	Shows brief overview information for the RIP interface.
`all-vrfs`	Displays interface information for all VRFs.
`vrf`	Selects specific VRF.
<VRF-NAME>	Specifies VRF.

Usage

- Parameters display general RIP information for a specific RIP process.
- If a VRF is not mentioned, information for the default VRF is displayed.

Examples

```
switch# show ip rip interface
Interface 1/1/1 is up, IP Address is 10.10.10.1/24
------------------------------------------------------------------------
VRF             : Default            Process-ID     : 1
Status          : Oper Up            Mode           : Send and Receive
MTU             : 500                Version        : RIPv2
Poision Reverse : Enabled

Interface 1/1/2 is up, IP Address is 20.10.10.1/24
------------------------------------------------------------------------
VRF             : Default            Process-ID     : 1
```

```
Status          : Admin Down         Mode           : Receive
MTU             : 500                Version        : RIPv2
Poision Reverse : Enabled

Interface 1/1/3 is up, IP Address is 30.10.10.1/24
------------------------------------------------------------------------
VRF             : Default            Process-ID     : 1
Status          : Admin Down         Mode           : Send
MTU             : 500                Version        : RIPv2
Poision Reverse : Enabled

switch# show ip rip interface brief
VRF : default   Process-ID : 1
--------------------------------

Total Number of Interfaces: 2

Interface     IP-Address/Mask    Status    MTU
-------------------------------------------------
1/1/1         10.10.10.1/24       up       500
1/1/2         20.10.10.1/24       up       500
1/1/3         30.10.10.1/24       up       500
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Auditors or Administrators or local user group members with execution rights for this command. Auditors can execute this command from the auditor context (auditor>) only.

show ip rip neighbors

```
show ip rip [<PROCESS-ID>] neighbors [<IP-ADDRESS>] [all-vrfs | vrf <VRF-NAME>]
```

Description

Displays information about RIP neighbors.

Parameter	Description
<PROCESS-ID>	Specifies RIP process ID. Range: 1-63.
<IP-ADDRESS>	Specifies IP address of a specific neighbor to display information on.
`all-vrfs`	Displays neighbor information for all VRFs.

Parameter	Description
`vrf`	Selects VRF to display neighbor information.
<VRF-NAME>	Specifies VRF name.

Usage

- Parameters display RIP neighbor information for a specific RIP process.
- Parameters display RIP neighbor information for a specific neighbor.
- If a VRF is not mentioned, information for the default VRF is displayed.

Examples

Displaying RIP neighbor information for all VRFs:

```
switch# show ip rip neighbors all-vrfs
VRF : default            Process-ID : 1
---------------------------------------

Total Number of Neighbors: 1

Peer-Address    Type    Last-Update  Rcvd-Bad-Pkts    Rcvd-Bad-Routes
-------------------------------------------------------------------
1.1.1.2         RIPv2   0:0:7        4                5
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Auditors or Administrators or local user group members with execution rights for this command. Auditors can execute this command from the auditor context (auditor>) only.

show ip rip routes

`show ip rip [<PROCESS-ID>] routes [<PREFIX/LENGTH>] [all-vrfs | vrf <VRF-NAME>]`

Description

Displays RIP routing table for a specific RIP process.

Parameter	Description
<PROCESS-ID>	Specifies RIP process ID to display information for a specific RIP process. Range: 1-63.
<PREFIX/LENGTH>	Specifies the network prefix.
`all-vrfs`	Displays RIP routing information for all VRFs.
`vrf`	Selects VRF to display RIP routing information.
<VRF-NAME>	Specifies VRF name.

Usage

- *<PREFIX/LENGTH>* is an optional parameter that displays RIP routing table information for a specific subnet.
- If a VRF is not mentioned, information for the default VRF is displayed.

Examples

Displaying RIP routing table for all VRFs:

```
switch# show ip rip routes all-vrfs
VRF : default              Process-ID : 1
-------------------------------------
Total Number of Routes : 6

Prefix              Metric     Interface      Nexthop
-----------------------------------------------------
10.1.0.0/16           2         1/1/1         30.1.1.2
20.1.2.0/24           3         1/1/1         30.1.1.2
30.1.1.0/24           1         1/1/1

VRF : vrf_1                Process-ID : 34
-------------------------------------

Prefix               Metric     Interface      Nexthop
-----------------------------------------------------
20.1.0.0/16           10         1/1/2         50.1.1.2
40.1.2.0/24           14         1/1/2         50.1.1.2
50.1.1.0/24            1         1/1/2
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400	Operator (>) or Manager (#)	Auditors or Administrators or local user group members with execution rights for this command. Auditors can execute this

Platforms	Command context	Authority
8320 8325 8360 9300 10000		command from the auditor context (auditor>) only.

show ip rip statistics

```
show ip rip [<PROCESS-ID>] statistics [all-vrfs | vrf <VRF-NAME>]
```

Description

Displays RIP statistics.

Parameter	Description
<PROCESS-ID>	Specifies RIP process ID. Range: 1-63.
`all-vrfs`	Displays statistics information for all VRFs.
`vrf`	Selects VRF to display RIP statistics information for.
<VRF-NAME>	Specifies VRF name.

Usage

- Parameters can display information for all VRFs or a specific VRF.
- If a VRF is not mentioned, information for the default VRF is displayed.

Examples

Displaying RIP statistics for all VRFs:

```
switch# show ip rip statistics all-vrfs
VRF : default  Process-ID : 1
-------------------------------------

Global Route Changes : 50
Global Queries       : 2
Last Cleared         : 0h 30m 28s ago

VRF : vrf_1    Process-ID : 34
-------------------------------------

Global Route Changes : 20
Global Queries       : 0
Last Cleared         : 0h 30m 28s ago
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Auditors or Administrators or local user group members with execution rights for this command. Auditors can execute this command from the auditor context (auditor>) only.

show ip rip statistics interface

```
show ip rip [<PROCESS-ID>] statistics interface [<INTERFACE-NAME>] [all-vrfs | vrf <VRF-NAME>]
```

Description

Displays RIP statistics for RIP enabled interfaces.

Parameter	Description
<PROCESS-ID>	Specifies RIP process ID. Range: 1-63.
<INTERFACE-NAME>	Specifies name of interface.
`all-vrfs`	Displays RIP interface statistics for all VRFs.
`vrf`	Selects VRF to display RIP interface statistics.
<VRF-NAME>	Specifies VRF name.

Usage

- Parameters can display information for all VRFs or a specific VRF.
- If a VRF is not mentioned, information for the default VRF is displayed.

Examples

Displaying RIP statistics for a RIP enabled interface:

```
switch# show ip rip statistics interface 1/1/1
VRF : default  Process-ID : 1      interface 1/1/1
-------------------------------------------------

IP-Address    Trigger-Updates    Rcvd-Bad-Packets    Rcvd-Bad-Routes
-------------------------------------------------------------------------
10.1.1.1      15                 3                   4

Last Cleared : 0h 30m 28s ago
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Auditors or Administrators or local user group members with execution rights for this command. Auditors can execute this command from the auditor context (auditor>) only.

show running-config

```
show running config
```

Description

Displays all running configurations for all protocols including RIP.

Examples

Displaying all running configurations for all protocols including RIP:

```
switch# show running-config
Current configuration:
!
!Version Halon 0.1.0 (Build: genericx86-64-Halon-0.1.0-master-20170309054955-dev)
!Schema version 0.1.8
lldp enable
timezone set utc
vrf blue
vrf green
vrf red
led base-loc_fdc on
led base-loc on
led base-hlth_fdc fast_blink
led base-pwr_fdc on
!
!
!
!
!
!
aaa authentication login default local
aaa authorization commands default none
!
!
!
!
router ospf 1 vrf red
router rip 1
    maximum-paths 5
    distance 1
router rip 1 vrf red
    default-information originate always
    maximum-paths 7
    distance 5
    redistribute ospf 1
    timers update 40 timeout 200 garbage-collection 120
vlan 1
    no shutdown
interface lag 44
```

```
    no shutdown
    ip address 33.1.1.1/24
    ip rip 1 33.1.1.1
        send disable
interface 1/1/1
    no shutdown
    ip address 33.44.1.1/24
    ip address 44.44.1.1/24 secondary
    ip rip 1 33.44.1.1
        send disable
    ip rip 1 44.44.1.1
        send disable
interface 1/1/2
interface loopback 2
    ip address 55.55.55.55/32
    ip rip 1 55.55.55.55
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Auditors or Administrators or local user group members with execution rights for this command. Auditors can execute this command from the auditor context (auditor>) only.

RIPng (IPv6) commands

Configuration commands

router ripng

```
router ripng <PROCESS-ID> [vrf <VRF-NAME>]
no router ripng <PROCESS-ID> [vrf <VRF-NAME>]
```

Description

Creates RIPng process if not already created and enters the `router ripng <PROCESS-ID>` context for the VRF mentioned. If no VRF is mentioned, a default is used. Only one RIPng process is allowed per VRF.

The `no` form of this command deletes the RIPng instance for the VRF. If no VRF is mentioned the default is deleted.

Parameter	Description
<PROCESS-ID>	Specifies name of the RIPng process ID. Range: 1-63.
`vrf`	Sets VRF name for RIPng process.
<VRF-NAME>	VRF name for VRF.

Examples

Creating RIPng process and naming the VRF:

```
switch(config)# router ripng 2 vrf red
```

Deleting RIPng process:

```
switch(config)# no router ripng 2 vrf red
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

Interface commands

ipv6 ripng

```
ipv6 ripng <PROCESS-ID>
no ipv6 ripng <PROCESS-ID>
```

Description

Enables RIPng process on interface and creates a new context.

The `no` form of this command deletes RIPng process on interface.

Parameter	Description
<PROCESS-ID>	Specifies RIPng process ID. Range: 1-63.

Examples

Enabling RIPng process on an interface:

```
switch(config)# interface 1/1/1
switch (config-if)# ipv6 ripng 1
switch (config-if-ripng)#
```

Deleting RIPng process on an interface:

```
switch(config)# interface 1/1/1
switch (config-if)# no ipv6 ripng 1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if	Administrators or local user group members with execution rights for this command.

Routing commands

enable

```
enable
no enable
```

Description

Enables RIPng process if disabled. By default RIPng process is enabled.

The no form of this command disables the RIPng process.

Examples

Enabling RIPng process when disabled:

```
switch(config)# router ripng 1
switch(config-ripng-1)# enable
```

Disabling RIPng process when enabled:

```
switch(config)# router ripng 1
switch(config-ripng-1)# no enable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

disable

```
disable
no disable
```

Description

Disables RIPng process.

The `no` form of this command enables the RIPng process.

Examples

Disabling RIPng process:

```
switch(config)# router ripng 1
switch(config-ripng-1)# disable
```

Enabling RIPng process:

```
switch(config)# router ripng 1
switch(config-ripng-1)# no disable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400	`config`	Administrators or local user group members with execution rights for this command.

Platforms	Command context	Authority
8320 8325 8360 9300 10000		

distance

```
distance <DISTANCE>
no distance
```

Description

Configures administrative distance for RIPng. Administrative distance is used as criteria to select the best route when multiple protocols have the same route.

The `no` form of this command sets the RIPng administrative distance to the default. Default: 120.

Parameter	Description
<DISTANCE>	Specifies RIPng administrative distance. Range: 1 to 255.

Examples

Configuring administrative distance for RIPng:

```
switch(config)# router ripng 1
switch(config-ripng-1)# distance 100
```

Setting administrative distance for RIPng to default values:

```
switch(config)# router ripng 1
switch(config-ripng-1)# no distance
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

maximum-paths

```
maximum-paths <MAX-VALUE>
no maximum-paths
```

Description

Sets the maximum number of ECMP routes that RIPng can support.

The `no` form of this command sets the maximum number of ECMP routes to the default value of 4.

Parameter	Description
<MAX-VALUE>	Sets the number of RIPng ECMP routes. Range: 1-8.

Examples

Setting maximum number of RIPng ECMP routes:

```
switch(config)# router ripng 1
switch (config-ripng-1)# maximum-paths 8
```

Setting maximum number of RIPng ECMP routes to default:

```
switch(config)# router ripng 1
switch (config-ripng-1)# no maximum-paths
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

redistribute

```
redistribute {bgp | connected | ospfv3 <PROCESS-ID> | static}
no redistribute {bgp | connected | ospfv3 <PROCESS-ID> | static}
```

Description

Redistributes routes originating from other protocols into RIPng.

The `no` form of this command disables redistribution of routes originating from other protocols into RIPng.

Parameter	Description
bgp	Specifies BGP routes to redistribute into RIPng.
connected	Specifies connected routes (directly attached subnet or host) to redistribute into RIPng.
ospfv3 *<PROCESS-ID>*	Specifies OSPFv3 route to redistribute into RIPng.
static	Specifies static route to redistribute into RIPng.

Examples

Redistributing BGP routes into RIPng:

```
switch(config)# router ripng 1
switch(config-ripng-1)# redistribute bgp
```

Disabling BGP routes that originate from other protocols and redistribute into RIPng:

```
switch(config)# router ripng 1
switch(config-ripng-1)# no redistribute bgp
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config	Administrators or local user group members with execution rights for this command.

timers update

```
timers update <INTERVAL> timeout <DURATION> garbage-collection <PERIOD>
no timers
```

Description

Configures RIPng timers with specific values.

The no form of this command sets all RIPng timers to default values.

Parameter	Description
`timers update <INTERVAL>`	Specifies frequency at which RIPng sends updates to all of its peers. Range: 1 to 2147484. Default: 30.
`timeout <DURATION>`	Specifies timeout duration from the point of the last refresh after a route is received from a peer timeout and is marked as expired. Range: 1 to 255. Default: 180.
`garbage-collection <PERIOD>`	Specifies amount of time route remains in routing table after route expiration. Range: 1 to 255. Default: 120.

Examples

Configuring RIPng timers with specific values:

```
switch(config)# router ripng 1
switch(config-ripng-1)# timers update 40 timeout 200 garbage-collection 150
```

Configuring RIPng timers with default values:

```
switch(config)# router ripng 1
switch(config-ripng-1)# no timers
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config`	Administrators or local user group members with execution rights for this command.

RIPng clear commands

clear ipv6 ripng statistics

`clear ipv6 ripng [<PROCESS-ID>] statistics [all-vrfs | vrf <VRF-NAME>]`

Description

Clears RIPng event statistics.

Parameter	Description
<PROCESS-ID>	Specifies RIPng process ID. Range: 1-63
`all-vrfs`	Clears statistics for all VRFs.
`vrf`	Selects VRF to clear statistics for.
<VRF-NAME>	Specifies VRF name.

Examples

Clearing RIPng event statistics:

```
switch# clear ipv6 ripng statistics
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Administrators or local user group members with execution rights for this command.

RIPng interface commands

enable

```
enable
no enable
```

Description

Enables RIPng process on interface.

The `no` form of this command disables RIPng process on interface.

Examples

Enabling RIPng process on interface:

```
switch(config)# interface 1/1/1
switch(config-if)# ipv6 ripng 1
switch(config-if-ripng)# enable
```

Disabling RIPng process on interface:

```
switch(config)# interface 1/1/1
switch(config-if)# ipv6 ripng 1
switch(config-if-ripng)# no enable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if	Administrators or local user group members with execution rights for this command.

disable

```
disable
no disable
```

Description

Disables RIPng process on interface.

The no form of this command enables RIPng process on interface.

Examples

Disabling RIP process for all RIP enabled IP addresses on interface:

```
switch(config)# interface 1/1/1
switch(config-if)# ipv6 ripng 1
switch(config-if-ripng)# disable
```

Enabling RIP process for all RIP enabled IP addresses on interface:

```
switch(config)# interface 1/1/1
switch(config-if)# ipv6 ripng 1
switch(config-if-ripng)# no disable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if	Administrators or local user group members with execution rights for this command.

send disable

```
send disable
no send disable
```

Description

Disables interface from sending RIPng packets. An interface can send RIPng packets by default.

The no form of this command enables interface to send RIPng packets, if disabled.

Examples

Disabling interface from sending RIPng packets:

```
switch(config)# interface 1/1/1
switch (config-if)# ipv6 ripng 1
switch (config-if-ripng)# send disable
```

Enabling interface to send RIPng packets:

```
switch(config)# interface 1/1/1
switch (config-if)# ipv6 ripng 1
switch (config-if-ripng)# no send disable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	config-if	Administrators or local user group members with execution rights for this command.

receive disable

```
receive disable
no receive disable
```

Description

Disables interface from receiving RIPng packets for all enabled IP addresses. An interface can receive RIPng packets by default.

The `no` form of this command enables interface to receive RIPng packets, if disabled.

Examples

Disabling interface from receiving RIPng packets:

```
switch(config)# interface 1/1/1
switch(config-if)# ipv6 ripng 1
switch (config-if-ripng)# receive disable
```

Enabling interface to receive RIPng packets when disabled:

```
switch(config)# interface 1/1/1
switch(config-if)# ipv6 ripng 1
switch (config-if-ripng)# no receive disable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	`config-if`	Administrators or local user group members with execution rights for this command.

RIPng show commands

show capacities ripng

```
show capacities ripng
```

Description

Displays the maximum number of RIPng interfaces, routes and process.

Examples

Displaying maximum number of RIPng interfaces, routes and process:

```
switch# show capacities ripng

System Capacities: Filter RIPng
Capacities Name                                                                  Value
-------------------------------------------------------------------------------------
Maximum number of RIPng interfaces configurable in the system                    32
Maximum number of RIPng processes supported across each VRF                      1
Maximum number of routes in RIPng supported across all VRFs                      2540
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Auditors or Administrators or local user group members with execution rights for this command. Auditors can execute this command from the auditor context (auditor>) only.

show capacities-status ripng

```
show capacities-status ripng
```

Description

Displays number of RIPng interfaces, routes and process configured in the system.

Examples

Displaying number of RIPng interfaces, routes and process:

```
switch# show capacities-status ripng

System Capacities Status: Filter RIPng
Capacities Name
        Value  Maximum
-------------------------------------------------------------------------------------------
-----------------------
Number of RIPng interfaces configured in the system
            0       32
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Auditors or Administrators or local user group members with execution rights for this command. Auditors can execute this command from the auditor context (auditor>) only.

show ipv6 ripng

```
show ipv6 ripng [<PROCESS-ID>] [all-vrfs | vrf <VRF-NAME>]
```

Description

Displays general RIPng configuration.

Parameter	Description
<PROCESS-ID>	Specifies RIPng process ID. Range: 1-63.
`all vrfs`	Displays general RIPng information for all VRFs.
`vrf`	Selects VRF to display general RIPng information for.
<VRF-NAME>	Specifies VRF name.

Usage

- Parameters display general RIPng information for a specific RIPng process.
- Parameters display general RIPng information for a specific or all VRFs.
- If a VRF is not mentioned, information for the default VRF is displayed.

Examples

Displaying general RIPng configuration for all VRFs:

```
switch# show ipv6 ripng 34 all-vrfs
VRF : Default                        Process-ID : 34
------------------------------------------------------------------------
Protocol Status         : Enabled    ECMP            : 6
Update Time             : 60   sec   Timeout Time    : 240 sec
Garbage Collection Time : 250 sec    Distance        : 100
Redistribution          : static,
                          ospfv3 1

VRF : vrf_1                          Process-ID : 34
------------------------------------------------------------------------
Protocol Status         : Enabled    ECMP            : 4
Update Time             : 30   sec   Timeout Time    : 180 sec
Garbage Collection Time : 120 sec    Distance        : 120
Redistribution          : None
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Auditors or Administrators or local user group members with execution rights for this command. Auditors can execute this command from the auditor context (auditor>) only.

show ipv6 ripng interface

```
show ipv6 ripng [<PROCESS-ID>] interface [<INTERFACE-NAME>] [brief] [all-vrfs | vrf <VRF-NAME>]
```

Description

Displays information about RIPng enabled interfaces.

Parameter	Description
<PROCESS-ID>	Specifies RIPng process ID. Range: 1-63.
<INTERFACE-NAME>	Specifies interface.
`brief`	Shows brief overview information for RIPng interface.
`all-vrfs`	Displays interface information for all VRFs.
`vrf`	Selects specific VRF.
<VRF-NAME>	Specifies VRF.

Usage

- Parameters display general RIPng information for a specific RIPng process.
- Parameters display general RIPng information for a specific or all VRFs.
- If a VRF is not mentioned, information for the default VRF is displayed.

Examples

```
switch# show ipv6 ripng interface
Interface 1/1/1 is up, IPv6 Address is fe80::7272:cfff:fe70:67a
------------------------------------------------------------------------
VRF             : Default            Process-ID      : 1
Status          : Oper Up            Mode            : Send and Receive
MTU             : 500                Poision Reverse : Enabled

Interface 1/1/2 is up, IPv6 Address is fe80::7272:cfff:fe70:67a
```

```
--------------------------------------------------------------------------
VRF             : Default            Process-ID      : 1
Status          : Admin Down         Mode            : Receive
MTU             : 500                Poision Reverse : Enabled

Interface 1/1/3 is up, IPv6 Address is fe80::7272:cfff:fe70:67a
--------------------------------------------------------------------------
VRF             : Default            Process-ID      : 1
Status          : Admin Down         Mode            : Send
MTU             : 500                Poision Reverse : Enabled

switch# show ipv6 ripng interface brief
VRF : default   Process-ID : 1
--------------------------------

Total Number of Interfaces: 2

Interface     IPv6-Address                  Status    MTU
------------------------------------------------------------
1/1/1         fe80::7272:cfff:fe70:67a      up        500
1/1/2         fe80::7272:cfff:fe71:67a      up        500
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Auditors or Administrators or local user group members with execution rights for this command. Auditors can execute this command from the auditor context (auditor>) only.

show ipv6 ripng neighbors

```
show ipv6 ripng [<PROCESS-ID>] neighbors [<LINK-LOCAL-ADDRESS>] [all-vrfs | vrf <VRF-NAME>]
```

Description

Displays information about RIPng neighbors.

Parameter	Description
<PROCESS-ID>	Specifies RIPng process ID. Range: 1-63.
`neighbors`	Specifies neighbor IP address.
<LINK-LOCAL-ADDRESS>	Specifies link-local address.

Parameter	Description
`all-vrfs`	Displays neighbor information for all VRFs.
`vrf`	Selects VRF to display neighbor information.
<VRF-NAME>	Specifies VRF name.

Usage

- Parameters display RIPng neighbor information for a specific RIPng process.
- Parameters display RIPng neighbor information for a specific neighbor.
- Parameters display general RIPng information for a specific or all VRFs.
- If a VRF is not mentioned, information for the default VRF is displayed.

Examples

Displaying RIPng neighbor information for all VRFs:

```
switch# show ipv6 ripng neighbors all-vrfs
VRF : default            Process-ID : 1
----------------------------------------

Total Number of Neighbors: 1

Peer-Address     Type    Last-Update  Rcvd-Bad-Pkts    Rcvd-Bad-Routes
-------------------------------------------------------------------------
fe80::7272:cfff:fe70:86ae
                 RIPng   0:0:7        4                5
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Auditors or Administrators or local user group members with execution rights for this command. Auditors can execute this command from the auditor context (auditor>) only.

show ipv6 ripng routes

`show ipv6 ripng [<PROCESS-ID>] routes [<PREFIX/LENGTH>] [all-vrfs | vrf <VRF-NAME>]`

Description

Displays RIPng routing table for a specific RIPng process.

Parameter	Description
<PROCESS-ID>	Specifies RIPng process ID to display information for a specific RIPng process. Range: 1-63.
<PREFIX/LENGTH>	Specifies the network prefix.
`all-vrfs`	Displays RIPng routing information for all VRFs.
`vrf`	Selects VRF to display RIPng routing information.
<VRF-NAME>	Specifies VRF name.

Usage

- *<PREFIX/LENGTH>* is an optional parameter that displays RIPng routing table information for a specific subnet.
- If a VRF is not mentioned, information for the default VRF is displayed.

Examples

Displaying RIPng routing table for all VRFs:

```
switch# show ipv6 ripng routes all-vrfs
VRF : default              Process-ID : 1
-----------------------------------------

Prefix              Metric     Interface      Nexthop
-------------------------------------------------------------------------
2001:DB8:10::/64      2         1/1/1         FE80::2E0:E6FF:FE1B:8242
2002:DB8:10::/64      3         1/1/1         FE80::2E0:E6FF:FE1B:8242
2003:DB8:10::/64      1         1/1/1

VRF : vrf_1                Process-ID : 34
-----------------------------------------

Prefix               Metric     Interface      Nexthop
-------------------------------------------------------------------------
3001:DB8:10::/64      10         1/1/2         FE80::2E0:E6FF:FE1B:8232
3002:DB8:10::/64      14         1/1/2         FE80::2E0:E6FF:FE1B:8232
3003:DB8:10::/64       1         1/1/2
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320	Operator (>) or Manager (#)	Auditors or Administrators or local user group members with execution rights for this command. Auditors can execute this command from the auditor context (auditor>) only.

Platforms	Command context	Authority
8325 8360 9300 10000		

show ipv6 ripng statistics

```
show ipv6 ripng [<PROCESS-ID>] statistics [all-vrfs | vrf <VRF-NAME>]
```

Description

Displays RIPng statistics.

Parameter	Description
<PROCESS-ID>	Specifies RIPng process ID. Range: 1-63.
`all-vrfs`	Displays statistics information for all VRFs.
`vrf`	Selects VRF and displays RIPng statistics for it.
<VRF-NAME>	Specifies VRF name.

Usage

- Parameters can display information for all VRFs or a specific VRF.
- If a VRF is not mentioned, information for the default VRF is displayed.

Examples

Displaying RIPng statistics for all VRFs:

```
switch# show ipv6 ripng statistics all-vrfs
VRF : default  Process-ID : 1
-------------------------------------

Global Route Changes : 50
Global Queries       : 2
Last Cleared         : 0h 30m 28s ago

VRF : vrf_1    Process-ID : 34
-------------------------------------

Global Route Changes : 20
Global Queries       : 0
Last Cleared         : 0h 30m 28s ago
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Auditors or Administrators or local user group members with execution rights for this command. Auditors can execute this command from the auditor context (auditor>) only.

show ipv6 ripng statistics interface

```
show ipv6 ripng [<PROCESS-ID>] statistics interface [<INTERFACE-NAME>] [all-vrfs | vrf <VRF-NAME>]
```

Description

Displays RIPng statistics for RIPng enabled interfaces.

Parameter	Description
<PROCESS-ID>	Specifies RIPng process ID. Range: 1-63.
<INTERFACE-NAME>	Specifies name of interface.
`all-vrfs`	Displays RIPng interface statistics for all VRFs.
`vrf`	Selects VRF to display RIPng interface statistics.
<VRF-NAME>	Specifies VRF name.

Usage

- Parameters can display information for all VRFs or a specific VRF.
- If a VRF is not mentioned, information for the default VRF is displayed.

Examples

Displaying RIPng statistics for a RIPng enabled interface:

```
switch# show ipv6 ripng statistics interface 1/1/1
VRF : default  Process-ID : 1      interface 1/1/1
-------------------------------------------------

IPv6-Address          Trigger-Updates    Rcvd-Bad-Packets    Rcvd-Bad-Routes
-------------------------------------------------------------------------------
fe80::7272:cfff:fe70:86ae
                      15                 3                   4

Last Cleared: 0h 30m 28s ago
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Auditors or Administrators or local user group members with execution rights for this command. Auditors can execute this command from the auditor context (auditor>) only.

show running-config

```
show running config
```

Description

Displays all running configurations for all protocols including RIPng.

Examples

Displaying all running configurations for all protocols including RIPng:

```
switch# show running-config
Current configuration:
!
!Version Halon 0.1.0 (Build: genericx86-64-Halon-0.1.0-master-20170309054955-dev)
!Schema version 0.1.8
lldp enable
timezone set utc
vrf green
vrf red
led base-loc_fdc on
led base-loc on
led base-hlth_fdc fast_blink
led base-pwr_fdc on
!
!
!
!
!
!
aaa authentication login default local
aaa authorization commands default none
!
!
!
!
router ospfv3 1
router ripng 1
    maximum-paths 5
    distance 1
    redistribute ospfv3 1
    timers update 40 timeout 200 garbage-collection 150
router ripng 1 vrf red
    default-information originate always
    maximum-paths 7
    distance 5
vlan 1
    no shutdown
```

```
interface lag 44
    no shutdown
    ipv6 address link-local
    ipv6 ripng 1
        send disable
interface 1
    no shutdown
    ipv6 address link-local
    ipv6 ripng 1
        receive disable
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
6300 6400 8320 8325 8360 9300 10000	Operator (>) or Manager (#)	Auditors or Administrators or local user group members with execution rights for this command. Auditors can execute this command from the auditor context (auditor>) only.

Accessing Aruba Support

Aruba Support Services	https://www.arubanetworks.com/support-services/
AOS-CX Switch Software Documentation Portal	https://www.arubanetworks.com/techdocs/AOS-CX/help_portal/Content/home.htm
Aruba Support Portal	https://asp.arubanetworks.com/
North America telephone	1-800-943-4526 (US & Canada Toll-Free Number) +1-408-754-1200 (Primary - Toll Number) +1-650-385-6582 (Backup - Toll Number - Use only when all other numbers are not working)
International telephone	https://www.arubanetworks.com/support-services/contact-support/

Be sure to collect the following information before contacting Support:

- Technical support registration number (if applicable)
- Product name, model or version, and serial number
- Operating system name and version
- Firmware version
- Error messages
- Product-specific reports and logs
- Add-on products or components
- Third-party products or components

Other useful sites

Other websites that can be used to find information:

Airheads social forums and Knowledge Base	https://community.arubanetworks.com/
AOS-CX Switch Software Documentation Portal	https://www.arubanetworks.com/techdocs/AOS-CX/help_portal/Content/home.htm
Aruba	https://www.arubanetworks.com/techdocs/hardware/DocumentationPortal/Content/home.htm

Hardware Documentation and Translations Portal	
Aruba software	https://asp.arubanetworks.com/downloads
Software licensing	https://lms.arubanetworks.com/
End-of-Life information	https://www.arubanetworks.com/support-services/end-of-life/
Aruba Developer Hub	https://developer.arubanetworks.com/

Accessing Updates

You can access updates from the Aruba Support Portal or the HPE My Networking Website.

Aruba Support Portal

https://asp.arubanetworks.com/downloads

If you are unable to find your product in the Aruba Support Portal, you may need to search My Networking, where older networking products can be found:

My Networking

https://www.hpe.com/networking/support

To view and update your entitlements, and to link your contracts and warranties with your profile, go to the Hewlett Packard Enterprise Support Center **More Information on Access to Support Materials** page:

https://support.hpe.com/portal/site/hpsc/aae/home/

Access to some updates might require product entitlement when accessed through the Hewlett Packard Enterprise Support Center. You must have an HP Passport set up with relevant entitlements.

Some software products provide a mechanism for accessing software updates through the product interface. Review your product documentation to identify the recommended software update method.

To subscribe to eNewsletters and alerts:

https://asp.arubanetworks.com/notifications/subscriptions (requires an active Aruba Support Portal (ASP) account to manage subscriptions). Security notices are viewable without an ASP account.

Warranty Information

To view warranty information for your product, go to https://www.arubanetworks.com/support-services/product-warranties/.

Regulatory Information

To view the regulatory information for your product, view the *Safety and Compliance Information for Server, Storage, Power, Networking, and Rack Products*, available at https://www.hpe.com/support/Safety-Compliance-EnterpriseProducts

Additional regulatory information

Aruba is committed to providing our customers with information about the chemical substances in our products as needed to comply with legal requirements, environmental data (company programs, product recycling, energy efficiency), and safety information and compliance data, (RoHS and WEEE). For more information, see https://www.arubanetworks.com/company/about-us/environmental-citizenship/.

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