Routing Command Reference for Cisco NCS 5500 Series, Cisco NCS 540 Series, and Cisco NCS 560 Series Routers

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Preface

The *Routing Command Reference for Cisco NCS 5500 Series Routers* preface contains these sections:

- Changes to This Document, on page xxi
- Communications, Services, and Additional Information, on page xxi

Changes to This Document

This table lists the technical changes made to this document since it was first printed.

Date	Change Summary
December 2015	Initial release of this document.
July 2016	Republished with documentation updates for 6.0.2 features.
November 2016	Republished with documentation updates for 6.1.1 features.
July 2017	Republished with documentation updates for Release 6.2.2 features.
September 2017	Republished with documentation updates for Release 6.3.1 features.
July 2018	Republished with documentation updates for Release 6.5.1 features.
December 2019	Republished with documentation updates for Release 6.6.3 features.
November 2021	Republished with documentation updates for Release 7.5.1 features.

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BFD Commands

Note All commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 540 Series Router that is introduced from Cisco IOS XR Release 6.3.2. References to earlier releases in Command History tables apply to only the Cisco NCS 5500 Series Router.

Note

- Starting with Cisco IOS XR Release 6.6.25, all commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 560 Series Routers.
- Starting with Cisco IOS XR Release 6.3.2, all commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 540 Series Router.
- References to releases before Cisco IOS XR Release 6.3.2 apply to only the Cisco NCS 5500 Series Router.
- Cisco IOS XR Software Release 7.0.1 specific updates are not applicable for the following variants of Cisco NCS 540 Series Routers:
  - N540-28Z4C-SYS-A
  - N540-28Z4C-SYS-D
  - N540X-16Z4G8Q2C-A
  - N540X-16Z4G8Q2C-D
  - N540X-16Z8Q2C-D
  - N540-12Z20G-SYS-A
  - N540-12Z20G-SYS-D
  - N540X-12Z16G-SYS-A
  - N540X-12Z16G-SYS-D

This module describes the commands used to configure and monitor the Bidirectional Forwarding (BFD) protocol on Cisco NCS 5500 Series Routers.

For detailed information about BFD concepts, configuration tasks, and examples, see the Implementing BFD on Routing Command Reference for Cisco NCS 5500 Series Routers module in the *Routing Configuration Guide for Cisco NCS 5500 Series Routers*.

- bfd fast-detect, on page 3
- bfd minimum-interval, on page 6
- bfd multipath include location, on page 8
- bfd multiplier, on page 9
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- show bfd reflector, on page 21
- show bfd session, on page 23
- show bfd label session, on page 28

bfd fast-detect

To enable Bidirectional Forwarding Detection (BFD) to detect failures in the path between adjacent forwarding engines, use the **bfd fast-detect** command in the appropriate configuration mode. To return the software to the default state in which BFD is not enabled, use the **no** form of this command.

bfd fast-detect [**disable** | **strict-mode** | **strict-mode-negotiate** | **override**]
no bfd fast-detect [**disable** | **strict-mode** | **strict-mode-negotiate** | **override**]

Syntax Description

disable	Disables the detection of failures in the path between adjacent forwarding engines for a specified entity, such as a BGP neighbor or OSPF interface.
ipv4	Enables Intermediate System-to-Intermediate System (IS-IS) BFD detection of failures in the path between adjacent forwarding engines. **Note** The **ipv4** keyword is available in IS-IS router configuration mode only.
strict-mode	Prevents the establishment of BGP neighbor session until the BFD session is also up and running. This behaviour is in compliance with Cisco's propriety definition of BFD.
strict-mode-negotiate	Holds down the neighbor session until BFD session is up. This behaviour is in compliance with the IETF standards.
override	Enforce the IETF strict mode for BFD, regardless of the capabilities negotiated between the two peers.

Command Default

BFD detection of failures in the path between adjacent forwarding engines is disabled.

Command Modes

Neighbor configuration

Session group configuration

Neighbor group configuration

Interface configuration

Interface configuration

Router configuration

Area configuration

Area interface configuration

Interface configuration

ARP host-tracking configuration

Command History

Release	Modification
Release 6.1x	This command was introduced.

Release	Modification
Release 24.1.1	This command was made available in the host-tracking configuration mode.
Release 24.3.1	This command was modified. The keywords strict-mode-negotiate and override were added.

Usage Guidelines

Note BFD can support multihop for internal and external BGP peers.

Use the **bfd fast-detect** command to provide protocol- and media-independent, short-duration failure detection of the path between adjacent forwarding engines, including the interfaces and data links.

BFD must be configured on directly connected neighbors for a BFD session to be established between the neighbors.

In OSPF and OSPF3 environments, the setting of the **bfd fast-detect** command is inherited from the highest-level configuration mode in which the command was configured. From the lowest to the highest configuration modes, the inheritance rules are as follows:

- If you enable BFD in area interface configuration mode, it is enabled on the specified interface only.
- If you enable BFD in area configuration mode, it is enabled on all interfaces in the specified area.
- If you enable BFD in router configuration mode, it is enabled on all areas and all associated interfaces in the specified routing process.

In OSPF environments, the **disable** option enables you to override the inheritance rules described previously. For example, if you enable BFD in an OSPF area, BFD is enabled on all interfaces in that area. If you do not want BFD running on one of the interfaces in that area, you must specify the **bfd fast-detect disable** command for that interface only.

To disable BFD or return the software to the default state in which BFD is not enabled in IS-IS router configuration mode, you must enter the **no bfd fast-detect** command.

Task ID

Task ID	Operations
bgp	read, write
isis	read, write
ospf	read, write

Examples

The following example shows how to configure BFD on a BGP router:

```
Router#(config)# route-policy pass-all
Router#(config-rpl)# pass
Router#(config-rpl)# end-policy
Router#(config-rpl)# end
Router## configure
Router#(config)# router bgp 65000
Router#(config-bgp)# bfd minimum-interval 3
Router#(config-bgp)# address-family ipv4 unicast\
Router#(config-bgp-af)# exit
Router#(config-bgp)# neighbor 192.168.70.24
Router#(config-bgp-nbr)# remote-as 2
Router#(config-bgp-nbr)# address-family ipv4 unicast
Router#(config-bgp-nbr)# bfd fast-detect
Router#(config-bgp-nbr)# route-policy pass-all in
Router#(config-bgp-nbr)# route-policy pass-all out
```

The following example shows how to configure host tracking using BFD:

```
Router#(config)# interface BVI1
Router#(config-if)# host-tracking
Router#(config-if-host-tracking)# bgp-gateway
Router#(config-if-host-tracking)# arp
Router#(config-if-host-tracking-arp)# bfd fast-detect
```

The following example shows how to configure the BGP BFD strict-mode negotiate mode, requiring mutual capability advertisement for active BGP and BFD session linkage.

```
Router# configure
Router#(config)# router bgp 65000
Router#(config-bgp)# neighbor 192.168.70.24
Router#(config-bgp-nbr)# bfd fast-detect strict-mode-negotiate
```

The following example show how to configure the BGP BFD strict-mode negotiate override mode to enforce IETF strict mode operation regardless of peer advertisement, ensuring BGP session establishment only after the activation of the BFD session.

```
Router# configure
Router#(config)# router bgp 65000
Router#(config-bgp)# neighbor 192.168.70.24
Router#(config-bgp-nbr)# bfd fast-detect strict-mode-negotiate override
```

bfd minimum-interval

To specify the minimum control packet interval for BFD sessions for the corresponding BFD configuration scope, use the **bfd minimum-interval** command in the appropriate configuration mode. To return the router to the default setting, use the **no** form of this command.

bfd minimum-interval *milliseconds*
no bfd minimum-interval [*milliseconds*]

Syntax Description

milliseconds	Interval between sending BFD hello packets to the neighbor. The range is 300 to 30000 milliseconds.

Command Modes

Router configuration

Interface configuration

Router configuration

Area configuration

Area interface configuration

Interface configuration

Command History

Release	Modification
Release 6.1x	This command was introduced.

Usage Guidelines

In OSPF environments, the setting of the **bfd minimum-interval** command is inherited from the highest-level configuration mode in which the command was configured. From the lowest to the highest configuration modes, the inheritance rules are as follows:

- If you configure the minimum interval in area interface configuration mode, the updated interval affects the BFD sessions on the specified interface only.
- If you configure the minimum interval in area configuration mode, the updated interval affects the BFD sessions on all interfaces in the specified area.
- If you configure the minimum interval in router configuration mode, the updated interval affects the BFD sessions in all areas and all associated interfaces in the specified routing process.

If desired, you can override these inheritance rules by explicitly configuring the **bfd minimum-interval** command for a specific area interface or area.

Note When multiple applications share the same BFD session, the application with the most aggressive timer wins locally. Then, the result is negotiated with the peer router.

Keep the following router-specific rules in mind when configuring the minimum BFD interval:

- The maximum rate in packets-per-second (pps) for BFD sessions is linecard-dependent. If you have multiple linecards supporting BFD, then the maximum rate for BFD sessions per system is the supported linecard rate multiplied by the number of linecards.
- If a session is running in asynchronous mode without echo, then PPS used for this session is (1000 / asynchronous interval in milliseconds).
- If a session is running in asynchronous mode with echo, then PPS used for this session is (1000 / echo interval in milliseconds).

  This is calculated as: 1000 / value of the **bfd minimum-interval** command.

- The table below defines the maximum number of BFD sessions that is allowed per line card.

Table 1: Supported Scale

Timer Value	Maximum Number of Sessions Supported in a line card.	Maximum Number of Sessions Supported in a system.
300 ms	250	500
1 second	250	500
2 seconds	250	500

Task ID

Task ID	Operations
bgp	read, write
isis	read, write
ospf	read, write

Examples

The following example shows how to set the BFD minimum interval for a BGP routing process:

```
RP/0/RP0/CPU0:router(config)# router bgp 6500
RP/0/RP0/CPU0:router(config-bgp)# bfd minimum-interval 300
```

bfd multipath include location

To include specific linecards to host BFD multiple path sessions, use the **bfd multipath include location** command in the XR configuration mode. To remove the configuration, use the **no** form of this command.

bfd multipath include location *node-id*
no bfd multipath include location *node-id*

Syntax Description

location *node-id*	Configures BFD multipath on the specified location. The *node-id* variable is mentioned in the *rack/slot/module* notation.

Command Default

No default behavior or values

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.3x	This command was introduced.

Task ID

Task ID	Operation
bgp	read, write
ospf	read, write
isis	read, write

Example

This example shows how to run the **bfd multipath include location** command on a specific location:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# bfd multipath include location 0/5/CPU0
```

bfd multiplier

To set the Bidirectional Forwarding Detection (BFD) multiplier, use the **bfd multiplier** command in the appropriate configuration mode. To return the router to the default setting, use the **no** form of this command.

bfd multiplier *multiplier*
no bfd multiplier [*multiplier*]

Syntax Description

multiplier Number of times a packet is missed before BFD declares the neighbor down. The ranges are as follows:

- BGP—2 to 16
- IS-IS—2 to 50

Command Default

The default multiplier is 3.

Command Modes

Router configuration

Interface configuration

Router configuration

Area configuration

Area interface configuration

Interface configuration

Command History

Release	Modification
Release 6.1x	This command was introduced.

Usage Guidelines

In OSPF environments, the setting of the **bfd multiplier** command is inherited from the highest-level configuration mode in which the command was configured. From the lowest to the highest configuration modes, the inheritance rules are as follows:

- If you configure a multiplier in area interface configuration mode, the updated multiplier affects the BFD sessions on the specified interface only.
- If you configure a multiplier in area configuration mode, the updated multiplier affects the BFD sessions on all interfaces in the specified area.
- If you configure a multiplier in router configuration mode, the updated multiplier affects the BFD sessions in all areas and all associated interfaces in the specified routing process.

If desired, you can override these inheritance rules by explicitly configuring the **bfd multiplier** command for a specific area interface or area.

If the multiplier is changed using the **bfd multiplier** command, the new value is used to update all existing BFD sessions for the protocol.

Task ID

Task ID	Operations
bgp	read, write
isis	read, write
ospf	read, write

Examples

The following example shows how to set the BFD multiplier in a BGP routing process:

```
RP/0/RP0/CPU0:router(config)# router bgp 65000
RP/0/RP0/CPU0:router(config-bgp)# bfd multiplier 3
```

fast-detect sbfd

To enable seamless bidirectional forwarding detection (SBFD) fast-detection on a specified IPv4 destination address, use the **fast-detect sbfd** command.

fast-detect sbfd

Syntax Description

This command has no keywords or arguments.

Command Default

No default behavior or values.

Command Modes

Tunnel interface configuration

Command History

Release	Modification
Release 24.2.1	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

This example shows how to enable SBFD fast-detection on the specified IPv4 destination address:

```
Router#configure
Router(config)#interface tunnel-te1
Router(config-if)#ipv4 unnumbered loopback0
Router(config-if)#destination 1.1.1.5
Router(config-if)#bfd
Router(config-tunte-bfd)#fast-detect sbfd
Router(config-tunte-bfd)#exit
```

Related Commands

Command	Description
sbfd , on page 20	Enters seamless BFD (SBFD) mode.

hw-module profile offload

To enable the offload of IPv6 BFD to the network processing unit of the line card, use the **hw-module profile offload** command in XR Configuration mode.

Syntax Description

1	Indicates the IPv6 BFD and Precision Timing Protocol (PTP) feature.
2	Indicates the IPv6 BFD and acceleration of route download on the scale line card.
3	Indicates the acceleration of route download on the scale line card and PTP feature.

Syntax Description

This command has no arguments and keywords.

Command Default

The default option is 1.

Command Modes

XR Configuration

Command History

Release	Modification
Release 6.6.1	This command was introduced.

Usage Guidelines

Reload the router for the **hw-module profile offload** command to take effect.

Though you can configure this command on all NCS 5500 routers, this command takes effect only on NCS5501-SE platform.

Example

The following example shows how to offload IPv6 BFD with the PTP feature:

```
Router# configure
Router(config)# hw-module profile offload 1
```

hw-module profile bfd statistics singlepath

To view statistics specifically for a BFD session, use the **hw-module profile bfd statistics singlepath** command in XR Configuration mode.

hw-module profile bfd statistics singlepath

Syntax Description

This command has no arguments and keywords.

Command Default

Transmission and Reception statistics per-session are not collected.

Command Modes

XR configuration

Command History

Release	Modification
Release 24.1.1	This command was introduced.

Usage Guidelines

You can configure the **hw-module profile bfd statistics singlepath** command only on Cisco NCS 5700 line cards with external-TCAM which provides an extended scale in addition to the on-chip scale. These line cards have only the **l2max-se** and **l3max-se** hardware MDB profiles. Hence, you must configure either of the MDB profiles to be able to configure the **hw-module profile bfd statistics singlepath** command.

Before configuring the **hw-module profile bfd statistics singlepath** command, you need to configure the following commands:

- **hw-module profile npu native-mode-enable** command: Configuring this comamnd enables the Cisco NCS 5700 Series native mode.
- Depending on your network's traffic type, configure either of the following commands:
  - Configure the **hw-module profile mdb l2max-se** command for networks that primarily handle Layer 2 traffic.
  - Configure the **hw-module profile mdb l3max-se** command for networks that primarily handle Layer 3 traffic.

It is necessary to reload the line card after executing the **hw-module profile bfd statistics singlepath** command for the configuration to take effect.

Task ID

Task ID	Operation
bfd	read, write

Example

The following example configures the hardware module profile to collect statistics specifically for single-path BFD sessions.

```
Router# configure
Router# hw-module profile mdb l3max-se
Router# hw-module profile bfd statistics singlepath
Router# commit
```

local-discriminator

To configure a unique local disciminator on the SBFD reflector, use the **local-discriminator** command in SBFD configuration mode.

local-discriminator { *ipv4-address* *32-bit-value* | **dynamic** | **interface** *interface* }

Syntax Description

ipv4-address	Configures the IPv4 address as the local discriminator.
32-bit-value	Configures a unique 32-bit value as the local discriminator.
dynamic	Creates a randomly generated value as the local discriminator.
interface *interface*	Configures the IPv4 address of the interface as the local discriminator.

Command Default

None

Command Modes

SBFD configuration mode

Command History

Release	Modification
Release 24.2.1	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

To ensure the BFD packet arrives on the intended reflector, configure at least one globally unique discriminator for each reflector. Globally unique discriminators of the reflector are known by the initiator before the session starts.

Example

This example shows how to configure various local discriminators on the SBFD reflector:

```
Router(config)# sbfd
Router(config-sbfd)# local-discriminator 1.1.1.5
Router(config-sbfd)# local-discriminator 987654321
Router(config-sbfd)# local-discriminator dynamic
Router(config-sbfd)# local-discriminator interface Loopback0
```

Related Commands

Command	Description
remote-discriminator, on page 17	Specifies the remote discriminator that maps to the remote target on the SBFD initiator.
remote-target, on page 18	Maps a destination address to a remote discriminator.

Command	Description
sbfd , on page 20	Enters seamless bidirectional forwarding detection (SBFD) mode.
show bfd label session, on page 28	Displays the BFD initiator session information.
show bfd reflector, on page 21	Displays the SBFD reflector configuration.

remote-discriminator

To specify the remote discriminator that maps to the remote target on the SBFD initiator, use the **remote-discriminator** command in SBFD remote target configuration mode.

remote-discriminator *value*

Syntax Description

value	Specifies the remote discriminator value (which maps to the local discriminator of the reflector).

Command Default

None

Command Modes

SBFD remote-target configuration mode

Command History

Release	Modification
Release 24.2.1	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The SBFD initiator uses a Remote Target Identifier (RTI) table to map a destination address (Target Identifier) to a remote discriminator.

If the destination is an IPv4 address, the destination or target address can be used as the remote discriminator. (Configuration of an RTI is optional.)

Example

This example shows how to configure various local discriminators on the SBFD reflector:

```
Router(config)# sbfd
Router(config-sbfd)# remote-target ipv4 1.1.1.5
Router(config-sbfd-nnnn)# remote-discriminator 16843013
```

Related Commands

Command	Description
local-discriminator, on page 15	Configures a unique local disciminator on the SBFD reflector.
remote-target, on page 18	Maps a destination address to a remote discriminator.
sbfd , on page 20	Enters seamless bidirectional forwarding detection (SBFD) mode.
show bfd label session, on page 28	Displays the BFD initiator session information.
show bfd reflector, on page 21	Displays the SBFD reflector configuration.

remote-target

To map a destination address to a remote discriminator, use the **remote-target** command in SBFD configuration mode.

remote-target ipv4 *ipv4-address*

Syntax Description

ipv4 *ipv4-address*	Configures the IPv4 address of the reflector.

Command Default

None

Command Modes

SBFD configuration mode

Command History

Release	Modification
Release 24.2.1	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The SBFD initiator uses a Remote Target Identifier (RTI) table to map a destination address (Target Identifier) to a remote discriminator.

Example

This example shows how to configure the SBFD reflector IPv4 address as the remote target:

```
Router(config)#sbfd
Router(config-sbfd)#remote-target ipv4 1.1.1.5
Router(config-sbfd-nnnn)#
```

Related Commands

Command	Description
local-discriminator, on page 15	Configures a unique local disciminator on the SBFD reflector.
remote-discriminator, on page 17	Specifies the remote discriminator that maps to the remote target on the SBFD initiator.
sbfd , on page 20	Enters seamless bidirectional forwarding detection (SBFD) mode.
show bfd label session, on page 28	Displays the BFD initiator session information.
show bfd reflector, on page 21	Displays the SBFD reflector configuration.

router pim

To enter Protocol Independent Multicast (PIM) configuration mode, use the **router pim** command in XR configuration mode. To return to the default behavior, use the **no** form of this command.

router pim [**address family ipv4**]
no router pim [**address family ipv4**]

Syntax Description

address-family	(Optional) Specifies which address prefixes to use.
ipv4	(Optional) Specifies IPv4 address prefixes.

Command Default

The default is IPv4 address prefixes.

Command Modes

XR Config mode

Command History

Release	Modifications
Release 6.3x	This command was introduced.

Task ID

Task ID	Operations
multicast	read, write

Examples

This example shows how to enter PIM configuration mode for IPv4 address prefixes:

```
RP/0/RP0/CPU0:router(config)# router pim
RP/0/RP0/CPU0:router(config-pim-default-ipv4)#
```

This example shows how to enter PIM configuration mode for IPv4 address prefixes:

```
RP/0/RP0/CPU0:router(config)# router pim address-family ipv4
RP/0/RP0/CPU0:router(config-pim-default-ipv4)#
```

sbfd

To enter seamless bidirectional forwarding detection (SBFD) mode for configuring local and remote discriminators, use the **sbfd** command in global configuration mode.

sbfd

Command Modes

Global configuration mode

Command History

Release	Modification
Release 24.2.1	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Example

This example shows how to enter SBFD configuration mode:

```
Router(config)# sbfd
Router(config-sbfd)#
```

Related Commands

Command	Description
fast-detect sbfd, on page 11	Enables SBFD fast-detection on a specified IPv4 destination address.
local-discriminator, on page 15	Configures a unique local disciminator on the SBFD reflector.
remote-discriminator, on page 17	Specifies the remote discriminator that maps to the remote target on the SBFD initiator.
remote-target, on page 18	Maps a destination address to a remote discriminator.
show bfd label session, on page 28	Displays the SBFD initiator session information.
show bfd reflector, on page 21	Displays the SBFD reflector configuration.

show bfd reflector

To verify the SBFD reflector configuration, use the **show bfd reflector** command.

show bfd reflector { **counter** | **info** } [**location** *node-id*]

Syntax Description

counter	Displays the BFD session counters.
info	Displays the BFD session information.
location *node-id*	(Optional) Displays BFD sessions hosted from the specified location. The *node-id* argument is entered in the *rack/slot/module* notation.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 24.2.1	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operation
bgp	read
ospf	read
isis	read
mpls-te	read

Example

This example shows how to display the BFD reflector session counters:

```
Router#show bfd reflector counter location 0/0/CPU0
-------------------------------------------------------------------------------
Rx                  Tx                                DROPPED
                                        NO PPS      LTI MISS    NO MEMORY   TOTAL
-------------------------------------------------------------------------------
961                 960             0           0           0           0
```

This example shows how to display the BFD reflector information:

```
Router# show bfd reflector info location 0/0/CPU0
-------------------------------------
Local        Remote       Src
Discr        Discr       IP Addr
-------------------------------------
16843013     65556       1.1.1.1
```

Related Commands

Command	Description
local-discriminator	Configures a unique local disciminator on the SBFD reflector.
remote-discriminator	Specifies the remote discriminator that maps to the remote target on the SBFD initiator.
remote-target	Maps a destination address to a remote discriminator.
sbfd	Enters seamless bidirectional forwarding detection (SBFD) mode.
show bfd label session	Displays the BFD initiator session information.

show bfd session

To display Bidirectional Forwarding Detection (BFD) session information, use the **show bfd session** command in XR Exec mode.

show bfd [**ipv4** | [**singlehop** | **multihop**] | [**singlehop** | **multihop**] | **all**] **session** [**interface** *type interface-path-id* [**destination** *ip-address*] [**detail**]] **location** *node-id*

Syntax Description

ipv4	(Optional) Displays BFD over IPv4 information only.
ipv6	(Optional) Displays BFD over IPv6 information only.
singlehop	(Optional) Displays BFD singlehop information only.
multihop	(Optional) Displays BFD multihop information only.
all	(Optional) Displays both BFD over IPv4 and BFD over IPv6 information.
interface	(Optional) Specifies the interface for which to show information.
type	Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (**?**) online help function.
destination *ip-address*	(Optional) Displays the BFD session destined for the specified IP address.
detail	(Optional) Displays detailed session information, including statistics and number of state transitions.

location *node-id*	(Optional) Displays BFD sessions hosted from the specified location. The *node-id* argument is entered in the *rack/slot/module* notation.

Command Default

The default is the default address family identifier (AFI) that is set by the **set default-afi** command.

Command Modes

XR Exec mode

Command History

Release	Modification
Release 6.1x	This command was introduced.

Usage Guidelines

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack*/*slot*/*module*/*port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.
  - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.
- The BFD UP time in the show output printed using CLI, and the show output from SNMP may differ. The CLI output is the appropriate value. The difference doesn't impact the functioning of the device.

Task ID

Task ID	Operations
bgp	read
ospf	read
isis	read

Examples

The following example shows the output from the **show bfd session** command with the **detail** keyword and IPv4 as the default:

```
Router# show bfd session detail

I/f:TenGigE0/2/0/0.6, Location:0/2/CPU0, dest:10.0.6.2, src:10.0.6.1
 State:UP for 0d:0h:3m:4s, number of times UP:1
Received parameters:
 Version:1, desired tx interval:2 s, required rx interval:2 s
 Required echo rx interval:1 ms, multiplier:3, diag:None
 My discr:589830, your discr:590028, state UP, D/F/P/C/A:0/0/0/1/0
Transmitted parameters:
 Version:1, desired tx interval:2 s, required rx interval:2 s
```

```
 Required echo rx interval:1 ms, multiplier:3, diag:None
 My discr:590028, your discr:589830, state UP, D/F/P/C/A:0/0/0/1/0
Timer Values:
 Local negotiated async tx interval:2 s
 Remote negotiated async tx interval:2 s
 Desired echo tx interval:250 ms, local negotiated echo tx interval:250 ms
 Echo detection time:750 ms(250 ms*3), async detection time:6 s(2 s*3)
Local Stats:
 Intervals between async packets:
   Tx:Number of intervals=100, min=952 ms, max=2001 ms, avg=1835 ms
       Last packet transmitted 606 ms ago
   Rx:Number of intervals=100, min=1665 ms, max=2001 ms, avg=1828 ms
       Last packet received 1302 ms ago
 Intervals between echo packets:
   Tx:Number of intervals=100, min=250 ms, max=252 ms, avg=250 ms
       Last packet transmitted 188 ms ago
   Rx:Number of intervals=100, min=250 ms, max=252 ms, avg=250 ms
       Last packet received 187 ms ago
 Latency of echo packets (time between tx and rx):
   Number of packets:100, min=1 ms, max=2 ms, avg=1 ms
Session owner information:
  Client           Desired interval         Multiplier
  ---------------- --------------------     --------------
  bgp-             250 ms                   3
```

The following example shows the output from the **show bfd session** command with the **all** keyword, which displays both IPv4 and IPv6 information:

```
Router# show bfd all session location 0/1/CPU0

Mon Nov  5 08:51:50.339 UTC
IPv4:
-----
Interface            Dest Addr           Local det time(int*mult)      State
                                           Echo            Async
-------------------- --------------- ---------------- ---------------- ---------
PO0/1/0/0            10.0.0.2        300ms(100ms*3)   6s(2s*3)         UP
```

Table 2: show bfd session detail command Field Descriptions

Field	Description
I/f	Interface type.
Location	Location of the node that hosts the local endpoint of the connection, in the *rack/slot/module* notation
dest	IP address of the destination endpoint.
src	IP address of the source endpoint.
State	Current state of the connection, and the number of days, hours, minutes, and seconds that this connection has been active.
number of times UP	Number of times this connection has been brought up.

Field	Description
Received parameters	Provides information on the last transmitted control packet for the session: • Version—Version number of the BFD protocol. • desired tx interval—Desired transmit interval. • required rx interval—Required receive interval. • Required echo rx interval—Required echo receive interval. • multiplier— Number of times a packets is missed before BFD declares the neighbor down. • diag—diagnostic code specifying the peer system's reason for the last transition of the session from Up to some other state. • My discr—unique, nonzero discriminator value generated by the transmitting system, used to demultiplex multiple BFD sessions between the same pair of systems. • your discr— discriminator received from the corresponding remote system. This field reflects back the received value of My discr, or is zero if that value is unknown.
Transmitted parameters	Provides information on the last transmitted control packet for the session: • Version—Version number of the BFD protocol. • desired tx interval—Desired transmit interval. • required rx interval—Required receive interval • Required echo rx interval—Required echo receive interval • multiplierNumber of times a packets is missed before BFD declares the neighbor down. • diag—diagnostic code specifying the local system's reason for the last transition of the session from Up to some other state. • My discr—unique, nonzero discriminator value generated by the transmitting system, used to demultiplex multiple BFD sessions between the same pair of systems. • your discr— discriminator received from the corresponding remote system. This field reflects back the received value of My discr, or is zero if that value is unknown.
Timer Values	Provides information on the timer values used by the local and remote ends, as follows: • Local negotiated async tx interval—interval at which control packets are being transmitted by the local end. • Remote negotiated async tx interval—interval at which control packets should be transmitted by the remote end. • Desired echo tx interval—interval at which the local end would like to transmit echo packets. • local negotiated echo tx interval—interval at which echo packets are being transmitted by the local end. • Echo detection time—local failure detection time of echo packets. It is the product of the local negotiated echo tx interval and the local multiplier. • async detection time—local failure detection time of the asynchronous mode (control packets). It is the product of the remote negotiated async tx interval and the remote multiplier.

Field	Description

Local Stats	Displays the local transmit and receive statistics,
	• Intervals between async packets—provides measurements on intervals between control packets (tx and rx):
	  • Number of intervals—number of sampled intervals between control packets
	  • min—minimum measured interval between 2 consecutive control packets
	  • max—maximum measured interval between 2 consecutive control packets
	  • avg—average measured interval between 2 consecutive control packets
	  • Last packet received/transmitted—indicates how long ago the last control packet was received/transmitted.
	• Intervals between echo packets—provides measurements on intervals between echo packets (tx and rx). The measurements have the same meaning as for async packets.
	• Latency of echo packets (time between tx and rx)—provides measurements on latency of echo packets, i.e. the time between tx and rx of echo packets:
	  • Number of packets—number of sampled echo packets.
	  • min—minimum measured latency for echo packets.
	  • max—maximum measured latency of echo packets.
	  • avg—average measured latency of echo packets.

Session owner information	Provides the following information about the session owner. • Client—name of the client application process. • Desired interval—desired interval provided by the client, in milliseconds. • Multiplier—multiplier value provided by the client.

show bfd label session

To display the BFD initiator session information, use the **show bfd label session** command.

show bfd label session [**status**] [**location** *node-id*] [**detail**]

Syntax Description

status	(Optional) Displays the status of the BFD session.
location *node-id*	(Optional) Displays BFD sessions hosted from the specified location. The *node-id* argument is entered in the *rack/slot/module* notation.
detail	(Optional) Displays detailed session information, including statistics and number of state transitions.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 24.2.1	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operation
bgp	read
ospf	read
isis	read
mpls-te	read

Example

This example shows how to display the BFD session information:

```
Router#show bfd label session

Interface           Label               Local det time(int*mult)      State
                                     Echo             Async
------------------- --------------- ---------------- ---------------- ----------
tt1 (LSP:2)         24008           n/a              150ms(50ms*3)    UP
```

This example shows how to display the detailed BFD session information:

```
RP/0/RSP0/CPU0:router5# show bfd label session detail
I/f: tt1 (LSP:2), Location: 0/1/CPU0, Label: 24008
 State: UP for 0d:0h:10m:32s, number of times UP: 1
 Session type: SW/LB/V4/SH/TH/SB
LSP ping request sent:
 Number of times sent: 0 times
 Number of error send: 0 times
 Last sent time: [NA]
 Last result: 0x0 (No error)
 Last error time: [NA]
 Last error: 0x0 (No error)
LSP ping reply rcvd:
 Last received discriminator: 0x0
 Number of times rcvd: 0 times
 Last rcvd time: [NA]
 Last return code/subcode/output: 0/0/''
Received parameters:
 Version: 1, desired tx interval: 50 ms, required rx interval: 50 ms
 Multiplier: 3, diag: None
 My discr: 16843013, your discr: 65556, state UP, D/F/P/C/A: 0/0/0/1/0
Transmitted parameters:
 Version: 1, desired tx interval: 50 ms, required rx interval: 0 ms
 Multiplier: 3, diag: None
 My discr: 65556, your discr: 16843013, state UP, D/F/P/C/A: 1/0/0/1/0
Timer Values:
 Local negotiated async tx interval: 50 ms
 Remote negotiated async tx interval: 50 ms
async detection time: 150 ms(50 ms*3)
Local Stats:
 Intervals between async packets:
   Tx: Number of intervals=100, min=44 ms, max=51 ms, avg=47 ms
       Last packet transmitted 7 ms ago
   Rx: Number of intervals=100, min=40 ms, max=55 ms, avg=47 ms
       Last packet received 44 ms ago
MP download state: BFD_MP_DOWNLOAD_ACK
State change time: Jan  6 12:20:37.073
Session owner information:
                           Desired               Adjusted
  Client               Interval   Multiplier Interval   Multiplier
  -------------------- ---------------------- ---------------------
  MPLS-TE              50 ms      3          50 ms      3
```

This example shows how to display the status of the BFD session on the specified linecard location:

```
Router#show bfd label session status location 0/1/CPU0
I/f: tt1 (LSP:2), Location: 0/1/CPU0 table_id:0x0
State: UP, flags:0x80040
Iftype: 0x24, basecaps: 36
Async InLabel: 24008
Additional info from Flags:
 FIB is READY
 Session Active on 0/1/CPU0

. . .

Received parameters:
 Version: 1, desired tx interval: 50 ms, required rx interval: 50 ms
 Multiplier: 3, diag: None
 My discr: 16843013, your discr: 65556, state UP, D/F/P/C/A: 0/0/0/1/0

Transmitted parameters:
 Version: 1, desired tx interval: 50 ms, required rx interval: 0 ms
```

```
Multiplier: 3, diag: None
My discr: 65556, your discr: 16843013, state UP, D/F/P/C/A: 1/0/0/1/0
```

Related Commands

Command	Description
local-discriminator	Configures a unique local disciminator on the SBFD reflector.
remote-discriminator	Specifies the remote discriminator that maps to the remote target on the SBFD initiator.
remote-target	Maps a destination address to a remote discriminator.
sbfd	Enters seamless bidirectional forwarding detection (SBFD) mode.
show bfd reflector	Displays the SBFD reflector configuration.

IS-IS Commands

Note All commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 540 Series Router that is introduced from Cisco IOS XR Release 6.3.2. References to earlier releases in Command History tables apply to only the Cisco NCS 5500 Series Router.

Note

- Starting with Cisco IOS XR Release 6.6.25, all commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 560 Series Routers.
- Starting with Cisco IOS XR Release 6.3.2, all commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 540 Series Router.
- References to releases before Cisco IOS XR Release 6.3.2 apply to only the Cisco NCS 5500 Series Router.
- Cisco IOS XR Software Release 7.0.1 specific updates are not applicable for the following variants of Cisco NCS 540 Series Routers:
  - N540-28Z4C-SYS-A
  - N540-28Z4C-SYS-D
  - N540X-16Z4G8Q2C-A
  - N540X-16Z4G8Q2C-D
  - N540X-16Z8Q2C-D
  - N540-12Z20G-SYS-A
  - N540-12Z20G-SYS-D
  - N540X-12Z16G-SYS-A
  - N540X-12Z16G-SYS-D

This module describes the commands used to configure and monitor the Intermediate System-to-Intermediate System (IS-IS) protocol on Cisco NCS 5500 Series Routers.

For detailed information about IS-IS concepts, configuration tasks, and examples, see the Implementing IS-IS on Routing Command Reference for Cisco NCS 5500 Series Routers module in the *Routing Configuration Guide for Cisco NCS 5500 Series Routers*.

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address-family (IS-IS)

To enter address family configuration mode for configuring Intermediate System-to-Intermediate System (IS-IS) routing that use standard IP Version 4 (IPv4) and IP Version 6 (IPv6) address prefixes, use the **address-family** command in XR Config mode or interface configuration mode. To disable support for an address family, use the **no** form of this command.

address-family {**ipv4** | **ipv6**} {**unicast** | **multicast**}
no address-family {**ipv4** | **ipv6**} {**unicast** | **multicast**}

Syntax Description

ipv4	Specifies IPv4 address prefixes.
ipv6	Specifies IPv6 address prefixes.
unicast	Specifies unicast address prefixes.
multicast	Specifies multicast address prefixes.

Command Default

An address family is not specified. The default subaddress family (SAFI) is unicast.

Command Modes

XR Config mode

Interface configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **address family** command to place the router or interface in address family configuration mode. In router address family configuration mode, you can configure routing that uses standard IPv4 or IPv6 address prefixes. An address family must be specified in interface configuration mode. In interface address family configuration mode, you can alter interface parameters for IPv4or IPv6.

You must specify an address family in order to configure parameters that pertain to a single address family.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to configure the IS-IS router process with IPv4 unicast address prefixes:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE 0/1/0/0
RP/0/RP0/CPU0:router(config-isis-if)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-if-af)#
```

adjacency-check disable

To suppress Intermediate System-to-Intermediate System (IS-IS) IP Version 4 (IPv4) or IP Version 6 (IPv6) protocol-support consistency checks that are performed prior to forming adjacencies on hello packets, use the **adjacency-check disable** command in address family configuration mode. To remove this function, use the **no** form of this command.

adjacency-check disable
no adjacency-check disable

Command Default

Adjacency check is enabled

Command Modes

Address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

IS-IS performs consistency checks on hello packets and forms an adjacency only with a neighboring router that supports the same set of protocols. A router running IS-IS for both IPv4 and IPv6 does not form an adjacency with a router running IS-IS for IPv4 only.

Use the **adjacency-check disable** command to suppress the consistency checks for IPv6 IS-IS and allow an IPv4 IS-IS router to form an adjacency with a router running IPv4 IS-IS and IPv6. IS-IS never forms an adjacency between a router running IPv4 IS-IS only and a router running IPv6 only.

In addition, the **adjacency-check disable** command suppresses the IPv4 or IPv6 subnet consistency check and allows IS-IS to form an adjacency with other routers regardless of whether they have an IPv4 or IPv6 subnet in common.

Task ID

Task ID	Operations
isis	read, write

Examples

The command in the following example disables the adjacency checks:

The following example shows how the network administrator introduces IPv6 into an existing IPv4 IS-IS network and ensures that the checking of hello packet checks from adjacent neighbors is disabled until all neighbor routers are configured to use IPv6:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# address-family ipv6 |ipv4
RP/0/RP0/CPU0:router(config-isis-af)# adjacency-check disable
```

adjacency stagger (IS-IS)

To configure staggering of IS-IS adjacency during reload, process restart, and process clear, use the **adjacency stagger** command in router configuration mode. To turn off adjacency staggering, either use the **disable** keyword or use the **no** form of this command.

adjacency stagger {**disable** | *initial-num-nbr* *max-num-nbr*}
no adjacency stagger

disable	Disables adjacency staggering.
initial-num-nbr	The initial number of simultaneous neighbors allowed to form adjacency to FULL in any area to bring up to FULL after a router reload, IS-IS process restart, or IS-IS process clear. Range is 1-65535. Default is 2.
max-num-nbr	The subsequent number of simultaneous neighbors allowed to form adjacency, per IS-IS instance, after the initial set of IS-IS neighbors have become FULL. Range is 1-65535. Default is 64.

Command Default

IS-IS adjacency staggering is enabled.

Command Modes

Router configuration

Table 3: Command History

Release	Modification
Release 6.3.1	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Staggering of the IS-IS adjacency during reload, process restart (without NSR or graceful-restart), and process clear reduces the overall adjacency convergence time.

Initially, allow 2 (configurable) neighbors to form adjacency to FULL per area. After the first adjacency reaches FULL, up to 64 (configurable) neighbors can form adjacency simultaneously for the IS-IS instance (all areas). However, areas without any FULL adjacency is restricted by the initial area limit.

Note Adjacency stagger and IS-IS nonstop forwarding (NSF) are mutually exclusive. Adjacency stagger is not activated if nonstop forwarding (NSF) is configured in the router along with IS-IS configuration.

Table 4: Task ID

Task ID	Operations
IS-IS	read, write

The following example shows how to configure adjacency stagger for a 2 neighbors initially and for a maximum of 32 neighbors:

```
Router# configure
Router(config)# router isis 1
Router(config-isis)# adjacency stagger 2 32
```

algorithm 0

The **algorithm 0** command allows you to override the maximum-paths configuration for an address-family and IS-IS instance pair. The **maximum-paths** subcommand under **algorithm 0** configuration block will be applied to the standard SPF algorithm of that IS-IS instance.

algorithm 0
address-family { **ipv4** | **ipv6** } **unicast**
maximum-paths *maximum-paths*

Syntax Description

address-family {ipv4 | ipv6}	Configures the address family for IS-IS.
unicast	Specifies unicast address prefixes.
maximum-paths	Specifies the maximum number of parallel routes that an IP routing protocol installs in the routing table. The range is 1 to 64.

Command Default

No default Command

Command Modes

IS-IS interface

Command History

Release	Modification
Release 7.8.1	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read, write

The following example shows how to override the maximum-paths configuration using algorithm 0:

```
Router(config)# router isis isp
Router(config-isis)# algorithm 0
Router(config-isis-std-algo)# address-family ipv4 unicast
Router(config-isis-std-algo-af)# maximum-paths 2
Router(config-isis-std-algo-af)# commit
```

authentication-check disable

To suppress Intermediate System-to-Intermediate System (IS-IS) authentication check, use the **authentication-check disable** command in configuration mode. To remove this function, use the **no** form of this command.

authentication-check disable
no authentication-check disable

Command Default

Authentication check is enabled

Command Modes

XR Config mode

Command History

Release	Modification
Release 7.7.1	This command was introduced.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to disable authentication check for IS-IS.

```
Router# configure
Router(config)# router isis 1
Router(config)# authentication-check disable
Router(config)# commit
```

circuit-type

To configure the type of adjacency used for the Intermediate System-to-Intermediate System (IS-IS) protocol, use the **circuit-type** command in interface configuration mode. To reset the circuit type to Level l and Level 2, use the **no** form of this command.

circuit-type {**level-1** | **level-1-2** | **level-2-only**}
no circuit-type

Syntax Description

level-1	Establishes only Level 1 adjacencies over an interface.
level-1-2	Establishes both Level 1 and Level 2 adjacencies, if possible.
level-2-only	Establishes only Level 2 adjacencies over an interface.

Command Default

Default adjacency types are Level 1 and Level 2 adjacencies.

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Adjacencies may not be established even if allowed by the **circuit-type** command. The proper way to establish adjacencies is to configure a router as a Level 1, Level 1 and Level 2, or Level 2-only system using the is-type, on page 76 command. Only on networking devices that are between areas (Level 1 and Level 2 networking devices) should you configure some interfaces to be Level 2-only to prevent wasting bandwidth by sending out unused Level 1 hello packets. Remember that on point-to-point interfaces, the Level 1 and Level 2 hello packets are in the same packet.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to configure a Level 1 adjacency with its neighbor on tenGigE interface 0/2/0/0 and Level 2 adjacencies with all Level 2-capable routers on tenGigE interface 0/5/0/2:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# is-type level-1-2
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE  0/2/0/0
RP/0/RP0/CPU0:router(config-isis-if)# circuit-type level-1
RP/0/RP0/CPU0:router(config-isis-if)# exit
RP/0/RP0/CPU0:router(config-isis)# interface tenGigE 0/5/0/2
RP/0/RP0/CPU0:router(config-isis-if)# circuit-type level-2-only
```

In this example, only Level 2 adjacencies are established because the **is-type** command is configured:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# is-type level-2-only
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE  0/2/0/0
RP/0/RP0/CPU0:router(config-isis-if)# circuit-type level-1-2
```

clear isis process

To clear the link-state packet (LSP) database and adjacency database sessions for an Intermediate System-to-Intermediate System (IS-IS) instance or all IS-IS instances, use the **clear isis process** command in XR EXEC mode.

clear isis [**instance** *instance-id*] **process**

Syntax Description

instance *instance-id*	(Optional) Specifies IS-IS sessions for the specified IS-IS instance only. • The *instance-id* argument is the instance identifier (alphanumeric) defined by the **router isis** command.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **clear isis process** command without any keyword to clear all the IS-IS instances. Add the **instance** *instance-id* keyword and argument to clear the specified IS-IS instance.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows the IS-IS LSP database and adjacency sessions being cleared for instance 1:

```
RP/0/RP0/CPU0:router# clear isis instance 1 process
```

clear isis route

To clear the Intermediate System-to-Intermediate System (IS-IS) routes in a topology, use the **clear isis route** command in XR EXEC mode.

clear isis [**instance** *instance-id*] {**afi-all** | **ipv4** | **ipv6**} {**unicast** | **multicast** | **safi-all**} [**topology** *topo-name*] **route**

Syntax Description

instance *instance-id*	(Optional) Specifies IS-IS sessions for the specified IS-IS instance only. • The *instance-id* argument is the instance identifier (alphanumeric) defined by the **router isis** command.
afi-all	Specifies IP Version 4 (IPv4) and IP Version 6 (IPv6) address prefixes.
ipv4	Specifies IPv4 address prefixes.
ipv6	Specifies IPv6 address prefixes.
unicast	Specifies unicast address prefixes.
multicast	Specifies multicast address prefixes.
safi-all	Specifies all secondary address prefixes.
topology *topo-name*	(Optional) Specifies topology table information and name of the topology table.

Command Default

No default behavior or value

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **clear isis route** command to clear the routes from the specified topology or all routes in all topologies if no topology is specified.

Task ID

Task ID	Operations
isis	execute
rib	read, write
basic-services	read, write

Examples

The following example shows how to clear the routes with IPv4 unicast address prefixes:

```
RP/0/RP0/CPU0:router# clear isis ipv4 unicast route
```

clear isis statistics

To clear the Intermediate System-to-Intermediate System (IS-IS) statistics, use the **clear isis statistics** command in XR EXEC mode.

clear isis [**instance** *instance-id*] **statistics** [*type interface-path-id*]

Syntax Description

instance *instance-id*	(Optional) Clears IS-IS sessions for the specified IS-IS instance only. • The *instance-id* argument is the instance identifier (alphanumeric) defined by the **router isis** command.
type	Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **clear isis statistics** command to clear the information displayed by the **show isis statistics** command.

Task ID

Task ID	Operations
isis	execute
rib	read, write
basic-services	read, write

Examples

The following example shows the IS-IS statistics for a specified interface being cleared:

```
RP/0/RP0/CPU0:router# clear isis instance 23 statistics
```

csnp-interval

To configure the interval at which periodic complete sequence number PDU (CSNP) packets are sent on broadcast interfaces, use the **csnp-interval** command in interface configuration mode. To restore the default value, use the **no** form of this command.

csnp-interval *seconds* [**level** {**1** | **2**}]
no csnp-interval *seconds* [**level** {**1** | **2**}]

Syntax Description

seconds	Interval (in seconds) of time between transmission of CSNPs on multiaccess networks. This interval applies only for the designated router. Range is 0 to 65535 seconds.
level { **1** | **2** }	(Optional) Specifies the interval of time between transmission of CSNPs for Level 1 or Level 2 independently.

Command Default

seconds : 10 seconds

Both Level 1 and Level 2 are configured if no level is specified.

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The **csnp-interval** command applies only to the designated router (DR) for a specified interface. Only DRs send CSNP packets to maintain database synchronization. The CSNP interval can be configured independently for Level 1 and Level 2.

Use of the **csnp-interval** command on point-to-point subinterfaces makes sense only in combination with the IS-IS mesh-group feature.

Task ID

Task ID	Operations
isis	execute
rib	read, write
basic-services	read, write

Examples

The following example shows how to set the CSNP interval for Level 1 to 30 seconds:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE 0/0/2/0
RP/0/RP0/CPU0:router(config-isis-if)# csnp-interval 30 level 1
```

default-information originate (IS-IS)

To generate a default route into an Intermediate System-to-Intermediate System (IS-IS) routing domain, use the **default-information originate** command in address family configuration mode. To remove the **default-information originate** command from the configuration file and restore the system to its default condition, use the **no** form of this command.

default-information originate [**external** | **route-policy** *route-policy-name*]
no default-information originate [**external** | **route-policy** *route-policy-name*]

Syntax Description

external	(Optional) Enables default route to be originated as an external route.
route-policy	(Optional) Defines the conditions for the default route.
route-policy-name	(Optional) Name for the route policy.

Command Default

A default route is not generated into an IS-IS routing domain.

Command Modes

Address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

If a router configured with the **default-information originate** command has a route to 0.0.0.0 in the routing table, IS-IS originates an advertisement for 0.0.0.0 in its link-state packets (LSPs).

Without a route policy, the default is advertised only in Level 2 LSPs. For Level 1 routing, there is another process to find the default route, which is to look for the closest Level 1 and Level 2 router. The closest Level 1 and Level 2 router can be found by looking at the attached-bit (ATT) in Level 1 LSPs.

A route policy can be used for two purposes:

- To make the router generate the default route in its Level 1 LSPs.
- To advertise 0.0.0.0/0 conditionally.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to generate a default external route into an IS-IS domain:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# address-family ipv4 unicast
```

```
RP/0/RP0/CPU0:router(config-isis-af)# default-information originate
```

disable (IS-IS)

To disable the Intermediate System-to-Intermediate System (IS-IS) topology on a specified interface, use the **disable** command in interface address family configuration mode or interface configuration mode. To remove this function, use the **no** form of this command.

disable [**level** { **1** | **2** }]
no disable

Syntax Description

level { **1** | **2** }	(Optional) Sets level-1 and level-2 adjacency with neighbors on a given interface.

Command Default

IS-IS protocol is enabled.

Command Modes

Interface address family configuration and Interface configuration mode

Command History

Release	Modification
Release 6.0	This command was introduced.
Release 7.10.1	The command is updated for interface level.

Usage Guidelines

You can now disable IS-IS adjacency on a given interface or disable adjacency for a specific level.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to disable the IS-IS protocol for IPv4 unicast on HundredGigE interface 0/1/0/1:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE 0/1/0/1
RP/0/RP0/CPU0:router(config-isis-if)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-if-af)# disable
```

The following example shows how to disable the IS-IS protocol at the interface level:

```
Router(config)#router isis isp
Router(config-isis)#interface HundredGigE 0/1/0/1
Router(config-isis-if)#disable
Router (config)#commit
```

distance (IS-IS)

To define the administrative distance assigned to routes discovered by the Intermediate System-to-Intermediate System (IS-IS) protocol, use the **distance** command in address family configuration mode. To remove the **distance** command from the configuration file and restore the system to its default condition in which the software removes a distance definition, use the **no** form of this command.

distance *weight* [*prefix maskprefix/length* | [*prefix-list-name*]]
no distance [*weight*] [*prefix maskprefix/length* | [*prefix-list-name*]]

Syntax Description

weight	Administrative distance to be assigned to IS-IS routes. Range is 1 to 255.
prefix	(Optional) The *prefix* argument specifies the IP address in four-part, dotted-decimal notation.
mask	(Optional) IP address mask.
/length	(Optional) The length of the IP prefix. A decimal value that indicates how many of the high-order contiguous bits of the address compose the prefix (the network portion of the address). A slash must precede the decimal value. Range is 0 to 32 for IPv4 addresses and 0 to 128 for IPv6 addresses.
prefix-list-name	(Optional) List of routes to which administrative distance applies.

Command Default

weight : 115

Command Modes

Address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

An administrative distance is an integer from 1 to 255. In general, the higher the value, the lower the trust rating. An administrative distance of 255 means that the routing information source cannot be trusted at all and should be ignored. Weight values are subjective; no quantitative method exists for choosing weight values.

Use the **distance** command to configure the administrative distances applied to IS-IS routes when they are inserted into the Routing Information Base (RIB), and influence the likelihood of these routes being preferred over routes to the same destination addresses discovered by other protocols.

The *address/prefix-length* argument defines to which source router the distance applies. In other words, each IS-IS route is advertised by another router, and that router advertises an address that identifies it. This source address is displayed in the output of the **show isis route detail** command.

The **distance** command applies to the routes advertised by routers whose address matches the specified prefix. The *prefix-list-name* argument can then be used to refine this further so that the **distance** command affects only specific routes.

Task ID

Task ID	Operations
isis	read, write

Examples

In the following example, a distance of 10 is assigned to all routes to 2.0.0.0/8 and 3.0.0.0/8 (or more specific prefixes) that are advertised by routers whose ID is contained in 1.0.0.0/8. A distance of 80 is assigned to all other routes.

```
RP/0/RP0/CPU0:router(config)# ipv4 prefix-list target_routes
RP/0/RP0/CPU0:router(config-ipv4_pfx)# permit 2.0.0.0/8
RP/0/RP0/CPU0:router(config-ipv4_pfx)# permit 3.0.0.0/8
RP/0/RP0/CPU0:router(config-ipv4_pfx)# deny 0.0.0.0/0
RP/0/RP0/CPU0:router(config-ipv4_pfx)# exit
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-af)# distance 10 1.0.0.0/8 target_routes
RP/0/RP0/CPU0:router(config-isis-af)# distance 80
```

fast-reroute per-link (IS-IS)

To enable IP fast reroute (IPFRR) loop-free alternate (LFA) prefix independent per-link computation, use the **fast-reroute per-link** command in interface address family configuration mode. To disable this feature, use the **no** form of this command.

fast-reroute per-link [**exclude interface** *type interface-path-id* | **level** {**1** | **2**} | **lfa-candidate interface** *type interface-path-id*]
no fast-reroute per-link

Syntax Description

exclude	Specifies fast-reroute (FRR) loop-free alternate (LFA) computation exclusion information
level {1 | 2}	Configures FRR LFA computation for one level only.
lfa-candidate	Specifies FRR LFA computation candidate information
interface	Specifies an interface that needs to be either excluded from FRR LFA computation (when used with **exclude** keyword) or to be included to LFA candidate list in FRR LFA computation (when used with the **lfa-candidate** keyword).
type	Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

IP fast-reroute LFA per-link computation is disabled.

Command Modes

Interface address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
isis	read, write

This example shows how to configure per-link fast-reroute LFA computation for the IPv4 unicast topology at Level 1:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE 0/3/0/0
RP/0/RP0/CPU0:router(config-isis-if)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-if-af)# fast-reroute per-link level 1
```

fast-reroute per-prefix (IS-IS)

To enable IP fast reroute (IPFRR) loop-free alternate (LFA) prefix dependent computation, use the **fast-reroute per-prefix** command in interface address family configuration mode. LFA is supported only on Enhanced Ethernet line card. To disable this feature, use the **no** form of this command.

fast-reroute per-prefix [**exclude interface** *type interface-path-id* | **level** {**1** | **2**} | **lfa-candidate interface** *type interface-path-id* | **remote-lfa** {**maximum-metric** *metric-value* | **tunnel mpls-ldp**}**prefix-list***prefix-list-name*[**level** {**1** | **2**}]]
no fast-reroute per-prefix

Syntax Description

exclude	Specifies fast-reroute (FRR) loop-free alternate (LFA) computation exclusion information
level {1 | 2}	Configures FRR LFA computation for one level only.
lfa-candidate	Specifies FRR LFA computation candidate information
interface	Specifies an interface that needs to be either excluded from FRR LFA computation (when used with **exclude** keyword) or to be included to LFA candidate list in FRR LFA computation (when used with the **lfa-candidate** keyword).
type	Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
remote-lfa	Enable remote LFA related configuration.
prefix-list *prefix-list-name*	Filter PQ node router ID based on prefix list.

Command Default

IP fast-reroute LFA per-prefix computation is disabled.

Command Modes

Interface address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
isis	read, write

This example shows how to configure per-prefix fast-reroute LFA computation for the IPv4 unicast topology at Level 1:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE 0/3/0/0
RP/0/RP0/CPU0:router(config-isis-if)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-if-af)# fast-reroute per-prefix level 1
```

This example shows how to configure per-prefix remote-lfa prefix list. The prefix-list option filters PQ node router ID based on prefix list.

```
RP/0/RP0/CPU0:router(config-isis-af)# fast-reroute per-prefix remote-lfa prefix-list
```

fast-reroute per-link priority-limit (IS-IS)

To enable the IP fast reroute (IPFRR) loop-free alternate (LFA) prefix independent per-link computation, use the **fast-reroute per-link priority-limit** command in address family configuration mode. To disable this feature, use the **no** form of this command.

fast-reroute per-link priority-limit {**critical** | **high** | **medium**} **level** {**1** | **2**}
no fast-reroute per-link priority-limit

Syntax Description

critical	Enables LFA omputation for critical priority prefixes only.
high	Enables LFA computation for for criticaland high priority prefixes.
medium	Enables LFA computation for for critical, high, and medium priority prefixes.
level {1|2}	Sets priority-limit for routing Level 1 or Level 2 independently.

Command Default

Fast-reroute per link priority limit LFA computation is disabled.

Command Modes

IPv4 unicast address family configuration

IPv6 unicast address family configuration

IPv4 multicast address family configuration

IPv6 multicast address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read, write

This example shows how to configure fast-reroute prefix independent per-link computation for critical priority prefixes for level 1 only:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#router isis isp_lfa
RP/0/RP0/CPU0:router(config-isis)#address-family ipv4
RP/0/RP0/CPU0:router(config-isis-af)#fast-reroute per-link priority-limit critical level 1
```

fast-reroute per-prefix load-sharing disable (IS-IS)

To disable load sharing prefixes across multiple backups, use the **fast-reroute per-prefix load-sharing disable** command in IPv4 address family configuration mode. To disable this feature, use the **no** form of this command.

fast-reroute per-prefix load-sharingdisable
no fast-reroute per-prefix load-sharingdisable

Syntax Description

level {1|2}	Disables load-sharing for Level 1 or Level 2 independently.

Command Default

Load sharing is enabled.

Command Modes

IPv4 unicast address family configuration

IPv4 multicast address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read, write

This example shows how to disable load-sharing prefixes across multiple backups for level 1 routes:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#router isis isp_lfa
RP/0/RP0/CPU0:router(config-isis)#address-family ipv4
RP/0/RP0/CPU0:router(config-isis-af)#fast-reroute per-prefix load-sharing disable level 1
```

fast-reroute per-prefix tiebreaker (IS-IS)

To configure tie-breaker for multiple backups, use the **fast-reroute per-prefix tiebreaker** command in IPv4 address family configuration mode. To disable tie-breaker configuration, use the **no** form of this command.

fast-reroute per-prefix tiebreaker [**downstream** | **lc-disjoint** | **lowest-backup-metric** | **node-protecting** | **primary-path** | **secondary-path**] **index** *index_number* **level {1 | 2}**
no fast-reroute per-prefix tiebreaker

Syntax Description

downstream	Configures to prefer backup path via downstream node, in case of tie-breaker.
lc-disjoint	Configures to prefer Prefer line card disjoint backup path.
lowest-backup-metric	Configures to prefer backup path with lowest total metric.
node-protecting	Configures to prefer node protecting backup path.
primary-path	Configures to prefer backup path from ECMP set.
secondary-path	Configures to prefer non-ECMP backup path.
index	Sets preference order among tie-breakers.
index_number	Value for the index. Range is 1-255.
level {1 | 2}	Configures tiebreaker for Level 1 or Level 2 independently.

Command Default

Tie-breaker for multiple backups is not configured.

Command Modes

IPv4 unicast address family configuration

IPv4 multicast address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read, write

This example shows how to configure preference of backup path via downstream node in case of a tie-breaker for selection of backup path from multiple backup paths:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#router isis isp_lfa
RP/0/RP0/CPU0:router(config-isis)#address-family ipv4
RP/0/RP0/CPU0:router(config-isis-af)#fast-reroute per-prefix tiebreaker downstream index
255
```

flex-algo

The **flex-algo** command allows you to customize IGP shortest path computation according to your needs.

flex-algo *flex-algo-num*
address-family { **ipv4** | **ipv6** } **unicast**
maximum-paths *maximum-paths*

Syntax Description

flex-algo-num	The flex-algo algorithm number. Its value is from 128 to 255.
address-family {ipv4 | ipv6}	Configures the address family for IS-IS.
unicast	Specifies unicast address prefixes.
maximum-paths	Specifies the maximum number of parallel routes that an IP routing protocol installs in the routing table. The range is 1 to 64.

Command Default

No default Command

Command Modes

IS-IS interface

Command History

Release	Modification
Release 7.8.1	This command was modified with **address-family [ipv4 | ipv6] unicast** and **maximum-paths <maximum-paths>** subcommands.
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read, write

The following example shows how to specify the maximum number of parallel routes:

```
Router(config)# router isis isp
Router(config-isis)# flex-algo 128
Router(config-isis-flex-algo)# address-family ipv4 unicast
Router(config-isis-flex-algo)# maximum-paths 5
Router(config-isis-flex-algo)# commit
```

hello-interval (IS-IS)

To specify the length of time between consecutive hello packets sent by the Intermediate System-to-Intermediate System (IS-IS) protocol software, use the **hello-interval** command in interface configuration mode. To restore the default value, use the **no** form of this command.

hello-interval *seconds* [**level** {**1** | **2**}]
no hello-interval [*seconds*] [**level** {**1** | **2**}]

Syntax Description

seconds	Integer value (in seconds) for the length of time between consecutive hello packets. By default, a value three times the hello interval *seconds* is advertised as the *hold time* in the hello packets sent. (That multiplier of three can be changed by using the **hello-multiplier** command.) With smaller hello intervals, topological changes are detected more quickly, but there is more routing traffic. Range is 1 to 65535 seconds.
level { **1** | **2** }	(Optional) Specifies the hello interval for Level 1 and Level 2 independently. For broadcast interfaces only.

Command Default

seconds : 10 seconds

Both Level 1 and Level 2 are configured if no level is specified.

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The hello interval can be configured independently for Level 1 and Level 2, except on serial point-to-point interfaces. (Because only a single type of hello packet is sent on serial links, it is independent of Level 1 or Level 2.) Configuring Level 1 and Level 2 independently is used on LAN interfaces.

Note A shorter hello interval gives quicker convergence, but increases bandwidth and CPU usage. It might also add to instability in the network.

A slower hello interval saves bandwidth and CPU. Especially when used in combination with a higher hello multiplier, this strategy may increase overall network stability.

For point-to-point links, IS-IS sends only a single hello for Level 1 and Level 2, making the **level** keyword meaningless on point-to-point links. To modify hello parameters for a point-to-point interface, omit the **level** keyword.

Note Currently, a user can configure an aggressive hello-interval (lower than the default of 10 seconds for peer-to-peer session). But, if NSR or NSF is configured, the default hello interval has to be used so that the sessions do not run into the risk of flapping during switchover.

Using LAN adjacencies in high availability (HA) scenarios is not recommended, since there is no designated intermediate system (DIS) redundancy in the protocol and traffic will either drop or be rerouted temporarily during DIS re-election.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to configure HundredGigE 0/6/0/0 to advertise hello packets every 5 seconds for Level 1 topology routes. This situation causes more traffic than configuring a longer interval, but topological changes are detected more quickly.

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE 0/6/0/0
RP/0/RP0/CPU0:router(config-isis-if)# hello-interval 5 level 1
```

hello-multiplier

To specify the number of Intermediate System-to-Intermediate System (IS-IS) hello packets a neighbor must miss before the router should declare the adjacency as down, use the **hello-multiplier** command in interface configuration mode. To restore the default value, use the **no** form of this command.

hello-multiplier *multiplier* [**level** {**1** | **2**}]
no hello-multiplier [*multiplier*] [**level** {**1** | **2**}]

Syntax Description

multiplier	Advertised hold time in IS-IS hello packets is set to the hello multiplier times the hello interval. Range is 3 to 1000. Neighbors declare an adjacency to this down router after not having received any IS-IS hello packets during the advertised hold time. The hold time (and thus the hello multiplier and the hello interval) can be set on an individual interface basis, and can be different between different networking devices in one area. Using a smaller hello multiplier gives faster convergence, but can result in more routing instability. Increase the hello multiplier to a larger value to help network stability when needed. Never configure a hello multiplier to a value lower than the default value of 3.
level { **1** | **2** }	(Optional) Specifies the hello multiplier independently for Level 1 or Level 2 adjacencies.

Command Default

multiplier : 3

Both Level 1 and Level 2 are configured if no level is specified.

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The "holding time" carried in an IS-IS hello packet determines how long a neighbor waits for another hello packet before declaring the neighbor to be down. This time determines how quickly a failed link or neighbor is detected so that routes can be recalculated.

Use the **hello-multiplier** command in circumstances where hello packets are lost frequently and IS-IS adjacencies are failing unnecessarily. You can raise the hello multiplier and lower the hello interval (hello-interval (IS-IS), on page 61 command) correspondingly to make the hello protocol more reliable without increasing the time required to detect a link failure.

On point-to-point links, there is only one hello for both Level 1 and Level 2. Separate Level 1 and Level 2 hello packets are also sent over nonbroadcast multiaccess (NBMA) networks in multipoint mode, such as X.25, Frame Relay, and ATM.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how the network administrator wants to increase network stability by making sure an adjacency goes down only when many (ten) hello packets are missed. The total time to detect link failure is 60 seconds. This strategy ensures that the network remains stable, even when the link is fully congested.

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE 0/2/0/1
RP/0/RP0/CPU0:router(config-isis-if)# hello-interval 6
RP/0/RP0/CPU0:router(config-isis-if)# hello-multiplier 10
```

hello-padding

To configure padding on Intermediate System-to-Intermediate System (IS-IS) hello protocol data units (IIH PDUs) for all IS-IS interfaces on the router, use the **hello-padding** command in interface configuration mode. To suppress padding, use the **no** form of this command.

hello-padding {**disable** | **sometimes**} [**level** {**1** | **2**}]
no hello-padding {**disable** | **sometimes**} [**level** {**1** | **2**}]

Syntax Description

disable	Suppresses hello padding.
sometimes	Enables hello padding during adjacency formation only.
level { **1** | **2** }	(Optional) Specifies hello padding for Level 1 or Level 2 independently.

Command Default

Hello padding is enabled.

Command Modes

Interface configuration and IS-IS process configuration

Command History

Release	Modification
Release 6.0	This command was introduced.
Release 7.10.1	This command was extended to IS-IS process configuration mode.

Usage Guidelines

You might want to suppress hello padding to conserve network resources. The lower the circuit speed, the higher the percentage of padding overhead. Before suppressing the hello padding, you should know your physical and data link layer configurations and have control over them, and also know your router configuration at the network layer.

For point-to-point links, IS-IS sends only a single hello for Level 1 and Level 2, making the **level** keyword meaningless on point-to-point links. To modify hello parameters for a point-to-point interface, omit the **level** keyword.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to suppress IS-IS hello padding over local area network (LAN) circuits for interface HundredGigE 0/2/0/1:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE 0/2/0/1
RP/0/RP0/CPU0:router(config-isis-if)# hello-padding disable
```

The following example shows how to suppress IS-IS hello padding at the process level:

```
Router (config)#router isis 100
Router (config-isis)#hello-padding disable
Router (config)#commit
```

hello-password

To configure the authentication password for an Intermediate System-to-Intermediate System (IS-IS) interface, use the **hello-password** command in interface configuration mode. To disable authentication, use the **no** form of this command.

hello-password [**hmac-md5** | **text**] [**clear** | **encrypted**] *password* [**level** {**1** | **2**}] [**send-only**]
no hello-password [**hmac-md5** | **text**] [**clear** | **encrypted**] *password* [**level** {**1** | **2**}] [**send-only**]

Syntax Description

hmac-md5	(Optional) Specifies that the password use HMAC-MD5 authentication.
text	(Optional) Specifies that the password use clear text password authentication.
clear	(Optional) Specifies that the password be unencrypted.
encrypted	(Optional) Specifies that the password be encrypted using a two-way algorithm.
password	Authentication password you assign for an interface.
level { **1** | **2** }	(Optional) Specifies whether the password is for a Level 1 or a Level 2 protocol data unit (PDU).
send-only	(Optional) Specifies that the password applies only to protocol data units (PDUs) that are being sent and does not apply to PDUs that are being received.

Command Default

Both Level 1 and Level 2 are configured if no level is specified.

password: encrypted text

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

When a **text** password is configured, it is exchanged as clear text. Therefore, the **hello-password** command provides limited security.

When an **hmac-md5** password is configured, the password is never sent over the network and is instead used to calculate a cryptographic checksum to ensure the integrity of the exchanged data.

For point-to-point links, IS-IS sends only a single hello for Level 1 and Level 2, making the **level** keyword meaningless on point-to-point links. To modify hello parameters for a point-to-point interface, omit the **level** keyword.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to configure a password with HMAC-MD5 authentication for hello packets running on HundredGigE 0/2/0/3 interface:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE 0/2/0/3
RP/0/RP0/CPU0:router(config-isis-if)# hello-password hmac-md5 clear mypassword
```

hello-password keychain

To configure the authentication password keychain for an Intermediate System-to-Intermediate System (IS-IS) interface, use the **hello-password keychain** command in interface configuration mode. To disable the authentication password keychain, use the **no** form of this command.

hello-password keychain *keychain-name* [**level** {**1** | **2**}] [**send-only**]
no hello-password keychain *keychain-name* [**level** {**1** | **2**}] [**send-only**]

Syntax Description

keychain	Keyword that specifies the keychain to be configured. An authentication password keychain is a sequence of keys that are collectively managed and used for authenticating a peer-to-peer group.
keychain-name	Specifies the name of the keychain.
level { **1** | **2** }	(Optional) Specifies whether the keychain is for a Level 1 or a Level 2 protocol data unit (PDU).
send-only	(Optional) Specifies that the keychain applies only to protocol data units (PDUs) that are being sent and does not apply to PDUs that are being received.

Command Default

Both Level 1 and Level 2 are configured if no level is specified.

password: encrypted text

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Specify a keychain to enable keychain authentication between two IS-IS peers. Use the **keychain** *keychain-name* keyword and argument to implement hitless key rollover for authentication.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to configure a password keychain for level 1, send only authentication on a HundredGigE:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE 0/1/0/0
RP/0/RP0/CPU0:router(config-isis-if)# hello-password keychain mykeychain level 1 send-only
```

hello-password accept

To configure an additional authentication password for an Intermediate System-to-Intermediate System (IS-IS) interface, use the **hello-password accept** command in interface configuration mode. To disable authentication, use the **no** form of this command.

hello-password accept {**clear** | **encrypted**} *password* [**level** {**1** | **2**}]
no hello-password accept {**clear** | **encrypted**} *password* [**level** {**1** | **2**}]

Syntax Description

clear	Specifies that the password be unencrypted.
encrypted	Specifies that the password be encrypted using a two-way algorithm.
password	Authentication password you assign.
level { **1** | **2** }	(Optional) Specifies the password for Level 1 or Level 2 independently.

Command Default

Both Level 1 and Level 2 are configured if no level is specified.

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **hello-password accept** command to add an additional password for an IS-IS interface. An authentication password must be configured using the **hello-password** command before an accept password can be configured for the corresponding level.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to configure a password:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE 0/2/0/3
RP/0/RP0/CPU0:router(config-isis)# hello-password accept encrypted 111D1C1603
```

hostname dynamic disable

To disable Intermediate System-to-Intermediate System (IS-IS) routing protocol dynamic hostname mapping, use the **hostname dynamic** command in XR Config mode. To remove the specified command from the configuration file and restore the system to its default condition, use the **no** form of this command.

hostname dynamic disable
no hostname dynamic disable

Syntax Description

disable	Disables dynamic host naming.

Command Default

Router names are dynamically mapped to system IDs.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

In an IS-IS routing domain, each router is represented by a 6-byte hexadecimal system ID. When network administrators maintain and troubleshoot networking devices, they must know the router name and corresponding system ID.

Link-state packets (LSPs) include the dynamic hostname in the type, length, and value (TLV) which carries the mapping information across the entire domain. Every router in the network, upon receiving the TLV from an LSP, tries to install it in a mapping table. The router then uses the mapping table when it wants to convert a system ID to a router name.

To display the entries in the mapping tables, use the **show isis hostname** command.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to disable dynamic mapping of hostnames to system IDs:

```
RP/0/RP0/CPU0:router(config)# router isis isp
 RP/0/RP0/CPU0:router(config-isis)# hostname dynamic disable
```

iid disable

To suppress instance-ID TLV for `hello` and `lsp` packets when multiple IS-IS instances are configured in a router, use the **iid disable** command in process configuration mode.

To remove this function, use the **no** form of this command.

iid disable

Syntax Description

This command has no keywords or arguments.

Command Default

Sending or receiving is enabled.

Command Modes

IS-IS process configuration

Command History

Release	Modification
Release 7.10.1	The command was introduced.

Usage Guidelines

Each IS-IS instance has a unique instance-ID set, the TLV of which is sent in the **hello** and **lsp** packets.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to suppress instance ID TLV at the IS-IS process configuration level:

```
Router(config-isis)#iid disable
Router(config-isis)#commit
```

ignore-lsp-errors

To override the default setting of a router to ignore Intermediate System-to-Intermediate System (IS-IS) link-state packets (LSPs) that are received with internal checksum errors, use the **ignore-lsp-errors disable** command in XR Config mode. To enable ignoring IS-IS LSP errors, use the **no** form of this command.

ignore-lsp-errors disable
no ignore-lsp-errors disable

Syntax Description

disable	Disables the functionality of the command.

Command Default

The system ignores corrupt LSPs.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The IS-IS protocol definition requires that a received LSP with an incorrect data-link checksum be purged by the receiver, which causes the initiator of the packet to regenerate it. However, if a network has a link that causes data corruption and at the same time is delivering LSPs with correct data-link checksums, a continuous cycle of purging and regenerating large numbers of packets can occur. Because this situation could render the network nonfunctional, use this command to ignore these LSPs rather than purge the packets.

The receiving network devices use link-state packets to maintain their routing tables.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to instruct the router to purge LSPs that cause the initiator to regenerate LSPs:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# ignore-lsp-errors disable
```

instance-id

To allow a router to share one or more circuits among multiple Intermediate System to Intermediate System (IS-IS) routing protocol instances, use the **instance-id** command in router configuration mode.

instance-id *identifier*

Syntax Description

identifier	Specifies the Intermediate System to Intermediate System (IS-IS) routing protocol instance. Range is 1-65535.

Command Default

Disabled

Command Modes

Router configuration

Command History

Release	Modification
Release 6.1.x	This command was introduced.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to configure multiple instances on a single router:

```
RP/0/RP0/CPU0:router(config)# router isis ring
RP/0/RP0/CPU0:router(config-isis)# instance-id 1
RP/0/RP0/CPU0:router(config-isis)# exit
RP/0/RP0/CPU0:router(config)# router isis 1
RP/0/RP0/CPU0:router(config-isis)# instance-id 6
RP/0/RP0/CPU0:router(config-isis)#
```

interface (IS-IS)

To configure the Intermediate System-to-Intermediate System (IS-IS) protocol on an interface, use the **interface** command in XR Config mode. To disable IS-IS routing for interfaces, use the **no** form of this command.

interface *type* *interface-path-id*
no interface *type* *interface-path-id*

Syntax Description

type	Interface type. For more information, use the question mark (**?**) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (**?**) online help function.

Command Default

No interfaces are specified.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

An address family must be established on the IS-IS interface before the interface is enabled for IS-IS protocol operation.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to enable an IS-IS multitopology configuration for IPv4 on HundredGigE interface 0/3/0/0:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# net 49.0000.0000.0001.00
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE 0/3/0/0
RP/0/RP0/CPU0:router(config-isis-if)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-if-af)# metric-style wide level 1
!
RP/0/RP0/CPU0:router(config)# interface HundredGigE 0/3/0/0
RP/0/RP0/CPU0:router(config-if)# ipv4 address 2001::1/64
```

is-type

To configure the routing level for an Intermediate System-to-Intermediate System (IS-IS) area, use the **is-type** command in XR Config mode. To set the routing level to the default level, use the **no** form of this command.

is-type {**level-1** | **level-1-2** | **level-2-only**}
no is-type [**level-1** | **level-1-2** | **level-2-only**]

Syntax Description

level-1	Specifies that the router perform only Level 1 (intra-area) routing. This router learns only about destinations inside its area. Level 2 (interarea) routing is performed by the closest Level 1-2 router.
level-1-2	Specifies that the router perform both Level 1 and Level 2 routing.
level-2-only	Specifies that the routing process acts as a Level 2 (interarea) router only. This router is part of the backbone, and does not communicate with Level 1-only routers in its own area.

Command Default

Both Level 1 and Level 2 are configured if no level is specified.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

When the router is configured with Level 1 routing only, this router learns about destinations only inside its area. Level 2 (interarea) routing is performed by the closest Level 1-2 router.

When the router is configured with Level 2 routing only, this router is part of the backbone, and does not communicate with Level 1 routers in its own area.

The router has one link-state packet database (LSDB) for destinations inside the area (Level 1 routing) and runs a shortest path first (SPF) calculation to discover the area topology. It also has another LSDB with link-state packets (LSPs) of all other backbone (Level 2) routers, and runs another SPF calculation to discover the topology of the backbone and the existence of all other areas.

We highly recommend that you configure the type of an IS-IS routing process to establish the proper level of adjacencies. If there is only one area in the network, there is no need to run both Level 1 and Level 2 routing algorithms.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to specify that the router is part of the backbone and that it does not communicate with Level 1-only routers:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# is-type level-2-only
```

link-down fast-detect

To enable fast detection of link down events under ISIS, use the link-down fast-detect command in ISIS interface configuration mode.

link-down fast-detect

Syntax Description

This command has no arguments or keywords.

Command Default

Fast detect is not enabled.

Command Modes

ISIS interface configuration

Command History

Release	Modification
Release 6.0	This command was introduced

The following example shows how to enable fast detection of link down events under ISIS:

```
Router(config)# router isis isp
Router(config-isis)# interface HundredGigE0/3/0/2
Router(config-isis-if)# link-down fast-detect
```

log pdu drops

To log Intermediate System-to-Intermediate System (IS-IS) protocol data units (PDUs) that are dropped, use the **log pdu drops** command in XR Config mode. To disable this function, use the **no** form of this command.

log pdu drops
no log pdu drops

Command Default

PDU logging is disabled.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **log pdu drops** command to monitor a network when IS-IS PDUs are suspected of being dropped. The reason for the PDU being dropped and current PDU drop statistics are recorded.

The following are examples of PDU logging output:

```
%ISIS-4-ERR_LSP_INPUT_Q_OVERFLOW - An incoming LSP or SNP pdu was dropped because the input
 queue was full
%ISIS-3-ERR_SEND_PAK - The process encountered a software-error while sending the IS-IS
packet
```

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to enable PDU logging:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# log pdu drops
```

lsp-fast-flooding

To enable the fast flooding of Link State Packets (LSPs) to improve network response to topology changes, use the **lsp-fast-flooding** command in IS-IS router configuration mode.

lsp-fast-flooding [**max-lsp-tx** *lsps-per-sec* | **remote-psnp-delay** *milliseconds*\

Syntax Description

max-lsp-tx *lsps-per-sec*	(Optional) Sets the maximum number of LSPs that can be transmitted per second. The default is 1000. The range is from 33 through 5000
remote-psnp-delay *milliseconds*	(Optional) Specifies the maximum delay, in milliseconds, that the router should wait for a PSNP acknowledgment from neighbors after sending an LSP. The default is 500 ms. The range is from 1 through 5000 ms.

Command Default

This command is disabled by default. IS-IS fast flooding of LSPs is not enabled.

Command Modes

Router configuration

Command History

Release	Modification
Release 24.3.1	This command was introduced.

Usage Guidelines

None.

Task ID

Task ID	Operation
isis	read, write

Example

This example shows how to enable IS-IS fast flooding of LSPs.

```
Router# configure terminal
Router(config)# router isis 1
Router(config-router)# lsp-fast-flooding
```

This example shows how to set the maximum LSP transmission rate to 600 LSPs per second.

```
Router# configure terminal
Router(config)# router isis 1
Router(config-router)# lsp-fast-flooding
Router(config-isis-lsp-fast-flooding)# max-lsp-tx 600
```

This example shows how to set the PSNP acknowledgment delay to 600 milliseconds.

```
Router# configure terminal
Router(config)# router isis 1
Router(config-router)# lsp-fast-flooding
Router(config-isis-lsp-fast-flooding)# remote-psnp-delay 600
```

lsp fast-flood threshold

To configure the link-state packet (LSP) fast-flood threshold, use the **lsp fast-flood threshold** command in interface configuration mode. To restore the default value, use the **no** form of this command.

lsp fast-flood threshold *lsp-number* [**level** {**1** | **2**}]
no lsp fast-flood threshold [*lsp-number*] [**level** {**1** | **2**}]

Syntax Description

lsp-number	Number of LSPs to send back to back. Range is 1 to 4294967295.
level { **1** | **2** }	(Optional) Specifies the LSP threshold for Level 1 or Level 2 independently.

Command Default

10 LSPs are allowed in a back-to-back window

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **lsp fast-flood threshold** command to accelerate convergence of LSP database. LSPs are sent back-to-back over an interface up to the specified limit. Past the limit, LSPs are sent out in the next batch window as determined by LSP pacing interval.

Duration of back-to-back window = LSP interval * LSP fast-flood threshold limit.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to configure the LSP threshold:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE 0/3/0/0
RP/0/RP0/CPU0:router(config-isis-if)# lsp fast-flood threshold 234 level 1
```

lsp-gen-interval

To customize IS-IS throttling of link-state packet (LSP) generation, use the **lsp-gen-interval** command in XR Config mode. To restore the default value, use the **no** form of this command.

lsp-gen-interval [**initial-wait** *initial*] [**secondary-wait** *secondary*] [**maximum-wait** *maximum*] [**level** {**1** | **2**}]
no lsp-gen-interval [[**initial-wait** *initial*] [**secondary-wait** *secondary*] [**maximum-wait** *maximum*]] [**level** {**1** | **2**}]

Syntax Description

initial-wait *initial*	Specifies the initial LSP generation delay (in milliseconds). Range is 0 to 120000 milliseconds.
secondary-wait *secondary*	Specifies the hold time between the first and second LSP generation (in milliseconds). Range is 1 to 120000 milliseconds.
maximum-wait *maximum*	Specifies the maximum interval (in milliseconds) between two consecutive occurrences of an LSP being generated. Range is 1 to 120000 milliseconds.
level { **1** | **2** }	(Optional) Specifies the LSP time interval for Level 1 or Level 2 independently.

Command Default

initial-wait *initial* : 50 milliseconds

secondary-wait *secondary* : 200 milliseconds

maximum-wait *maximum* : 5000 milliseconds

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

During prolonged periods of network instability, repeated recalculation of LSPs can cause increased CPU load on the local router. Further, the flooding of these recalculated LSPs to the other Intermediate Systems in the network causes increased traffic and can result in other routers having to spend more time running route calculations.

Use the **lsp-gen-interval** command to reduce the rate of LSP generation during periods of instability in the network. This command can help to reduce CPU load on the router and to reduce the number of LSP transmissions to its IS-IS neighbors.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to set the maximum interval between two consecutive occurrences of an LSP to 15 milliseconds and the initial LSP generation delta to 5 milliseconds:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# lsp-gen-interval maximum-wait 15 initial-wait 5
```

lsp-interval

To configure the amount of time between consecutive link-state packets (LSPs) sent on an Intermediate System-to-Intermediate System (IS-IS) interface, use the **lsp-interval** command in interface configuration mode. To restore the default value, use the **no** form of this command.

lsp-interval *milliseconds* [**level** {**1** | **2**}]
no lsp-interval [*milliseconds*] [**level** {**1** | **2**}]

Syntax Description

milliseconds	Time delay (in milliseconds) between successive LSPs. Range is 1 to 4294967295.
level { **1** | **2** }	(Optional) Configures the LSP time delay for Level 1 or Level 2 independently.

Command Default

milliseconds : 33 milliseconds

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to cause the system to send LSPs every 100 milliseconds (10 packets per second) on Level 1 and Level 2:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE 0/2/0/1
RP/0/RP0/CPU0:router(config-isis-if)# lsp-interval 100
```

lsp-mtu

To set the maximum transmission unit (MTU) size of Intermediate System-to-Intermediate System (IS-IS) link-state packets (LSPs), use the **lsp-mtu** command in XR Config mode. To restore the default, use the **no** form of this command.

lsp-mtu *bytes* [**level** {**1** | **2**}]
no lsp-mtu [*bytes*] [**level** {**1** | **2**}]

Syntax Description

bytes	**Note**	Range is 128 to 8979 bytes from Release 6.6.3 onwards.
level { **1** | **2** }		(Optional) Specifies routing Level 1 or Level 2 independently.

Command Default

Both Level 1 and Level 2 are configured if no level is specified.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.
Release 6.6.3	The maximum packet size is increased to 8979.

Usage Guidelines

Under normal conditions, the default MTU size should be sufficient. However, if the MTU size of a link is less than 1500 bytes, the LSP MTU size must be lowered accordingly on each router in the network. If this action is not taken, routing becomes unpredictable.

This guideline applies to all Cisco networking devices in a network. If any link in the network has a reduced MTU size, all devices must be changed, not just the devices directly connected to the link.

Note Do not set the **lsp-mtu** command (network layer) to a value greater than the link MTU size that is set with the **mtu** command (physical layer).

To be certain about a link MTU size, use the show isis interface, on page 162 command to display the value.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to set the MTU size to 1300 bytes:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# lsp-mtu 1300
```

lsp-password

To configure the link-state packet (LSP) authentication password, use the **lsp-password** command in XR Config mode. To remove the **lsp-password** command from the configuration file and disable link-state packet authentication, use the **no** form of this command.

lsp-password [[**hmac-md5** | **text**] [**clear** | **encrypted**] *password* | **keychain** *keychain-name*] [**level** {**1** | **2**}] [**send-only**] [**snp send-only**] | [**enable-poi**]]
no lsp-password [[**hmac-md5** | **text**] [**clear** | **encrypted**] *password* | **keychain** *keychain-name*] [**level** {**1** | **2**}] [**send-only**] [**snp send-only**] | [**enable-poi**]]

Syntax Description

hmac-md5	Specifies that the password uses HMAC-MD5 authentication.
text	Specifies that the password uses clear text password authentication.
clear	Specifies that the password be unencrypted.
encrypted	Specifies that the password be encrypted using a two-way algorithm.
password	Authentication password you assign.
keychain	(Optional) Specifies a keychain.
keychain-name	Name of the keychain.
level { **1** | **2** }	(Optional) Specifies the password for Level 1 or Level 2 independently.
send-only	(Optional) Adds passwords to LSP and sequence number protocol (SNP) data units when they are sent. Does not check for authentication in received LSPs or sequence number PDUs (SNPs).
snp send-only	(Optional) Adds passwords to SNP data units when they are sent. Does not check for authentication in received SNPs. This option is available when the **text** keyword is specified.
enable-poi	The **enable-poi** keyword inserts the purge originator identification (POI), if you are using cryptographic authentication. If you are not using cryptographic authentication, then the POI is inserted by default.

Command Default

Both Level 1 and Level 2 are configured if no level is specified.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.
Release 6.5.1	The **enable-poi** keyword is added.

Usage Guidelines

When a **text** password is configured, it is exchanged as clear text. Therefore, the **lsp-password** command provides limited security.

When an **HMAC-MD5** password is configured, the password is never sent over the network and is instead used to calculate a cryptographic checksum to ensure the integrity of the exchanged data.

The recommended password configuration is that both incoming and outgoing SNPs be authenticated.

Note To disable SNP password checking, the **snp send-only** keywords must be specified in the **lsp-password** command.

To configure an additional password, use the **lsp-password accept** command.

Specify a key chain to enable key chain authentication between two IS-IS peers. Use the **keychain** *keychain-name* keyword and argument to implement hitless key rollover for authentication.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to configure separate Level 1 and Level 2 LSP and SNP passwords, one with HMAC-MD5 authentication and encryption and one with clear text password authentication and no encryption:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# lsp-password hmac-md5 clear password1 level 1
RP/0/RP0/CPU0:router(config-isis)# lsp-password text clear password2 level 2
```

lsp-password accept

To configure an additional link-state packet (LSP) authentication password, use the **lsp-password accept** command in XR Config mode. To remove the **lsp-password accept** command from the configuration file and restore the system to its default condition, use the **no** form of this command.

lsp-password accept {**clear** | **encrypted**} *password* [**level** {**1** | **2**}]
no lsp-password accept [{**clear** | **encrypted**} *password* [**level** {**1** | **2**}]]

Syntax Description

clear	Specifies that the password be unencrypted.
encrypted	Specifies that the password be encrypted using a two-way algorithm.
password	Authentication password you assign.
level { **1** | **2** }	(Optional) Specifies the password for Level 1 or Level 2 independently.

Command Default

Both Level 1 and Level 2 are configured if no level is specified.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The **lsp-password accept** command adds an additional password for use when the system validates incoming LSPs and sequence number PDUs (SNPs). An LSP password must be configured using the **lsp-password** command before an accept password can be configured for the corresponding level.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to configure an accept Level 1 LSP and SNP password:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# lsp-password encrypted password1 level 1
```

lsp-refresh-interval

To set the time between regeneration of link-state packets (LSPs) that contain different sequence numbers, use the **lsp-refresh-interval** command in XR Config mode. To restore the default refresh interval, use the **no** form of this command.

lsp-refresh-interval *seconds* [**level** {**1** | **2**}]
no lsp-refresh-interval [*seconds* [**level** {**1** | **2**}]]

Syntax Description

seconds	Refresh interval (in seconds). Range is 1 to 65535 seconds.
level { **1** | **2** }	(Optional) Specifies routing Level 1 or Level 2 independently.

Command Default

seconds : 900 seconds (15 minutes)

Both Level 1 and Level 2 are configured if no level is specified.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The refresh interval determines the rate at which the software periodically sends the route topology information that it originates. This behavior is done to keep the information from becoming too old. By default, the refresh interval is 900 seconds (15 minutes).

LSPs must be refreshed periodically before their lifetimes expire. The refresh interval must be less than the LSP lifetime specified with this router command. Reducing the refresh interval reduces the amount of time that undetected link-state database corruption can persist at the cost of increased link utilization. (This event is extremely unlikely, however, because there are other safeguards against corruption.) Increasing the interval reduces the link utilization caused by the flooding of refreshed packets (although this utilization is very small).

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to change the LSP refresh interval to 10,800 seconds (3 hours):

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# lsp-refresh-interval 10800
```

maximum-paths (IS-IS)

To configure the maximum number of parallel routes that an IP routing protocol installs in the routing table, use the **maximum-paths** command in address family configuration mode. To remove the **maximum-paths** command from the configuration file and restore the system to its default condition about the routing protocol, use the **no** form of this command.

maximum-paths *maximum*
no maximum-paths

Syntax Description

maximum	Maximum number of parallel routes that IS-IS can install in a routing table. Range is 1 to 64

Command Default

No default Command

Command Modes

Address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to allow a maximum of 16 paths to a destination:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-af)# maximum-paths 16
```

maximum-redistributed-prefixes (IS-IS)

To specify an upper limit on the number of redistributed prefixes (subject to summarization) that the Intermediate System-to-Intermediate System (IS-IS) protocol advertises, use the **maximum-redistributed-prefixes** command in address family mode. To disable this feature, use the **no** form of this command.

maximum-redistributed-prefixes *maximum* [**level** {**1** | **2**}]
no maximum-redistributed-prefixes [*maximum* [**level** {**1** | **2**}]]

Syntax Description

maximum	Maximum number of redistributed prefixes advertised. Range is 1 to 28000.
level { **1** | **2** }	(Optional) Specifies maximum prefixes for Level 1 or Level 2.

Command Default

maximum: 10000

level : 1-2

Command Modes

Address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **maximum-redistributed-prefixes** command to prevent a misconfiguration from resulting in redistribution of excess prefixes. If IS-IS encounters more than the maximum number of prefixes, it sets a bi-state alarm. If the number of to-be-redistributed prefixes drops back to the maximum or lower—either through reconfiguration or a change in the redistribution source—IS-IS clears the alarm.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to specify the number of redistributed prefixes at 5000 for Level 2:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-af)# maximum-redistributed-prefixes 5000 level 2
```

max-lsp-tx

To set the maximum number of Link State Packets (LSPs) that can be transmitted per second in an IS-IS routing process, use the **max-lsp-tx** command in IS-IS router lsp-fast-flooding configuration mode. To remove the configured maximum LSP transmission rate, use the **no** form of this command.

max-lsp-tx *lsps-per-sec*

Syntax Description

lsps-per-sec	The maximum number of LSPs that can be transmitted per second. The default is 1000 ms. The range is from 33 through 5000 ms.

Command Default

The command is disabled by default.

Command Modes

IS-IS router lsp-fast-flooding configuration

Command History

Release	Modification
Release 24.3.1	This command was introduced.

Usage Guidelines

None

Task ID

Task ID	Operation
isis	read, write

Example

This example shows how to set maximum LSP transmission rate to 600 LSPs per second.

```
Router# configure terminal
Router(config)# router isis 1
Router(config-isis)# lsp-fast-flooding
Router(config-isis-lsp-fast-flooding)# max-lsp-tx 600
```

max-lsp-lifetime

To set the maximum time that link-state packets (LSPs) persist without being refreshed, use the **max-lsp-lifetime** command in XR Config mode. To restore the default time, use the **no** form of this command.

max-lsp-lifetime *seconds* [**level** {**1** | **2**}]
no max-lsp-lifetime [*seconds* [**level** {**1** | **2**}]]

Syntax Description

seconds	Lifetime (in seconds) of the LSP. Range from 1 to 65535 seconds.
level { **1** | **2** }	(Optional) Specifies routing Level 1 or Level 2 independently.

Command Default

seconds : 1200 seconds (20 minutes)

Both Level 1 and Level 2 are configured if no level is specified.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

You might need to adjust the maximum LSP lifetime if you change the LSP refresh interval with the **lsp-refresh-interval** command. The maximum LSP lifetime must be greater than the LSP refresh interval.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to set the maximum time that the LSP persists to 11,000 seconds (more than 3 hours):

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# max-lsp-lifetime 11000
```

mesh-group (IS-IS)

To optimize link-state packet (LSP) flooding in highly meshed networks, use the **mesh-group** command in interface configuration mode. To remove a subinterface from a mesh group, use the **no** form of this command.

mesh-group {*number* | **blocked**}
no mesh-group

Syntax Description

number	Number identifying the mesh group of which this interface is a member. Range is 1 to 4294967295.
blocked	Specifies that no LSP flooding takes place on this interface.

Command Default

There is no mesh group configuration (normal LSP flooding).

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

LSPs first received on subinterfaces that are not part of a mesh group are flooded to all other subinterfaces in the usual way.

LSPs first received on subinterfaces that are part of a mesh group are flooded to all interfaces except those in the same mesh group. If the **blocked** keyword is configured on a subinterface, then a newly received LSP is not flooded out over that interface.

To minimize the possibility of incomplete flooding, you should allow unrestricted flooding over at least a minimal set of links in the mesh. Selecting the smallest set of logical links that covers all physical paths results in very low flooding, but less robustness. Ideally you should select only enough links to ensure that LSP flooding is not detrimental to scaling performance, but enough links to ensure that under most failure scenarios, no router is logically disconnected from the rest of the network. In other words, blocking flooding on all links permits the best scaling performance, but there is no flooding. Permitting flooding on all links results in very poor scaling performance.

Note See RFC 2973 for details about the mesh group specification.

Task ID

Task ID	Operations
isis	read, write

Examples

In the following example, six interfaces are configured in three mesh groups. LSPs received are handled as follows:

- LSPs first received by GigabitEthernet interface 0/1/0/0 are flooded to all interfaces except GigabitEthernet 0/1/0/1 (which is part of the same mesh group) and GigabitEthernet 0/3/0/0 (which is blocked).
- LSPs first received by GigabitEthernet 0/2/0/1 are flooded to all interfaces except GigabitEthernet 0/2/0/0 (which is part of the same mesh group) and GigabitEthernet 0/3/0/0 (which is blocked).
- LSPs first received by GigabitEthernet 0/3/0/0 are not ignored, but flooded as usual to all interfaces.
- LSPs received first through GigabitEthernet 0/3/0/1 are flooded to all interfaces, except GigabitEthernet 0/3/0/0 (which is blocked).

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# interface GigabitEthernet 0/1/0/0
RP/0/RP0/CPU0:router(config-isis-if)# mesh-group 10
RP/0/RP0/CPU0:router(config-isis-if)# exit
RP/0/RP0/CPU0:router(config-isis)# interface GigabitEthernet 0/1/0/1
RP/0/RP0/CPU0:router(config-isis-if)# mesh-group 10
RP/0/RP0/CPU0:router(config-isis-if)# exit
RP/0/RP0/CPU0:router(config-isis)# interface GigabitEthernet 0/2/0/0
RP/0/RP0/CPU0:router(config-isis-if)# mesh-group 11
RP/0/RP0/CPU0:router(config-isis-if)# exit
RP/0/RP0/CPU0:router(config-isis)# interface GigabitEthernet 0/2/0/1
RP/0/RP0/CPU0:router(config-isis-if)# mesh-group 11
RP/0/RP0/CPU0:router(config-isis-if)# exit
RP/0/RP0/CPU0:routerconfig-isis)# interface GigabitEthernet 0/3/0/1
RP/0/RP0/CPU0:router(config-isis-if)# mesh-group 12
RP/0/RP0/CPU0:router(config-isis-if)# exit
RP/0/RP0/CPU0:router(config-isis)# interface GigabitEthernet 0/3/0/0
RP/0/RP0/CPU0:router(config-isis-if)# mesh-group blocked
```

metric (IS-IS)

To configure the metric for an Intermediate System-to-Intermediate System (IS-IS) interface, use the **metric** command in address family or interface address family configuration mode. To restore the default metric value, use the **no** form of this command.

metric {*default-metric* | **maximum**} [**level** {**1** | **2**}]
no metric [{*default-metric* | **maximum**} [**level** {**1** | **2**}]]

Syntax Description

default-metric	Metric assigned to the link and used to calculate the cost from each other router using the links in the network to other destinations. Range is 1 to 63 for narrow metric and 1 to 16777214 for wide metric. **Note** Setting the default metric under address family results in setting the same metric for all interfaces that is associated with the address family. Setting a metric value under an interface overrides the default metric
maximum	Specifies maximum wide metric. All routers exclude this link from their shortest path first (SPF).
level { **1** | **2** }	(Optional) Specifies the SPF calculation for Level 1 or Level 2 independently.

Command Default

default-metric : Default is 10.

Both Level 1 and Level 2 are configured if no level is specified.

Command Modes

Address family configuration

Interface address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Specifying the **level** keyword resets the metric only for the specified level. We highly recommend that you configure metrics on all interfaces.

Set the default metric under address family to set the same metric for all interfaces that is associated with the address family. Set a metric value under an interface to override the default metric.

We highly recommend that you configure metrics on all interfaces.

Metrics of more than 63 cannot be used with narrow metric style.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to configure HundredGigE interface with a default link-state metric cost of 15 for Level 1:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE0/1/0/1
RP/0/RP0/CPU0:router(config-isis-if)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-if-af)# metric 15 level 1
```

The following example shows how to configure a metric cost of 15 for all interfaces under address family IPv4 unicast for level 2:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-af)# metric 15 level 2
```

metric-style narrow

To configure the Intermediate System-to-Intermediate System (IS-IS) software to generate and accept old-style type, length, and value (TLV) objects, use the **metric-style narrow** command in address family configuration mode. To remove the **metric-style narrow** command from the configuration file and restore the system to its default condition, use the **no** form of this command.

metric-style narrow [**transition**] [**level** {**1** | **2**}]
no metric-style narrow [**transition**] [**level** {**1** | **2**}]

Syntax Description

transition	(Optional) Instructs the router to generate and accept both old-style and new-style TLV objects. It generates only old-style TLV objects.
level { **1** | **2** }	(Optional) Specifies routing Level 1 or Level 2 independently.

Command Default

Old-style TLVs are generated.

Both Level 1 and Level 2 are configured if no level is specified.

Command Modes

Address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

IS-IS traffic engineering extensions include new-style TLV objects with wider metric fields than old-style TLV objects. By default, the router generates old-style TLV objects only. To perform Multiprotocol Label Switching traffic engineering (MPLS TE), a router must generate new-style TLV objects.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to configure the router to generate and accept only old-style TLV objects on router Level 1:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-af)# metric-style narrow level 1
```

metric-style transition

To configure the Intermediate System-to-Intermediate System (IS-IS) software to generate and accept both old-style and new-style type, length, and value (TLV) objects, use the **metric-style transition** command in address family configuration mode. To remove the **metric-style transition** command from the configuration file and restore the system to its default condition, use the **no** form of this command.

metric-style transition [**level** {**1** | **2**}]
no metric-style transition [**level** {**1** | **2**}]

Syntax Description

transition	Instructs the router to generate and accept both old-style and new-style TLV objects.
level { **1** | **2** }	(Optional) Specifies routing Level 1 or Level 2 independently.

Command Default

Old-style TLVs are generated, if this command is not configured.

Both Level 1 and Level 2 are configured if no level is specified.

Command Modes

Address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

IS-IS traffic engineering extensions include new-style TLV objects which have wider metric fields than old-style TLV objects. By default, the router generates old-style TLV objects only. To perform Multiprotocol Label Switching traffic engineering (MPLS TE), a router needs to generate new-style TLV objects.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to configure the router to generate and accept both old-style and new-style TLV objects on Level 2:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-af)# metric-style transition level 2
```

metric-style wide

To configure the Intermediate System-to-Intermediate System (IS-IS) software to generate and accept only new-style type, length, and value (TLV) objects, use the **metric-style wide** command in address family configuration mode. To remove the **metric-style wide** command from the configuration file and restore the system to its default condition, use the **no** form of this command.

metric-style wide [**transition**] [**level** {**1** | **2**}]
no metric-style wide [**transition**] [**level** {**1** | **2**}]

Syntax Description

transition	(Optional) Instructs the router to generate and accept both old-style and new-style TLV objects. It generates only new-style TLV objects.
level { **1** | **2** }	(Optional) Specifies routing Level 1 or Level 2 independently.

Command Default

Old-style TLV lengths are generated, if this command is not configured.

Both Level 1 and Level 2 are configured if no level is specified.

Command Modes

Address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

IS-IS traffic engineering extensions include new-style TLV objects with wider metric fields than old-style TLV objects. If you enter the **metric-style wide** command, a router generates and accepts only new-style TLV objects. Therefore, the router uses less memory and fewer other resources rather than generating both old-style and new-style TLV objects.

To perform MPLS traffic engineering, a router needs to generate new-style TLV objects.

Note This discussion of metric styles and transition strategies is oriented toward traffic engineering deployment. Other commands and models might be appropriate if the new-style TLV objects are desired for other reasons. For example, a network may require wider metrics, but might not use traffic engineering.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to configure a router to generate and accept only new-style TLV objects on Level 1:

```
RP/0/RP0/CPU0:router(config)# router isis isp
```

```
RP/0/RP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RSP0RP0/CPU0:router(config-isis-af)# metric-style wide level 1
```

microloop avoidance

To avoid micro-loops by delaying the convergence of all or protected prefixes, use the **microloop avoidance** command. Valid triggers for microloop avoidance feature are local link-down events only, such as link down, BFD down, and IS-IS adjacency down. Microloops caused by other triggers are not avoided by this feature. Consider microloop avoidance segment-routing command for extended trigger coverage.

To disable this function, use the **no** prefix for this command.

microloop avoidance [**protected** | **rib-update-delay** *delay*]
no microloop avoidance

Syntax Description

(none)	Delays convergence of all prefixes.
protected	(Optional) Delays convergence of protected prefixes.
rib-update-delay *delay*	(Optional) Delays convergence of all prefixes and updates RIB after the configured delay. The range is 1 to 60000 milliseconds. The default value is 5000ms (for both the flavours of uloop avoidance).

Command Default

Micro-loop avoidance is disabled by default.

Command Modes

router isis configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

When the network converges after a link failure restoration, micro-loops can form due to inconsistencies in the forwarding tables of different routers. By delaying the convergence of prefixes, you can avoid the formation of micro-loops.

You can delay the convergence of all or protected prefixes by using the **microloop avoidance** command. When configured, the command applies to all prefixes by default. To enable it for only protected prefixes, use the **protected** option.

If another event occurs when the microloop avoidance timer is running, the microloop avoidance process is cancelled, and RIB delay timer is cancelled and prefixes are sent to RIB immediately.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to configure micro-loop avoidance with IS-IS:

```
Router# configure
```

```
Router(config)# router isis 50
Router(config-isis)# microloop avoidance rib-update-delay 400
```

min-lsp-arrivaltime

To control the rate of incoming LSPs (link-state packets) LSPs, use the **min-lsp-arrivaltime** command in XR Config mode. To remove this function use the **no** form of this command.

min-lsp-arrivaltime [**initial-wait initial**] [**secondary-wait secondary**] [**maximum-wait maximum**] [**level** {**1** | **2**}]
no min-lsp-arrivaltime [**initial-wait initial**] [**secondary-wait secondary**] [**maximum-wait maximum**] [**level** {**1** | **2**}]

Syntax Description

initial-wait initial	Initial LSP calculation delay (in milliseconds). Range is 0 to 120000.
secondary-wait *secondary*	Hold time between the first and second LSP calculations (in milliseconds). Range is 0 to 120000.
maximum-wait *maximum*	Maximum interval (in milliseconds) between two consecutive LSP calculations. Range is 0 to 120000.
level { **1** | **2** }	(Optional) Enables the LSP interval configuration for Level 1 or Level 2 independently.

Command Default

Both Level 1 and Level 2 are configured if no level is specified.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

This command can be used to protect a router against the possible instability of its neighbor's LSPs.

The command parameters are similair to **lsp-gen-interval**command and neighbors lsp-gen-interval values can be used to set the **min-lsp-arrivaltime**

Note The initial-wait of minimum-lsp-arrival has no use in computing maximum counts and maximum window sizes of the LSP arrival time parameter.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to configure min-lsp-arrival time commands:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config)# router isis isp min-lsp-arrivaltime
RP/0/RP0/CPU0:router(config)# router isis 1 min-  lsp-arrivaltime initial-wait
RP/0/RP0/CPU0:router(config)#router isis 1 min-lsp-arrivaltime maximum-wait
RP/0/RP0/CPU0:router(config)#router isis 1 min-lsp-arrivaltime secondary-wait
```

mpls ldp auto-config

To enable Label Distribution Protocol (LDP) Interior Gateway Protocol (IGP) interface auto-configuration, use the **mpls ldp auto-config** command in IPv4 address family configuration mode. To disable LDP IGP auto-configuration, use the **no** form of this command.

mpls ldp auto-config
no mpls ldp auto-config

Syntax Description

This command has no keywords or arguments.

Command Default

LDP IGP auto-configuration is disabled.

Command Modes

IPv4 address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **mpls ldp auto-config** command to automatically configure LDP on a set of interfaces associated with a specified IGP instance. Further, LDP IGP auto-configuration provides a means to block LDP from being enabled on a specified interface. If you do not want an IS-IS interface to have LDP enabled, use the **igp auto-config disable** command.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to enable LDP IGP auto-configuration:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-af)# mpls ldp auto-config
```

mpls ldp sync (IS-IS)

To configure Label Distribution Protocol (LDP) IS-IS synchronization, use the **mpls ldp sync** command in interface address family configuration mode. To disable LDP synchronization, use the **no** form of this command.

mpls ldp sync [**level** {**1** | **2**}]
no mpls ldp sync [**level** {**1** | **2**}]

Syntax Description

level { **1** | **2** }	(Optional) Sets LDP synchronization for the specified level.

Command Default

If a level is not specified, LDP synchronization is set for both levels.

Command Modes

Interface address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

MPLS VPN traffic forwarded using LDP labels can be dropped in the following instances:

- A new link is introduced in the network and IS-IS has converged before LDP establishes labels.
- An existing LDP session goes down while IS-IS adjacency is intact over the link.

In both instances, outbound LDP labels are not available for forwarding MPLS traffic. LDP IS-IS synchronization addresses the traffic drop. When the **mpls ldp sync** command is configured, IS-IS advertises the maximum possible link metric until LDP has converged over the link. The link is less preferred and least used in forwarding MPLS traffic. When LDP establishes the session and exchanges labels, IS-IS advertises the regular metric over the link.

Note IS-IS advertises the maximum metric –1 (16777214) if wide metrics are configured since the maximum wide metric is specifically used for link exclusion from the shortest path first algorithm (SPF) (RFC 3784). However, the maximum narrow metric is unaffected by this definition.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to enable LDP IS-IS synchronization:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE 0/3/0/0
RP/0/RP0/CPU0:router(config-isis-if)# address-family ipv4 unicast
```

```
RP/0/RP0/CPU0:router(config-isis-if-af)# mpls ldp sync
```

nsf (IS-IS)

To enable nonstop forwarding (NSF) on the next restart, use the **nsf** command in XR Config mode. To restore the default setting, use the **no** form of this command.

nsf {**cisco** | **ietf**}
no nsf {**cisco** | **ietf**}

Syntax Description

cisco	Specifies Cisco-proprietary NSF restart.
ietf	Specifies Internet Engineering Task Force (IETF) NSF restart.

Command Default

NSF is disabled.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

NSF allows an Intermediate System-to-Intermediate System (IS-IS) instance to restart using checkpointed adjacency and link-state packet (LSP) information, and to perform restart with no impact on its neighbor routers. In other words, there is no impact on other routers in the network due to the destruction and recreation of adjacencies and the system LSP.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to enable Cisco proprietary NSF:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# nsf cisco
```

nsf interface-expires

To configure the number of resends of an acknowledged nonstop forwarding (NSF)-restart acknowledgment, use the **nsf interface-expires** command in XR Config mode. To restore the default value, use the **no** form of this command.

nsf interface-expires *number*
no nsf interface-expires

Syntax Description

number	Number of resends. Range is 1 to 3.

Command Default

number : 3 resends

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

When a hello packet sent with the NSF restart flag set is not acknowledged, it is re-sent. Use the **nsf interface-expires** command to control the number of times the NSF hello is re-sent. When this limit is reached on an interface, any neighbor previously known on that interface is assumed to be down and the initial shortest path first (SPF) calculation is permitted, provided that all other necessary conditions are met.

The total time period available for adjacency reestablishment (interface-timer * interface-expires) should be greater than the expected total NSF restart time.

The **nsf interface-expires** command applies only to Internet Engineering Task Force (IETF)-style NSF. It has no effect if Cisco-proprietary NSF is configured.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to allow only one retry attempt on each interface if an IETF NSF restart signal is not acknowledged:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# nsf ietf
RP/0/RP0/CPU0:router(config-isis)# nsf interface-expires 1
```

nsf interface-timer

To configure the time interval after which an unacknowledged Internet Engineering Task Force (IETF) nonstop forwarding (NSF) restart attempt is repeated, use the **nsf interface-timer** command in router configuration mode. To restore the default value, use the **no** form of this command.

nsf interface-timer *seconds*
no nsf interface-timer

Syntax Description

seconds	NSF restart time interval (in seconds). Range is 3 to 20 seconds.

Command Default

seconds : 10 seconds

Command Modes

Router configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

When the IETF NSF restart process begins, hello packets send an NSF restart flag that must be acknowledged by the neighbors of the router. Use the **nsf interface-timer** command to control the restart time interval after the hello packet is re-sent. The restart time interval need not match the hello interval.

The **nsf interface-timer** command applies only to IETF-style NSF. It has no effect if Cisco proprietary NSF is configured.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to ensure that a hello packet with the NSF restart flag set is sent again every 5 seconds until the flag is acknowledged:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# nsf ietf
RP/0/RP0/CPU0:router(config-isis)# nsf interface-timer 5
```

nsf lifetime (IS-IS)

To configure the maximum route lifetime following a nonstop forwarding (NSF) restart, use the **nsf lifetime** command in XR Config mode. To restore the default value, use the **no** form of this command.

nsf lifetime *seconds*
no nsf lifetime

Syntax Description

seconds	Maximum route lifetime (in seconds) following an NSF restart. Range is 5 to 300 seconds.

Command Default

seconds : 60 seconds (1 minute)

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **nsf lifetime** command to set the maximum available time for the reacquisition of checkpointed adjacencies and link-state packets (LSPs) during a Cisco proprietary NSF restart. LSPs and adjacencies not recovered during this time period are abandoned, thus causing changes to the network topology.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to configure the router to allow only 20 seconds for the entire NSF process:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# nsf cisco
RP/0/RP0/CPU0:router(config-isis)# nsf lifetime 20
```

passive (IS-IS)

To suppress Intermediate System-to-Intermediate System (IS-IS) packets from being transmitted to the interface and received packets from being processed on the interface, use the **passive** command in interface configuration mode. To restore IS-IS packets coming to an interface, use the **no** form of this command.

passive
no passive

Command Default

Interface is active.

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to configure the router to suppress IS-IS packets on GigabitEthernet interface 0/1/0/1:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# interface GigabitEthernet 0/1/0/1
RP/0/RP0/CPU0:router(config-isis-if)# passive
```

prefix-sid index

To specify or advertize prefix (node) segment ID (SID) on all routers, use the **prefix-sid index** command in IPv4 address family configuration mode. To stop advertizing prefix SID, use the **no** form of this command.

The segment routing must be configured on the ISIS instance before configuring prefix SID value.

prefix-sid index *sid-value*

no prefix-sid index *sid-value*

Syntax Description

sid-value	Specifies the prefix SID value. Value range is between 0 and 1048575.

Command Default

No default behavior or values.

Command Modes

IPv4 address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read, write

Examples

This example shows how to advertize prefix SID.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router isis 100
RP/0/RP0/CPU0:router(config-isis)# interface loopback0
RP/0/RP0/CPU0:router(config-isis-if)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-if-af)# prefix-sid index 16041
```

priority (IS-IS)

To configure the priority of designated routers, use the **priority** command in interface configuration mode. To reset the default priority, use the **no** form of this command.

priority *value* [**level** {**1** | **2**}]
no priority [*value*] [**level** {**1** | **2**}]

Syntax Description

value	Priority of a router. Range is 0 to 127.
level { **1** | **2** }	(Optional) Specifies routing Level 1 or Level 2 independently.

Command Default

value : 64

Both Level 1 and Level 2 are configured if no level is specified.

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Priorities can be configured for Level 1 and Level 2 independently. Specifying Level 1 or Level 2 resets priority only for Level 1 or Level 2 routing, respectively. Specifying no level allows you to configure all levels.

The priority is used to determine which router on a LAN is the designated router or Designated Intermediate System (DIS). The priorities are advertised in the hello packets. The router with the highest priority becomes the DIS.

In the Intermediate System-to-Intermediate System (IS-IS) protocol, there is no backup designated router. Setting the priority to 0 lowers the chance of this system becoming the DIS, but does not prevent it. If a router with a higher priority comes online, it takes over the role from the current DIS. For equal priorities, the higher MAC address breaks the tie.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to give Level 1 routing priority by setting the priority level to 80. This router is now more likely to become the DIS.

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE /6/0/0
RP/0/RP0/CPU0:router(config-isis-if)# priority 80 level 1
```

propagate level

To propagate routes from one Intermediate System-to-Intermediate System (IS-IS) level into another level, use the **propagate level** command in address family configuration mode. To disable propagation, use the **no** form of this command.

propagate level {**1** | **2**} **into level** {**1** | **2**} **route-policy** *route-policy-name*
no propagate level {**1** | **2**} **into level** {**1** | **2**}

Syntax Description

level { **1** | **2** }	Propagates from routing Level 1 or Level 2 routes.
into	Propagates from Level 1 or Level 2 routes into Level 1 or Level 2 routes.
route-policy *route-policy-name*	Specifies a configured route policy.

Command Default

Route leaking (Level 2 to Level 1) is disabled.

Command Modes

Address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

In general, route propagation from Level 1 to Level 2 is automatic. You might want to use this command to better control which Level 1 routes can be propagated into Level 2.

Propagating Level 2 routes into Level 1 is called *route leaking*. Route leaking is disabled by default. That is, Level 2 routes are not automatically included in Level 1 link-state packets (LSPs). If you want to leak Level 2 routes into Level 1, you must enable that behavior by using this command.

Propagation from Level 1 into Level 1 and from Level 2 into Level 2 is not allowed.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to redistribute Level 2 routes to Level 1:

```
 RP/0/RP0/CPU0:router(config)# ipv4 access-list 101 permit ip 10.0.0.0 255.0.0.0 10.1.0.1
0.255.255.255
 RP/0/RP0/CPU0:router(config)# router isis isp
 RP/0/RP0/CPU0:router(config-isis)# net 49.1234.2222.2222.2222.00
 RP/0/RP0/CPU0:router(config-isis)# address-family ipv4 unicast
 RP/0/RP0/CPU0:router(config-isis-af)# propagate level 2 into level 1 route-policy policy_a
```

psnp-interval

To configure the interval at which the Intermediate System to Intermediate System (IS-IS) protocol sends Partial Sequence Number PDUs (PSNPs) to acknowledge received Link State PDUs (LSPs), use the **psnp-interval** in router configuration mode.

psnp-interval *milliseconds*

Syntax Description

milliseconds	The interval, specified in milliseconds, at which PSNPs are sent to acknowledge received LSPs. The range is from 1 to 5000 milliseconds. The default value is 50 milliseconds.

Command Default

This command is disabled by default.

Command Modes

Router configuration

Command History

Release	Modification
Release 24.3.1	This command was introduced.

Usage Guidelines

None

Task ID

Task ID	Operation
isis	read, write

Example

This example shows how to configure the PSNP interval to 100 milliseconds for an IS-IS process tagged 1:

```
Router(config)# router isis 1
Router(config-isis)# psnp-interval 100
```

redistribute (IS-IS)

To redistribute routes from one routing protocol into Intermediate System-to-Intermediate System (IS-IS), use the **redistribute** command in address family configuration mode. To remove the **redistribute** command from the configuration file and restore the system to its default condition in which the software does not redistribute routes, use the **no** form of this command.

Border Gateway Protocol (BGP)
redistribute bgp *process-id* [**level-1** | **level-2** | **level-1-2**] [**metric** *metric-value*] [**metric-type** {**internal** | **external** | **rib-metric-as-external** | **rib-metric-as-internal**}] [**route-policy** *route-policy-name*]
no redistribute

Connected Routes
redistribute connected [**level-1** | **level-2** | **level-1-2**] [**metric** *metric-value*] [**metric-type** {**internal** | **external** | **rib-metric-as-external** | **rib-metric-as-internal**}] [**route-policy** *route-policy-name*]
no redistribute

Intermediate System-to-Intermediate System (IS-IS)
redistribute isis *process-id* [**level-1** | **level-2** | **level-1-2**] [**metric** *metric-value*] [**metric-type** {**internal** | **external** | **rib-metric-as-external** | **rib-metric-as-internal**}] [**route-policy** *route-policy-name*]
no redistribute
down-flag-clear

Open Shortest Path First (OSPF)
redistribute ospf *process-id* [**level-1** | **level-2** | **level-1-2**] [**match** {**external** [**1** | **2**] | **internal** | **nssa-external** [**1** | **2**]}] [**metric** *metric-value*] [**metric-type** {**internal** | **external** | **rib-metric-as-external** | **rib-metric-as-internal**}] [**route-policy** *route-policy-name*]
no redistribute

Open Shortest Path First Version 3 (OSPFv3)
redistribute ospfv3 *process-id* [**level-1** | **level-2** | **level-1-2**] [**match** {**external** [**1** | **2**] | **internal** | **nssa-external** [**1** | **2**]}] [**metric** *metric-value*] [**metric-type** {**internal** | **external** | **rib-metric-as-external** | **rib-metric-as-internal**}] [**route-policy** *route-policy-name*]
no redistribute

Static Routes
redistribute static [**level-1** | **level-2** | **level-1-2**] [**metric** *metric-value*] [**metric-type** {**1** {**internal** | **external** | **rib-metric-as-external**} | **2** **rib-metric-as-internal** }] [**route-policy** *route-policy-name*]
no redistribute

RIP
redistribute rip [**level-1** | **level-2** | **level-1-2**] [**metric** *metric-value*] [**metric-type** {**internal** | **external** | **rib-metric-as-external** | **rib-metric-as-internal**}] [**route-policy** *route-policy-name*]
no redistribute rip [**level-1** | **level-2** | **level-1-2**] [**metric** *metric-value*] [**metric-type** {**internal** | **external** | **rib-metric-as-external** | **rib-metric-as-internal**}] [**route-policy** *route-policy-name*]

Subscriber Routes
redistribute subscriber [**level-1** | **level-2** | **level-1-2**] [**metric** *metric-value*] [**metric-type** {**internal** | **external** | **rib-metric-as-external** | **rib-metric-as-internal**}] [**route-policy** *route-policy-name*]

no redistribute subscriber [**level-1** | **level-2** | **level-1-2**] [**metric** *metric-value*] [**metric-type** {**internal** | **external** | **rib-metric-as-external** | **rib-metric-as-internal**}] [**route-policy** *route-policy-name*]

Syntax Description

process-id	For the **bgp** keyword, an autonomous system number has the following ranges: • Range for 2-byte Autonomous system numbers (ASNs) is 1 to 65535. • Range for 4-byte Autonomous system numbers (ASNs) in asplain format is 1 to 4294967295. • Range for 4-byte Autonomous system numbers (ASNs) is asdot format is 1.0 to 65535.65535. For the **isis** keyword, an IS-IS instance identifier from which routes are to be redistributed. For the **ospf** keyword, an OSPF process name from which routes are to be redistributed. The value takes the form of a string. A decimal number can be entered, but it is stored internally as a string. For the **ospfv3** keyword, an OSPFv3 process name from which routes are to be redistributed. The value takes the form of a string. A decimal number can be entered, but it is stored internally as a string.
level-1	(Optional) Specifies that redistributed routes are advertised in the Level-1 LSP of the router.
level-1-2	(Optional) Specifies that redistributed routes are advertised in the Level-1-2 LSP of the router.
level-2	(Optional) Specifies that redistributed routes are advertised in the Level-2 LSP of the router.
metric *metric-value*	(Optional) Specifies the metric used for the redistributed route. Range is 0 to 16777215. The *metric-value* must be consistent with the IS-IS metric style of the area and topology into which the routes are being redistributed.
metric-type { **internal** | **external** } **metric-type** { **internal** | **external** | **rib-metric-as-external** | **rib-metric-as-internal** }	(Optional) Specifies the external link type associated with the route advertised into the ISIS routing domain. It can be one of two four values: • external • **internal** –Use the **internal** keyword to set IS-IS internal metric-type • **external** –Use the **external** keyword to set IS-IS external metric-type • rib-metric-as-external–Use the **rib-metric-as-external** keyword to use RIB metric and set IS-IS external metric-type • rib-metric-as-internal–Use the **rib-metric-as-internal** keyword to use RIB metric and set IS-IS internal metric-type Any route with an internal metric (however large the metric is) is preferred over a route with external metric (however small the metric is). Use the **rib-metric-as-external** and **rib-metric-as-internal** keywords to preserve RIB metrics when redistributing routes from another IS-IS router instance or another protocol.
route-policy *route-policy-name*	(Optional) Specifies the identifier of a configured policy. A policy is used to filter the importation of routes from this source routing protocol to IS-IS.

match { **internal** | **external** [**1** | **2**] | **nsaa-external** [**1** | **2**]}	(Optional) Specifies the criteria by which OSPF routes are redistributed into other routing domains. It can be one or more of the following: • **internal** —Routes that are internal to a specific autonomous system (intra- and interarea OSPF routes). • **external** [**1 | 2**]—Routes that are external to the autonomous system, but are imported into OSPF as Type 1 or Type 2 external routes. • **nssa-external** [**1 | 2**]—Routes that are external to the autonomous system, but are imported into OSPF as Type 1 or Type 2 not-so-stubby area (NSSA) external routes. For the **external** and **nssa-external** options, if a type is not specified, then both Type 1 and Type 2 are assumed.
down-flag-clear	(Optional) Specifies that routes redistributed from another IS-IS instance should be advertised with the up/down bit set to zero. This is contrary to the behavior specified by RFC 5305 and RFC 7775 and can lead to route loops.

Command Default

Level 2 is configured if no level is specified.

metric-type: internal

match : If no match keyword is specified, all OSPF routes are redistributed.

Command Modes

Address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Note When redistributing routes (into IS-IS) using both command keywords for setting or matching of attributes and a route policy, the routes are run through the route policy first, followed by the keyword matching and setting.

Use the **redistribute** command to control the redistribution of routes between separate IS-IS instances. To control the propagation of routes between the levels of a single IS-IS instance, use the propagate level, on page 118 command.

Only IPv4 OSPF addresses can be redistributed into IS-IS IPv4 address families and only IPv6 OSPFv3 prefixes can be distributed into IS-IS IPv6 address families.

Task ID

Task ID	Operations
isis	read, write

Examples

In this example, IS-IS instance isp_A readvertises all of the routes of IS-IS instance isp_B in Level 2 LSP. Note that the **level-2** keyword affects which levels instance isp_A advertises the routes in and has no impact on which routes from instance isp_B are advertised. (Any Level 1 routes from IS-IS instance isp_B are included in the redistribution.

```
RP/0/RSP0RP0/CPU0:router(config)# router isis isp_A
RP/0/RSP0RP0/CPU0:router(config-isis)# net 49.1234.2222.2222.2222.00
RP/0/RSP0RP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RSP0RP0/CPU0:router(config-isis-af)# redistribute isis isp_B level-2
!
RP/0/RSP0RP0/CPU0:router(config)# router isis isp_B
RP/0/RSP0RP0/CPU0:router(config-isis)# is-type level 1
RP/0/RSP0RP0/CPU0:router(config-isis)# net 49.4567.2222.2222.2222.00
RP/0/RSP0RP0/CPU0:router(config-isis)# address-family ipv4 unicast
```

remote-psnp-delay

To specify the maximum delay, in milliseconds, that the router should wait for a Partial Sequence Number Protocol (PSNP) acknowledgment from neighbors after sending a Link State Packet (LSP), use the **remote-psnp-delay** command in appropriate mode. To remove the configured maximum delay, use the **no** form of this command.

remote-psnp-delay *milliseconds*

Syntax Description

milliseconds	Maximum delay, in milliseconds, that the router should wait for a PSNP acknowledgment from neighbors after sending a LSP. The range is from 1 through 5000 ms.

Command Default

The command is disabled by default.

Command Modes

IS-IS router lsp-fast-flooding configuration

Interface configuration

Command History

Release	Modification
Release 24.3.1	This command was introduced.

Usage Guidelines

The order of precedence of the configuration using the **remote-psnp-delay** command is as follows:

1. The **remote-psnp-delay** command in interface configuration mode.
2. The value in the PSNP sub-TLV received from the neighbour, if any.
3. The **remote-psnp-delay** command in router configuration mode.

Task ID

Task ID	Operation
isis	read, write

Example

This example shows how to set the PSNP acknowledgment delay to 600 milliseconds on a device.

```
Router# configure terminal
Router(config)# router isis 1
Router(config-isis)# lsp-fast-flooding
Router(config-isis-lsp-fast-flooding)# remote-psnp-delay 600
Router(config-isis-lsp-fast-flooding)# commit
```

This example shows how to set the PSNP acknowledgment delay to 600 milliseconds on an interface.

```
Router# configure terminal
Router(config)# router isis 1
Router(config-isis)# interface GigabitEthernet0/0/0/0
Router(config-isis-if)# remote-psnp-delay 600
```

retransmit-interval (IS-IS)

To configure the amount of time between retransmission of each Intermediate System-to-Intermediate System (IS-IS) link-state packet (LSP) on a point-to-point link, use the **retransmit-interval** command in interface configuration mode. To restore the default value, use the **no** form of this command.

retransmit-interval *seconds* [**level** {**1** | **2**}]
no retransmit-interval [*seconds* [**level** {**1** | **2**}]]

Syntax Description

seconds	Time (in seconds) between consecutive retransmissions of each LSP. It is an integer that should be greater than the expected round-trip delay between any two networking devices on the attached network. Range is 0 to 65535 seconds.
level { **1** | **2** }	(Optional) Specifies routing Level 1 or Level 2 independently.

Command Default

seconds : 5 seconds

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

To prevent needless transmission results, the *seconds* argument should be conservative.

The **retransmit-interval** command has no effect on LAN (multipoint) interfaces. On point-to-point links, the value can be increased to enhance network stability.

Because retransmissions occur only when LSPs are dropped, setting this command to a higher value has little effect on reconvergence. The more neighbors networking devices have, and the more paths over which LSPs can be flooded, the higher this value can be made.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to configure GigabitEthernet interface 0/2/0/1 for retransmission of IS-IS LSPs every 60 seconds for a large serial line:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE 0/2/0/1
RP/0/RP0/CPU0:router(config-isis-if)# retransmit-interval 60
```

retransmit-throttle-interval

To configure minimum interval between retransmissions of different Intermediate System-to-Intermediate System (IS-IS) link-state packets (LSPs) on a point-to-point interface, use the **retransmit-throttle-interval** command in interface configuration mode. To remove the command from the configuration file and restore the system to its default condition, use the **no** form of this command.

retransmit-throttle-interval *milliseconds* [**level** {**1** | **2**}]
no retransmit-throttle-interval [*milliseconds* [**level** {**1** | **2**}]]

Syntax Description

milliseconds	Minimum delay (in milliseconds) between LSP retransmissions on the interface. Range is 0 to 65535.
level { **1** | **2** }	(Optional) Specifies routing Level 1 or Level 2 independently.

Command Default

Default is 0.

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **retransmit-throttle-interval** command to define the minimum period of time that must elapse between retransmitting any two consecutive LSPs on an interface. The **retransmit-throttle-interval** command may be useful in very large networks with many LSPs and many interfaces as a way of controlling LSP retransmission traffic. This command controls the rate at which LSPs can be re-sent on the interface.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to configure HundredGigE interface 0/2/0/1 to limit the rate of LSP retransmissions to one every 300 milliseconds:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE 0/2/0/1
RP/0/RP0/CPU0:router(config-isis-if)# retransmit-throttle-interval 300
```

route source first-hop

To replace the originating route with first-hop for multicast traffic, use the **route source first-hop** command in ISIS address-family submode. To remove the first-hop for multicast traffic, use the **no** form of this command.

routesourcefirst-hop

This command has no keywords or arguments.

Command Default

no route source first-hop is enabled.

Command Modes

ISIS address-family submode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

This command replaces the originating router address with first-hop router address in the RIB table and facilitates computing alternate paths for multicast traffic. This feature is incompatible with other IOS-XR features, such as MPLS-TE inter-area tunnels. You must use the **route source first-hop** command only to support MoFRR with multicast multipath.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to replace the originating route with first-hop:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# address-family ipv4 multicast
RP/0/RP0/CPU0:router(config-isis-af)# route source first-hop
```

Related Commands

Command	Description
net	Configures an IS-IS NET for the routing process.

segment-routing

To enable segment routing for IPv4 addresses with MPLS data plane, use the **segment-routing** command in IPv4 address family configuration mode. To disable segment routing, use the **no** form of this command.

segment-routing mpls

no segment-routing

Syntax Description

mpls	Enables segment routing for IPv4 addresses with MPLS data plane.

Command Default

No default behavior or values

Command Modes

IPv4 address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The prefix SID value must be removed from all the interfaces under the same ISIS instance before disabling segment routing.

Task ID

Task ID	Operations
isis	read, write

Examples

This example shows how to enable segment routing with MPLS data plane.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router isis 100
RP/0/RP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-af)# segment-routing mpls
```

set-attached-bit

To configure an Intermediate System-to-Intermediate System (IS-IS) instance with an attached bit in the Level 1 link-state packet (LSP), use the **set-attached-bit** command in address family configuration mode. To remove the **set-attached-bit** command from the configuration file and restore the system to its default condition, use the **no** form of this command.

set-attached-bit
no set-attached-bit

Command Default

Attached bit is not set in the LSP.

Command Modes

Address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **set-attached bit** command to set an IS-IS instance with an attached bit in the Level 1 LSP that allows another IS-IS instance to redistribute Level 2 topology. The attached bit is used when the Level 2 connectivity from another IS-IS instance is advertised by the Level 1 attached bit.

Cisco IOS XR software does not support multiple Level 1 areas in a single IS-IS routing instance. But the equivalent functionality is achieved by redistribution of routes between two IS-IS instances by using the redistribute (IS-IS), on page 120 command.

The attached bit is configured for a specific address family only if the **single-topology** command is not configured.

Note If connectivity for the Level 2 instance is lost, the attached bit in the Level 1 instance LSP continues sending traffic to the Level 2 instance and causes the traffic to be dropped.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to set the attached bit for a Level 1 instance that allows the Level 2 instance to redistribute routes from the Level 1 instance:

```
RP/0/RP0/CPU0:router(config)# router isis 1
RP/0/RP0/CPU0:router(config-isis)# net 49.0001.0001.0001.0001.00
RP/0/RP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-af)# redistribute isis 2 level 2
!
RP/0/RP0/CPU0:router(config-isis-af)# interface HundredGigE 0/3/0/0
```

```
RP/0/RP0/CPU0:router(config-isis-af-if)# address-family ipv4 unicast
!
!
RP/0/RP0/CPU0:router(config)# router isis 2
RP/0/RP0/CPU0:router(config-isis)# is-type level-1
RP/0/RP0/CPU0:router(config-isis)# net 49.0002.0001.0001.0002.00
RP/0/RP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-af)# set-attachedbit send always-bitset
!
RP/0/RP0/CPU0:routerfig-isis-af)# interface HundredGigE 0/1/0/0
RP/0/RP0/CPU0:router(config-isis-af-if)# address-family ipv4 unicast
```

set default-isis-instance

When multiple IS-IS instances are configured on a router, by default, **show isis** commands display information from all IS-IS instances. To display information from only one specific IS-IS instance, use the **set default-isis-instance** *instance-name* command in the XR EXEC mode.

When the default IS-IS instance is set, all the show IS-IS commands during the terminal session display only information from that default IS-IS instance. To revert back to the default behaviour of displaying information from all IS-IS instances, use the **set default-isis-instance all** command.

set default-isis-instance { *instance-name* | **all** }

Syntax Description

instance-name	Displays information for the specified *instance-name* when running **show isis** commands.
all	Displays information from all configured IS-IS instances when running **show isis** commands.

Command Default

By default, all configured IS-IS instances are displayed when you run any **show isis** command.

Command Modes

XR EXEC mode

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
isis	read, write

Examples

Example 1: This example shows how to set a specific IS-IS instance as the default instance.

```
RP/0/1/CPU0:ios#set default-isis-instance india
Tue Apr 23 11:47:04.353 CEST
%% Default isis instance is set to  india
```

Example 2: This example uses the **show isis summary** command to display information from the default instance set in Example 1.

```
RP/0/1/CPU0:ios#show isis summary
Tue Apr 23 11:47:10.802 CEST

                                (L1/L2)     (L1/L2)       (L1/L2)       (IPv4/IPv6)
Tag                     Level   Adj         Routers       LSPs          Routes
---                     -----   ---         -------       ----          ------
india                   L2      0/1         0/2           0/2           0/0
RP/0/1/CPU0:ios#
```

Example 3: This example shows how to set all configured IS-IS instances as default instances.

```
RP/0/1/CPU0:ios#set default-isis-instance all
Tue Apr 23 11:47:19.308 CEST
%% Default isis instance is set to  all
```

Example 4: This example uses the **show isis summary** command to display information from all the configured instances set in Example 3.

```
RP/0/1/CPU0:ios#show isis summary
Tue Apr 23 11:47:24.697 CEST

                              (L1/L2)     (L1/L2)      (L1/L2)      (IPv4/IPv6)
Tag                    Level  Adj         Routers      LSPs         Routes
---                    -----  ---         -------      ----         ------
eu                     L2     0/2         0/6          0/6          5/5
india                  L2     0/1         0/2          0/2          0/0
RP/0/1/CPU0:ios#
```

set-overload-bit

To configure the router to signal other routers not to use it as an intermediate hop in their shortest path first (SPF) calculations, use the **set-overload-bit** command in XR Config mode. To remove the designation, use the **no** form of this command.

set-overload-bit [**on-startup** {*delay* | **wait-for-bgp**}] [**level** {**1** | **2**}] [**advertise** {**external** | **interlevel**}]
no set-overload-bit [**on-startup** {*delay* | **wait-for-bgp**}] [**level** {**1** | **2**}] [**advertise** {**external** | **interlevel**}]

Syntax Description

on-startup	(Optional) Sets the overload bit only temporarily after reboot.
delay	(Optional) Time (in seconds) to advertise when the router is overloaded after reboot. Range is 5 to 86400 seconds (86400 seconds = 1 day).
wait-for-bgp	(Optional) Sets the overload bit on startup until the Border Gateway Protocol (BGP) signals converge or time out.
level { **1** | **2** }	(Optional) Specifies the overload bit for Level 1 or Level 2 independently.
advertise { **external** | **interlevel**	(Optional) Sets the overload bit set if the router advertises the following types of IP prefixes: • **external**—If overload-bit set advertises IP prefixes learned from other protocols • **interlevel**— If overload-bit set advertise IP prefixes learned from another ISI S level

Command Default

The overload bit is not set.

Both Level 1 and Level 2 are configured if no level is specified.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **set-overload-bit** command to force the router to set the overload bit in its nonpseudonode link-state packets (LSPs). Normally the setting of the overload bit is allowed only when a router experiences problems. For example, when a router is experiencing a memory shortage, the reason might be that the link-state database is not complete, resulting in an incomplete or inaccurate routing table. If the overload bit is set in the LSPs of the unreliable router, other routers can ignore the router in their SPF calculations until it has recovered from its problems. The result is that no paths through the unreliable router are seen by other routers in the Intermediate System-to-Intermediate System (IS-IS) area. However, IP prefixes directly connected to this router are still reachable.

The **set-overload-bit** command can be useful when you want to connect a router to an IS-IS network, but do not want real traffic flowing through it under any circumstances.

Routers with overload bit set are:

- A test router in the lab, connected to a production network.
- A router configured as an LSP flooding server, for example, on a nonbroadcast multiaccess (NBMA) network, in combination with the mesh group feature.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to configure the overload bit:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# set-overload-bit
```

show isis

The **show isis** command displays general information about an IS-IS instance and protocol operation. If the instance ID is not specified, the command shows information about all IS-IS instances.

show isis [**instance** *instance-id*]

Syntax Description

instance *instance-id* (Optional) Displays the IS-IS adjacencies for the specified IS-IS instance only.

Note The instance-id argument is the instance identifier (alphanumeric) defined by the **router isis** command.

Command Default

No instance ID specified displays IS-IS adjacencies for all the IS-IS instances.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

For each instance, the first line of output lists the IS-IS instance ID with the following lines identifying the IS-IS system ID, supported levels (level 1, level 2, or level-1-2), configured area addresses, active area addresses, status (enabled or not) and type (Cisco or IETF) of nonstop forwarding (NSF), and the mode in which the last IS-IS process startup occurred.

Next, the status of each configured address family (or just IPv4 unicast if none are configured) is summarized. For each level (level 1 or level 2), the metric style (narrow or wide) generated and accepted is listed along with the status of incremental shortest path first (iSPF) computation (enabled or not). Then redistributed protocols are listed, followed by the administrative distance applied to the redistributed routes. From Release 6.6.1, status of incremental shortest path first (iSPF) computation (enabled or not) is not listed.

Finally, the running state (active, passive, or disabled) and configuration state (active or disabled) of each IS-IS interface is listed.

Task ID

Task ID	Operations
isis	read

Examples

The following is sample output from the **show isis** command:

```
Router# show isis
Wed Aug 20 23:54:55.043 PST DST

IS-IS Router: lab
  System Id: 0000.0000.0002
  IS Levels: level-2-only
  Manual area address(es):
    49.1122
```

```
Routing for area address(es):
  49.1122
Non-stop forwarding: Disabled
Most recent startup mode: Cold Restart
Topologies supported by IS-IS:
  IPv4 Unicast
    Level-2
      Metric style (generate/accept): Narrow/Narrow
      Metric: 10
    No protocols redistributed
    Distance: 115
Interfaces supported by IS-IS:
  Loopback0 is running passively (passive in configuration)
  POS0/1/0/2 is running actively (active in configuration)
  POS0/1/0/3 is running actively (active in configuration
```

This table describes the significant fields shown in the display.

Table 5: show isis Field Descriptions

Field	Description
IS-IS Router	IS-IS instance ID.
System Id	IS-IS system ID.
IS Levels	Supported levels for the instance.
Manual area address(es)	Domain and area.
Routing for area address(es):	Configured area addresses and active area addresses.
Non-stop forwarding	Status (enabled or not) and type (Cisco or IETF) of nonstop forwarding (NSF).
Most recent startup mode	The mode in which the last IS-IS process startup occurred.
Topologies supported by IS-IS	The summary of the status of each configured address family (or just IPv4 unicast if none are configured).
Redistributed protocols	List of redistributed protocols, followed by the administrative distance applied to the redistributed routes.
Metric style (generate/accept)	The status of each configured address family (or just IPv4 unicast if none are configured) is summarized. For each level (level 1 or level 2), the metric style (narrow or wide) generated and accepted is listed along with the status of incremental shortest path first (iSPF) computation (enabled or not). From Release 6.6.1, status of incremental shortest path first (iSPF) computation (enabled or not) is not listed.
Interfaces supported by IS-IS	The running state (active, passive, or disabled) and configuration state (active or disabled) of each IS-IS interface.

show isis adjacency

To display Intermediate System-to-Intermediate System (IS-IS) adjacencies, use the **show isis adjacency** command in XR EXEC mode.

show isis [**instance** *instance-id*] **adjacency** [**level** {**1**|**2**}] [*type interface-path-id*] [**detail**] [**systemid** *system-id*]

Syntax Description

instance *instance-id*	(Optional) Displays the IS-IS adjacencies for the specified IS-IS instance only. • The *instance-id* argument is the instance identifier (alphanumeric) defined by the **router isis** command.
level { **1** | **2** }	(Optional) Displays the IS-IS adjacencies for Level 1 or Level 2 independently.
type	Interface type. For more information, use the question mark (**?**) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (**?**) online help function.
detail	(Optional) Displays neighbor IP addresses and active topologies.
systemid *system-id*	(Optional) Displays the information for the specified router only.

Command Default

No instance ID specified displays IS-IS adjacencies for all the IS-IS instances.

Both Level 1 and Level 2 are configured if no level is specified.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read

Examples

The following is sample output from the **show isis adjacency** command:

```
RP/0/RP0/CPU0:router# show isis adjacency
```

```
IS-IS p Level-1 adjacencies:
System Id      Interface        SNPA           State Hold     Changed  NSF      BFD
12a4           PO0/1/0/1        *PtoP*         Up    23       00:00:06 Capable  Init
12a4           Gi0/6/0/2        0004.2893.f2f6 Up    56       00:04:01 Capable  Up

Total adjacency count: 2

IS-IS p Level-2 adjacencies:
System Id      Interface        SNPA           State Hold     Changed  NSF      BFD
12a4           PO0/1/0/1        *PtoP*         Up    23       00:00:06 Capable  None
12a4           Gi0/6/0/2        0004.2893.f2f6 Up    26       00:00:13 Capable  Init

Total adjacency count: 2
```

This table describes the significant fields shown in the display.

Table 6: show isis adjacency Field Descriptions

Field	Description
Level-1	Level 1 adjacencies.
Level-2	Level 2 adjacencies.
System ID	Dynamic hostname of the system. The hostname is specified using the **hostname** command. If the dynamic hostname is not known or the **hostname dynamic disable** command has been executed, the 6-octet system ID is used.
Interface	Interface used to reach the neighbor.
SNPA	Data-link address (also known as the Subnetwork Point of Attachment [SNPA]) of the neighbor.
State	Adjacency state of the neighboring interface. Valid states are Down, Init, and Up.
Holdtime	Hold time of the neighbor.
Changed	Time the neighbor has been up (in hours:minutes:seconds).
NSF	Specifies whether the neighbor can adhere to the IETF-NSF restart mechanism.
BFD	Specifies the Bidirectional Forwarding Detection (BFD) status for the interface. Valid status are: • None—BFD is not configured. • Init—BFD session is not up. One reason is that other side is not yet enabled. • Up—BFD session has been established. • Down—BFD session holdtime expired.

show isis adjacency-log

To display the Intermediate System-to-Intermediate System (IS-IS) adjacency log, use the **show isis adjacency-log** command in XR EXEC mode.

show isis adjacency-log [**level** {**1** | **2**}] [**last** *number* | **first** *number*]

Syntax Description

level { **1** | **2** }	(Optional) Displays the IS-IS adjacency log for Level 1 or Level 2 independently.
last *number*	(Optional) Specifies that the output is restricted to the last *number* of entries. Range is 1 to 100.
first *number*	(Optional) Specifies that the output is restricted to the first *number* of entries. Range is 1 to 100.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read

Examples

The following is sample output from the **show isis adjacency-log** command:

```
RP/0/RP0/CPU0:router# show isis adjacency-log

   IS-IS 10 Level 1 Adjacency log
When           System          Interface          State   Details
4d00h          12a1            PO0/5/0/0          d -> i
4d00h          12a1            PO0/5/0/0          i -> u  New adjacency
                                                          IPv4 Unicast Up
4d00h          12a1            Gi0/6/0/0          d -> u  New adjacency
4d00h          12a1            Gi0/6/0/0          u -> d  Interface state
down
3d17h          12a1            Gi0/6/0/0          d -> u  New adjacency
3d17h          12a1            Gi0/6/0/0          u -> d  Interface state
down
01:44:07       12a1            Gi0/6/0/0          d -> u  New adjacency

   IS-IS 10 Level 2 Adjacency log
When           System          Interface          State   Details
4d00h          12a1            PO0/5/0/0          d -> i
4d00h          12a1            PO0/5/0/0          i -> u  New adjacency
```

```
                                                                IPv4 Unicast Up
4d00h          12a1            Gi0/6/0/0          d -> u  New adjacency
4d00h          12a1            Gi0/6/0/0          u -> d  Interface state
down
3d17h          12a1            Gi0/6/0/0          d -> u  New adjacency
3d17h          12a1            Gi0/6/0/0          u -> d  Interface state
down
01:44:07       12a1            Gi0/6/0/0          d -> u  New adjacency
```

This table describes the significant fields shown in the display.

Table 7: show isis adjacency-log Field Descriptions

Field	Description
When	Elapsed time (in hh:mm:ss) since the event was logged.
System	System ID of the adjacent router.
Interface	Specific interface involved in the adjacency change.
State	State transition for the logged event.
Details	Description of the adjacency change.

show isis checkpoint adjacency

To display the Intermediate System-to-Intermediate System (IS-IS) checkpoint adjacency database, use the **show isis checkpoint adjacency** command in XR EXEC mode.

show isis [**instance** *instance-id*] **checkpoint adjacency**

Syntax Description

instance *instance-id*	(Optional) Displays the IS-IS checkpoint adjacencies for the specified IS-IS instance only. • The *instance-id* argument is the instance identifier (alphanumeric) defined by the **router isis** command.

Command Default

No instance ID specified displays IS-IS checkpoint adjacencies for all the IS-IS instances.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show isis checkpoint adjacency** command to display the checkpointed adjacencies. With this information you can restore the adjacency database during a Cisco proprietary nonstop forwarding (NSF) restart. This command, with the **show isis adjacency** command, can be used to verify the consistency of the two databases.

Task ID

Task ID	Operations
isis	read

Examples

The following is sample output from the **show isis checkpoint adjacency** command:

```
RP/0/RP0/CPU0:router# show
           isis
           checkpoint
           adjacency

 Interface        Level  System ID        State  Circuit ID          Chkpt ID
 Gi3/0/0/1          1     router-gsr8      Up     0001.0000.0008.04   80011fec
 Gi0/4/0/1          1     router-gsr9      Up     0001.0000.0006.01   80011fd8
 Gi3/0/0/1          2     router-gsr8      Up     0001.0000.0008.04   80011fc4
```

This table describes the significant fields shown in the display.

Table 8: show isis checkpoint adjacency Field Descriptions

Field	Description
Interface	Interface used to reach the neighbor.
Level	Lists either routers with Level 1 or Level 2 adjacency configured.
System ID	Dynamic hostname of the system. The hostname is specified using the **hostname** command. If the dynamic hostname is not known or **hostname dynamic disable** command has been executed, the 6-octet system ID is used.
State	State of the neighboring interface.
Circuit ID	Unique ID issued to a circuit at its creation.
Chkpt ID	Unique ID issued to the checkpoint at its creation.

show isis checkpoint interface

To display the Intermediate System-to-Intermediate System (IS-IS) checkpoint interfaces, use the **show isis checkpoint interface** command in XR EXEC mode.

show isis checkpoint interface

This command has no keywords or arguments.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read

Examples

The following is sample output from the **show isis checkpoint interface** command:

```
RP/0/RP0/CPU0:router# show isis checkpoint interface

IS-IS 10 checkpoint interface
Interface         Index  CircNum  DIS Areas    Chkpt ID
PO0/5/0/0         0      0        NONE         80002fe8
Gi0/6/0/0         1      3        L1L2         80002fd0
```

This table describes the significant fields shown in the display.

Table 9: show isis checkpoint interface Field Descriptions

Field	Description
Interface	Interface used to reach the neighbor.
Index	Interface index assigned to an interface upon its creation.
CircNum	Unique ID issued to a circuit internally.
DIS Areas	Designated Intermediate System area.
Chkpt ID	Unique ID issued to the checkpoint at its creation.

show isis checkpoint lsp

To display the Intermediate System-to-Intermediate System (IS-IS) checkpoint link-state packet (LSP) protocol data unit (PDU) identifier database, use the **show isis checkpoint lsp** command in XR EXEC mode.

show isis [**instance** *instance-id*] **checkpoint lsp**

Syntax Description

instance *instance-id*	(Optional) Displays the IS-IS checkpoint LSPs for the specified instance only. • The *instance-id* argument is the instance identifier (alphanumeric) defined by the **router isis** command.

Command Default

No instance ID specified displays IS-IS checkpoint LSPs for all the IS-IS instances.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The checkpointed LSPs displayed by this command are used to restore the LSP database during a Cisco-proprietary nonstop forwarding (NSF) restart. The **show isis checkpoint lsp** command, with the **show isis database** command, may be used to verify the consistency of the two databases.

Task ID

Task ID	Operations
isis	read

Examples

The following is sample output from the **show isis checkpoint lsp** command:

```
RP/0/RP0/CPU0:router#
            show isis checkpoint lsp


Level  LSPID              Chkpt ID
1      router-gsr6.00-00  80011f9c
1      router-gsr6.01-00  80011f88
1      router-gsr8.00-00  80011f74
1      router-gsr9.00-00  80011f60
2      router-gsr6.00-00  80011f4c
2      router-gsr6.01-00  80011f38
2      router-gsr8.00-00  80011f24
2      router-gsr9.00-00  80011f10
Total LSP count: 8 (L1: 4, L2 4, local L1: 2, local L2 2)
```

This table describes the significant fields shown in the display.

Table 10: show isis checkpoint lsp Field Descriptions

Field	Description
Level	Routers with Level 1 or Level 2 adjacency configured.
LSPID	LSP identifier. The first six octets form the system ID of the router that originated the LSP. The next octet is the pseudonode ID. When this byte is 0 zero, the LSP describes links from the system. When it is nonzero, the LSP is a so-called nonpseudonode LSP. This is similar to a router link-state advertisement (LSA) in the Open Shortest Path First (OSPF) protocol. The LSP describes the state of the originating router. For each LAN, the designated router for that LAN creates and floods a pseudonode LSP, describing all systems attached to that LAN. The last octet is the LSP number. If there is more data than can fit in a single LSP, the LSP is divided into multiple LSP fragments. Each fragment has a different LSP number. An asterisk (*) indicates that the LSP was originated by the system on which this command is issued.
Chkpt ID	Unique ID issued to the checkpoint at its creation.

show isis database

To display the Intermediate System-to-Intermediate System (IS-IS) link-state packet (LSP) database, use the **show isis database** command in XR EXEC mode.

show isis [**instance** *instance-id*] **database** [**level** {**1** | **2**}] [**update**] [**summary**] [**detail**] [**verbose**] [******lsp-id*]

Syntax Description

instance *instance-id*	(Optional) Displays the IS-IS LSP database for the specified instance only. • The *instance-id* argument is the instance identifier (alphanumeric) defined by the **router isis** command.
level { **1** | **2** }	(Optional) Displays the IS-IS LSP database for Level 1 or Level 2 independently.
update	(Optional) Displays contents of LSP database managed by update thread.
summary	(Optional) Displays the LSP ID number, sequence number, checksum, hold time, and bit information.
detail	(Optional) Displays the contents of each LSP.
verbose	(Optional) Displays the contents of each LSP.
***** | *lsp-id*	(Optional) LSP protocol data units (PDUs) identifier. Displays the contents of a single LSP by its ID number or may contain an * as a wildcard character.

Command Default

No instance ID specified displays the IS-IS LSP database for all the IS-IS instances.

Both Level 1 and Level 2 is configured if no level is specified.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.
Release 6.5.1	The output of this command shows an additional field called **Rcvd**.

Usage Guidelines

Each of the options for the **show isis database** command can be entered in an arbitrary string within the same command entry. For example, the following are both valid command specifications and provide the same output: **show isis database detail level 2** and **show isis database level 2 detail** .

The **summary** keyword used with this command allows you to filter through a large IS-IS database and quickly identify problematic areas.

Task ID

Task ID	Operations
isis	read

Examples

The following is sample output from the **show isis database** command with no keywords specified:

```
RP/0/RP0/CPU0:router# show isis database

IS-IS Area a1 (Level-1) Link State Database
LSPID                 LSP Seq Num  LSP Checksum  LSP Holdtime  ATT/P/OL
router-gsr6.00-00   * 0x00000016   0x62c8        896             0/0/0
router-gsr6.01-00   * 0x0000000f   0x56d9        902             0/0/0
router-gsr8.00-00     0x00000019   0x4b6d        1015            0/0/0
router-gsr9.00-00     0x00000016   0x33b7        957             0/0/0


 Total LSP count: 4 (L1: 4, L2 0, local L1: 2, local L2 0)
```

The following sample output shows the remaining lifetime value that is received in LSP database. The received value is shown in the output under the **Rcvd** field.

```
RP/0/0/CPU0:ios#show isis database
Thu Dec 14 16:03:45.131 EST

IS-IS 100 (Level-1) Link State Database
LSPID                 LSP Seq Num   LSP Checksum  LSP Holdtime/Rcvd  ATT/P/OL
1111.1111.1111.00-00* 0x0073000e     0x0001                1002/*           1/0/1
1111.1111.1112.00-00  0x0073004a     0x0001                1195/59          1/0/1
1111.1111.1112.01-00  0x007300b8     0x0001                1178/59          0/0/1
1111.1111.1112.03-00  0x007300b6     0x0001                1179/59          0/0/1
1111.1111.1113.00-00  0x0073000d     0x0001                533/1200         1/0/1

 Total Level-1 LSP count: 5     Local Level-1 LSP count: 1
```

This table describes the significant fields shown in the display.

Table 11: show isis database Field Descriptions

Field	Description
LSPID	LSP identifier. The first six octets form the system ID of the router that originated the LSP. The next octet is the pseudonode ID. When this byte is 0, the LSP describes links from the system. When it is nonzero, the LSP is a so-called nonpseudonode LSP. This is similar to a router link-state advertisement (LSA) in the Open Shortest Path First (OSPF) protocol. The LSP describes the state of the originating router. For each LAN, the designated router for that LAN creates and floods a pseudonode LSP, describing all systems attached to that LAN. The last octet is the LSP number. If there is more data than can fit in a single LSP, the LSP is divided into multiple LSP fragments. Each fragment has a different LSP number. An asterisk (*) indicates that the LSP was originated by the system on which this command is issued.
LSP Seq Num	Sequence number for the LSP that allows other systems to determine if they have received the latest information from the source.
LSP Checksum	Checksum of the entire LSP packet.

Field	Description
LSP Holdtime	Time the LSP remains valid (in seconds). An LSP hold time of 0 indicates that this LSP was purged and is being removed from the link-state database (LSDB) of all routers. The value indicates how long the purged LSP stays in the LSDB before being completely removed.
ATT/P/OL	ATT—Attach bit. This bit indicates that the router is also a Level 2 router, and it can reach other areas. Level 1-only routers and Level 1-2 routers that have lost connection to other Level 2 routers use the Attach bit to find the closest Level 2 router. They point to a default route to the closest Level 2 router. P—P bit. Detects if the intermediate system is area partition repair capable. Cisco and other vendors do not support area partition repair. OL—Overload bit. Determines if the IS is congested. If the Overload bit is set, other routers do not use this system as a transit router when calculating routers. Only packets for destinations directly connected to the overloaded router are sent to this router.

The following is sample output from the **show isis database** command with the **summary** keyword:

```
RP/0/RP0/CPU0:router# show isis database summary

  IS-IS 10 Database Summary for all LSPs
                              Active              Purged               All
                          L1    L2   Total   L1    L2   Total   L1    L2   Total
                        ----- ----- -----  ----- ----- -----  ----- ----- -----
  Fragment 0 Counts
            Router LSPs:     1     1     2      0     0     0      1     1     2
       Pseudo-node LSPs:     0     0     0      0     0     0      0     0     0
               All LSPs:     1     1     2      0     0     0      1     1     2
  Per Topology
      IPv4 Unicast
        ATT bit set LSPs:     0     0     0      0     0     0      0     0     0
        OVL bit set LSPs:     0     0     0      0     0     0      0     0     0

  All Fragment Counts
            Router LSPs:     1     1     2      0     0     0      1     1     2
       Pseudo-node LSPs:     0     0     0      0     0     0      0     0     0
               All LSPs:     1     1     2      0     0     0      1     1     2
```

This table describes the significant fields shown in the display.

Table 12: show isis database summary Field Descriptions

Field	Description
Router LSPs	Active, purged, and total LSPs associated with routers.
Pseudo-node LSPs:	Active, purged, and total LSPs associated with pseudonodes.
All LSPs:	Total active and purged LSPs.
ATT bit set LSPs	Attach bit (ATT). Indicates that the router is also a Level 2 router, and it can reach other areas. Level 1-only routers and Level 1-2 routers that have lost connection to other Level 2 routers use the Attach bit to find the closest Level 2 router. They point to a default route to the closest Level 2 router.

Field	Description
OVL bit set LSPs	Overload bit. Indicates if the IS is congested. If the Overload bit is set, other routers do not use this system as a transit router when calculating routers. Only packets for destinations directly connected to the overloaded router are sent to this router.

The following is sample output from the **show isis database** command with the **detail verbose** keyword specified:

```
 RP/0/RP0/CPU0:router# show isis instance isp database detail verbose

  IS-IS isp test (Level-1) Link State Database
      LSPID                 LSP Seq Num  LSP Checksum  LSP Holdtime  ATT/P/OL
      router-5router1.00-00       0x00000003 * 0x00000d44 0x8074460 0x7e2c 457 535
     0/0/0
        Area Address: 4900
    Area Address: 01
        NLPID:        0xcc
    NLPID:  Hostname:    router-50x8e
        IP Address:  172.1.1.5
        MetricMT: 0  IP 172.3.55.0/24Standard (IPv4 Unicast)
        Metric: 10         IP 172.6.1.0/24
    MT:           IPv6 Unicast                                      0/0/0
    MT:           IPv4 Multicast                  Metric: 10 IP 172.7.0./0/240
        Metric: 10         IS router-11.00
        Metric: 10         IS router-11.01
    MT:           IPv6 Multicast                router-11.00-00  * 0x0000000b   0x8074460
       1161            0/0/0
    Hostname:  Area Address: 49router1
        NLPID:       0xcc
        Hostname:    router-11
    IP Address:   192.168.0.145
        IP IPv6 Address:  172.1.11.11192:168::145     MetricRouter ID: 0        IP
172192.1168.1110.0/24145
        Metric: 10         IP 172IS-Extended router1.016.1.0/24
        Metric: 10         IP 172IS-Extended router2.007.0.0/24
        Metric: 10         IS routerIS-11Extended router2.0100
        Metric: 10         IS router-5.00
      router-11.01-00  * 0x00000001   0x80770ec        457             0/0/0
        Metric: 0          IS router-11.00
        Metric: 0          IS router-5.00
      Affinity: 0x00000000
      Interface IP Address: 10.3.11.145
      Neighbor IP Address: 10.3.11.143
      Physical BW: 155520 kbits/sec
       Total LSP count: 3 (L1: 3, L2 0, local L1: 2, local L2 0)
      Reservable Global pool BW: 0 kbits/sec
      Global Pool BW Unreserved:
      IS-IS isp (Level-2) Link State Database
      LSPID                 LSP Seq Num  LSP Checksum  LSP Holdtime  ATT/P/OL
      router-5.00-00     0x00000005   0x807997c        457             0/0/0
        [0]: 0        kbits/sec          [1]: 0        kbits/sec
        [2]: 0        kbits/sec          [3]: 0        kbits/sec
        [4]: 0        kbits/sec          [5]: 0        kbits/sec
        [6]: 0        kbits/sec          [7]: 0        kbits/sec
    MPLS SRLG: Area Address: 49router2.00
      Interface IP Address: 10.3.11.145
      Neighbor IP Address: 10.3.11.143
        NLPIDFlags:       0xcc0x1   HostnameSRLGs:    router-5IP Address[0]:  172.6.10,
[1.5]: 20
        Metric: 0 10  IP 172IP-Extended 10.3.5511.0/24
```

```
   Metric: 10         IP 172IP-Extended 192.1686.10.0145/2432
   Metric: 10         IS routerMT (IPv6 Unicast) IS-11Extended router1.0001
   Metric: 10         IP 172.1.0.0MT (IPv6 Unicast) IPv6 192:168::145/24128
   Metric: 10         IS routerMT (IPv4 Multicast) IS-11Extended router1.01
   Metric: 10         IP 172.8.111.0/24


 router-11.00-00  * 0x0000000d   0x807997c        1184            0/0/0
   Area Address: 49
   NLPID:       0xcc
   Hostname:    router-11
   IP Address:  172.28.111.111
   Metric: 0          IP 172.8.111.0/24
   Metric: 10         IP 172.6.1.0/24
   Metric: 10         IP 172MT (IPv4 Multicast) IP-Extended 192.7168.0./
   Metric: 10         IS router-11.01
   Metric: 10         IS router-5.00
   Metric: 10         IP 172.3.55.0MT (IPv6 Multicast) IPv6 192:168::145/24.01-00
0x0000013e 0x80770ec 0x3309 457 1159              0/0/0
   Metric: 0          IS routerIS-11Extended router1.00
   Metric: 0          IS routerIS-5Extended router2.00

  Total LSP count: 3 (L1: 0, L2 3, local L1: 0, local L2 2)
```

As the output shows, besides the information displayed with the **show isis database** command, the command with the **detail verbose** keyword displays the contents of each LSP.

Table 13: show isis instance isp database detail Field Descriptions

Field	Description
LSPID	LSP identifier. The first six octets form the system ID of the router that originated the LSP. The next octet is the pseudonode ID. When this byte is 0, the LSP describes links from the system. When it is nonzero, the LSP is a so-called nonpseudonode LSP. This is similar to a router link-state advertisement (LSA) in the Open Shortest Path First (OSPF) protocol. The LSP describes the state of the originating router. For each LAN, the designated router for that LAN creates and floods a pseudonode LSP, describing all systems attached to that LAN. The last octet is the LSP number. If there is more data than can fit in a single LSP, the LSP is divided into multiple LSP fragments. Each fragment has a different LSP number. An asterisk (*) indicates that the LSP was originated by the system on which this command is issued.
LSP Seq Num	Sequence number for the LSP that allows other systems to determine if they have received the latest information from the source.
LSP Checksum	Checksum of the entire LSP packet.
LSP Holdtime	Amount of time the LSP remains valid (in seconds). An LSP hold time of 0 indicates that this LSP was purged and is being removed from the link-state database (LSDB) of all routers. The value indicates how long the purged LSP stays in the LSDB before being completely removed.

Field	Description
ATT/P/OL	ATT—Attach bit. This bit indicates that the router is also a Level 2 router, and it can reach other areas. Level 1-only routers and Level 1-2 routers that have lost connection to other Level 2 routers use the Attach bit to find the closest Level 2 router. They point to a default route to the closest Level 2 router. P—P bit. Detects if the intermediate system is area partition repair capable. Cisco and other vendors do not support area partition repair. OL—Overload bit. Determines if the IS is congested. If the Overload bit is set, other routers do not use this system as a transit router when calculating routers. Only packets for destinations directly connected to the overloaded router are sent to this router.
Area Address	Reachable area addresses from the router. For Level 1 LSPs, these are the area addresses configured manually on the originating router. For Level 2 LSPs, these are all the area addresses for the area this route belongs to.
NLPID	Network Layer Protocol Identifier.
Hostname	Hostname of the node.
IP Address:	Address of the node.
Metric	IS-IS metric for the cost of the adjacency between the originating router and the advertised neighbor, or the metric of the cost to get from the advertising router to the advertised destination (which can be an IP address, an end system (ES), or a Connectionless Network Service (CLNS) prefix).

The following is additional sample output from the **show isis database detail** command. This is a Level 2 LSP. The area address 39.0001 is the address of the area in which the router resides.

```
RP/0/RSP0/CPU0:router# show isis database level 2 detail

IS-IS Level-2 Link State Database
LSPID                 LSP Seq Num  LSP Checksum  LSP Holdtime  ATT/P/OL
0000.0C00.1111.00-00* 0x00000006   0x4DB3        1194          0/0/0
  Area Address: 39.0001
  NLPID:       0x81 0xCC
  IP Address:  172.18.1.17
  Metric: 10   IS 0000.0C00.1111.09
  Metric: 10   IS 0000.0C00.1111.08
  Metric: 10   IP 172.17.4.0 255.255.255.0
  Metric: 10   IP 172.18.8.0 255.255.255.0
  Metric: 0    IP-External 10.0.0.0 255.0.0.0
```

The IP entries are the directly connected IP subnets the router is advertising (with associated metrics). The IP-External entry is a redistributed route.

Table 14: show isis database level 2 detail Field Descriptions

Field	Description
LSPID	LSP identifier. The first six octets form the system ID of the router that originated the LSP. The next octet is the pseudonode ID. When this byte is 0, the LSP describes links from the system. When it is nonzero, the LSP is a so-called nonpseudonode LSP. This is similar to a router link-state advertisement (LSA) in the Open Shortest Path First (OSPF) protocol. The LSP describes the state of the originating router. For each LAN, the designated router for that LAN creates and floods a pseudonode LSP, describing all systems attached to that LAN. The last octet is the LSP number. If there is more data than can fit in a single LSP, the LSP is divided into multiple LSP fragments. Each fragment has a different LSP number. An asterisk (*) indicates that the LSP was originated by the system on which this command is issued.
LSP Seq Num	Sequence number for the LSP that allows other systems to determine if they have received the latest information from the source.
LSP Checksum	Checksum of the entire LSP packet.
LSP Holdtime	Time the LSP remains valid (in seconds). An LSP hold time of 0 indicates that this LSP was purged and is being removed from the link-state database (LSDB) of all routers. The value indicates how long the purged LSP stays in the LSDB before being completely removed.
ATT/P/OL	ATT—Attach bit. This bit indicates that the router is also a Level 2 router, and it can reach other areas. Level 1-only routers and Level 1-2 routers that have lost connection to other Level 2 routers use the Attach bit to find the closest Level 2 router. They point to a default route to the closest Level 2 router. P—P bit. Detects if the intermediate system is area partition repair capable. Cisco and other vendors do not support area partition repair. OL—Overload bit. Determines if the IS is congested. If the Overload bit is set, other routers do not use this system as a transit router when calculating routers. Only packets for destinations directly connected to the overloaded router are sent to this router.
Area Address	Reachable area addresses from the router. For Level 1 LSPs, these are the area addresses configured manually on the originating router. For Level 2 LSPs, these are all the area addresses for the area to which this route belongs.
NLPID	Network Layer Protocol Identifier.
Hostname	Hostname of the node.
IP Address:	IP address of the node.
Metric:	IS-IS metric for the cost of the adjacency between the originating router and the advertised neighbor, or the metric of the cost to get from the advertising router to the advertised destination (which can be an IP address, an end system (ES), or a Connectionless Network Service (CLNS) prefix).

Table 15: show isis database verbose Field Descriptions

Field	Description
LSPID	LSP identifier. The first six octets form the system ID of the router that originated the LSP. The next octet is the pseudonode ID. When this byte is zero, the LSP describes links from the system. When it is nonzero, the LSP is a so-called nonpseudonode LSP. This is similar to a router link-state advertisement (LSA) in the Open Shortest Path First (OSPF) protocol. The LSP describes the state of the originating router. For each LAN, the designated router for that LAN creates and floods a pseudonode LSP, describing all systems attached to that LAN. The last octet is the LSP number. If there is more data than can fit in a single LSP, the LSP is divided into multiple LSP fragments. Each fragment has a different LSP number. An asterisk (*) indicates that the LSP was originated by the system on which this command is issued.
LSP Seq Num	Sequence number for the LSP that allows other systems to determine if they have received the latest information from the source.
LSP Checksum	Checksum of the entire LSP packet.
LSP Holdtime	Time the LSP remains valid (in seconds). An LSP hold time of zero indicates that this LSP was purged and is being removed from the link-state database (LSDB) of all routers. The value indicates how long the purged LSP stays in the LSDB before being completely removed.
ATT/P/OL	ATT—Attach bit. This bit indicates that the router is also a Level 2 router, and it can reach other areas. Level 1-only routers and Level 1-2 routers that have lost connection to other Level 2 routers use the Attach bit to find the closest Level 2 router. They point to a default route to the closest Level 2 router. P—P bit. Detects if the intermediate system is area partition repair capable. Cisco and other vendors do not support area partition repair. OL—Overload bit. Determines if the IS is congested. If the Overload bit is set, other routers do not use this system as a transit router when calculating routers. Only packets for destinations directly connected to the overloaded router are sent to this router.
Area Address	Reachable area addresses from the router. For Level 1 LSPs, these are the area addresses configured manually on the originating router. For Level 2 LSPs, these are all the area addresses for the area to which this route belongs.
NLPID	Network Layer Protocol Identifier.
Hostname	Hostname of the node.
IP Address	IP address of the node.
Metric	IS-IS metric for the cost of the adjacency between the originating router and the advertised neighbor, or the metric of the cost to get from the advertising router to the advertised destination (which can be an IP address, an end system (ES), or a Connectionless Network Service (CLNS) prefix).

Field	Description
MPLS SRLG	MPLS SRLG TLV information per neighbor, identified by hostname or system ID.
Interface IP Address	Local interface IP address.
Neighbor IP Address	Remote interface IP address.
Flags	Flags carried in SRLG TLV. The Least Significant Bit (LSB) is set if the interface is numbered.
SRLGs	SRLG values.

This is the sample output from the **show isis database verbose** command. The output shows IPv4 adjacency segment ID (SID), prefix (node) SID, and Segment Routing Global Block (SRGB) values.

```
RP/0/RP0/CPU0:router show isis database verbose
Fri May  2 17:53:44.575 PDT

IS-IS DEFAULT (Level-1) Link State Database
LSPID                 LSP Seq Num  LSP Checksum  LSP Holdtime  ATT/P/OL
p1.00-00              0x00000080   0x4780        1044            1/0/0
  Area Address: 49.0001
  NLPID:        0xcc
  NLPID:        0x8e
  MT:           Standard (IPv4 Unicast)
  MT:           IPv6 Unicast                                     1/0/0
  Hostname:     p1
  IP Address:   172.16.255.101
  IPv6 Address: 2001:db8::ff:101
  Router Cap:   172.16.255.101, D:0, S:0
    Segment Routing: I:1 V:0, SRGB Base: 16000 Range: 7999
  Metric: 10         IS-Extended p2.00
    Interface IP Address: 172.16.2.4
    Neighbor IP Address: 172.16.2.5
    ADJ-SID: F:0 B:0 weight:0 Adjacency-sid:24002
  Metric: 10         IS-Extended pe1.00
    Interface IP Address: 172.16.1.1
    Neighbor IP Address: 172.16.1.0
    ADJ-SID: F:0 B:0 weight:0 Adjacency-sid:24003
  Metric: 10         IP-Extended 172.16.1.0/31
  Metric: 10         IP-Extended 172.16.2.2/31
  Metric: 10         IP-Extended 172.16.2.4/31
  Metric: 10         IP-Extended-Interarea 172.16.255.2/32
    Admin. Tag: 255
    Prefix-SID Index: 42, R:1 N:0 P:1
  Metric: 0          IP-Extended 172.16.255.101/32
    Prefix-SID Index: 141, R:0 N:0 P:0
  Metric: 10         MT (IPv6 Unicast) IS-Extended p2.00
  Metric: 10         MT (IPv6 Unicast) IS-Extended pe1.00
  Metric: 10         MT (IPv6 Unicast) IPv6 2001:db8::1:0/127
  Metric: 10         MT (IPv6 Unicast) IPv6 2001:db8::2:2/127
  Metric: 10         MT (IPv6 Unicast) IPv6 2001:db8::2:4/127
  Metric: 10         MT (IPv6 Unicast) IPv6-Interarea 2001:db8::ff:2/128
    Admin. Tag: 255
  Metric: 0          MT (IPv6 Unicast) IPv6 2001:db8::ff:101/128
```

show isis database-log

To display the entries in the Intermediate System-to-Intermediate System (IS-IS) database log, use the **show isis database-log** command in XR EXEC mode.

show isis database-log [**level** {**1** | **2**}] [**last** *number* | **first** *number*]

Syntax Description

level { **1** | **2** }	(Optional) Displays the database log for Level 1 or Level 2 independently.
last *number*	(Optional) Specifies that the output be restricted to the last *number* of entries. Range is 1 to 1000.
first *number*	(Optional) Specifies that the output be restricted to the first *number* of entries. Range is 1 to 1000.

Command Default

Both Level 1 and Level 2 are configured if no level is specified.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read

Examples

The following is sample output from the **show isis database-log** command:

```
RP/0/RP0/CPU0:router# show isis database-log

   IS-IS 10 Level 1 Link State Database Log
                                 New LSP                 Old LSP
WHEN     LSPID               Op  Seq Num    Holdtime OL  Seq Num    Holdtime OL
01:17:19 12b1.03-00          REP 0x00000003 1200      0  0x00000002 340       0
001:06:20 12b1.00-00         REP 0x000001d8 1200      0  0x000001d7 375       0
01:06:00 12b1.03-00          REP 0x00000004 1200      0  0x00000003 520       0
01:05:46 12a1.00-00          REP 0x000001fc 1200      0  0x000001fb 425       0
00:55:01 12b1.00-00          REP 0x000001d9 1200      0  0x000001d8 520       0
00:53:39 12b1.03-00          REP 0x00000005 1200      0  0x00000004 459       0
00:53:19 12a1.00-00          REP 0x000001fd 1200      0  0x000001fc 453       0
00:42:12 12b1.00-00          REP 0x000001da 1200      0  0x000001d9 431       0
00:39:56 12b1.03-00          REP 0x00000006 1200      0  0x00000005 376       0
00:38:54 12a1.00-00          REP 0x000001fe 1200      0  0x000001fd 334       0
00:29:10 12b1.00-00          REP 0x000001db 1200      0  0x000001da 418       0
00:27:22 12b1.03-00          REP 0x00000007 1200      0  0x00000006 446       0
00:25:10 12a1.00-00          REP 0x000001ff 1200      0  0x000001fe 375       0
00:17:04 12b1.00-00          REP 0x000001dc 1200      0  0x000001db 473
```

This table describes the significant fields shown in the display.

Table 16: show isis database-log Field Descriptions

Field	Description
WHEN	Elapsed time (in hh:mm:ss) since the event was logged.
LSPID	LSP identifier. The first six octets form the system ID of the router that originated the LSP. The next octet is the pseudonode ID. When this byte is 0 zero, the LSP describes links from the system. When it is nonzero, the LSP is a so-called nonpseudonode LSP. This is similar to a router link-state advertisement (LSA) in the Open Shortest Path First (OSPF) protocol. The LSP describes the state of the originating router. For each LAN, the designated router for that LAN creates and floods a pseudonode LSP, describing all systems attached to that LAN. The last octet is the LSP number. If there is more data than can fit in a single LSP, the LSP is divided into multiple LSP fragments. Each fragment has a different LSP number. An asterisk (*) indicates that the LSP was originated by the system on which this command is issued.
New LSP	New router or pseudonode appearing in the topology.
Old LSP	Old router or pseudonode leaving the topology.
Op	Operation on the database: inserted (INS) or replaced (REP).
Seq Num	Sequence number for the LSP that allows other systems to determine if they have received the latest information from the source.
Holdtime	Time the LSP remains valid (in seconds). An LSP hold time of 0 indicates that this LSP was purged and is being removed from the link-state database (LSDB) of all routers. The value indicates how long the purged LSP stays in the LSDB before being completely removed.
OL	Overload bit. Determines if the IS is congested. If the Overload bit is set, other routers do not use this system as a transit router when calculating routers. Only packets for destinations directly connected to the overloaded router are sent to this router.

show isis fast-reroute

To display per-prefix LFA information, use the **show isis fast-reroute** command in XR EXEC mode.

show isis fast-reroute
A.B.C.D/length | **detail** | **summary** | **sr-only**

Command Default

None

Command History

Release	Modification
Release 6.0	This command was introduced.
Release 6.3.2	The **sr-only** keyword was added.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read

The following is sample output from **show isis fast-reroute** command that displays per-prefix LFA information:

```
RP/0/RP0/CPU0:router# show isis fast-reroute 10.1.6.0/24

L1 10.1.6.0/24 [20/115]
     via 10.3.7.47, POS0/3/0/1, router2
       FRR backup via 10.1.7.145, GigabitEthernet0/1/0/3, router3
```

The following is sample output from **show isis fast-reroute detail** command that displays tie-breaker information about the backup:

```
RP/0/RP0/CPU0:router# show isis fast-reroute 10.1.6.0/24 detail

L1 10.1.6.0/24 [20/115] low priority
     via 10.3.7.47, POS0/3/0/1, router2
       FRR backup via 10.1.7.145, HundredGigE 0/1/0/3, router3
       P: No, TM: 30, LC: Yes, NP: No, D: No
     src router2.00-00, 192.168.0.47
   L2 adv [20] native, propagated
```

The following is sample output from **show isis fast-reroute summary** command that displays the number of prefixes having protection per priority:

```
RP/0/RP0/CPU0:router#show isis fast-reroute summary
IS-IS frr IPv4 Unicast FRR summary

                                        Critical   High       Medium     Low        Total
```

```
                                     Priority   Priority   Priority      Priority

Prefixes reachable in L1
  All paths protected     0              0             2                8               10

  Some paths protected 0              0             1                3               4

  Unprotected                0              0             1                3
 4
  Protection coverage    0.00%     0.00%     75.00%     78.57%     77.78%
Prefixes reachable in L2
  All paths protected     0              0             0               0                0

  Some paths protected 0              0             1               0                1

  Unprotected                0              0             0               0
 0
  Protection coverage    0.00%     0.00%     100.00%   0.00%      100.00%
```

The following is sample output from **show isis fast-reroute sr-only** command that displays fast-reroute repair paths for prefixes associated with a segment routing prefix SID:

```
RP/0/RP0/CPU0:router#show isis fast-reroute sr-only
IS-IS 1 IPv4 Unicast FRR backups

Codes: L1 - level 1, L2 - level 2, ia - interarea (leaked into level 1)
       df - level 1 default (closest attached router), su - summary null
       C - connected, S - static, R - RIP, B - BGP, O - OSPF
       E - EIGRP, A - access/subscriber, M - mobile, a - application
       i - IS-IS (redistributed from another instance)
       D - Downstream, LC - Line card disjoint, NP - Node protecting
       P - Primary path, SRLG - SRLG disjoint, TM - Total metric via backup

Maximum parallel path count: 8

L2 20.1.0.101/32 [10/115]
     via 10.1.1.101, GigabitEthernet0/0/0/2, r101, SRGB Base: 16000, Weight: 0
        Backup path: TI-LFA (link), via 10.4.1.103, GigabitEthernet0/0/0/1 r103, SRGB Base:
 16000, Weight: 0
           P node: r103.00 [20.1.0.103], Label: ImpNull
           Q node: r102.00 [20.1.0.102], Label: 24001
           Prefix label: 16101
           Backup-src: r101.00
L2 20.1.0.102/32 [30/115]
     via 10.1.1.101, GigabitEthernet0/0/0/2, r101, SRGB Base: 16000, Weight: 0
        Backup path: TI-LFA (link), via 10.4.1.103, GigabitEthernet0/0/0/1 r103, SRGB Base:
 16000, Weight: 0
           P node: r103.00 [20.1.0.103], Label: ImpNull
           Q node: r102.00 [20.1.0.102], Label: 24001
           Prefix label: ImpNull
           Backup-src: r102.00
L2 20.1.0.103/32 [20/115]
     via 10.4.1.103, GigabitEthernet0/0/0/1, r103, SRGB Base: 16000, Weight: 0
        Backup path: TI-LFA (link), via 10.1.1.101, GigabitEthernet0/0/0/2 r101, SRGB Base:
 16000, Weight: 0
           P node: r102.00 [20.1.0.102], Label: 16102
           Q node: r103.00 [20.1.0.103], Label: 24001
           Prefix label: ImpNull
           Backup-src: r103.00
```

show isis hostname

To display the entries in the Intermediate System-to-Intermediate System (IS-IS) router name-to-system ID mapping table, use the **show isis hostname** command in XR EXEC mode.

show isis [**instance** *instance-id*] **hostname**

Syntax Description

instance *instance-id*	(Optional) Displays the IS-IS router name-to-system ID mapping table for the specified IS-IS instance only. The *instance-id* argument is the instance identifier (alphanumeric) defined by the **router isis** command.

Command Default

No instance ID specified displays the IS-IS router name-to-system ID mapping table for all the IS-IS instances.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The **show isis hostname** command does not display entries if the dynamic hostnames are disabled.

Task ID

Task ID	Operations
isis	read

Examples

The following is sample output from the **show isis hostname** command with the **instance** and *instance-id* values specified:

```
RP/0/RP0/CPU0:router# show isis instance isp hostname

ISIS isp hostnames
    Level  System ID      Dynamic Hostname
     1     0001.0000.0005 router
     2   * 0001.0000.0011 router-11
```

This table describes the significant fields shown in the display.

Table 17: show isis instance isp hostname Field Descriptions

Field	Description
Level	IS-IS level of the router.

Field	Description
System ID	Dynamic hostname of the system. The hostname is specified using the **hostname** command. If the dynamic hostname is not known or **hostname dynamic disable** command has been executed, the 6-octet system ID is used.
Dynamic Hostname	Hostname of the router.
*	Local router.

show isis interface

To display information about the Intermediate System-to-Intermediate System (IS-IS) interfaces, use the **show isis interface** command in XR EXEC mode.

show isis interface [*type interface-path-id* | **level** {**1** | **2**}] [**brief**]

Syntax Description

type	Interface type. For more information, use the question mark (**?**) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (**?**) online help function.
level { **1** | **2** }	(Optional) Displays IS-IS interface information for Level 1 or Level 2 independently.
brief	(Optional) Displays brief interface output.

Command Default

Displays all IS-IS interfaces.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read

Examples

The following is sample output from the **show isis interface** command:

```
RP/0/RP0/CPU0:router#show isis interface
          HundredGigE0/3/0/2
 tenGigE 0/3/0/2                  Enabled
  Adjacency Formation:      Enabled
  Prefix Advertisement:     Enabled
  BFD:                      Disabled
  BFD Min Interval:         150
  BFD Multiplier:           3

  Circuit Type:             level-2-only
  Media Type:               P2P
  Circuit Number:           0
```

```
Extended Circuit Number:  67111168
Next P2P IIH in:          4 s
LSP Rexmit Queue Size:    0

Level-2
  Adjacency Count:        1
  LSP Pacing Interval:    33 ms
  PSNP Entry Queue Size:  0

CLNS I/O
  Protocol State:         Up
  MTU:                    4469

IPv4 Unicast Topology:    Enabled
  Adjacency Formation:    Running
  Prefix Advertisement:   Running
  Metric (L1/L2):         10/100
  MPLS LDP Sync (L1/L2):  Disabled/Disabled
IPv6 Unicast Topology:    Disabled (Not cfg on the intf)

IPv4 Address Family:      Enabled
  Protocol State:         Up
  Forwarding Address(es): 10.3.10.143
  Global Prefix(es):      10.3.10.0/24
IPv6 Address Family:      Disabled (No topology enabled which uses IPv6)

LSP transmit timer expires in 0 ms
LSP transmission is idle
Can send up to 9 back-to-back LSPs in the next 0 ms
```

This table describes the significant fields shown in the display.

Table 18: show isis interface Field Descriptions

Field	Description
HundredGigE 0/6/0/0	Status of the interface, either enabled or disabled.
Adjacency formation:	Status of adjacency formation, either enabled or disabled.
Prefix Advertisement:	Status of advertising connected prefixes, either enabled or disabled.
BFD:	Status of Bidirectional Forwarding Detection (BFD), either enabled or disabled.
BFD Min Interval:	BFD minimum interval.
BFD Multiplier:	BFD multiplier.
Circuit Type:	Levels the interface is running on (circuit-type configuration) which may be a subset of levels on the router.
Media Type:	Media type on which IS-IS is running.
Circuit Number:	Unique ID assigned to a circuit internally (8-bit integer).
Extended Circuit Number:	Valid only for point-to-point interfaces (32-bit integer).
LSP Rexmit Queue Size:	Number of LSPs pending retransmission on the interface.

Field	Description
Adjacency Count:	Number of adjacencies formed with a neighboring router that supports the same set of protocols.
PSNP Entry Queue Size:	Number of SNP entries pending inclusion in the next PSNP.
LAN ID:	ID of the LAN.
Priority (Local/DIS):	Priority of this interface or priority of the Designated Intermediate System.
Next LAN IIH in:	Time (in seconds) in which the next LAN hello message is sent.
LSP Pacing Interval:	Interval at which the link-state packet (LSP) transmission rate (and by implication the reception rate of other systems) is to be reduced.
Protocol State:	Running state of the protocol (up or down).
MTU:	Link maximum transmission unit (MTU).
SNPA:	Data-link address (also known as the Subnetwork Point of Attachment [SNPA]) of the neighbor.
All Level-n ISs:	Status of interface membership in Layer 2 multicast group. The status options are Yes or reason for not being a member of the multicast group.
IPv4 Unicast Topology:	Status of the topology, either enabled or disabled.
Adjacency Formation:	Status of adjacency formation. The status options are Running or a reason for not being ready to form adjacencies.
Prefix Advertisement:	Status of advertising prefixes, either enabled or disabled.
Metric (L1/L2):	IS-IS metric for the cost of the adjacency between the originating router and the advertised neighbor, or the metric of the cost to get from the advertising router to the advertised destination (which can be an IP address, an end system (ES), or a connectionless network service (CLNS) prefix).
MPLS LDP Sync (L1/L2)	Status of LDP IS-IS synchronization, either enabled or disabled. When enabled, the state of synchronization (Sync Status) is additionally displayed as either achieved or not achieved.
IPv4 Address Family:	Status of the address family, either enabled or disabled.
Protocol State:	State of the protocol.
Forwarding Address(es):	Addresses on this interface used by the neighbor for next-hop forwarding.
Global Prefix(es):	Prefixes for this interface included in the LSP.
LSP transmit timer expires in	LSP transmission expiration timer interval (in milliseconds).

Field	Description
LSP transmission is	State of LSP transmission. Valid states are: • idle • in progress • requested • requested and in progress

The following is sample output from the **show isis interface** command with the **brief** keyword:

```
RP/0/0/CPU0:router# show isis interface brief

    Interface      All     Adjs    Adj Topos  Adv Topos  CLNS   MTU    Prio
                   OK    L1   L2    Run/Cfg    Run/Cfg                L1   L2
-----------------  ---  ---------  ---------  ---------  ----  ----  --------
PO0/5/0/0          Yes    1    1      1/1        1/1     Up    4469    -    -
Gi0/6/0/0          Yes    1*   1*     1/1        1/1     Up    1497   64   64
```

This table describes the significant fields shown in the display.

Table 19: show isis interface brief Field Descriptions

Field	Description
Interface	Name of the interface.
All OK	Everything is working as expected for this interface.
Adjs L1 L2	Number of L1 and L2 adjacencies over this interface.
Adj Topos Run/Cfg	Number of topologies that participate in forming adjacencies. Number of topologies that were configured to participate in forming adjacencies.
Adv Topos Run/Cfg	Number of topologies that participate in advertising prefixes. Number of topologies that were configured to participate in advertising prefixes.
CLNS	Status of the Connectionless Network Service. Status options are Up or Down.
MTU	Maximum transfer unit size for the interface.
Prio L1 L2	Interface L1 priority. Interface L2 priority.

show isis lsp-log

To display link-state packet (LSP) log information, use the **show isis lsp-log** command in XR EXEC mode.

show isis [**instance** *instance-id*] **lsp-log** [**level** {**1** | **2**}] [**last** *number* | **first** *number*]

Syntax Description

instance *instance-id*	(Optional) Displays the LSP log information for the specified IS-IS instance only. • The *instance-id* argument is the instance identifier (alphanumeric) defined by the **router isis** command.
level { **1** | **2** }	(Optional) Displays the Intermediate System-to-Intermediate System (IS-IS) link-state database for Level 1 or Level 2 independently.
last *number*	(Optional) Specifies that the output be restricted to the last *number* of entries. Range is 1 to 20.
first *number*	(Optional) Specifies that the output be restricted to the first *number* of entries. Range is 1 to 20.

Command Default

No instance ID specified displays the LSP log information for all the IS-IS instances.

Both Level 1 and Level 2 are configured if no level is specified.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read

Examples

The following is sample output from the **show isis lsp-log** command with the **instance** and *instance-id* values specified:

```
RP/0/RP0/CPU0:router# show isis instance isp lsp-log

ISIS isp Level 1 LSP log
  When       Count      Interface       Triggers
00:02:36         1
00:02:31         1                      LSPREGEN
00:02:26         1      PO4/1           DELADJ
00:02:24         1      PO4/1           NEWADJ
00:02:23         1      Gi5/0           DIS
00:01:27         1      Lo0             IPDOWN
```

```
00:01:12         1      Lo0             IPUP


ISIS isp Level 2 LSP log
  When       Count      Interface       Triggers
00:02:36         1
00:02:30         1                      LSPREGEN
00:02:26         1      PO4/1           DELADJ
00:02:24         1      PO4/1           NEWADJ
00:02:23         1      Gi5/0           DIS
00:02:21         1                      AREASET
00:01:27         1      Lo0             IPDOWN
00:01:12         1      Lo0             IPUP
```

This table describes the significant fields shown in the display.

Table 20: show isis instance isp lsp-log Field Descriptions

Field	Description
Level	IS-IS level of the router.
When	How long ago (in hh:mm:ss) an LSP rebuild occurred. The last 20 occurrences are logged.
Count	Number of events that triggered this LSP run. When there is a topology change, often multiple LSPs are received in a short period. A router waits 5 seconds before running a full LSP, so it can include all new information. This count denotes the number of events (such as receiving new LSPs) that occurred while the router was waiting its 5 seconds before running full LSP.
Interface	Interface that corresponds to the triggered reasons for the LSP rebuild.
Triggers	A list of all reasons that triggered an LSP rebuild. The triggers are: • AREASET—area set changed • ATTACHFLAG—bit attached • CLEAR— **clear** command • CONFIG—configuration change • DELADJ—adjacency deleted • DIS—DIS changed • IFDOWN—interface down • IPADDRCHG—IP address change • IPDEFORIG—IP def-orig • IPDOWN—connected IP down • IFDOWN—interface down • IPEXT—external IP • IPIA—nterarea IP • IPUP—connected IP up • LSPDBOL—LSPDBOL bit • LSPREGEN—LSP regeneration • NEWADJ— new adjacency

show isis mesh-group

To display Intermediate System-to-Intermediate System (IS-IS) mesh group information, use the **show isis mesh-group** command in XR EXEC mode.

show isis [**instance** *instance-id*] **mesh-group**

Syntax Description

instance *instance-id*	(Optional) Displays the mesh group information for the specified IS-IS instance only. • The *instance-id* argument is the instance identifier (alphanumeric) defined by the **router isis** command.

Command Default

No instance ID specified displays the IS-IS mesh group information for all the IS-IS instances.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read

Examples

The following is sample output from the **show isis mesh-group** command with the **instance** and *instance-id* values specified:

```
RP/0/RP0/CPU0:router# show isis instance isp mesh-group

 ISIS isp Mesh Groups

 Mesh group 6:
 HundredGigE 0/4/0/1
```

This table describes the significant fields shown in the display.

Table 21: show isis instance isp mesh-group Field Descriptions

Field	Description
Mesh group	Mesh group number to which this interface is a member. A mesh group optimizes link-state packet (LSP) flooding in nonbroadcast multiaccess (NBMA) networks with highly meshed, point-to-point topologies. LSPs that are first received on interfaces that are part of a mesh group are flooded to all interfaces except those in the same mesh group.
GigabitEthernet0/4/0/1	Interface belonging to mesh group 6.

show isis neighbors

To display information about Intermediate System-to-Intermediate System (IS-IS) neighbors, use the **show isis neighbors** command in XR EXEC mode.

show isis [**instance** *instance-id*] **neighbors** [*type interface-path-id* | **summary**] [**detail**] [**systemid** *system-id*]

Syntax Description

instance *instance-id*	(Optional) Displays the IS-IS neighbor information for the specified IS-IS instance only. • The *instance-id* argument is the instance identifier (alphanumeric) defined by the **router isis** command.
type	Interface type. For more information, use the question mark (**?**) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (**?**) online help function.
summary	(Optional) Displays neighbor status count for each level.
detail	(Optional) Displays additional details.
systemid *system-id*	(Optional) Displays the information for the specified neighbor only.

Command Default

No instance ID specified displays neighbor information for all the IS-IS instances.

Both Level 1 and Level 2 are configured if no level is specified.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read

Examples

The following is sample output from the **show isis neighbors** command with the **instance** and *instance-id* values specified:

```
Total neighbor count: 3
RP/0/RSP0RP0/CPU0:router# show isis instance isp neighbors detail

IS-IS isp neighbors:
System Id      Interface        SNPA           State Holdtime Type IETF-NSF
e222e          Gi0/1/0/0        *PtoP*         Up    23       L1   Capable
  Area Address(es): 00
  IPv4 Address(es): 10.1.0.45*
  IPv6 Address(es): fe80::212:daff:fe6b:68a8*
    Topologies: 'IPv4 Unicast' 'IPv6 Unicast'
  Uptime: 01:09:44
  IPFRR: LFA Neighbor: elise
         LFA IPv4 address: 10.100.1.2
         LFA Router address: 192.168.0.45
e333e LFA Interface: Gi0/1/0/0.1      0012.da6b.68a8 Up    8        L1   Capable 1
e333e          Gi0/1/0/0.1      0012.da6b.68a8 Up    8        L1   Capable
  Area Address(es): 00
  IPv4 Address(es): 10.100.1.2*
  Topologies: 'IPv4 Unicast'
  Uptime: 01:09:46
  IPFRR: LFA Neighbor: elise
         LFA IPv4 address: 10.1.0.45
         LFA Router address: 192.168.0.45
         LFA Interface: Gi0/1/0/0
m44i           Gi0/1/0/1        0012.da62.e0a8 Up    7        L1   Capable
  Area Address(es): 00 11
  IPv4 Address(es): 10.1.2.47*
  IPv6 Address(es): fe80::212:daff:fe62:e0a8*
    Topologies: 'IPv4 Unicast' 'IPv6 Unicast'
  Uptime: 01:09:33

Total neighbor count: 3
```

This table describes the significant fields shown in the display.

Table 22: show isis instance isp neighbors Field Descriptions

Field	Description
System ID	Dynamic hostname of the system. The hostname is specified using the **hostname** command. If the dynamic hostname is not known or **hostname dynamic disable** command has been executed, the 6-octet system ID is used.
Interface	Interface through which the neighbor is reachable.
SNPA	Data-link address (also known as the Subnetwork Point of Attachment [SNPA]) of the neighbor.
State	Adjacency state of the neighboring interface. Valid states are: Down, Init, and Up.
Holdtime	Hold time of the neighbor.
Type	Type of adjacency.
IETF-NSF	Specifies whether the neighbor can adhere to the IETF-NSF restart mechanism. Valid states are Capable and Unable.
Area Address(es)	Number of area addresses on this router.

Field	Description
IPv4 Address(es)	IPv4 addresses configured on this router.
Topologies	Address and subaddress families for which IS-IS is configured.
Uptime	Time (in hh:mm:ss) that the neighbor has been up.
IPFRR: LFA Neighbor	IP fast reroute (IPFRR) loop-free alternate (LFA) neighbor.
LFA IPv4 address:	Address of the LFA.
LFA Interface:	LFA interface.

The following is sample output from the **show isis neighbors** command with the **summary** keyword specified:

```
RP/0/RP0/CPU0:router# show isis instance isp neighbors summary

ISIS isp neighbor summary:
    State         L1       L2     L1L2
    Up             0        0        2
    Init           0        0        0
    Failed         0        0        0
```

This table describes the significant fields shown in the display.

Table 23: show isis neighbors summary Field Descriptions

Field	Description
State	State of the neighbor is up, initialized, or failed.
L1	Number of Level 1 neighbors.
L2	Number of Level 2 neighbors.
LlL2	Number of Level 1 and 2 neighbors.

show isis protocol

To display summary information about an Intermediate System-to-Intermediate System (IS-IS) instance, use the **show isis protocol** command in XR EXEC mode.

show isis [**instance** *instance-id*] **protocol**

Syntax Description

instance *instance-id*	(Optional) Displays the IS-IS adjacencies for the specified IS-IS instance only. • The *instance-id* argument is the instance identifier (alphanumeric) defined by the **router isis** command.

Command Default

No instance ID specified displays IS-IS adjacencies for all the IS-IS instances.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.
Release 24.2.1	This command was was modified. The fields to indicate the memory state of the IS-IS protocol were included.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read

Examples

The following is sample output from the **show isis protocol** command:

```
Router# show isis protocol

IS-IS Router: isp
      System Id: 0001.0000.0011
      IS Levels: level-1-2
      Manual area address(es):
        49

      Routing for area address(es):
        49
      Non-stop forwarding: Cisco Proprietary NSF Restart enabled
      Process startup mode: Cold Restart
      Topologies supported by IS-IS:
        IPv4 Unicast
          No protocols redistributed
          Distance: 115
      Interfaces supported by IS-IS:
        Loopback0 is running passively (passive in configuration)
        GigabitEthernet 0/4/0/1 is running actively (active in configuration)
```

```
          GigabitEthernet 0/5/0/1 is running actively (active in configuration)

   Memory state: Normal
     Last change: 2024 Jan 27 23:05:48.952
     Last memory usage/limit: 608032/1610612400 0%
   Memory state monitoring interval: 60 s
   Memory usage/limit: 19983152/1610612400 1%
   Memory usage specifics (count/bytes):
     Nodes: 3/1104     /* Nodes are using 1,104 bytes across 3 nodes.*/
     LSPs: 3/1248      /* LSPs are using 1,248 bytes across 3 LSPs.*/
     Links: 12/14592   /* Links are using 14,592 bytes across 12 links.*/
     Prefixes: 12/3264 /* Prefixes are using 3,264 bytes across 12 prefixes. */
     Nets: 8/4640      /* Nets are using 4,640 bytes across 8 nets.*/
    Paths: 0/0       /* Paths are currently not using any memory (0 bytes across 0 paths).
*/
```

This table describes the significant fields shown in the display.

Table 24: show isis protocol Field Descriptions

Field	Description
System ID:	Dynamic hostname of the system. The hostname is specified using the **hostname** command. If the dynamic hostname is not known or **hostname dynamic disable** command has been executed, the 6-octet system ID is used.
IS Levels:	IS-IS level of the router.
Manual area address(es)	Area addresses that are manually configured.
Routing for areaaddress(es)	Area addresses for which this router provides the routing.
Non-stop forwarding:	Status and name of nonstop forwarding (NSF).
Process startup mode:	Mode in which the last process startup occurred. Valid modes are: • Cisco Proprietary NSF Restart • IETF NSF Restart • Cold Restart
No protocols redistributed:	No redistributed protocol information exists to be displayed.
Distance:	Administrative distance for this protocol.
Memory state	Current status of memory usage for IS-IS process.
Last change	Timestamp of the last change in memory state.
Last memory usage/limit	The previous recorded memory usage in bytes and the maximum memory limit. The percentage shows the proportion of the limit used.
Memory state monitoring interval	The frequency at which the memory state is checked for the IS-IS process.

Field	Description
Memory usage/limit	The current memory usage against the maximum memory limit for the IS-IS process. The percentage shows the current proportion of the limit used.
Memory usage specifics (count/bytes)	A detailed breakdown of memory usage by various components or functions within the IS-IS process, indicating the count and memory consumption.
Nodes	Number of nodes and memory in bytes used by the nodes.
LSPs	Number of nodes and memory in bytes used by the LSPs.
Links	Number of nodes and memory in bytes used by the links.
Prefixes	Number of nodes and memory in bytes used by the prefixes.
Nets	Number of nodes and memory in bytes used by the network entities.
Paths	Number of nodes and memory in bytes used by the paths.

show isis route

To display IP reachability information for an Intermediate System-to-Intermediate System (IS-IS) instance, use the **show isis route** command in XR EXEC mode.

show isis [**instance** *instance-id*] [**ipv4** | **ipv6** | **afi-all**] [**unicast** | **multicast** [**topology** {**all***topo-name*}] | **safi-all**] **route** [*ip-address mask* | *ip-address* / *length* [**longer-prefixes**]] [**summary**] **[multicast-intact]** [**backup**] [**detail**] [**sr-only**]

Syntax Description

instance *instance-id*	(Optional) Displays the IP reachability information for the specified IS-IS instance only. • The *instance-id* argument is the instance identifier (alphanumeric) defined by the **router isis** command.
ipv4	(Optional) Specifies IP Version 4 address prefixes.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
afi-all	(Optional) Specifies all address prefixes.
unicast	(Optional) Specifies unicast address prefixes.
multicast	(Optional) Specifies multicast address prefixes.
topology	(Optional) Specifies IS-IS paths to intermediate systems.
all	(Optional) Specifies all topologies.
topology *topo-name*	(Optional) Specifies topology table information and name of the topology table.
safi-all	(Optional) Specifies all secondary address prefixes.
ip-address	(Optional) Network IP address about which routing information should be displayed.
mask	(Optional) Network mask specified in either of two ways: • Network mask can be a four-part, dotted decimal address. For example, 255.0.0.0 indicates that each bit equal to 1 means the corresponding address bit is a network address. • Network mask can be indicated as a slash (/) and number. For example, /8 indicates that the first 8 bits of the mask are ones, and the corresponding bits of the address are the network address.
/ *length*	(Optional) Length of the IP prefix. A decimal value that indicates how many of the high-order contiguous bits of the address compose the prefix (the network portion of the address). A slash must precede the decimal value. Range is 0 to 32.
longer-prefixes	(Optional) Displays route and more-specific routes.
summary	(Optional) Displays topology summary information.

multicast-intact	(Optional) Displays multicast intact information for this entry.
systemid	(Optional) Displays multicast information by system ID.
backup	(Optional) Displays backup information for this entry.
detail	(Optional) Displays link-state packet (LSP) details.
sr-only	(Optional) Displays SR-labeled prefixes only.

Command Default

No instance ID specified displays the IP reachability information for all the IS-IS instances.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.
Release 6.3.2	The **sr-only** keyword was added.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read

Examples

The following is sample output from the **show isis route** command:

```
RP/0/RSP0RP0/CPU0:router# show isis route

IS-IS isp IPv4 Unicast routes
Codes: L1 - level 1, L2 - level 2, ia - interarea (leaked into level 1)
df - level 1 default (closest attached router), su - summary null
C - connected, S - static, R - RIP, B - BGP, O - OSPF
i - IS-IS (redistributed from another instance)

Maximum parallel path count: 8

L2 10.76.240.6/32 [4/115]
via 10.76.245.252, SRP0/1/0/2, isp2
via 10.76.246.252, SRP0/1/0/0, isp2
C 10.76.240.7/32
is directly connected, Loopback0
L2 10.76.240.9/32 [256/115]
via 10.76.249.2, HundredGigE 0/3/0/0, isp3
L2 10.76.240.10/32 [296/115]
via 10.76.249.2, HundredGigE 0/3/0/0, isp3
C 10.76.245.0/24
is directly connected, SRP0/1/0/2
C 10.76.246.0/24
is directly connected, SRP0/1/0/0
C 10.76.249.0/26
```

```
  is directly connected, HundredGigE 0/3/0/0
  L2 10.101.10.0/24 [296/115]
  via 10.76.249.2, HundredGigE 0/3/0/0, isp3
```

This table describes the significant fields shown in the display.

Table 25: show isis route ipv4 unicast Field Descriptions

Field	Description
C172.18.0.0/24	Connected route for HundredGigE interface 0/5/0/0.
C 172.19.1.0/24	Connected route for HundredGigE interface 0/4/0/1.
L1 172.35.0.0/24 [10]	Level 1 route to network 172.35.0.0/24.
C 172.18.0/24	Connected route for loopback interface 0.

This is sample output from the **show isis route** command with **detail** keyword that shows prefix segment ID (SID) and Segment Routing Global Block (SRGB) values:

```
Sun May  4 13:05:11.073 PDT

L2 172.16.255.2/32 [10/115] medium priority
     via 172.16.2.2, HundredGigE 0/0/0/1, pe2 tag 255, SRGB Base: 16000, Weight: 0
     src pe2.00-00, 172.16.255.2, tag 255, prefix-SID index 42, R:0 N:0 P:0
   L1 adv [10] native, propagated, interarea, tag 255, prefix-SID index 42, R:0
         N:0 P:0
```

This is sample output from the **show isis route** command with **sr-only** keyword that shows only routes associated with a segment routing prefix SID:

```
RP/0/RP0/CPU0:router# show isis route sr-only

IS-IS 1 IPv4 Unicast routes

Codes: L1 - level 1, L2 - level 2, ia - interarea (leaked into level 1)
       df - level 1 default (closest attached router), su - summary null
       C - connected, S - static, R - RIP, B - BGP, O - OSPF
       A - access/subscriber, M - mobile, a - application
       i - IS-IS (redistributed from another instance)

Maximum parallel path count: 8

C  20.1.0.100/32
     is directly connected, Loopback0
L2 20.1.0.101/32 [10/115]
     via 10.1.1.101, GigabitEthernet0/0/0/2, r101, SRGB Base: 16000, Weight: 0
L2 20.1.0.102/32 [30/115]
     via 10.1.1.101, GigabitEthernet0/0/0/2, r101, SRGB Base: 16000, Weight: 0
L2 20.1.0.103/32 [20/115]
     via 10.4.1.103, GigabitEthernet0/0/0/1, r103, SRGB Base: 16000, Weight: 0
```

show isis spf-log

To display how often and why the router has run a full shortest path first (SPF) calculation, use the **show isis spf-log** command in XR EXEC mode.

show isis [**instance** *instance-id*] [[**ipv4** | **ipv6** | **afi-all**] [**unicast** | **multicast** [**topology** { **all** *topo-name* }] | **safi-all**]] **spf-log** [**level** { **1** | **2** }] [**fspf** | **prc** | **nhc**] [**detail** | **verbose** | **plfrr** | **ppfrr**] [**last** *number* | **first** *number*]

Syntax Description

instance *instance-id*	(Optional) Displays the IS-IS SPF log for the specified IS-IS instance only.
ipv4	(Optional) Specifies IP Version 4 address prefixes.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
afi-all	(Optional) Specifies all address prefixes.
unicast	(Optional) Specifies unicast address prefixes.
multicast	(Optional) Specifies multicast address prefixes.
topology **all** | *topo-name*	(Optional) Specifies topology table information for all topologies or for the specified topology table (*top-name*).
safi-all	(Optional) Specifies all secondary address prefixes.
level { **1** | **2** }	(Optional) Displays the IS-IS SPF log for Level 1 or Level 2 independently.
fspf	(Optional) Specifies full SPF entries only.
prc	(Optional) Specifies partial route calculations only.
nhc	(Optional) Specifies next-hop route calculations only.
plfrr	(Optional) Specifies per link fast-reroute calculations only.
ppfrr	(Optional) Specifies per prefix fast-reroute calculations only.
detail	(Optional) Specifies detailed output. Includes a breakdown of the time taken to perform the calculation and changes resulting from the calculation.
verbose	(Optional) Specifies verbose output.
last *number*	(Optional) Specifies that the output is restricted to the last *number* of entries. Range is 1 to 210.
first *number*	(Optional) Specifies that the output is restricted to the first *number* of entries. Range is 1 to 210.

Command Default

No instance ID specified displays IS-IS adjacencies for all the IS-IS instances.

Both Level 1 and Level 2 are configured if no level is specified.

Displays all types of route calculation (not just fspf, and prc).

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read

Examples

The following is sample output from the **show isis spf-log** command:

```
Router# show isis spf-log

      IS-IS 1 Level 1 IPv4 Unicast Route Calculation Log
                   Time  Total Trig
 Timestamp   Type (ms)  Nodes Count First Trigger LSP Triggers
 ----------- ---- ----  ----- ----- ----- ------- --- --------
 --- Thurs Aug 19 2004 ---
 12:00:50.787  FSPF  1    1     3   ensoft-grs7.00-00 LSPHEADER TLVCODE
 12:00:52.846  FSPF  1    1     1   ensoft-grs7.00-00 LSPHEADER
 12:00:56.049  FSPF  1    1     1   ensoft-grs7.00-00 TLVCODE
 12:01:02.620  FSPF  1    1     2   ensoft-grs7.00-00 NEWADJ LINKTLV

      IS-IS 1 Level 1 IPv4 Unicast Route Calculation Log
                   Time  Total Trig
 Timestamp   Type (ms)  Nodes Count First Trigger LSP Triggers
 ----------- ---- ----  ----- ----- ----- ------- --- --------
 --- Mon Aug 19 2004 ---
 12:00:50.790  FSPF  0    1     4   ensoft-grs7.00-00 LSPHEADER TLVCODE
 12:00:54.043  FSPF  1    1     2   ensoft-grs7.00-00 NEWADJ LSPHEADER
 12:00:55.922  FSPF  1    2     1   ensoft-grs7.00-00 NEWLSPO
 12:00:56.724  FSPF  1    13    1   ensoft-grs7.00-00 NEWLSPO
```

This table describes the significant fields shown in the display.

Table 26: show isis spf-log ipv4 unicast Field Descriptions

Field	Description
Level	IS-IS level of the router.
Timestamp	Time when the SPF calculation started.
Duration	Number of milliseconds taken to complete this SPF run. Elapsed time is wall clock time, not CPU time.

Field	Description
Nodes	Number of routers and pseudonodes (LANs) that make up the topology calculated in this SPF run.
Trig Count	Number of events that triggered this SPF run. When there is a topology change, often multiple link-state packets (LSPs) are received in a short time. Depending on the configuration of the **spf-interval** command, a router may wait for a fixed period of time before running a router calculation. This count denotes the number of triggering events that occurred while the router was waiting to run the calculation. For a full description of the triggering events, see *List of Triggers*.
First Trigger LSP	LSP ID stored by the router whenever a full SPF calculation is triggered by the arrival of a new LSP. The LSP ID can suggest the source of routing instability in an area. If multiple LSPs are causing an SPF run, only the LSP ID of the first received LSP is remembered.
Triggers	List of all reasons that triggered a full SPF calculation. For a list of possible triggers, see *List of Triggers*.

This table lists triggers of a full SPF calculation.

Table 27: List of Triggers

Trigger	Description
PERIODIC	Runs a full SPF calculation very 15 minutes.
NEWLEVEL	Configured new level (using is-type) on this router.
RTCLEARED	Cleared IS-IS topology on the router.
MAXPATHCHANGE	Changed IP maximum parallel path.
NEWMETRIC	Changed link metric.
ATTACHFLAG	Changed Level 2 Attach bit.
ADMINDIST	Configured another administrative distance for the IS-IS instance on this router.
NEWADJ	Created a new adjacency to another router.
DELADJ	Deleted adjacency.
BACKUP	Installed backup route.
NEXTHOP	Changed IP next-hop address.
NEWLSP0	New LSP 0 appeared in the topology.
LSPEXPIRED	Some LSP in the link-state database (LSDB) has expired.
LSPHEADER	Changed important LSP header fields.
TLVCODE	Type, length, and value (TLV) objects code mismatch, indicating that different TLV objects are included in the newest version of an LSP.

Trigger	Description
LINKTV	Changed Link TLV content.
PREFIXTLV	Changed Prefix TLV content.
AREAADDRTLV	Changed Area address TLV content.
IP ADDRTLV	Changed IP address TLV content.
TUNNEL	Changed RRR tunnel.

The following is sample output from the **show isis spf-log** command with the **first** keyword specified:

```
RP/0/RP0/CPU0:router# show isis spf-log first 2

    IISIS isp Level 1 IPv4 Unicast Route Calculation Log
                  Time  Total Trig
Timestamp   Type (ms)  Nodes Count First Trigger LSP   Triggers
  Mon Aug 16 2004
19:25:35.140  FSPF  1    1     1             12a5.00-00 NEWLSP0
19:25:35.646  FSPF  1    1     1                        NEWADJ


   IISIS isp Level 2  IPv4 Unicast Route Calculation Log
                  Time  Total Trig
Timestamp   Type (ms)  Nodes Count First Trigger LSP   Triggers
  Mon Aug 16 2004
19:25:35.139  FSPF  1    1     1             12a5.00-00 NEWLSP0
19:25:35.347  FSPF  1    1     2             12a5.00-00 NEWSADJ TLVCODE
```

This table describes the significant fields shown in the display.

Table 28: show isis spf-log first Field Descriptions

Field	Description
Level	IS-IS level of the router.
Timestamp	Time at which the SPF calculation started.
Type	Type of route calculation. The possible types are incremental full SPF (FSPF), or partial route calculation (PRC).
Time (ms)	Number of milliseconds taken to complete this SPF run. Elapsed time is wall clock time, not CPU time.
Nodes	Number of routers and pseudonodes (LANs) that make up the topology calculated in this SPF run.

Field	Description
Trig Count	Number of events that triggered this SPF run. When there is a topology change, often multiple link-state packets (LSPs) are received in a short time. Depending on the configuration of the **spf-interval** command, a router may wait for a fixed period of time before running a router calculation. This count denotes the number of triggering events that occurred while the router was waiting to run the calculation. For a full description of the triggering events, see *List of Triggers*.
First Trigger LSP	LSP ID stored by the router whenever a full SPF calculation is triggered by the arrival of a new LSP. The LSP ID can suggest the source of routing instability in an area. If multiple LSPs are causing an SPF run, only the LSP ID of the first received LSP is remembered.
Triggers	List of all reasons that triggered a full SPF calculation. For a list of possible triggers, see *List of Triggers*.

The following is sample output from the **show isis spf-log** command with the **detail** keyword specified:

```
RP/0/RP0/CPU0:router# show isis spf-log detail

    IISIS isp Level 1 IPv4 Unicast Route Calculation Log
                  Time  Total Trig
Timestamp   Type (ms)  Nodes Count First Trigger LSP   Triggers
  Mon Aug 16 2004
19:25:35.140  FSPF  1    1     1             12a5.00-00 NEWLSP0
  Delay:              51ms (since first trigger)
  SPT Calculation
    CPU Time:         0ms
    Real Time:        0ms
  Prefix Updates
    CPU Time:         1ms
    Real Time:        1ms
  New LSP Arrivals:    0
  Next Wait Interval: 200ms
                              Results
                        Reach Unreach Total
   Nodes:                   1       0     1
   Prefixes (Items)
     Critical Priority:     0       0     0
     High Priority:         0       0     0
     Medium Priority        0       0     0
     Low Priority           0       0     0

     All Priorities         0       0     0
   Prefixes (Routes)
     Critical Priority:     0       -     0
     High Priority:         0       -     0
     Medium Priority        0        -    0
     Low Priority:          0        -    0

     All Priorities         0        -    0
```

This table describes the significant fields shown in the display.

Table 29: show isis spf-log detail Field Descriptions

Field	Description
Level	IS-IS level of the router.
Timestamp	Time at which the SPF calculation started.
Type	Type of route calculation. The possible types are incremental full SPF (FSPF), or partial route calculation (PRC).
Time (ms)	Number of milliseconds taken to complete this SPF run. Elapsed time is wall clock time, not CPU time.
Nodes	Number of routers and pseudonodes (LANs) that make up the topology calculated in this SPF run.
Trig Count	Number of events that triggered this SPF run. When there is a topology change, often multiple link-state packets (LSPs) are received in a short time. Depending on the configuration of the **spf-interval** command, a router may wait for a fixed period of time before running a router calculation. This count denotes the number of triggering events that occurred while the router was waiting to run the calculation. For a full description of the triggering events, see *List of Triggers*.
First Trigger LSP	LSP ID stored by the router whenever a full SPF calculation is triggered by the arrival of a new LSP. The LSP ID can suggest the source of routing instability in an area. If multiple LSPs are causing an SPF run, only the LSP ID of the first received LSP is remembered.
Triggers	List of all reasons that triggered a full SPF calculation. For a list of possible triggers, see *List of Triggers*.
Delay	Two different delays exist: **1.** The delay between the time when the route calculation was first triggered and the time when it was run. **2.** The delay between the end of the last route calculation and the start of this one. This is used to verify that the SPF-interval timers are working correctly, and is only reported for calculations after the first delay.
CPU Time	Two different CPU times exist: **1.** CPU time (in milliseconds) taken to calculate the shortest path tree (SPT). **2.** CPU time (in milliseconds) taken to perform the prefix updates.
Real Time	Two different real times exist: **1.** Real time (in milliseconds) taken to calculate the shortest path tree (SPT). **2.** Real time (in milliseconds) taken to perform the prefix updates.
New LSP Arrivals	Number of LSP arrivals since the start of this route calculation.

Field	Description
Next Wait Interval	Enforced delay until the next route calculation can be run, based on the **spf-interval** command configuration.
Reach	Number of reachable nodes or prefixes.
Unreach	Number of unreachable nodes or prefixes.
Total	Total number of nodes or prefixes at various priorities.

show isis statistics

To display Intermediate System-to-Intermediate System (IS-IS) traffic counters, use the **show isis statistics** command in XR EXEC mode.

show isis [**instance** *instance-id*] **statistics** [*type interface-path-id*]

Syntax Description

instance *instance-id*	(Optional) Displays the IS-IS traffic statistics for the specified IS-IS instance only. • The *instance-id* argument is the instance identifier (alphanumeric) defined by the **router isis** command.
type	Interface type. For more information, use the question mark (**?**) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (**?**) online help function.

Command Default

No instance ID specified displays IS-IS traffic statistics for all the IS-IS instances.

IS-IS traffic statistics are displayed for all interfaces.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The **show isis statistics** command displays IS-IS traffic counters for the specified interface or all traffic counters if no interface is specified.

Task ID

Task ID	Operations
isis	read

Examples

The following is sample output from the **show isis statistics** command that shows all traffic counters:

```
Router#show isis statistics
IS-IS isp statistics:
    Fast PSNP cache (hits/tries): 164115/301454
    Fast CSNP cache (hits/tries): 41828/43302
    Fast CSNP cache updates: 2750
    LSP checksum errors received: 0
    LSP Dropped: 1441
    SNP Dropped: 1958
```

```
      UPD Max Queue size: 2431
      Average transmit times and rate:
        Hello:          0 s,     987947 ns,          4/s
        CSNP:           0 s,    1452987 ns,          0/s
        PSNP:           0 s,    1331690 ns,          0/s
        LSP:            0 s,    1530018 ns,          1/s
      Average process times and rate:
        Hello:          0 s,     874584 ns,         41/s
        CSNP:           0 s,     917925 ns,         29/s
        PSNP:           0 s,    1405458 ns,          0/s
        LSP:            0 s,    4352850 ns,          0/s
      Level-1:
        LSPs sourced (new/refresh): 3376/2754
        Level-1::LSPs sourced (new/refresh)SPF calculations :3376/2754      IPv4 Unicast :
 0    Next Hop Calculations : 520    Partial Route Calculations : 0         NextIPFRR R-hop
 Calculations   SPF calculations    : 0
          Partial Route Calculations IPFRR Parallel calculations: 0
        IPv6 Unicast
          SPF calculations           : 527
          ISPF calculations      : 0
          Next Hop Calculations      : 13
          Partial Route Calculations : 1
          Level-2:
        LSPs sourced (new/refresh): 4255/3332
        IPv4 Unicast
          SPF calculations           : 432
          ISPF calculations      : 0
          Next Hop Calculations      : 8
          LSPs sourced (new/refresh)Partial Route Calculations: 4255/33320LSPs sourced
(new/refresh)IPFRR R-SPF calculations   : 4255/33320
          IPFRR Parallel calculations: 0
        IPv4 IPv6 Unicast
          SPF calculations           : 432444
          Next-hop Next Hop Calculations      : 882
          Partial Route Calculations : 01      Interface GigabitEthernet0/1/0/1.1:
      Level-1 Hellos (sent/rcvd): 22398/25633
      Level-1 DR Elections      : 66
      Level-1 LSPs (sent/rcvd)  : 246/7077
      Level-1 CSNPs (sent/rcvd) : 0/33269
      Level-1 PSNPs (sent/rcvd) : 22/0
      Level-1 LSP Flooding Duplicates  : 25129
      Level-2 Hellos (sent/rcvd): 22393/67043
      Level-2 DR Elections      : 55
      Level-2 LSPs (sent/rcvd)  : 265/437
      Level-2 CSNPs (sent/rcvd) : 0/86750
      Level-2 PSNPs (sent/rcvd) : 0/0
      Level-2 LSP Flooding Duplicates  : 78690
```

This table describes the significant fields shown in the display.

Table 30: show isis statistics Field Descriptions

Field	Description
Fast PSNP cache (hits/tries)	Number of successful lookups (hits) along with the number of lookup attempts (tries). To save time or processing power when receiving multiple copies of the same LSP, IS-IS attempts to look up incoming LSPs to see if they have been received recently.

Field	Description
Fast CSNP cache (hits/tries):	Number of successful lookups (hits) along with the number of lookup attempts (tries). To reduce CSNP construction time, IS-IS maintains a cache of CSNPs and attempts to look up CSNP in this cache before transmission on the interface.
Fast CSNP cache updates:	Number of times the CSNP cache has been updated since the last clearing of statistics. The cache is updated on LSP addition or removal from the database.
LSP checksum errors received:	Number of internal checksum errors received in LSPs.
IIH (LSP/SNP) dropped:	Number of hello, LSP, and SNP messages dropped.
IIH (UPD) Max Queue size:	Maximum number of queued packets.
Average transmit times and rate:	Average time taken to transmit the pdu type across all interfaces and the corresponding rate at which the pdu type is being transmitted.
Average process times and rate:	Average time taken to process an incoming pdu type across all interfaces and the corresponding rate at which the pdu type is being received.
LSPs sourced (new/refresh):	Number of LSPs this IS-IS instance has created or refreshed. To find more details on these LSPs, use the **show isis lsp-log** command.
SPF calculations:	Number of shortest path first (SPF) calculations. SPF calculations are performed only when the topology changes. They are not performed when external routes change. The interval at which SPF calculations are performed is configured using the **spf-interval** command.
iSPF calculations:	Number of incremental shortest path first (iSPF) calculations. iSPF calculations are performed only when ISPF has been configured in the isis address family configuration submode.
Partial Route Calculations:	Number of partial route calculations (PRCs). PRCs are processor intensive. Therefore, it may be useful to limit their number, especially how often a PRC is done, especially on slower networking devices. Increasing the PRC interval reduces the processor load on the router, but might slow the rate of convergence. The interval at which PRC calculations are performed is configured using the **spf-interval** command.
Level-(1/2) (LSPs/CSNPs/PSNPs/Hellos) (sent/rcvd):	Number of LSPs, Complete Sequence Number Packets (CSNPs), Partial Sequence Number Packets (PSNPs), and hello packets sent or received on this interface.
PTP Hellos (sent/rcvd):	Point-to-point (PTP) hellos sent and received.
LSP Retransmissions:	Total number of retransmissions on each IS-IS LSP on a point-to-point interface. The LSP retransmission interval can be configured using the **retransmit-throttle-interval** command.
Level-(1.2) DRElections:	Total number of Designated Intermediate System elections that have taken place. These counts are maintained on an individual level basis.

Field	Description
LSP Flooding Duplicates:	Number of duplicate LSPs filtered from flooding to the neighbor. In case of parallel interfaces to the same neighbor, IS-IS optimizes the flooding by avoiding sending the same LSP copy on other interfaces.

show isis topology

To display a list of connected Intermediate System-to-Intermediate System (IS-IS) routers in all areas, use the **show isis topology** command in XR EXEC mode.

show isis [**instance instance-id**] [[**ipv4** | **ipv6** | **afi-all**] [**unicast** | **multicast** [**topology** { **all** | **topo-name** }] | **safi-all**]] | **summary** | **level** { **1** | **2** } **[multicast-intact]** [**systemid system-id**] [**detail**]

Syntax Description

instance *instance-id*	(Optional) Displays the IS-IS topology for the specified IS-IS instance only. • The *instance-id* argument is the instance identifier (alphanumeric) defined by the **router isis** command.
ipv4	(Optional) Specifies IP Version 4 address prefixes.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
afi-all	(Optional) Specifies all address prefixes.
unicast	(Optional) Specifies unicast address prefixes.
multicast	(Optional) Specifies multicast address prefixes.
topology *topo-name*	(Optional) Specifies topology table information and name of the topology table.
safi-all	(Optional) Specifies all secondary address prefixes.
summary	(Optional) Displays a brief list of the IS-IS topology.
level { **1** | **2** }	(Optional) Displays the IS-IS link-state topology for Level 1 or Level 2 independently.
multicast-intact	(Optional) Displays multicast intact information on the IS-IS topology.
systemid *system-id*	(Optional) Displays the information for the specified router only.
detail	(Optional) Displays detailed information on the IS-IS topology.
flex-algo	Displays the information on Flexible Algorithms.
algo-no	Displays the Flexible Algorithm information for the specified algorithem number. Default algorithm is 0. Range is 128-255.
data-plane	Displays the data-plane associated with the Flexible Algorithm. Segment Routing is default data-plane.
segment-routing	Displays segment routing data-plane associated to the Flexible Algorithm
ip	Displays the IP data-plane associated to the Flexible Algorithm.

Command Default

No instance ID specified displays a list of connected routers in all areas for all the IS-IS instances.

Both Level 1 and Level 2 are configured if no level is specified.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.
Release 7.6.1	The **data-plane** keyword is added. The data-planes **segment-routing | ip** are added.

Usage Guidelines

Use the **show isis topology** command to verify the presence and connectivity among all routers in all areas.

Use the **show isis topology flex-algo dataplane** command to display information on Flexible Algorithms.

Task ID

Task ID	Operations
isis	read

Examples

The following is sample output from the **show isis topology** command:

```
RP/0/RP0/CPU0:router# show isis topology

IS-IS isp paths to (Level-1) routers
    System Id       Metric  Next-hop Interface       SNPA
    ensoft-5        10      ensoft-5        PO0/4/0/1       *PtoP*
    ensoft-5        10      ensoft-5        Gi0/5/0/0       0003.6cff.0680
    ensoft-11       --

    IS-IS isp paths to (Level-2) routers
    System Id       Metric  Next-hop Interface       SNPA
    ensoft-5        10      ensoft-5        PO0/4/0/1       *PtoP*
    ensoft-5        10      ensoft-5        Gi0/5/0/0       0003.6cff.0680
    ensoft-11       --
```

This table describes the significant fields shown in the display.

Table 31: show isis topology ipv4 unicast Field Descriptions

Field	Description
System ID	Dynamic hostname of the system. The hostname is specified using the **hostname** command. If the dynamic hostname is not known or **hostname dynamic disable** command has been executed, the 6-octet system ID is used.
Metric	Metric assigned to the link and used to calculate the cost from each router using the links in the network to other destinations. Range is 1 to 16777214. Default is 1 to 63 for narrow metric and 1 to 16777214 for wide metric. 0 is set internally if no metric has been specified by the user.
Next-hop	Address of the next-hop.

Field	Description
Interface	Interface used to reach the neighbor.
SNPA	Data-link address (also known as the Subnetwork Point of Attachment [SNPA]) of the neighbor.

The following is sample output from the **show isis topology** command with the **summary** keyword specified:

```
RP/0/RP0/CPU0:router# show isis topology summary

IS-IS 10 IS Topology Summary IPv4 Unicast
                          L1                          L2
                Reach  UnReach  Total      Reach  UnReach  Total
               ------- ------- -------    ------- ------- -------
Router nodes:        1       1       2          1       1       2
Pseudo nodes:        0       0       0          0       0       0

 Total nodes:        1       1       2          1       1       2
```

This table describes the significant fields shown in the display.

Table 32: show isis topology summary Field Descriptions

Field	Description
L1/L2	IS-IS level of the router.
Reach	Number of router nodes or pseudonodes that are reachable.
UnReach	Number of router nodes or pseudonodes that are unreachable.
Total	Total number of reachable and unreachable nodes.

The following is sample output from the **show isis topology flex-algo** command with the **dataplane ip** keyword specified:

```
Router# show isis topology flex-algo 128 data-plane ip
 Tue Aug 17 04:56:16.130 PDT

IS-IS 1 paths to IPv4 Unicast (Level-1) routers
System Id          Metric    Next-Hop           Interface       SNPA
plzen              --
budvar             20        topvar             Gi0/2/0/7       *PtoP*
gambrinus          10        gambrinus          Gi0/2/0/3       *PtoP*
krusovice          30        gambrinus          Gi0/2/0/3       *PtoP*
krusovice          30        topvar             Gi0/2/0/7       *PtoP*
topvar             10        topvar             Gi0/2/0/7       *PtoP*
bazant             20        gambrinus          Gi0/2/0/3       *PtoP*
```

show protocols (IS-IS)

To group a number of protocol show commands according to the specified address family, use the **show protocols** command in XR EXEC mode.

show protocols [**afi-all** | **ipv4** | **ipv6**] [**all***protocol*]

Syntax Description

afi-all	(Optional) Specifies all address families.
ipv4	(Optional) Specifies an IPv4 address family.
ipv6	(Optional) Specifies an IPv6 address family.
all	(Optional) Specifies all protocols for a given address family.
protocol	(Optional) Specifies a routing protocol. For the IPv4 address family, the options are: • **bgp** • **isis** • **ospf** • **rip** For the IPv6 address family, the options are: • **bgp** • **isis** • **ospfv3**

Command Default

If no address family is specified, the default is IPv4.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

If IPv6 is enabled on an IS-IS instance, the instance is displayed in the **show protocols ipv6** command output. IPv4 IS-IS instances are displayed in the **show protocols ipv4** command output.

When using the **show protocols** command with the **ipv6** or **ipv4** keyword, you get all routing instances in that particular address family—not only IS-IS instances.

Task ID

Task ID	Operations
isis	read
rib	read

Examples

The following example shows the output for the **show protocols** command :

```
Router# show protocols ipv4

IS-IS Router: uut
  System Id: 0000.0000.12a8
  IS Levels: level-1-2
  Manual area address(es):
    49.1515.1515
  Routing for area address(es):
    49.1515.1515
  Non-stop forwarding: Disabled
  Most recent startup mode: Cold Restart
  Topologies supported by IS-IS:
    IPv4 Unicast
      Level-1
        Metric style (generate/accept): Narrow/Narrow
      Level-2
        Metric style (generate/accept): Narrow/Narrow
      Redistributing:
        static
      Distance: 115
    IPv6 Unicast
      Level-1
      Level-2
      No protocols redistributed
      Distance: 45
  Interfaces supported by IS-IS:
    GigabitEthernet 0/6/0/0 is running actively (active in configuration)
```

This table describes the significant fields shown in the display.

Table 33: show protocols ipv4 Field Descriptions

Field	Description
System ID	Dynamic hostname of the system. The hostname is specified using the **hostname** command. If the dynamic hostname is not known or **hostname dynamic disable** command has been executed, the 6-octet system ID is used.
IS Levels	IS-IS level of the router.
Manual area address(es)	Area addresses configured manually on the originating router.
Routing for area address(es)	Area addresses for which this router provides the routing.
Non-stop forwarding	Status and name of NSF.
Most recent startup mode	Mode in which the most recent startup was performed.
Topologies supported by IS-IS	Address and subaddress family IS-IS are configured.
Metric style	Type, length, and value (TLV) objects accepted by IS-IS. To configure this value, see the metric-style narrow, on page 100, metric-style transition, on page 101, or metric-style wide, on page 102 command.

Field	Description
Redistributing	IS-IS is configured to redistribute IP static routes into Level 1 or Level 2. The **redistribute** command is used to configure redistribution.
Distance	Administrative distance.
Interfaces supported by IS-IS	Interfaces and their states currently supported by IS-IS. Both operational and configuration status are displayed.

The following example shows how to disable the IPv4 address family, with no output shown for IS-IS IPv4 instances from the **show protocols ipv4** command:

```
Router# configure
Router(config)# router isis uut
Router(config-isis)# no address-family ipv4 unicast
Router(config-isis)# commit

Router# show protocols ipv4
```

shutdown (IS-IS)

To disable the Intermediate System-to-Intermediate System (IS-IS) protocol on a particular interface, use the **shutdown** command in interface configuration mode. To re-enable the IS-IS protocol, use the **no** form of this command.

shutdown
no shutdown

Command Default

IS-IS protocol is enabled.

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example disables the IS-IS protocol on HundredGigE interface 0/1/0/1:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE 0/1/0/1
RP/0/RP0/CPU0:router(config-isis-if)# shutdown
```

single-topology

To configure the link topology for IP Version 4 (IPv4) when IP Version 6 (IPv6) is configured, use the **single-topology** command in address family configuration mode. To remove the **single-topology** command from the configuration file and restore the system to its default condition, use the **no** form of this command.

single-topology
no single-topology

Command Default

Performs in multitopology mode in which independent topologies for IPv4 and IPv6 are running in a single area or domain.

Command Modes

IPv6 address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **single-topology** command to allow Intermediate System-to-Intermediate System (IS-IS) for IPv6 to be configured on interfaces along with an IPv4 network protocol. All interfaces must be configured with the identical set of network protocols, and all routers in the IS-IS area (for Level 1 routing) or the domain (for Level 2 routing) must support the identical set of network layer protocols on all interfaces.

When single-topology support for IPv6 is being used, only old-style type, length, and value (TLV) objects may be used and a single shortest path (SPF) individual level is used to compute IPv4 (if configured) and IPv6 routes. The use of a single SPF means that both IPv4 IS-IS and IPv6 IS-IS routing protocols must share a network topology.

To allow link information to be shared between IPv4 and IPv6, you must configure the **single-topology** command for an address family. In single-topology IPv6 mode, the configured metric is always the same for both IPv4 and IPv6.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to enable single-topology mode for IPv6:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# net 49.0000.0000.0001.00
RP/0/RP0/CPU0:router(config-isis)# address-family ipv6 unicast
RP/0/RP0/CPU0:router(config-isis-af)# single-topology
```

snmp-server traps isis

To enable the Simple Network Management Protocol (SNMP) server notifications (traps) available for IS-IS, use the **snmp-server traps isis** command in XR Config mode. To disable all available SNMP notifications, use the **no** form of this command.

snmp-server traps isis {**all** | *traps set*}
no snmp-server traps isis {**all** | *traps set*}

Syntax Description

all	Specifies all IS-IS SNMP server traps.
traps set	Specify any set of trap names.

Command Default

SNMP server traps notification is disabled.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read, write

Examples

The following examples show how to enable all SNMP server traps available for isis:

```
RP/0/RP0/CPU0:router(config)# snmp-server traps isis?

adjacency-change                isisAdjacencyChange
all                             Enable all IS-IS traps
area-mismatch                   isisAreaMismatch
attempt-to-exceed-max-sequence  isisAttemptToExceedMaxSequence
authentication-failure          isisAuthenticationFailure
authentication-type-failure     isisAuthenticationTypeFailure
corrupted-lsp-detected          isisCorruptedLSPDetected
database-overload               isisDatabaseOverload
id-len-mismatch                 isisIDLenMismatch
lsp-error-detected              isisLSPErrorDetected
lsp-too-large-to-propagate      isisLSPTooLargeToPropagate
manual-address-drops            isisManualAddressDrops
max-area-addresses-mismatch     isisMaxAreaAddressesMismatch
orig-lsp-buff-size-mismatch     isisOrigLSPBuffSizeMismatch
own-lsp-purge                   isisOwnLSPPurge
protocols-supported-mismatch    isisProtocolsSupportedMismatch
```

```
    rejected-adjacency              isisRejectedAdjacency
    sequence-number-skip            isisSequenceNumberSkip
    version-skew                    isisVersionSkew

  RP/0/RP0/CPU0:router(config)#snmp-server traps isis all
```

The following example shows how to enable area-mismatch lsp-error-detected trap:

```
            RP/0/RP0/CPU0:router(config)# snmp-server traps isis area-mismatch
lsp-error-detected
```

spf-interval

To customize IS-IS throttling of shortest path first (SPF) calculations, use the **spf-interval** command in address family configuration mode. To restore default values, use the **no** form of this command.

spf-interval [**initial-wait** *initial* | **secondary-wait** *secondary* | **maximum-wait** *maximum*] **. . .** [**level** {**1** | **2**}]
no spf-interval [[**initial-wait** *initial* | **secondary-wait** *secondary* | **maximum-wait** *maximum*] **. . .**] [**level** {**1** | **2**}]

Syntax Description

initial-wait *initial*	Initial SPF calculation delay (in milliseconds) after a topology change. Range is 0 to 120000.
secondary-wait *secondary*	Hold time between the first and second SPF calculations (in milliseconds). Range is 0 to 120000.
maximum-wait *maximum*	Maximum interval (in milliseconds) between two consecutive SPF calculations. Range is 0 to 120000.
level { **1** | **2** }	(Optional) Enables the SPF interval configuration for Level 1 or Level 2 independently.

Command Default

initial-wait *initial* : 50 milliseconds

secondary-wait *secondary* : 200 milliseconds

maximum-wait *maximum* : 5000 milliseconds

Command Modes

Address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

SPF calculations are performed only when the topology changes. They are not performed when external routes change.

Use the **spf-interval** command to control how often the software can perform the SPF calculation. The SPF calculation is processor intensive. Therefore, it may be useful to limit how often this calculation is done, especially when the area is large and the topology changes often. Increasing the SPF interval reduces the processor load of the router, but potentially slows the rate of convergence.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to set the initial SPF calculation delay to 10 milliseconds and the maximum interval between two consecutive SPF calculations to 5000 milliseconds:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-af)# spf-interval initial-wait 10 maximum-wait 5000
```

spf-interval ietf

To set an shortest path first (SPF) interval in IS-IS for SPF calculations, use the **spf-interval ietf** command in the System Admin Config mode. Use the **no** form of this command to enable the fabric bundle port.

spf-interval ietf [**initial-wait** *msec* | **short-wait** *msec* | **long-wait** *msec* | **learn-interval** *msec* | **holddown-interval** *msec*] [**level** { **1** | **2** }]

Syntax Description

spf-interval	Specifies the number of seconds between two consecutive SPF calculations.
ietf	Specifies Internet Engineering Task Force (IETF) RFC standard 8405.
initial-wait *msec*	Initial SPF calculation delay before running a route calculation. The initial-wait must be less than or equal to short-wait. Range is 0 to 120000. The default value is 50 milliseconds.
short-wait *msec*	Short SPF calculation delay before running a route calculation. The short-wait must be less than or equal to long-wait. Range is 0 to 120000. The default value is 200 milliseconds.
long-wait *msec*	Long SPF calculation delay before running a route calculation. Range is 0 to 120000. The default value is 5000 milliseconds.
learn-interval *msec*	Time To Learn interval for running a route calculation. The learn-interval must be less than or equal to holddown-interval. Range is 0 to 120000. The default value is 500 milliseconds.
holddown-interval *msec*	Hold-down interval for running a route calculation. Range is 0 to 120000. The default value is 10000 milliseconds.
level { **1** | **2** }	(Optional) Enables the SPF interval configuration for Level 1 or Level 2 independently.

Command Default

None

Command Modes

System Admin Config mode

Command History

Release	Modification
Release 7.7.1	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

SPF calculations are performed only when the topology changes. They are not performed when external routes change.

Task ID

Task ID	Operations
is-is	read, write

Example

The following example shows how to configure IETF to set an SPF interval in IS-IS for SPF calculations.

```
Router# configure
Router(config)# router isis isp
Router(config-isis)# address-family ipv4 unicast
Router(config-isis-af)# spf-interval ietf?
initial-wait   Initial delay before running a route calculation [50]
short-wait     Short delay before running a route calculation [200]
long-wait      Long delay before running a route calculation [5000]
learn-interval Time To Learn interval for running a route calculation [500]
holddown-interval  Holddown interval for running a route calculation [10000]
level             Set SPF interval for one level only
Router(config-isis-af)# spf-interval ietf
Router(config-isis-af)#commit
```

The following **show** command displays the output with the new spf-interval algorithm. The output displays the actual delay taken to compute the SPF.

```
Router# show isis ipv4 spf-log last 5 detail
   IS-IS 1 Level 2 IPv4 Unicast Route Calculation Log
                     Time Total Trig.
Timestamp    Type   (ms) Nodes Count First Trigger LSP    Triggers
------------ ----- ----- ----- ----- -------------------- ------------------------
--- Wed Mar 16 2022 ---
15:31:49.763  FSPF     1     6     3         tb5-r4.00-00 LINKBAD PREFIXBAD
  Delay:                 101ms (since first trigger)
                         261177ms (since end of last calculation)
  Trigger Link:          tb5-r2.00
  Trigger Prefix:        34.1.24.0/24
  New LSP Arrivals:      0
  SR uloop:              No
  Next Wait Interval:    200ms
  RIB Batches:           1 (0 critical, 0 high, 0 medium, 1 low)
  Timings (ms):          +--Total--+
                          Real   CPU
    SPT Calculation:         1     1
    Route Update:            0     0
                         ----- -----
```

spf prefix-priority (IS-IS)

To assign a priority to an ISIS prefix for customizing the RIB update sequence, use the**spf prefix-priority** command in address family configuration mode. To restore default values, use the **no** form of this command.

spf prefix-priority [**level** {**1** | **2**}] {**critical** | **high** | **medium**} {*access-list-name* | **tag** *tag*}
no spf prefix-priority [**level** {**1** | **2**}] {**critical** | **high** | **medium**} [*access-list-name* | **tag** *tag*]

Syntax Description

level { **1** | **2** }	(Optional) Enables the assignment of a priority to Level 1 or Level 2 independently.
critical	Assigns a critical priority.
high	Assigns a high priority.
medium	Assigns a medium priority.
access-list-name	Name of an access list.
tag *tag*	Specifies a tag to indicate priority. The *tag* argument range is 1 to 4294967295.

Command Default

By default, IPv4 prefixes with a length of 32 and IPv6 prefixes with a length of 128 are given medium priority. The remaining prefixes are given low priority.

Command Modes

Address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **spf prefix-priority** command to change the sequence of prefix updates to the RIB after an SPF is run. ISIS installs prefixes in the RIB according to the following priority order:

Critical > High > Medium > Low

The **spf prefix-priority** command supports prefix lists for the first three priorities. The unmatched prefixes are updated with low priority.

If a **spf prefix-priority** is specified, the default behavior of prioritizing either length 32 or 128 prefixes for IPv4 or IPv6, respectively, as **medium** is disabled.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to set the prefix priorities:

```
RP/0/RP0/CPU0:router(config)# ipv4 prefix-list isis-critical-acl
RP/0/RP0/CPU0:router(config-ipv4_pfx)# 10 permit 0.0.0.0/0 eq 32
```

```
!
RP/0/RP0/CPU0:router(config)# ipv4 prefix-list isis-med-acl
RP/0/RP0/CPU0:router(config-ipv4_pfx)# 10 permit 0.0.0.0/0 eq 29
!
RP/0/RP0/CPU0:router(config)# ipv4 prefix-list isis-high-acl
RP/0/RP0/CPU0:router(config-ipv4_pfx)# 10 permit 0.0.0.0/0 eq 30
!
RP/0/RP0/CPU0:router(config)# router isis ring
RP/0/RP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-af)# spf prefix-priority critical isis-critical-acl
RP/0/RP0/CPU0:router(config-isis-af)# spf prefix-priority high isis-high-acl
RP/0/RP0/CPU0:router(config-isis-af)# spf prefix-priority medium isis-med-acl
```

summary-prefix (IS-IS)

To create aggregate addresses for the Intermediate System-to-Intermediate System (IS-IS) protocol, use the **summary-prefix** command in address family configuration mode. To restore the default behavior, use the **no** form of this command.

Syntax Description

address	Summary address designated for a range of IPv4 addresses. The *address* argument must be in four-part, dotted-decimal notation.
/ *prefix-length*	Length of the IPv4 or IPv6 prefix. A decimal value that indicates how many of the high-order contiguous bits of the address compose the prefix (the network portion of the address). A slash must precede the decimal value.
ipv6-prefix	Summary prefix designated for a range of IPv6 prefixes. The *ipv6-prefix* argument must be in the form documented in RFC 2373, in which the address is specified in hexadecimal using 16-bit values between colons.
level { **1** | **2** }	(Optional) Redistributes routes into Level 1 or Level 2 and summarizes them with the configured address and mask value.
tag *tag*	Sets a tag value. The value range is 1- 4294967295.

Command Default

All redistributed routes are advertised individually.

Both Level 1 and Level 2 are configured if no level is specified.

Command Modes

Address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Multiple groups of addresses can be summarized for a given level. Routes learned from other routing protocols can also be summarized. The metric used to advertise the summary is the smallest metric of all the more-specific routes. Use the **summary-prefix** command to help reduce the size of the routing table.

This command also reduces the size of the link-state packets (LSPs) and thus the link-state database. It also helps ensure stability, because a summary advertisement depends on many more specific routes. If one more-specific route flaps, in most cases, this flap does not cause a flap of the summary advertisement.

The drawback of summary addresses is that other routes might have less information to calculate the most optimal routing table for all individual destinations.

Note When IS-IS advertises a summary prefix, it automatically inserts the summary prefix into the IP routing table but labels it as a “discard” route entry. Any packet that matches the entry is discarded to prevent routing loops. When IS-IS stops advertising the summary prefix, the routing table entry is removed.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to redistribute Open Shortest Path First (OSPF) routes into IS-IS:

The following example shows how to redistribute Open Shortest Path First (OSPF) routes into IS-IS. In the OSPF routing table, IPv6 routes exist for 3ffe:f000:0001:0000::/64, 3ffe:f000:0002:0000::/64, 3ffe:f000:0003:0000::/64, and so on. This example shows only 3ffe:f000::/24 advertised into IPv6 IS-IS Level 2.

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# address-family ipv4 ipv6 unicast
RP/0/RP0/CPU0:router(config-isis-af)# redistribute ospf ospfv3 2 level-2
RP/0/RP0/CPU0:router(config-isis-af)# summary-prefix 10.10.10.10 3ffe:f000::/24 level-2
RP/0/RP0/CPU0:router(config-isis-af)# summary-prefix 10.10.10.10 3ffe:f000::/24 tag
```

suppressed

To allow an IS-IS interface to participate in forming adjacencies without advertising connected prefixes in the system link-state packets (LSPs), use the **suppressed** command in interface configuration mode. To enable advertising connected prefixes, use the **no** form of this command.

suppressed
no suppressed

Command Default

Interface is active.

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **suppressed** command to reduce the number of routes that IS-IS has to maintain, improving convergence times after an isolated failure. Improvement is noticeable if the command is used widely throughout the network. Other routers in the domain do not install routes to the affected connected prefixes.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to disable the advertisement of connected prefixes on HundredGigE interface 0/1/0/1:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE 0/1/0/1
RP/0/RP0/CPU0:router(config-isis-if)# suppressed
```

tag (IS-IS)

To associate and advertise a tag with the prefix of an IS-IS interface, use the **tag** command in interface address family configuration mode. To restore the default behavior, use the **no** form of this command.

tag *tag*
no tag [*tag*]

Syntax Description

tag	Interface tag. Range is 1 to 4294967295.

Command Default

Default is that no tag is associated and advertised.

Command Modes

Interface address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to associate and advertise an interface tag:

```
RP/0/RP0/CPU0:router(config)# router isis isp
RP/0/RP0/CPU0:router(config-isis)# interface HundredGigE 0/3/0/0
RP/0/RP0/CPU0:router(config-isis-if)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-if-af)# tag 234
```

topology-id

To differentiate one topology in the domain from another while configuring a multicast routing table, use the **topology-id** command in Intermediate System-to-Intermediate System (IS-IS) address family configuration submode. To disable the topology use the **no** form of the command.

topology-id *isis-multicast-topology-id-number*
no topology-id *isis-multicast-topology-id-number*

Syntax Description

isis-multicast-topology-id-number	ID number for a specific IS-IS multicast topology. Range is 6 to 4095.

Command Default

No topology is associated with a routing table by default.

Command Modes

IS-IS address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to differentiate a topology from another in the multicast routing table in IS-IS routing:

```
RP/0/RP0/CPU0:router(config)# router  isis isp
RP/0/RP0/CPU0:router(config-isis)# address-family ipv4 multicast topology   green
RP/0/RP0/CPU0:router(config-isis-af)# topology-id 2666
```

trace (IS-IS)

To set the the IS-IS buffer size, use the **trace** command in XR Config mode. To return to the default value, use the **no** form of this command.

trace [**detailed** | **severe** | **standard**] *max-trace-entries*
no trace [**detailed** | **severe** | **standard**]

Syntax Description

detailed	Specifies the buffer size for detailed traces. Range is
severe	Specifies the buffer size for severe traces. Range is
standard	Specifies the buffer size for standard traces. Range is
max-trace-entries	Sets the maximum number of trace entries. Range is 1-20000

Command Default

None

Command Modes

Router IS-IS configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
isis	read, write

Examples

The following example shows how to set the isis buffer size for severe traces to 1200:

```
RP/0/RP0/CPU0:router(config)#router isis isp
RP/0/RP0/CPU0:router(config-isis)#trace sever 1200
```

EIGRP Commands

Note All commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 540 Series Router that is introduced from Cisco IOS XR Release 6.6.3.

This module describes the commands used to configure and monitor the Enhanced Interior Gateway Routing Protocol (EIGRP) protocol on Cisco NCS 5500 Series Routers.

For detailed information about EIGRP concepts, configuration tasks, and examples, see the Implementing BFD on Routing Command Reference for Cisco NCS 5500 Series Routers module in the *Routing Configuration Guide for Cisco NCS 5500 Series Routers*.

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address-family (EIGRP)

To enable an IPv4 address family under Enhanced Interior Gateway Routing Protocol (EIGRP), use the **address-family** command in the appropriate mode. To remove the address family from the EIGRP configuration, use the **no** form of this command.

address-family {**ipv4** | **ipv6**}
no address-family {**ipv4** | **ipv6**}

Syntax Description

ipv4	Selects IPv4 address family.

Command Default

No default behavior or values

Command Modes

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Use the **address-family ipv4** command to configure IPv4 address family sessions in EIGRP.

EIGRP Virtual Private Networks (VPNs) can be configured under IPv4 address family configuration modes after first entering VRF configuration mode. All commands in address family configuration mode can be configured in VRF address families except the **autonomous-system** and **maximum-prefix** commands.

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to configure an IPv4 VRF address family session after defining the VRF named vrf1:

```
Routing(config)# router eigrp 1
Routing(config-eigrp)# vrf vrf1
Routing(config-eigrp-vrf)# address-family ipv4
Routing(config-eigrp-vrf-af)# default-metric 1000 100 255 1 1500
```

authentication keychain

To authenticate all EIGRP protocol traffic on one or more interfaces based on the MD5 algorithm, use the **authentication keychain** command in an appropriate configuration mode. To disable authentication, use the **no** form of this command.

authentication keychain *key-chain-name*
no authentication keychain *key-chain-name*

Syntax Description

key-chain-name	Name of the authentication keychain

Command Default

Authentication is disabled.

Command Modes

IPv4 address family interface configuration

IPv6 address family interface configuration

IPv4 VRF address family interface configuration

IPv6 VRF address family interface configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Use the **address-family ipv4** command to configure IPv4 address family sessions in EIGRP and the **address-family ipv6** command to configure IPv6 address family sessions in EIGRP.

EIGRP Virtual Private Networks (VPNs) can be configured under IPv4 and IPv6 address family configuration modes after first entering VRF configuration mode.

Examples

The following example shows how to enable an EIGRP authentication keychain:

```
Router# configure eigrp 1
Router(config-eigrp)# address-family ipv4
Router(config-eigrp-af)# interface GigabitEthernet 0/2/0/0
Router(config-eigrp-if)# authentication key chain key1
```

auto-summary (EIGRP)

To allow automatic summarization of subnet routes into network-level routes for an Enhanced Interior Gateway Routing Protocol (EIGRP) process, use the **auto-summary** command in the appropriate configuration mode. To disable this function and send subprefix routing information across classful network boundaries, use the **no** form of this command.

auto-summary
no auto-summary

Syntax Description

This command has no keywords or arguments.

Command Default

The behavior of this command is disabled by default. (The software sends subnet routing information across classful network boundaries.)

Command Modes

IPv4 Address family configuration

IPv4 VRF address family configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Route summarization reduces the amount of routing information in the routing tables. Use the **auto-summary** command to allow the software to create summary subprefixes to the classful network boundary when crossing classful network boundaries.

EIGRP summary routes are given an administrative distance value of 5. You cannot configure this value.

Examples

The following example shows how to enable automatic summarization for EIGRP 1:

```
Router(config)# router eigrp 1
Router(config-eigrp)# vrf vpn-1
Router(config-eigrp-vrf)# address-family ipv4
Router(config-eigrp-vrf-af)# auto-summary
```

autonomous-system

To configure an Enhanced Interior Gateway Routing Protocol (EIGRP) routing process to run within a VPN routing and forwarding instance (VRF), use the **autonomous-system** command in IPv4 VRF address family configuration mode.

To configure the autonomous-system number for an address-family of Enhanced Interior Gateway Routing Protocol (EIGRP) routing process, use the **autonomous-system** command in the address family configuration mode. To remove the autonomous-system number for an address-family of EIGRP routing process, use the **no** form of this command.

autonomous-system *as-number*
no autonomous-system *as-number*

Syntax Description

as-number	Autonomous system number of the EIGRP routing process. Range is from 1 to 65535.

Command Default

None

Command Modes

IPv4 address family configuration (For EIGRP configured using virtual-name only).

IPv4 VRF address family configuration.

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Use the **autonomous-system** command in IPv4 VRF address family configuration mode.

The same VRF-autonomous-system combination cannot be used across multiple process instances.

Task ID

Task ID	Operations
eigrp	read, write

Examples

This example shows how to configure autonomous system 101 under VRF VPN-1:

```
Router(config)# router eigrp 1
Router(config-eigrp)# vrf vpn-1
Router(config-eigrp-vrf)# address-family ipv4
Router(config-eigrp-vrf-af)# autonomous-system 101
```

This example shows how to configure autonomous-system 1 for default/global VRF of EIGRP configured using virtual-name:

```
Router(config)# router eigrp name
Router(config-eigrp)# address-family ipv4
```

```
Router(config-eigrp-af)# autonomous-system 1
```

bandwidth-percent (EIGRP)

To configure the percentage of bandwidth that may be used by EIGRP on an interface, use the **bandwidth-percent** command in interface configuration mode. To restore the default value, use the **no** form of this command.

bandwidth-percent *percent*
no bandwidth-percent

Syntax Description

percent	Percentage of bandwidth that EIGRP may use.

Command Default

percent : 50

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

EIGRP uses up to 50 percent of the bandwidth of a link, as defined by the bandwidth interface configuration command. This command may be used if some other fraction of the bandwidth is desired. Values greater than 100 percent may be configured. The configuration option may be useful if the bandwidth is set artificially low for other reasons.

Examples

The following example shows how to configure EIGRP to use up to 75 percent (42 kbps) of an interface in autonomous system 209:

```
Router(config)# router eigrp 1
Router(config-eigrp)# address-family ipv4
Router(config-eigrp-af)# router-id 10.1.1.1
Router(config-eigrp-af)# interface GigabitEthernet 0/1/0/0
Router(config-eigrp-af-if)# bandwidth-percent 75
```

clear eigrp neighbors

To remove and re-establish Enhanced Interior Gateway Routing Protocol (EIGRP) neighbor entries from the appropriate table, use the **clear eigrp neighbors** command in EXEC configuration mode.

clear eigrp [*as-number*] [**vrf** {**vrf***all*}] [**ipv4** | **ipv6**] **neighbors** [*ip-addresstype interface-path-id*] [**soft**]

Syntax Description

as-number	(Optional) Autonomous system number. Range is from 1 to 65535.
vrf { *vrf* | **all** }	(Optional) Specifies a particular VPN routing and forwarding instance (VRF) or all VRF instances.
ipv4	(Optional) Specifies the IPv4 address family.
ip-address	(Optional) Address of the neighbor.
type	Interface type. For more information, use the question mark (**?**) online help function.
interface-path-id	Physical interface or virtual interface. Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (**?**) online help function.
soft	(Optional) Specifies a soft reset.

Command Default

When no autonomous system number or VRF instance is specified, all EIGRP neighbor entries are cleared from the table.

Command Modes

EXEC configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to clear all EIGRP VRF entries for neighbor Gigabit Ethernet interface 0/5/0/0:

```
Router# clear eigrp customer_1 neighbors GigabitEthernet 0/5/0/0
```

clear eigrp topology

To remove and relearn Enhanced Interior Gateway Routing Protocol (EIGRP) topology entries from the appropriate table, use the **clear eigrp topology** command in EXEC configuration mode.

clear eigrp [*as-number*] [**vrf** {**vrf***all*}] [**ipv4** | **ipv6**] **topology** [*prefix mask prefixl/ength*]

Syntax Description

as-number	(Optional) Autonomous system number. Range is from 1 to 65535.
vrf { *vrf* | **all** }	(Optional) Specifies a particular VPN routing and forwarding instance (VRF) or all VRF instances.
ipv4	(Optional) Specifies the IPv4 address family.
prefix	IP prefix, which limits output to a specific route.
mask	IP address mask.
/ *length*	Prefix length, which can be indicated as a slash (/) and number. For example, /8 indicates that the first eight bits in the IP prefix are network bits. If *length* is used, the slash is required.

Command Default

No EIGRP topology entries are cleared.

Command Modes

EXEC configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Examples

The following example shows how to clear EIGRP topology entries for a specific route:

```
Router# clear eigrp topology 10.1.0.0/8
```

default-information

To control the candidate default routing information for an Enhanced Interior Gateway Routing Protocol (EIGRP), use the **defaultinformation** command in the appropriate configuration mode. To suppress EIGRP candidate default information in incoming or outgoing updates, use the **no** form of this command.

default-information allowed {**in** | **out**} [**route-policy** *name*]
no default-information allowed {**in** | **out**} [**route-policy** *name*]

Syntax Description

allowed	Specifies EIGRP to allow default routing information.
in	Specifies EIGRP to allow inbound default routing information.
out	Specifies EIGRP to allow outbound default routing information.
route-policy *name*	(Optional) Specifies a route policy.

Command Default

Default routing information is not accepted or flagged.

Command Modes

Address family configuration

IPv4 VRF address family configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to configure inbound default routes specified with route policy acme to be accepted by an EIGRP peer in autonomous system 1:

```
Router(config)# router eigrp 1
Router(config-eigrp)# vrf vrf1
Router(config-eigrp-vrf)# address-family ipv4
Router(config-eigrp-vrf-af)# default-information accept in route-policy acme
```

default-metric (EIGRP)

To set metrics for an Enhanced Interior Gateway Routing Protocol (EIGRP), use the **defaultmetric** command in the appropriate configuration mode. To remove the metric values and restore the default state, use the **no** form of this command.

default-metric *bandwidth delay reliability loading mtu*
no default-metric

Syntax Description

bandwidth	Minimum bandwidth of the route in kilobits per second. Range is 1 to 4294967295.
delay	Route delay in ten microsecond units. Range is 1 to 4294967295.
reliability	Likelihood of successful packet transmission expressed as a number between 0 and 255. The value 255 means 100-percent reliability; 0 means the link is not reliable.
loading	Effective bandwidth of the route expressed as a number from 1 to 255 (255 is 100-percent loading).
mtu	Minimum maximum transmission unit (MTU) size of the route in bytes. Range is from 1 to 65535.

Command Default

No default values

Command Modes

IPv4 address family configuration

IPv4 VRF address family configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Use the **default-metric** command to provide default metric values while redistributing a protocol into EIGRP.

Metric defaults have been carefully set to work for a wide variety of networks. Take great care when changing these values.

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to take redistributed Routing Information Protocol (RIP) metrics and translate them into EIGRP metrics with values as follows: bandwidth = 1000, delay = 100, reliability = 250, loading = 100, and MTU = 1500.

```
Router(config)# router eigrp 1
Router(config-eigrp)# vrf vrf1
```

```
Router(config-eigrp-vrf)# address-family ipv4
Router(config-eigrp-vrf-af)# redistribute rip
Router(config-eigrp-vrf-af)# default-metric 1000 100 250 100 1500
```

distance (EIGRP)

To allow the use of one of two administrative distances—internal and external—that could provide a better route to a node, use the **distance** command in the appropriate configuration mode. To reset these values to their defaults, use the **no** form of this command.

distance *internal-distance* *external-distance*
no distance

Syntax Description

internal-distance	Administrative distance for EIGRP internal routes. Internal routes are those that are learned from another entity within the same autonomous system (AS). The distance can be a value from 1 to 255.
external-distance	Administrative distance for EIGRP external routes. External routes are those for which the best path is learned from a source external to the AS. The distance can be a value from 1 to 255.

Command Default

internal-distance : 90

external-distance : 170

Command Modes

IPv4 address family configuration

IPv4 VRF address family configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

An administrative distance is a rating of the trustworthiness of a routing information source, such as an individual router or a group of routers. Numerically, an administrative distance is an integer from 0 to 255. In general, the higher the value, the lower the trust rating. An administrative distance of 255 means the routing information source cannot be trusted at all and should be ignored.

Use the **distance** command if another protocol is known to provide a better route to a node than was actually learned through the external Enhanced Interior Gateway Routing Protocol (EIGRP) or some internal routes should be preferred by EIGRP.

To display the default administrative distance for a specified routing process, use the **show protocols** EXEC command.

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to set the administrative distance of all EIGRP 1 internal routes (within vrf vpn-1) to 80 and all EIGRP external routes to 130:

```
Router(config)# router eigrp 1
Router(config-eigrp)# vrf vrf1
Router(config-eigrp-vrf)# address-family ipv4
Router(config-eigrp-vrf-af)# distance 80 130
```

hello-interval (EIGRP)

To configure the hello interval for an interface, use the **hello-interval** command in interface configuration mode. To restore the default value, use the **no** form of this command.

hello-interval *seconds*
no hello-interval

Syntax Description

seconds	Hello interval (in seconds). Range is from 1 to 65535.

Command Default

For low-speed, nonbroadcast multiaccess (NBMA) networks: 60 seconds

For all other networks: 5 seconds

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to set the hello interval to 10 seconds for the interface:

```
Router(config)# router eigrp 1
Router(config-eigrp)# address-family ipv4
Router(config-eigrp)# router-id 10.1.1.1
Router(config-eigrp-af)# interface GigabitEthernet 0/1/0/0
Router(config-eigrp-af-if)# hello-interval 10
```

hold-time (EIGRP)

To configure the hold time for an interface, use the **hold-time** command in interface configuration mode. To restore the default value, use the **no** form of this command.

hold-time *seconds*
no hold-time

Syntax Description

seconds	Hold time (in seconds). Range is from 1 to 65535.

Command Default

Three times the default hello interval time of 15 seconds.

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

On very congested and large networks, the default hold time might not be sufficient time for all routers to receive hello packets from their neighbors. In this case, you may want to increase the hold time.

We recommend that the hold time be at least three times the hello interval. If a router does not receive a hello packet within the specified hold time, routes through this router are considered unavailable.

Increasing the hold time delays route convergence across the network.

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to set the hold time to 0 to 40 seconds for the interface:

```
Router(config)# router eigrp 1
Router(config-eigrp)# address-family ipv4
Router(config-eigrp)# router-id 10.1.1.1
Router(config-eigrp-af)# interface GigabitEthernet 0/1/0/0
Router(config-eigrp-af-if)# hold-time 40
```

interface (EIGRP)

To define the interfaces on which the Enhanced Interior Gateway Routing Protocol (EIGRP) routing protocol runs, use the **interface** command in the appropriate configuration mode. To disable EIGRP routing for interfaces, use the **no** form of this command.

interface *type* *interface-path-id*
no interface *type* *interface-path-id*

Syntax Description

type	Interface type. For more information, use the question mark (**?**) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (**?**) online help function.

Command Default

When you do not specify this command in configuration mode, EIGRP routing for interfaces is not enabled.

Command Modes

IPv4 address family configuration

IPv4 VRF address family configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Use the **interface** command to associate a specific interface with an EIGRP process. The interface remains associated with the process even when the IPv4 address of the interface changes.

This command places the router in interface configuration mode, from which you can configure interface-specific settings. Commands configured under this mode (such as the **hello-interval** command) are automatically bound to that interface.

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to enter interface configuration mode for EIGRP process 1 and set the hello interval to 10 seconds for GigabitEthernet interface 0/1/0/0:

```
Router(config)# router eigrp 1
Router(config-eigrp)# address-family ipv4
Router(config-eigrp)# router-id 10.1.1.1
Router(config-eigrp-af)# interface GigabitEthernet 0/1/0/0
```

```
Router(config-eigrp-af-if)# hello-interval 10
```

log-neighbor-changes

To enable the logging of changes in Enhanced Interior Gateway Routing Protocol (EIGRP) neighbor adjacencies, use the **log-neighbor-changes** command in the appropriate configuration mode. To disable the logging of changes in EIGRP neighbor adjacencies, use the **no** form of this command.

log-neighbor-changes
no log-neighbor-changes

Command Default

This command has no keywords or arguments.

Adjacency changes are not logged.

Command Modes

IPv4 address family configuration

IPv4 VRF address family configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Use the **log-neighbor-changes** command to log neighbor adjacency changes, monitor the stability of the routing system, and help detect problems. Logging is disabled by default. To disable the logging of neighbor adjacency changes, use the **no** form of this command.

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to enable logging of neighbor changes for EIGRP 1:

```
Router(config)# router eigrp 1
Router(config-eigrp)# address-family ipv4
Router(config-eigrp-af)# log-neighbor-changes
```

log-neighbor-warnings

To enable the logging of Enhanced Interior Gateway Routing Protocol (EIGRP) neighbor warning messages, use the **log-neighbor-warnings** command in the appropriate configuration mode. To disable the logging of EIGRP neighbor warning messages, use the **no** form of this command.

log-neighbor-warnings
no log-neighbor-warnings

Syntax Description

This command has no keywords or arguments.

Command Default

Neighbor warning messages are not logged.

Command Modes

IPv4 address family configuration

IPv4 VRF address family configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Use the **log-neighbor-warnings** command to disable and enable neighbor warning messages. When neighbor warning messages occur, they are not logged by default.

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to configure log neighbor warning messages for EIGRP process 20:

```
Router(config)# router eigrp 20
Router(config-eigrp) vrf vrf1
Router(config-eigrp-vrf)# address-family ipv4
Router(config-eigrp-vrf-af)# log-neighbor-warnings
```

maximum-paths (EIGRP)

To control the maximum number of parallel routes that the Enhanced Interior Gateway Routing Protocol (EIGRP) can support, use the **maximum-paths** command in the appropriate configuration mode. To remove the **maximum-paths** command from the configuration file and restore the system to its default condition with respect to the routing protocol, use the **no** form of this command.

maximum-paths *maximum*
no maximum-paths

Syntax Description

maximum	Maximum number of parallel routes that EIGRP can install in a routing table. Range is from 1 to 32 routes .

Command Default

maximum : 4

Command Modes

IPv4 address family configuration

IPv4 VRF address family configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Use the **maximum-paths** command to allow the EIGRP protocol to install multiple paths into the routing table for each prefix. Multiple paths are installed for both internal and external routes, providing these routes are learned in the same autonomous system and that they are equal cost (according to the EIGRP best path algorithm).

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to allow a maximum of 10 paths to a destination:

```
Router(config)# router eigrp 1
Router(config-eigrp) vrf vrf1
Router(config-eigrp-vrf)# address-family ipv4
Router(config-eigrp-vrf-af)# maximum-paths 10
```

maximum-prefix (EIGRP)

To limit the number of prefixes that are accepted under a VRF address family by Enhanced Interior Gateway Routing Protocol (EIGRP), use the **maximum-prefix** command in IPv4 VRF address family configuration mode. To disable this function, use the **no** form of this command.

maximum-prefix *maximum* [*threshold*] [**dampened**] [**reset-time** *minutes*] [**restart** *minutes*] [**restart-count** *number*] [**warning-only**]
no maximum-prefix *maximum* [*threshold*] [**dampened**] [**reset-time** *minutes*] [**restart** *minutes*] [**restart-count** *number*] [**warning-only**]

Syntax Description

maximum	Maximum number of prefixes allowed under an address family. Range is from 1 to 4294967295. The number of prefixes that can be configured is limited only by the available system resources on the router.
threshold	(Optional) Syslog warning messages are specified as a percentage of the maximum prefix limit that was exceeded. The prefix percentage number range is from 1 to 100. The default is 75 percent.
dampened	(Optional) A decay penalty is applied to the restart time period each time the maximum prefix limit is exceeded. The half-life for the decay penalty is 150 percent of the default or user-defined restart time value in minutes. This keyword is disabled by default.
reset-time *minutes*	(Optional) The restart count is reset to 0 after the default or user-defined reset time period has expired. The range of values that can be applied with the *minutes* argument is from 1 to 65535 minutes. The default reset-time period is 15 minutes.
restart *minutes*	(Optional) A time period when router adjacencies are not formed or when redistributed routes are not accepted from the RIB after the maximum prefix limit has been exceeded. The value for the *minutes* argument is from 1 to 65535 minutes. The default restart time period is 5 minutes.
restart-count *number*	(Optional) Number of times a peering session is automatically reestablished after the peering session is torn down or after the redistribute route is cleared and relearned when the maximum prefix exceeds limits. The default restart count limit is 3. **Caution** After the restart count threshold is crossed, you need to use the `clear eigrp neighbors` command to re-establish normal peering, redistribution, or both.
warning-only	(Optional) Configures the router to generate syslog messages only when the maximum prefix limit is reached, instead of terminating the peering session.

Command Default

threshold: 75 percent

dampened : False

reset-time : 15 minutes

restart : 5 minutes

restart-count : 3

warning-only : False

Command Modes

IPv4 VRF address family configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Use the **maximum-prefix** command to limit the number of prefixes that are accepted from all sources. When the maximum prefix limit is exceeded, sessions with remote peers are torn down, all routes learned from remote peers and through redistribution are removed from the topology and routing tables, and redistribution and peering are suspended for the default or user-defined time period.

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to configure the maximum prefix limit for an EIGRP process, which includes routes learned through redistribution and routes learned through EIGRP peering sessions. The maximum limit is set to 50,000 prefixes. When the number of prefixes learned through redistribution reaches 37,500 (75 percent of 50,000), warning messages are displayed in the console. When the maximum prefix limit is exceeded, all peering sessions are reset, the topology and routing tables are cleared and redistributed routes and all peering sessions are placed in a penalty state.

```
Router(config)# router eigrp 1
Router(config-eigrp)# vrf vrf1
Router(config-eigrp-vrf)# address-family ipv4
Router(config-eigrp-vrf-af)# maximum-prefix 50000
```

metric (EIGRP)

To set metrics for an Enhanced Interior Gateway Routing Protocol (EIGRP) interface, use the **metric** command in interface configuration mode. To remove the metric values and restore the default state, use the **no** form of this command.

metric {**bandwidth** | **delay** | **load** | **reliability**}
no metric

Syntax Description

bandwidth	Minimum interface bandwidth of the route in kilobits per second. Range is 1 to 4294967295.
delay	Interface route delay in tens of microseconds. Delay is 1 or any positive number that is a multiple of 39.1 nanoseconds. Range is 1 to 4294967295.
load	Effective bandwidth of the route expressed as a number from 1 to 255 (255 is 100-percent loaded).
reliability	Likelihood of successful packet transmission expressed as a number between 0 and 255. The value 255 means 100-percent reliability; 0 means no reliability.

Command Default

Metric values are not set.

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Use the **metric** command to provide metric values while redistributing a protocol into an EIGRP interface. Metric defaults have been carefully set to work for a wide variety of networks. Take great care when changing these values.

This example shows how to configure metric values for interface POS 0/1/0/1 with values as bandwidth = 100, delay = 7, reliability = 250, and load = 100.

```
Router# configure
Router(config)# router eigrp 100
Router(config-eigrp)# address-family ipv4
Router(config-eigrp-af)# interface GigabitEthernet 0/1/0/1
Router(config-eigrp-af-if)# metric bandwidth 100 delay 7 reliability 250 load 100
```

metric maximum-hops

To advertise as unreachable those Enhanced Interior Gateway Routing Protocol (EIGRP) routes with a hop count higher than is specified by the command, use the **metric maximum-hops** command in the appropriate configuration mode. To reset the value to the default, use the **no** form of this command.

metric maximum-hops *hops-number*
no metric maximum-hops

Syntax Description

hops-number	Maximum hop count. Range is from 1 to 255 hops.

Command Default

hops-number : 100

Command Modes

IPv4 address family configuration

IPv4 VRF address family configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Use the **metric maximum-hops** command to provide a safety mechanism that breaks any potential *count-to-infinity* problems. This command causes the EIGRP routing protocol to advertise as unreachable routes with a hop count greater than the value assigned to the *hops-number* argument.

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to configure a hop count to 200 for a router that has a complex WAN generating a large hop count under normal (nonlooping) operations.

```
Router(config)# router eigrp 1
Router(config-eigrp) address-family ipv4
Router(config-eigrp-af)# metric maximum-hops 200
```

metric rib-scale

To set a RIB scale for EIGRP, use the **metric rib-scale** command in an appropriate configuration mode. To remove the RIB scale and restore the default state, use the **no** form of this command.

metric rib-scale *scale-down-value*
no metric rib-scale

Syntax Description

scale-down-value	Amount to divide the EIGRP Wide Metric by to convert to a 4 Byte RIB metric. Legal ranges are 1-256. Results are expressed as whole integers only (no rounding).

Command Default

Default RIB scale is 128 in the 64 bit mode.

In 32 bit mode, rib scale is always 1.

Command Modes

IPv4 address family configuration

IPv6 address family configuration

IPv4 VRF address family configuration

IPv6 VRF address family configuration (Only supported in 64 bit mode)

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

The ability to scale the RIB metric is provided through the use of the **metric rib-scale** configuration command. When entered, the command will result in all routes in the RIB being cleared and replaced with the new metric values.

Task ID

Task ID	Operation
eigrp	read, write

This example shows how to set the metric rib-scale as 64:

```
Router#configure
Router(config)#router eigrp 1
Router(config-eigrp)#address-family ipv4
Router(config-eigrp-af)#metric rib-scale 64
```

metric weights

To allow the tuning of the Enhanced Interior Gateway Routing Protocol (EIGRP) metric calculations, use the **metric weights** command in the appropriate configuration mode. To reset the values to their defaults, use the **no** form of this command.

metric weights *tos k1 k2 k3 k4 k5*
no metric weights

Syntax Description

tos	Type of service (ToS) which must always be 0.
k1 k2 k3 k4 k5	Constants that convert an EIGRP metric vector into a scalar quantity. The range is 0 to 4294967295.

Command Default

tos: 0

k1: 1

k2: 0

k3: 1

k4: 0

k5: 0

Command Modes

IPv4 address family configuration

IPv4 VRF address family configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Use the **metric weights** command to alter the default behavior of EIGRP routing and metric computation and allow the tuning of the EIGRP metric calculation for a particular ToS.

If k5 equals 0, the composite EIGRP metric is computed according to the following formula:

metric = [k1 * bandwidth + (k2 * bandwidth)/(256 – load) + k3 * delay]

If k5 does not equal zero, an additional operation is performed:

metric = metric * [k5/(reliability + k4)]

Bandwidth is inverse minimum bandwidth of the path in BPS scaled by a factor of 2.56 * 1012. The range is from a 1200-bps line to 10 terabits per second.

Delay is in units of 10 microseconds. The range of delay is from 10 microseconds to 168 seconds. A delay of all 1s indicates that the network is unreachable.

The delay parameter is stored in a 32-bit field, in increments of 39.1 nanoseconds. The range of delay is from 1 (39.1 nanoseconds) to hexadecimal FFFFFFFF (decimal 4,294,967,040 nanoseconds). A delay of all 1s (that is, a delay of hexadecimal FFFFFFFF) indicates that the network is unreachable.

This table lists the default values used for several common media.

Table 34: Bandwidth Values by Media Type

Media Type	Delay	Bandwidth
Satellite	5120 (2 seconds)	5120 (500 megabits)
Ethernet	25600 (1 milliseconds [ms])	256000 (10 megabits)
1.544 Mbps	512000 (20,000 ms)	1,657,856 bits
64 kbps	512000 (20,000 ms)	40,000,000 bits
56 kbps	512000 (20,000 ms)	45,714,176 bits
10 kbps	512000 (20,000 ms)	256,000,000 bits
1 kbps	512000 (20,000 ms)	2,560,000,000 bits

Reliability is given as a fraction of 255. That is, 255 is a reliability of 100 percent or a perfectly stable link. Load is given as a fraction of 255. A load of 255 indicates a completely saturated link.

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to set the metric weights to change the default values:

```
Router(config)# router eigrp 1
Router(config-eigrp) address-family ipv4
Router(config-eigrp-af)# metric weights 0 2 0 2 0 0
```

neighbor (EIGRP)

To define a neighboring router with which to exchange Enhanced Interior Gateway Routing Protocol (EIGRP) information, use the **neighbor** command in interface configuration mode. To remove an entry, use the **no** form of this command.

neighbor *ip-address* *interface* [**remote** [*max-hops*]]
noneighbor *ip-address* *interface* [**remote** [*max-hops*]]

Syntax Description

ip-address	IP address of a peer router with which routing information is exchanged.
interface	Interface through which peering is established.
remote	Specifies that the neighbor is remote.
max-hops	The maximum number of hops within which the neighbor is expected to be reachable from the configured router. The default value is 100 hops.

Command Default

No neighboring routers are defined.

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Use the **neighbor** command to permit the point-to-point (nonbroadcast) exchange of routing information.

If a neighbor is configured on an interface using the **neighbor** command, the interface stops sending or receiving multicast hello messages. However, the interface can send or receive unicast hello messages. So each neighbor on a LAN must be configured individually .Multiple **neighbor** commands can be used to specify additional neighbors or peers.

Task ID

Task ID	Operations
eigrp	read, write

Examples

This example shows how to permit the sending of EIGRP updates to specific neighbors. One copy of the update is generated for each neighbor:

```
Router(config)# router eigrp 100
Router(config-eigrp) address-family ipv4
Router(config-eigrp-af)# interface GigabitEthernet 0/0/0/3
Router(config-eigrp-af-if)# neighbor 172.20.1.2 remote 10
```

neighbor maximum-prefix

To limit the number of prefixes that are accepted from a single Enhanced Interior Gateway Routing Protocol (EIGRP) neighbor or all EIGRP VPN neighbors, use the **neighbor maximum-prefix** command in IPv4 VRF address family configuration mode. To disable this function, use the **no** form of this command.

Single-Neighbor Configuration CLI
neighbor *ip-address* **maximum-prefix** *maximum* [*threshold*] [**warning-only**]
no neighbor *ip-address* **maximum-prefix**

All-Neighbor Configuration CLI
neighbor maximum-prefix *maximum* [*threshold*] [**dampened**] [**reset-time** *minutes*] [**restart** *minutes*] [**restart-count** *number*] [**warning-only**]
no neighbor maximum-prefix

Syntax Description

ip-address	(Optional) IP address of a single peer.
maximum	Maximum number of prefixes accepted. The range is from 1 to 4294967295. The number of prefixes that can be configured is limited only by the available system resources on the router.
threshold	(Optional) Syslog warning messages are specified as a percentage of the maximum prefix limit that was exceeded. The prefix percentage number range is from 1 to 100. The default is 75 percent.
dampened	(Optional) Configures a decay penalty to be applied to the restart time period each time the maximum prefix limit is exceeded. The half-life for the decay penalty is 150 percent of the default or user-defined restart time value in minutes. This keyword is disabled by default.
reset-time *minutes*	(Optional) Configures the router to reset the restart count to 0 after the default or configured reset time period has expired. The range is from 1 to 65535 minutes.
restart *minutes*	(Optional) Configures a time period in which the router does not form adjacencies or accept redistributed routes from the RIB after the maximum prefix limit has been exceeded. The range is from 1 to 65535 minutes.
restart-count *number*	(Optional) Configures the number of times a peering session can be automatically reestablished after the peering session has been torn down or a redistribute route has been cleared and relearned because the maximum prefix limit has been exceeded. **Caution** After the restart count threshold is crossed, you need to use the **clear eigrp neighbors** command to reestablish normal peering, redistribution, or both.
warning-only	(Optional) Configures the router to generate syslog messages only when the maximum prefix limit is reached, instead of terminating the peering session.

Command Default

threshold: 75 percent

dampened : disabled

warning-only : disabled

reset-time : 15 minutes

restart : 5 minutes

restart-count : 3

Command Modes

IPv4 VRF address family configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

The **neighbor maximum-prefix**command is configured to protect an individual peering session or all peering sessions. When this feature is enabled and the maximum prefix limit is exceeded, the router tears down the peering session, clears all routes that are learned from the peer, and then places the peer in a penalty state for the default or user-defined time period. After the penalty time period expires, normal peering is reestablished.

Note In EIGRP, **neighbor** commands have been used traditionally to configure static neighbors. In the context of this feature, however, the **neighbor maximum-prefix** command can be used to configure the maximum prefix limit for both statically configured and dynamically discovered neighbors.

When configuring the **neighbor maximum-prefix** command to protect a single peering session, just the maximum prefix limit, percentage threshold, and warning only configuration options can be configured. Session dampening, restart, and reset timers are configured on a global basis.

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to configure the maximum prefix limit for a single peer. The maximum limit is set to 1000 prefixes, and the warning threshold is set to 80 percent. When the maximum prefix limit is exceeded, the session with this peer is torn down, all routes learned from this peer are removed from the topology and routing tables, and this peer is placed in a penalty state for 5 minutes (default penalty value).

```
Router(config)# router eigrp 1
Router(config-eigrp)# vrf vrf1
Router(config-eigrp-vrf)# address-family ipv4
Router(config-eigrp-vrf-af)# neighbor 10.0.0.1 maximum-prefix 1000 80
```

The following example shows how to configure the maximum prefix limit for all peers. The maximum limit is set to 10,000 prefixes, the warning threshold is set to 90 percent, the restart timer is set to 4 minutes, a decay penalty is configured for the restart timer with the **dampened** keyword, and all timers are configured to be reset to 0 every 60 minutes. When the maximum prefix limit is exceeded,

all peering sessions are torn down, all routes learned from all peers are removed from the topology and routing tables, and all peers are placed in a penalty state for 4 minutes (user-defined penalty value). A dampening exponential decay penalty is also applied.

```
Router(config)# router eigrp 1
Router(config-eigrp)# vrf vrf1
Router(config-eigrp-vrf)# address-family ipv4
Router(config-eigrp-vrf-af)# neighbor maximum-prefix 10000 90 dampened reset-time 60
restart4
```

next-hop-self disable

To instruct the Enhanced Interior Gateway Routing Protocol (EIGRP) process to use the received next-hop value when advertising the routes, use the **next-hop-self disable**command in interface configuration mode. To revert to the default, use the **no** form of this command.

next-hop-self disable
no next-hop-self disable

Syntax Description

This command has no keywords or arguments.

Command Default

EIGRP always sets the IP next-hop value to be itself.

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

EIGRP, by default, sets the IP next-hop value to be itself for routes that it is advertising, even when advertising those routes on the same interface from which learned them. To change this default, you must use the **next-hop-self disable** interface configuration command to instruct EIGRP to use the received next-hop value when advertising these routes.

The **next-hop-self disable** feature is not available for redistributed routes.

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to change the default IP next-hop value and instruct EIGRP to use the received next-hop value:

```
Router(config)# router eigrp 1
Router(config-eigrp) address-family ipv4
Router(config-eigrp-af)# interface GigabitEthernet 0/1/0/0
Router(config-eigrp-af-if)# next-hop-self disable
```

passive-interface (EIGRP)

To disable sending and receiving "hello" messages on an Enhanced Interior Gateway Routing Protocol (EIGRP) interface and to disable formation of neighbors on the interface, use the **passive-interface** command in interface configuration mode. To reenable sending and receiving "hello messages", use the **no** form of this command.

passive-interface
no passive-interface

Syntax Description

This command has no keywords or arguments.

Command Default

passive-interface command is disabled on an interface.

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Use the **passive-interface** command to disable sending of "hello" massages. The particular subnet on that interface will continue to be advertised by EIGRP to neighbors on other interfaces.

Task ID

Task ID	Operations
eigrp	read, write

Examples

This example shows how to configure **passive-interface** command on GigabitEthernet interface 0/6/5/0:

```
RP/0/RP0/CPU0:router(config)# router eigrp 1
RP/0/RP0/CPU0:router(config-eigrp) address-family ipv6
RP/0/RP0/CPU0:router(config-eigrp-af)# interface GigabitEthernet 0/6/5/0
RP/0/RP0/CPU0:router(config-eigrp-af-if)# passive-interface
```

redistribute (EIGRP)

To inject routes from one routing domain into the Enhanced Interior Gateway Routing Protocol (EIGRP), use the **redistribute** command in the appropriate configuration mode. To remove the **redistribute** command from the configuration file and restore the system to its default condition in which the software does not redistribute routes, use the **no** form of this command.

redistribute {**{bgp** | **connected** | **isis** | **ospf** | **rip** | **static** | **eigrp}** | [*as-numberinstance-name*]}[**route-policy** *name*]
no redistribute

Syntax Description

bgp	Distributes routes from the BGP protocol.
connected	Distributes routes that are established automatically by virtue of having enabled IP on an interface.
isis	Distributes routes from the IS-IS protocol.
ospf	Distributes routes from the OSPF protocol. This protocol is supported in the IPv4 address family.
static	Redistributes IP static routes.
as-number | *instance-name*	Represents one of the following three options: For the **bgp** keyword: Range for 2-byte Autonomous system numbers (ASNs) is 1 to 65535. Range for 4-byte Autonomous system numbers (ASNs) in asplain format is 1 to 4294967295. Range for 4-byte Autonomous system numbers (ASNs) is asdot format is 1.0 to 65535.65535. For the **isis** keyword, an IS-IS instance name from which routes are to be redistributed. The value takes the form of a string. A decimal number can be entered, but it is stored internally as a string. For the **ospf** keyword, an OSPF instance name from which routes are to be redistributed. The value takes the form of a string. A decimal number can be entered, but it is stored internally as a string.
route-policy *name*	(Optional) Specifies the identifier of a configured policy. A policy is used to filter the importation of routes from this source routing protocol to EIGRP.

Command Default

Route redistribution is disabled.

Command Modes

IPv4 address family configuration

IPv4 VRF address family configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Redistributed routing information should always be filtered by the **route-policy** *name* keyword and argument. This filtering ensures that only those routes intended by the administrator are redistributed by EIGRP.

A default metric is usually required to redistribute routes from another protocol into EIGRP. The metric is configured through the **default-metric** command or under the route policy configured with the **redistribute** command. The one exception to this requirement is when EIGRP redistributes BGP routes on a provider edge (PE) router in an MPLS-VPN scenario. If the originating protocol of the route is EIGRP with the same autonomous system (as in MPLS-VPN), the metric would be learned automatically from the extended communities of the BGP route.

Task ID

Task ID	Operations
eigrp	read, write

Examples

This example shows how to cause BGP routes to be redistributed into an EIGRP autonomous system:

```
RP/0/RP0/CPU0:router(config)# router eigrp 1
RP/0/RP0/CPU0:router(config-eigrp) address-family ipv4
RP/0/RP0/CPU0:router(config-eigrp-af)# redistribute bgp 100
```

This example shows how to redistribute the specified IS-IS process routes into an EIGRP autonomous system within a VPN routing and forwarding instance (VRF). The IS-IS routes are redistributed using route policy 3.

```
RP/0/RP0/CPU0:router(config)# router eigrp 109
RP/0/RP0/CPU0:router(config-eigrp)# vrf vpn-1
RP/0/RP0/CPU0:router(config-eigrp-vrf)# address-family ipv4
RP/0/RP0/CPU0:router(config-eigrp-vrf-af)# redistribute isis 108 route-policy 3
```

route-policy (EIGRP)

To apply a routing policy to updates advertised to or received from an Enhanced Interior Gateway Routing Protocol (EIGRP) neighbor, use the **route-policy** command in the appropriate configuration mode. To disable applying routing policy to updates, use the **no** form of this command.

route-policy *route-policy-name* {**in** | **out**}
no route-policy *route-policy-name* {**in** | **out**}

Syntax Description

route-policy-name	Name of route policy.
in	Applies policy to inbound routes.
out	Applies policy to outbound routes.

Command Default

No policy is applied.

Command Modes

IPv4 address family configuration

IPv4 VRF address family configuration

Interface configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Use the **route-policy** command to specify a routing policy for an inbound or outbound route. The policy can be used to filter routes or modify route attributes.

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to apply the IN-Ipv4 policy to inbound IP Version 4 (IPv4) routes:

```
RP/0/RP0/CPU0:router(config)# router eigrp 1
RP/0/RP0/CPU0:router(config-eigrp) address-family ipv4
RP/0/RP0/CPU0:router(config-eigrp-af)# route-policy IN-IPv4 in
```

router-id (EIGRP)

To configure a router ID for an Enhanced Interior Gateway Routing Protocol (EIGRP) process, use the **router-id** command in the appropriate configuration mode. To cause the software to use the default method of determining the router ID, use the **no** form of this command.

router-id *router-id*
no router-id

Syntax Description

router-id	32-bit router ID value specified in four-part, dotted-decimal notation.

Command Default

If this command is not configured, EIGRP chooses an IPv4 address as the router ID from one of its interfaces.

Command Modes

IPv4 address family configuration

IPv4 VRF address family configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

It is good practice to use the **router-id** command to explicitly specify a unique 32-bit numeric value for the router ID. This action ensures that EIGRP can function regardless of the interface address configuration.

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to assign the IP address of 172.20.1.1 to the EIGRP process 1:

```
RP/0/RP0/CPU0:router(config)# router eigrp 1
RP/0/RP0/CPU0:router(config-eigrp) address-family ipv4
RP/0/RP0/CPU0:router(config-eigrp-af)# router-id 172.20.1.1
```

show eigrp accounting

To display prefix accounting information for Enhanced Interior Gateway Routing Protocol (EIGRP) processes, use the **show eigrp accounting** command in EXEC mode.

show eigrp [*as-number*] [**vrf** {*vrf-name* | **all**}] [**ipv4** | **ipv6**] **accounting**

Syntax Description

as-number	(Optional) Autonomous system number. This option is available when a VPN routing and forwarding (VRF) instance is not specified. Range is from 1 to 65535.
vrf { *vrf-name* | **all** }	(Optional) Specifies a particular VPN routing and forwarding instance (VRF) or all VRF instances.
[**ipv4**]	(Optional) Specifies the IPv4 address family.

Command Default

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Examples

The following is sample output from the **show eigrp accounting** command:

```
Router# show eigrp accounting

IP-EIGRP accounting for AS(100)/ID(10.0.2.1) Routing Table: RED
Total Prefix Count: 4  States: A-Adjacency, P-Pending, D-Down

State Address/Source   Interface        Prefix   Restart  Restart/
                                        Count     Count   Reset(s)
 P    Redistributed     ----               0          3        211
 A    10.0.1.2          Gi0/6/0/0/         2          0         84
 P    10.0.2.4          Gi00/2/0/3         0          2        114
 D    10.0.1.3          Gi0/6/0/0          0          3          0
```

Note Connected and summary routes are not listed individually in the output of this command but are counted in the total aggregate count for each process.

This table describes the significant fields shown in the display.

Table 35: show eigrp accounting Field Descriptions

Field	Description
EIGRP accounting for AS	Identifies the EIGRP instance along with the AS number, router ID and table ID.
Total Prefix Count	Shows the aggregate sum of the prefixes in an EIGRP instance topology table. The count includes prefixes learned from all neighbors or from redistribution.
States: A-Adjacency, P-Pending, D-Down	A-Adjacency: Indicates a stable adjacency with the neighbor or a normal redistribution state. P-Pending: Neighbor adjacency or redistribution is suspended or in a penalized state because the maximum prefix limit was exceeded. D-Down: Neighbor adjacency or redistribution is suspended permanently until a manual reset is performed with the **clear route** command.
Address/Source	Shows the peer IP address of the redistribution source.
Prefix Count	Displays the total number of learned prefixes by source. **Note** Routes can be learned for the same prefix from multiple sources, and the sum of all prefix counts in this column may be greater than the figure displayed in the “Prefix Count” field.
Restart Count	Number of times a route source exceeded the maximum prefix limit.
Restart Reset(s)	Displays the time, in seconds, that a route source is in a P (penalized) state. If the route source is in an A (stable or normal) state, the displayed time, in seconds, is the time period until penalization history is reset.

show eigrp interfaces

To display information about interfaces configured for Enhanced Interior Gateway Routing Protocol (EIGRP), use the **show eigrp interfaces** command in EXEC mode.

show eigrp [*as-number*] [**vrf** {*vrf-name* | **all**}] [**ipv4** | **ipv6**] **interfaces** [*type interface-path-id*] [**detail**]

Syntax Description

as-number	(Optional) Autonomous system number. This option is available when a VPN routing and forwarding (VRF) instance is not specified. Range for 2-byte Autonomous system numbers (ASNs) is 1 to 65535. Range for 4-byte Autonomous system numbers (ASNs) in asplain format is 1 to 4294967295. Range for 4-byte Autonomous system numbers (ASNs) is asdot format is 1.0 to 65535.65535.
vrf { *vrf-name* | **all** }	(Optional) Specifies a particular VPN routing and forwarding instance (VRF) or all VRF instances.
[**ipv4**]	(Optional) Specifies the IPv4 address family.
type	(Optional) Interface type. For more information, use the question mark (**?**) online help function.
interface-path-id	Physical interface or virtual interface. Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (**?**) online help function.
detail	(Optional) Displays detailed EIGRP interface information.

Command Default

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Use the **show eigrp interfaces** command to determine on which interfaces EIGRP is active and learn information about EIGRP related to those interfaces.

If an interface is specified, only that interface is displayed. Otherwise, all interfaces on which EIGRP is running are displayed.

If an autonomous system is specified, only the routing process for the specified autonomous system is displayed. Otherwise, all EIGRP processes are displayed.

Task ID

Task ID	Operations
EIGRP	read

Examples

The following is sample output from the **show eigrp interfaces** command:

```
RP/0/RP0/CPU0:router# show eigrp interfaces

IP EIGRP interfaces for process 1

                        Xmit Queue    Mean   Pacing Time   Multicast   Pending
Interface        Peers  Un/Reliable   SRTT   Un/Reliable   Flow Timer  Routes

Gi0/6/0/2.212      0        0/0          0      11/434          0          0

Gi0/6/0/0          1        0/0        337       0/10           0          0

 Gi0/2/0/3         1        0/0         10       1/63         103          0

Gi0/6/2/5          1        0/0        330       0/16           0          0
```

This table describes the significant fields shown in the display.

Table 36: show eigrp interfaces Field Descriptions

Field	Description
Interface	Interface over which EIGRP is configured.
Peers	Number of directly connected EIGRP neighbors.
Xmit Queue Un/Reliable	Number of packets remaining in the unreliable and reliable transmit queues.
Mean SRTT	Mean smoothed round-trip time (SRTT) internal (in milliseconds).
Pacing Time Un/Reliable	Pacing time used to determine when EIGRP packets should be sent out the interface (unreliable and reliable packets).
Multicast Flow Timer	Maximum number of seconds in which the router sends multicast EIGRP packets.
Pending Routes	Number of routes in the packets in the transmit queue waiting to be sent.

The following is sample output from the **show eigrp interfaces** command when issued with the **detail** keyword:

```
RP/0/RP0/CPU0:router# show eigrp interfaces detail

IPv4-EIGRP interfaces for AS(100)

                        Xmit Queue   Mean   Pacing Time   Multicast    Pending
Interface        Peers  Un/Reliable  SRTT   Un/Reliable   Flow Timer   Routes
Lo0                0        0/0         0     640/640          0           0
  Hello interval is 5 sec, hold time is 15 sec
  Next xmit serial <none>
  Un/reliable mcasts: 0/0  Un/reliable ucasts: 0/0
```

```
Mcast exceptions: 0  CR packets: 0  ACKs suppressed: 0
Retransmissions sent: 0  Out-of-sequence rcvd: 0
Bandwidth percent is 50
Total packets received: 0
Authentication mode: MD5  Key chain: key1
No active key found in keychain database
Valid authenticated packets received: 0
Packets dropped due to wrong keychain config: 0
Packets dropped due to missing authentication: 0
Packets dropped due to invalid authentication: 0
Effective Metric:
  Bandwidth: 10000000, Delay: 500, Reliability: 255, Load: 1, MTU: 1514
```

This table describes the significant fields shown in the display.

Table 37: show eigrp interfaces detail Field Descriptions

Field	Description
Hello interval	Hello packet transmission interval.
hold time	Hold time announced to neighbors. If neighbors do not get hello packets from the router for this period, neighbors declare that the neighbor relationship is down.
Next xmit serial	Next transmission serial number.
Un/reliable mcasts	Number of unreliable and reliable multicast packets sent on this interface.
Un/reliable ucasts	Number or unreliable and reliable unicast packets sent on this interface.
Mcast exceptions	Number of multicast exceptions (sequence TLVs).
CR packets	Number of packets sent with the conditional receive bit set.
ACKs suppresses	Number of ACK packets suppressed.
Retransmissions	Number of retransmissions sent on this interface.
Out-of-sequence rcvd	Number of packets received out of sequence.
Bandwidth percent	Configured percent of bandwidth.
Authentication	Mode of authentication.
Valid authenticated packets received	Number of valid authentication packets.
Packets dropped due to wrong keychain config	Number of packets dropped due to wrong keychain configuration.
Packets dropped due to missing authentication	Number of packets dropped due to missing authentication.

Field	Description
Packets dropped due to invalid authentication	Number of packets dropped due to invalid authentication.

show eigrp neighbors

To display information about neighbors discovered by Enhanced Interior Gateway Routing Protocol (EIGRP), use the **show eigrp neighbors** command in EXEC mode.

show eigrp *as-number*vrf {*vrf-name* | **all**}**ipv4ipv6**

Syntax Description

as-number	(Optional) Autonomous system number. This option is available when a VPN routing and forwarding (VRF) instance is not specified. Range is from 1 to 65535.
vrf { *vrf-name* | **all** }	(Optional) Specifies a particular VPN routing and forwarding instance (VRF) or all VRF instances.
[**ipv4**]	(Optional) Specifies the IPv4 address family.
detail	(Optional) Displays detailed EIGRP neighbor information.
type	Interface type. For more information, use the question mark (**?**) online help function.
interface-path-id	Physical interface or virtual interface. Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (**?**) online help function.
static	(Optional) Displays static routes.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Use the **show eigrp neighbors** command to determine when neighbors become active and inactive. This command is also useful for debugging certain types of transport problems.

Task ID

Task ID	Operations
EIGRP	read

Examples

The following is sample output from the **show eigrp neighbors** command:

```
RP/0/RP0/CPU0:router# show eigrp neighbors

IP-EIGRP Neighbors for process 77
```

```
Address                 Interface     Holdtime Uptime   Q      Seq  SRTT  RTO
                                      (secs)   (h:m:s)  Count  Num  (ms)  (ms)

172.16.81.28             Gi0/2/0/3     13       0:00:41  0      11   4     20

172.16.80.28            Gi0/6/0/0      14       0:02:01  0      10   12    24

172.16.80.31            Gi0/6/2/5      12       0:02:02  0      4    5     20

RP/0/RP0/CPU0:router#
```

This table describes the significant fields shown in the display.

Table 38: show eigrp neighbors Field Descriptions

Field	Description
process	Autonomous system number specified in the router configuration command.
Address	IP address of the EIGRP peer.
Interface	Interface on which the router is receiving hello packets from the peer.
Holdtime	Length of time (in seconds) that the Cisco IOS XR software waits to hear from the peer before declaring that the peer is down.
Uptime	Elapsed time (in hours, minutes, and seconds) since the local router first heard from this neighbor.
Q Count	Number of EIGRP packets (update, query, and reply) that the software waits to send.
Seq Num	Sequence number of the last update, query, or reply packet that was received from this neighbor.
SRTT	Smoothed round-trip time. This is the number of milliseconds required for an EIGRP packet to be sent to this neighbor and for the local router to receive an acknowledgment of that packet.
RTO	Retransmission timeout (in milliseconds). This is the amount of time the software waits before resending a packet from the retransmission queue to a neighbor.

The following is sample output from the **show eigrp neighbors** command when issued with the **detail** keyword:

```
RP/0/RP0/CPU0:router# show eigrp neighbors detail

IP-EIGRP neighbors for AS 1

H   Address                 Interface       Hold Uptime   SRTT   RTO  Q  Seq
                                            (sec)         (ms)       Cnt Num
0   11.0.0.10               Gi0/6/0/0         14 01:00:52    3   200  0  10

   Version 12.4/1.2, Retrans: 0, Retries: 0, Prefixes: 3
```

This table describes the significant fields shown in the display.

Table 39: show eigrp neighbors detail Field Descriptions

Field	Description
Version	Version of EIGRP software (major.minor) running on the node and neighbor.
Retrans	Number of retransmissions sent to this neighbor.
Retries	Number of retransmissions sent to this neighbor since the last acknowledgement (ACK).
Prefixes	Number of prefixes learned from this neighbor.

show eigrp topology

To display the Enhanced Interior Gateway Routing Protocol (EIGRP) topology table, use the **show eigrp topology** command in EXEC mode.

show eigrp [*as-number*] [**vrf** {*vrf-name* | **all**}] [**ipv4** | **ipv6**] **topology** [*ip-address mask*] {**active** | **all-links** | **detail-links** | **pending** | **summary** | **zero-successors**}

Syntax Description

as-number	(Optional) Autonomous system number. This option is available when a VPN routing and forwarding (VRF) instance is not specified. Range for 2-byte Autonomous system numbers (ASNs) is 1 to 65535. Range for 4-byte Autonomous system numbers (ASNs) in asplain format is 1 to 4294967295. Range for 4-byte Autonomous system numbers (ASNs) is asdot format is 1.0 to 65535.65535.
vrf { *vrf-name* | **all** }	(Optional) Specifies a particular VPN routing and forwarding instance (VRF) or all VRF instances.
[**ipv4**]	(Optional) Specifies the IPv4 address family.
ip-address	(Optional) IP address in four-part, dotted-decimal notation.
mask	(Optional) Network mask specified in either of two ways: Network mask can be a four-part, dotted decimal address. For example, 255.0.0.0 indicates that each bit equal to 1 means the corresponding address bit is a network address. Network mask can be indicated as a slash (/) and number. For example, /8 indicates that the first 8 bits of the mask are 1s, and the corresponding bits of the address are the network address.
active	(Optional) Displays only active entries in the EIGRP topology table.
all-links	(Optional) Displays all entries in the EIGRP topology table.
detail-links	(Optional) Displays detailed information for all entries in the EIGRP topology table.
pending	(Optional) Displays all entries in the EIGRP topology table that are waiting for an update from a neighbor or are waiting to reply to a neighbor.
summary	(Optional) Displays a summary of the EIGRP topology table.
zero-successors	(Optional) Displays available routes in the EIGRP topology table.

Command Modes

EXEC

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

When the **show eigrp topology** command is used without any keywords or arguments, only routes that are feasible successors are displayed.

The **show eigrp topology** command can be used to determine Diffusing Update Algorithm (DUAL) states and to debug possible DUAL problems.

Task ID

Task ID	Operations
EIGRP	read

Examples

The following is sample output from the **show eigrp topology** command. The EIGRP metrics for specified internal routes and external routes are displayed.

```
RP/0/RP0/CPU0:router# show eigrp topology 10.2.1.0/24

IP-EIGRP (AS 1): Topology entry for 10.2.1.0/24
  State is Passive, Query origin flag is 1, 1 Successor(s), FD is 281600
  Routing Descriptor Blocks:
  0.0.0.0 (GigabitEthernet0/6/0/0), from Connected, Send flag is 0x0
    Composite metric is (281600/0), Route is Internal !This is the internal route.
    Vector metric:
      Minimum bandwidth is 10000 Kbit
      Total delay is 1000 microseconds
      Reliability is 255/255
      Load is 1/255
      Minimum MTU is 1500
      Hop count is 0

RP/0/RP0/CPU0:router# show eigrp topology 10.4.80.0/20

IP-EIGRP (AS 1): Topology entry for 10.4.80.0/20
  State is Passive, Query origin flag is 1, 1 Successor(s), FD is 409600
  Routing Descriptor Blocks:
  10.2.1.1 (GigabitEthernet0/6/0/0), from 10.2.1.1, Send flag is 0x0
    Composite metric is (409600/128256), Route is External
    Vector metric:
      Minimum bandwidth is 10000 Kbit
      Total delay is 6000 microseconds
      Reliability is 255/255
      Load is 1/255
      Minimum MTU is 1500
      Hop count is 1
    External data:
      Originating router is 10.89.245.1
      AS number of route is 0
      External protocol is Connected, external metric is 0
      Administrator tag is 0 (0x00000000)
```

This table describes the significant fields shown in the display.

Table 40: show eigrp topology Field Descriptions

Field	Description
Query origin	Query origin state.
Successors	Number of feasible successors for this prefix.
FD	Feasible distance for this prefix.
10.2.1.1 (Gi0/0)	Next hop and interface from which this path was learned.
from 10.2.1.1	Information source for this path.
Send flag	Indicates if the sending of this prefix is pending to this neighbor.
Composite Metric (409600/128256)	The first number is the EIGRP metric that represents the cost to the destination. The second number is the EIGRP metric that this peer advertised.
Route is	Type of route (internal or external).
Vector Metric	Shows the metric (bandwidth, delay, reliability, load, MTU, and hop count) advertised by the neighbor.
External Data	Shows the external information (originating router ID, AS number, external protocol, metric, and tag) advertised by the neighbor.

show eigrp traffic

To display the number of Enhanced Interior Gateway Routing Protocol (EIGRP) packets sent and received, use the **show eigrp traffic** command in EXEC mode.

show eigrp [*as-number*] [**vrf** {*vrf-name* | **all**}][**ipv4** | **ipv6**] **traffic**

Syntax Description

as-number	(Optional) Autonomous system number. This option is available when a VPN routing and forwarding (VRF) instance is not specified. Range is from 1 to 65535.
vrf { *vrf-name* | **all** }	(Optional) Specifies a particular VPN routing and forwarding instance (VRF) or all VRF instances.
[**ipv4**]	(Optional) Specifies the IPv4 address family.

Command Modes

EXEC

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Use the **show eigrp traffic** command to find the number of packets sent and received.

In addition, this command is useful in determining whether packets from one node are not reaching the neighboring node due to connectivity or configuration problems.

Task ID

Task ID	Operations
EIGRP	read

Examples

The following is sample output from the **show eigrp traffic** command:

```
RP/0/RP0/CPU0:router# show eigrp traffic

IP-EIGRP Traffic Statistics for AS 1

  Hellos sent/received: 736/797
  Updates sent/received: 6/6
  Queries sent/received: 0/1
  Replies sent/received: 1/0
  Acks sent/received: 6/6
  Input queue high water mark 0, 0 drops
  SIA-Queries sent/received: 0/0
  SIA-Replies sent/received: 0/0
```

This table describes the significant fields shown in the display.

Table 41: show eigrp traffic Field Descriptions

Field	Description
AS	Autonomous system number specified in the **router eigrp** command.
Hellos sent/received	Number of hello packets sent and received.
Updates sent/received	Number of update packets sent and received.
Queries sent/received	Number of query packets sent and received.
Replies sent/received	Number of reply packets sent and received.
Acks sent/received	Number of acknowledgment packets sent and received.
Input queue high water mark	Maximum number of packets in the input queue and number of drops.
SIA-Queries sent/received	Number of Stuck-in-Active query packets sent and received.
SIA-Replies sent/received	Number of Stuck-in-Active reply packets sent and received.

show protocols (EIGRP)

To display information about the Enhanced Interior Gateway Routing Protocol (EIGRP) process configuration, use the **show protocols** command in EXEC mode.

show protocols [**ipv4** | **afi-all**] [**all** *protocol*] [**default-context** | **vrf***vrf-name*] [**private**]

Syntax Description

ipv4	(Optional) Specifies an IPv4 address family.
afi-all	(Optional) Specifies all address families.
all	(Optional) Specifies all protocols for a given address family.
protocol	(Optional) Specifies a routing protocol. For the IPv4 address family, the options are **eigrp** , **bgp** , **isis** , **ospf** , and **rip** .
default-context	(Optional) Displays default context information. This keyword is available when the **eigrp** or **rip** protocol is specified.
vrf *vrf-name*	(Optional) Displays VPN routing and forwarding (VRF) information for the specified process. This keyword is available when the **eigrp** or **rip** protocol is specified.
private	(Optional) Displays private EIGRP data. This keyword is available when the **eigrp** is specified.

Command Modes

EXEC

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Use the **show protocols** command to get information about the protocols running on the router and to quickly determine which protocols are active. The command is designed to summarize the important characteristics of the running protocol, and command output varies depending on the specific protocol selected.

For EIGRP, the command output lists the instance number, default AS context, router ID, default networks, distance, maximum paths, and so on.

Task ID

Task ID	Operations
EIGRP	read

Examples

The following is sample output from the **show protocols eigrp** command:

```
RP/0/RP0/CPU0:router# show protocols eigrp

Routing Protocol: EIGRP, instance 1
 Default context AS: 1, Router ID: 192.168.0.22
```

```
Address Family: IPv4
 Default networks not flagged in outgoing updates
 Default networks not accepted from incoming updates
 Distance: internal 90, external 170
 Maximum paths: 4
 EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0
 EIGRP maximum hopcount 100
 EIGRP maximum metric variance 1

 SIA Active timer is 180s
 Interfaces:
  GigabitEthernet0/6/0/0
```

This table describes the significant fields shown in the display.

Table 42: show protocols Field Descriptions

Field	Descriptions
instance	AS number of the instance. • Range for 2-byte Autonomous system numbers (ASNs) is 1 to 65535. • Range for 4-byte Autonomous system numbers (ASNs) in asplain format is 1 to 4294967295. • Range for 4-byte Autonomous system numbers (ASNs) is asdot format is 1.0 to 65535.65535.
AS	AS number of this context. • Range for 2-byte Autonomous system numbers (ASNs) is 1 to 65535. • Range for 4-byte Autonomous system numbers (ASNs) in asplain format is 1 to 4294967295. • Range for 4-byte Autonomous system numbers (ASNs) is asdot format is 1.0 to 65535.65535.
Address Family	Address family for which the configuration status is shown.
Default Networks Candidate	Default network acceptance and announcement behavior.
Distance	Administrative distance of EIGRP routes.
Maximum paths	Maximum paths installed in RIB for a route.
Metric Weight	Current metric weights used by EIGRP.
Maximum hopcount	Maximum hop count accepted by EIGRP.
Variance	Metric variance used to find feasible paths for a route.
Route hold time	Time duration for which routes learned from a neighbor are held without deletion while the neighbor is undergoing a graceful restart.
SIA Active time	Active time period for SIA.
Interfaces	List of interfaces configured for EIGRP.

site-of-origin (EIGRP)

To configure the Site of Origin (SoO) filtering on an Enhanced Interior Gateway Routing Protocol (EIGRP) interface, use the **site-of-origin** command in interface configuration mode. To disable SoO filtering on an interface, use the **no** form of this command.

site-of-origin {*as-number* **:** *number* | *ip-address* **:** *number*}
no site-of-origin

Syntax Description

as-number :	Autonomous system number. Range for 2-byte Autonomous system numbers (ASNs) is 1 to 65535. Range for 4-byte Autonomous system numbers (ASNs) in asplain format is 1 to 4294967295. Range for 4-byte Autonomous system numbers (ASNs) is asdot format is 1.0 to 65535.65535. The colon is used to separate the autonomous system number and network number.
number	Network number. Range is from 0 to 4294967295 when a 2-byte AS number is used. Range is from 0 to 65535 when a 4-byte AS number is used.
ip-address :	IP address in four-part, dotted-decimal notation. The colon is used to separate the IP address and network number.

Command Default

No default behavior or values

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

An EIGRP process must be capable of retrieving the SoO attribute on routes redistributed from the Border Gateway Protocol (BGP) when required to support complex topologies that include MPLS VPN links between sites with backdoor links.

Use the **site-of-origin** command to set an SoO BGP extended community attribute that is used to identify routes that have originated from a site so that the readvertisement of that prefix back to the source site can be prevented. The SoO extended community uniquely identifies the site from which a provider edge (PE) router has learned a route.

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to configure SoO filtering on an EIGRP interface:

```
RP/0/RP0/CPU0:router(config)# router eigrp 1
RP/0/RP0/CPU0:router(config-eigrp) vrf customer1
RP/0/RP0/CPU0:router(config-eigrp-vrf) address-family ipv4
RP/0/RP0/CPU0:router(config-eigrp-vrf-af)# interface GigabitEthernet 0/1/0/0
RP/0/RP0/CPU0:router(config-eigrp--vrf-af-if)# site-of-origin 10.0.0.1:20
```

split-horizon disable (EIGRP)

To disable split horizon for an Enhanced Interior Gateway Routing Protocol (EIGRP) process, use the **split-horizon disable** command in interface configuration mode. To enable split horizon, use the **no** form of this command.

split-horizon disable
no split-horizon disable

Syntax Description

This command has no keywords or arguments.

Command Default

Split horizon is enabled for an EIGRP process.

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Examples

The following example shows how to disable split horizon an a GigabitEthernet link:

```
RP/0/RP0/CPU0:router(config)# router eigrp 1
RP/0/RP0/CPU0:router(config-eigrp) address-family ipv4
RP/0/RP0/CPU0:router(config-eigrp-af)# interface GigabitEthernet 0/1/0/0
RP/0/RP0/CPU0:router(config-eigrp-af-if)# split-horizon disable
```

stub (EIGRP)

To configure a router as a stub for Enhanced Interior Gateway Routing Protocol (EIGRP), use the **stub** command in the appropriate configuration mode. To disable this function, use the **no** form of this command.

stub [**receive-only** | [**connected**] [**redistributed**] [**static**] [**summary**]]
no stub [**receive-only** | [**connected**] [**redistributed**] [**static**] [**summary**]]

Syntax Description

receive-only	(Optional) Sets the router as a receive-only neighbor.
connected	(Optional) Advertises connected routes.
redistributed	(Optional) Advertises redistributed routes from other protocols and autonomous systems.
static	(Optional) Advertises static routes.
summary	(Optional) Advertises summary routes.

Command Default

Stub routing is disabled.

When stub routing is specified, connected and summary routes are advertised by default.

Command Modes

IPv4 address family configuration

IPv4 VRF address family configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Use the **stub** command to configure a router as a stub in which the router directs all IP traffic to a distribution router.

The **stub** command can be modified with several options, and these options can be used in any combination except for the **receive-only** keyword.

The **receive-only** keyword restricts the router from sharing any of its routes with any other router in that EIGRP autonomous system and does not permit any other option to be specified because it prevents any type of route from being sent. The four other optional keywords (**connected** , **static** , **summary** , and **redistributed**) can be used in any combination but cannot be used with the **receive-only** keyword. If any of these four keywords is used with the **stub** command, only the route types specified by the particular keyword or keywords are sent. Route types specified by the nonused keyword or keywords are not sent.

The **connected** keyword permits EIGRP stub routing to send connected routes. If all the connected routes are not covered by EIGRP interfaces, it may be necessary to redistribute connected routes with the **redistribute connected** command under the EIGRP process. This option is enabled by default.

The **static** keyword permits EIGRP stub routing to send static routes. Without the configuration of this option, EIGRP does not send any static routes. You may still need to redistribute static routes with the **redistribute static** command.

The **summary** keyword permits EIGRP stub routing to send summary routes. Summary routes can be created manually with the **summary address** command or automatically at a major network border router with the **auto-summary** command enabled. This option is enabled by default.

The **redistributed** keyword permits EIGRP stub routing to send other routing protocols and autonomous systems. Without the configuration of this option, EIGRP does not advertise redistributed routes.

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to configure, as a stub, the router that advertises connected and summary routes:

```
RP/0/RP0/CPU0:router(config)# router eigrp 1
RP/0/RP0/CPU0:router(config-eigrp) address-family ipv4
RP/0/RP0/CPU0:router(config-eigrp-af)# stub
```

The following example shows how to configure the router as a receive-only neighbor (connected, summary, and static routes are not sent):

```
RP/0/RP0/CPU0:router(config)# router eigrp 1
RP/0/RP0/CPU0:router(config-eigrp) address-family ipv4
RP/0/RP0/CPU0:router(config-eigrp-af)# stub receive-only
```

summary-address (EIGRP)

To configure a summary aggregate address for the specified Enhanced Interior Gateway Routing Protocol (EIGRP) interface, use the **summary-address** command in interface configuration mode. To disable a configuration, use the **no** form of this command.

summary-address *ip-address* {/*lengthmask*} [*admin-distance*]
no summary-address *ip-address* {/*lengthmask*}

Syntax Description

ip-address	The IP address argument specifies the summary IP address to apply to an interface in four-part, dotted-decimal notation.
/ *length*	Prefix length, which can be indicated as a slash (/) and number. For example, /8 indicates that the first eight bits in the IP prefix are network bits. If *length* is used, the slash is required.
mask	IP address mask.
admin-distance	(Optional) Administrative distance. A value from 1 to 255.

Command Default

An administrative distance of 5 is applied to EIGRP summary routes.

No summary addresses are predefined.

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

The **summary-address** command is used to configure interface-level address summarization. EIGRP summary routes are given an administrative distance of 5. The administrative distance is used to advertise a summary without installing it in the routing table.

By default, EIGRP summarizes subnet routes to the network level. The **no auto-summary** command can be entered to configure subnet level summarization.

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to configure an administrative distance of 95 on an EIGRP interface for the 192.168.0.0/16 summary address:

```
RP/0/RP0/CPU0:router(config)# router eigrp 1
RP/0/RP0/CPU0:router(config-eigrp) address-family ipv4
RP/0/RP0/CPU0:router(config-eigrp-af)# interface GigabitEthernet 0/1/0/0
```

```
RP/0/RP0/CPU0:router(config-eigrp-af-if)# summary-address 192.168.0.0/16 95
```

timers active-time

To adjust the Enhanced Interior Gateway Routing Protocol (EIGRP) routing wait time, use the **timers active-time** command in the appropriate configuration mode. To disable this function, use the **timers active-time no** form of the command.

timers active-time [*time-limit* | **disabled**]
no timers active-time

Syntax Description

time-limit	Active time limit (in minutes). Range is from 1 to 4294967295 minutes.
disabled	Disables the timers and permits the routing wait time to remain active indefinitely.

Command Default

Disabled

Command Modes

IPv4 address family configuration

IPv4 VRF address family configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Use the **timers active-time** command to control the time the router waits (after query is sent) before declaring the route to be in the stuck in active (SIA) state.

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to configure an indefinite routing wait time on the specified EIGRP route:

```
RP/0/RP0/CPU0:router(config)# router eigrp 1
RP/0/RP0/CPU0:router(config-eigrp) address-family ipv4
RP/0/RP0/CPU0:router(config-eigrp-af)# timers active-time disabled
```

variance

To control load balancing in an Enhanced Interior Gateway Routing Protocol (EIGRP)-based internetwork, use the **variance** command in the appropriate configuration mode. To reset the variance to the default value, use the **no** form of this command.

variance *multiplier*
no variance

Syntax Description

multiplier	Metric value used for load balancing. Range is from 1 to 128.

Command Default

multiplier : 1 (equal-cost load balancing)

Command Modes

IPv4 address family configuration

IPv4 VRF address family configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Use the **variance** command to set a variance on the EIGRP router so that the router can determine the feasibility of a potential route. A route is feasible if the next router in the path is closer to the destination than the current router and the metric for the entire path is within the variance. Only paths that are feasible can be used for load balancing and included in the routing table.

If the following two conditions are met, the route is considered feasible and can be added to the routing table:

1. The local best metric must be greater than the metric learned from the next router.
2. The multiplier times the local best metric for the destination must be greater than or equal to the metric through the next router.

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to set a variance of 4:

```
RP/0/RP0/CPU0:router(config)# router eigrp 1
RP/0/RP0/CPU0:router(config-eigrp) address-family ipv4
RP/0/RP0/CPU0:router(config-eigrp-af)# variance 4
```

vrf (EIGRP)

To define a VPN routing and forwarding (VRF) instance and enter VRF configuration mode, use the **vrf** command in router configuration mode. To remove a VRF instance, use the **no** form of this command.

vrf *vrf-name*
no vrf *vrf-name*

Syntax Description

vrf-name	VPN routing and forwarding instance.

Command Default

No VRFs are defined.

Command Modes

Router configuration

Command History

Release	Modification
Release 6.6.3	This command was introduced.

Usage Guidelines

Use the **vrf** command to configure a VRF instance. A VRF instance is a collection of VPN routing and forwarding tables maintained at the provider edge (PE) router.

From VRF configuration mode, you must enter address family configuration mode and then issue commands, such as the **auto-summary** command.

A single EIGRP routing process can support multiple VRFs. The number of VRFs that can be configured is limited by available system resources on the router, which is determined by the number of VRFs, running processes, and available memory. However, only a single VRF can be supported by each VPN. Redistribution between different VRFs is not supported.

MPLS VPN support between PE and customer edge (CE) routers is configured only on PE routers that provide VPN services over the service provider backbone. The customer site does not require any changes to equipment or configurations to support the EIGRP VPN. Typically, a metric must be configured for routes to be advertised to the CE router. The metric can be configured under the route-policy for the **redistribute** protocol command or configured with the **default-metric** command.

You must remove IPv4/IPv6 addresses from an interface prior to assigning, removing, or changing a VRF on an IP interface. If this is not done in advance, any attempt to change the VRF on an IP interface is rejected.

Task ID

Task ID	Operations
eigrp	read, write

Examples

The following example shows how to enter IPv4 VRF address family configuration mode and identify EIGRP commands that can be issued from that mode.

```
RP/0/RP0/CPU0:router(config)# router eigrp 1
RP/0/RP0/CPU0:router(config-eigrp)# vrf vpn-1
```

```
RP/0/RP0/CPU0:router(config-eigrp-vrf)# address-family ipv4
RP/0/RP0/CPU0:router(config-eigrp-vrf-af)# ?

  auto-summary           Auto summarisation
  autonomous-system      Set the autonomous system of VRF
  commit                 Commit the configuration changes to running
  default-information    Handling of default route
  default-metric         Set metric of redistributed routes
  describe               Describe a command without taking real actions
  distance               Set distance for EIGRP routes
  do                     Run an exec command
  exit                   Exit from this submode
  interface              EIGRP interface configuration submode
  log-neighbor-changes   Enable/Disable EIGRP neighbor logging
  log-neighbor-warnings  Enable/Disable EIGRP neighbor warnings
  maximum-paths          Maximum paths
  maximum-prefix         Maximum number of IP prefixes acceptable in aggregate
  metric                 Modify EIGRP routing metrics and parameters
  neighbor               Neighbor prefix limits configuration
  no                     Negate a command or set its defaults
  redistribute           Redistribute another protocol
  route-policy           Configure inbound/outbound policies
  router-id              Set router ID
  show                   Show contents of configuration
  stub                   EIGRP stub
  timers                 Configure EIGRP timers
  variance               Control load balancing variance
```

OSPF Commands

All commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 540 Series Router that is introduced from Cisco IOS XR Release 6.3.2. References to earlier releases in Command History tables apply to only the Cisco NCS 5500 Series Router.

Note

- Starting with Cisco IOS XR Release 6.6.25, all commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 560 Series Routers.
- Starting with Cisco IOS XR Release 6.3.2, all commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 540 Series Router.
- References to releases before Cisco IOS XR Release 6.3.2 apply to only the Cisco NCS 5500 Series Router.
- Cisco IOS XR Software Release 7.0.1 specific updates are not applicable for the following variants of Cisco NCS 540 Series Routers:
  - N540-28Z4C-SYS-A
  - N540-28Z4C-SYS-D
  - N540X-16Z4G8Q2C-A
  - N540X-16Z4G8Q2C-D
  - N540X-16Z8Q2C-D
  - N540-12Z20G-SYS-A
  - N540-12Z20G-SYS-D
  - N540X-12Z16G-SYS-A
  - N540X-12Z16G-SYS-D

This module describes the commands used to configure and monitor the Open Shortest Path First (OSPF) routing protocol.

For detailed information about OSPF concepts, configuration tasks, and examples, see the Implementing OSPF on Cisco NCS 5500 Series Routers module in the *Routing Configuration Guide for Cisco NCS 5500 Series Routers*.

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- timers lsa group-pacing, on page 464
- timers lsa min-arrival, on page 465
- timers throttle lsa all (OSPF), on page 466
- timers throttle spf (OSPF), on page 468
- transmit-delay (OSPF), on page 470
- virtual-link (OSPF), on page 472
- vrf (OSPF), on page 474

address-family (OSPF)

To enter address family configuration mode for Open Shortest Path First (OSPF), use the **address-family** command in the appropriate mode. To disable address family configuration mode, use the **no** form of this command.

address-family ipv4 [**unicast**]
no address-family ipv4 [**unicast**]

Syntax Description

ipv4	Specifies IP Version 4 (IPv4) address prefixes.
unicast	(Optional) Specifies unicast address prefixes.

Command Default

An address family is not specified.

Command Modes

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

OSPF version 2 automatically provides routing services for IPv4 unicast topologies, so this command is redundant.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure the OSPF router process with IPv4 unicast address prefixes:

```
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# address-family ipv4 unicast
```

adjacency stagger (OSPF)

To configure staggering of OSPF adjacency during reload, process restart, and process clear, use the **adjacency stagger** command in XR Config mode. To turn off adjacency staggering, either use the **disable** keyword or use the **no** form of this command.

adjacency stagger {**disable** | *initial-num-nbr* *max-num-nbr*}
no adjacency stagger

Syntax Description

disable	Disables adjacency staggering.
initial-num-nbr	The initial number of simultaneous neighbors allowed to form adjacency to FULL in any area to bring up to FULL after a router reload, OSPF process restart, or OSPF process clear. Range is 1-65535. Default is 2.
max-num-nbr	The subsequent number of simultaneous neighbors allowed to form adjacency, per OSPF instance, after the initial set of OSPF neighbors have become FULL. Range is 1-65535. Default is 64.

Command Default

OSPF adjacency staggering is enabled.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Staggering of the OSPF adjacency during reload, process restart (without NSR or graceful-restart), and process clear reduces the overall adjacency convergence time.

Initially, allow 2 (configurable) neighbors to form adjacency to FULL per area. After the first adjacency reaches FULL, up to 64 (configurable) neighbors can form adjacency simultaneously for the OSPF instance (all areas). However, areas without any FULL adjacency is restricted by the initial area limit.

Note Adjacency stagger and OSPF nonstop forwarding (NSF) are mutually exclusive. Adjacency stagger will not be activated if **nsf** is configured under router ospf configuration.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure adjacency stagger for a 2 neighbors initially and for a maximum of 3 neighbors:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# adjacency stagger 2 3
```

area (OSPF)

To configure an Open Shortest Path First (OSPF) area, use the **area** command in the appropriate mode. To terminate an OSPF area, use the **no** form of this command.

area *area-id*
no area *area-id*

Syntax Description

area-id	Identifier of an OSPF area. The *area-id* argument can be specified as either a decimal value or an IP address (dotted decimal) format. Range is 0 to 4294967295.

Command Default

No OSPF area is defined.

Command Modes

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **area** command to explicitly configure an area. Commands configured under the area configuration mode (such as the **interface** [OSPF] and **authentication** commands), are automatically bound to that area.

To modify or remove the area, the *area-id* argument format must be the same as the format used when creating the area. Otherwise, even if the actual 32-bit value matches, the area is not matched. For example, if you create an area with an *area-id* of 10 it would not match an *area-id* of 0.0.0.10.

Note To remove the specified area from the router configuration, use the **no area** *area-id* command. The **no area** *area-id* command removes the area and all area options, such as **authentication** , **default-cost** , **nssa** , **range** , **stub** , **virtual-link** , and **interface.**

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure area 0 and HundredGigE interface 0/2/0/0. HundredGigE interface 0/2/0/0 is bound to area 0 automatically.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/2/0/0
```

authentication (OSPF)

To enable plain text, Message Digest 5 (MD5) authentication, or null authentication for an Open Shortest Path First (OSPF) interface, use the **authentication** command in the appropriate mode. To remove such authentication, use the **no** form of this command.

authentication [**message-digest** [**keychain** *keychain*] | **null**]
no authentication

Syntax Description

message-digest	(Optional) Specifies that MD5 is used.
keychain *keychain*	(Optional) Specifies a keychain name.
null	(Optional) Specifies that no authentication is used. Useful for overriding password or MD5 authentication if configured for an area.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the authentication parameter specified by the area.

If this command is not specified in area configuration mode, then the interface adopts the authentication parameter specified for the process.

If this command is not specified at any level, then the interface does not use authentication.

If no keyword is specified, plain text authentication is used.

Command Modes

Interface configuration

Area configuration

Router configuration

Virtual-link configuration

VRF configuration

Multi-area interface configuration

Sham-link configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **authentication** command to specify an authentication type for the interface, which overrides the authentication specified for the area to which this interface belongs. If this command is not included in the configuration file, the authentication configured in the area to which the interface belongs is assumed (as specified by the area **authentication** command).

The authentication type and password must be the same for all OSPF interfaces that are to communicate with each other through OSPF. If you specified plain text authentication, use the **authentication-key** command to specify the plain text password.

If you enable MD5 authentication with the **message-digest** keyword, you must configure a key with the **message-digest-key** interface command.

To manage the rollover of keys and enhance MD5 authentication for OSPF, you can configure a container of keys called a keychain with each key comprising the following attributes: generate/accept time, key identification, and authentication algorithm. The keychain management feature is always enabled.

Note Changes to the system clock will impact the validity of the keys in the existing configuration.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to set authentication for areas 0 and 1 of OSPF routing process 201. Authentication keys are also provided.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 201
RP/0/RP0/CPU0:router(config-ospf)# router-id 10.1.1.1
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-ar)# authentication
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/1/0/1
RP/0/RP0/CPU0:router(config-ospf-ar-if)# authentication-key mykey
RP/0/RP0/CPU0:router(config-ospf-ar-if)# exit
RP/0/RP0/CPU0:router(config-ospf)# area 1
RP/0/RP0/CPU0:router(config-ospf-ar)# authentication
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/1/0/0
RP/0/RP0/CPU0:router(config-ospf-ar-if)# authentication-key mykey1
```

The following example shows how to configure use of an authentication keychain:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 201
RP/0/RP0/CPU0:router(config-ospf)# router-id 10.1.1.1
RP/0/RP0/CPU0:router(config-ospf)# authentication message-digest keychain mykeychain
```

authentication-key (OSPF)

To assign a password to be used by neighboring routers that are using the Open Shortest Path First (OSPF) simple password authentication, use the **authentication-key** command in the appropriate mode. To remove a previously assigned OSPF password, use the **no** form of this command.

authentication-key [**clear** | **encrypted**] *password*
no authentication-key

Syntax Description

clear	(Optional) Specifies that the key be clear text.
encrypted	(Optional) Specifies that the key be encrypted using a two-way algorithm.
password	Any contiguous string up to 8 characters in length that can be entered from the keyboard. For example, *mypswd2*.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the OSPF password parameter specified by the area.

If this command is not specified in area configuration mode, then the interface adopts the OSPF password parameter specified for the process.

If this command is not specified at any level, then no password is specified.

Clear is the default if the **clear** or **encrypted** keyword is not specified.

Command Modes

Interface configuration

Area configuration

Router configuration

Virtual-link configuration

VRF configuration

Multi-area configuration

Sham-link configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The password created by this command is inserted directly into the OSPF header when the Cisco IOS XR software originates routing protocol packets. A separate password can be assigned to each network on an individual interface basis. All neighboring routers on the same network must have the same password to be able to exchange OSPF information.

The **authentication-key** command must be used with the **authentication** command. If the **authentication** command is not configured, the password provided by the **authentication-key** command is ignored and no authentication is adopted by the OSPF interface.

Note The **authentication-key** command cannot be used with the **authentication** command when the **message-digest** or **null** keyword is configured.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure an authentication password as the string yourpass:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 201
RP/0/RP0/CPU0:router(config-ospf)# authentication-key yourpass
```

auto-cost (OSPF)

To control how the Open Shortest Path First (OSPF) protocol calculates default metrics for the interface, use the **auto-cost** command in the appropriate mode. To revert to the default reference bandwidth, use the **no** form of this command.

auto-cost {**reference-bandwidth** *mbps* | **disable**}
no auto-cost {**reference-bandwidth** | **disable**}

Syntax Description

reference-bandwidth *mbps*	Specifies a rate in Mbps (bandwidth). Range is 1 to 4294967.
disable	Assigns a cost based on interface type.

Command Default

mbps : 100 Mbps

Command Modes

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

By default OSPF calculates the OSPF metric for an interface according to the bandwidth of the interface.

The OSPF metric is calculated as the *mbps* value divided by bandwidth, with *mbps* equal to 108 by default.

If you have multiple links with high bandwidth (such as OC-192), you might want to use a larger number to differentiate the cost on those links. That is, the metric calculated using the default *mbps* value is the same for all high-bandwidth links.

Recommended usage of cost configuration for OSPF interfaces with high bandwidth is to be consistent: Either explicitly configure (by using the **cost** command) or choose the default (by using the **auto-cost** command).

The value set by the **cost** command overrides the cost resulting from the **auto-cost** command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to set the reference value for the auto cost calculation to 1000 Mbps:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# auto-cost reference-bandwidth 1000
```

capability opaque disable

To prevent Multiprotocol Label Switching traffic engineering (MPLS TE) topology information flooded to the network through opaque LSAs, use the **capability opaque disable** command in the appropriate mode. To restore MPLS TE topology information flooded through opaque LSAs to the network, use the **no** form of the command.

capability opaque disable
no capability opaque disable

Command Default

Opaque LSAs are allowed.

Command Modes

XR Config mode

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The **capability opaque disable** command prevents flooded MPLS TE information (Types 1 and 4) through opaque LSAs of all scope (Types 9, 10, and 11).

Control opaque LSA support capability must be enabled for OSPF to support MPLS TE.

The MPLS TE topology information is flooded to the area through opaque LSAs by default.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to prevent OSPF from supporting opaque services:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# capability opaque disable
```

clear ospf process

To reset an Open Shortest Path First (OSPF) router process without stopping and restarting it, use the **clear ospf process** command in XR EXEC mode.

clear ospf [*process-name* [**vrf** {*vrf-name* | **all**}]] **process**

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPF routing process. The process name is defined by the **router ospf** command. If this argument is included, only the specified routing process is affected. Otherwise, all OSPF processes are reset.
vrf	(Optional) An OSPF VPN routing and forwarding (VRF) instance.
vrf-name	(Optional) Name of the OSPF VRF instance to be reset.
all	(Optional) Resets all OSPF VRF instances.

Command Default

No default behavior or value

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

When the OSPF router process is reset, OSPF releases all resources allocated, cleans up the internal database, and shuts down and restarts all interfaces that belong to the process.

Note The **clear ospf process** command may change the router ID unless the OSPF router ID is explicitly configured through the router-id (OSPF), on page 396 command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to reset all OSPF processes:

```
RP/0/RP0/CPU0:router# clear ospf process
```

The following example shows how to reset the OSPF 1 process:

```
RP/0/RP0/CPU0:router# clear ospf 1 process
```

clear ospf redistribution

To clear all routes redistributed from other protocols out of the Open Shortest Path First (OSPF) routing table, use the **clear ospf redistribution** command in XR EXEC mode.

clear ospf [*process-name* [**vrf** {*vrf-name* | **all**}]] **redistribution**

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPF routing process. The process name is defined by the **router ospf** command. If this argument is included, only the specified routing process is affected. Otherwise, all OSPF routes are cleared.
vrf	(Optional) OSPF VPN routing and forwarding (VRF) instance.
vrf-name	(Optional) Name of the OSPF VRF instance to be reset.
all	(Optional) Resets all OSPF VRF instances.

Command Default

No default behavior or value

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **clear ospf redistribution** command to cause the routing table to be read again. OSPF regenerates and sends Type 5 and Type 7 link-state advertisements (LSAs) to its neighbors. If an unexpected route has appeared in the OSPF redistribution, using this command corrects the issue.

Note Use of this command can cause a significant number of LSAs to flood the network. We recommend that you use this command with caution.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to clear all redistributed routes across all processes from other protocols:

```
RP/0/RP0/CPU0:router# clear ospf redistribution
```

clear ospf routes

To clear all Open Shortest Path First (OSPF) routes from the OSPF routing table, use the **clear ospf routes** command in XR EXEC mode.

clear ospf [*process-name* [**vrf** {*vrf-name* | **all**}]] **routes**

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPF routing process. The process name is defined by the **router ospf** command. If this argument is included, only the specified routing process is affected. Otherwise, all OSPF routes are cleared.
vrf	(Optional) OSPF VPN routing and forwarding (VRF) instance.
vrf-name	(Optional) Name of the OSPF VRF instance to be reset.
all	(Optional) Resets all OSPF VRF instances.

Command Default

No default behavior or value

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to clear all OSPF routes from the OSPF routing table and recompute valid routes. When the OSPF routing table is cleared, OSPF routes in the global routing table are also recalculated.

```
RP/0/RP0/CPU0:router# clear ospf routes
```

clear ospf statistics

To clear the Open Shortest Path First (OSPF) statistics of neighbor state transitions, use the **clear ospf statistics** command in XR EXEC mode.

clear ospf [*process-name* [**vrf** {*vrf-name* | **all**}]] **statistics** [**neighbor** [*type* *interface-path-id*] [*ip-address*]]

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPF routing process. The process name is defined by the **router ospf** command. If this argument is included, only the specified routing process is affected. Otherwise, all OSPF statistics of neighbor state transitions are cleared.
vrf	(Optional) OSPF VPN routing and forwarding (VRF) instance.
vrf-name	(Optional) Name of the OSPF VRF instance to be reset.
all	(Optional) Resets all OSPF VRF instances.
neighbor	(Optional) Clears the state transition counters of the specified neighbor only.
type	(Optional) Interface type. For more information, use the question mark (?) online help function.
interface-path-id	(Optional) Physical interface or virtual interface. Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
ip-address	(Optional) IP address of a specified neighbor for whom you want to clear the state transition counter.

Command Default

No default behavior or value

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **clear ospf statistics** command to reset OSPF counters. Reset is useful to detect changes in counter values.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to reset the OSPF transition state counters for all neighbors on Packet-over-SONET/SDH (POS) interface 0/2/0/0:

```
RP/0/RP0/CPU0:router# clear ospf statistics neighbor POS 0/2/0/0
```

cost (OSPF)

To explicitly specify the interface (network) for Open Shortest Path First (OSPF) path calculation, use the **cost** command in the appropriate mode. To remove the cost, use the **no** form of this command.

cost *cost*
no cost

Syntax Description

cost	Unsigned integer value expressed as the link-state metric. Range is 1 to 65535.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the cost parameter specified by the area.

If this command is not specified in area configuration mode, then the interface adopts the cost parameter specified for the process.

If this command is not specified at any level, then the cost is calculated by the **auto-cost** command.

Command Modes

Interface configuration

Area configuration

Router configuration

VRF configuration

Multi-area configuration

Sham-link configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The link-state metric is advertised as the link cost in the router link advertisement. Cisco IOS XR software does not support type of service (ToS), so you can assign only one cost for each interface.

In general, the path cost is calculated using the following formula:

108 / bandwidth (the default auto cost is set to 100 Mbps)

This calculation is the default reference bandwidth used by the auto-costing calculation which establishes the interface auto-cost The **auto-cost** command can set this reference bandwidth to some other value. The **cost** command is used to override the auto-costing calculated default value for interfaces.

Using this formula, the default path cost is 1 for any interface that has a link bandwidth of 100 Mbps or higher. If this value does not suit the network, configure the reference bandwidth for auto calculating costs based on the link bandwidth.

The value set by the **cost** command overrides the cost resulting from the **auto-cost (OSPF)** command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to set the cost value to 65 for HundredGigE interface 0/1/0/1:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/1/0/1
RP/0/RP0/CPU0:router(config-ospf-ar-if)# cost 65
```

cost-fallback (OSPF)

To apply higher cost than the normal interface cost when the cumulative bandwidth of a bundle interface goes below the threshold specified and to revert to the original cost if the cumulative bandwidth goes above the configured threshold, use the **cost-fallback** command. To remove the cost-fallback, use the **no** form of this command.

cost-fallback cost threshold bandwidth
no cost-fallback

Syntax Description

cost **threshold**	Unsigned integer value expressed as the link-state metric. Range is 1 to 65535, but typically, cost-fallback value is supposed to be set to a value higher than the normal cost.
bandwidth	Unsigned integer value expressed in Mbits per second. Range is 1 to 4294967.

Command Default

If this command is not specified in interface configuration mode, the currently effective interface cost takes effect even when the cumulative bandwidth goes down below the maximum bandwidth. Unlike the interface cost command, this cost-fallback command is available only under interface configuration mode; it is not available in area or process level. Unlike other interface specific parameters, no inheritance will take place from area or process level if this command is not specified at interface level.

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The fallback cost must be set to a higher value than the normal interface cost. The motivation of setting the fallback cost is to cost out an interface or disfavor an interface without shutting it down when its cumulative bandwidth goes below the user specified threshold, so that the traffic can take an alternative path. The normal interface cost will take over when the cumulative bandwidth reaches or exceeds user-specified threshold.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to set the cost-fallback value:

The following example shows how to set the cost-fallback value for Bundle-Ether:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 100
RP/0/RP0/CPU0:router(config-ospf)# router-id 2.2.2.2
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-ar)# interface bundle-Ether
RP/0/RP0/CPU0:router(config-ospf-ar-if)# cost-fallback 1000 threshold 300
```

database-filter all out (OSPF)

To filter outgoing link-state advertisements (LSAs) to an Open Shortest Path First (OSPF) interface, use the **database-filter all out** command in the appropriate mode. To restore the forwarding of LSAs to the interface, use the **disable** form of the command.

database-filter all out [**disable** | **enable**]

Syntax Description

disable	(Optional) Disables filtering.
enable	(Optional) Enables filtering.

Command Default

The database filter is disabled.

Command Modes

Interface configuration

Area configuration

Router configuration

VRF configuration

Multi-area configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Use the **database-file all out** command to perform the same function that the neighbor database-filter all out, on page 363 command performs on a neighbor basis.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to prevent flooding of OSPF LSAs to broadcast, nonbroadcast, and point-to-point networks reachable through HundredGigE interface 0/1/0/1:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/1/0/1
RP/0/RP0/CPU0:router(config-ospf-ar-if)# database-filter all out
```

dead-interval (OSPF)

To set the interval after which a neighbor is declared dead when no hello packets are observed, use the **dead-interval** command in the appropriate mode. To return to the default time, use the **no** form of this command.

dead-interval *seconds*
no dead-interval

Syntax Description

seconds	Integer that specifies the interval (in seconds). Range is 1 to 65535. The value must be the same for all nodes on the network.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the dead interval parameter specified by the area.

If this command is not specified in area configuration mode, then the interface adopts the dead interval parameter specified for the process.

If this command is not specified at any level, then the dead interval is four times the interval set by the **hello-interval** (OSPF) command.

Command Modes

Interface configuration

Area configuration

Router configuration

Virtual-link configuration

VRF configuration

Multi-area configuration

Sham-link configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The dead interval value must be the same for all routers and access servers on a specific network.

If the hello interval is configured, the dead interval value must be larger than the hello interval value. The dead interval value is usually configured four times larger than the hello interval value.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to set the OSPF dead interval to 40 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/1/0/1
RP/0/RP0/CPU0:router(config-ospf-ar-if)# dead-interval 40
```

default-cost (OSPF)

To specify a cost for the default summary route sent into a stub area or not-so-stubby area (NSSA), use the **default-cost** command in area configuration mode. To remove the assigned default route cost, use the **no** form of this command.

default-cost *cost*
no default-cost *cost*

Syntax Description

cost	Cost for the default summary route used for a stub or NSSA area. The acceptable value is a 24-bit number.

Command Default

cost : 1

Command Modes

Area configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **default-cost** command only on an Area Border Router (ABR) attached to a stub or an NSSA area.

In all routers and access servers attached to the stub area, the area should be configured as a stub area using the **stub** command in the area submode. Use the **default-cost** command only on an ABR attached to the stub area. The **default-cost** command provides the metric for the summary default route generated by the ABR into the stub area.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to assign a default cost of 20 to a stub area. The HundredGigE interface 0/4/0/3 is also configured in the stub area):

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 201
RP/0/RP0/CPU0:router(config-ospf)# area 10.15.0.0
RP/0/RP0/CPU0:router(config-ospf-ar)# stub
RP/0/RP0/CPU0:router(config-ospf-ar)# default-cost 20
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/4/0/3
```

default-information originate (OSPF)

To generate a default external route into an Open Shortest Path First (OSPF) routing domain, use the **default-information originate** command in the appropriate mode. To disable this feature, use the **no** form of this command.

default-information originate [**always**] [**metric** *metric-value*] [**metric-type** *type-value*] [**route-policy** *policy-name*] [**tag** *tag-value*]
no default-information originate

Syntax Description

always	(Optional) Always advertises the default route regardless of whether the routing table has a default route.
metric *metric-value*	(Optional) Specifies the metric used for generating the default route. The default metric value is 1. Range is 1 to 16777214.
metric-type *type-value*	(Optional) Specifies the external link type associated with the default route advertised into the OSPF routing domain. It can be one of the following values: **1**—Type 1 external route **2**—Type 2 external route
tag *tag-value*	(Optional) 32-bit dotted-decimal value attached to each external route. This is not used by the OSPF protocol itself. It may be used to communicate information between autonomous system boundary routers (ASBRs). If a tag is not specified, then the configured OSPF process number is used.
route-policy *policy-name*	(Optional) Specifies that a routing policy be used and the routing policy name.

Command Default

When you do not use this command in router configuration mode, no default external route is generated into an OSPF routing domain.

metric-value : 1

type-value : 2

tag-value: configured OSPF process number

Command Modes

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Whenever you use the **redistribute** or **default-information originate** command to redistribute routes into an OSPF routing domain, the software automatically becomes an Autonomous System Boundary Router (ASBR). However, an ASBR does not, by default, generate a default route into the OSPF routing domain. The software still must have a default route for itself before it generates one, except when you have specified the **always** keyword.

The **default-information originate** route-policy attach point conditionally injects the default route 0.0.0.0/0 into the OSPF link-state database, and is done by evaluating the attached policy. If any routes specified in the policy exist in the global RIB, then the default route is inserted into the link-state database. If there is no match condition specified in the policy, the policy passes and the default route is generated into the link-state database.

For information about the default-information originate attach point, see the *OSPF Policy Attach Points* section in the *Implementing Routing Policy* chapter in *Routing Configuration Guide for Cisco NCS 5500 Series RoutersRouting Configuration Guide for Cisco NCS 540 Series RoutersRouting Configuration Guide*.

For information about routing policies, see the *Routing Policy Commands* chapter in the *Routing Command Reference Guide*.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to specify a metric of 100 for the default route redistributed into the OSPF routing domain and an external metric type of Type 1:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#router ospf 109
RP/0/RP0/CPU0:router(config-ospf)#redistribute igrp 108 metric 100
RP/0/RP0/CPU0:router(config-ospf)#default-information originate metric 100 metric-type 1
```

default-metric (OSPF)

To set default metric values for routes redistributed from another protocol into the Open Shortest Path First (OSPF) protocol, use the **default-metric** command in the appropriate mode. To return to the default state, use the **no** form of this command.

default-metric *value*
no default-metric *value*

Syntax Description

value	Default metric value appropriate for the specified routing protocol. Range is 1 to 16777214.

Command Default

Built-in, automatic metric translations, as appropriate for each routing protocol.

Command Modes

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **default-metric** command with the **redistribute** command to cause the current routing protocol to use the same metric value for all redistributed routes. A default metric helps solve the problem of redistributing routes with incompatible metrics. Whenever metrics do not convert, use a default metric to provide a reasonable substitute and enable the redistribution to proceed.

The default-metric value configured in OSPF configuration does not apply to connected routes that are redistributed to OSPF using the **redistribute connected** command. To set a non-default metric for connected routes, configure OSPF with the **redistribute connected metric** *metric-value* command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to advertise Intermediate System-to-Intermediate System (IS-IS) protocol-derived routes into OSPF and assign a metric of 10:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# default-metric 10
RP/0/RP0/CPU0:router(config-ospf)# redistribute isis IS-IS_isp
```

demand-circuit (OSPF)

To configure the Open Shortest Path First (OSPF) protocol to treat the interface as an OSPF demand circuit, use the **demand-circuit** command in the appropriate mode. To remove the demand circuit designation from the interface, use the **no** form of this command.

demand-circuit [**disable** | **enable**]
no demand-circuit

Syntax Description

disable	(Optional) Disables the interface as an OSPF demand circuit.
enable	(Optional) Enables the interface as an OSPF demand circuit.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the demand circuit parameter specified by the area.

If this command is not specified in area configuration mode, then the interface adopts the demand circuit parameter specified for the process.

If this command is not specified at any level, then the circuit is not a demand circuit.

Command Modes

Interface configuration

Area configuration

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

On point-to-point interfaces, only one end of the demand circuit must be configured with this command. Periodic hello messages are suppressed and periodic refreshes of link-state advertisements (LSAs) do not flood the demand circuit. Use the **demand-circuit** command to allow the underlying data link layer to be closed when the topology is stable. In point-to-multipoint topology, only the multipoint end must be configured with this command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to set the configuration for an OSPF demand circuit:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
```

```
RP/0/RP0/CPU0:router(config-ospf)# demand-circuit
```

disable-dn-bit-check

To specify that down bits should be ignored, use the **disable-dn-bit-check** command in VPN routing and forwarding (VRF) configuration mode. To specify that down bits should be considered, use the **no** form of this command.

disable-dn-bit-check
no disable-dn-bit-check

Command Default

Down bits are considered.

Command Modes

VRF configuration mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to specify that down bits be ignored:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# vrf v1
RP/0/RP0/CPU0:router(config-ospf-vrf)# disable-dn-bit-check
```

distance (OSPF)

To define an administrative distance, use the **distance** command in an appropriate configuration mode. To remove the **distance** command from the configuration file and restore the system to its default condition in which the software removes a distance definition, use the **no** form of this command.

distance *weight* [*ip-address* *wildcard-mask* [*access-list-name*]]
no **distance** *weight* *ip-address* *wildcard-mask* [*access-list-name*]

Syntax Description

weight	Administrative distance. Range is 10 to 255. Used alone, the *weight* argument specifies a default administrative distance that the software uses when no other specification exists for a routing information source. Routes with a distance of 255 are not installed in the routing table. lists the default administrative distances. Table 43: Default Administrative Distances, on page 317
ip-address	(Optional) IP address in four-part, dotted-decimal notation.
wildcard-mask	(Optional) Wildcard mask in four-part, dotted decimal format. A bit set to 1 in the *mask* argument instructs the software to ignore the corresponding bit in the address value.
access-list-name	(Optional) Name of an IP access list to be applied to incoming routing updates.

Command Default

If this command is not specified, then the administrative distance is the default, as specified in Table 43: Default Administrative Distances, on page 317.

Command Modes

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

An administrative distance is an integer from 10 to 255. In general, the higher the value, the lower the trust rating. An administrative distance of 255 means that the routing information source cannot be trusted at all and should be ignored. Weight values are subjective; no quantitative method exists for choosing weight values.

If an access list is used with this command, it is applied when a network is being inserted into the routing table. This behavior allows you to filter networks based on the IP prefix supplying the routing information. For example, you could filter possibly incorrect routing information from networking devices not under your administrative control.

The order in which you enter **distance** commands can affect the assigned administrative distances in unexpected ways (see the “Examples” section for further clarification).

This table lists default administrative distances.

Table 43: Default Administrative Distances

Route Source	Default Distance
Connected interface	0
Static route out on interface	0
State route to next-hop	1
External BGP	20
OSPF	110
IS-IS	115
RIP version 1 and 2	120
Internal BGP	200
Unknown	255

Task ID

Task ID	Operations
ospf	read, write

Examples

In the following example, the **router ospf** command sets up OSPF routing instance1. The first **distance** command sets the default administrative distance to 255, which instructs the software to ignore all routing updates from networking devices for which an explicit distance has not been set. The second **distance** command sets the administrative distance for all networking devices on the Class C network 192.168.40.0 0.0.0.255 to 90.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# distance 255
RP/0/RP0/CPU0:router(config-ospf)# distance 90 192.168.40.0 0.0.0.255
```

distance ospf

To define Open Shortest Path First (OSPF) route administrative distances based on route type, use the **distance ospf** command in router configuration mode. To restore the default value, use the **no** form of this command.

distance ospf {**intra-area** | **inter-area** | **external**} *distance*
no distance ospf

Syntax Description

intra-area | **inter-area** | **external**	Sets the type of area. It can be one of the following values: **intra-area** —All routes within an area. **inter-area** —All routes from one area to another area. **external** —All routes from other routing domains, learned by redistribution. Any combination of the above areas is allowed.
distance	Route administrative distance.

Command Default

distance : 110

Command Modes

Router configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

You must specify one of the keywords.

Use the **distance ospf** command to perform the same function as the **distance** command used with an access list. However, the **distance ospf** command sets a distance for an entire group of routes, rather than a specific route that passes an access list.

A common reason to use the **distance ospf** command is when you have multiple OSPF processes with mutual redistribution, and you want to prefer internal routes from one over external routes from the other.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to change the external distance to 200, making the route less reliable:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# redistribute ospf 2
RP/0/RP0/CPU0:router(config-ospf)# distance ospf external 200
RP/0/RP0/CPU0:router(config-ospf)# exit
```

```
RP/0/RP0/CPU0:router(config)# router ospf 2
RP/0/RP0/CPU0:router(config-ospf)# redistribute ospf 1
RP/0/RP0/CPU0:router(config-ospf)# distance ospf external 200
```

distribute-list

To filter networks received or transmitted in Open Shortest Path First (OSPF) updates, use the **distribute-list** command in the appropriate mode. To change or cancel the filter, use the **no** form of this command.

distribute-list {*access-list-name* {**in** | **out** [**bgp** *number* | **connected** | **ospf** *instance* | **static**]} | **route-policy** *route-policy-name* **in**}
no distribute-list {*access-list-name* {**in** | **out**} | **route-policy** *route-policy-name* **in**}

Syntax Description

access-list-name	Standard IP access list name. The list defines which networks are to be received and which are to be suppressed in routing updates.
in	Applies the access list or route-policy to incoming routing updates.
out	Applies the access list to outgoing routing updates. The **out** keyword is available only in router configuration mode.
bgp	(Optional) Applies the access list to BGP routes.
connected	(Optional) Applies the access list to connected routes.
ospf	(Optional) Applies the access list to OSPF routes (not the current OSPF process).
static	(Optional) Applies the access list to statically configured routes.
route-policy *route-policy-name*	Specifies the route-policy to filter OSPF prefixes.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the distribute list parameter specified by the area.

If this command is not specified in area configuration mode, then the interface adopts the distribute list parameter specified for the process.

If this command is not specified at any level, then the distribute list is disabled.

Command Modes

Interface configuration

Area configuration

Router configuration

VRF configuration

Multi-area configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **distribute-list** command to limit which OSPF routes are installed on this router. The **distribute-list** command does not affect the OSPF protocol itself.

The **distribute-list in** is configurable at instance (process), area, and interface levels. Regular OSPF configuration inheritance applies. Configuration is inherited from instance > area > interface levels.

Use the **route-policy** *route-policy-name* keyword and argument to allow use of route policies to filter OSPF prefixes.

Note Either an access-list, or a route-policy can be used in a single command, not both. Configuring the command with access-list removes the route-policy configuration, and vice versa.

The "if tag..." statements can be used in **distribute-list in** *route-policy*. The matching on route tag supports operators "eq/ge/is/le". Operator "in" is not supported.

Note When distribute-list ACL or route-policy is modified, OSPF removes all routes from the RIB, and repopulates the RIB. Due to an expected delay in the repopulation of the RIB, there could be traffic disruption.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to prevent OSPF routes from the 172.17.10.0 network from being installed if they are learned in area 0:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# ipv4 access-list 3
RP/0/RP0/CPU0:router(config-ipv4-acl)# deny 172.17.10.0 0.0.0.255
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit any any
!
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-ar)# distribute-list 3 in
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/1/0/3
```

domain-id (OSPF)

To specify the Open Shortest Path First (OSPF) VPN routing and forwarding (VRF) domain ID, use the **domain-id** command in VRF configuration mode. To remove an OSPF VRF domain ID, use the **no** form of this command.

domain-id [**secondary**] **type** [**0005** | **0105** | **0205** | **8005**] **value** *value*
no domain-id [**secondary**] **type** [**0005** | **0105** | **0205** | **8005**] **value** *value*

Syntax Description

secondary	(Optional) OSPF secondary domain ID.
type	Primary OSPF domain ID in hex format.
value *value*	OSPF domain ID value in hex format (six octets).

Command Default

No domain ID is specified.

Command Modes

VRF configuration mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

An OSPF domain id must be explicitly configured. The OSPF domain ID helps OSPF determine how to translate a prefix received through Border Gateway Protocol (BGP) from the remote provider edge (PE). If the domain IDs match, OSPF generates a Type 3 link state advertisement (LSA). If the domain IDs do not match, OSPF generates a Type 5 LSA.

There is only one primary domain ID. There can be multiple secondary domain IDs.

Note When an IOS XR router and an IOS router are configured as peers, the two Domain IDs must match. Manually configure the IOS XR Domain ID value to match the IOS default Domain ID value. This ensures that the routes have route code "OIA" because they are learned as inter-area routes. If the Domain IDs do not match, the routes have route code, "O-E2" because they are learned as external routes. Use the **show ip ospf** command to get the OSPF Domain ID from the IOS router. Then, set the IOS XR Domain ID to the same value using the **domain-id** command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to specify a domain ID:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf o1
RP/0/RP0/CPU0:router(config-ospf)# vrf v1
RP/0/RP0/CPU0:router(config-ospf-vrf)# domain-id type 0105 value AABBCCDDEEFF
```

domain-tag

To specify the Open Shortest Path First (OSPF) VPN routing and forwarding (VRF) domain tag, use the **domain-tag** command in VRF configuration mode. To remove an OSPF VRF domain tag, use the **no** form of this command.

domain-tag *tag*
no domain-tag

Syntax Description

tag	OSPF domain tag as a 32-bit value. The valid range is 0 to 4294967295.

Command Default

No OSPF VRF domain tag is specified.

Command Modes

VRF configuration mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The domain tag is added to any Type 5 link state advertisements (LSAs) generated as a result of VPN-IP routes received from Border Gateway Protocol (BGP). The domain-tag is derived from BGP autonomous system number (ASN).

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to specify the domain tag:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf o1
RP/0/RP0/CPU0:router(config-ospf)# domain-tag 234
```

exchange-timer

To set a time limit to prevent an indefinite EXCHANGE or LOADING phase during adjacency formation, use the **exchange-timer** command in router configuration mode.

exchange-timer *exchange-time-in-minutes* **hold-time** *hold-time-in-minutes* **recovery-count** *recovery-count*

Syntax Description

exchange-time-in-minutes	Duration in minutes, after which the OSPF interface state is brought down if adjacencies remain in the exchange/loading phase on that interface. The range is from 1 to 35791394. The default value is 10.
hold-time	Specifies the option to set the time after which a recovery attempt will be made.
hold-time-in-minutes	Duration in minutes until which the OSPF interface state is kept in the down state before attempting recovery once it was made down due to exchange-timeout. The range is from 1 to 35791394. The default value is 5 minutes.
recovery-count	Specifies the number of attempts the router makes to bring up the adjacency toward the ASBR before keeping the adjacency shut indefinitely.
recovery-count	The maximum number of retries that a router undertakes to restore the OSPF state of an interface before it is considered to be permanently down. Once this limit is surpassed, the OSPF state of the interface remains down until it is manually reset, as outlined in the subsequent recovery section. The recovery count value resets to the default value of 300 when the interface adjacency reaches the FULL state with the neighbor. The range is from 1 to 4294967294. The default value is 300.

Command Default

The exchange timer operates using its default values.

Command Modes

Router Configuration

Command History

Release	Modification
Release 7.10.1	This command was introduced.

Usage Guidelines

- To adjust the default parameters of the exchange timer, you can use the **exchange-timer** command. We recommend configuring this command with values that suit your specific scale requirements.

  By default, the exchange timer is enabled with the following default values:

  - Default Exchange Time: 10 minutes

- Default Hold Time: 5 minutes
- Default Recovery Count: 300

These default values have been chosen to ensure that the interface remains operational for an extended period before being permanently brought down. The total duration for attempting recovery is calculated as follows:

```
(Exchange Time + Hold Time) * Recovery Count = 3.125 days
```

- To recover a permanently disabled interface:

  Option 1:

  1. Shut down the permanently disabled interface (**shutdown** command).
  2. Bring up the interface (**no shutdown** command).

  Option 2:

  1. Remove the interface from OSPF.
  2. Add the interface again to OSPF.

Task ID

Task ID	Operation
OSPF	read, write

Example

The following example shows how to set a time limit to prevent an indefinite EXCHANGE or LOADING phase during adjacency formation.

```
Router(config)# router ospf 1
Router(config-ospf)# exchange-timer 357913 hold-time 35791 recovery-count 4294967294
```

fast-reroute (OSPFv2)

To enable IP fast reroute loop-free alternate (LFA) computation, use the **fast-reroute** command in the appropriate OSPF configuration mode. To disable the IP fast reroute loop-free alternate computation, use the **no** form of this command.

To disable loop-free alternate computation that is enabled on a higher level, use the **fast-reroute** command with **disable** keyword.

fast-reroute {**per-link** | **per-prefix**} [**disable**]
no fast-reroute

Syntax Description

per-link	Enables per-link loop-free alternate computation.
per-prefix	Enables per-prefix loop-free alternate computation.
disable	(Optional) Disables loop-free alternate computation that was enabled on a higher level.

Command Default

IP fast-reroute LFA computation is disabled.

Command Modes

Area configuration

Interface configuration

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Only one mode of computation can be configured on an interface - per-link or per-prefix. Different modes of computations can be enabled on different interfaces; one set of interface using per-link and other set using per-prefix computation. Based on the outgoing interface of the primary path, per-link or per-prefix backup path will be computed.

Task ID

Task ID	Operation
ospf	read, write

This example shows how to enable per-link computation of loop-free alternates under interface POS 0/3/0/0:

```
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/3/0/0
```

```
RP/0/RP0/CPU0:router(config-ospf-ar-if)# fast-reroute per-link
```

This example shows how to enable per-prefix computation of loop-free alternates under area 0:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#router ospf 1
RP/0/RP0/CPU0:router(config-ospf)#area 0
RP/0/RP0/CPU0:router(config-ospf-ar)#fast-reroute per-prefix
```

This example shows how to disable computation of loop-free alternates that was configured under area 0:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#router ospf 1
RP/0/RP0/CPU0:router(config-ospf)#area 0
RP/0/RP0/CPU0:router(config-ospf-ar)#fast-reroute per-prefix
RP/0/RP0/CPU0:router(config-ospf-ar)#interface HundredGigE 0/3/0/0
RP/0/RP0/CPU0:router(config-ospf-ar-if)#fast-reroute disable
```

fast-reroute per-link exclude interface

To excludes specified interface to be used as a backup during (IPFRR) loop-free alternate (LFA) computation, use the **fast-reroute per-link exclude interface** command, in the appropriate OSPF configuration mode. To disable this feature, use the **no** form of this command.

fast-reroute per-link exclude interface *type interface-path-id*
no fast-reroute per-link exclude interface *type interface-path-id*

Syntax Description

type	Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

No interfaces are excluded.

Command Modes

Interface configuration

Area configuration

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to exclude an interface from IP fast reroute loop-free alternate (LFA) computation:

```
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf-ar-if)# fast-reroute per-link exclude interface HundredGigE
 0/3/2/1
```

fast-reroute per-prefix exclude interface (OSPFv2)

To exclude interface to be used as a backup path from fast-reroute loop-free alternate per-prefix computation, use the **fast-reroute per-prefix exclude interface** command in the appropriate OSPF configuration mode. To disable this feature, use the **no** form of this command.

fast-reroute per-prefix exclude interface *type interface-path-id*
no fast-reroute per-prefix exclude interface *type interface-path-id*

Syntax Description

type	Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

No interfaces are excluded.

Command Modes

Interface configuration

Area configuration

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Backup paths via the excluded interfaces will not be computed.

Task ID

Task ID	Operation
ospf	read, write

This example shows how to exclude interface POS0/6/0/1 from being used as a backup path:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#router ospf 100
RP/0/RP0/CPU0:router(config-ospf)#fast-reroute per-prefix exclude interface HundredGigE
0/6/0/1
```

fast-reroute per-prefix use-candidate-only (OSPFv2)

To restrict the backup interfaces to those that are present on the LFA candidate list, use the **fast-reroute per-prefix use-candidate-only** command in router OSPF configuration mode. To disable this feature, use the **no** form of this command.

fast-reroute per-prefix use-candidate-only [**enable** | **disable**]
fast-reroute per-prefix use-candidate-only

Syntax Description

enable	Enables backup selection from candidate-list only.
disable	Disables backup selection from candidate-list only.

Command Default

Disabled.

Command Modes

Router OSPF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
ospf	read, write

This example shows how to restrict the backup interfaces to those that are present on the LFA candidate list:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#router ospf 100
RP/0/RP0/CPU0:router(config-ospf)#fast-reroute per-prefix use-candidate-only
```

flood-reduction (OSPF)

To suppress the unnecessary flooding of link-state advertisements (LSAs) in stable topologies, use the **flood-reduction** command in the appropriate mode. To remove this functionality from the configuration, use the **no** form of this command.

flood-reduction [**enable** | **disable**]
no flood-reduction [**enable** | **disable**]

Syntax Description

enable	(Optional) Turns on this functionality at a specific level.
disable	(Optional) Turns off this functionality at a specific level.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the flood reduction parameter specified by the area.

If this command is not specified in area configuration mode, then the interface adopts the flood reduction parameter specified for the process.

If this command is not specified at any level, then flood reduction is disabled.

Command Modes

Interface configuration

Area configuration

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

All routers supporting the OSPF demand circuit are compatible and can interact with routers supporting flooding reduction.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to reduce the flooding of unnecessary LSAs for area 0:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/1/0/3
RP/0/RP0/CPU0:router(config-ospf-ar-if)# flood-reduction
```

hello-interval (OSPF)

To specify the interval between consecutive hello packets that are sent on the Open Shortest Path First (OSPF) interface, use the **hello-interval** command in the appropriate mode. To return to the default time, use the **no** form of this command.

hello-interval *seconds*
no hello-interval

Syntax Description

seconds	Interval (in seconds). The value must be the same for all nodes on a specific network. Range is 1 to 65535.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the hello interval parameter specified by the area.

If this command is not specified in area configuration mode, then the interface adopts the hello interval parameter specified for the process.

If this command is not specified at any level, then the hello interval is 10 seconds (broadcast) or 30 seconds (non-broadcast).

Command Modes

Interface configuration

Area configuration

Router configuration

Virtual-link configuration

VRF configuration

Multi-area configuration

Sham-link configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The hello interval value is advertised in the hello packets. The shorter the hello interval, the faster topological changes are detected, but more routing traffic occurs. This value must be the same for all routers and access servers on a specific network.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to set the interval between hello packets to 15 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/1/0/1
RP/0/RP0/CPU0:router(config-ospf-ar-if)# hello-interval 15
```

ignore lsa mospf

To suppress the sending of syslog messages when the router receives link-state advertisement (LSA) Type 6 multicast Open Shortest Path First (MOSPF) packets, which are unsupported, use the **ignore lsa mospf** command in an appropriate configuration mode. To restore the sending of syslog messages, use the **no** form of this command.

ignore lsa mospf
no ignore lsa mospf

This command has no keywords or arguments.

Command Default

When you do not specify this command in router configuration mode, each MOSPF packet received by the router causes the router to send a syslog message.

Command Modes

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Cisco routers do not support LSA Type 6 (MOSPF), and they generate syslog messages if they receive such packets. If the router is receiving many MOSPF packets, you might want to configure the router to ignore the packets and thus prevent a large number of syslog messages.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure the router to suppress the sending of syslog messages when it receives MOSPF packets:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# ignore lsa mospf
```

interface (OSPF)

To define the interfaces on which the Open Shortest Path First (OSPF) protocol runs, use the **interface** command in area configuration mode. To disable OSPF routing for interfaces, use the **interface** form of this command.

interface *type* *interface-path-id*
no interface *type* *interface-path-id*

Syntax Description

type	Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or virtualinterface. **Note** se the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

When you do not specify this command in configuration mode, OSPF routing for interfaces is not enabled.

Command Modes

Area configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **interface** command to associate a specific interface with an area. The interface remains associated with the area even when the IP address of the interface changes.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how the OSPF routing process 109 defines four OSPF areas (0, 2, 3, and 10.9.50.0), and associates an interface with each area:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 109
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 4/0/0/3
!
RP/0/RP0/CPU0:router(config-ospf)# area 2
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/1/0/3
!
RP/0/RP0/CPU0:router(config-ospf)# area 3
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 3/0/0/2
```

```
!
RP/0/RP0/CPU0:router(config-ospf)# area 10.9.50.0
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 3/0/0/1
```

log adjacency changes (OSPF)

To configure the router to send a syslog message when the state of an Open Shortest Path First (OSPF) neighbor changes, use the **log adjacency changes** command in XR Config mode. To turn off this function, use the **disable** keyword. To log all state changes, use the **detail** keyword.

log adjacency changes {**detail** | **disable**}

Syntax Description

detail	Provides all (DOWN, INIT, 2WAY, EXSTART, EXCHANGE, LOADING, FULL) adjacency state changes.
disable	Disables sending adjacency change messages.

Command Default

The router sends a syslog message when the state of an OSPF neighbor changes.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **log adjacency changes** command to display high-level changes to the state of the peer relationship. Configure this command if you want to know about OSPF neighbor changes.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure the software to send a syslog message for any OSPF neighbor state changes:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 109
RP/0/RP0/CPU0:router(config-ospf)# log adjacency changes detail
```

loopback stub-network

To enable advertising loopback as stub networks, use the **loopback stub-network** command in an appropriate configuration mode. To disable advertising loopback as stubnetworks, use the **no** form of this command.

loopback stub-network [**enable** | **disable**]
no loopback stub-network

Syntax Description

enable	(Optional) Enables advertising loopbacks as stub networks.
disable	(Optional) Disables advertising loopbacks as stub networks.

Command Default

By default, OSPF advertises loopbacks as stub hosts.

Command Modes

OSPF interface configuration

OSPF router configuration

OSPF area configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

In the interface submode, the command can be enabled only on loopback interfaces.

Task ID

Task ID	Operation
ospf	read, write

Examples

The following example shows how to enable advertising loopback as a stub network, under OSPF interface configuration:

```
RP/0/RP0/CPU0:router(config)#router ospf 100
RP/0/RP0/CPU0:router(config-ospf)#loopback stub-network enable
```

max external-lsa

To specify the maximum number of external LSAs that the router will accept from a neighbor, use the **max-external-lsa** command in router configuration mode.

max-external-lsa *lsa-limit* *logging-threshold-percentage* [**suppress-neighbor** | **warning-only**]

Syntax Description

lsa-limit	Specifies the maximum number of external LSAs that a router will accept from a neighbor. If the neighbor sends more than the specified number of LSAs, the adjacency will be brought down and kept down for a specified interval. The range is from 1 to 4294967294. The default value is 50,000.
logging-threshold-percentage	Specifies the percentage of the total number of external LSAs from an ASBR at which a warning log is given. The default value is 75.
suppress-neighbor	Specifies that the link towards an ASBR be brought down if the ASBR is the immediate neighbor. This option is enabled by default.
warning-only	Specifies the option to overwrite the suppress-neighbor behavior. If the **warning-only** keyword is configured instead of **suppress-neighbor** keyword, the link to the ASBR is not brought down when the limit of external LSAs is reached. Only alert logs is given.

Command Default

If the command is not configured, the ASBR does not monitor unsuccessful adjacencies towards other ASBRs caused by the ASBR reaching the configured maximum limit for external Link State Advertisements (LSAs). Additionally, the ASBR does not incorporate a counter that, upon reaching the specified number of attempts to establish adjacency, causes the neighbor to cease further efforts, triggering permanent adjacency downtime.

Command Modes

Router Configuration

Command History

Release	Modification
Release 7.10.1	This command was introduced.

Usage Guidelines

We recommend configuring this command with values that suit your specific scale requirements.

Task ID

Task ID	Operation
OSPF	read, write

Example

The following example show how to configure the maximum number of external LSAs, the warning log percentage, and the link-down option for an OSPF router.

```
Router(config)# router ospf 1
Router(config-ospf)# area 0
Router(config-ospf-ar)# max-external-lsa 50000 suppress-neighbor
```

max-lsa

To limit the number of nonself-generated link-state advertisements (LSAs) that an Open Shortest Path First (OSPF) routing process can keep in the OSPF link-state database (LSDB), use the **max-lsa** command in XR Config mode. To remove the limit of non self-generated LSAs that an OSPF routing process can keep in the OSPF LSDB, use the **no** form of this command.

max-lsa *max* [*threshold*] [**warning-only**] [**ignore-time** *value*] [**ignore-count** *value*] [**reset-time** *value*]
no max-lsa *max* [*threshold*] [**warning-only**] [**ignore-time** *value*] [**ignore-count** *value*] [**reset-time** *value*]

Syntax Description

max	Maximum number of nonself-generated LSAs the OSPF process can keep in the OSPF LSBD. The default is 500000 LSAs.
threshold	(Optional) The percentage of the maximum LSA number, as specified by the maximum-number argument, at which a warning message is logged. The default is 75 percent.
warning-only	(Optional) Specifies that only a warning message is sent when the maximum limit for LSAs is exceeded. Disabled by default.
ignore-time *value*	(Optional) Specifies the time, in minutes, to ignore all neighbors after the maximum limit of LSAs has been exceeded. The default is 5 minutes.
ignore-count *value*	(Optional) Specifies the number of times the OSPF process can consecutively be placed into the ignore state. The default is 5 times.
reset-time *value*	(Optional) Specifies the time, in minutes, after which the ignore count is reset to zero. The default is 2 times **ignore-time** .

Command Default

Disabled

Command Modes

XR Config mode

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

This command allows you to protect the OSPF routing process from the large number of received LSAs that can result from a misconfiguration on another router in the OSPF domain (for example, the redistribution of a large number of IP prefixes to OSPF).

When this feature is enabled, the router keeps count of the number of all received (nonself-generated) LSAs. When the configured *threshold* value is reached, an error message is logged. When the configured *max* number of received LSAs is exceeded, the router stops accepting new LSAs.

If the count of received LSAs is higher than the configured *max* number after one minute, the OSPF process disables all adjacencies in the given context and clears the OSPF database. This state is called the ignore state. In this state, all OSPF packets received on all interfaces belonging to the OSPF instance are ignored and no OSPF packets are generated on its interfaces. The OSPF process remains in the ignore state for the duration of the configured **ignore-time** . When the **ignore-time** expires, the OSPF process returns to normal operation and starts building adjacencies on all its interfaces.

To prevent the OSPF instance from endlessly oscillating between its normal state and the ignore state, as a result of the LSA count immediately exceeding the *max* number again after it returns from the ignore state, the OSPF instance keeps a count of how many times it has been in the ignore state. This counter is called the **ignore-count** . If the **ignore-count** exceeds its configured value, the OSPF instance remains in the ignore state permanently.

To return the OSPF instance to its normal state, you must issue the **clear ip ospf** command. The **ignore-count** is reset to zero if the LSA count does not exceed the *max* number again during the time configured by the **reset-time** keyword.

If you use the **warning-only** keyword, the OSPF instance never enters the ignore state. When LSA count exceeds the *max* number, the OSPF process logs an error message and the OSPF instance continues in its normal state operation.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure the OSPF instance to accept 12000 nonself-generated LSAs in the global routing table, and 1000 nonself-generated LSAs in VRF V1.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 0
RP/0/RP0/CPU0:router(config-ospf)# max-lsa 12000
RP/0/RP0/CPU0:router(config-ospf)# vrf V1
RP/0/RP0/CPU0:router(config-ospf)# max-lsa 1000
```

The following example shows how to display the current status of the OSPF instance:

```
RP/0/RP0/CPU0:router# show ospf 0

  Routing Process "ospf 0" with ID 10.0.0.2
  NSR (Non-stop routing) is Disabled
  Supports only single TOS(TOS0) routes
  Supports opaque LSA
  It is an area border router
  Maximum number of non self-generated LSA allowed 12000
     Current number of non self-generated LSA 1
     Threshold for warning message 75%
     Ignore-time 5 minutes, reset-time 10 minutes
     Ignore-count allowed 5, current ignore-count 0
```

max-metric

To configure the Open Shortest Path First (OSPF) protocol to signal other networking devices not to prefer the local router as an intermediate hop in their shortest path first (SPF) calculations, use the **max-metric** command in XR Config mode. To disable this function, use the **no** form of this command.

max-metric router-lsa [**external-lsa** *overriding metric*] [**include-stub**] [**on-proc-migration**] [**on-proc-restart**] [**on-startup**] [**on-switchover**] [**wait-for-bgp**] [**summary-lsa**]
no max-metric router-lsa

Syntax Description

router-lsa	Always originates router link-state advertisements (LSAs) with the maximum metric.
external-lsa *overriding metric*	(Optional) Overrides the external-lsa metric with the max-metric value.The *overriding metric* argument specifies the number of in-summary-LSAs. The range is 1 to 16777215>. The default is 16711680.
include-stub	(Optional) Advertises stub links in router-LSA with the max-metric value (0xFFFF).
on-proc-migration *time*	(Optional) Sets the maximum metric temporarily after a process migration to originate router-LSAs with the max-metric value. The *time* range is 5 to 86400 seconds.
on-proc-restart *time*	(Optional) Sets the maximum metric temporarily after a process restart to originate router-LSAs with the max-metric value. The *time* range is 5 to 86400 seconds.
on-startup *time*	(Optional) Sets the maximum metric temporarily after a reboot to originate router-LSAs with the max-metric value. The *time* range is 5 to 86400 seconds.
on-switchover *time*	(Optional) Sets the maximum metric temporarily after a switchover to originate router-LSAs with the max-metric value. The *time* range is 5 to 86400 seconds. **Note** OSPF will not populate maximum metric on the router's generated LSAs, when the OSPF routing process is configured to support Nonstop Routing (NSR) or Nonstop Forwarding/Graceful restart (NSF/GR).
wait-for-bgp	(Optional) Causes OSPF to originate router LSAs with the maximum metric and allows Border Gateway Protocol (BGP) to decide when to start originating router LSAs with a normal metric instead of the maximum metric.
summary-lsa	(Optional) specifies the number of in summary-LSAs. The range is 1 to 16777215. The default is 16711680.

Command Default

Router LSAs are originated with normal link metrics.

overriding-metric :16711680

Command Modes

XR Config mode

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **max-metric** command to cause the software to originate router LSAs with router link metrics set to LSInfinity (0XFFFF). This feature can be useful in Internet backbone routers that run both OSPF and BGP because OSPF converges more quickly than BGP and may begin attracting traffic before BGP has converged, resulting in dropped traffic.

If this command is configured, the router advertises its locally generated router LSAs with a metric of 0XFFFF. This action allows the router to converge but not attract transit traffic if there are better, alternative paths around this router. After the specified *announce-time* value or notification from BGP has expired, the router advertises the local router LSAs with the normal metric (interface cost).

If this command is configured with the **on-startup** keyword, then the maximum metric is temporarily set only after reboot is initiated. If this command is configured without the **on-startup** keyword, then the maximum metric is permanently used until the configuration is removed.

If the **include-stub** keyword is enabled, the stub-links in the router LSA will be sent with the max-metric. If the **summary-lsa** keyword is enabled, all self-generated summary LSAs will have a metric set to 0xFF0000, unless the metric value is specified with the max-metric value parameter. If the **external-lsa** keyword is enabled, all self-generated external LSAs will have a metric set to 0xFF0000, unless the metric value is specified with the max-metric value parameter.

This command might be useful when you want to connect a router to an OSPF network, but do not want real traffic flowing through it if there are better, alternative paths. If there are no alternative paths, this router still accepts transit traffic as before.

Some cases where this command might be useful are as follows:

- During a router reload, you prefer that OSPF wait for BGP to converge before accepting transit traffic. If there are no alternative paths, the router still accepts transit traffic.
- A router is in critical condition (for example, it has a very high CPU load or does not have enough memory to store all LSAs or build the routing table).
- When you want to gracefully introduce or remove a router to or from the network.
- When you have a test router in a lab, connected to a production network.

Note For older OSPF implementations (RFC 1247), router links in received router LSAs with a metric and cost of LSInfinity are not used during SPF calculations. Hence, no transit traffic is set to the routers originating such router LSAs.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure OSPF to originate router LSAs with the maximum metric until BGP indicates that it has converged:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 109
RP/0/RP0/CPU0:router(config-ospf)# max-metric router-lsa on-startup wait-for-bgp
```

maximum interfaces (OSPF)

To limit the number of interfaces that can be configured for an Open Shortest Path First (OSPF) process, use the **maximum interfaces** command in the appropriate mode. To return to the default limit, use the **no** form of this command.

maximum interfaces *number-interfaces*
no maximum interfaces

Syntax Description

number-interfaces	Number of interfaces. Range is 1 to 4294967295.

Command Default

If the command is not specified, the default is 1024.

Command Modes

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **maximum interface** command to increase or decrease the limit on the number of interfaces configured for an OSPF process.

You cannot configure a limit lower than the number of interfaces currently configured for the OSPF process. To lower the limit, remove interfaces from the OSPF configuration until the number of configured interfaces is at or below the desired limit. You may then apply the new, lower limit.

Task ID

Task ID	Operations
ospf	read, write

Examples

This example shows how to configure a maximum interface limit of 1500 on a router:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 109
RP/0/RP0/CPU0:router(config-ospf)# maximum interfaces 1500
```

maximum paths (OSPF)

To control the maximum number of parallel routes that the Open Shortest Path First (OSPF) protocol can support, use the **maximum paths** command in an appropriate configuration mode. To remove the **maximum paths** command from the configuration file and restore the system to its default condition with respect to the routing protocol, use the **no** form of this command.

maximum paths *maximum-routes-number*
no maximum paths

Syntax Description

maximum-routes-number Maximum number of parallel routes that OSPF can install in a routing table. Range is 1 to 64.

Note The maximum number of paths that can be configured is 64.

Command Default

The default value for maximum-paths depends on the platform supported maximum-paths value. 32 paths

Command Modes

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The default value for maximum-path depends on the platform supported maximum-path value. Any custom value you define for the maximum-path parameter must be within the maximum value supported by platform. The configuration will be rejected if the value you have specified is more then what the platform supports.

When the maximum number of parallel routes is reduced, all existing paths are pruned and paths reinstalled at the new maximum number. During this route-reduction period, you may experience some packet loss for a few seconds. This may impact route traffic.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to allow a maximum of two paths to a destination:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 109
RP/0/RP0/CPU0:router(config-ospf)# maximum paths 2
```

maximum redistributed-prefixes (OSPF)

To limit the aggregate number of prefixes that can be redistributed into an Open Shortest Path First (OSPF) process, use the **maximum redistributed-prefix** command in the appropriate mode. To return to the default limit, use the **no** form of this command.

maximum redistributed-prefixes *maximum* [*threshold-value*] [**warning-only**]
no maximum redistributed-prefixes

Syntax Description

maximum	Number of routes. Range is 1 to 4294967295.
threshold-value	(Optional) Threshold value (as a percentage) at which to generate a warning message. Range is 1 to 100.
warning-only	(Optional) Gives only a warning when the limit is exceeded.

Command Default

If the command is not specified, the default is 10000.

The threshold value defaults to 75 percent.

Command Modes

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.
Release 7.9.1	• Support for the maximum redistributed-prefixes limit was added for the prefixes redistributed as Type-3 LSAs. • Support for counting only the number of redistributed prefixes instead of the number of LSAs was added. (If multiple prefixes are aggregated in an LSA using the summary-prefix command, individual prefixes will be counted)

Usage Guidelines

- Use the **maximum redistributed-prefixes** command to increase or decrease the maximum number of prefixes (also referred to as routes) redistributed for an OSPF process.

  If the maximum value specified is less than the existing number of redistributed prefixes, then the prefixes are reset and the redistribution is restarted.

- Starting Cisco IOS XR Software Release 7.9.1, when the maximum redistributed-prefixes (OSPF)command is used to create aggregate LSAs for the routes redistributed into OSPF, each individual redistributed prefix mapped under the subnet advertised in the LSA is counted instead of the number of LSAs. For example, if 5 redistributed prefixes are aggregated by one LSA using the **summary-prefix** command, only the number of redistributed prefixes, which is 5 in this case, is counted and not the number of LSAs, which is 1.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure a maximum number of routes that can be redistributed for an OSPF routing process:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 109
RP/0/RP0/CPU0:router(config-ospf)# maximum redistributed-prefixes 15000
```

message-digest-key

To specify a key used with Open Shortest Path First (OSPF) Message Digest 5 (MD5) authentication, use the **message-digest-key** command in the appropriate mode. To remove an old MD5 key, use the **no** form of this command.

message-digest-key *key-id* **md5** {*key* | **clear** *key* | **encrypted** *key*}
no message-digest-key *key-id*

Syntax Description

key-id	Key number. Range is 1 to 255.
md5	Enables OSPF MD5 authentication.
key	Alphanumeric string of up to 16 characters.
clear	Specifies that the key be clear text.
encrypted	Specifies that the key be encrypted using a two-way algorithm.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the message digest key parameter specified by the area.

If this command is not specified in area configuration mode, then the interface adopts the message digest key parameter specified for the process.

If this command is not specified at any level, then OSPF MD5 authentication is disabled.

Command Modes

Interface configuration

Area configuration

XR Config mode

Virtual-link configuration

VRF configuration

Multi-area configuration

Sham-link configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Usually, one key individual interface is used to generate authentication information when packets are sent and to authenticate incoming packets. The same key identifier on the neighbor router must have the same *key* value.

For authentication to be enabled, you must configure the **message-digest-key** command together with the **authentication** command and its **message-digest** keyword. Both the **message-digest-key** and **authentication** commands can be inherited from a higher configuration level.

The process of changing keys is as follows. Suppose the current configuration is:

```
interface HundredGigE 0/3/0/2
 message-digest-key 100 md5 OLD
```

You change the configuration to the following:

```
interface HundredGigE 0/3/0/2
 message-digest-key 101 md5 NEW
```

The system assumes its neighbors do not have the new key yet, so it begins a rollover process. It sends multiple copies of the same packet, each authenticated by different keys. In this example, the system sends out two copies of the same packet—the first one authenticated by key 100 and the second one authenticated by key 101.

Rollover allows neighboring routers to continue communication while the network administrator is updating them with the new key. Rollover stops after the local system finds that all its neighbors know the new key. The system detects that a neighbor has the new key when it receives packets from the neighbor authenticated by the new key.

After all neighbors have been updated with the new key, the old key should be removed. In this example, you would enter the following:

```
interface ethernet 1
 no ospf message-digest-key 100
```

Then, only key 101 is used for authentication on interface 1.

We recommend that you not keep more than one key individual interface. Every time you add a new key, you should remove the old key to prevent the local system from continuing to communicate with a hostile system that knows the old key. Removing the old key also reduces overhead during rollover.

Note The MD5 key is always stored in encrypted format on the router. The **clear** and **encrypted** keywords inform the router whether the value that is entered is encrypted or unencrypted.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to set a new key 19 with the password *8ry4222* :

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 109
RP/0/RP0/CPU0:router(config-ospf)# area 0

RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/1/0/1
```

```
RP/0/RP0/CPU0:router(config-ospf-ar-if)# message-digest-key 19 md5 8ry4222
```

mpls ldp auto-config (OSPF)

To enable Label Distribution Protocol (LDP)-Interior Gateway Protocol (IGP) interface automatic configuration, use the **mpls ldp auto-config** command in the appropriate mode. To disable LDP-IGP interface automatic configuration, use the **no** form of this command.

mpls ldp auto-config
no mpls ldp auto-config

Command Default

LDP-IGP interface automatic configuration is disabled for OSPF.

Command Modes

Interface configuration

Area configuration

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to enable LDP-IGP interface automatic configuration:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf o1
RP/0/RP0/CPU0:router(config-ospf)# mpls ldp auto-config
```

mpls ldp sync (OSPF)

To enable Label Distribution Protocol (LDP)-Interior Gateway Protocol (IGP) synchronization, use the **mpls ldp sync** command in the appropriate mode. To disable LDP-IGP synchronization, use the **no** form of this command.

mpls ldp sync [**disable**]
no mpls ldp sync

Syntax Description

disable	(Optional) Disables MPLS LDP synchronization from within the OSPF interface and area configuration submodes only. For the OSPF router configuration mode, use the **no** form of the command.

Command Default

LDP-IGP synchronization is disabled for OSPF.

Command Modes

Interface configuration

Area configuration

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to enable LDP-IGP synchronization:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf o1
RP/0/RP0/CPU0:router(config-ospf)# mpls ldp sync
```

mtu-ignore (OSPF)

To prevent Open Shortest Path First (OSPF) from checking whether neighbors are using the same maximum transmission unit (MTU) on a common interface when exchanging database descriptor (DBD) packets, use the **mtu-ignore** command in the appropriate mode. To reset to default, use the **no** form of this command.

mtu-ignore [**disable** | **enable**]
no mtu-ignore

Syntax Description

disable	(Optional) Enables checking for whether OSPF neighbors are using the MTU on a common interface.
enable	(Optional) Disables checking for whether OSPF neighbors are using the MTU on a common interface.

Command Default

The default is **mtu-ignore** with no keywords, which disables MTU checking.

If this command is not specified in interface configuration mode,

then the interface adopts the MTU ignore parameter specified by the area.

If this command is not specified in area configuration mode,

then the interface adopts the MTU ignore parameter specified for the process.

If this command is not specified at any level,

then OSPF checks the MTU received from neighbors when exchanging DBD packets.

Command Modes

Interface configuration

Area configuration

XR Config mode

VRF configuration

Multi-area configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

OSPF checks whether OSPF neighbors are using the same MTU on a common interface. This check is performed when neighbors exchange DBD packets. If the receiving MTU in the DBD packet is higher than the MTU configured on the incoming interface, OSPF adjacency is not established.

The keywords, **disable** and **enable** , do not need to be used. If no keywords are used, the **mtu-ignore** command disables MTU checking. You can then use the **no mtu-ignore** command to activate MTU checking.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to disable MTU mismatch detection on receiving DBD packets:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 109
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/1/0/3
RP/0/RP0/CPU0:router(config-ospf-ar-if)# mtu-ignore
```

multi-area-interface

To enable multiple adjacencies for different Open Shortest Path First (OSPF) areas and enter multi-area interface configuration mode, use the **multi-area-interface** command in the area configuration mode. To reset to the default, use the **no** form of this command.

multi-area-interface *type* *interface-path-id*
no multi-area-interface *type* *interface-path-id*

Syntax Description

type	Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

An OSPF network is enabled for one area only.

Command Modes

Area configuration

Command History

Release	Modification
Release 24.2.1	The command is extended to support loopback interfaces.
Release 6.0	This command was introduced.

Usage Guidelines

Use the **multi-area-interface** command to enable area border routers (ABRs) to establish multiple adjacencies for different OSPF areas.

Each multiple area adjacency is announced as a point-to-point unnumbered link in the configured area. This point-to-point link provides a topological path for that area. The first or primary adjacency using the link advertises the link consistent with draft-ietf-ospf-multi-area-adj-06.txt.

You can configure multi-area adjacency on any interface where only two OSF speakers are attached. In the case of native broadcast networks, the interface must be configured as an OPSF point-to-point type using the **network point-to-point** command to enable the interface for a multi-area adjacency.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to enable multiple area adjacency for OSPF 109:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 109
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/1/0/3
RP/0/RP0/CPU0:router(config-ospf-ar-if)# area 1
RP/0/RP0/CPU0:router(config-ospf-ar)# multi-area-interface HundredGigE 0/1/0/3
RP/0/RP0/CPU0:router(config-ospf-ar-mif)# ?

    authentication       Enable authentication
    authentication-key   Authentication password (key)
    commit               Commit the configuration changes to running
    cost                 Interface cost
    database-filter      Filter OSPF LSA during synchronization and flooding
    dead-interval        Interval after which a neighbor is declared dead
    describe             Describe a command without taking real actions
    distribute-list      Filter networks in routing updates
    do                   Run an exec command
    exit                 Exit from this submode
    hello-interval       Time between HELLO packets
    message-digest-key   Message digest authentication password (key)
    mtu-ignore           Enable/Disable ignoring of MTU in DBD packets
    no                   Negate a command or set its defaults
    packet-size          Customize size of OSPF packets upto MTU
    pwd                  Commands used to reach current submode
    retransmit-interval  Time between retransmitting lost link state advertisements
    root                 Exit to the global configuration mode
    show                 Show contents of configuration
    transmit-delay       Estimated time needed to send link-state update packet
RP/0/RP0/CPU0:router(config-ospf-ar-mif)#
```

The following example shows how to configure, associate, and reuse a loopback IPv4 interface address for all areas in an ABR:

```
Router(config)#interface Loopback 0
Router(config-if)#ipv4 address 192.0.2.2/32
Router(config-if)#commit

Router(config)#router ospf 100
Router(config-ospf)#router-id 10.10.10.1
Router(config-ospf)#area 1
Router(config-ospf-ar)#interface Loopback 0
Router(config-ospf-ar-if)#commit

Router(config)#router ospf 100
Router(config-ospf)#router-id 10.10.10.1
Router(config-ospf)#area 0
Router(config-ospf-ar)#multi-area-interface Loopback 0
Router(config-ospf-ar-mif)#commit
```

neighbor (OSPF)

To configure Open Shortest Path First (OSPF) routers interconnecting to nonbroadcast networks, use the **neighbor** command in interface configuration mode. To remove a configuration, use the **no** form of this command.

neighbor *ip-address* [**cost** *number*] [**priority** *number*] [**poll-interval** *seconds*]
no neighbor *ip-address* [**cost** *number*] [**priority** *number*] [**poll-interval** *seconds*]

Syntax Description

ip-address	Interface IP address of the neighbor.
cost *number*	(Optional) Assigns a cost to the neighbor, in the form of an integer from 1 to 65535. Neighbors with no specific cost configured assume the cost of the interface, based on the **cost** command. On point-to-multipoint interfaces, **cost** *number* is the only keyword and argument combination that works. The **cost** keyword does not apply to nonbroadcast multiaccess (NBMA) networks.
priority *number*	(Optional) Specifies an 8-bit number indicating the router priority value of the nonbroadcast neighbor associated with the IP address specified. The **priority** keyword does not apply to point-to-multipoint interfaces.
poll-interval *seconds*	(Optional) Specifies an unsigned integer value (in seconds) reflecting the poll interval. RFC 1247 recommends that this value be much larger than the hello interval. The **poll-interval** keyword does not apply to point-to-multipoint interfaces.

Command Default

No configuration is specified.

priority *number* : 0

poll-interval *seconds* : 120 seconds (2 minutes)

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

You must include one neighbor entry in the software configuration for each known nonbroadcast network neighbor. The neighbor address must be on the primary address of the interface.

If a neighboring router has become inactive (hello packets have not been received for the router dead interval period), it may still be necessary to send hello packets to the dead neighbor. These hello packets are sent at a reduced rate called the *poll interval*.

When the router starts up, it sends only hello packets to those routers with nonzero priority; that is, routers that are eligible to become designated routers (DRs) and backup designated routers (BDRs). After the DR and BDR are selected, the DR and BDR start sending hello packets to all neighbors to form adjacencies.

To filter all outgoing OSPF link-state advertisement (LSA) packets for the neighbor, use the **neighbor database-filter all out** command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to declare a router at address 172.16.3.4 on a nonbroadcast network, with a priority of 1 and a poll interval of 180 seconds:

```
RP/0/RP0/CPU0:router(config-ospf-ar-if)# neighbor 172.16.3.4 priority 1 poll-interval 180
```

The following example illustrates a network with nonbroadcast:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface HundredGigE 1/0/0/3
RP/0/RP0/CPU0:router(config-if)# ip address 172.16.3.10 255.255.255.0

RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 1/0/0/3
RP/0/RP0/CPU0:router(config-ospf-ar-if)# network nonbroadcast
RP/0/RP0/CPU0:router(config-ospf-ar-if)# neighbor 172.16.3.4 priority 1 poll-interval 180

RP/0/RP0/CPU0:router(config-ospf-ar-if)# neighbor 172.16.3.5 cost 10 priority 1
poll-interval 180
RP/0/RP0/CPU0:router(config-ospf-ar-if)# neighbor 172.16.3.6 cost 15 priority 1
poll-interval 180
RP/0/RP0/CPU0:router(config-ospf-ar-if)# neighbor 172.16.3.7 priority 1 poll-interval 180
```

neighbor database-filter all out

To filter all outgoing link-state advertisements (LSAs) to an Open Shortest Path First (OSPF) neighbor, use the **neighbor database-filter all out** command in interface configuration mode. To restore the forwarding of LSAs to the neighbor, use the **no** form of this command.

neighbor *ip-address* **database-filter all out**
no neighbor *ip-address* **database-filter all out**

Syntax Description

ip-address	IP address of the neighbor to which outgoing LSAs are blocked.

Command Default

Instead of all outgoing LSAs being filtered to the neighbor, they are flooded to the neighbor.

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **neighbor database-filter all out** command to filter all outgoing OSPF LSA packets during synchronization and flooding for point-to-multipoint neighbors on nonbroadcast networks. More neighbor options are available with the **neighbor** command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to prevent flooding of OSPF LSAs from point-to-multipoint networks to the neighbor at IP address 10.2.3.4:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 1/0/0/3
RP/0/RP0/CPU0:router(config-ospf-ar-if)# neighbor 10.2.3.4 database-filter all out
```

network (OSPF)

To configure the Open Shortest Path First (OSPF) network type to a type other than the default for a given medium, use the **network** command in the appropriate mode. To return to the default value, use the **no** form of this command.

network {**broadcast** | **non-broadcast** | {**point-to-multipoint** [**non-broadcast**] | **point-to-point**}}
no network

Syntax Description

broadcast	Sets the network type to broadcast.
non-broadcast	Sets the network type to nonbroadcast multiaccess (NBMA).
point-to-multipoint	Sets the network type to point-to-multipoint.
non-broadcast	(Optional) Sets the point-to-multipoint network to be nonbroadcast. If you use this keyword, the **neighbor** command is required.
point-to-point	Sets the network type to point-to-point.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the network parameter specified by the area.

If this command is not specified in area configuration mode, then the interface adopts the network parameter specified for the process.

If this command is not specified at any level, then the OSPF network type is the default of the given medium.

TenGigEthernet interfaces default to broadcast.

Command Modes

Interface configuration

Area configuration

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **network** command to configure broadcast networks as NBMA networks when, for example, routers in your network do not support multicast addressing.

Configuring NBMA networks as either broadcast or nonbroadcast assumes that there are virtual circuits from every router to every router or fully meshed network. However, there are other configurations where this assumption is not true; for example, a partially meshed network. In these cases, you can configure the OSPF network type as a point-to-multipoint network. Routing between two routers that are not directly connected go through the router that has virtual circuits to both routers. You need not configure neighbors when using this command.

If this command is issued on an interface that does not allow it, this command is ignored.

OSPF has two features related to point-to-multipoint networks. One feature applies to broadcast networks; the other feature applies to nonbroadcast networks:

- On point-to-multipoint, broadcast networks, you can use the **neighbor** command, and you must specify a cost to that neighbor.
- On point-to-multipoint, nonbroadcast networks, you must use the **neighbor** command to identify neighbors. Assigning a cost to a neighbor is optional.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure the OSPF network as a nonbroadcast network:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/1/0/3
RP/0/RP0/CPU0:router(config-ospf-ar-if)# network non-broadcast
RP/0/RP0/CPU0:router(config-ospf-ar-if)# neighbor 172.16.3.4 priority 1 poll-interval 180
```

nsf (OSPF)

To configure nonstop forwarding (NSF) for the Open Shortest Path First (OSPF) protocol, use the **nsf** command in the appropriate mode. To remove this command from the configuration file and restore the system to its default condition, use the **no** form of this command.

nsf {**cisco** [**enforce global**] | **ietf** [**helper disable**]}
no nsf {**cisco** [**enforce global**] | **ietf** [**helper disable**]}

Syntax Description

cisco	Enables Cisco Nonstop Forwarding.
enforce global	(Optional) Cancels NSF restart when non-NSF network device neighbors are detected.
ietf	Enables Internet Engineering Task Force (IETF) graceful restart.
helper disable	(Optional) Disables router helper support.

Command Default

NSF is disabled.

Command Modes

XR Config mode

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The NSF feature allows for the forwarding of data packets to continue along known routes while routing protocol information (such as OSPF) is being restored following a switchover.

Use the **nsf** command if the router is expected to perform NSF during restart. To experience the full benefits of this feature, configure all neighboring routers with NSF.

When this command is used without the optional **cisco enforce global** keywords and non-NSF neighbors are detected, the NSF restart mechanism aborts on the interfaces of those neighbors and functions properly on others.

When this command is used with the optional **cisco enforce global** keywords and non-NSF neighbors are detected, NSF restart is canceled for the entire OSPF process.

IETF graceful restart provides an NSF mechanism to allow data traffic to flow seamlessly with no packet drops during the transient period when OSPF attempts to recover after a process restart or RP failover, within the guidelines of RFC 3623.

By default, neighbors in helper mode listen to both the NSF Cisco- and NSF IETF-type LSAs. The **nsf** command enables one type of mechanism that would undergo an RP failover or, anticipating an OSPF process restart. If the **cisco** or **ietf** keyword is not entered, NSF is not enabled, irrespective of neighbors in listening mode for both NSF Cisco and NSF IETF.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to cancel NSF restart for the entire OSPF process if non-NSF neighbors are detected on any network interface during restart:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# nsf cisco enforce global
```

nsf flush-delay-time (OSPF)

To configure the maximum time allowed for nonstop forwarding (NSF) external route queries for the Open Shortest Path First (OSPF) protocol, use the **nsf flush-delay-time** command in the appropriate mode. To remove this command from the configuration file and restore the system to its default condition, use the **no** form of this command.

nsf flush-delay-time *seconds*
no nsf flush-delay-time *seconds*

Syntax Description

seconds	Length of time (in seconds) allowed for NSF external route queries. Range is 1 to 3600 seconds.

Command Default

seconds : 300

Command Modes

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure the maximum time for NSF to learn external routes for OSPF at 60 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# nsf flush-delay-time 60
```

nsf interval (OSPF)

To configure the minimum time between consecutive nonstop forwarding (NSF) restart attempts for the Open Shortest Path First (OSPF) protocol, use the **nsf interval** command in the appropriate mode. To remove this command from the configuration file and restore the system to its default condition, use the **no** form of this command.

nsf interval *seconds*
no nsf interval *seconds*

Syntax Description

seconds	Length of time (in seconds) between consecutive restart attempts. Range is 90 to 3600 seconds.

Command Default

seconds : 90

Command Modes

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

When you use the **nsf interval** command, the OSPF process must be up for at least 90 seconds before OSPF attempts to perform an NSF restart.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure the minimum time between consecutive NSF restart attempts at 120 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:routerr(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# nsf interval 120
```

nsf lifetime (OSPF)

To configure the maximum time that routes are held in the Routing Information Base (RIB) following an Open Shortest Path First (OSPF) process restart, use the **nsf lifetime** command in the appropriate mode. To remove this command from the configuration file and restore the system to its default condition, use the **no** form of this command.

nsf lifetime *seconds*
no nsf lifetime *seconds*

Syntax Description

seconds	The length of time (in seconds) that routes are held in the RIB. Range is 90 to 3600 seconds.

Command Default

seconds : 95

Command Modes

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

When you use this command, the OSPF process must reconverge within the maximum length of time configured. If the convergence exceeds this length of time, routes are purged from RIB and nonstop forwarding (NSF) restart may fail.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure the maximum lifetime for OSPF NSF at 120 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# nsf lifetime 120
```

nssa (OSPF)

To configure an area as a not-so-stubby area (NSSA), use the **nssa** command in area configuration mode. To remove the NSSA distinction from the area, use the **no** form of this command.

nssa [**no-redistribution**] [**default-information-originate** [**metric** *metric-value*] [**metric-type** *type-value*]] [**no-summary**]
no nssa

Syntax Description

no-redistribution	(Optional) Imports routes only into the normal areas, but not into the NSSA area, by the **redistribute** command when the router is an NSSA Area Border Router (ABR).
default-information-originate	(Optional) Generates a Type 7 default into the NSSA area. This keyword takes effect only on an NSSA ABR or NSSA Autonomous System Boundary Router (ASBR).
metric *metric-value*	(Optional) Specifies the metric used for generating the default route. If you omit a value and do not specify a value using the **defaultmetric** command, the default metric value is 10. Range is 1 to 16777214.
metric-type *type-value*	(Optional) Specifies the external link type associated with the default route advertised into the OSPF routing domain. It can be one of the following values: **1**—Type 1 external route **2**—Type 2 external route
no-summary	(Optional) Prevents an ABR from sending summary link advertisements into the NSSA.

Command Default

No NSSA area is defined.

Command Modes

Area configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

An NSSA does not flood Type 5 external LSAs from the core into the area, but can import autonomous system external routes in a limited fashion within the area.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure area 1 as an NSSA area:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# area 1
RP/0/RP0/CPU0:router(config-ospf-ar)# nssa
```

ospf name-lookup

To configure the Open Shortest Path First (OSPF) protocol to look up Domain Name System (DNS) names, use the **ospf name-lookup** command in XR Config mode. To disable this function, use the **no** form of this command.

ospf name-lookup
no ospf name-lookup

Command Default

Routers are displayed by router ID or neighbor ID.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **ospf name-lookup** command to easily identify a router when executing all OSPF **show** command displays. The router is displayed by name rather than by its router ID or neighbor ID.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure OSPF to identify a router by name:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# ospf name-lookup
```

packet-size (OSPF)

To configure the size of Open Shortest Path First (OSPF) packets up to the size specified by the maximum transmission unit (MTU), use the **packet-size** command in the appropriate configuration mode. To disable this function and reestablish the default packet size, use the **no** form of this command.

packet-size *bytes*
no packet-size

Syntax Description

bytes	Size, in bytes. Range is 576 to 10000 bytes.

Command Default

If the command is not specified, the default packet size is either the interface IP MTU size (if that is lower than 9000 bytes) or 9000 bytes.

Command Modes

XR Config mode

Area configuration

Interface configuration

VRF configuration

Multi-area configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **packet-size** command to customize the size of OSPF packets. The OSPF protocol compares the packet size and the MTU size and uses the lower packet size value.

If the command is not configured, the default packet size is equal to the interface IP MTU size (if that is lower than 9000 bytes) or 9000 bytes. For example, if the interface IP MTU size is 1500 bytes, OSPF uses packet size of 1500 bytes on the interface because the byte size is lower than 9000 bytes. If the interface IP MTU size is 9500 bytes, OSPF uses packet size of 9000 bytes on the interface because the byte size exceeds 9000 bytes. The interface IP MTU size depends on the interface and the platform. In most cases, the default interface IP MTU value will be lower than 9000 bytes.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure the packet size on an interface:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# area 0
```

```
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 1/0/0/2
RP/0/RP0/CPU0:router(config-ospf-ar-if)# packet-size 3500
```

passive (OSPF)

To suppress the sending of Open Shortest Path First (OSPF) protocol operation on an interface, use the **passive** command in the appropriate mode. To remove the passive configuration, use the **no** form of this command.

passive [**disable** | **enable**]
no passive

Syntax Description

disable	(Optional) Sends OSPF updates.
enable	(Optional) Disables sending OSPF updates.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the passive parameter specified by the area.

If this command is not specified in area configuration mode, then the interface adopts the passive parameter specified for the process.

If this command is not specified at any level, then the passive parameter is disabled and OSPF updates are sent on the interface.

Command Modes

Interface configuration

Area configuration

XR Config mode

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

OSPF routing information is neither sent nor received through the specified interface. The interface appears as a stub network in the OSPF router (Type 1) link-state advertisement (LSA).

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows that GigabitEthernet interface 1/0/0/2 reduces OSPF updates because passive mode is enabled; however, HundredGigE interface 0/1/0/3 receives normal OSPF traffic flow:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 1/0/0/2
```

```
RP/0/RP0/CPU0:router(config-ospf-ar-if)# passive
RP/0/RP0/CPU0:router(config-ospf-ar-if)# exit
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 1/0/0/3
RP/0/RP0/CPU0:router(config-ospf-ar-if)# end
```

priority (OSPF)

To set the router priority for an interface, which helps determine the designated router for an Open Shortest Path First (OSPF) link, use the **priority** command in the appropriate mode. To return to the default value, use the **no** form of this command.

priority *value*
no priority *value*

Syntax Description

value	8-bit unsigned integer indicating the router priority value. Range is 0 to 255.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the priority parameter specified by the area.

If this command is not specified in area configuration mode, then the interface adopts the priority parameter specified for the process.

If this command is not specified at any level, then the default priority is 1.

Command Modes

Interface configuration

Area configuration

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

When two routers attached to a network both attempt to become the designated router, the one with the higher router priority takes precedence. If there is a tie, the router with the higher router ID takes precedence. A router with a router priority set to zero is ineligible to become the designated router or backup designated router. Router priority is configured only for interfaces to multiaccess networks (in other words, not point-to-point networks).

This priority value is used when you configure the Open Shortest Path First (OSPF) protocol for nonbroadcast networks using the **neighbor** command for OSPF.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows that priority is set through the **priority** and **neighbor** commands for Routers A and B and that the neighbor priority value must reflect that of the neighbor router:

```
Router A
  RP/0/RP0/CPU0:router# configure
  RP/0/RP0/CPU0:router(config)# interface HundredGigE 0/1/0/1
  RP/0/RP0/CPU0:router(config-if)# ipv4 address 10.0.0.2 255.255.255.0
  RP/0/RP0/CPU0:router(config-if)# exit
  RP/0/RP0/CPU0:router(config)# router ospf 1
  RP/0/RP0/CPU0:router(config-ospf)# area 0
  RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/1/0/1
  RP/0/RP0/CPU0:router(config-ospf-ar-if)# network non-broadcast
  RP/0/RP0/CPU0:router(config-ospf-ar-if)# priority 4
  RP/0/RP0/CPU0:router(config-ospf-ar-if)# neighbor 10.0.0.1 priority 6

Router B
  RP/0/RP0/CPU0:router# configure
  RP/0/RP0/CPU0:router(config)# interface HundredGigE POS 0/2/0/1
  RP/0/RP0/CPU0:router(config-if)# ipv4 address 10.0.0.1 255.255.255.0
  RP/0/RP0/CPU0:router(config-if)# exit
  RP/0/RP0/CPU0:router(config)# router ospf 1
  RP/0/RP0/CPU0:router(config-ospf)# area 0
  RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/2/0/1
  RP/0/RP0/CPU0:router(config-ospf-ar-if)# network non-broadcast
  RP/0/RP0/CPU0:router(config-ospf-ar-if)# priority 6
  RP/0/RP0/CPU0:router(config-ospf-ar-if)# neighbor 10.0.0.2 priority 4
```

protocol shutdown

To disable an instance of the Open Shortest Path First (OSPF) protocol so that it cannot form an adjacency on any interface, use the **protocol shutdown** command in the XR Config mode. To reenable the OSPF protocol, use the **no** form of this command.

protocol shutdown
no protocol shutdown

Command Default

No default behavior or values

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **protocol shutdown** command to disable the OSPF protocol for a specific routing instance without removing any existing OSPF configuration parameters.

The OSPF protocol continues to run on the router and you can use the current OSPF configuration, but OSPF does not form any adjacencies on any interface.

This command is similar to performing the **no router ospf** command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to disable the OSPF 1 instance:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospf)# protocol shutdown
```

queue dispatch flush-lsa

To change the number of LSAs scheduled (rate-limited) for flushing, that are processed in each iteration, use the **queue dispatch flush-lsa** command in XR Config mode. To return to the system default value, use the **no** form of this command.

queue dispatch flush-lsa *count*
no queue dispatch flush-lsa

Syntax Description

count	Maximum number of LSAs flushed per run. Range is 30 to 3000.

Command Default

The default LSAs flushed per run is 150 (when the count is not configured).

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to limit the number of LSAs flushed per run to 30:

```
RP/0/RP0/CPU0:router(config-ospf)# queue dispatch flush-lsa 30
```

Use the show ospf message-queue, on page 427 command to see the queue dispatch values, peak lengths, and limits.

queue dispatch incoming

To limit the number of incoming packets (LSAUpdates, LSAcks, DBDs, LSRequests, and Hellos that trigger a change state) processed, use the **queue dispatch incoming** command in XR Config mode. To return to the system default value, use the **no** form of this command.

queue dispatch incoming *count*
no queue dispatch incoming

Syntax Description

count	Maximum number of continuous events processed. Range is 30 to 3000.

Command Default

The default incoming count is 300 packets (when the count is not configured).

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how limit the number of incoming packets processed to 500:

```
RP/0/RP0/CPU0:router(config-ospf)# queue dispatch incoming 500
```

Use the show ospf message-queue, on page 427 command to see the queue dispatch values, peak lengths, and limits.

queue dispatch rate-limited-lsa

To set the maximum number of rate-limited link-state advertisement (LSA) (re-)originations processed per run, use the **queue dispatch rate-limited-lsa** command in XR Config mode. To return to the system default value, use the **no** form of this command.

queue dispatch rate-limited-lsa *count*
no queue dispatch rate-limited-lsa

Syntax Description

count	Maximum number of rate-limited LSAs processed per run. Range is 30 to 3000.

Command Default

The default number of rate-limited LSAs processed per run is 300 (when this count is not configured).

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to set the maximum number of rate-limited LSA (re-)originations processed per run to 300:

```
RP/0/RP0/CPU0:router(config-ospf)# queue dispatch rate-limited-lsa 300
```

queue dispatch spf-lsa-limit

To change the maximum number of Type 3-4 and Type 5-7 link-state advertisements (LSAs) processed per shortest path first (SPF) iteration within a single SPF run, use the **queue dispatch spf-lsa-limit** command in XR Config mode. To return to the system default value, use the **no** form of this command.

queue dispatch spf-lsa-limit *count*
no queue dispatch spf-lsa-limit

Syntax Description

count	Maximum number of continuous Type 3-4 and Type 5-7 LSAs processed per SPF in each scheduled iteration within a single SPF run. Range is 30 to 3000.

Command Default

The default number of Type 3-4 and Type 5-7 processed per run is 150 LSAs (when this command is not configured).

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to limit the number of continuous Type 3-4 and Type 5-7 LSAs processed by SPF per scheduling run, to 100:

```
RP/0/RP0/CPU0:router(config-ospf)# queue dispatch spf-lsa-limit 100
```

queue limit

To set the high watermark for incoming events by priority, use the **queue limit** in XR Config mode. To return to the system default values, use the **no** form of this command.

queue limit {**high** | **medium** | **low**} *count*
no queue limit {**high** | **medium** | **low**}

Syntax Description

high	High watermark for incoming high-priority events (state-changing Hellos).
medium	High watermark for incoming medium-priority events (LSA ACK).
low	High watermark for incoming low-priority events (DBD/LSUpd/LSReq).
count	Maximum number of events per queue. Events are dropped when the priority queue size exceeds this value. Range is 1000 to 30000.

Command Default

High watermark: 9500 (when the corresponding configuration is not present).

Medium watermark: 9000 (when the corresponding configuration is not present).

Low watermark: 8000 (when the corresponding configuration is not present).

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Always keep the limits in the following order of priority:

Limit for High > Limit for Medium > Limit for Low

Task ID

Task ID	Operations
ospf	read, write

Examples

The following examples show how to set the maximum number of events per queue:

```
RP/0/RP0/CPU0:router(config-ospf)# queue limit high 11000
RP/0/RP0/CPU0:router(config-ospf)# queue limit medium 10000
RP/0/RP0/CPU0:router(config-ospf)# queue limit low 9000
```

range (OSPF)

To consolidate and summarize routes at an area boundary, use the **range** command in area configuration mode. To disable this function, use the **no** form of this command.

range *ip-address mask* [**advertise** | **not-advertise**]
no range *ip-address mask* [**advertise** | **not-advertise**]

Syntax Description

ip-address	IP address in four-part, dotted-decimal notation.
mask	IP address mask.
advertise	(Optional) Sets the address range status to advertise and generates a Type 3 summary link-state advertisement (LSA).
not-advertise	(Optional) Sets the address range status to DoNotAdvertise. The Type 3 summary LSA is suppressed and the component networks remain hidden from other networks.

Command Default

When this command is not specified for Area Border Routers (ABRs), routes at an area boundary are not consolidated or summarized.

Advertise is the default.

Command Modes

Area configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **range** command only with Area Border Router (ABRs). Use the command to consolidate or summarize routes for an area. The result is that a single summary route is advertised to other areas by the ABR. Routing information is condensed at area boundaries. External to the area, a single route is advertised for each address range. This process is called *route summarization* .

Multiple range configurations specifying the **range** command can be configured. Thus, the OSPF protocol can summarize addresses for many different sets of address ranges.

The summarized route uses the maximum cost of the routes assumed in the range.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows area 36.0.0.0 consisting of interfaces whose IP addresses have “10.31.x.x” as the first two octets. The **range** command summarizes interfaces. Instead of advertising eight networks individually, the single route 10.31.0.0 255.255.0.0 is advertised:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 201
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-ar-if)# interface HundredGigE 0/3/0/2
!
RP/0/RP0/CPU0:router(config-ospf)# area 36.0.0.0
RP/0/RP0/CPU0:router(config-ospf-ar)# range 10.31.0.0 255.255.0.0
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/1/0/0
RP/0/RP0/CPU0:router(config-ospf-ar-if)# interface HundredGigE 0/1/0/0
RP/0/RP0/CPU0:router(config-ospf-ar-if)# interface HundredGigE 0/1/0/1
RP/0/RP0/CPU0:router(config-ospf-ar-if)# interface HundredGigE 0/1/0/2
RP/0/RP0/CPU0:router(config-ospf-ar-if)# interface HundredGigE 0/1/0/3
RP/0/RP0/CPU0:router(config-ospf-ar-if)# interface HundredGigE 0/2/0/0
RP/0/RP0/CPU0:router(config-ospf-ar-if)# interface HundredGigE 0/2/0/1
RP/0/RP0/CPU0:router(config-ospf-ar-if)# interface HundredGigE 0/2/0/2
RP/0/RP0/CPU0:router(config-ospf-ar-if)# interface HundredGigE 0/2/0/3
RP/0/RP0/CPU0:router(config-ospf-ar-if)# end
```

redistribute (OSPF)

To redistribute routes from one routing domain into Open Shortest Path First (OSPF), use the **redistribute** command in the appropriate mode. To remove the **redistribute** command from the configuration file and restore the system to its default condition in which the software does not redistribute routes, use the **no** form of this command.

Border Gateway Protocol (BGP)
redistribute bgp *process-id* [**preserve-med**] [**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**route-policy** *policy-name*] [**tag** *tag-value*]
no redistribute bgp *process-id* [**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**route-policy** *policy-name*] [**tag** *tag-value*]

Local Interface Routes
redistribute connected [**instance** *instance-name*] [**instance IPCP**][**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**route-policy** *policy-name*] [**tag** *tag-value*]
no redistribute connected [**instance** *instance-name*] [**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**route-policy** *policy-name*] [**tag** *tag-value*]

Directed-attached gateway redundancy (DAGR)
redistribute dagr [**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**route-policy** *policy-name*] [**tag** *tag-value*]
no redistribute dagr [**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**route-policy** *policy-name*] [**tag** *tag-value*]

Intermediate System-to-Intermediate System (IS-IS)
redistribute isis *process-id* [**level-1** | **level-2** | **level-1-2**] [**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**route-policy** *policy-name*] [**tag** *tag-value*]
no redistribute isis *process-id* [**level-1** | **level-2** | **level-1-2**] [**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**route-policy** *policy-name*] [**tag** *tag-value*]

Open Shortest Path First (OSPF)
redistribute ospf *process-id* [**match** {**external** [**1** | **2**] | **internal** | **nssa-external** [**1** | **2**]}] [**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**route-policy** *policy-name*] [**tag** *tag-value*]
no redistribute ospf *process-id* [**match** {**external** [**1** | **2**] | **internal** | **nssa-external** [**1** | **2**]}] [**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**route-policy** *policy-name*] [**tag** *tag-value*]

Routing Information Protocol (RIP)
redistribute rip [**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**route-policy** *policy-name*] [**tag** *tag-value*]
no redistribute rip [**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**route-policy** *policy-name*] [**tag** *tag-value*]

IP Static Routes
redistribute static [**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**route-policy** *policy-name*] [**tag** *tag-value*]
no redistribute static [**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**route-policy** *policy-name*] [**tag** *tag-value*]

Lsa-type summary
redistribute *protocol* [**lsa-type**]
summary

Syntax Description

bgp	Distributes routes from the BGP protocol.
process-id	For the **bgp** keyword, an autonomous system number has the following ranges: • Range for 2-byte Autonomous system numbers (ASNs) is 1 to 65535. • Range for 4-byte Autonomous system numbers (ASNs) in asplain format is 1 to 4294967295. • Range for 4-byte Autonomous system numbers (ASNs) is asdot format is 1.0 to 65535.65535. For the **isis** keyword, an IS-IS instance name from which routes are to be redistributed. The value takes the form of a string. A decimal number can be entered, but it is stored internally as a string. For the **ospf** keyword, an OSPF instance name from which routes are to be redistributed. The value takes the form of a string. A decimal number can be entered, but it is stored internally as a string.
preserve-med	(Optional) Preserves the Multi Exit Discriminator (MED) of BGP routes.
metric *metric-value*	(Optional) Specifies the metric used for the redistributed route. Range is 1 to 16777214. Use a value consistent with the source protocol.
metric-type { **1** | **2** }	(Optional) Specifies the external link type associated with the route advertised into the OSPF routing domain. It can be one of two values: • **1** —Type 1 external route • **2** —Type 2 external route
tag *tag-value*	(Optional) Specifies the value attached to each external route. This value is not used by the OSPF protocol itself, but is carried in the external LSAs. Range is 0 to 4294967295.
route-policy *policy-name*	(Optional) Specifies the identifier of a configured policy. A policy is used to filter the importation of routes from this source routing protocol to OSPF.
connected	Distributes routes that are established automatically by virtue of having enabled IP on an interface.
instance	Connected instance.
instance-name	Name of the connected instance.
instance IPCP	Distributes routes from IPCP protocols.
isis	Distributes routes from the IS-IS protocol.
level-1	(Optional) Redistributes Level 1 routes into other IP routing protocols independently.

l **evel-1-2**	(Optional) Distributes both Level 1 and Level 2 routes into other IP routing protocols.
level-2	(Optional) Distributes Level 2 routes into other IP routing protocols independently.
ospf	Distributes routes from the OSPF protocol.
match { **internal** | **external [1** | **2**] | **nssa-external** [**1** | **2]** }	(Optional) Specifies the criteria by which OSPF routes are redistributed into other routing domains. It can be one or more of the following: • **internal** —Routes that are internal to a specific autonomous system (intra- and inter-area OSPF routes). • **external** [**1 | 2**]—Routes that are external to the autonomous system, but are imported into OSPF as Type 1 or Type 2 external routes. • **nssa-external** [**1 | 2**]—Routes that are external to the autonomous system, but are imported into OSPF as Type 1 or Type 2 not-so-stubby area (NSSA) external routes. For the **external** and **nssa-external** options, if a type is not specified, then both Type 1 and Type 2 are assumed. If no match is specified, the default is no filtering.
rip	Distributes routes from the RIP protocol.
static	Distributes IP static routes.
dagr	Distributes routes from the directed-attached gateway redundancy (DAGR).
lsa-type	LSA type for redistributed routes.

Command Default

Route redistribution is disabled.

metric *metric-value:* Default is 20 for routes from all protocols except BGP routes, for which the default is 1.

metric-type : Type 2 external route.

Command Modes

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Note When redistributing routes (into OSPF) using both command keywords for setting or matching of attributes and a route policy, the routes are run through the route policy first, followed by the keyword matching and setting.

Redistributed routing information should always be filtered by the **policy** *policy-name* keyword and argument. This filtering ensures that only those routes intended by the administrator are redistributed into OSPF.

For information about routing policies, see the *Routing Policy Commands on Router Routing Command Reference Guide*.

Whenever you use the **redistribute** or default-information originate (OSPF), on page 310 command to redistribute routes into an OSPF routing domain, the router automatically becomes an ASBR. However, an ASBR does not, by default, generate a default route into the OSPF routing domain.

When routes are redistributed between OSPF processes, no OSPF metrics are preserved.

When routes are redistributed into OSPF and no metric is specified with the **metric** keyword, OSPF uses 20 as the default metric for routes from all protocols except BGP routes, which get a metric of 1.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to cause BGP routes to be redistributed into an OSPF domain:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 110
RP/0/RP0/CPU0:router(config-ospf)# redistribute bgp 100
```

The following example shows how to redistribute the specified IS-IS process routes into an OSPF domain. The IS-IS routes are redistributed with a metric of 100.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 109
RP/0/RP0/CPU0:router(config-ospf)# redistribute isis 108 metric 100
```

In the following example, network 10.0.0.0 appears as an external link-state advertisement (LSA) in OSPF 1:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface HundredGigE 0/1/0/1
RP/0/RP0/CPU0:router(config-if)# ip address 10.0.0.0 255.0.0.0
!
RP/0/RP0/CPU0:router(config)# interface HundredGigE 0/2/0/2
RP/0/RP0/CPU0:router(config)# ip address 10.99.0.0 255.0.0.0
!
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# redistribute ospf 2
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/2/0/2
!
RP/0/RP0/CPU0:router(config)# router ospf 2
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/1/0/1
```

The following example displays the configuration of the **redistribute** *protocol* **lsa-type summary** command to redistribute the routes from particular protocol as Type-3 summary LSAs:

```
Router# config
Router(config)#router ospf 1
Router(config-ospf)#redistribute static lsa-type summary
Router(config-ospf)#summary-in
Router(config-ospf)#commit
```

retransmit-interval (OSPF)

To specify the time between link-state advertisement (LSA) retransmissions for adjacencies belonging to the Open Shortest Path First (OSPF) interface, use the **retransmit-interval** command in the appropriate mode. To return to the default value, use the **no** form of this command.

retransmit-interval *seconds*
no retransmit-interval

Syntax Description

seconds	Time (in seconds) between retransmissions. It must be greater than the expected round-trip delay between any two routers on the attached network. Range is 1 to 65535 seconds.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the retransmit interval parameter specified by the area.

If this command is not specified in area configuration mode, then the interface adopts the retransmit interval parameter specified for the process.

If this command is not specified at any level, then the default retransmit interval is 5 seconds.

Command Modes

Interface configuration

Area configuration

XR Config mode

Virtual-link configuration

VRF configuration

Multi-area configuration

Sham-link configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

When a router sends an LSA to its neighbor, it keeps the LSA until it receives the acknowledgment message. If the router receives no acknowledgment, it resends the LSA.

The setting of this parameter should be conservative, or needless retransmission results. The value should be larger for serial lines and virtual links.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to set the retransmit interval value to 8 seconds in interface configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 201
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/2/0/1
RP/0/RP0/CPU0:router(config-ospf-ar-if)# retransmit-interval 8
```

route-policy (OSPF)

To specify a routing policy to filter Type 3 link-state advertisements (LSA), use the **route-policy** command in area configuration mode. To disable the routing policy, use the **no** form of this command.

route-policy *route-policy-name* {**in** | **out**}
no route-policy *route-policy-name* {**in** | **out**}

Syntax Description

route-policy-name	Name of route policy.
in	Applies policy to inbound routes.
out	Applies policy to outbound routes.

Command Default

No policy is applied.

Command Modes

Area configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **route-policy** command to specify an OSPF routing policy for an inbound or outbound route. The policy can be used to filter routes or modify route attributes.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to specify an OSPF route policy for inbound routes in area 0:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 109
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-area)# route-policy area0_in in
```

router-id (OSPF)

To configure a router ID for the Open Shortest Path First (OSPF) process, use the **router-id** command in the appropriate mode. To cause the software to use the default method of determining the router ID, use the **no** form of this command after clearing or restarting the OSPF process.

router-id router-id
no router-id router-id

Syntax Description

router-id	32-bit router ID value specified in four-part, dotted-decimal notation.

Command Default

If this command is not configured, the router ID is the highest IP version 4 (IPv4) address for an interface on the router, with any loopback interface taking precedence.

Command Modes

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

It is good practice to use the **router-id** command to explicitly specify a unique 32-bit numeric value for the router ID. This action ensures that OSPF can function regardless of the interface address configuration. Clear the OSPF process using the **clear ospf process** command or restart the OSPF process for the **no router-id** command to take effect.

OSPF attempts to obtain a router ID in the following ways (in order of preference):

1. By default, when the OSPF process initializes, it checks if there is a router-id in the checkpointing database.
2. The 32-bit numeric value specified by the OSPF **router-id** command in router configuration mode. (This value can be any 32-bit value. It is not restricted to the IPv4 addresses assigned to interfaces on this router, and need not be a routable IPv4 address.)
3. The ITAL selected router-id.
4. The primary IPv4 address of an interface over which this OSPF process is running. The first interface address in the OSPF interface is selected.

Note Unlike OSPF version 3, OSPF version 2 is guaranteed to have at least one interface with an IPv4 address configured.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to assign the IP address of 172.20.10.10 to the OSPF process 109:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 109
RP/0/RP0/CPU0:router(config-ospf)# router-id 172.20.10.10
```

router ospf (OSPF)

To configure an Open Shortest Path First (OSPF) routing process, use the **router ospf** command in XR Config mode. To terminate an OSPF routing process, use the **no** form of this command.

router ospf *process-name*
no router ospf *process-name*

Syntax Description

process-name	Name that uniquely identifies an OSPF routing process. The process name is any alphanumeric string no longer than 40 characters without spaces.

Command Default

No OSPF routing process is defined.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

You can specify multiple OSPF routing processes in each router. Up to 10 processes can be configured. The recommendation is not to exceed 4 OSPF processes.

All OSPF configuration commands must be configured under an OSPF routing process. For example, two of these commands are the **default-metric** command and the **router-id** command.

Task ID

Task ID	Operations
ospf	read, write
rib	read, write

Examples

The following example shows how to instantiate an OSPF routing process called 109:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 109
```

security ttl (OSPF)

To set the security time-to-live (TTL) value in the IP header for Open Shortest Path First (OSPF) packets, use the **security ttl** command in the appropriate configuration mode. To remove this command from the configuration file and restore the system to its default condition, use the **no** form of this command.

security ttl [**hops** *hops-number*]
no security ttl

Syntax Description

hops *hops-number*	IP hops. Maximum number of hops allowed. Range is 1 to 254 hops.

Command Default

hops-number : 1

Command Modes

XR Config mode

Area configuration

Interface configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The **security ttl** command is used for the Generalized TTL Security Mechanism (GTSM) feature to prevent network attacks.

During the act of receiving Link State Advertisement (LSA) from neighbors, network attacks can occur because there are no checks that unicast or multicast packets are originating from a neighbor that is one hop away or multiple hops away over virtual links.

For virtual links, OSPF packets travel multiple hops across the network; hence, the TTL value can be decremented several times. For these type of links, a minimum TTL value must be allowed and accepted for multiple-hop packets.

To filter network attacks originating from invalid sources traveling over multiple hops, the GTSM, RFC 3682, is used to prevent the attacks. GTSM filters link-local addresses and allows for only one-hop neighbor adjacencies through the configuration of TTL value 255. The TTL value in the IP header is set to when OSPF packets are originated and checked on the received OSPF packets against the default GTSM TTL value 255 or the user configured GTSM TTL value, blocking unauthorized OSPF packets originated from TTL hops away.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to set the security TTL for an interface:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/6/0/3
RP/0/RP0/CPU0:router(config-ospf-ar-if)# security ttl 2
```

sham-link

To configure an Open Shortest Path First OSPF sham link between two provider edge routers, use the **sham-link** command in VRF area configuration mode. To terminate an (OSPF) sham link, use the **no** form of this command.

sham-link *source-address* *destination-address*
no sham-link

Syntax Description

source-address	IP address of the local (source) sham-link endpoint specified in four-part, dotted-decimal notation.
destination-address	IP address of the remote (destination) sham-link endpoint specified in four-part, dotted-decimal notation.

Command Default

No sham link is configured.

Command Modes

VRF area configuration.

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **sham-link** command to configure a point-to-point connection between two provider edge (PE) routers creating an interconnect between two VPN sites (VPN backbone). Sham links are configured on PE provider edge (PE) routers in a Multiprotocol Label Switching (MPLS) VPN backbone.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure an OSPF sham link:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 109
RP/0/RP0/CPU0:router(config_ospf)# vrf vrf_a
RP/0/RP0/CPU0:router(config_ospf_vrf)# area 0
RP/0/RP0/CPU0:router(config_ospf_vrf_ar)# sham-link 192.168.40.0 172.16.30.0
RP/0/RP0/CPU0:router(config_ospf_vrf_ar_sl)# cost 23
```

show ospf

To display general information about Open Shortest Path First (OSPF) routing processes, use the **show ospf** command in XR EXEC mode.

show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [**summary**]

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPF routing process. The process name is defined by the **router ospf** command. If this argument is included, only information for the specified routing process is displayed.
vrf *vrf-name* **all**	(Optional) Specifies an OSPF VPN routing and forwarding (VRF) instance. The *vrf-name* argument can be specified as an arbitrary string. The strings "default" and "all" are reserved values of the *vrf-name* argument.
summary	(Optional) Displays OSPF summary information.

Command Default

IPv4 and unicast address prefixes

Command Modes

XR EXEC mode

OSPFv3

Command History

Release	Modification
Release 7.9.1	This command is modified to display the maximum number of redistributed prefixes.
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show ospf** command to provide basic information about the OSPF processes running on the router. Additional options provide in-depth information.

Task ID

Task ID	Operations
ospf	read

Examples

The following is sample output from the **show ospf** command:

```
RP/0/RP0/CPU0:router#show ospf

Routing Process "ospf 1" with ID 1.1.1.1
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
 It is an area border router
 Initial SPF schedule delay 5000 msecs
 Minimum hold time between two consecutive SPFs 10000 msecs
 Maximum wait time between two consecutive SPFs 10000 msecs
 Initial LSA throttle delay 500 msecs
```

```
Minimum hold time for LSA throttle 5000 msecs
Maximum wait time for LSA throttle 5000 msecs
Minimum LSA interval 5000 msecs. Minimum LSA arrival 1 secs
Maximum number of configured interfaces 255
Number of external LSA 0. Checksum Sum 00000000
Number of opaque AS LSA 0. Checksum Sum 00000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 2. 2 normal 0 stub 0 nssa
External flood list length 0
Non-Stop Forwarding enabled
   Area BACKBONE(0) (Inactive)
       Number of interfaces in this area is 2
       SPF algorithm executed 8 times
       Number of LSA 2. Checksum Sum 0x01ba83
       Number of opaque link LSA 0. Checksum Sum 00000000
       Number of DCbitless LSA 0
       Number of indication LSA 0
       Number of DoNotAge LSA 0
       Flood list length 0
   Area 1
       Number of interfaces in this area is 1
       SPF algorithm executed 9 times
       Number of LSA 2. Checksum Sum 0x0153ea
       Number of opaque link LSA 0. Checksum Sum 00000000
       Number of DCbitless LSA 0
       Number of indication LSA 0
       Number of DoNotAge LSA 0
       Flood list length 0
```

This table describes the significant fields shown in the display.

Table 44: show ospf Field Descriptions

Field	Description
Routing Process “ospf 201” with ID 172.22.110.200	OSPF process name.
Supports only	Number of types of service supported (Type 0 only).
It is	Types are internal, area border, or autonomous system boundary.
Redistributing External Routes from	Lists of redistributed routes, by protocol.
SPF schedule delay	Delay time of SPF calculations.
Minimum LSA interval	Minimum interval between LSAs.
Minimum LSA arrival	Minimum elapsed time between accepting an update for the same link-state advertisement (LSA).
external LSA	Total number of Type 5 LSAs in the LSDB.
opaque LSA	Total number of Type 10 LSAs in the LSDB.
DCbitless...AS LSA	Total number of Demand Circuit Type 5 and Type 11 LSAs.

Field	Description
DoNotAge...AS LSA	Total number of Type 5 and Type 11 LSAs with the DoNotAge bit set.
Number of areas	Number of areas in router, area addresses, and so on.
Area BACKBONE	Backbone is area 0.

This sample output from the **show ospf vrf** *vrf_name* command displays the VRF Lite status:

```
RP/0/RP0/CPU0:router#show ospf vrf vrf1

 VRF vrf1 in Routing Process "ospf 100" with ID 1.1.1.1
 NSR (Non-stop routing) is Disabled
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
 It is an area border router
 VRF Lite is enabled
 Router is not originating router-LSAs with maximum metric
 Initial SPF schedule delay 50 msecs
 Minimum hold time between two consecutive SPFs 200 msecs
 Maximum wait time between two consecutive SPFs 5000 msecs
 Initial LSA throttle delay 50 msecs
 Minimum hold time for LSA throttle 200 msecs
 Maximum wait time for LSA throttle 5000 msecs
 Minimum LSA interval 200 msecs. Minimum LSA arrival 100 msecs
 LSA refresh interval 1800 seconds
 Flood pacing interval 33 msecs. Retransmission pacing interval 66 msecs
 Adjacency stagger enabled; initial (per area): 2, maximum: 64
    Number of neighbors forming: 0, 2 full
 Maximum number of configured interfaces 1024
 Number of external LSA 0. Checksum Sum 00000000
 Number of opaque AS LSA 0. Checksum Sum 00000000
 Number of DCbitless external and opaque AS LSA 0
 Number of DoNotAge external and opaque AS LSA 0
 Number of areas in this router is 2. 2 normal 0 stub 0 nssa
 External flood list length 0
 SNMP trap is disabled
    Area BACKBONE(0)
        Number of interfaces in this area is 1
        SPF algorithm executed 4 times
        Number of LSA 16.  Checksum Sum 0x071c6a
        Number of opaque link LSA 0.  Checksum Sum 00000000
        Number of DCbitless LSA 0
        Number of indication LSA 0
        Number of DoNotAge LSA 0
        Flood list length 0
        Number of LFA enabled interfaces 0, LFA revision 0
        Number of Per Prefix LFA enabled interfaces 0
        Number of neighbors forming in staggered mode 0, 1 full
    Area 1
        Number of interfaces in this area is 4
        SPF algorithm executed 5 times
        Number of LSA 14.  Checksum Sum 0x066d93
        Number of opaque link LSA 0.  Checksum Sum 00000000
        Number of DCbitless LSA 0
        Number of indication LSA 0
        Number of DoNotAge LSA 0
        Flood list length 0
        Number of LFA enabled interfaces 0, LFA revision 0
        Number of Per Prefix LFA enabled interfaces 0
```

```
        Number of neighbors forming in staggered mode 0, 1 full
```

The **show ospf** command displays the maximum number of redistributed prefix is limited to 1000.

```
Router #show ospf
Thu Dec  8 18:16:48.332 IST

 Routing Process "ospf 1" with ID 192.168.0.1
 Role: Primary Active
 NSR (Non-stop routing) is Enabled
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
 It is an autonomous system boundary router
 Maximum number of non self-generated LSA allowed 1000
    Current number of non self-generated LSA 804
    Threshold for warning message 60%
    Ignore-time 1 minutes, reset-time 2 minutes
    Ignore-count allowed 2, current ignore-count 0
 Redistributing External Routes from,
    static
 Maximum number of redistributed prefixes 1000
    Threshold for warning message 70%
    Current number of redistributed prefixes 100
```

show ospf border-routers

To display the internal Open Shortest Path First (OSPF) routing table entries to an Area Border Router (ABR) and Autonomous System Boundary Router (ASBR), use the **show ospf border-routers** command in XR EXEC mode.

show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] **border-routers** [*router-id*]

Syntax Description

process-name	(Optional) OSPF process name. If this argument is included, only information for the specified routing process is included.
vrf *vrf-name* **all**	(Optional) Specifies an OSPF VPN routing and forwarding (VRF) instance. The *vrf-name* argument can be specified as an arbitrary string. The strings “default” and “all” are reserved vrf-names.
router-id	(Optional) Router ID associated with the border router. The value of the *router-id* argument can be any 32-bit router ID value specified in four-part, dotted-decimal notation. No default exists.

Command Default

IPv4 and unicast address prefixes

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show ospf border-routers** command to list all OSPF border routers visible to the specified processes and to ascertain the OSPF topology of the router.

Task ID

Task ID	Operations
ospf	read

Examples

The following is sample output from the **show ospf border-routers** command:

```
RP/0/RP0/CPU0:router# show ospf border-routers

OSPF 1 Internal Routing Table

Codes: i - Intra-area route, I - Inter-area route

i 172.31.97.53 [1] via 172.16.1.53, GigabitEthernet 3/0/0/0, ABR/ASBR , Area 0, SPF 3
```

This table describes the significant fields shown in the display.

Table 45: show ospf border-routers Field Descriptions

Field	Description
i	Type of this route; i indicates an intra-area route, I an interarea route.
172.31.97.53	Router ID of destination.
[1]	Cost of using this route.
172.16.1.53	Next-Next hop toward the destination.
GigabitEthernet 3/0/0/0	Packets destined for 172.16.1.53 are sent over GigabitEthernet interface 3/0/0/0.
ABR/ASBR	Router type of the destination; it is either an Area Border Router (ABR) or Autonomous System Boundary Router (ASBR) or both.
Area 0	Area ID of the area from which this route is learned.
SPF 3	Internal number of the shortest path first (SPF) calculation that installs this route.

show ospf database

To display lists of information related to the Open Shortest Path First (OSPF) database for a specific router, use the **show ospf database** command in XR EXEC mode.

show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database**
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**adv-router** *ip-address*]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**asbr-summary**] [*link-state-id*]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**asbr-summary**] [*link-state-id*] [**internal**] [**adv-router** [*ip-address*]]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**asbr-summary**] [*link-state-id*] [**internal**] [**self-originate**]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**database-summary**]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**external**] [*link-state-id*]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**external**] [*link-state-id*] [**internal**] [**adv-router** [*ip-address*]]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**external**] [*link-state-id*] [**internal**] [**self-originate**]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**network**] [*link-state-id*]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**network**] [*link-state-id*] [**internal**] [**adv-router** [*ip-address*]]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**network**] [*link-state-id*] [**internal**] [**self-originate**]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**nssa-external**] [*link-state-id*]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**nssa-external**] [*link-state-id*] [**internal**] [**adv-router** [*ip-address*]]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**nssa-external**] [*link-state-id*] [**internal**] [**self-originate**]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**opaque-area**] [*link-state-id*]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**opaque-area**] [*link-state-id*] [**internal**] [**adv-router**] [*ip-address*]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**opaque-area**] [*link-state-id*] [**internal**] [**self-originate**]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**opaque-as**] [*link-state-id*]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**opaque-as**] [*link-state-id*] [**internal**] [**adv-router** [*ip-address*]]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**opaque-as**] [*link-state-id*] [**internal**] [**self-originate**]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**opaque-link**] [*link-state-id*]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**opaque-link**] [*link-state-id*] [**internal**] [**adv-router** [*ip-address*]]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**opaque-link**] [*link-state-id*] [**internal**] [**self-originate**]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**router**] [*link-state-id*]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**router**] [**internal**] [**adv-router** [*ip-address*]]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**router**] [**internal**] [**self-originate**] [*link-state-id*]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**self-originate**]

show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**summary**] [*link-state-id*]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**summary**] [*link-state-id*] [**internal**] [**adv-router** [*ip-address*]]
show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **database** [**summary**] [*link-state-id*] [**internal**] [**self-originate**] [*link-state-id*]
show ospf [*process-name*] **database** [**database-summary**] [**detail**]
show ospf [*process-name*] **database** [**database-summary**] [**adv-router** *router ID*]

Syntax Description

process-name	(Optional) OSPF process name that uniquely identifies an OSPF routing process. The process name is any alphanumeric string no longer than 40 characters. If this argument is included, only information for the specified routing process is included.
vrf	(Optional) Specifies an OSPF VPN routing and forwarding (VRF) instance.
vrf-name	(Optional) Name of the OSPF VRF. The *vrf-name* argument can be specified as an arbitrary string. The strings “default” and “all” are reserved VRF names.
all	(Optional) Specifies all OSPF VRF instances.
area-id	(Optional) Area number used to define the particular area.
adv-router *ip-address*	(Optional) Displays all LSAs of the specified router.
asbr-summary	(Optional) Displays information only about the Autonomous System Boundary Router (ASBR) summary LSAs.
link-state-id	(Optional) Portion of the Internet environment that is being described by the advertisement. The value entered depends on the link-state type of the advertisement. It must be entered in the form of an IP address. When the link-state advertisement (LSA) is describing a network, the *link-state-id* can take one of two forms: • The network IP address (as in Type 3 summary link advertisements and in autonomous system external link advertisements). • A derived address obtained from the link-state ID. **Note** Masking the link-state ID of a network link advertisement with the subnet mask of the network yields the IP address of the network. When the LSA is describing a router, the link-state ID is always the OSPF router ID of the described router. When an autonomous system external advertisement (LS Type = 5) is describing a default route, its link-state ID is set to Default Destination (0.0.0.0).
internal	(Optional) Displays internal LSA information.
self-originate	(Optional) Displays only self-originated LSAs (from the local router).
database-summary	(Optional) Displays how many of each type of LSA for each area there are in the database and the total.
external	(Optional) Displays information only about the external LSAs.

network	(Optional) Displays information only about the network LSAs.
nssa-external	(Optional) Displays information only about the not-so-stubby area (NSSA) external LSAs.
opaque-area	(Optional) Displays information about the opaque Type 10 LSAs. Type 10 denotes an area-local scope. Refer to RFC 2370 for more information on the opaque LSA options.
opaque-as	(Optional) Displays information about the opaque Type 11 LSAs. Type 11 denotes that the LSA is flooded throughout the autonomous system.
opaque-link	(Optional) Displays information about the opaque Type 9 LSAs. Type 9 denotes a link-local scope.
router	(Optional) Displays information only about the router LSAs.
summary	(Optional) Displays information only about the summary LSAs.
detail	(Optional) With **database-summary** , the keyword displays information about the number of LSA counts per router sorted by total LSA count.

Command Default

IPv4 and unicast address prefixes

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 7.9.1	The **show ospf database database-summary** with the **adv-router** *router ID* keyword displays the router information and the LSAs received from a particular router.
Release 7.9.1	The **show ospf database database-summary** command with the **detail** keyword displays the number of LSA counts per router.
Release 6.0	This command was introduced.

Usage Guidelines

The various forms of the **show ospf database** command deliver information about different OSPF link-state advertisements. This command can be used to examine the link-state database (LSD) and its contents. Each router participating in an area having identical database entries pertaining to that area (with the exception of LSAs that are being flooded). Numerous options (such as **network** and **router**) are used to display portions of the database.

Task ID

Task ID	Operations
ospf	read

Examples

The following is sample output from the **show ospf database** command when no arguments or keywords are used:

```
RP/0/RP0/CPU0:router# show ospf database

OSPF Router with ID (172.20.1.11) (Process ID 1)

                Router Link States (Area 0)

 Link ID         ADV Router      Age         Seq#       Checksum Link count
 172.20.1.8       172.20.1.8       1381      0x8000010D    0xEF60   2
 172.20.1.11      172.20.1.11      1460      0x800002FE    0xEB3D   4
 172.20.1.12      172.20.1.12      2027      0x80000090    0x875D   3
 172.20.1.27      172.20.1.27      1323      0x800001D6    0x12CC   3

                Net Link States (Area 0)

 Link ID         ADV Router      Age         Seq#       Checksum
 172.22.1.27      172.20.1.27      1323      0x8000005B    0xA8EE
 172.22.1.11      172.20.1.11      1461      0x8000005B    0x7AC

                Type-10 Opaque Link Area Link States (Area 0)

 Link ID         ADV Router      Age         Seq#       Checksum Opaque ID
 10.0.0.0         172.20.1.11      1461      0x800002C8    0x8483     0
 10.0.0.0         172.20.1.12      2027      0x80000080    0xF858     0
 10.0.0.0         172.20.1.27      1323      0x800001BC    0x919B     0
 10.0.0.1         172.20.1.11      1461      0x8000005E    0x5B43     1
```

This table describes the significant fields shown in the display.

Table 46: show ospf database Field Descriptions

Field	Description
Link ID	Router ID number.
ADV Router	ID of the advertising router.
Age	Link-state age.
Seq#	Link-state sequence number (detects old or duplicate LSAs).
Checksum	Fletcher checksum of the complete contents of the LSA.
Link count	Number of interfaces detected for the router.
Opaque ID	Opaque LSA ID number.

The following is sample output from the **show ospf database** command with the **asbr-summary** keyword:

```
RP/0/RSP0RP0/CPU0:router# show ospf database asbr-summary

OSPF Router with ID (192.168.0.1) (Process ID 300)

Summary ASB Link States (Area 0.0.0.0)

  LS age: 1463
```

```
  Options: (No TOS-capability)
  LS Type: Summary Links (AS Boundary Router)
  Link State ID: 172.17.245.1 (AS Boundary Router address)
  Advertising Router: 172.17.241.5
  LS Seq Number: 80000072
  Checksum: 0x3548
  Length: 28
  Network Mask: /0
 TOS: 0  Metric: 1
```

This table describes the significant fields shown in the display.

Table 47: show ospf database asbr-summary Field Descriptions

Field	Description
OSPF Router with ID	Router ID number.
Process ID	OSPF process name.
LS age	Link-state age.
Options	Type of service options (Type 0 only).
LS Type	Link-state type.
Link State ID	Link-state ID (ASBR).
Advertising Router	ID of the advertising router.
LS Seq Number	Link-state sequence (detects old or duplicate LSAs).
Checksum	Link-state checksum (Fletcher checksum of the complete contents of the LSA).
Length	Length (in bytes) of the LSAs.
Network Mask	Network mask implemented.
TOS	Type of service.
Metric	Link-state metric.

The following is sample output from the **show ospf database** command with the **external** keyword:

```
RP/0/RP0/CPU0:router# show ospf database external

OSPF Router with ID (192.168.0.1) (Process ID 300)

                    Type-5 AS External Link States

  LS age: 280
  Options: (No TOS-capability)
  LS Type: AS External Link
  Link State ID: 172.17.0.0 (External Network Number)
  Advertising Router: 172.17.70.6
  LS Seq Number: 80000AFD
```

```
Checksum: 0xC3A
Length: 36
Network Mask: 255.255.0.0
      Metric Type: 2 (Larger than any link state path)
      TOS: 0
      Metric: 1
      Forward Address: 0.0.0.0
      External Route Tag: 0
```

This table describes the significant fields shown in the display.

Table 48: show ospf database external Field Descriptions

Field	Description
OSPF Router with Router ID	Router ID number.
Process ID	OSPF process name.
LS age	Link-state age.
Options	Type of service options (Type 0 only).
LS Type	Link-state type.
Link State ID	Link-state ID (external network number).
Advertising Router	ID of the advertising router.
LS Seq Number	Link-state sequence number (detects old or duplicate LSAs).
Checksum	Link-state checksum (Fletcher checksum of the complete contents of the LSA).
Length	Length (in bytes) of the LSA.
Network Mask	Network mask implemented.
Metric Type	External type.
TOS	Type of service.
Metric	Link-state metric.
Forward Address	Forwarding address. Data traffic for the advertised destination is forwarded to this address. If the forwarding address is set to 0.0.0.0, data traffic is forwarded instead to the originator of the advertisement.
External Route Tag	External route tag, a 32-bit field attached to each external route. This tag is not used by the OSPF protocol itself.

The following is sample output from the **show ospf database** command with the **network** keyword:

```
RP/0/RP0/CPU0:router# show ospf database network

 OSPF Router with ID (192.168.0.1) (Process ID 300)
```

```
Net Link States (Area 0.0.0.0)

  LS age: 1367
  Options: (No TOS-capability)
  LS Type: Network Links
  Link State ID: 172.23.1.3 (address of Designated Router)
  Advertising Router: 192.168.0.1
  LS Seq Number: 800000E7
  Checksum: 0x1229
  Length: 52
  Network Mask: /24
        Attached Router: 192.168.0.1
        Attached Router: 172.23.241.5
        Attached Router: 172.23.1.1
        Attached Router: 172.23.54.5
        Attached Router: 172.23.1.5
```

This table describes the significant fields shown in the display.

Table 49: show ospf database network Field Descriptions

Field	Description
OSPF Router with ID	Router ID number.
Process ID	OSPF process name.
LS age	Link-state age.
Options	Type of service options (Type 0 only).
LS Type	Link-state type.
Link State ID	Link-state ID of the designated router.
Advertising Router	ID of the advertising router.
LS Seq Number	Link-state sequence number (detects old or duplicate LSAs).
Checksum	Link-state checksum (Fletcher checksum of the complete contents of the LSA).
Length	Length (in bytes) of the LSA.
Network Mask	Network mask implemented.
Attached Router	List of routers attached to the network, by IP address.

The following is sample output, carrying Multiprotocol Label Switching traffic engineering (MPLS TE) specification information, from the **show ospf database** command with the **opaque-area** keyword and a *link-state-id* of adv-router:

```
RP/0/RP0/CPU0:router# show ospf database opaque-area adv-router 172.20.1.12

  OSPF Router with ID (172.20.1.11) (Process ID 1)

                Type-10 Opaque Link Area Link States (Area 0)
```

```
    LS age: 224
    Options: (No TOS-capability, DC)
    LS Type: Opaque Area Link
    Link State ID: 1.0.0.0
    Opaque Type: 1
    Opaque ID: 0
    Advertising Router: 172.20.1.12
    LS Seq Number: 80000081
    Checksum: 0xF659
    Length: 132
    Fragment number : 0

      MPLS TE router ID : 172.20.1.12

      Link connected to Point-to-Point network
        Link ID : 172.20.1.11
        Interface Address : 172.21.1.12
        Neighbor Address : 172.21.1.11
        Admin Metric : 10
        Maximum bandwidth : 193000
        Maximum reservable bandwidth : 125000
        Number of Priority : 8
        Priority 0 : 125000      Priority 1 : 125000
        Priority 2 : 125000      Priority 3 : 125000
        Priority 4 : 125000      Priority 5 : 125000
        Priority 6 : 125000      Priority 7 : 100000
        Affinity Bit : 0x0

      Number of Links : 1
```

The following is the sample output from the **show ospf database opaque-area** command displaying the extended link LSA information.

```
RP/0/RP0/CPU0:router# show ospf database opaque-area 4.0.0.0
LS age: 361
  Options: (No TOS-capability, DC)
  LS Type: Opaque Area Link
  Link State ID: 8.0.0.40
  Opaque Type: 8
  Opaque ID: 40
  Advertising Router: 100.0.0.3
  LS Seq Number: 8000012e
Checksum: 0xeab4
  Length: 92

    Extended Link TLV: Length: 68
      Link-type : 2
      Link ID   : 100.0.9.4
      Link Data : 100.0.9.3

     LAN Adj sub-TLV: Length: 16
       Flags      : 0x0
       MTID       : 0
       Weight     : 0
       Neighbor ID: 100.0.0.1

       SID/Label sub-TLV: Length: 3
          SID       : 24001

     LAN Adj sub-TLV: Length: 16
```

```
      Flags      : 0x0
      MTID       : 0
      Weight     : 0
      Neighbor ID: 100.0.0.2

      SID/Label sub-TLV: Length: 3
         SID       : 24000

    Adj sub-TLV: Length: 12
       Flags     : 0x0
       MTID      : 0
       Weight    : 0

      SID/Label sub-TLV: Length: 3
         SID       : 24002
```

The following is sample output from the **show ospf database** command that displays a Type 10, Router Information LSA:

```
RP/0/RP0/CPU0:router# show ospf database opaque-area 4.0.0.0

            OSPF Router with ID (3.3.3.3) (Process ID orange)

                Type-10 Opaque Link Area Link States (Area 0)

  LS age: 105
  Options: (No TOS-capability, DC)
  LS Type: Opaque Area Link
  Link State ID: 4.0.0.0
  Opaque Type: 4
  Opaque ID: 0
  Advertising Router: 3.3.3.3
  LS Seq Number: 80000052
  Checksum: 0x34e2
  Length: 52
  Fragment number: 0

    Router Information TLV: Length: 4
    Capabilities:
      Graceful Restart Helper Capable
      Traffic Engineering enabled area
      All capability bits: 0x50000000

    PCE Discovery TLV: Length: 20
      IPv4 Address: 3.3.3.3
      PCE Scope: 0x20000000
      Compute Capabilities:
      Inter-area default (Rd-bit)
      Compute Preferences:
      Intra-area: 0  Inter-area:  0
      Inter-AS:   0  Inter-layer: 0
```

This table describes the significant fields shown in the display.

Table 50: show ospf database opaque-area Field Descriptions

Field	Description
OSPF Router with ID	Router ID number.

Field	Description
Process ID	OSPF process name.
LS age	Link-state age.
Options	Type of service options (Type 0 only).
LS Type	Link-state type.
Link State ID	Link-state ID.
Opaque Type	Opaque link-state type.
Opaque ID	Opaque ID number.
Advertising Router	ID of the advertising router.
LS Seq Number	Link-state sequence (detects old or duplicate LSAs).
Checksum	Link-state checksum (Fletcher checksum of the complete contents of the LSA).
Length	Length (in bytes) of the LSA.
Fragment number	Arbitrary value used to maintain multiple traffic engineering LSAs.
Link ID	Link ID number.
Interface Address	ID address of the interface.
Neighbor Address	IP address of the neighbor.
Admin Metric	Administrative metric value used by MPLS TE.
Maximum bandwidth	Specifies maximum bandwidth (in kbps).
Maximum reservable bandwidth	Specifies maximum reservable bandwidth (in kbps).
Number of Priority	Priority number.
Affinity Bit	Used by MPLS TE.
Router Information TLV	Router capabilities are advertised in this TLV.
Capabilities	Some router capabilities include stub router, traffic engineering, graceful restart, and graceful restart helper.
PCE Discovery TLV	PCE address and capability information is advertised in this TLV.
IPv4 Address	Configured PCE IPv4 address.
PCE Scope	Computation capabilities of the PCE.
Compute Capabilities	Compute capabilities and preferences of the PCE.

Field	Description
Inter-area default (RD-bit)	PCE compute capabilities such as intra-area, inter-area, inter-area default, inter-AS, inter-AS default and inter-layer.
Compute Preferences	Order or preference of path computation that includes intra-area, inter-area, inter-AS, and inter-layer preferences.

The following is sample output from the **show ospf database** command with the **router** keyword:

```
RP/0/RP0/CPU0:router# show ospf database router

OSPF Router with ID (192.168.0.1) (Process ID 300)

Router Link States (Area 0.0.0.0)

  LS age: 1176
  Options: (No TOS-capability)
  LS Type: Router Links
  Link State ID: 172.23.21.6
  Advertising Router: 172.23.21.6
  LS Seq Number: 80002CF6
  Checksum: 0x73B7
  Length: 120
  AS Boundary Router
  Number of Links: 8

 Link connected to: another Router (point-to-point)
(Link ID) Neighboring Router ID: 172.23.21.5
(Link Data) Router Interface address: 172.23.21.6
 Number of TOS metrics: 0
  TOS 0 Metrics: 2
```

This table describes the significant fields shown in the display.

Table 51: show ospf database router Field Descriptions

Field	Description
OSPF Router with ID	Router ID number.
Process ID	OSPF process name.
LS age	Link-state age.
Options	Type of service options (Type 0 only).
LS Type	Link-state type.
Link State ID	Link-state ID.
Advertising Router	ID of the advertising router.
LS Seq Number	Link-state sequence (detects old or duplicate LSAs).
Checksum	Link-state checksum (Fletcher checksum of the complete contents of the LSA).

Field	Description
Length	Length (in bytes) of the LSA.
AS Boundary Router	Definition of router type.
Number of Links	Number of active links.
Link ID	Link type.
Link Data	Router interface address.
TOS	Type of service metric (Type 0 only).

The following is sample output from **show ospf database** command with the **summary** keyword:

```
RP/0/RP0/CPU0:router# show ospf database summary

       OSPF Router with ID (192.168.0.1) (Process ID 300)

 Summary Net Link States (Area 0.0.0.0)

  LS age: 1401
  Options: (No TOS-capability)
  LS Type: Summary Links (Network)
  Link State ID: 172.23.240.0 (Summary Network Number)
  Advertising Router: 172.23.241.5
  LS Seq Number: 80000072
  Checksum: 0x84FF
  Length: 28
  Network Mask: /24
     TOS: 0  Metric: 1
```

This table describes the significant fields shown in the display.

Table 52: show ospf database summary Field Descriptions

Field	Description
OSPF Router with ID	Router ID number.
Process ID	OSPF process name.
LS age	Link-state age.
Options	Type of service options (Type 0 only).
LS Type	Link-state type.
Link State ID	Link-state ID (summary network number).
Advertising Router	ID of the advertising router.
LS Seq Number	Link-state sequence (detects old or duplicate LSAs).
Checksum	Link-state checksum (Fletcher checksum of the complete contents of the LSA).

Field	Description
Length	Length (in bytes) of the LSA.
Network Mask	Network mask implemented.
TOS	Type of service.
Metric	Link-state metric.

The following is sample output from **show ospf database** command with the **database-summary** keyword:

```
RP/0/RP0/CPU0:router# show ospf database database-summary

          OSPF Router with ID (172.19.65.21) (Process ID 1)

Area 0 database summary
  LSA Type      Count    Delete   Maxage
  Router        2        0        0
  Network       1        0        0
  Summary Net   2        0        0
  Summary ASBR  0        0        0
  Type-7 Ext    0        0        0
  Opaque Link   0        0        0
  Opaque Area   0        0        0
  Subtotal      5        0        0

Process 1 database summary
  LSA Type      Count    Delete   Maxage
  Router        2        0        0
  Network       1        0        0
  Summary Net   2        0        0
  Summary ASBR  0        0        0
  Type-7 Ext    0        0        0
  Opaque Link   0        0        0
  Opaque Area   0        0        0
  Type-5 Ext    2        0        0
  Opaque AS     0        0        0
  Total         7        0        0
```

The **show ospf database database-summary** command with the **detail** keyword displays the number of LSA counts per router:

```
Router#show ospf database database-summary detail
Tue Dec  6 19:20:34.090 IST


            OSPF Router with ID (192.168.0.1) (Process ID 1)

Router 192.168.0.4 LSA summary
  LSA Type      Count    Delete   Maxage
  Router        0        0        0
  Network       0        0        0
  Summary Net   0        0        0
  Summary ASBR  0        0        0
  Type-5 Ext    697      0        0
  Type-7 Ext    0        0        0
  Opaque Link   0        0        0
```

```
  Opaque Area   0        0        0
  Opaque AS     6        0        0
  Total         703      0        0

Router 192.168.0.1 LSA summary
  LSA Type      Count    Delete   Maxage
  Router        1        0        0
  Network       0        0        0
  Summary Net   0        0        0
  Summary ASBR  0        0        0
  Type-5 Ext    0        0        0
  Type-7 Ext    0        0        0
  Opaque Link   0        0        0
  Opaque Area   64       0        0
  Opaque AS     0        0        0
  Total         65       0        0

Router 192.168.0.2 LSA summary
  LSA Type      Count    Delete   Maxage
  Router        1        0        0
  Network       0        0        0
  Summary Net   21       0        0
  Summary ASBR  2        0        0
  Type-5 Ext    0        0        0
  Type-7 Ext    0        0        0
  Opaque Link   0        0        0
  Opaque Area   21       0        0
  Opaque AS     0        0        0
  Total         45       0        0

Router 192.168.0.6 LSA summary
  LSA Type      Count    Delete   Maxage
  Router        1        0        0
  Network       0        0        0
  Summary Net   21       0        0
  Summary ASBR  2        0        0
  Type-5 Ext    0        0        0
  Type-7 Ext    0        0        0
  Opaque Link   0        0        0
  Opaque Area   19       0        0
  Opaque AS     0        0        0
  Total         43       0        0

Router 192.168.0.3 LSA summary
  LSA Type      Count    Delete   Maxage
  Router        0        0        0
  Network       0        0        0
  Summary Net   0        0        0
  Summary ASBR  0        0        0
  Type-5 Ext    7        0        0
  Type-7 Ext    0        0        0
  Opaque Link   0        0        0
  Opaque Area   0        0        0
  Opaque AS     6        0        0
  Total         13       0        0
```

The **show ospf database database-summary** with the **adv-router** *router ID* keyword displays the router information and the LSAs received from a particular router:

```
Router#show ospf database database-summary adv-router 192.168.0.4
Tue Dec  6 19:21:04.549 IST


            OSPF Router with ID (192.168.0.1) (Process ID 1)
```

```
Router 192.168.0.4 LSA summary
  LSA Type      Count    Delete   Maxage
  Router        0        0        0
  Network       0        0        0
  Summary Net   0        0        0
  Summary ASBR  0        0        0
  Type-5 Ext    697      0        0
  Type-7 Ext    0        0        0
  Opaque Link   0        0        0
  Opaque Area   0        0        0
  Opaque AS     6        0        0
  Total         703      0        0
```

This table describes the significant fields shown in the display.

Table 53: show ospf database database-summary Field Descriptions

Field	Description
LSA Type	Link-state type.
Count	Number of advertisements in that area for each link-state type.
Delete	Number of LSAs that are marked “Deleted” in that area.
Maxage	Number of LSAs that are marked “Maxaged” in that area.

show ospf flood-list

To display a list of Open Shortest Path First (OSPF) link-state advertisements (LSAs) waiting to be flooded over an interface, use the **show ospf flood-list** command in XR EXEC mode.

show **ospf** [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **flood-list** [*type* *interface-path-id*]

Syntax Description

process-name	(Optional) OSPF process name that uniquely identifies an OSPF routing process. The process name is any alphanumeric string no longer than 40 characters. If this argument is included, only information for the specified routing process is included.
vrf	(Optional) Specifies an OSPF VPN routing and forwarding (VRF) instance.
vrf-name	(Optional) Name of the OSPF VRF. The *vrf-name* argument can be specified as an arbitrary string. The strings “default” and “all” are reserved VRF names.
all	(Optional) Specifies all OSPF VRF instances.
area-id	(Optional) Area number used to define the particular area.
type	Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

All interfaces

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show ospf flood-list** command to display LSAs in flood queue and queue length.

Flood list information is transient and normally the flood lists are empty.

Task ID

Task ID	Operations
ospf	read

Examples

The following is sample output from the **show ospf flood-list** command for interface GigabitEthernet 3/0/0/0:

```
RP/0/RP0/CPU0:router# show ospf flood-list HundredGigE 3/0/0/0


 Interface GigabitEthernet3/0/0/0, Queue length 20
 Link state retransmission due in 12 msec
 Displaying 6 entries from flood list:

 Type  LS ID           ADV RTR         Seq NO      Age    Checksum
    5  10.2.195.0       200.0.0.163     0x80000009  0      0xFB61
    5  10.1.192.0       200.0.0.163     0x80000009  0      0x2938
    5  10.2.194.0       200.0.0.163     0x80000009  0      0x757
    5  10.1.193.0       200.0.0.163     0x80000009  0      0x1E42
    5  10.2.193.0       200.0.0.163     0x80000009  0      0x124D
    5  10.1.194.0       200.0.0.163     0x80000009  0      0x134C
```

This table describes the significant fields shown in the display.

Table 54: show ospf flood-list Field Descriptions

Field	Description
GigabitEthernet3/0/0/0	Interface for which information is displayed.
Queue length	Number of LSAs waiting to be flooded.
Link state retransmission due in	Length of time (in milliseconds) before next link-state transmission.
Type	Type of LSA.
LS ID	Link-state ID of the LSA.
ADV RTR	IP address of the advertising router.
Seq NO	Sequence number of the LSA.
Age	Age of the LSA (in seconds).
Checksum	Checksum of the LSA.

show ospf interface

To display strict-mode information use the **show ospf interface** command in XR EXEC mode.

show ospf interface [**interface** *type* *interface-path-id*]

Syntax Description

type	Interface type. For more information, use the question mark (**?**) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (**?**) online help function.

Command Default

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
bgp	read
ospf	read

show ospf interface

The following example shows the output from the **show ospf interface** command.

```
RP/0/0/CPU0:rt2(config-ospf-ar-if)# show ospf interface HundredGigE 0/2/0/0
Sun Feb 15 12:17:35.072 IST

HundredGigE 0/2/0/0 is up, line protocol is up
  Internet Address 10.1.1.2/24, Area 0
  Process ID 1, Router ID 2.2.2.2, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1, MTU 1500, MaxPktSz 1500
  BFD enabled, BFD interval 150 msec, BFD multiplier 3, Mode: Strict
  Designated Router (ID) 2.2.2.2, Interface address 10.1.1.2
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:07:358
  Index 1/1, flood queue length 0
  Next 0(0)/0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
```

```
LS Ack List: current length 0, high water mark 1
Neighbor Count is 1, Adjacent neighbor count is 0
Suppress hello for 0 neighbor(s)
Multi-area interface Count is 0
```

show ospf message-queue

To display the information about the queue dispatch values, peak lengths, and limits, use the **show ospf message-queue** command in XR EXEC mode.

show ospf message-queue

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ospf	read

Examples

The following is sample output from the **show ospf message-queue** command:

```
RP/0/RP0/CPU0:router# show ospf 1 message-queue

OSPF 1
  Hello Input Queue:
    Current queue length: 0
    Event scheduled: 0
    Total queuing failures: 0
    Maximum length : 102
    Pkts pending processing: 0
    Limit: 5000

  Router Message Queue
    Current instance queue length: 0
    Current redistribution queue length: 0
    Current ex spf queue length: 0
    Current sum spf queue length: 0
    Current intra spf queue length: 0
    Event scheduled: 0
    Maximum length : 101
    Total low queuing failures: 0
    Total medium queuing failures: 0
    Total high queuing failures: 0
    Total instance events: 919
    Processing quantum : 300
    Low queuing limit: 8000
    Medium queuing limit: 9000
    High queuing limit: 9500
```

```
    Rate-limited LSA processing quantum: 150
    Current rate-limited LSA queue length: 0
    Rate-limited LSA queue peak len: 517

    Rate-limited LSAs processed: 4464
    Flush LSA processing quantum: 150
    Current flush LSA queue length: 0
    Flush LSA queue peak len: 274
    Rate-limited flush LSAs processed: 420

    SPF-LSA-limit processing quantum: 150
    Managed timers processing quantum: 50
    Instance message count: 0
    Instance pulse send count: 919
    Instance pulse received count: 919
    Global pulse count: 0
    Instance Pulse errors: 0

  TE Message Queue
    Current queue length: 0
    Total queuing failures: 0
    Maximum length : 0

 Number of Dlink errors: 0
```

This table describes the significant fields shown in the display.

Table 55: show ospf message-queue Field Descriptions

Field	Description
Hello Input Queue	This section provides statistics on the number of events and incoming packets processed in the Hello (incoming packet) thread of the OSPF process.
Router Message Queue	This section provides statistics on the events and messages processed in the Router (primary) thread of the OSPF process.
TE Message Queue	This section provides statistics on traffic-engineering events and messages received by OSPF from TE (the te_control process). These events are processed in the Router thread of the OSPF process.
Number of Dlink errors	The number of enqueuing or dequeuing errors seen across all the linked-lists in the OSPF process.

show ospf neighbor

To display Open Shortest Path First (OSPF) neighbor information on an individual interface basis, use the **show ospf neighbor** command in XR EXEC mode.

show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **neighbor** [[*type* *interface-path-id*] [*neighbor-id*] [**detail**] | **area-sorted** | **capabilities**]

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPF routing process. The process name is defined by the **router ospf** command. If this argument is included, only information for the specified routing process is displayed.
vrf *vrf-name* **all**	(Optional) Specifies an OSPF VPN routing and forwarding (VRF) instance. The *vrf-name* argument can be specified as an arbitrary string. The strings “default” and “all” are reserved VRF names.
area-id	(Optional) Area ID. If you do not specify an area, all areas are displayed.
type	Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
neighbor-id	(Optional) Neighbor ID.
detail	(Optional) Displays all neighbors given in detail (lists all neighbors).
area-sorted	(Optional) Specifies that all neighbors are grouped by area.
capabilities	(Optional) Displays the capabilties of all neighbors advertised in the Router Information Link State Advertisement (RI LSA).

Command Default

All neighbors

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 24.2.1	The **capabilities** keyword was introduced.
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ospf	read

Examples

The following is sample output from the **show ospf neighbor** command showing two lines of summary information for each neighbor:

```
RP/0/RP0/CPU0:router# show ospf neighbor

Neighbors for OSPF

Neighbor ID     Pri  State         Dead Time  Address           Interface
192.168.199.137 1    FULL/DR       0:00:31    172.31.80.37      HundredGigE 0/3/0/2
    Neighbor is up for 18:45:22
192.168.48.1     1    FULL/DROTHER  0:00:33    192.168.48.1       HundredGigE 0/3/0/3
    Neighbor is up for 18:45:30
192.168.48.200   1    FULL/DROTHER  0:00:33    192.168.48.200     HundredGigE 0/3/0/3
    Neighbor is up for 18:45:25
192.168.199.137 5    FULL/DR       0:00:33    192.168.48.189     HundredGigE 0/3/0/3
    Neighbor is up for 18:45:27
```

This table describes the significant fields shown in the display.

*Table 56: **show ospf neighbor** Field Descriptions*

Field	Description
Neighbor ID	Neighbor router ID.
Pri	Designated router priority.
State	OSPF state.
Dead time	Time (in hh:mm:ss) that must elapse before OSPF declares the neighbor dead.
Address	Address of next hop.
Interface	Interface name of next hop.
Neighbor is up	Amount of time (in hh:mm:ss) that the OSPF neighbor has been up.

The following is sample output showing summary information about the neighbor that matches the neighbor ID:

```
RP/0/RP0/CPU0:router# show ospf neighbor 192.168.199.137

 Neighbor 192.168.199.137, interface address 172.31.80.37
    In the area 0.0.0.0 via interface HundredGigE 0/3/0/2
    Neighbor priority is 1, State is FULL, 6 state changes
    DR is 0.0.0.0 BDR is 0.0.0.0
    Options is 0x2
    Dead timer due in 0:00:32
```

```
    Neighbor is up for 18:45:30
    Number of DBD retrans during last exhange 0
    Index 1/1, retransmission queue length 0, number of retransmission 0
    First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0)
    Last retransmission scan length is 0, maximum is 0
    Last retransmission scan time is 0 msec, maximum 0 msec
 Neighbor 192.168.199.137, interface address 192.168.48.189
    In the area 0.0.0.0 via interface HundredGigE 0/3/0/3
    Neighbor priority is 5, State is FULL, 6 state changes
    Options is 0x2
    Dead timer due in 0:00:32
    Neighbor is up for 18:45:30
    Number of DBD retrans during last exhange 0
    Index 1/1, retransmission queue length 0, number of retransmission 0
    First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0)
    Last retransmission scan length is 0, maximum is 0
    Last retransmission scan time is 0 msec, maximum 0 msec

 Total neighbor count: 2
```

This table describes the significant fields shown in the display.

Table 57: show ospf neighbor 192.168.199.137 Field Descriptions

Field	Description
Neighbor	Neighbor router ID.
interface address	IP address of the interface.
In the area	Area and interface through which the OSPF neighbor is known.
Neighbor priority	Router priority of neighbor and neighbor state.
State	OSPF state.
state changes	Number of state changes for this neighbor.
DR is	Neighbor ID of the designated router.
BDR is	Neighbor ID of the backup designated router.
Options	Hello packet options field contents(E-bit only; possible values are 0 and 2; 2 indicates area is not a stub; 0 indicates area is a stub).)
Dead timer	Time (in hh:mm:ss) to elapse before OSPF declares the neighbor dead.
Neighbor is up	Amount of time (in hh:mm:ss) that the OSPF neighbor has been up.
Number of DBD retrans	Number of re-sent database description packets.
Index	Index and the remaining lines of this command give detailed information about flooding information received from the neighbor.

If you specify the interface along with the neighbor ID, the software displays the neighbors that match the neighbor ID on the interface, as in the following sample display:

```
RP/0/RP0/CPU0:router# show ospf neighbor HundredGigE 0/3/0/2 192.168.199.137

 Neighbor 192.168.199.137, interface address 172.31.80.37
    In the area 0.0.0.0 via interface HundredGigE 0/3/0/2
    Neighbor priority is 1, State is FULL, 6 state changes
    DR is 0.0.0.0 BDR is 0.0.0.0
    Options is 0x2
    Dead timer due in 0:00:32
    Neighbor is up for 18:45:30
    Number of DBD retrans during last exhange 0
    Index 1/1, retransmission queue length 0, number of retransmission 0
    First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0)
    Last retransmission scan length is 0, maximum is 0
    Last retransmission scan time is 0 msec, maximum 0 msec

Total neighbor count: 1
```

This table describes the significant fields shown in the display.

Table 58: show ospf neighbor HundredGigE 0/3/0/2 192.168.199.137 Field Descriptions

Field	Description
Neighbor	Neighbor router ID.
interface address	IP address of the interface.
In the area	Area and interface through which the OSPF neighbor is known.
Neighbor priority	Router priority of the neighbor.
State	OSPF state.
state changes	Number of state changes for this neighbor.
DR is	Neighbor ID of the designated router.
BDR is	Neighbor ID of the backup designated router.
Options	Hello packet options field contents (E-bit only; possible values are 0 and 2; 2 indicates area is not a stub; 0 indicates area is a stub)
Dead timer	Time (in hh:mm:ss) to elapse before OSPF declares the neighbor dead.
Neighbor is up	Amount of time (in hh:mm:ss) that the OSPF neighbor has been up.
Number of DBD retrans	Number of re-sent database description packets.
Index	Index and the remaining lines of this command give detailed information about flooding information received from the neighbor.

You can also specify the interface without the neighbor ID to show all neighbors on the specified interface, as in the following sample display:

```
RP/0/RP0/CPU0:router# show ospf neighbor HundredGigE POS 0/3/0/3
```

```
Neighbors for OSPF ospf1

   ID          Pri   State        Dead Time     Address         Interface
192.168.48.1     1    FULL/DROTHER  0:00:33    192.168.48.1      HundredGigE POS 0/3/0/3

    Neighbor is up for 18:50:52
192.168.48.200   1    FULL/DROTHER  0:00:32    192.168.48.200    HundredGigE POS 0/3/0/3

    Neighbor is up for 18:50:52
192.168.199.137 5    FULL/DR       0:00:32    192.168.48.189    HundredGigE POS 0/3/0/3
    Neighbor is up for 18:50:52

Total neighbor count: 3
```

This table describes the significant fields shown in the display.

Table 59: show ospf neighbor HundredGigE 0/3/0/3 Field Descriptions

Field	Description
ID	Neighbor router ID.
Pri	Route priority of the neighbor.
State	OSPF state.
Dead Time	Time (in hh:mm:ss) to elapse before OSPF declares the neighbor dead.
Address	Address of next hop.
Interface	Interface name of next hop.
Neighbor is up	Time (in hh:mm:ss) that the OSPF neighbor has been up.
Options	Hello packet options field contents (E-bit only; possible values are 0 and 2; 2 indicates area is not a stub; 0 indicates area is a stub)
Dead timer	Time (in hh:mm:ss) to elapse before OSPF declares the neighbor dead.
Neighbor is up	Amount of time (in hh:mm:ss) that the OSPF neighbor has been up.
Number of DBD retrans	Number of re-sent database description packets.
Index	Index and the remaining lines of this command give detailed information about flooding information received from the neighbor.

The following samples are from output from the **show ospf neighbor detail** command:

```
RP/0/RP0/CPU0:router# show ospf neighbor detail

 Neighbor 192.168.199.137, interface address 172.31.80.37
    In the area 0.0.0.0 via interface HundredGigE 0/3/0/2
    Neighbor priority is 1, State is FULL, 6 state changes
    DR is 0.0.0.0 BDR is 0.0.0.0
    Options is 0x2
    Dead timer due in 0:00:32
    Neighbor is up for 18:45:30
```

```
    Number of DBD retrans during last exhange 0
    Index 1/1, retransmission queue length 0, number of retransmission 0
    First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0)
    Last retransmission scan length is 0, maximum is 0
    Last retransmission scan time is 0 msec, maximum 0 msec

Total neighbor count: 1


 Neighbor 10.1.1.1, interface address 192.168.13.1
    In the area 0 via interface HundredGigE 0/3/0/1
    Neighbor priority is 1, State is FULL, 10 state changes
    DR is 0.0.0.0 BDR is 0.0.0.0
    Options is 0x52
    LLS Options is 0x1 (LR)
    Dead timer due in 00:00:36
    Neighbor is up for 1w2d
    Number of DBD retrans during last exchange 0
    Index 3/3, retransmission queue length 0, number of retransmission 5
    First 0(0)/0(0) Next 0(0)/0(0)
    Last retransmission scan length is 1, maximum is 1
    Last retransmission scan time is 0 msec, maximum is 0 msec

 Neighbor 10.4.4.4, interface address 192.168.34.4
    In the area 0 via interface HundredGigE 0/3/0/2
    Neighbor priority is 1, State is FULL, 48 state changes
    DR is 0.0.0.0 BDR is 0.0.0.0
    Options is 0x12
    LLS Options is 0x1 (LR)
    Dead timer due in 00:00:30
    Neighbor is up for 00:40:03
    Number of DBD retrans during last exchange 0
    Index 2/2, retransmission queue length 0, number of retransmission 6
    First 0(0)/0(0) Next 0(0)/0(0)
    Last retransmission scan length is 0, maximum is 1
    Last retransmission scan time is 0 msec, maximum is 0 msec
```

This table describes the significant fields shown in the display.

Table 60: show ospf neighbor detail Field Descriptions

Field	Description
Neighbor	Neighbor router ID.
interface address	IP address of the interface.
In the area	Area and interface through which the OSPF neighbor is known.
Neighbor priority	Router priority of neighbor and neighbor state.
State	OSPF state.
state changes	Number of state changes for this neighbor.
DR is	Neighbor ID of the designated router.
BDR is	Neighbor ID of the backup designated router.

Field	Description
Options	Hello packet options field contents. (E-bit only; possible values are 0 and 2; 2 indicates that the area is not a stub; 0 indicates that the area is a stub).)
LLS Options is 0x1 (LR)	Neighbor is NFS Cisco capable.
Dead timer	Time (in hh:mm:ss) to elapse before OSPF declares the neighbor dead.
Neighbor is up	Amount of time (in hh:mm:ss) that the OSPF neighbor has been up.
Number of DBD retrans	Number of re-sent database description packets.
Index	Index and the remaining lines of this command give detailed information about flooding information received from the neighbor.

The following example displays the traffic engineering support, hostname, and graceful restart and helper capabilities of neighboring connected routers, which are enabled for Segment Routing.

```
Router#show ospf neighbor capabilities
Mon Apr 29 08:27:07.289 UTC

Capabilities advertised in RI LSA
  TE - Traffic Engineering
  GR - Graceful Restart
  GH - Graceful Restart Helper

  NA - Capabilities TLV Not Advertised

Neighbors for OSPF 1

Area 1
Neighbor ID            Address              Interface       SR-Enabled    Capabilities
192.168.199.137        209.165.200.225/27       Gi100/0/0/0     Yes           TE, GR, GH
    HostName: Device_3
192.168.48.1           209.165.200.226/27        Gi100/0/0/4     No            NA
192.168.48.200         209.165.200.227/27       Gi10/0/0/0      Yes           TE, GR, GH
    HostName: Device_0

Total neighbor count: 3
```

This table describes the significant fields shown in the display.

Table 61: show ospf neighbor capabilties Field Descriptions

Field	Description
SR-Enabled	Indicates whether a neighbor router is enabled for Segment Routing or not. The valid values are Yes and No.

Field	Description
Capabilities	Includes the capabilities advertised in the RI LSA of a neighbor router. In general, Traffic Engineering (TE), Graceful Restart (GR), and Graceful Restart Helper (GH) capabilities are advertised. By default, routers advertise the GH capability in the RI LSA. To enable the TE and GR capabilities on neighboring routers, you require configuration at either the area or OSPF level. When Segment Routing is not enabled for a neighbor router, it does not advertise any capabilities in the RI LSA, which is indicated by NA.
Hostname	Indicates the hostname of the neighbor router. If the hostname is not configured, the RI LSA uses the default hostname of the neighbor router.
Neighbor ID	Router ID of the neighbor router.
Address	IP address of the neighbor router.
Interface	Interface IP address of the neighbor router.

The following example shows the capabilities of neighbor 192.168.199.130 listed in the summary information:

```
Router#show ospf neighbor 192.168.199.130
Mon Nov 6 19:13:08.861 IST
* Indicates MADJ interface
# Indicates Neighbor awaiting BFD session up

Neighbors for OSPF 1

 Neighbor 192.168.199.130, interface address 172.31.80.37
    In the area 0 via interface GigabitEthernet0/2/0/4
    Neighbor priority is 1, State is FULL, 6 state changes
    DR is 0.0.0.0 BDR is 0.0.0.0
    Options is 0x52
    LLS Options is 0x1 (LR)
    Dead timer due in 00:00:32
    Neighbor is up for 00:08:50
    Number of DBD retrans during last exchange 0
    Index 3/6, retransmission queue length 0, number of retransmission o
    First 0(0) /0(0) Next 0(0) /0(0)
    Last retransmission scan length is 0, maximum is 0
    Last retransmission scan time is l msec, maximum is 8 msec
    LS Ack list: NSR-sync pending 0, high water mark o
    Adjacency SIDs:
        Label: 24010,    Dynamic, Unprotected
        Label: 24011,    Dynamic,   Protected (Has backup)
    Neighbor Interface ID: 4
    Segment-Routing Enabled
      Strict SPF capable
      Start SID: 16000 Range Size: 8000
      Flex algo Enabled
    Capabilities advertised in RI LSA
      Graceful Restart capable
```

```
      Graceful Restart Helper capable
HostName: r5

Total neighbor count: 1
```

show ospf request-list

To display the first ten link-state requests pending that the local router is making to the specified Open Shortest Path First (OSPF) neighbor and interface, use the **show ospf request-list** command in XR EXEC mode.

show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **request-list** [*type interface-path-id*] [*neighbor-id*]

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPF routing process. The process name is defined by the **router ospf** command. If this argument is included, only information for the specified routing process is displayed.
vrf	(Optional) Specifies an OSPF VPN routing and forwarding (VRF) instance.
vrf-name	(Optional) Name of the OSPF VRF. The *vrf-name* argument can be specified as an arbitrary string. The strings “default” and “all” are reserved VRF names.
all	(Optional) Specifies all OSPF VRF instances.
area-id	(Optional) Area ID. If you do not specify an area, all areas are displayed.
type	Interface type. For more information, use the question mark (?) online help function.
i *nterface-path-id*	Physical interface or virtual interface. Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
neighbor-id	(Optional) IP address of the OSPF neighbor.

Command Default

All neighbors

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

You might use this command when the databases of two neighboring routers are out of synchronization or if the adjacency does not form between them. Adjacency means that the routers synchronize their databases when they discover each other.

You can look at the list to determine if one router is trying to request a particular database update. Entries that are suspended in the list usually indicate that updates are not being delivered. One possible reason for this behavior is a maximum transmission unit (MTU) mismatch between the routers.

You might also look at this list to make sure it is not corrupted. The list should refer to database entries that actually exist.

Request list information is transient and normally the lists are empty.

Task ID

Task ID	Operations
ospf	read

Examples

The following is sample output from the **show ospf request-list** command:

```
RP/0/RP0/CPU0:router# show ospf request-list 10.0.124.4 HundredGigE 3/0/0/0

Request Lists for OSPF pagent

 Neighbor 10.0.124.4, interface HundredGigE 3/0/0/0 address 10.3.1.2

 Type   LS ID            ADV RTR        Seq NO        Age   Checksum
    1   192.168.58.17     192.168.58.17   0x80000012     12   0x0036f3
    2   192.168.58.68     192.168.58.17   0x80000012     12   0x00083f
```

This table describes the significant fields shown in the display.

Table 62: show ospf request-list 10.0.124.4 HundredGigE 3/0/0/0 Field Descriptions

Field	Description
Neighbor	Specific neighbor receiving the request list from the local router.
Interface	Specific interface over which the request list is being sent.
Address	Address of the interface over which the request list is being sent.
Type	Type of link-state advertisement (LSA).
LS ID	Link-state ID of the LSA.
ADV RTR	IP address of the advertising router.
Seq NO	Sequence number of the LSA.
Age	Age of the LSA (in seconds).
Checksum	Checksum of the LSA.

show ospf retransmission-list

To display the first ten link-state entries in the Open Shortest Path First (OSPF) retransmission list that the local router sends to the specified neighbor over the specified interface, use the **show ospf retransmission-list** command in XR EXEC mode.

show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] [*area-id*] **retransmission-list** [*type interface-path-id*] [*neighbor-id*]

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPF routing process. The process name is defined by the **router ospf** command. If this argument is included, only information for the specified routing process is displayed.
vrf *vrf-name* **all**	(Optional) Specifies an OSPF VPN routing and forwarding (VRF) instance. The *vrf-name* argument can be specified as an arbitrary string. The strings "default" and "all" are reserved VRF names.
area-id	(Optional) Area ID. If you do not specify an area, all areas are displayed.
type	Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
neighbor-id	(Optional) IP address of the OSPF neighbor.

Command Default

All neighbors

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

You might use this command when the databases of two neighboring routers are out of synchronization or if the adjacency is not forming between them. Adjacency means that the routers synchronize their databases when they discover each other.

You can look at the list to determine if one router is trying to request a particular database update. Entries that appear to be suspended in the list usually indicate that updates are not being delivered. One possible reason for this behavior is a maximum transmission unit (MTU) mismatch between the routers.

You might also look at this list to make sure it is not corrupted. The list should refer to database entries that actually exist.

Retransmission list information is transient, and normally the lists are empty.

Task ID

Task ID	Operations
ospf	read

Examples

The following is sample output from the **show ospf retransmission-list** command:

```
RP/0/RP0/CPU0:router# show ospf retransmission-list 10.0.124.4 HundredGigE 3/0/0/0

 Neighbor 10.0.124.4, interface HundredGigE 3/0/0/0 address 10.3.1.2
```

This table describes the significant fields shown in the display.

Table 63: show ospf retransmission-list 10.0.124.4 GigabitEthernet3/0/0/0 Field Descriptions

Field	Description
Neighbor	Specified neighbor receiving the retransmission list from the local router.
Interface	Specified interface over which the retransmission list is being sent.
Address	Address of the interface.

show ospf routes

To display the Open Shortest Path First (OSPF) topology table, use the **show ospf routes** command in XR EXEC mode.

show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] **routes** [**connected** | **external** | **local**] [*prefix mask*] [*prefix*/*length*] **[multicast-intact] [backup-path]**

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPF routing process. The process name is defined by the **router ospf** command. If this argument is included, only information for the specified routing process is displayed.
vrf *vrf-name* **all**	(Optional) Specifies an OSPF VPN routing and forwarding (VRF) instance. The *vrf-name* argument can be specified as an arbitrary string. The strings "default" and "all" are reserved VRF names.
connected	(Optional) Displays connected routes.
external	(Optional) Displays routes redistributed from other protocols.
local	(Optional) Displays the local routes redistributed from the Routing Information Base (RIB).
prefix	(Optional) IP prefix, which limits output to a specific route. If the *prefix* argument is specified, either the *length* or *mask* argument is required.
mask	(Optional) IP address mask.
/ *length*	(Optional) Prefix length, which can be indicated as a slash (/) and number. For example, /8 indicates that the first eight bits in the IP prefix are network bits. If *length* is used, the slash is required.
multicast-intact	(Optional) Displays multicast intact paths.
backup-path	(Optional) Displays fast-reroute backup path information.

Command Default

All route types

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show ospf routes** command to display the OSPF private routing table (which contains only routes calculated by OSPF). If there is something wrong with a route in the RIB, then it is useful to check the OSPF copy of the route to determine if it matches the RIB contents. If it does not match, there is a synchronization problem between OSPF and the RIB. If the routes match and the route is incorrect, OSPF has made an error in its routing calculation.

Task ID

Task ID	Operations
ospf	read

show ospf routes command output with TI-LFA information

This is sample output from the **show ospf routes** command with **backup-path** keyword that displays backup-path information, including TI-LFA:

```
RP/0/RP0/CPU0:routersh ospf 1 routes 2.2.2.2/32 backup-path
Fri Apr  4 02:08:04.210 PDT

Topology Table for ospf 1 with ID 1.1.1.1

Codes: O - Intra area, O IA - Inter area
     O E1 - External type 1, O E2 - External type 2
     O N1 - NSSA external type 1, O N2 - NSSA external type 2

O    2.2.2.2/32, metric 3
     10.1.0.2, from 2.2.2.2, via HundredGigE 0/0/0/7, path-id 1
         Backup path: TI-LFA, P node: 4.4.4.4, Labels: 16004, 123
            10.0.3.2, from 2.2.2.2, via HundredGigE 0/0/0/3, protected bitmap 0x1
            Attribues: Metric: 104, SRLG Disjoint
```

This table describes the significant fields shown in the display.

Table 64: show ospf route Field Descriptions

Field	Description
O	OSPF route.
E	External Type 1 or 2 route.
N	NSSA Type 1 or 2
2.2.2.2/32	Network and subnet mask to which the local router has a route.
metric	Cost to reach network 10.3.1.0.
10.1.0.2	Next-hop router on the path to network 10.3.1.0.
from 2.2.2.2	Router ID 172.16.10.1 is the router that advertised this route.
via GigabitEthernet0/0/0/7	Packets destined for the given prefix (10.3.1.0/24) are sent over GigabitEthernet interface 0/0/0/7.
Backup path	Indicates the topology independent loop-free alternate backup path. Here, the backup path uses the P node 4.4.4.4.

Examples

The following is sample output from the **show ospf routes** command:

```
RP/0/RP0/CPU0:router# show ospf routes
```

```
Topology Table for ospf 1 with ID 10.3.4.2

Codes:O - Intra area, O IA - Inter area
       O E1 - External type 1, O E2 - External type 2
       O N1 - NSSA external type 1, O N2 - NSSA external type 2

O E2 10.3.1.0/24, metric 1
       10.3.4.1, from 172.16.10.1, via HundredGigE 0/1/0/1
O    10.3.4.0/24, metric 1562
       10.3.4.2, directly connected, via HundredGigE 0/1/0/1
O E2 10.1.0.0/16, metric 1
       10.3.4.1, from 172.16.10.1, via HundredGigE 0/1/0/1
O IA 10.10.10.0/24, metric 1572
       10.3.4.1, from 172.16.10.1, via HundredGigE 0/1/0/1
O E2 130.10.10.0/24, metric 20
       10.3.4.1, from 172.16.10.1, via HundredGigE 0/1/0/1
```

This table describes the significant fields shown in the display.

Table 65: show ospf route Field Descriptions

Field	Description
O	OSPF route.
E	External Type 1 or 2 route.
N	NSSA Type 1 or 2
10.3.1.0/24	Network and subnet mask to which the local router has a route.
metric	Cost to reach network 10.3.1.0.
10.3.4.1	Next-hop router on the path to network 10.3.1.0.
from 172.16.10.1	Router ID 172.16.10.1 is the router that advertised this route.
via GigabitEthernet 0/1/0/1	Packets destined for the given prefix (10.3.1.0/24) are sent over GigabitEthernet interface 0/1/0/1.

This table describes the significant fields shown in the display.

Table 66: show ospf route Field Descriptions

Field	Description
O	OSPF route.
E2	External Type 2 route.
10.3.1.0/24	Network and subnet mask to which the local router has a route.
metric 1	Cost to reach network 10.3.1.0.
10.3.4.1	Next-hop router on the path to network 10.3.1.0.

Field	Description
from 172.16.10.1	Router ID 172.16.10.1 is the router that advertised this route.
via POS 0/1/0/1	Packets destined for the given prefix (10.3.1.0/24) are sent over POS interface 0/1/0/1.

The following is sample output from the **show ospf routes** command with a process name of 100:

```
RP/0/RP0/CPU0:router# show ospf 100 routes

Topology Table for ospf 100 with ID 172.23.54.14

Codes:O - Intra area, O IA - Inter area
       O E1 - External type 1, O E2 - External type 2
       O N1 - NSSA external type 1, O N2 - NSSA external type 2

O    10.1.5.0/24, metric 1562
       10.1.5.14, directly connected, via HundredGigE 0/3/0/3
O IA 21.0.0.0/24, metric 1572
       10.1.5.12, from 172.23.54.12, via HundredGigE 0/3/0/3
O    10.0.0.0/24, metric 10
       10.0.0.12, directly connected, via HundredGigE 0/2/0/3
```

This table describes the significant fields shown in the display.

Table 67: show ospf 100 route Field Descriptions

Field	Description
O	OSPF route.
IA	Interarea route.
10.1.5.0/24	Network and subnet mask to which the local router has a route.
metric 1562	Cost to reach network 10.1.5.0.
10.1.5.14	Next-hop router on the path to network 10.1.5.0.
from 172.23.54.12	Router ID 172.23.54.12 is the router that advertised this route.
via GigabitEthernet 0/3/0/3	Packets destined for the given prefix (10.3.1.0/24) are sent over GigabitEthernet interface 0/3/0/3.

The following is sample output from the **show ospf routes** command with a prefix of 10.0.0.0 and a length of 24:

```
RP/0/RP0/CPU0:router# show ospf routes 10.0.0.0/24

Topology Table for ospf 100 with ID 172.23.54.14

Codes:O - Intra area, O IA - Inter area
       O E1 - External type 1, O E2 - External type 2
       O N1 - NSSA external type 1, O N2 - NSSA external type 2
```

```
O IA 10.0.0.0/24, metric 1572
       10.1.5.12, from 172.23.54.12, via GigabitEthernet 0/3/0/3
```

This table describes the significant fields shown in the display.

Table 68: show ospf route 10.0.0.0/24 Field Descriptions

Field	Description
O	Route is an OSPF route.
IA	Route to network 10.0.0.0 is an interarea route.
10.0.0.0/24	Network and subnet mask to which the local router has a route.
metric 1572	Cost to reach network 10.0.0.0.
10.1.5.12	IP address of next-hop router on the path to network 10.0.0.0.
from 172.23.54.12	Router ID 172.23.54.12 is the router that advertised this route.
via GigabitEthernet 0/3/0/3	Packets destined for the given prefix (10.0.0.0/24) are sent over GigabitEthernet interface 0/3/0/3.

show ospf sham-links

To display Open Shortest Path First (OSPF) sham-link information, use the **show ospf sham-links** command in XR EXEC mode.

show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] **sham-links**

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPF routing process. The process name is defined by the **router ospf** command. If this argument is included, only information for the specified routing process is displayed.
vrf	(Optional) Specifies an OSPF VPN routing and forwarding (VRF) instance.
vrf-name	(Optional) Name of the OSPF VRF. The *vrf-name* argument can be specified as an arbitrary string. The strings “default” and “all” are reserved VRF names.
all	(Optional) Specifies all OSPF VRF instances.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show ospf sham-links** command to display OSPF sham-link information.

Task ID

Task ID	Operations
ospf	read

Examples

The following is sample output from the **show ospf sham-links** command:

```
RP/0/RP0/CPU0:router# show ospf 1 vrf vrf_1 sham-links

Sham Links for OSPF 1, VRF vrf_1

Sham Link OSPF_SL0 to address 10.0.0.3 is up
Area 0, source address 10.0.0.1
IfIndex = 185
Run as demand circuit
DoNotAge LSA allowed., Cost of using 1
Transmit Delay is 1 sec, State POINT_TO_POINT,
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:04
Adjacency State FULL (Hello suppressed)
Number of DBD retrans during last exchange 0
Index 2/2, retransmission queue length 0, number of retransmission 0
```

```
First 0(0)/0(0) Next 0(0)/0(0)
Last retransmission scan length is 0, maximum is 0
Last retransmission scan time is 0 msec, maximum is 0 msec
Keychain-based authentication enabled
Key id used is 2
```

This table describes the significant fields shown in the display.

Table 69: show ospf sham-links Field Descriptions

Field	Description
Sham Link OSPF_SL0 to address	Address of the destination endpoint of the sham link.
IfIndex	ifindex associated with the sham link.
Run as demand circuit	Sham link is treated as a demand circuit.
DoNotAge LSA allowed	DoNotAge LSAs are allowed to be flooded over the sham link.
Cost of using	Sham-link cost.
Transmit Delay	Sham-link transmit delay.
State	Sham-link interface state.
Timer intervals configured	Various sham-link interface-related timers.
Hello due in	Time before the next Hello is sent over the sham link.
Adjacency State	State of the adjacency with the neighbor over the sham link.
Number of DBD retrans during last exchange	Number of DBD retransmissions during the last exchange over the sham link.
Index	Area flood index.
retransmission queue length	Retransmission queue length on the sham link.
number of retransmission	Number of retransmissions over the sham-link interface.
First	First flood information.
Next	Next flood information.
Last retransmission scan length is	Last retransmission scan length on the sham-link interface.
maximum is	Maximum retransmission scan length on the sham-link interface.
Last retransmission scan time is	Last retransmission scan time on the sham-link interface.
maximum is 0 msec	Maximum retransmission scan time on the sham-link interface.
Keychain-based authentication enabled	Keychain-based authentication is enabled.
Key id used is	Key ID used.

show ospf summary-prefix

To display Open Shortest Path First (OSPF) aggregated summary address information, use the **show ospf summary-prefix** command in XR EXEC mode.

show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] **summary-prefix**

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPF routing process. The process name is defined by the **router ospf** command. If this argument is included, only information for the specified routing process is displayed.
vrf *vrf-name* **all**	(Optional) Specifies an OSPF VPN routing and forwarding (VRF) instance. The *vrf-name* argument can be specified as an arbitrary string. The strings "default" and "all" are reserved VRF names.

Command Default

All summary prefixes

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show ospf summary-prefix** command if you configured summarization of external routes with the **summary-prefix** command and you want to display configured summary addresses.

Task ID

Task ID	Operations
ospf	read

Examples

The following is sample output from the **show ospf summary-prefix** command:

```
RP/0/RP0/CPU0:router# show ospf summary-prefix

OSPF Process 1, summary-prefix

10.1.0.0/255.255.0.0 Metric 20, Type 2, Tag 0
```

This table describes the significant fields shown in the display.

Table 70: show ospf summary-prefix Field Descriptions

Field	Description
10.1.0.0/255.255.0.0	Summary address designated for a range of addresses. The IP subnet mask used for the summary route.

Field	Description
Metric	Metric used to advertise the summary routes.
Type	External link-state advertisements (LSA) metric type.
Tag	Tag value that can be used as a “match” value for controlling redistribution through route maps.

show ospf virtual-links

To display parameters and the current state of Open Shortest Path First (OSPF) virtual links, use the **show ospf virtual-links** command in XR EXEC mode.

show ospf [*process-name*] [**vrf** {*vrf-name* | **all**}] **virtual-links**

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPF routing process. The process name is defined by the **router ospf** command. If this argument is included, only information for the specified routing process is displayed.
vrf *vrf-name* **all**	(Optional) Specifies an OSPF VPN routing and forwarding (VRF) instance. The *vrf-name* argument can be specified as an arbitrary string. The strings "default" and "all" are reserved VRF names.

Command Default

All virtual links

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show ospf virtual-links** command to display useful information for debugging OSPF routing operations.

Task ID

Task ID	Operations
ospf	read

Examples

The following is sample output from the **show ospf virtual-links** command:

```
RP/0/RP0/CPU0:router# show ospf virtual-links

Virtual Link to router 172.31.101.2 is up
Transit area 0.0.0.1, via interface GigabitEthernet 0/3/0/0, Cost of using 10
Transmit Delay is 1 sec, State POINT_TO_POINT
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 0:00:08
Adjacency State FULL
```

This table describes the significant fields shown in the display.

Table 71: show ospf virtual-links Field Descriptions

Field	Description
Virtual Link to router 172.31.101.2 is up	OSPF neighbor and whether the link to that neighbor is up or down.
Transit area 0.0.0.1	Transit area through which the virtual link is formed.
via interface GigabitEthernet 0/3/0/0	Interface through which the virtual link is formed.
Cost of usingusing 10	Cost of reaching the OSPF neighbor through the virtual link.
Transmit Delay is 1 sec	Transmit delay (in seconds) on the virtual link.
State POINT_TO_POINT	State of the OSPF neighbor.
Timer intervals	Various timer intervals (in seconds) configured for the link.
Hello due in 0:00:08	When the next hello message is expected from the neighbor (in hh:mm:ss).
Adjacency State FULL	Adjacency state between the neighbors.

show protocols (OSPF)

To display information about the OSPFv2 processes running on the router, use the **show protocols** command in XR EXEC mode.

show protocols [**afi-all** | **ipv4** | **ipv6**] [**all***protocol*]

Syntax Description

afi-all	(Optional) Specifies all address families.
ipv4	(Optional) Specifies an IPv4 address family.
ipv6	(Optional) Specifies an IPv6 address family.
all	(Optional) Specifies all protocols for a given address family.
protocol	(Optional) Specifies a routing protocol. For the IPv4 address family, the options are: • **bgp** • **isis** • **ospf** • **rip** For the IPv6 address family, the options are: • **bgp** • **isis** • **ospfv3**

Command Default

No default behavior or value

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ospf	read
rib	read

Examples

The following is an OSPF configuration and the resulting **show protocols ospf** display:

```
RP/0/RP0/CPU0:router#show running router ospf 1
```

```
router ospf 1
 router-id Loopback0
 nsf
 redistribute connected
 redistribute isis 3
 area 0
  mpls traffic-eng
  interface Loopback0
  !
  interface Loopback1
  !
  interface Loopback2
  !
  interface HundredGigE  0/3/0/0
  !
  interface HundredGigE 0/3/0/1
  !
  interface HundredGigE 0/3/0/2
  !
  interface HundredGigE 0/3/0/3
  !
 !
 mpls traffic-eng router-id Loopback0

!

RP/0/RP0/CPU0:router# show protocols ospf
Routing Protocol OSPF 1
  Router Id: 55.55.55.55
  Distance: 110
  Non-Stop Forwarding: Enabled
  Redistribution:
    connected
    isis 3
  Area 0
    MPLS/TE enabled
    HundredGigE 0/3/0/3
    HundredGigE 0/3/0/2
    HundredGigE 0/3/0/1
    HundredGigE 0/3/0/0
    Loopback2
    Loopback0
```

This table describes the significant fields shown in the display.

Table 72: show protocols ospf Field Descriptions

Field	Description
Router Id	ID of the router for this configuration.
Distance	Administrative distance of OSPF routes relative to routes from other protocols.
Non-Stop Forwarding	Status of nonstop forwarding.
Redistribution	Lists the protocols that are being redistributed.
Area	Information about the current area including list of interfaces and the status of Multiprotocol Label Switching traffic engineering (MPLS TE).

snmp context (OSPF)

To specify an SNMP context for an OSPF instance, use the **snmp context** command in XR Config mode or in VRF configuration mode. To remove the SNMP context, use the **no** form of this command.

snmp context *context_name*
no snmp context *context_name*

Syntax Description

context_name	Specifies name of the SNMP context for OSPF instance.

Command Default

SNMP context is not specified.

Command Modes

XR Config mode

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The snmp-server commands need to be configured to perform SNMP request for the OSPF instance. Refer *SNMP Server Commands* module in *System Management Command Reference* for information on using the **snmp-server** commands.

Note To map an SNMP context with a protocol instance, topology or VRF entity, use the **snmp-server context mapping** command. However, the **feature** option of this command does not work with OSPF protocol.

Task ID

Task ID	Operation
ospf	read, write

This example shows how to configure an SNMP context *foo* for OSPF instance *100*:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#router ospf 100
RP/0/RP0/CPU0:router(config-ospf)#snmp context foo
```

This example shows how to configure **snmp-server** commands to be used with the **snmp context** command:

```
RP/0/RP0/CPU0:router(config)#snmp-server host 10.0.0.2 traps version 2c public udp-port
1620
RP/0/RP0/CPU0:router(config)#snmp-server community public RW
RP/0/RP0/CPU0:router(config)#snmp-server contact foo
```

```
RP/0/RP0/CPU0:router(config)#snmp-server community-map public context foo
```

This is a sample SNMP context configuration for OSPF instance *100*:

```
snmp-server host 10.0.0.2 traps version 2c public udp-port 1620
snmp-server community public RW
snmp-server contact foo

snmp-server community-map public context foo


router ospf 100
 router-id 2.2.2.2
 bfd fast-detect
 nsf cisco
snmp context foo
 area 0
  interface Loopback1
  !
 !
 area 1
  interface HundredGigE 0/2/0/1
   demand-circuit enable
  !
  interface HundredGigE 0/3/0/0
  !
  interface HundredGigE 0/3/0/1
  !
 !
!
```

snmp trap (OSPF)

To enable SNMP trap for an OSPF instance, use the **snmp trap** command in VRF configuration mode. To disable SNMP trap for the OSPF instance, use the **no** form of this command.

snmp trap
no snmp trap

Syntax Description

This command has no keywords or arguments.

Command Default

Disabled.

Command Modes

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
ospf	read, write

This example shows how to enable SNMP trap for OSPF instance *100* under VRF *vrf-1*:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#router ospf 100
RP/0/RP0/CPU0:router(config-ospf)#vrf vrf-1
RP/0/RP0/CPU0:router(config-ospf-vrf)#snmp trap
```

snmp trap rate-limit (OSPF)

To control the number of traps that OSPF sends by configuring window size and the maximum number of traps during that window, use the **snmp trap rate-limit** command in XR Config mode. To disable configuring the window size and maximum number of traps during the window, use the **no** form of this command.

snmp trap rate-limit *window-size max-num-traps*
no snmp trap rate-limit *window-size max-num-traps*

Syntax Description

window-size	Specifies the trap rate limit sliding window size.
max-num-traps	Specifies the maximum number of traps sent in window time.

Command Default

The default window size is 10 seconds and the maximum number of traps sent in the window time is 7.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
ospf	read,write

Examples

The following example shows how to set the trap rate limit sliding window size to 30 and the maximum number of traps sent to 100:

```
RP/0/RP0/CPU0:router(config)#router ospf 100
RP/0/RP0/CPU0:router(config-ospf)#snmp trap rate-limit 30 100
```

spf prefix-priority (OSPFv2)

To prioritize OSPFv2 prefix installation into the global Routing Information Base (RIB) during Shortest Path First (SPF) run, use the **spf prefix-priority** command in router configuration mode. To return to the system default value, use the **no** form of this command.

spf prefix-priority route-policy *policy-name*
no spf prefix-priority route-policy *policy-name*

Syntax Description

route-policy *policy-name* Specifies the route policy to apply to OSPFv2 prefix prioritization.

Note If SPF prefix prioritization is configured, /32 prefixes are no longer preferred by default. To retain the /32 prefixes in higher-priority queues, define the route-policy accordingly.

Command Default

SPF prefix prioritization is disabled.

Command Modes

OSPF router configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

SPF prefix prioritization is disabled, by default. In disabled mode, the /32 prefixes are installed into the global RIB before other prefixes.

If SPF prefix prioritization is enabled, routes are matched against the route-policy criteria and are assigned to the appropriate priority queue based on the spf-priority set. Unmatched prefixes, including the /32 prefixes, are placed in the low-priority queue.

If all /32 prefixes are desired in the high-priority queue or medium-priority queue, configure the following single route map:

```
prefix-set ospf-medium-prefixes
   0.0.0.0/0 ge 32
end-set
```

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure OSPFv2 SPF prefix prioritization:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# prefix-set ospf-critical-prefixes
RP/0/RP0/CPU0:router(config-pfx)# 66.0.0.0/16
```

```
RP/0/RP0/CPU0:router(config-pfx)# end-set
RP/0/RP0/CPU0:router(config)# route-policy ospf-spf-priority
RP/0/RP0/CPU0:router(config-rpl)# if destination in ospf-critical-prefixes then set
spf-priority critical
endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# router-id 66.0.0.1
RP/0/RP0/CPU0:router(config-ospf)# spf prefix-priority route-policy ospf-spf-priority
```

stub (OSPF)

To define an area as a stub area, use the **stub** command in area configuration mode. To disable this function, use the **no** form of this command.

stub [**no-summary**]
no stub

Syntax Description

no-summary	(Optional) Prevents an Area Border Router (ABR) from sending summary link advertisements into the stub area.

Command Default

No stub area is defined.

Command Modes

Area configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

You must configure the **stub** command on all routers in the stub area.

Use the **default-cost** command on the ABR of a stub area to specify the cost of the default route advertised into the stub area by the ABR.

To further reduce the number of link-state advertisements (LSAs) sent into a stub area, you can configure the **no-summary** keyword on the ABR to prevent it from sending summary LSAs (LSA Type 3) into the stub area.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to assign a default cost of 20 to stub network 10.0.0.0:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 201
RP/0/RP0/CPU0:router(config-ospf)# area 10.0.0.0
RP/0/RP0/CPU0:router(config-ospf-ar)# stub
RP/0/RP0/CPU0:router(config-ospf-ar)# default-cost 20
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/3/0/3
```

summary-prefix (OSPF)

To create aggregate addresses for routes being redistributed from another routing protocol into the Open Shortest Path First (OSPF) protocol, use the **summary-prefix** command in the appropriate mode. To stop summarizing redistributed routes, use the **no** form of the command.

summary-prefix *address mask* [**not-advertise** | **tag** *tag*]
no summary-prefix *address mask*

Syntax Description

address	Summary address designated for a range of addresses.
mask	IP subnet mask used for the summary route.
not-advertise	(Optional) Suppresses summary routes that match the address and mask pair from being advertised.
tag *tag*	(Optional) Tag value that can be used as a "match" value for controlling redistribution through route policies.

Command Default

When this command is not used, specific addresses are created for each route from another route source being distributed into the OSPF protocol.

Command Modes

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **summary-prefix** command to cause an OSPF Autonomous System Boundary Router (ASBR) to advertise one external route as an aggregate for all redistributed routes that are covered by the address. This command summarizes only routes from other routing protocols that are being redistributed into OSPF.

You can use this command multiple times to summarize multiple groups of addresses. The metric used to advertise the summary is the lowest metric of all the more specific routes. This command helps reduce the size of the routing table.

If you want to summarize routes between OSPF areas, use the **range** command.

Task ID

Task ID	Operations
ospf	read, write

Examples

In the following example, summary address 10.1.0.0 includes address 10.1.1.0, 10.1.2.0, 10.1.3.0, and so on. Only the address 10.1.0.0 is advertised in an external link-state advertisement.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 201
RP/0/RP0/CPU0:router(config-ospf)# summary-prefix 10.1.0.0 255.255.0.0
```

timers lsa group-pacing

To change the interval at which Open Shortest Path First (OSPF) link-state advertisements (LSAs) are collected into a group and refreshed, checksummed, or aged, use the **timers lsa group-pacing** command in the appropriate mode. To restore the default value, use the **no** form of this command.

timers lsa group-pacing *seconds*
no timers lsa group-pacing

Syntax Description

seconds	Interval (in seconds) at which LSAs are grouped and refreshed, checksummed, or aged. Range is 10 seconds to 1800 seconds.

Command Default

seconds : 240 seconds

Command Modes

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

OSPF LSA group pacing is enabled by default. For typical customers, the default group pacing interval for refreshing, checksumming, and aging is appropriate and you need not configure this feature.

The duration of the LSA group pacing is inversely proportional to the number of LSAs the router is handling. For example, if you have approximately 10,000 LSAs, decreasing the pacing interval would benefit you. If you have a very small database (40 to 100 LSAs), increasing the pacing interval to 10 to 20 minutes might benefit you slightly.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to change the OSPF pacing between LSA groups to 60 seconds:

```
RP/0/RP0/CPU0:router# configure
 RP/0/RP0/CPU0:router(config)# router ospf 1
 RP/0/RP0/CPU0:router(config-ospf)# timers lsa group-pacing 60
```

timers lsa min-arrival

To limit the frequency that new instances of any particular Open Shortest Path First (OSPF) link-state advertisements (LSAs) can be accepted during flooding, use the **timers lsa min-arrival** command in the appropriate mode. To restore the default value, use the **no** form of this command.

timers lsa min-arrival *milliseconds*

no timers lsa min-arrival

Syntax Description

milliseconds	Minimum interval (in milliseconds) between accepting same LSA. Range is 0 to 600000 milliseconds.

Command Default

milliseconds : 100 milliseconds

Command Modes

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to change the minimum interval between accepting the same LSA to 2 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# timers lsa min-arrival 2
```

timers throttle lsa all (OSPF)

To modify the Open Shortest Path First (OSPF) link-state advertisement (LSA) throttling, use the **timers throttle lsa all** command in the appropriate mode. To revert LSA throttling to default settings, use the **no** form of this command

timers throttle lsa all *start-interval hold-interval max-interval*
no timers throttle lsa all

Syntax Description

start-interval	Delay to generate first occurance of LSA in milliseconds. Range is 0 to 600000 milliseconds.
hold-interval	Minimum delay between originating the same LSA in milliseconds. Range is 1 to 600000 milliseconds.
max-interval	Maximum delay between originating the same LSA in milliseconds. Range is 1 to 600000 milliseconds.

Command Default

start-interval : 50 milliseconds

hold-interval : 200 milliseconds

max-interval : 5000 milliseconds

Command Modes

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The *lsa-start* time is the delay before flooding the first instance of an LSA. The *lsa-hold* interval is the minimum time to elapse before flooding an updated instance of an LSA. The *lsa-max-wait* time is the maximum time that can elapse before flooding an updated instance of an LSA.

For quick convergence, use smaller times for the *lsa-start* time and *lsa-hold* interval. However, in relatively large networks, this may result in a large number of LSAs being flooded in a relatively short time. A balance with the *lsa-start* time and *lsa-hold* interval can be iteratively arrived at for the size of your network. The *lsa-max-wait* time can be used to ensure that OSPF reconverges within a reasonable amount of time.

Note LSA throttling is always enabled. You can change the timer values with the **timers throttle lsa all** command or specify the **no** keyword to revert back to the default settings.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to change the start, hold, and maximum wait interval values to 500, 1000, and 90,000 milliseconds, respectively:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# timers throttle lsa all 500 1000 90000
```

The following example is output from the show ospf command that displays the modified LSA throttle settings:

```
RP/0/RP0/CPU0:router# show ospf

Routing Process "ospf 1" with ID 1.1.1.1
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
 It is an area border router
 Initial SPF schedule delay 5000 msecs
 Minimum hold time between two consecutive SPFs 10000 msecs
 Maximum wait time between two consecutive SPFs 10000 msecs
 Initial LSA throttle delay 500 msecs
 Minimum hold time for LSA throttle 1000 msecs
 Maximum wait time for LSA throttle 90000 msecs
 Minimum LSA interval 1000 msecs. Minimum LSA arrival 1 secs
 Maximum number of configured interfaces 255
 Number of external LSA 0. Checksum Sum 00000000
 Number of opaque AS LSA 0. Checksum Sum 00000000
 Number of DCbitless external and opaque AS LSA 0
 Number of DoNotAge external and opaque AS LSA 0
 Number of areas in this router is 2. 2 normal 0 stub 0 nssa
 External flood list length 0
 Non-Stop Forwarding enabled
    Area BACKBONE(0) (Inactive)
        Number of interfaces in this area is 2
        SPF algorithm executed 8 times
        Number of LSA 2. Checksum Sum 0x01ba83
        Number of opaque link LSA 0. Checksum Sum 00000000
        Number of DCbitless LSA 0
        Number of indication LSA 0
        Number of DoNotAge LSA 0
        Flood list length 0
    Area 1
        Number of interfaces in this area is 1
        SPF algorithm executed 9 times
        Number of LSA 2. Checksum Sum 0x0153ea
        Number of opaque link LSA 0. Checksum Sum 00000000
        Number of DCbitless LSA 0
        Number of indication LSA 0
        Number of DoNotAge LSA 0
        Flood list length 0
```

timers throttle spf (OSPF)

To modify the Open Shortest Path First (OSPF) shortest path first (SPF) throttling, use the **timers throttle spf** command in the appropriate mode. To revert SPF throttling to default settings, use the **no** form of this command.

timers throttle spf *spf-start spf-hold spf-max-wait*
no timers throttle spf

Syntax Description

spf-start	Initial SPF schedule delay (in milliseconds). Range is 1 to 600000 milliseconds.
spf-hold	Minimum hold time (in milliseconds) between two consecutive SPF calculations. Range is 1 to 600000 milliseconds.
spf-max-wait	Maximum wait time (in milliseconds) between two consecutive SPF calculations. Range is 1 to 600000 milliseconds.

Command Default

spf-start:50 milliseconds

spf-hold: 200 milliseconds

spf-max-wait: 5000 milliseconds

Command Modes

Router configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The *spf-start* time is the delay before running SPF for the first time. The *spf-hold* interval is the minimum time to elapse between subsequent SPF runs. The *spf-max-wait* time is the maximum time that can elapse before running SPF again.

Tip Setting a low *spf-start* time and *spf-hold* time causes routing to switch to the alternate path more quickly if there is a failure; however, it consumes more CPU processing time.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to change the start, hold, and maximum wait interval values to 5, 1000, and 90000 milliseconds, respectively:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# timers throttle spf 5 1000 90000
```

transmit-delay (OSPF)

To set the estimated time required to send a link-state update packet on the interface, use the **transmit-delay** command in the appropriate mode. To return to the default value, use the **no** form of this command.

transmit-delay *seconds*
no transmit-delay *seconds*

Syntax Description

seconds	Time (in seconds) required to send a link-state update. Range is 1 to 65535 seconds.

Command Default

seconds: 1 second

Command Modes

XR Config mode

Area configuration

Interface configuration

Virtual-link configuration

VRF configuration

Multi-area configuration

Sham-link configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Link-state advertisements (LSAs) in the update packet must have their ages incremented by the amount specified in the *seconds* argument before transmission. The value assigned should take into account the transmission and propagation delays for the interface.

If the delay is not added before transmission over a link,the time in which the LSA propagates over the link is not considered. This setting has significance only on very low-speed networks not supported in Cisco IOS XR software or on networks such as satellite circuits that incur a very long (greater than one second) delay time.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure a transmit delay for interface HundredGigE 0/3/0/0:

```
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# area 0
RP/0/RP0/CPU0:router(config-ospf-ar)# interface HundredGigE 0/3/0/0
```

```
RP/0/RP0/CPU0:router(config-ospf-ar-if)# transmit-delay 3
```

virtual-link (OSPF)

To define an Open Shortest Path First (OSPF) virtual link, use the **virtual-link** command in area configuration mode. To remove a virtual link, use the **no** form of this command.

virtual-link *router-id*
no virtual-link *router-id*

Syntax Description

router-id	Router ID associated with the virtual link neighbor. The router ID appears in the **show ospf** command display. The router ID can be any 32-bit router ID value specified in four-part, dotted-decimal notation.

Command Default

No virtual links are defined.

Command Modes

Area configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

All areas in an OSPF autonomous system must be physically connected to the backbone area (area 0). In some cases in which this physical connection is not possible, you can use a virtual link to connect to the backbone through a nonbackbone area. You can also use virtual links to connect two parts of a partitioned backbone through a nonbackbone area. The area through which you configure the virtual link, known as a transit area, must have full routing information. The transit area cannot be a stub or not-so-stubby area.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to establish a virtual link with default values for all optional parameters:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 201
RP/0/RP0/CPU0:router(config-ospf)# area 10.0.0.0
RP/0/RP0/CPU0:router(config-ospf-ar)# virtual-link 10.3.4.5
RP/0/RP0/CPU0:router(config-ospf-ar-vl)#
```

The following example shows how to establish a virtual link with clear text authentication called mykey:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 201
RP/0/RP0/CPU0:router(config-ospf)# area 10.0.0.0
```

```
RP/0/RP0/CPU0:router(config-ospf-ar)# virtual-link 10.3.4.5
RP/0/RP0/CPU0:router(config-ospf-ar-vl)# authentication-key 0 mykey
```

vrf (OSPF)

To configure an Open Shortest Path First (OSPF) VPN routing and forwarding (VRF) instance, use the **vrf** command in XR Config mode. To terminate an OSPF VRF, use the **no** form of this command.

vrf *vrf-name*
no vrf *vrf-name*

Syntax Description

vrf-name	Identifier of an OSPF VRF. The *vrf-name* argument can be specified as an arbitrary string. The strings "default" and "all" are reserved VRF names.

Command Default

No OSPF VRF is defined.

Command Modes

Router configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **vrf** command to explicitly configure a VRF. Commands configured under the VRF configuration mode (such as the **interface** [OSPF] and **authentication** commands) are automatically bound to that VRF.

To modify or remove the VRF, the *vrf-id* argument format must be the same as the format used when creating the area.

Note To remove the specified VRF from the router configuration, use the **no vrf** *vrf-id* command. The **no vrf** *vrf-id* command removes the VRF and all VRF options, such as **authentication** , **default-cost** , **nssa** , **range** , **stub** , **virtual-link** , and **interface.**

To avoid possibly having the router ID change under a VRF, explicitly configure the router ID using the **router-id** command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure VRF vrf1 and HundredGigE interface 0/2/0/0. HundredGigE interface 0/2/0/0 is bound to VRF vrf1 automatically.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# vrf vrf1
RP/0/RP0/CPU0:router(config-ospf-vrf)# area area1
```

```
RP/0/RP0/CPU0:router(config-ospf-vrf-ar)# interface HundredGigE 0/2/0/0
```

OSPFv3 Commands

Note All commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 540 Series Router that is introduced from Cisco IOS XR Release 6.3.2. References to earlier releases in Command History tables apply to only the Cisco NCS 5500 Series Router.

Note

- Starting with Cisco IOS XR Release 6.6.25, all commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 560 Series Routers.
- Starting with Cisco IOS XR Release 6.3.2, all commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 540 Series Router.
- References to releases before Cisco IOS XR Release 6.3.2 apply to only the Cisco NCS 5500 Series Router.
- Cisco IOS XR Software Release 7.0.1 specific updates are not applicable for the following variants of Cisco NCS 540 Series Routers:
  - N540-28Z4C-SYS-A
  - N540-28Z4C-SYS-D
  - N540X-16Z4G8Q2C-A
  - N540X-16Z4G8Q2C-D
  - N540X-16Z8Q2C-D
  - N540-12Z20G-SYS-A
  - N540-12Z20G-SYS-D
  - N540X-12Z16G-SYS-A
  - N540X-12Z16G-SYS-D

This module describes the commands used to configure and monitor the IP Version 6 (IPv6) Open Shortest Path First Version 3 (OSPFv3) routing protocol.

For detailed information about OSPFv3 concepts, configuration tasks, and examples, see the Implementing OSPF on Cisco NCS 5500 Series Routers module in the *Routing Configuration Guide for Cisco NCS 5500 Series Routers*.

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address-family (OSPFv3)

To enter address family configuration mode for Open Shortest Path First Version 3 (OSPFv3), use the **address-family** command in the router ospv3 configuration mode. To disable address family configuration mode, use the **no** form of this command.

address-family ipv6 [**unicast**]
no address-family ipv6 [**unicast**]

Syntax Description

ipv6	Specifies IP Version 6 (IPv6) address prefixes.
unicast	(Optional) Specifies unicast address prefixes.

Command Default

An address family is not specified.

Command Modes

Router ospfv3 configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure the OSPFv3 router process with IPv6 unicast address prefixes:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# address-family ipv6 unicast
```

area (OSPFv3)

To configure an Open Shortest Path First Version 3 (OSPFv3) area, use the **area** command in an appropriate configuration mode. To remove an OSPFv3 area, use the **no** form of this command.

area *area-id*
no area *area-id*

Syntax Description

area-id	Identifier of an OSPFv3 area. The *area-id* argument can be specified as either a decimal value or as an IPv4 address.

Command Default

No OSPFv3 areas are defined.

Command Modes

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

An area must be explicitly configured with the **area** command.

Use the **area** command to place the router in area configuration mode (prompt: config-router-ar), from which you can configure area-specific settings. Commands configured under this mode (such as the **interface** command) are automatically bound to that area.

Note To remove the specified OSPFv3 area from the router ospfv3 configuration, use the **no area** *area-id* command. The **no area** *area-id* command removes the OSPFv3 area including all OSPFv3 area options, and all the OSPFv3 interfaces and interface options that are configured under the area.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure area 0 for OSPFv3 process 1. The HundredGigE 0/1/0/1 interface also is configured:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# area 0
RP/0/RP0/CPU0:router(config-ospfv3-ar)# interface HundredGigE 0/1/0/1
```

authentication (OSPFv3)

To enable plain text, Message Digest 5 (MD5) authentication, or null authentication for an Open Shortest Path First Version 3 (OSPFv3) interface, use the **authentication** command in an appropriate configuration mode. To remove such authentication, use the **no** form of this command.

authentication {**ipsec** **spi** *spi-value* {**md5** | **sha1**} [**clear** | **password**] *password* | **disable**}
no **authentication**

Syntax Description

ipsec	Specifies IP Security (IPSec). IPSec supported only for OSPFv3.
spi *spi-value*	Specifies a security policy index (SPI) value. Range is 256 to 4294967295.
md5	Enables Message Digest 5 (MD5) authentication.
sha1	Enables SHA1 authentication.
clear	(Optional) Specifies that the key be unencrypted.
password	(Optional) Specifies that the key be encrypted using a two-way algorithm.
password	Any contiguous string that can be entered from the keyboard.
disable	Disables authentication for OSPFv3 packets.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the authentication parameter specified by the area.

If this command is not specified in area configuration mode, then the interface adopts the authentication parameter specified for the process.

If this command is not specified at any level, then the interface does not use authentication.

Command Modes

Interface configuration

Area configuration

Router configuration

Virtual-link configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **authentication** command to specify an authentication type for the interface, which overrides the authentication specified for the area to which this interface belongs. If this command is not included in the

configuration file, the authentication configured in the area to which the interface belongs is assumed (as specified by the area **authentication** command).

The authentication type and password must be the same for all OSPFv3 interfaces that are to communicate with each other through OSPFv3.

Note

- IPSec is supported only for Open Shortest Path First version 3 (OSPFv3).
- If OSPFv3 is configured along with IPsec authentication, then it is likely that adjacencies may flap on a Route Processor Fail Over (RPFO) even when NSR and/or Graceful Restart is enabled.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to enable MD5 authentication:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospfv3 201
RP/0/RP0/CPU0:router(config-ospfv3)# router-id 10.1.1.1
RP/0/RP0/CPU0:router(config-ospfv3)# authentication ipsec spi 500 md5
1234567890abcdef1234567890abcdef
```

auto-cost (OSPFv3)

To control how the Open Shortest Path First Version 3 (OSPFv3) protocol calculates default metrics for an interface, use the **auto-cost** command in an appropriate configuration mode. To set link cost based only on the interface type, use the **disable** form of this command. To re-enable OSPFv3 metric calculation for an interface according to the bandwidth of the interface, use the **no** form of this command.

auto-cost [**reference-bandwidth** *mbps* | **disable**]
no auto-cost [**reference-bandwidth** *mbps* | **disable**]

Syntax Description

reference-bandwidth *mbps*	(Optional) Sets the rate in Mbps (bandwidth). Range is 1 to 4294967.
disable	(Optional) Sets the link cost based only on the interface type.

Command Default

mbps : 100 Mbps

Command Modes

Router ospfv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

By default OSPFv3 calculates the OSPFv3 metric for an interface according to the bandwidth of the interface.

The **no auto-cost disable** form of this command reenables OSPFv3 metric calculation for an interface according to the bandwidth of the interface.

To set link cost based only on the interface type, use the **disable** keyword.

If you have multiple links with high bandwidth, you might want to use a larger number to differentiate the cost on those links.

Recommended usage of cost configuration for all OSPFv3 configured interfaces is to be consistent: Either explicitly configure link costs (by using the **cost** command) or choose an appropriate default (by using the **auto-cost** command).

The value set by the **cost** command overrides the cost resulting from the **auto-cost** command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to set the reference value for the auto cost to 64:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
```

```
RP/0/RP0/CPU0:router(config-ospfv3)# auto-cost reference-bandwidth 64
```

capability vrf-lite (OSPFv3)

To ignore DN bit in LSAs received from peers in the given VRF and to disable automatic ABR status in that VRF, use the **capability vrf-lite** command in OSPFv3 VRF configuration mode. To disable ignoring the DN bit in LSAs and to re-enable automatic ABR status in the VRF, use the **no** form of this command.

capability vrf-lite
no capability vrf-lite

This command has no keywords or arguments.

Command Default

Disabled.

Command Modes

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **capability vrf-lite** command when routers (sometimes called multi-vrf CE routers) are directly connected through interfaces associated with a VRF, but without being connected to other PEs through the MPLS/VPN BGP Backbone.

When OSPFv3 is enabled in a VRF, the router is always an ABR. With the capability vrf-lite command enabled, the router becomes an ABR only if it is connected to area 0 (backbone area), and there are other (non-backbone) areas enabled on this router in the given VRF.

Note Routes may be re-introduced to the VPN backbone when this command is used.

Task ID

Task ID	Operation
ospf	read, write

This example shows how to enable VRF-lite capability for OSPFv3 instance *1* under VRF *vrf1*:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)#vrf vrf1
RP/0/RP0/CPU0:router(config-ospfv3-vrf)#capability vrf-lite
```

clear ospfv3 process

To reset an Open Shortest Path First Version 3 (OSPFv3) router process without removing and reconfiguring it, use the **clear ospfv3 process** command in XR EXEC mode.

clear ospfv3 [*process-name*] [**vrf** *vrf-name*] **process**

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPFv3 routing process. The process name is defined by the **router ospfv3** command. If this argument is included, only the specified routing process is affected. Otherwise, all OSPFv3 processes are reset.
vrf	(Optional) Specifies VPN routing and forwarding (VRF).
vrf-name	Name of a VRF.

Command Default

No default behavior or value

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

When the OSPFv3 router process is reset, OSPFv3 releases all resources allocated, cleans up the internal database, uninstalls routes, and resets all OSPFv3 adjacencies.

Note The **clear ospfv3 process** command might clear the router ID configuration if the OSPF router ID is not explicitly configured through the router-id (OSPFv3), on page 548 command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to reset all OSPFv3 processes:

```
RP/0/RP0/CPU0:router# clear ospfv3 process
```

The following example shows how to reset the OSPFv3 process 1:

```
RP/0/RP0/CPU0:router# clear ospfv3 1 process
```

clear ospfv3 redistribution

To flush all the Type 5 and Type 7 link-state advertisements (LSAs) originated by an Open Shortest Path First Version 3 (OSPFv3) process, use the **clear ospfv3 redistribution** command in XR EXEC mode.

clear ospfv3 [*process-name*] [**vrf** *vrf-name*] **redistribution**

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPFv3 routing process. The process name is defined by the **router ospfv3** command. If this argument is included, only the specified routing process is affected. Otherwise, all OSPFv3 processes are reset.
vrf	(Optional) Specifies VPN routing and forwarding (VRF).
vrf-name	Name of a VRF.

Command Default

No default behavior or value

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **clear ospfv3 redistribution** command to cause the routing table to be read again. OSPFv3 regenerates and sends Type 5 and Type 7 link-state advertisements (LSAs) to its neighbors. If an unexpected route has appeared in the OSPFv3 redistribution, using this command corrects the issue.

Note Use of this command can cause a significant number of LSAs to flood the network. We recommend that you use this command with caution.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to clear all OSPFv3 redistributed routes from other protocols:

```
RP/0/RP0/CPU0:router# clear ospfv3 redistribution
```

clear ospfv3 routes

To clear the Open Shortest Path First Version 3 (OSPFv3) internal route table, use the **clear ospfv3 routes** command in XR EXEC mode.

clear ospfv3 [*process-name*] [**vrf** *vrf-name*] **routes**

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPFv3 routing process. The process name is defined by the **router ospfv3** command. If this argument is included, only the specified routing process is affected. Otherwise, all OSPFv3 processes are reset.
vrf	(Optional) Specifies VPN routing and forwarding (VRF).
vrf-name	Name of a VRF.

Command Default

No default behavior or value

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **clear ospfv3 routes** command to force the internal route table to be repopulated by causing recalculation of the shortest path first (SPF) routing table. When the OSPFv3 routing table is cleared, OSPFv3 routes in the global routing table are also recalculated.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to clear all OSPFv3 routes from the OSPFv3 routing table and recomputes valid routes:

```
RP/0/RP0/CPU0:router# clear ospfv3 routes
```

clear ospfv3 statistics

To clear the Open Shortest Path First Version 3 (OSPFv3) statistical counters, use the **clear ospfv3 statistics** command in XR EXEC mode.

clear ospfv3 [*process-name*] [**vrf** *vrf-name*] **statistics** [**neighbor** [*type interface-path-id*] [*router-id*]]

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPFv3 routing process. The process name is defined by the **router ospfv3** command. If this argument is included, only the specified routing process is affected.
neighbor	(Optional) Clears counters for the specified neighbor only.
type	Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
router-id	(Optional) Specified router ID. This argument must be in 32-bit dotted-decimal notation, similar to an IPv4 address. This argument clears the counters of the specified neighbor only.
vrf	(Optional) Specifies VPN routing and forwarding (VRF).
vrf-name	Name of a VRF.

Command Default

No default behavior or value

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **clear ospfv3 statistics** command to reset statistics so that subsequent changes are easily observed.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to clear the OSPFv3 statistical counters of all neighbors on HundredGigE interface 0/2/0/0:

```
RP/0/RP0/CPU0:router# clear ospfv3 statistics neighbor HundredGigE 0/2/0/0
```

cost (OSPFv3)

To explicitly specify the cost of the interface (network) for OSPF path calculations, use the **cost** command in an appropriate configuration mode. To remove the cost, use the **no** form of this command.

cost *cost*
no cost

Syntax Description

cost	Unsigned integer value expressed as the link-state metric. Range is 1 to 65535.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the cost parameter specified by the area.

If this command is not specified in area configuration mode, then the interface adopts the cost parameter specified for the process.

If this command is not specified at any level, then the cost is based on the interface bandwidth, as specified by the **auto-cost** command.

Command Modes

Interface configuration

Area configuration

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The link-state metric is advertised as the link cost in the router link advertisement.

In general, the path cost is calculated using the following formula:

10^8 / bandwidth

Using this formula, the default path cost is 1 for OC-3 Packet-over-SONET/SDH (POS). If this value does not suit your network, you can use your own method of calculating path costs.

The value set by the **cost** command overrides the cost resulting from the **auto-cost** command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to set the cost value to 65 for HundredGigE interface 0/1/0/1:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 201
```

```
RP/0/RP0/CPU0:router(config-ospfv3)# area 0
RP/0/RP0/CPU0:router(config-ospfv3-ar)# interface HundredGigE 0/1/0/1
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# cost 65
```

database-filter all out (OSPFv3)

To filter outgoing link-state advertisements (LSAs) to an Open Shortest Path First Version 3 (OSPFv3) interface, use the **database-filter all out** command in an appropriate configuration mode. To restore the forwarding of LSAs to the interface, use the **no** form of this command.

database-filter all out
no database-filter all out

Syntax Description

This command has no keywords or arguments.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the database filter parameter specified for the area.

If this command is not specified in area configuration mode, then the interface adopts the database filter parameter specified for the process.

If this command is not specified in router ospfv3 configuration mode, then the database filter is disabled and all outgoing LSAs are flooded to the interface.

Command Modes

Interface configuration

Area configuration

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **database-filter all out** command to perform the same function that the **neighbor** command (with the **database-filter** keyword) performs on a neighbor basis.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to prevent flooding of OSPFv3 LSAs to neighbors reachable through HundredGigE interface 0/2/0/3:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# area 0
RP/0/RP0/CPU0:router(config-ospfv3-ar)# interface HundredGigE 0/2/0/3
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# database-filter all out
```

dead-interval (OSPFv3)

To set the interval after which a neighbor is declared dead when no hello packets are observed, use the **dead-interval** command in an appropriate configuration mode. To return to the default time, use the **no** form of this command.

dead-interval *seconds*
no dead-interval

Syntax Description

seconds	Unsigned integer that specifies the interval (in seconds). The value must be the same for all nodes on the same network link. Range is 1 to 65535.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the dead interval parameter specified for the area.

If this command is not specified in area configuration mode, then the interface adopts the dead interval parameter specified for the process.

If this command is not specified in router ospfv3 configuration mode, then the dead interval is four times the interval set by the **hello-interval (OSPFv3)** command.

Command Modes

Interface configuration

Area configuration

Router OSPFv3 configuration

Virtual-link configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Two Open Shortest Path First Version 3 (OSPFv3) routers do not become adjacent if their dead interval values differ.

If the hello interval is configured, the dead interval value must be larger than the hello interval value. The dead interval value is usually configured four times larger than the hello interval value.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to set the OSPFv3 dead interval on HundredGigE interface 0/2/0/3 to 40 seconds:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# area 0
RP/0/RP0/CPU0:router(config-ospfv3-ar)# interface HundredGigE 0/2/0/3
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# dead-interval 40
```

default-cost (OSPFv3)

To specify a cost for the default summary route sent into a stub area or not-so-stubby area (NSSA) for Open Shortest Path First Version 3 (OSPFv3) packets, use the **default-cost** command in area configuration mode. To remove the assigned default route cost, use the **no** form of this command.

default-cost *cost*
no default-cost

Syntax Description

cost	Cost for the default summary route used for a stub or NSSA area. The acceptable value is a 24-bit number ranging from 1 to 16777214.

Command Default

cost : 1

Command Modes

Area configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **default-cost** command only on an Area Border Router (ABR) attached to a stub or an NSSA area.

In all routers and access servers attached to the stub area, the area should be configured as a stub area using the **stub (OSPFv3)** command in the area configuration submode. Use the **default-cost** command only on an ABR attached to the stub area. The **default-cost** command provides the metric for the summary default route generated by the ABR into the stub area.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to assign a cost of 20 to the default route sent into area 10.15.0.0:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 201
RP/0/RP0/CPU0:router(config-ospfv3)# area 10.15.0.0
RP/0/RP0/CPU0:router(config-ospfv3-ar)# stub
RP/0/RP0/CPU0:router(config-ospfv3-ar)# default-cost 20
RP/0/RP0/CPU0:router(config-ospfv3-ar)# interface HundredGigE 0/3/0/1
```

default-information originate (OSPFv3)

To generate a default external route into an Open Shortest Path First Version 3 (OSPFv3) routing domain, use the **default-information originate** command in router ospfv3 configuration mode. To disable this feature, use the **no** form of this command.

default-information originate [**route-policy** *policy-name*] [**always**] [**metric** *metric-value*] [**metric-type** *type-value*] [**tag** *tag-value*]
no default-information originate [**route-policy** *policy-name*] [**always**] [**metric** *metric-value*] [**metric-type** *type-value*] [**tag** *tag-value*]

Syntax Description

route-policy *policy-name*	(Optional) Specifies the route policy to apply to default information origination.
always	(Optional) Always advertises the default route regardless of whether the software has a default route.
metric *metric-value*	(Optional) Specifies a metric used for generating the default route. The default metric value is 1. The value used is specific to the protocol.
metric-type *type-value*	(Optional) Specifies an external link type associated with the default route advertised into the OSPFv3 routing domain. It can be one of the following values: **1**—Type 1 external route **2**—Type 2 external route
tag *tag-value*	(Optional) 32-bit dotted-decimal value attached to each external route. This is not used by the OSPFv3 protocol itself. It may be used to communicate information between autonomous system boundary routers (ASBRs). If a tag is not specified, then zero (0) is used.

Command Default

A default external route into an OSPFv3 routing domain is not generated.

metric-value : 1

type-value : Type 2

tag-value: 0

Command Modes

Router ospfv3 configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Whenever you use the **redistribute** or **default-information** command to redistribute routes into an OSPFv3 routing domain, the software automatically becomes an ASBR. However, an ASBR does not, by default, generate a default route into the OSPFv3 routing domain. The software still must have a default route for itself before it generates one, except when you have specified the **always** keyword.

The **default-information originate** route-policy attach point conditionally injects the default route 0.0.0.0/0 into the OSPF link-state database, and is done by evaluating the attached policy. If any routes specified in the policy exist in the global RIB, then the default route is inserted into the link-state database. If there is no match condition specified in the policy, the policy passes and the default route is generated into the link-state database.

For information about the default-information originate attach point, see the *OSPF v3 Policy Attach Points* section in the *Implementing Routing Policy* chapter in *Routing Configuration Guide for Cisco NCS 5500 Series RoutersRouting Configuration Guide for Cisco NCS 540 Series RoutersRouting Configuration Guide*.

When you use the **default-information originate** command for the OSPFv3 process, the default network must reside in the routing table.

For information about routing policies, see the *Routing Policy Commands* chapter in the *Routing Command Reference Guide*.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to specify a metric of 100 for the default route redistributed into the OSPFv3 routing domain and an external metric type of Type 1:

```
RP/0/RP0/CPU0:router(config)#router ospfv3 109
RP/0/RP0/CPU0:router(config-ospfv3)#default-information originate metric 100 metric-type 1
```

default-metric (OSPFv3)

To set default metric values for routes redistributed from another protocol into Open Shortest Path First Version 3 (OSPFv3), use the **default-metric** command in an appropriate configuration mode. To return to the default state, use the **no** form of this command.

default-metric *value*
no default-metric *value*

Syntax Description

value	Default metric value appropriate for the specified routing protocol.

Command Default

Built-in, automatic metric translations, as appropriate for each routing protocol

Command Modes

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **default-metric** command with the **redistribute** command to cause the current routing protocol to use the same metric value for all redistributed routes. A default metric helps solve the problem of redistributing routes with incompatible metrics. Whenever metrics do not convert, use a default metric to provide a reasonable substitute and enable the redistribution to proceed.

The default-metric value configured in OSPF configuration does not apply to connected routes that are redistributed to OSPF using the **redistribute connected** command. To set a non-default metric for connected routes, configure OSPF with the **redistribute connected metric** *metric-value* command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure a router with both the Intermediate System-to-Intermediate System (IS-IS) and the OSPFv3 routing protocols. The OSPFv3 routing protocol advertises IS-IS derived routes and assigns the routes a metric of 10:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# default-metric 10
RP/0/RP0/CPU0:router(config-ospfv3)# redistribute isis IS-IS_isp
```

demand-circuit (OSPFv3)

To configure the Open Shortest Path First Version 3 (OSPFv3) router process to treat the interface as an OSPFv3 demand circuit, use the **demand-circuit** command in an appropriate configuration mode. To remove the demand circuit designation from the interface, use the **no** form of this command.

demand-circuit [**disable**]
no demand-circuit

Syntax Description

disable	(Optional) Disables the demand circuit configuration that may have been specified at a higher level in the configuration.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the demand circuit parameter specified for the area.

If this command is not specified in area configuration mode, then the interface adopts the demand circuit parameter specified for the process.

If this command is not specified at any level, then the interface is not a demand circuit.

Command Modes

Interface configuration

Area configuration

Router OSPFv3 configuration

Virtual-link configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

On point-to-point interfaces, only one end of the demand circuit must be configured with the **demand-circuit** command. Periodic hello messages are suppressed and periodic refreshes of link-state advertisements (LSAs) do not flood the demand circuit. This command allows the underlying data link layer to be closed when the topology is stable. In point-to-multipoint topology, only the multipoint end must be configured with this command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure HundredGigE interface 0/3/0/1 as an on-demand circuit:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# area 0
RP/0/RP0/CPU0:router(config-ospfv3)# interface HundredGigE 0/3/0/1
RP/0/RP0/CPU0:router(config-ospfv3-if)# demand-circuit
```

distance ospfv3

To define the Open Shortest Path First Version 3 (OSPFv3) route administrative distances based on route type, use the **distance ospfv3** command in router ospfv3 configuration mode. To restore the default value, use the **no** form of this command.

distance ospfv3 {**intra-area** | **inter-area** | **external**} *distance*
no distance ospfv3

Syntax Description

intra-area | **inter-area** | **external**	Type of area. It can be one of the following values: **intra-area** —All routes within an area. **inter-area** —All routes from one area to another area. **external** —All routes from other routing domains, learned by redistribution.
distance	The route administrative distance.

Command Default

distance : 110

Command Modes

Router ospfv3 configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

You must specify one of the keywords.

Use the **distance ospfv3** command to perform the same function as the **distance** command used with an access list. However, the **distance ospfv3** command sets a distance for an entire group of routes, rather than a specific route that passes an access list.

A common reason to use the **distance ospfv3** command is when you have multiple OSPFv3 processes with mutual redistribution, and you want to prefer internal routes from one over external routes from the other.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to change the external distance to 200, making it less reliable:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# redistribute ospfv3 2
RP/0/RP0/CPU0:router(config-ospfv3)# distance ospfv3 external 200
RP/0/RP0/CPU0:router(config-ospfv3)# exit
RP/0/RP0/CPU0:router(config)# router ospfv3 2
RP/0/RP0/CPU0:router(config-ospfv3)# redistribute ospfv3 1
```

```
RP/0/RP0/CPU0:router(config-ospfv3)# distance ospfv3 external 200
```

distribute-list prefix-list in

To filter the routes that Open Shortest Path First Version 3 (OSPFv3) installs in the Routing Information Base (RIB), use the **distribute-list prefix-list in** command in an appropriate configuration mode. To remove the filter, use the **no** form of this command.

distribute-list prefix-list *prefix-list-name* **in**
no distribute-list prefix-list *prefix-list-name* **in**

Syntax Description

prefix-list-name	IP Version 6 (IPv6) prefix list name. The list defines which IPv6 prefixes are installed in the RIB.

Command Default

All routes learned by OSPFv3 are installed in the RIB.

Command Modes

Interface configuration

Router OSPFv3 configuration

OSPFv3 VRF configuration

Usage Guidelines

Use the **distribute-list prefix-list** command to limit the routes that OSPFv3 installs in the RIB of your router. This command does not affect the information sent to other OSPFv3 routers or the routes that these routers compute and install.

Note Because the other OSPFv3 routers are not aware of any omissions in the RIB, they may send traffic addressed to the missing prefixes. If no other provision has been made for these prefixes, the packets are dropped.

When this command is specified in router ospfv3 configuration mode, the filter applies to all routes computed by OSPFv3.

When this command is specified in interface configuration mode, the filter applies only to routes that forward outgoing traffic over that interface.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to prevent OSPFv3 from installing any routes that have 2001:e624 as the first 32 bits of the address. OSPFv3 is also prevented from installing routes to 2002::/16 that use HundredGigE interface 0/2/0/0 as the next-hop interface:

```
RP/0/RP0/CPU0:router(config)# ipv6 prefix-list preflist1
RP/0/RP0/CPU0:router(config-ipv6-pfx)# deny 2001:e624::/32 le 128
RP/0/RP0/CPU0:router(config-ipv6-pfx)# permit ::/0 le 128
!
RP/0/RP0/CPU0:router(config)# ipv6 prefix-list preflist2
```

```
RP/0/RP0/CPU0:router(config-ipv6-pfx)# deny 2002::/16
RP/0/RP0/CPU0:router(config-ipv6-pfx)# permit ::/0 le 128
!
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# distribute-list prefix-list preflist1 in
RP/0/RP0/CPU0:router(config-ospfv3)# area 1
RP/0/RP0/CPU0:router(config-ospfv3-ar)# interface HundredGigE 0/2/0/0
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# distribute-list prefix-list preflist2 in
```

distribute-list prefix-list out

To filter the routes redistributed into Open Shortest Path First Version 3 (OSPFv3) from other routing protocols, use the **distribute-list prefix-list out** command in an appropriate configuration mode. To remove the filter, use the **no** form of this command.

distribute-list prefix-list *prefix-list-name* **out** [*protocol* [*process-id*]]
no distribute-list prefix-list *prefix-list-name* **out** [*protocol* [*process-id*]]

Syntax Description

prefix-list-name	IP Version 6 (IPv6) prefix list name. The list defines which IPv6 prefixes are installed in the RIB.
protocol	(Optional) Source protocol from which routes are being redistributed. It can be one of the following keywords: **bgp, isis**, **ospfv3, static**, and **connected**. The **static** keyword is used to redistribute IPv6 static routes. The **connected** keyword refers to routes that are established automatically because IPv6 is enabled on an interface. For routing protocols such as OSPFv3 and Intermediate System-to-Intermediate System (IS-IS), these routes are redistributed as external to the autonomous system.
process-id	(Optional) For the **bgp** keyword, an autonomous system number has the following ranges: • Range for 2-byte Autonomous system numbers (ASNs) is 1 to 65535. • Range for 4-byte Autonomous system numbers (ASNs) in asplain format is 1 to 4294967295. • Range for 4-byte Autonomous system numbers (ASNs) is asdot format is 1.0 to 65535.65535. For the **isis** keyword, an optional argument that defines a meaningful name for a routing process. You can specify only one IS-IS process for each router. Creating a name for a routing process means that you use names when configuring routing. For the **ospfv3** keyword, an appropriate OSPFv3 process name from which routes are to be redistributed. The value takes the form of a string. A decimal number can be entered, but it is stored internally as a string.

Command Default

All routes from protocols specified in the redistribute (OSPFv3), on page 542 command are redistributed into OSPFv3.

Command Modes

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Routes may be redistributed into OSPFv3 from several other routing protocols or from other OSPFv3 processes. These routes are then communicated to other OSPFv3 routes through Type 5 (External) or Type 7 not-so-stubby

area (NSSA) link-state advertisements (LSAs). Use the **distribute-list prefix-list out** command to control redistribution by matching redistributed routes against an IPv6 prefix list. Only routes permitted by the prefix list are redistributed into OSPFv3.

Each protocol being redistributed into OSPFv3 can have a separate prefix list. In addition, a prefix list can be defined that applies to all protocols.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to prevent OSPFv3 from redistributing routes that have 2001:e624 as the first 32 bits of the address. In addition, routes with a prefix beginning with 2064 are not redistributed from Border Gateway Protocol (BGP) autonomous system 1, and only those routes are redistributed from BGP autonomous system 5.

```
RP/0/RP0/CPU0:router(config)# ipv6 prefix-list p1
RP/0/RP0/CPU0:router(config-ipv6-pfx)# deny 2001:e624::/32 le 128
RP/0/RP0/CPU0:router(config-ipv6-pfx)# permit ::/0 le 128
!
RP/0/RP0/CPU0:router(config)# ipv6 prefix-list p2
RP/0/RP0/CPU0:router(config-ipv6-pfx)# deny 2064::/16 le 128
RP/0/RP0/CPU0:router(config-ipv6-pfx)# permit ::/0 le 128
!
RP/0/RP0/CPU0:router(config)# ipv6 prefix-list p3
RP/0/RP0/CPU0:router(config-ipv6-pfx)# permit 2064::/16 le 128
!
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# redistribute bgp 1
RP/0/RP0/CPU0:router(config-ospfv3)# redistribute bgp 5
RP/0/RP0/CPU0:router(config-ospfv3)# distribute-list prefix-list p1 out
RP/0/RP0/CPU0:router(config-ospfv3)# distribute-list prefix-list p2 out bgp 1
RP/0/RP0/CPU0:router(config-ospfv3)# distribute-list prefix-list p3 out bgp 5
```

domain-id (OSPFv3)

To specify the Open Shortest Path First Version 3 (OSPFv3) VPN routing and forwarding (VRF) domain ID, use the **domain-id** command in VRF configuration mode. To remove the OSPFv3 VRF domain ID, use the **no** form of this command.

domain-id [**secondary**] **type** [**0005** | **0105** | **0205**] **value** *domain-id_value*
no domain-id [**secondary**] **type** [**0005** | **0105** | **0205**] **value** *domain-id-value*

Syntax Description

secondary	(Optional) OSPFv3 secondary domain ID.
type	Primary OSPFv3 domain ID in hexadecimal format. • 0005 —Type 0x0005 • 0105 —Type 0x0105 • 0205—Type 0x0205
value	OSPF domain ID value in hexadecimal format.
domain-id-value	OSPF domain ID extended community value as a 6 byte hexadecimal number.

Command Default

No domain ID is specified.

Command Modes

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

If no value is specified for the domain ID, the default is Null (all zeros) primary domain ID. One or more secondary domain IDs can be specified.

Task ID

Task ID	Operation
ospf	read, write

This example shows how to specify a domain ID with type *0105* and value *AABBCCDDEEFF*:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf 1
RP/0/RP0/CPU0:router(config-ospf)# vrf vrf_1
RP/0/RP0/CPU0:router(config-ospf-vrf)# domain-id type 0105 value AABBCCDDEEFF
```

encryption

To encrypt and authenticate Open Shortest Path First Version 3 (OSPFv3) packets, use the **encryption** command in an appropriate configuration mode. To remove the encryption, use the **no** form of this command.

encryption {**disable** | **ipsec spi** *spi-value* **esp** {**3des** | **aes** [**192** | **256**] | **des** | **null** [**clear** | **password**] *encrypt-password*} [**authentication** {**md5** | **sha1**} [**clear** | **password**] *auth-password*]}
no encryption

Syntax Description

disable	Disables OSPFv3 packet encryption.
ipsec spi	Specifies IPSec ESP encryption and authentication with the Security Parameter Index (SPI) value. IPSec supported only for OSPFv3.
spi-value	SPI value. Range is 256 to 4294967295.
esp	Specifies Encryption Service Payload (ESP) encryption parameters.
3des	Specifies the triple DES algorithm.
aes	Specifies the Advanced Encryption Standard (AES) algorithm.
192	(Optional) Specifies the 192-bit AES algorithm
256	(Optional) Specifies the 256-bit AES algorithm
des	Specifies the Data Encryption Standard (DES) algorithm.
null	Specifies no AES algorithm.
md5	Enables Message Digest 5 (MD5) authentication.
sha1	Enables SHA1 authentication.
clear	Specifies that the key be unencrypted.
password	Specifies that the key be encrypted using a two-way algorithm.
encrypt-password	Any contiguous string that can be entered from the keyboard as the encryption password.
auth-password	Any contiguous string that can be entered from the keyboard as the authentication password.

Command Default

No default behavior or values.

Command Modes

Interface configuration

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **encryption** command to encrypt and authenticate OSPFv3 packets.

Note

- IPSec is supported only for Open Shortest Path First version 3 (OSPFv3).
- If OSPFv3 is configured along with IPsec authentication, then it is likely that adjacencies may flap on a Route Processor Fail Over (RPFO) even when NSR and/or Graceful Restart is enabled.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to encrypt and authenticate OSPFv3 packets:

```
RP/0/RP0/CPU0:router(config)#router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)#encryption ipsec spi 256 esp 3des clear
```

flood-reduction (OSPFv3)

To suppress the unnecessary flooding of link-state advertisements (LSAs) in stable topologies, use the **flood-reduction** command in an appropriate configuration mode. To disable this feature, use the **no** form of this command.

flood-reduction [**disable**]
no flood-reduction

Syntax Description

disable (Optional) Turns off this functionality at a specific level.

Note The **disable** keyword is not available in router ospfv3 configuration mode.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the flood reduction parameter specified by area.

If this command is not specified in area configuration mode, then the interface adopts the flood reduction parameter specified for the process.

If this command is not specified at any level, then flood reduction is disabled.

Command Modes

Interface configuration

Area configuration

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

All routers that support Open Shortest Path First Version 3 (OSPFv3) demand circuits are compatible with routers supporting flooding reduction.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to reduce the flooding of unnecessary LSAs for area 0:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# area 0
RP/0/RP0/CPU0:router(config-ospfv3-ar)# interface HundredGigE 0/1/0/3
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# flood-reduction
```

graceful-restart (OSPFv3)

To enable graceful restart, use the **graceful-restart** command in an appropriate configuration mode. To disable this feature, use the **no** form of this command.

graceful-restart [**helper disable** | **interval** *interval* | **lifetime** *lifetime*]
no graceful-restart [**helper disable** | **interval** *interval* | **lifetime** *lifetime*]

Syntax Description

helper disable	(Optional) Disables the routers helper support level.
interval *interval*	(Optional) Specifies the minimum interval between graceful restarts. Range is 90 to 3600 seconds.
lifetime *lifetime*	(Optional) Specifies the maximum route lifetime following a restart. Range is 90 to 3600 seconds.

Command Default

No default behavior or values.

Command Modes

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to enable the Graceful Restart feature with a minimum interval between restarts of 300 seconds:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# graceful-restart interval 300
```

hello-interval (OSPFv3)

To specify the interval between hello packets that Open Shortest Path First Version 3 (OSPFv3) sends on an interface, use the **hello-interval** command in an appropriate configuration mode. To return to the default time, use the **no** form of this command.

hello-interval *seconds*
no hello-interval

Syntax Description

seconds	Interval (in seconds). The value must be the same for all nodes on a specific network.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the hello interval parameter specified by area.

If this command is not specified in area configuration mode, then the interface adopts the hello interval parameter specified for the process.

If this command is not specified at any level, then the hello interval is 10 seconds (broadcast) or 30 seconds (non-broadcast).

Command Modes

Interface configuration

Area configuration

Router OSPFv3 configuration

Virtual-link configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The hello interval value is advertised in the hello packets. The shorter the hello interval, the faster topological changes are detected, but more routing traffic ensues. This value must be the same for all routers and access servers on a specific network.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to set the interval between hello packets to 15 seconds on GigabitEthernet interface 0/3/0/2:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# area 0
RP/0/RP0/CPU0:router(config-ospfv3-ar)# interface GigabitEthernet 0/3/0/2
```

```
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# hello-interval 15
```

instance (OSPFv3)

To set the 8-bit instance ID used in Open Shortest Path First Version 3 (OSPFv3) packets sent on an interface, use the **instance** command in an appropriate configuration mode. To remove the instance ID, use the **no** form of this command.

instance *instance-id*
no instance *instance-id*

Syntax Description

instance-id	Instance identifier sent in OSPFv3 packets. Range is 0 to 255. The same value must be used by all the communicating OSPFv3 routers on a link.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the instance parameter specified by the area.

If this command is not specified in area configuration mode, then the interface adopts the instance parameter specified for the process.

If this command is not specified at any level, then the instance is 0.

Command Modes

Interface configuration

Area configuration

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The OSPFv3 routing protocol allows multiple unrelated OSPFv3 processes to share a link by using an 8-bit "instance" value to demultiplex the protocol packets. Each OSPFv3 process sets its configured instance value in the OSPFv3 packets that it sends, and ignores received packets with instance values from other OSPFv3 processes.

Note The *instance-id* argument should not be confused with the *process-name* argument that is specified by the **router ospfv3** command. The former is an 8-bit integer that is sent to other routers as part of the OSPFv3 protocol, and the latter is a 1- to 40-character ASCII string that is significant only within a given router. The instance ID value is also unrelated to the router ID that is specified by the **router-id** command, which is a 32-bit integer value that uniquely identifies a router within an OSPFv3 routing domain.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to set the instance value for HundredGigE interface 0/3/0/1 to 42:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# area 0
RP/0/RP0/CPU0:router(config-ospfv3-ar)# interface HundredGigE 0/3/0/1
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# instance 42
```

interface (OSPFv3)

To define the interfaces on which Open Shortest Path First Version 3 (OSPFv3) runs, use the **interface** command in an appropriate configuration mode. To disable OSPFv3 routing for an interface, use the **no** form of this command.

interface *type* *interface-path-id*
no **interface** *type* *interface-path-id*

Syntax Description

type	Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

An interface is not defined.

Command Modes

Area configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **interface** command to associate a specific interface with an OSPFv3 area. The interface remains associated with the area even when the IPv6 address of the interface changes.

Similar to IPv4 address behavior for the **interface** command, all configured IPv6 addresses are advertised on an interface after the interface is associated to the OSPF routing process. The only difference is, IPv6 addresses can have multiple primary addresses.

This command places the router in interface configuration mode (prompt: config-router-ar-if), from which you can configure interface-specific settings. Commands configured under this mode (such as the **cost** command) are automatically bound to that interface.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to define two interfaces that belong to area 1. The cost value for packets on HundredGigE interface 0/3/0/1 is set at 40; the cost value for HundredGigE interface 0/3/0/2 is 65:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# area 1
RP/0/RP0/CPU0:router(config-ospfv3-ar)# interface HundredGigE 0/3/0/1
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# cost 40
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# exit
RP/0/RP0/CPU0:router(config-ospfv3-ar)# interface HundredGigE 0/3/0/2
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# cost 65
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# exit
```

log adjacency changes (OSPFv3)

To change the default syslog messages for Open Shortest Path First Version 3 (OSPFv3) neighbor state changes, use the **log adjacency changes** command in an appropriate configuration mode. To suppress all adjacency change messages, use the **disable** keyword.

log adjacency changes [**detail** | **disable**]

Syntax Description

detail	(Optional) Provides all (DOWN, INIT, 2WAY, EXSTART, EXCHANGE, LOADING, FULL) adjacency state changes.
disable	(Optional) Disables the neighbor state change messages.

Command Default

Neighbor state change messages are enabled.

Command Modes

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

By default, you are notified of OSPFv3 neighbor changes without explicitly configuring the **log adjacency changes** command. The syslog messages that are sent provide a high-level view of changes to the state of the OSPFv3 peer relationship.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to disable neighbor state change messages:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# log adjacency changes disable
```

The following example shows how to re-enable syslog messages for any OSPFv3 neighbor state changes:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# log adjacency changes
```

maximum interfaces (OSPFv3)

To control the maximum number of interfaces that can be configured under an Open Shortest Path First Version 3 (OSPFv3) process, use the **maximum interfaces** command in an appropriate configuration mode. To remove the **maximum interfaces** command from the configuration file and restore the system to its default condition with respect to the routing protocol, use the **no** form of this command.

maximum interfaces *number-interfaces*
no maximum interfaces

Syntax Description

number-interfaces	Maximum number of interfaces that can be configured for this OSPFv3 process. Range is 1 to 1024.Range is 1 to 4294967295.

Command Default

If the command is not specified, the default is 255.

If the command is not specified, the default is 1024.

Command Modes

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ospf	read, write

Examples

This example shows how to allow a maximum of 500 interfaces in an OSPFv3 process:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# maximum interfaces 500
```

This example shows how to allow a maximum of 1500 interfaces in an OSPFv3 process:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# maximum interfaces 1500
```

maximum paths (OSPFv3)

To control the maximum number of parallel routes that the Open Shortest Path First Version 3 (OSPFv3) can support, use the **maximum paths** command in an appropriate configuration mode. To remove the **maximum paths** command from the configuration file and restore the system to its default condition with respect to the routing protocol, use the **no** form of this command.

maximum paths *maximum-routes-number*
no maximum paths

Syntax Description

maximum-routes-number	Maximum number of parallel routes that OSPFv3 can install in a routing table. Range is 1 to 32. **Note** The maximum number of paths that can be configured is 32. **Note** The maximum number of paths that can be configured is 16.

Command Default

32 paths16 paths

Command Modes

Router OSPFv3 configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

When the maximum number of parallel routes is reduced, all existing paths are pruned and paths reinstalled at the new maximum number. During this route-reduction period, you may experience some packet loss for a few seconds. This may impact route traffic.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to allow a maximum of two paths to a destination:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# maximum paths 2
```

maximum redistributed-prefixes (OSPFv3)

To limit the number of prefixes redistributed into Open Shortest Path First Version 3 (OSPFv3) or to generate a warning when the number of prefixes redistributed into OSPFv3 reaches a maximum, use the **maximum redistributed-prefixes** command in an appropriate configuration mode. To remove the values, use the **no** form of this command.

maximum redistributed-prefixes *limit* [*threshold*] [**warning-only**]
no maximum redistributed-prefixes

Syntax Description

limit	Maximum number of IP Version 6 (IPv6) prefixes that are allowed to be redistributed into OSPFv3, or, if the **warning-only** keyword is present, sets the number of prefixes allowed to be redistributed into OSPFv3 before the system logs a warning message. Range is 1 to 4294967295. **Note** If the **warning-only** keyword is also configured, this value does not limit redistribution; it is simply the number of redistributed prefixes that, when reached, causes a warning message to be logged.
threshold	(Optional) Percentage of the value set for the maximum number of redistributed prefixes that, when reached, causes a warning message to be logged.
warning-only	(Optional) Causes a warning to be logged when the number of routes defined by the *limit* argument have been redistributed. Additional redistribution is not prevented.

Command Default

limit : 10240

threshold : 75 percent

Command Modes

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

If someone mistakenly injects a large number of IPv6 routes into OSPFv3, perhaps by redistributing Border Gateway Protocol (BGP) into OSPFv3, the network can be severely flooded. Limiting the number of redistributed routes prevents this potential problem.

When the **maximum redistributed-prefixes** command is configured, if the number of redistributed routes reaches the maximum value configured, no more routes are redistributed (unless the **warning-only** keyword is configured).

The redistribution limit applies only to external IPv6 prefixes. Default routes and summarized routes are not limited.

The limit is tracked separately for each not-so-stubby-area (NSSA) because redistribution to NSSAs is done independently for each NSSA and independently of all other regular areas.

Select a maximum value based on your knowledge of how many prefixes are redistributed on the router to the OSPFv3 process.

Task ID

Task ID	Operations
ospf	read, write

Examples

This example shows how to set a maximum of 2000 prefixes that can be redistributed into OSPFv3 process 1. If the number of prefixes redistributed reaches 75 percent of 2000 (1500 prefixes), a warning message is logged. Another warning is logged if the limit is reached and no more routes are redistributed.

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# redistribute bgp 2406
RP/0/RP0/CPU0:router(config-ospfv3)# maximum redistributed-prefixes 2000
```

mtu-ignore (OSPFv3)

To prevent the Open Shortest Path First Version 3 (OSPFv3) router process from checking whether neighbors are using the same maximum transmission unit (MTU) on a common interface when exchanging database descriptor (DBD) packets, use the **mtu-ignore** command in an appropriate configuration mode. To return to the default state, use the **no** form of this command.

mtu-ignore [**disable**]
no mtu-ignore

Syntax Description

disable (Optional) Disables the attribute in instances in which it is specified at a higher level in the configuration.

Note The **disable** keyword is not available in router ospfv3 configuration mode.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the MTU ignore parameter specified by the area.

If this command is not specified in area configuration mode, then the interface adopts the MTU ignore parameter specified for the process.

If this command is not specified at any level, then OSPFv3 checks the MTU received from neighbors when exchanging DBD packets.

Command Modes

Interface configuration

Area configuration

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **mtu-ignore** command to check whether OSPFv3 neighbors are using the same MTU on a common interface. This check is performed when neighbors exchange DBD packets. If the receiving MTU in the DBD packet is higher than the MTU configured on the incoming interface, OSPF adjacency is not established.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to disable MTU mismatch detection on received DBD packets on HundredGigE interface 0/1/0/3:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# area 0
RP/0/RP0/CPU0:router(config-ospfv3-ar)# interface HundredGigE 0/1/0/3
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# mtu-ignore
```

neighbor (OSPFv3)

To configure Open Shortest Path First Version 3 (OSPFv3) routers interconnecting to nonbroadcast networks, use the **neighbor** command in interface configuration mode. To remove a configuration, use the **no** form of this command.

neighbor *ipv6-address* [**priority** *number*] [**poll-interval** *seconds*] [**cost** *number*] [**database-filter all out**]
no neighbor *ipv6-address* [**priority** *number*] [**poll-interval** *seconds*] [**cost** *number*] [**database-filter all out**]

Syntax Description

ipv6-address	Link- local IP Version 6 (IPv6) address of the neighbor. This argument must be in the form documented in RFC 2373, in which the address is specified in hexadecimal using 16-bit values between colons.
priority *number*	(Optional) Specifies an 8-bit number indicating the router priority value of the nonbroadcast neighbor associated with the IP address specified. The **priority** keyword does not apply to point-to-multipoint interfaces.
poll-interval *seconds*	(Optional) Specifies an unsigned integer value (in seconds) reflecting the poll interval. RFC 1247 recommends that this value be much larger than the hello interval. The **poll-interval** keyword does not apply to point-to-multipoint interfaces.
cost *number*	(Optional) Assigns a cost to the neighbor, in the form of an integer from 1 to 65535. Neighbors with no specific cost configured assume the cost of the interface, based on the **cost** command. On point-to-multipoint interfaces, **cost** *number* is the only keyword and argument combination that works. The **cost** keyword does not apply to nonbroadcast multiaccess (NBMA) networks.
database-filter all out	(Optional) Filters outgoing link-state advertisements (LSAs) to an OSPFv3 neighbor.

Command Default

No configuration is specified.

priority *number* : 0

poll-interval *seconds* : 120 seconds (2 minutes)

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

One neighbor entry must be included in the software configuration for each known nonbroadcast network neighbor. The neighbor address must be the IPv6 link-local address of the interface.

If a neighboring router has become inactive (hello packets have not been seen for the router dead interval period), it may still be necessary to send hello packets to the dead neighbor. These hello packets are sent at a reduced rate called the poll interval.

When the router starts up, it sends only hello packets to those routers with nonzero priority; that is, routers that are eligible to become designated routers (DRs) and backup designated routers (BDRs). After the DR and BDR are selected, the DR and BDR then start sending hello packets to all neighbors to form adjacencies.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to declare a router at address fe80::3203:a0ff:fe9d:f3fe on a nonbroadcast network:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# area 0
RP/0/RP0/CPU0:router(config-ospfv3-ar)# interface HundredGigE 0/2/0/0
RP/0/RP0/CPU0:router(config-ospfv3-ar)# network non-broadcast
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# neighbor fe80::3203:a0ff:fe9d:f3fe
```

network (OSPFv3)

To configure the Open Shortest Path First Version 3 (OSPFv3) network type to a type other than the default for a given medium, use the **network** command in an appropriate configuration mode. To return to the default value, use the **no** form of this command.

network {**broadcast** | **non-broadcast** | {**point-to-multipoint** [**non-broadcast**] | **point-to-point**}}
no network

Syntax Description

broadcast	Sets the network type to broadcast.
non-broadcast	Sets the network type to nonbroadcast multiaccess (NBMA).
point-to-multipoint	Sets the network type to point-to-multipoint.
[**non-broadcast**]	(Optional) Sets the point-to-multipoint network to be nonbroadcast. If you use the **non-broadcast** keyword, the **neighbor** command is required.
point-to-point	Sets the network type to point-to-point.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the network parameter specified by the area.

If this command is not specified in area configuration mode, then the interface adopts the network parameter specified for the process.

If this command is not specified at any level, then the OSPFv3 network type is the default of the given medium.

Command Modes

Interface configuration

Area configuration

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **network** command to configure broadcast networks as NBMA networks when, for example, routers in your network do not support multicast addressing.

Most times, it is assumed that when you configure NBMA networks as either broadcast or nonbroadcast, there are virtual circuits from every router to every router or fully meshed network. However, there are other configurations where this assumption is not true; for example, a partially meshed network. In these cases, you can configure the OSPFv3 network type as a point-to-multipoint network. Routing between two routers that are not directly connected goes through the router that has virtual circuits to both routers. You need not configure neighbors when using this command.

If the **network** command is issued on an interface that does not allow it, this command is ignored.

OSPFv3 has two features related to point-to-multipoint networks. One feature applies to broadcast networks and the other feature applies to nonbroadcast networks:

- On point-to-multipoint, broadcast networks, you can use the **neighbor** command, and you must specify a cost to that neighbor.
- On point-to-multipoint, nonbroadcast networks, you must use the **neighbor** command to identify neighbors. Assigning a cost to a neighbor is optional.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure an Ethernet interface as point-to-point:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# area 0
RP/0/RP0/CPU0:router(config-ospfv3-ar)# interface HundredGigE 0/1/0/3
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# network point-to-point
```

nssa (OSPFv3)

To configure an area as a not-so-stubby area (NSSA), use the **nssa** command in area configuration mode. To remove the NSSA distinction from the area, use the **no** form of this command.

nssa [**no-redistribution**] [**default-information-originate** [**metric** *metric-value* | **metric-type** *type-value*]] [**no-summary**]
no nssa

Syntax Description

no-redistribution	(Optional) Imports routes into the normal areas, but not into the NSSA area, by the **redistribute** command when the router is an NSSA area border router (ABR).
default-information-originate	(Optional) Generates a Type 7 default into the NSSA area. This keyword takes effect only on an NSSA ABR or NSSA autonomous system boundary router (ASBR).
metric *metric-value*	(Optional) Specifies a metric used for generating the default route. If you do not specify a default route metric value using the **nssa** and **defaultmetric** commands, the default metric value is 10. The value used is specific to the protocol.
metric-type *type-value*	(Optional) Specifies an external link type associated with the default route advertised into the Open Shortest Path First Version 3 (OSPFv3) routing domain. It can be one of the following values: **1**—Type 1 external route **2**—Type 2 external route
no-summary	(Optional) Prevents an (ABR) from sending summary link advertisements into the NSSA area.

Command Default

No NSSA area is defined.

If you do not specify a value using the **default-metric** command, the default metric value is 10.

The default *type-value* is Type 2 external route.

Command Modes

Area configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

A default route need not be defined in an NSSA ABR when the **nssa** command is configured. However, if this command is configured on an NSSA ASBR, then a default route must be defined.

Note NSSA cannot be configured for area 0 (backbone area).

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure area 1 as an NSSA area:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# router-id 10.18.1.1
RP/0/RP0/CPU0:router(config-ospfv3)# area 1
RP/0/RP0/CPU0:router(config-ospfv3-ar)# nssa
```

ospfv3 name-lookup

To configure Open Shortest Path First Version 3 (OSPFv3) to look up Domain Name System (DNS) names, use the **ospfv3 name-lookup** command in XR Config mode mode. To disable this function, use the **no** form of this command.

ospfv3 name-lookup
no ospfv3 name-lookup

Syntax Description

This command has no arguments or keywords.

Command Default

Routers are displayed by router ID or neighbor ID.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **ospfv3 name-lookup** command to simplify the task of searching for a router. Routers are displayed by name rather than by router ID or neighbor ID.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure OSPFv3 to look up DNS names for use in all OSPFv3 **show** command displays:

```
RP/0/RP0/CPU0:router(config)# ospfv3 name-lookup
```

packet-size (OSPFv3)

To configure the size of Open Shortest Path First Version 3 (OSPFv3) packets up to the size specified by the maximum transmission unit (MTU), use the **packet-size** command in an appropriate configuration mode. To disable this function and reestablish the default packet size, use the **no** form of this command.

packet-size *bytes*
no packet-size

Syntax Description

bytes	Size in bytes. Range is 256 to 10000 bytes.

Command Default

If not specified, the default packet size is 1500 bytes.

Command Modes

Router OSPFv3 configuration

Area configuration

Interface configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **packet-size** command to customize the size of OSPFv3 packets. The OSPFv3 protocol compares the packet size and the MTU size and uses the lower packet size value.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure the packet size:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf osp3
RP/0/RP0/CPU0:router(config-ospfv3)# packet-size 3500
```

passive (OSPFv3)

To suppress the sending of Open Shortest Path First Version 3 (OSPFv3) packets on an interface, use the **passive** command in an appropriate configuration mode. To remove the passive configuration, use the **no** form of this command.

passive [**disable**]
no passive

Syntax Description

disable (Optional) Sends OSPFv3 updates.

Note The **disable** keyword is not available in router ospfv3 configuration mode.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the passive parameter specified by the area.

If this command is not specified in area configuration mode, then the interface adopts the passive parameter specified for the process.

If this command is not specified at any level, then the passive parameter is disabled and OSPFv3 updates are sent on the interface.

Command Modes

Interface configuration

Area configuration

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

OSPF routing information is neither sent nor received through the specified router interface. The specified interface address appears as a stub network in the OSPF domain.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows that OSPFv3 updates run over HundredGigE interface 0/3/0/0, 0/2/0/0, and 0/2/0/2. All other interfaces suppress sending OSPFv3 updates because they are in passive mode.

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# router-id 10.0.0.206
```

```
RP/0/RP0/CPU0:router(config-ospfv3)# passive
RP/0/RP0/CPU0:router(config-ospfv3)# area 0
RP/0/RP0/CPU0:router(config-ospfv3-ar)# interface HundredGigE 0/3/0/0
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# passive disable
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# exit
RP/0/RP0/CPU0:router(config-ospfv3-ar)# interface HundredGigE 0/3/0/1
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# exit
RP/0/RP0/CPU0:router(config-ospfv3-ar)# exit
RP/0/RP0/CPU0:router(config-ospfv3)# area 1
RP/0/RP0/CPU0:router(config-ospfv3-ar)# passive disable
RP/0/RP0/CPU0:router(config-ospfv3-ar)# interface HundredGigE 0/2/0/0
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# exit
RP/0/RP0/CPU0:router(config-ospfv3-ar)# interface HundredGigE 0/2/0/1
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# passive
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# exit
RP/0/RP0/CPU0:router(config-ospfv3-ar)# interface HundredGigE 0/2/0/2
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# exit
```

priority (OSPFv3)

To set the router priority for an interface, which helps determine the designated router for an Open Shortest Path First Version 3 (OSPFv3) link, use the **priority** command in an appropriate configuration mode. To return to the default value, use the **no** form of this command.

priority *value*
no priority

Syntax Description

value	8-bit unsigned integer indicating the router priority value. Range is 0 to 255.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the priority parameter specified by the area.

If this command is not specified in area configuration mode, then the interface adopts the priority parameter specified by the process.

If this command is not specified at any level, then the default priority is 1.

Command Modes

Interface configuration

Area configuration

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

When two routers attached to a network both attempt to become the designated router, the one with the higher router priority takes precedence. If there is a tie, the router with the higher router ID takes precedence. A router with a router priority set to zero is ineligible to become the designated router or backup designated router. Router priority is configured only for interfaces to broadcast and nonbroadcast multiaccess (NBMA) networks.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to set the router priority value to 4 on HundredGigE interface 0/1/0/1:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# area 0
RP/0/RP0/CPU0:router(config-ospfv3-ar)# interface HundredGigE 0/1/0/1
```

```
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# priority 4
```

protocol shutdown (OSPFv3)

To disable an instance of the Open Shortest Path First protocol, version 3 (OSPFv3), so that it cannot form an adjacency on any interface, use the **protocol shutdown** command in the ospfv3 configuration mode. To re-enable the OSPF protocol, use the **no** form of this command.

protocol shutdown
no protocol shutdown

Command Default

None

Command Modes

ospfv3 configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **protocol shutdown** command to disable the OSPFv3 protocol for a specific routing instance without removing any existing OSPF configuration parameters.

The OSPFv3 protocol continues to run on the router and you can use the current OSPFv3 configuration, but OSPFv3 does not form any adjacencies on any interface.

This command is similar to performing the **no router ospf** command.

Task ID

Task ID	Operations
ospf	read, write

Examples

This example shows how to disable the OSPFv3:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospfv3 100
RP/0/RP0/CPU0:router(config-ospfv3)# protocol shutdown
```

range (OSPFv3)

To consolidate and summarize routes at an area boundary for Open Shortest Path First Version 3 (OSPFv3), use the **range** command in area configuration mode. To restore the default values, use the **no** form of this command.

range *ipv6-prefix/prefix-length* [**advertise** | **not-advertise**] [**cost** *number*]
no range *ipv6-prefix/prefix-length* [**advertise** | **not-advertise**] [**cost** *number*]

Syntax Description

ipv6-prefix	Summary prefix designated for a range of IP Version 6 (IPv6) prefixes. This argument must be in the form documented in RFC 2373, in which the address is specified in hexadecimal using 16-bit values between colons.
/ *prefix-length*	Length of the IPv6 prefix. A decimal value that indicates how many of the high-order contiguous bits of the address compose the prefix (the network portion of the address). A slash must precede the decimal value.
advertise	(Optional) Sets the address range status to advertise and generates a Type 3 summary link-state advertisement (LSA).
not-advertise	(Optional) Sets the address range status to DoNotAdvertise. The Type 3 summary LSA is suppressed and the component networks remain hidden from other networks.
cost *number*	(Optional) Specifies a cost for the range. Range is 1 to 16777214.

Command Default

Routes are not consolidated and summarized for an area.

Command Modes

Area configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **range** command only with Area Border Routers (ABRs). It is used to consolidate or summarize routes for an area. The result is that a single summary route is advertised to other areas by the ABR. Routing information is condensed at area boundaries. External to the area, a single route is advertised for each address range. This process is called *route summarization* .

You can use the **range** command to configure multiple ranges. Thus, OSPFv3 can summarize addresses for many different sets of address ranges.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to specify one summary route to be advertised by the ABR to other areas for all IPv6 prefixes within the range defined by summary prefix 4004:f000::/32:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 201
RP/0/RP0/CPU0:router(config-ospfv3)# area 0
RP/0/RP0/CPU0:router(config-ospfv3-ar)# range 4004:f000::/32
```

redistribute (OSPFv3)

To redistribute routes from one routing domain into Open Shortest Path First Version 3 (OSPFv3), use the **redistribute** command in an appropriate configuration mode. To remove the **redistribute** command from the configuration file and restore the system to its default condition in which the software does not redistribute routes, use the **no** form of this command.

Border Gateway Protocol (BGP)
redistribute bgp *process-id* [**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**policy** *policy-name*] [**tag** *tag-value*]
no redistribute bgp *process-id* [**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**policy** *policy-name*] [**tag** *tag-value*]

Local Interface Routes
redistribute connected [**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**policy** *policy-name*] [**tag** *tag-value*]
no redistribute connected [**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**policy** *policy-name*] [**tag** *tag-value*]

Intermediate System-to-Intermediate System (IS-IS)
redistribute isis *process-id* [**level-1** | **level-2** | **level-1-2**] [**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**policy** *policy-name*] [**tag** *tag-value*]
no redistribute isis *process-id* [**level-1** | **level-2** | **level-1-2**] [**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**policy** *policy-name*] [**tag** *tag-value*]

Open Shortest Path First Version 3 (OSPFv3)
redistribute ospfv3 *process-id* **match** {**external** | **1** | **2** | **internal** | **nssa-external** | [**1** | **2**]} [**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**policy** *policy-name*] [**tag** *tag-value*]
no redistribute ospfv3 *process-id* [**match** | {**external** | **internal** | **nssa-external**}] [**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**policy** *policy-name*] [**tag** *tag-value*]

Static
redistribute static [**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**policy** *policy-name*] [**tag** *tag-value*]
no redistribute static [**metric** *metric-value*] [**metric-type** {**1** | **2**}] [**policy** *policy-name*] [**tag** *tag-value*]

Syntax Description

bgp	Distributes routes from the BGP protocol.

process-id	For the **bgp** keyword, an autonomous system number has the following ranges: • Range for 2-byte Autonomous system numbers (ASNs) is 1 to 65535. • Range for 4-byte Autonomous system numbers (ASNs) in asplain format is 1 to 4294967295. • Range for 4-byte Autonomous system numbers (ASNs) is asdot format is 1.0 to 65535.65535. For the **isis** keyword, an IS-IS instance name from which routes are to be redistributed. The value takes the form of a string. A decimal number can be entered, but it is stored internally as a string. For the **ospf** keyword, an OSPF instance name from which routes are to be redistributed. The value takes the form of a string. A decimal number can be entered, but it is stored internally as a string.
metric *metric-value*	(Optional) Specifies the metric used for the redistributed route. Range is 1 to 16777214. Use a value consistent with the destination protocol.
metric-type { **1** | **2** }	(Optional) Specifies the external link type associated with the route advertised into the OSPF routing domain. It can be one of two values: • **1**—Type 1 external route • **2**—Type 2 external route If no **metric-type** is specified, the default is Type 2 external routes.
tag *t ag-value*	(Optional) Specifies the 32-bit dotted-decimal value attached to each external route. This value is not used by the OSPF protocol itself, but is carried in the External LSAs. Range is 0 to 4294967295.
policy *policy-name*	(Optional) Specifies the identifier of a configured policy. A policy is used to filter the importation of routes from this source routing protocol to OSPF.
connected	Distributes routes that are established automatically by virtue of having enabled IP on an interface.
isis	Distributes routes from the IS-IS protocol.
level-1	(Optional) Redistributes Level 1 routes into other IP routing protocols independently.
level-1- 2	(Optional) Redistributes both Level 1 and Level 2 routes into other IP routing protocols.
level-2	(Optional) Redistributes Level 2 routes into other IP routing protocols independently.
ospf	Distributes routes from the OSPF protocol.

match { **internal** | **external** [**1** | **2**] | **nssa-external** [**1** | **2**]}	(Optional) Specifies the criteria by which OSPF routes are redistributed into other routing domains. It can be one or more of the following: • **internal** —Routes that are internal to a specific autonomous system (intra- and inter-area OSPF routes). • **external** [**1 | 2**]—Routes that are external to the autonomous system, but are imported into OSPF as Type 1 or Type 2 external routes. • **nssa-external** [**1 | 2**]—Routes that are external to the autonomous system, but are imported into OSPF as Type 1 or Type 2 not-so-stubby area (NSSA) external routes. For the **external** and **nssa-external** options, if a type is not specified, then both Type 1 and Type 2 are assumed. If no match is specified, the default is no filtering.
static	Redistributes IP static routes.

Command Default

Route redistribution is disabled.

metric *metric-value:* Default is 20 for routes from all protocols except BGP routes, in which the default is 1.

metric-type *type-value* : Type 2 external route

All routes from the OSPFv3 routing protocol are redistributed.

tag *tag-value* : If no value is specified, the remote autonomous system number is used for routes from Border Gateway Protocol (BGP); for other protocols, the default is 0.

Command Modes

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Note When redistributing routes (into OSPF) using both command keywords for setting or matching of attributes and a route policy, the routes are run through the route policy first, followed by the keyword matching and setting.

Disabling or changing the arguments of any keyword does not affect the state of other keywords.

In general, route redistribution from Level 1 to Level 2 is automatic. You might want to use this command to better control which Level 1 routes can be redistributed into Level 2.

The redistibution of Level 2 routes into Level 1 is called *route leaking*. Route leaking is disabled by default. That is, Level 2 routes are not automatically included in Level 1 link-state protocols. If you want to leak Level 2 routes into Level 1, you must enable that behavior by using this command.

Redistribution from Level 1 into Level 1 and from Level 2 into Level 2 is not allowed.

A router receiving a link-state packet with an internal metric considers the cost of the route from itself to the redistributing router plus the advertised cost to reach the destination. An external metric considers only the advertised metric to reach the destination.

Redistributed routing information should always be filtered by the **distribute-list prefix-list out** command. Use of this command ensures that only those routes intended by the administrator are passed along to the receiving routing protocol.

OSPFv3 Considerations

Whenever you use the **redistribute** or the **default-information** command to redistribute routes into an OSPFv3 routing domain, the router automatically becomes an ASBR. However, an ASBR does not, by default, generate a default route into the OSPFv3 routing domain.

When routes are redistributed between OSPFv3 processes, no OSPFv3 metrics are preserved.

When routes are redistributed into OSPF and no metric is specified with the **metric** keyword, OSPF uses 20 as the default metric for routes from all protocols except BGP routes, which get a metric of 1. Furthermore, when the router redistributes from one OSPFv3 process to another OSPFv3 process on the same router, and if no default metric is specified, the metrics in one process are carried to the redistributing process.

BGP Considerations

The only connected routes affected by this command are the routes not specified by the **network** (BGP) command.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to cause static routes to be redistributed into an OSPFv3 domain:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 109
RP/0/RP0/CPU0:router(config-ospfv3)# redistribute isis level-1
```

retransmit-interval (OSPFv3)

To specify the time between link-state advertisement (LSA) retransmissions for adjacencies belonging to the Open Shortest Path First Version 3 (OSPFv3) interface, use the **retransmit-interval** command in an appropriate configuration mode. To return to the default value, use the **no** form of this command.

retransmit-interval *seconds*
no retransmit-interval

Syntax Description

seconds	Time (in seconds) between retransmissions. It must be greater than the expected round-trip delay between any two routers on the attached network. Range is 1 to 65535 seconds.

Command Default

If this command is not specified in interface configuration mode, then the interface adopts the retransmit interval parameter specified by the area.

If this command is not specified in area configuration mode, then the interface adopts the retransmit interval parameter specified by the process.

If this command is not specified at any level, then the default retransmit interval is 5 seconds.

Command Modes

Interface configuration

Area configuration

Router OSPFv3 configuration

Virtual-link configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

When a router sends an LSA to its neighbor, it keeps the LSA until it receives the acknowledgment message. If the router receives no acknowledgment, it resends the LSA.

The setting of this parameter should be conservative, or needless retransmission results. The value should be larger for serial lines and virtual links.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to set the retransmit interval value to 8 seconds while in interface configuration mode:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
```

```
RP/0/RP0/CPU0:router(config-ospfv3)# area 0
RP/0/RP0/CPU0:router(config-ospfv3-ar)# interface HundredGigE 0/2/0/0
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# retransmit-interval 8
```

router-id (OSPFv3)

To configure a router ID for the Open Shortest Path First Version 3 (OSPFv3) routing process, use the **router-id** command in an appropriate configuration mode. To cause the software to use the default method of determining the router ID, use the **no** form of this command after clearing or restarting the OSPF process.

router-id *router-id*
no router-id *router-id*

Syntax Description

router-id	32-bit router ID value specified in four-part, dotted-decimal notation.

Command Default

If this command is not configured, the router ID is the highest IP address for an interface on the router, with any loopback interface taking precedence.

Command Modes

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

We recommend that you use the **router-id** command to explicitly specify a unique 32-bit numeric value for the router ID. This configuration ensures that OSPFv3 can function regardless of the interface address configuration. Clear the OSPF process using the **clear ospf process** command or restart the OSPF process for the **no router-id** command to take effect.

In router OSPFv3 configuration mode, OSPF attempts to obtain a router ID in the following ways (in order of preference):

1. By default, when the OSPF process initializes, it checks if there is a router-id in the checkpointing database.
2. The 32-bit numeric value specified by the OSPF **router-id** command in router configuration mode. (This value can be any 32-bit value. It is not restricted to the IPv4 addresses assigned to interfaces on this router, and need not be a routable IPv4 address.)
3. A global router ID provided by the system (possibly, the first loopback address found at the boot time.

If the OSPFv3 process cannot obtain a router ID from any of these sources, the router issues the following error message:

```
%OSPFv3-4-NORTRID : OSPFv3 process 1 cannot run - configure a router ID for this process
```

At this point, OSPFv3 is effectively passive on all its interfaces. To run OSPFv3, make a router ID available by one of the methods described.

In VRF configuration mode, it is mandatory to configure a router ID manually. Otherwise, the OSPFv3 process will not become operational in the VRF.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to assign the IP address of 10.0.0.10 to the OSPFv3 process 109:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 109
RP/0/RP0/CPU0:router(config-ospfv3)# router-id 10.0.0.10
```

router ospfv3

To configure an Open Shortest Path First Version 3 (OSPFv3) routing process, use the **router ospfv3** command in XR Config mode. To terminate an OSPFv3 routing process, use the **no** form of this command.

router ospfv3 *process-name*
no router ospfv3 *process-name*

Syntax Description

process-name	Name that uniquely identifies an OSPFv3 routing process. The process name is any alphanumeric string no longer than 40 characters.

Command Default

No OSPFv3 routing process is defined.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

You can specify multiple OSPFv3 routing processes in each router. Up to 10 processes can be configured. The recommendation is not to exceed 4 OSPFv3 processes.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to instantiate an OSPFv3 routing process with a process name of 1:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
```

sham-link (OSPFv3)

To configure an Open Shortest Path First version 3 (OSPFv3) sham link between two provider edge routers on a non-default VRF, use the **sham-link** command in OSPFv3 router area sub-configuration mode. To terminate an OSPFv3 sham link, use the **no** form of this command.

sham-link *source-address* *destination-address*
no sham-link

Syntax Description

source-address	IP address of the local (source) sham-link endpoint specified in four-part, dotted-decimal notation.
destination-address	IP address of the remote (destination) sham-link endpoint specified in four-part, dotted-decimal notation.

Command Default

No sham link is configured.

Command Modes

OSPFv3 router area sub-configuration.

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **sham-link** command to configure a point-to-point connection between two provider edge (PE) routers creating an interconnect between two VPN sites (VPN backbone). Sham links are configured on PE provider edge (PE) routers in a Multiprotocol Label Switching (MPLS) VPN backbone.

Task ID

Task ID	Operations
ospf	read, write

Examples

This example shows how to configure an OSPFv3 sham link:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospfv3 ospfv3
RP/0/RP0/CPU0:router(config_ospfv3)# vrf 1
RP/0/RP0/CPU0:router(config_ospfv3_vrf)# area 1
RP/0/RP0/CPU0:router(config_ospfv3_vrf_ar)# sham-link 100::1 200::1
RP/0/RP0/CPU0:router(config_ospf_vrf_ar_sl)# cost 23
```

show ospfv3

To display general information about Open Shortest Path First Version 3 (OSPFv3) routing processes, use the **show ospfv3** command in XR EXEC mode.

show ospfv3 [*process-name*] [**vrf** {**all** *vrf-name*}]**sham-links**

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPFv3 routing process. The process name is defined by the **router ospfv3** command. If this argument is included, only information for the specified routing process is displayed.
vrf	Specifies an OSPF VPN routing and forwarding (VRF) instance.
all	Display all the VRFs, excluding the default VRF.
vrf-name	Specifies the name of the of the OSPFv3 VRF.
sham-links	Displays OSPFv3 Sham-link information.

Command Default

None

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ospf	read

Examples

The following is a sample output from the **show ospfv3** command:

```
RP/0/RP0/CPU0:router# show ospfv3 1

Routing Process "ospfv3 test" with ID 3.3.3.3
It is an autonomous system boundary router
Redistributing External Routes from,
static
 Maximum number of redistributed prefixes 10240
 Threshold for warning message 75%
Initial SPF schedule delay 5000 msecs
Minimum hold time between two consecutive SPFs 10000 msecs
Maximum wait time between two consecutive SPFs 10000 msecs
Initial LSA throttle delay 0 msecs
Minimum hold time for LSA throttle 5000 msecs
Maximum wait time for LSA throttle 5000 msecs
```

```
Minimum LSA arrival 1000 msecs
LSA group pacing timer 240 secs
Interface flood pacing timer 33 msecs
Retransmission pacing timer 66 msecs
Maximum number of configured interfaces 255
Number of external LSA 1. Checksum Sum 0x004468
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
 Area BACKBONE(0) (Inactive)
  Number of interfaces in this area is 1
  SPF algorithm executed 1 times
  Number of LSA 3. Checksum Sum 0x018109
  Number of DCbitless LSA 0
  Number of indication LSA 0
  Number of DoNotAge LSA 0
  Flood list length 0
```

The following is a sample output from the **show ospfv3** command when OSPFv3 graceful shutdown has been initiated but not yet completed:

```
RP/0/RP0/CPU0:router# show ospfv3 1

Routing Process "ospfv3 test" with ID 3.3.3.3 transitioning to OSPFV3_ADMIN_DOWN state

Routing Process "ospfv3 test" with ID 3.3.3.3
It is an autonomous system boundary router
Redistributing External Routes from,
static
 Maximum number of redistributed prefixes 10240
 Threshold for warning message 75%
Initial SPF schedule delay 5000 msecs
Minimum hold time between two consecutive SPFs 10000 msecs
Maximum wait time between two consecutive SPFs 10000 msecs
Initial LSA throttle delay 0 msecs
Minimum hold time for LSA throttle 5000 msecs
Maximum wait time for LSA throttle 5000 msecs
Minimum LSA arrival 1000 msecs
LSA group pacing timer 240 secs
Interface flood pacing timer 33 msecs
Retransmission pacing timer 66 msecs
Maximum number of configured interfaces 255
Number of external LSA 1. Checksum Sum 0x004468
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
 Area BACKBONE(0) (Inactive)
  Number of interfaces in this area is 1
  SPF algorithm executed 1 times
  Number of LSA 3. Checksum Sum 0x018109
  Number of DCbitless LSA 0
  Number of indication LSA 0
  Number of DoNotAge LSA 0
  Flood list length 0
```

The following is a sample output from the **show ospfv3** command when OSPFv3 graceful shutdown is completed:

```
RP/0/RP0/CPU0:router# show ospfv3 1

Routing Process "ospfv3 test" with ID 3.3.3.3 in OSPFV3_ADMIN_DOWN state
%ROUTING-OSPFv3-6-GRACEFUL_SHUTDOWN : Shutdown Complete

Routing Process "ospfv3 test" with ID 3.3.3.3
It is an autonomous system boundary router
```

```
Redistributing External Routes from,
static
 Maximum number of redistributed prefixes 10240
 Threshold for warning message 75%
Initial SPF schedule delay 5000 msecs
Minimum hold time between two consecutive SPFs 10000 msecs
Maximum wait time between two consecutive SPFs 10000 msecs
Initial LSA throttle delay 0 msecs
Minimum hold time for LSA throttle 5000 msecs
Maximum wait time for LSA throttle 5000 msecs
Minimum LSA arrival 1000 msecs
LSA group pacing timer 240 secs
Interface flood pacing timer 33 msecs
Retransmission pacing timer 66 msecs
Maximum number of configured interfaces 255
Number of external LSA 1. Checksum Sum 0x004468
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
 Area BACKBONE(0) (Inactive)
  Number of interfaces in this area is 1
  SPF algorithm executed 1 times
  Number of LSA 3. Checksum Sum 0x018109
  Number of DCbitless LSA 0
  Number of indication LSA 0
  Number of DoNotAge LSA 0
  Flood list length 0
```

This table describes the significant fields shown in the display.

Table 73: show ospfv3 Field Descriptions

Field	Description
Routing Process “ospfv3 test” with ID	OSPFv3 process name.
It is	Types are internal, area border, or autonomous system boundary.
Redistributing External Routes from	Lists of redistributed routes, by protocol.
Maximum number of redistributed prefixes	Number of redistributed prefixes
Threshold for warning message	Warning message threshold.
Initial SPF schedule delay	Delay time of SPF calculations.
Minimum hold time between two consecutive SPFs	Minimum hold time between consecutive SPFs.
Maximum wait time between two consecutive SPFs	Maximum wait time between consecutive SPFs.
Initial LSA throttle delay	Delay time of LSA throttle.
Maximum hold time for LSA throttle	After initial throttle delay, the LSA generation is backed off by hold interval.
Maximum wait time for LSA throttle	Maximum throttle delay for LSA generation.
Minimum LSA arrival	Minimum LSA arrival.
LSA group pacing timer	Configured LSA group pacing timer (in seconds).

Field	Description
Interface flood pacing timer	Flooding pacing interval.
Retransmission pacing timer	Retransmission pacing interval.
Maximum number of configured interfaces	Maximum number of configured interfaces.
Number of external LSA	Number of external LSAs.
Number of areas in this router is	Number of areas configured for the router.
Number of interfaces in this area is	Number of interfaces in the area.
SPF algorithm executed *n* times	Times SPF algorithm was executed.
Number of LSA	Number of LSAs.
Number of DCbitless LSA	Number of DCbitless LSAs.
Number of indication LSA	Number of indication LSAs.
Number of DoNotAge LSA	Number of do-not-age LSAs.
Flood list length	Flood list length.

This is sample output from the show ospfv3 vrf command that displays domain -id configuration:

```
RP/0/RP0/CPU0:router#show ospfv3 0 vrf V1
Mon May 10 14:52:31.332 CEST

 Routing Process "ospfv3 0" with ID 100.0.0.2 VRF V1
 It is an area border and autonomous system boundary router
 Redistributing External Routes from,
    bgp 1
    Maximum number of redistributed prefixes 10240
    Threshold for warning message 75%
 Primary Domain ID:
   0x0005:0xcafe00112233
 Secondary Domain ID:
   0x0105:0xbeef00000001
   0x0205:0xbeef00000002
 Initial SPF schedule delay 5000 msecs
 Minimum hold time between two consecutive SPFs 10000 msecs
 Maximum wait time between two consecutive SPFs 10000 msecs
 Initial LSA throttle delay 0 msecs
 Minimum hold time for LSA throttle 5000 msecs
 Maximum wait time for LSA throttle 5000 msecs
 Minimum LSA arrival 1000 msecs
 LSA group pacing timer 240 secs
 Interface flood pacing timer 33 msecs
 Retransmission pacing timer 66 msecs
 Maximum number of configured interfaces 255
 Maximum number of configured paths 16
 Number of external LSA 2. Checksum Sum 0x015bb3
 Number of areas in this router is 1. 1 normal 0 stub 0 nssa
 Auto cost is enabled. Reference bandwidth 100
    Area BACKBONE(0)
        Number of interfaces in this area is 1
        SPF algorithm executed 2 times
```

```
        Number of LSA 4. Checksum Sum 0x02629d
        Number of DCbitless LSA 0
        Number of indication LSA 0
        Number of DoNotAge LSA 0
        Flood list length 0
```

This is sample output from the show ospfv3 vrf command that displays vrf-lite configuration:

```
RP/0/RP0/CPU0:router#show ospfv3 0 vrf V2
Mon May 10 18:01:38.654 CEST

 Routing Process "ospfv3 0" with ID 2.2.2.2 VRF V2
 VRF lite capability is enabled
 Initial SPF schedule delay 5000 msecs
 Minimum hold time between two consecutive SPFs 10000 msecs
 Maximum wait time between two consecutive SPFs 10000 msecs
 Initial LSA throttle delay 0 msecs
 Minimum hold time for LSA throttle 5000 msecs
 Maximum wait time for LSA throttle 5000 msecs
 Minimum LSA arrival 1000 msecs
 LSA group pacing timer 240 secs
 Interface flood pacing timer 33 msecs
 Retransmission pacing timer 66 msecs
 Maximum number of configured interfaces 255
 Maximum number of configured paths 16
 Number of external LSA 0. Checksum Sum 00000000
 Number of areas in this router is 0. 0 normal 0 stub 0 nssa
 Auto cost is enabled. Reference bandwidth 100
```

This is sample output from the **show ospfv3** command to verify that (Non-stop routing (NSR) is enabled:

```
RP/0/RP0/CPU0:router#show ospfv3

 Routing Process "ospfv3 100" with ID 3.3.3.3
 NSR (Non-stop routing) is Enabled
 It is an area border and autonomous system boundary router
 Redistributing External Routes from,
    bgp 100
    Maximum number of redistributed prefixes 10240
    Threshold for warning message 75%
 Initial SPF schedule delay 5000 msecs
 Minimum hold time between two consecutive SPFs 10000 msecs
 Maximum wait time between two consecutive SPFs 10000 msecs
 Initial LSA throttle delay 0 msecs
 Minimum hold time for LSA throttle 5000 msecs
 Maximum wait time for LSA throttle 5000 msecs
 Minimum LSA arrival 1000 msecs
 LSA group pacing timer 240 secs
 Interface flood pacing timer 33 msecs
 Retransmission pacing timer 66 msecs
 Maximum number of configured interfaces 512
 Maximum number of configured paths 16
 Number of external LSA 0. Checksum Sum 00000000
 Number of areas in this router is 15. 15 normal 0 stub 0 nssa
 Auto cost is enabled. Reference bandwidth 100
```

The following is a sample output from the **show ospfv3** command with **sham-links** keyword:

```
RP/0/RP0/CPU0:router# show ospfv3 vrf vrf1 sham-links

Sham Links for OSPFv3 100, VRF vrf1

Sham Link OSPF_SL1 to address 300::1 is up
Area 2, source address 100::1
IfIndex = 2
  Run as demand circuit
  DoNotAge LSA allowed., Cost of using 1
  Transmit Delay is 1 sec, State POINT_TO_POINT,
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:08
    Adjacency State FULL (Hello suppressed)
    Number of DBD retrans during last exchange 0
    Index 2/2, retransmission queue length 0, number of retransmission 0
    First 0(0)/0(0) Next 0(0)/0(0)
    Last retransmission scan length is 0, maximum is 0
    Last retransmission scan time is 0 msec, maximum is 0 msec
Sham Link OSPF_SL0 to address 200::1 is up
Area 2, source address 100::1
IfIndex = 2
  Run as demand circuit
  DoNotAge LSA allowed., Cost of using 1
  Transmit Delay is 1 sec, State POINT_TO_POINT,
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:01
    Adjacency State FULL (Hello suppressed)
    Number of DBD retrans during last exchange 0
    Index 3/3, retransmission queue length 0, number of retransmission 0
    First 0(0)/0(0) Next 0(0)/0(0)
    Last retransmission scan length is 0, maximum is 0
    Last retransmission scan time is 0 msec, maximum is 0 msec
```

show ospfv3 border-routers

To display the internal Open Shortest Path First Version 3 (OSPFv3) routing table entries to an area border router (ABR) and autonomous system boundary router (ASBR), use the **show ospfv3 border-routers** command in XR EXEC mode.

show ospfv3 [*process-name*] [**vrf** {**all** *vrf-name*}]**border-routers** [*router-id*]

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPFv3 routing process. The process name is defined by the **router ospfv3** command. If this argument is included, only information for the specified routing process is displayed.
vrf	Specifies an OSPF VPN routing and forwarding (VRF) instance.
all	Display all the VRFs, excluding the default VRF.
vrf-name	Specifies the name of the of the OSPFv3 VRF.
router-id	(Optional) 32-bit router ID value specified in four-part, dotted-decimal notation.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ospf	read

Examples

The following is sample output from the **show ospfv3 border-routers** command:

```
RP/0/RP0/CPU0:router# show ospfv3 border-routers

  OSPFv3 1 Internal Routing Table
  Codes: i - Intra-area route, I - Inter-area route
  i 10.0.0.207 [1] via fe80::3034:30ff:fe33:3742, HundredGigE 0/3/0/0, ABR/ASBR, Area 1,
SPF 3
  i 10.0.0.207 [10] via fe80::204:c0ff:fe22:73fe, Ethernet0/0/0/0, ABR/ASBR, Area 0, SPF 7
```

This table describes the significant fields shown in the display.

Table 74: show ospf border-routers Field Descriptions

Field	Description
i	Type of this route; i indicates an intra-area route, I an inter-area route.
10.0.0.207	Router ID of destination.
[1]	Cost of using this route.
fe80::3034:30ff:fe33:3742	Next-hop toward the destination.
HundredGigE 0/3/0/0	Packets destined for fe80::3034:30ff:fe33:3742 are sent over HundredGigE interface 3/0/0/0.
ABR/ASBR	Router type of the destination; it is either an area border router (ABR) or autonomous system boundary router (ASBR) or both.
Area 1	Area ID of the area from which this route is learned.
SPF 3	Internal number of the shortest path first (SPF) calculation that installs this route.

show ospfv3 database

To display lists of information related to the Open Shortest Path First Version 3 (OSPFv3) database for a specific router, use the **show ospfv3 database** command in XR EXEC mode.

show ospfv3 [*process-name* [*area-id*]] [**vrf** {**all** *vrf-name*}]**database**
show ospfv3 [*process-name* [*area-id*]] [**vrf** {**all** *vrf-name*}]**database**[**adv-router** [*router-id*]]
show ospfv3 [*process-name* [*area-id*]] [**vrf** {**all** *vrf-name*}]**database** [**database-summary**]
show ospfv3 [*process-name* [*area-id*]] [**vrf** {**all** *vrf-name*}]**database** [**external**] [*link-state-id*]
show ospfv3 [*process-name* [*area-id*]] [**vrf** {**all** *vrf-name*}]**database** [**external**] [*link-state-id*] [**internal**] [**adv-router** [*router-id*]]
show ospfv3 [*process-name* [*area-id*]] [**vrf** {**all** *vrf-name*}]**database** [**external**] [*link-state-id*] [**internal**] [**self-originate**]
show ospfv3 [*process-name* [*area-id*]] [**vrf** {**all** *vrf-name*}]**database** [**grace**] [*link-state-id*] [**adv-router** [*router-id*]] [**internal**] [**self-originate**]
show ospfv3 [*process-name* [*area-id*]][**vrf** {**all** *vrf-name*}] **database** [**inter-area prefix**] [*link-state-id*]
show ospfv3 [*process-name* [*area-id*]] **vrf** *vrf-name* **database** [**vrf** {**all** *vrf-name*}] [*link-state-id*] [**internal**] [**adv-router** [*router-id*]]
show ospfv3 [*process-name* [*area-id*]] [**vrf** {**all** *vrf-name*}]**database** [**inter-area prefix**] [*link-state-id*] [**internal**] [**self-originate**]
show ospfv3 [*process-name* [*area-id*]][**vrf** {**all** *vrf-name*}] **database** [**inter-area router**] [*link-state-id*]
show ospfv3 [*process-name* [*area-id*]] [**vrf** {**all** *vrf-name*}]**database** [**inter-area router**] [*link-state-id*] [**internal**] [**adv-router** [*router-id*]]
show ospfv3 [*process-name* [*area-id*]] [**vrf** {**all** *vrf-name*}]**database** [**inter-area router**] [*link-state-id*] [**internal**] [**self-originate**]
show ospfv3 [*process-name* [*area-id*]] [**vrf** {**all** *vrf-name*}]**database** [**link**] [*link-state-id*]
show ospfv3 [*process-name* [*area-id*]] [**vrf** {**all** *vrf-name*}]**database** [**link**] [*link-state-id*] [**internal**] [**adv-router** [*router-id*]]
show ospfv3 [*process-name* [*area-id*]] [**vrf** {**all** *vrf-name*}]**database** [**link**] [*link-state-id*] [**internal**] [**self-originate**]
show ospfv3 [*process-name* [*area-id*]] [**vrf** {**all** *vrf-name*}]**database** [**network**] [*link-state-id*]
show ospfv3 [*process-name* [*area-id*]][**vrf** {**all** *vrf-name*}] **database** [**network**] [*link-state-id*] [**internal**] [**adv-router** [*router-id*]]
show ospfv3 [*process-name* [*area-id*]] [**vrf** {**all** *vrf-name*}]**database** [**network**] [*link-state-id*] [**internal**] [**self-originate**]
show ospfv3 [*process-name* [*area-id*]][**vrf** {**all** *vrf-name*}] **database** [**nssa-external**] [*link-state-id*]
show ospfv3 [*process-name* [*area-id*]][**vrf** {**all** *vrf-name*}] **database** [**nssa-external**] [*link-state-id*] [**internal**] [**adv-router** [*router-id*]]
show ospfv3 [*process-name* [*area-id*]] [**vrf** {**all** *vrf-name*}]**database** [**nssa-external**] [*link-state-id*] [**internal**] [**self-originate**]
show ospfv3 [*process-name* [*area-id*]][**vrf** {**all** *vrf-name*}] **database** [**prefix**] [**ref-lsa**] [**router** | **network**] [*link-state-id*] [**internal**] [**adv-router** [*router-id*]]
show ospfv3 [*process-name* [*area-id*]][**vrf** {**all** *vrf-name*}] **database** [**prefix**] [**ref-lsa**] [**router** | **network**] [*link-state-id*] [**internal**] [**self-originate**]
show ospfv3 [*process-name* [*area-id*]] [**vrf** {**all** *vrf-name*}]**database** [**prefix**] [*link-state-id*]
show ospfv3 [*process-name* [*area-id*]][**vrf** {**all** *vrf-name*}] **database** [**prefix**] [*link-state-id*] [**internal**] [**adv-router** [*router-id*]]

show ospfv3 [*process-name* [*area-id*]][**vrf** {**all** *vrf-name*}] **database** [**prefix**] [*link-state-id*] [**internal**] [**self-originate**]
show ospfv3 [*process-name* [*area-id*]] [**vrf** {**all** *vrf-name*}]**database** [**router**] [*link-state-id*]
show ospfv3 [*process-name area-id*] [**vrf** {**all** *vrf-name*}]**database [router]** [**adv-router** [*router-id*]]
show ospfv3 [*process-name* [*area-id*]] [**vrf** {**all** *vrf-name*}]**database** [**router**] [*link-state-id*] [**internal**] [**self-originate**]
show ospfv3 [*process-name* [*area-id*]][**vrf** {**all** *vrf-name*}] **database** [**self-originate**]
show ospfv3 [*process-name* [*area-id*]] [**vrf** {**all** *vrf-name*}]**database** [**unknown** [**area** | **as** | **link**]] [*link-state-id*] [**internal**] [**adv-router** [*router-id*]] [**self-originate**]

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPFv3 routing process. The process name is defined by the **router ospfv3** command. If this argument is included, only information for the specified routing process is displayed.
area-id	(Optional) Area number used to define the particular area.
adv-router [*router-id*]	(Optional) Displays all link-state advertisements (LSAs) of the specified router.
asbr-summary	(Optional) Displays information only about the Autonomous System Boundary Router (ASBR) summary LSAs.
database-summary	(Optional) Displays how many of each type of LSA are in the database for each area and the total.
external	(Optional) Displays information only about external LSAs.
grace	(Optional) Displays information about the state for the graceful restart link.
internal	(Optional) Displays information only about internal LSAs.
self-originate	(Optional) Displays only self-originated LSAs (from the local router).
link-state-id	(Optional) LSA ID that uniquely identifies the LSA. For network LSAs and link LSAs, this ID is the interface ID of the link of the router originating the LSA.
inter-area prefix	(Optional) Displays information only about the interarea prefix LSAs.
inter-area router	(Optional) Displays information only about the interarea router LSAs.
link	(Optional) Displays information only about the link LSAs.
network	(Optional) Displays information only about the network LSAs.
nssa-external	(Optional) Displays information only about the not-so-stubby area (NSSA) external LSAs.
prefix	(Optional) Displays information only about the prefix LSAs.
ref-lsa	(Optional) Displays referenced LSA information.
router	(Optional) Displays information only about the router LSAs.
unknown	(Optional) Displays information only about unknown LSAs.
area	(Optional) Displays information only about the area LSAs.

as	(Optional) Displays information only about the autonomous system LSAs.
vrf	Specifies an OSPF VPN routing and forwarding (VRF) instance.
all	Display all the VRFs, excluding the default VRF.
vrf-name	Specifies the name of the of the OSPFv3 VRF.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The various forms of this command deliver information about different OSPFv3 link-state advertisements.

Task ID

Task ID	Operations
ospf	read

Examples

The following is sample output from the **show ospfv3 database** command with no arguments or keywords:

```
RP/0/RP0/CPU0:router# show ospfv3 database

              OSPFv3 Router with ID (10.0.0.207) (Process ID 1)

                  Router Link States (Area 0)

  ADV Router      Age         Seq#       Fragment ID  Link count  Bits
  0.0.0.1         163         0x80000039 0            2           None
  10.0.0.206      145         0x80000005 0            1           EB
  10.0.0.207      151         0x80000004 0            1           EB
  192.168.0.0     163         0x80000039 0            1           None

                  Net Link States (Area 0)

  ADV Router      Age         Seq#       Link ID    Rtr count
  10.0.0.207      152         0x80000002 1          3
  192.168.0.0     163         0x80000039 1          2

                  Inter Area Prefix Link States (Area 0)

  ADV Router      Age         Seq#       Prefix
  10.0.0.206      195         0x80000001 3002::/56
  10.0.0.207      197         0x80000001 3002::/56
  10.0.0.206      195         0x80000001 3002::206/128
  10.0.0.207      182         0x80000001 3002::206/128

                  Inter Area Router Link States (Area 0)

  ADV Router      Age         Seq#       Link ID    Dest RtrID
```

```
10.0.0.207      182         0x80000001 167772366  10.0.0.206
10.0.0.206      182         0x80000001 167772367  10.0.0.207

                Link (Type-8) Link States (Area 0)

ADV Router      Age         Seq#       Link ID    Interface
0.0.0.1         163         0x80000039 1          Et0/0/0/0
10.0.0.207      202         0x80000001 1          Et0/0/0/0
10.0.0.206      200         0x80000001 2          Et0/0/0/0

                Intra Area Prefix Link States (Area 0)

ADV Router      Age         Seq#       Link ID    Ref-lstype  Ref-LSID
192.168.0.0     163         0x80000039 0          0x2002      1
192.168.0.0     163         0x80000039 1          0x2001      0
10.0.0.207      157         0x80000001 1001       0x2002      1
```

This table describes the significant fields shown in the display.

Table 75: show ospfv3 database Field Descriptions

Field	Description
ADV Router	ID of advertising router.
Age	Link-state age.
Seq#	Link-state sequence number (detects old or duplicate LSAs).
Fragment ID	Router LSA fragment ID.
Link count	Number of links described.
Bits	B indicates that the router is an area border router. E indicates that the router is an autonomous system boundary router. V indicates that the router is a virtual link endpoint. W indicates that the router is a wildcard multicast receiver.
Link ID	Unique LSA ID.
Rtr count	Number of routers attached to the link.
Prefix	Prefix of the route being described.
Dest RtrID	Router ID of the router being described.
Interface	Link described by the LSA.
Ref-lstype	LSA type of the LSA being referenced.
Ref-LSID	LSA ID of the LSA being referenced.

The following is sample output from the **show ospfv3 database** command with the **external** keyword:

```
RP/0/RP0/CPU0:router# show ospfv3 database external
```

```
            OSPFv3 Router with ID (10.0.0.206) (Process ID 1)

                Type-5 AS External Link States

    LS age: 189
    LS Type: AS External Link
    Link State ID: 0
    Advertising Router: 10.0.0.206
    LS Seq Number: 80000002
    Checksum: 0xa303
    Length: 36
    Prefix Address: 2222::
    Prefix Length: 56, Options: None
    Metric Type: 2 (Larger than any link state path)
    Metric: 20
    External Route Tag: 0
```

This table describes the significant fields shown in the display.

Table 76: show ospfv3 database external Field Descriptions

Field	Description
OSPFv3 Router with ID	Router ID number.
Process ID	OSPFv3 process name.
LS age	Link-state age.
LS Type	Link-state type.
Link State ID	Link-state ID.
Advertising Router	ID of Advertising router.
LS Seq Number	Link-state sequence number (detects old or duplicate LSAs).
Checksum	LS checksum (Fletcher checksum of the complete contents of the LSA).
Length	Length (in bytes) of the LSA.
Prefix Address	IPv6 address prefix of the route being described.
Prefix Length	Length of the IPv6 address prefix.
Metric Type	External type.
Metric	Link-state metric.
External Route Tag	External route tag, a 32-bit field attached to each external route. This tag is not used by the OSPFv3 protocol itself.

The following is sample output from the **show ospfv3 database** command with the **inter-area prefix** keyword:

```
RP/0/RP0/CPU0:router# show ospfv3 database inter-area prefix
```

```
                OSPFv3 Router with ID (10.0.0.206) (Process ID 1)

                    Inter Area Prefix Link States (Area 0)

    LS age: 715
    LS Type: Inter Area Prefix Links
    Link State ID: 0
    Advertising Router: 10.0.0.206
    LS Seq Number: 80000002
    Checksum: 0x3cb5
    Length: 36
    Metric: 1
    Prefix Address: 3002::
    Prefix Length: 56, Options: None
```

This table describes the significant fields shown in the display.

Table 77: show ospfv3 database inter-area prefix Field Descriptions

Field	Description
OSPFv3 Router with ID	Router ID number.
Process ID	OSPFv3 process name.
LS age	Link-state age.
LS Type	Link-state type.
Link State ID	Link-state ID.
Advertising Router	ID of advertising router.
LS Seq Number	Link-state sequence (detects old or duplicate LSAs).
Checksum	Link-state checksum (Fletcher checksum of the complete contents of the LSA).
Length	Length (in bytes) of the LSA.
Metric	Link-state metric.
Prefix Address	IPv6 prefix of the route being described.
Prefix Length	IPv6 prefix length of the route being described.
Options	LA indicates that the prefix is a local address. MC indicates the prefix is multicast capable. NU indicates that the prefix is not unicast capable. P indicates that the prefix should be propagated at a not-so-stubby area (NSSA) area border.

The following is sample output from the **show ospfv3 database** command with the **inter-area router** keyword:

```
RP/0/RP0/CPU0:router# show ospfv3 database inter-area router

                OSPFv3 Router with ID (10.0.0.206) (Process ID 1)
```

```
                Inter Area Router Link States (Area 0)

    LS age: 1522
    Options: (V6-Bit E-Bit R-bit DC-Bit)
    LS Type: Inter Area Router Links
    Link State ID: 167772366
    Advertising Router: 10.0.0.207
    LS Seq Number: 80000002
    Checksum: 0xcaae
    Length: 32
    Metric: 1
    Destination Router ID: 10.0.0.206
```

This table describes the significant fields shown in the display.

Table 78: show ospfv3 database inter-area routerField Descriptions

Field	Description
OSPFv3 Router with ID	Router ID number.
Process ID	OSPFv3 process name.
LS age	Link-state age.
Options	Type of service options (Type 0 only): DC—Supports demand circuits.E—Capable of processing external LSAs. MC—Forwards IP multicast. N—Supports Type 7 LSAs. R—Router is active. V6—Include in IPv6 routing calculations.
LS Type	Link-state type.
Link State ID	Link-state ID.
Advertising Router	ID of the advertising router.
LS Seq Number	Link-state sequence (detects old or duplicate LSAs).
Checksum	Link-state checksum (Fletcher checksum of the complete contents of the LSA.)
Length	Length (in bytes) of the LSAs.
Metric	Link-state metric.
Destination Router ID	Router ID of the router being described.

The following is sample output from the **show ospfv3 database** command with the **link** keyword:

```
RP/0/RP0/CPU0:router# show ospfv3 database link

              OSPFv3 Router with ID (10.0.0.206) (Process ID 1)

                  Link (Type-8) Link States (Area 0)

    LS age: 620
    Options: (V6-Bit E-Bit R-bit DC-Bit)
```

```
LS Type: Link-LSA (Interface: Ethernet0/0/0/0)
Link State ID: 1 (Interface ID)
Advertising Router: 10.0.0.207
LS Seq Number: 80000003
Checksum: 0x7235
Length: 56
Router Priority: 1
Link Local Address: fe80::204:c0ff:fe22:73fe
Number of Prefixes: 1
Prefix Address: 7002::
Prefix Length: 56, Options: None
```

This table describes the significant fields shown in the display.

Table 79: show ospfv3 database link Field Descriptions

Field	Description
OSPFv3 Router with ID	Router ID number.
Process ID	OSPFv3 process name.
LS age	Link-state age.
Options	Type of service options (Type 0 only): DC—Supports demand circuits.E—Capable of processing external LSAs.MC—Forwards IP multicast.N—Supports type-7 LSAs.R—Router is active.V6—Include in IPv6 routing calculations.
LS Type	Link-state type.
Link State ID	Link-state ID (Interface ID).
Advertising Router	ID of the advertising router.
LS Seq Number	Link-state sequence (detects old or duplicate LSAs).
Checksum	Link-state checksum (Fletcher checksum of the complete contents of the LSA).
Length	Length (in bytes) of the LSAs.
Router Priority	Interface priority of originating router.
Link Local Address	Link local address of the interface.
Number of Prefixes	Number of prefixes associated with the link.
Prefix Address and Length	List of prefixes associated with the link.
Options	LA indicates that the prefix is a local address. MC indicates that the prefix is multicast capable. NU indicates that the prefix is not unicast capable. P indicates that the prefix should be propagated at an NSSA area border.

The following is sample output from the **show ospfv3 database** command with the **network** keyword:

```
RP/0/RP0/CPU0:router# show ospfv3 database network

              OSPFv3 Router with ID (10.0.0.206) (Process ID 1)

                  Net Link States (Area 0)

    LS age: 1915
    Options: (V6-Bit E-Bit R-bit DC-Bit)
    LS Type: Network Links
    Link State ID: 1 (Interface ID of Designated Router)
    Advertising Router: 10.0.0.207
    LS Seq Number: 80000004
    Checksum: 0x4330
    Length: 36
          Attached Router: 10.0.0.207
          Attached Router: 0.0.0.1
          Attached Router: 10.0.0.206
```

This table describes the significant fields shown in the display.

Table 80: show ospfv3 database network Field Descriptions

Field	Description
OSPFv3 Router with ID	Router ID number.
Process ID 1	OSPFv3 process name.
LS age	Link-state age.
Options	Type of service options (Type 0 only): DC—Supports demand circuits.E—Capable of processing external LSAs.MC—Forwards IP multicast.N—Supports Type 7 LSAs.R—Router is active.V6—Include in IPv6 routing calculations.
LS Type	Link-state type.
Link State ID	Link-state ID of the designated router.
Advertising Router	ID of the advertising router.
LS Seq Number	Link-state sequence (detects old or duplicate LSAs).
Checksum	Link-state checksum (Fletcher checksum of the complete contents of the LSA).
Length	Length (in bytes) of the LSA.
Attached Router	List of routers attached to the network, by router ID.

The following is sample output from the **show ospfv3 database** command with the **prefix** keyword:

```
RP/0/RP0/CPU0:router# show ospfv3 database prefix

              OSPFv3 Router with ID (10.0.0.206) (Process ID 1)
```

```
                Intra Area Prefix Link States (Area 1)

  Routing Bit Set on this LSA
  LS age: 356
  LS Type: Intra-Area-Prefix-LSA
  Link State ID: 0
  Advertising Router: 10.0.0.206
  LS Seq Number: 8000001e
  Checksum: 0xcdaa
  Length: 44
  Referenced LSA Type: 2001
  Referenced Link State ID: 0
  Referenced Advertising Router: 10.0.0.206
  Number of Prefixes: 1
  Prefix Address: 8006::
  Prefix Length: 56, Options: None, Metric: 1
```

This table describes the significant fields shown in the display.

Table 81: show ospfv3 database prefix Field Descriptions

Field	Description
OSPFv3 Router with ID	Router ID number.
Process ID 1	OSPFv3 process name.
LS age	Link-state age.
LS Type	Link-state type.
Link State ID	Link-state ID of the designated router.
Advertising Router	ID of the advertising router.
LS Seq Number	Link-state sequence (detects old or duplicate LSAs).
Checksum	Link-state checksum (Fletcher checksum of the complete contents of the LSA).
Length	Length (in bytes) of the LSA.
Referenced LSA Type	Router LSA or network LSA of the prefixes referenced.
Referenced Link State ID	Link-state ID of the router or network LSA.
Referenced Advertising Router	Advertising router of the referenced LSA.
Number of Prefixes	Number of prefixes listed in the LSA.
Prefix Address	Prefix associated with the router or network.
Prefix Length	Length of the prefix.
Options	LA indicates that the prefix is a local address. MC indicates that the prefix is multicast capable. NU indicates that the prefix is not unicast capable. P indicates the prefix should be propagated at an NSSA area border.

Field	Description
Metric	Cost of the prefix.

The following is sample output from the **show ospfv3 database** command with the **router** keyword:

```
RP/0/RP0/CPU0:router# show ospfv3 database router


              OSPFv3 Router with ID (10.0.0.206) (Process ID 1)

                  Router Link States (Area 0)

    LS age: 814
    Options: (V6-Bit E-Bit R-bit)
    LS Type: Router Links
    Link State ID: 0
    Advertising Router: 0.0.0.1
    LS Seq Number: 8000003c
    Checksum: 0x51ca
    Length: 56
    Number of Links: 2

      Link connected to: a Transit Network
      Link Metric: 10
      Local Interface ID: 1
        Neighbor (DR) Interface ID: 1
        Neighbor (DR) Router ID: 10.0.0.207

      Link connected to: a Transit Network
      Link Metric: 10
      Local Interface ID: 2
        Neighbor (DR) Interface ID: 1
        Neighbor (DR) Router ID: 10.0.0.0
```

This table describes the significant fields shown in the display.

Table 82: show ospfv3 database router Field Descriptions

Field	Description
OSPFv3 Router with ID	Router ID number.
Process ID 1	OSPFv3 process name.
LS age	Link-state age.
Options	Type of service options (Type 0 only): DC—Supports demand circuits.E—Capable of processing external LSAs.MC—Forwards IP multicast. N—Supports Type 7 LSAs.R—Router is active.V6—Include in IPv6 routing calculations.
LS Type	Link-state type.
Link State ID	Link-state ID of the designated router.

Field	Description
Advertising Router	ID of the advertising router.
LS Seq Number	Link-state sequence (detects old or duplicate LSAs).
Checksum	Link-state checksum (Fletcher checksum of the complete contents of the LSA).
Length	Length (in bytes) of the LSA.
Link connected to	The type of network to which this interface is connected. Values are: • Another Router (point-to-point). • A Transit Network. • A Virtual Link.
Link Metric	OSPF cost of using this link.
Local Interface ID	Number that uniquely identifies an interface on a router.

show ospfv3 flood-list

To display a list of Open Shortest Path First Version 3 (OSPFv3) link-state advertisements (LSAs) waiting to be flooded over an interface, use the **show ospfv3 flood-list** command in XR EXEC mode.

show ospfv3 [*process-name*] [*area-id*] [**vrf** {**all** *vrf-name*}]**flood-list** [*type* *interface-path-id*]

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPFv3 routing process. The process name is defined by the **router ospfv3** command. If this argument is included, only information for the specified routing process is displayed.
area-id	(Optional) Area number used to define the particular area.
type	Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
vrf	Specifies an OSPF VPN routing and forwarding (VRF) instance.
all	Display all the VRFs, excluding the default VRF.
vrf-name	Specifies the name of the of the OSPFv3 VRF.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show ospfv3 flood-list** command to display OSPFv3 packet pacing.

Task ID

Task ID	Operations
ospf	read

Examples

The following sample output from the **show ospfv3 flood-list** command shows three entries for the OSPFv3 1 process running over HundredGigE interface 0/3/0/0:

```
RP/0/RP0/CPU0:router# show ospfv3 flood-list HundredGigE 0/3/0/0
```

```
Flood Lists for OSPFv3 1

Interface HundredGigE 0/3/0/0, Queue length 3
 Link state retransmission due in 24 msec

Displaying 3 entries from flood list:

 Type       LS ID           ADV RTR    Seq NO        Age  Checksum
    3        0.0.0.199      10.0.0.207 0x80000002    3600 0x00c924
    3        0.0.0.200      10.0.0.207 0x80000002    3600 0x008966
    4       10.0.0.206      10.0.0.207 0x80000008       0 0x001951
```

This table describes the significant fields shown in the display.

Table 83: show ospfv3 flood-list Field Descriptions

Field	Description
Interface	Interface for which information is displayed.
Queue length	Number of LSAs waiting to be flooded.
Link state retransmission due in	Length of time before next link-state transmission.
Type	Type of LSA.
LS ID	Link-state ID of the LSA.
ADV RTR	IP address of advertising router.
Seq NO	Sequence number of LSA.
Age	Age of LSA (in seconds).
Checksum	Checksum of LSA.

show ospfv3 interface

To display Open Shortest Path First Version 3 (OSPFv3) interface information, use the **show ospfv3 interface** command in XR EXEC mode.

show ospfv3 [*process-name*] [*area-id*] **interface** [**vrf** {**all** *vrf-name*}][*type* *interface-path-id*]

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPFv3 routing process. The process name is defined by the **router ospfv3** command. If this argument is included, only information for the specified routing process is displayed.
area-id	(Optional) Area number used to define the particular area.
type	Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
vrf	Specifies an OSPF VPN routing and forwarding (VRF) instance.
all	Display all the VRFs, excluding the default VRF.
vrf-name	Specifies the name of the of the OSPFv3 VRF.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show ospfv3 interface** command when the adjacency between two neighboring routers is not forming. Adjacency means that the routers synchronize their databases when they discover each other.

You can look at the output to check the physical link and line protocol status and to confirm that the network type and timer intervals match those of the neighboring routers.

If you have configured BFD interface at the process level, then that applies to both area and interface level, unless area and interface level have different interval configurations specified.

Task ID

Task ID	Operations
ospf	read

Examples

The following is sample output from the **show ospfv3 interface** command when HundredGigE interface 0/2 5/0/0 is specified:

```
  RP/0/RP0/CPU0:router# show ospfv3 interface GigabitEthernet 0/
            2
            5

               /

            0
            0
            /0HundredGigE/25/0/0 is up, line protocol is up up
    Link Local address fe80::203213:a0ff1aff:fe9dfe14:f3fe3faa, Interface ID 2
    Area 0, Process ID 1foo, Instance ID 0, Router ID 101.01.01.2061
    Network Type BROADCAST, Cost: 101
    BFD enabled, interval 300 msec, multiplier 5
    Transmit Delay is 1 sec, State BDR, Priority 1
    Designated Router (ID) 102.02.02.2072, local address
fe80::20421b:c0ff53ff:fe22fe74:73feeab6
    Backup Designated router (ID) 101.01.01.2061, local address
fe80::203213:a0ff1aff:fe9dfe14:f3fe3faa
    Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
      Hello due in 00:00:06
    Index 0/21/1, flood queue length 0
    Next 0(0)/0(0)/0(0)
    Last flood scan length is 21, maximum is 92
    Last flood scan time is 0 msec, maximum is 1 0 msec
    Neighbor Count is 1, Adjacent neighbor count is 1
      Adjacent with neighbor 102.02.02.207 2  (Designated Router)
    Suppress hello for 0 neighbor(s)
```

This table describes the significant fields shown in the display.

Table 84: show ospfv3 interface Field Descriptions

Field	Description
HundredGigE	Status of the physical link and operational status of the protocol.
Link Local Address	Interface link local address and interface ID.
Area	OSPFv3 area ID, process ID, instance ID, and router ID.
BFD	BFD configuration state.
Transmit Delay	Transmit delay and interface state.
Designated Router	Designated router ID and respective interface IPv6 address.
Backup Designated router	Backup designated router ID and respective interface IPv6 address.
Timer intervals configured	Configuration of timer intervals.
Hello	Number of seconds until next hello packet is sent over this interface.
Index 0/2/1	Link, area and autonomous system flood indexes, and number of flood queue entries.

Field	Description
Next 0(0)/0(0)/0(0)	Next link, area and autonomous system flood information, data pointer, and index.
Last flood scan length	Length of last flood scan.
Last flood scan time	Time of last flood scan (in milliseconds).
Neighbor Count	Count of network neighbors and list of adjacent neighbors.
Suppress hello	Count of neighbors suppressing hello messages.

show ospfv3 message-queue

To display the information about the queue dispatch values, peak lengths, and limits, use the **show ospfv3 message-queue** command in XR EXEC mode.

show ospfv3 [*process-name*] [**vrf** {**all** *vrf-name*}] **message-queue**

This command has no keywords or arguments.

Syntax Description

vrf	Specifies an OSPF VPN routing and forwarding (VRF) instance.
all	Display all the VRFs, excluding the default VRF.
vrf-name	Specifies the name of the of the OSPFv3 VRF.

Command Default

None

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
ospf	read

This is sample output from the **show ospfv3 message-queue** command:

```
RP/0/RP0/CPU0:router#show ospfv3 message-queue
Mon May 31 16:07:47.143 CEST

OSPFv3 Process 0
  Hello Thread Packet Input Queue:
    Current queue length:         0
    Peak queue length:            2
    Queue limit:                  5000
    Packets received:             104091
    Packets processed:            104091
    Packets dropped:              0
    Processing quantum:           10
    Full quantum used:            0
    Pulses sent:                  104089
    Pulses received:              104089

  Router Thread Message Queue
    Current queue length:         0
    Peak queue length:            2
    Low queue limit:              8000
```

```
Medium queuing limit:         9000
High queuing limit:           9500
Messages queued:              1472
Messages deleted:             0
Messages processed:           1472
Low queue drops:              0
Medium queue drops:           0
High queue drops:             0
Processing quantum:           300
Full quantum used:            0
Pulses sent:                  1484
Pulses received:              1484
```

show ospfv3 neighbor

To display Open Shortest Path First Version 3 (OSPFv3) neighbor information on an individual interface basis, use the **show ospfv3 neighbor** command in XR EXEC mode.

show ospfv3 [*process-name*] [*area-id*] [**vrf** {**all** *vrf-name*}]**neighbor** [*type* *interface-path-id*] [*neighbor-id*] [**detail**]

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPFv3 routing process. The process name is defined by the **router ospfv3** command. If this argument is included, only information for the specified routing process is displayed.
area-id	(Optional) Area ID. If you do not specify an area, all areas are displayed.
type	Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
neighbor-id	(Optional) Neighbor router ID.
detail	(Optional) Displays all neighbors given in detail (lists all neighbors).
vrf	Specifies an OSPF VPN routing and forwarding (VRF) instance.
all	Display all the VRFs, excluding the default VRF.
vrf-name	Specifies the name of the of the OSPFv3 VRF.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show ospfv3 neighbor** command when the adjacency between two neighboring routers is not forming. Adjacency means that the routers synchronize their databases when they discover each other.

Task ID

Task ID	Operations
ospf	read

Examples

The following is sample output from the **show ospfv3 neighbor** command showing two lines of summary information for each neighbor:

```
RP/0/RP0/CPU0:router# show ospfv3 neighbor

  Neighbors for OSPFv3 1

  Neighbor ID     Pri   State           Dead Time   Interface ID    Interface
  10.0.0.207      1     FULL/  -        00:00:35    3               HundredGigE 0/3/0/0
      Neighbor is up for 01:08:05
  10.0.0.207      1     FULL/DR         00:00:35    2               Ethernet0/0/0/0
      Neighbor is up for 01:08:05

  Total neighbor count: 2
```

This table describes the significant fields shown in the display.

Table 85: show ospfv3 neighbor Field Descriptions

Field	Description
ID	Neighbor router ID.
Pri	Router priority for designated router election. A router with a priority of 0 is never elected as the designated router or backup designated router.
State	OSPFv3 state.
Dead Time	Time (in hh:mm:ss) to elapse before OSPFv3 declares the neighbor dead.
Interface ID	Number that uniquely identifies an interface on a router.
Interface	Name of the interface that connects to this neighbor.
Neighbor is up	Time (in hh:mm:ss) that the OSPFv3 neighbor has been up.

The following is sample output showing summary information about the neighbor that matches the neighbor ID:

```
RP/0/RP0/CPU0:router# show ospfv3 neighbor 10.0.0.207

  Neighbors for OSPFv3 1

   Neighbor 10.0.0.207
      In the area 0 via interface Ethernet0/0/0/0
      Neighbor: interface-id 2, link-local address fe80::204:c0ff:fe22:73fe
      Neighbor priority is 1, State is FULL, 6 state changes
      DR is 10.0.0.207 BDR is 10.0.0.206
      Options is 0x13
      Dead timer due in 00:00:38
      Neighbor is up for 01:09:21
      Index 0/1/2, retransmission queue length 0, number of retransmission 1
      First 0(0)/0(0)/0(0) Next 0(0)/0(0)/0(0)
      Last retransmission scan length is 1, maximum is 1
      Last retransmission scan time is 0 msec, maximum is 0 msec
```

```
 Neighbor 10.0.0.207
    In the area 1 via interface HundredGigE 0/3/0/0
    Neighbor: interface-id 3, link-local address fe80::3034:30ff:fe33:3742
    Neighbor priority is 1, State is FULL, 6 state changes
    Options is 0x13
    Dead timer due in 00:00:38
    Neighbor is up for 01:09:21
    Index 0/1/1, retransmission queue length 0, number of retransmission 1
    First 0(0)/0(0)/0(0) Next 0(0)/0(0)/0(0)
    Last retransmission scan length is 1, maximum is 1
    Last retransmission scan time is 0 msec, maximum is 0 msec


Total neighbor count: 2
```

This table describes the significant fields shown in the display.

Table 86: show ospfv3 neighbor 10.0.0.207 Field Descriptions

Field	Description
Neighbor	Neighbor router ID.
In the area	Area and interface through which the OSPFv3 neighbor is known.
link-local address	Link local address of the interface.
Neighbor priority	Router priority of neighbor and neighbor state.
State	OSPFv3 state.
state changes	Number of state changes for this neighbor.
DR is	Neighbor ID of the designated router.
BDR is	Neighbor ID of the backup designated router.
Options	Hello packet options field contents (E-bit only; possible values are 0 and 2; 2 indicates that area is not a stub; 0 indicates that area is a stub).
Dead timer	Time (in hh:mm:ss) to elapse before OSPFv3 declares the neighbor dead.
Neighbor is up	Time (in hh:mm:ss) that OSPFv3 neighbor has been up.
Index	Index and the remaining lines of this command give detailed information about flooding information received from the neighbor.

The following sample output shows the neighbors that match the neighbor ID on the interface when the interface along with the neighbor ID is specified:

```
RP/0/RP0/CPU0:router# show ospfv3 neighbor HundredGigE 0/3/0/1 10.0.0.207

  Neighbors for OSPFv3 1

   Neighbor 10.0.0.207
```

```
    In the area 0 via interface HundredGigE 0/3/0/1
    Neighbor: interface-id 2, link-local address fe80::204:c0ff:fe22:73fe
    Neighbor priority is 1, State is FULL, 6 state changes
    DR is 10.0.0.207 BDR is 10.0.0.206
    Options is 0x13
    Dead timer due in 00:00:39
    Neighbor is up for 01:11:21
    Index 0/1/2, retransmission queue length 0, number of retransmission 1
    First 0(0)/0(0)/0(0) Next 0(0)/0(0)/0(0)
    Last retransmission scan length is 1, maximum is 1
    Last retransmission scan time is 0 msec, maximum is 0 msec


  Total neighbor count: 1
```

This table describes the significant fields shown in the display.

Table 87: show ospfv3 neighbor HundredGigE 0/3/0/1 10.0.0.207 Field Descriptions

Field	Description
Neighbor	Neighbor router ID.
In the area	Area and interface through which the OSPFv3 neighbor is known.
link-local address	Link local address of the interface.
Neighbor priority	Router priority of neighbor and neighbor state.
State	OSPFv3 state.
state changes	Number of state changes for this neighbor.
DR is	Neighbor ID of the designated router.
BDR is	Neighbor ID of the backup designated router.
Options	Hello packet options field contents (E-bit only; possible values are 0 and 2; 2 indicates that area is not a stub; 0 indicates that area is a stub).
Dead timer	Time (in hh:mm:ss) to elapse before OSPFv3 declares the neighbor dead.
Neighbor is up	Time (in hh:mm:ss) that OSPFv3 neighbor has been up.
Index	Index and the remaining lines of this command give detailed information about flooding information received from the neighbor.

The following sample output shows all neighbors on the interface when the interface is specified:

```
RP/0/RP0/CPU0:router# show ospfv3 neighbor HundredGigE 0/3/0/1

  Neighbors for OSPFv3 1

  Neighbor ID     Pri   State           Dead Time   Interface ID    Interface
  10.0.0.207      1     FULL/DR         00:00:37    2               HundredGigE 0/3/0/1
      Neighbor is up for 01:12:33
```

```
  Total neighbor count: 1
```

This table describes the significant fields shown in the display.

Table 88: show ospfv3 neighbor HundredGigE 0/3/0/1 Field Descriptions

Field	Description
Neighbor ID	Neighbor router ID.
Pri	Router priority for designated router election. A router with a priority of 0 is never elected as the designated router or backup designated router.
State	OSPF state.
Dead Time	Time (in hh:mm:ss) to elapse before OSPF declares the neighbor dead.
Interface ID	Number that uniquely identifies an interface on a router.
Interface	Name of the interface that connects to this neighbor.
Neighbor is up	Amount of time (in hh:mm:ss) that the OSPF neighbor has been up.

The following is sample output showing detailed neighbor information for HundredGigE interface 0/3/0/1:

```
RP/0/RP0/CPU0:router# show ospfv3 neighbor HundredGigE 0/3/0/1 detail

  Neighbors for OSPFv3 1

   Neighbor 10.0.0.207
      In the area 0 via interface HundredGigE 0/3/0/1
      Neighbor: interface-id 2, link-local address fe80::204:c0ff:fe22:73fe
      Neighbor priority is 1, State is FULL, 6 state changes
      DR is 10.0.0.207 BDR is 10.0.0.206
      Options is 0x13
      Dead timer due in 00:00:39
      Neighbor is up for 01:13:40
      Index 0/1/2, retransmission queue length 0, number of retransmission 1
      First 0(0)/0(0)/0(0) Next 0(0)/0(0)/0(0)
      Last retransmission scan length is 1, maximum is 1
      Last retransmission scan time is 0 msec, maximum is 0 msec

  Total neighbor count: 1
```

This table describes the significant fields shown in the display.

Table 89: show ospfv3 neighbor HundredGigE 0/3/0/1 detail Field Descriptions

Field	Description
Neighbor	Neighbor router ID.
In the area	Area and interface through which the OSPFv3 neighbor is known.

Field	Description
link-local address	Link local address of the interface.
Neighbor priority	Router priority of neighbor and neighbor state.
State	OSPFv3 state.
state changes	Number of state changes for this neighbor.
DR is	Neighbor ID of the designated router.
BDR is	Neighbor ID of the backup designated router.
Options	Hello packet options field contents (E-bit only; possible values are 0 and 2; 2 indicates that area is not a stub; 0 indicates that area is a stub).
Dead timer	Time (in hh:mm:ss) to elapse before OSPFv3 declares the neighbor dead.
Neighbor is up	Time (in hh:mm:ss) that the OSPFv3 neighbor has been up.
Index	Index and the remaining lines of this command give detailed information about flooding information received from the neighbor.

The following is sample output showing neighbor information with BFD enabled for HundredGigE interface 0/5/0/0:

```
RP/0/RP0/CPU0:router# show ospfv3 neighbor detail
Thu Sep 11 02:02:46.267 UTC

  Neighbors for OSPFv3 foo

   Neighbor 2.2.2.2
      In the area 0 via interface HundredGigE 0/5/0/0     BFD enabled
      Neighbor: interface-id 2, link-local address fe80::21b:53ff:fe74:eab6
      Neighbor priority is 1, State is FULL, 6 state changes
      DR is 2.2.2.2 BDR is 1.1.1.1
      Options is 0x13
      Dead timer due in 00:00:32
      Neighbor is up for 00:06:16
      Index 1/1/1, retransmission queue length 0, number of retransmission 1
      First 0(0)/0(0)/0(0) Next 0(0)/0(0)/0(0)
      Last retransmission scan length is 1, maximum is 1
      Last retransmission scan time is 0 msec, maximum is 0 msec


  Total neighbor count: 1
```

show ospfv3 request-list

To display the first ten link-state requests pending that the local router is making to the specified Open Shortest Path First Version 3 (OSPFv3) neighbor and interface, use the **show ospfv3 request-list** command in XR EXEC mode.

show ospfv3 [*process-name*] [*area-id*] [**vrf** {**all** *vrf-name*}]**request-list** [*type* *interface-path-id*] [*neighbor-id*]

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPFv3 routing process. The process name is defined by the **router ospfv3** command. If this argument is included, only information for the specified routing process is displayed.
area-id	(Optional) Area ID. If you do not specify an area, all areas are displayed.
type	(Optional) Interface type. For more information, use the question mark (?) online help function.
interface-path-id	(Optional) Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
neighbor-id	(Optional) Router ID of the OSPFv3 neighbor. This argument must be in 32-bit dotted-decimal notation, similar to an IPv4 address.
vrf	Specifies an OSPF VPN routing and forwarding (VRF) instance.
all	Display all the VRFs, excluding the default VRF.
vrf-name	Specifies the name of the of the OSPFv3 VRF.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

You might use this command when the databases of two neighboring routers are out of synchronization or if the adjacency is not forming between them. Adjacency means that the routers synchronize their databases when they discover each other.

You can look at the list to determine if one router is trying to request a particular database update. Entries that appear to be suspended in the list usually indicate that updates are not being delivered. One possible reason for this behavior is a maximum transmission unit (MTU) mismatch between the routers.

You might also look at this list to make sure it is not corrupted. The list should refer to database entries that actually exist.

Task ID

Task ID	Operations
ospf	read

Examples

The following sample output shows request lists for neighbor 10.0.0.207 on the OSPFv3 1 process:

```
RP/0/RP0/CPU0:router# show ospfv3 1 request-list 10.0.0.207 HundredGigE 0/3/0/0

  Request Lists for OSPFv3 1

   Neighbor 10.0.0.207, interface HundredGigE 0/3/0/0 address fe80::3034:30ff:fe33:3742

   Type   LS ID            ADV RTR        Seq NO        Age   Checksum
      1   192.168.58.17     192.168.58.17   0x80000012     12   0x0036f3
      2   192.168.58.68     192.168.58.17   0x80000012     12   0x00083f
```

This table describes the significant fields shown in the display.

Table 90: show ospfv3 request-list Field Descriptions

Field	Description
Neighbor	Router ID of the neighboring router.
interface	Name of the interface that connects to this neighbor.
address	IPv6 address of the neighbor.
Type	Type of link-state advertisement (LSA).
LS ID	Link-state ID of the LSA.
ADV RTR	Router ID of the advertising router.
Seq NO	Sequence number of the LSA.
Age	Age of the LSA (in seconds).
Checksum	Checksum of the LSA.

show ospfv3 retransmission-list

To display the first ten link-state entries in the retransmission list that the local router sends to the specified neighbor over the specified interface, use the **show ospfv3 retransmission-list** command in XR EXEC mode.

show ospfv3 [*process-name*] [*area-id*] [**vrf** {**all** *vrf-name*}]**retransmission-list** [*type interface-path-id*] [*neighbor-id*]

Syntax Description

process-name	(Optional) Name that uniquely identifies an Open Shortest Path First Version 3 (OSPFv3) routing process. The process name is defined by the **router ospfv3** command. If this argument is included, only information for the specified routing process is displayed.
area-id	(Optional) Area ID. If you do not specify an area, all areas are displayed.
type	(Optional) Interface type. For more information, use the question mark (?) online help function.
interface-path-id	(Optional) Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
neighbor-id	(Optional) IP address of the OSPFv3 neighbor.
vrf	Specifies an OSPF VPN routing and forwarding (VRF) instance.
all	Display all the VRFs, excluding the default VRF.
vrf-name	Specifies the name of the of the OSPFv3 VRF.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

You might use this command when the databases of two neighboring routers are out of synchronization or if the adjacency is not forming between them. Adjacency means that the routers synchronize their databases when they discover each other.

You can look at the list to determine if one router is trying to request a particular database update. Entries that appear to be suspended in the list usually indicate that updates are not being delivered. One possible reason for this behavior is a maximum transmission unit (MTU) mismatch between the routers.

You might also look at this list to make sure it is not corrupted. The list should refer to database entries that actually exist.

Task ID

Task ID	Operations
ospf	read

Examples

The following sample output shows the retransmission list for neighbor 10.0.124.4 on HundredGigE interface 0/3/0/0:

```
RP/0/RP0/CPU0:router#show ospfv3 retransmission-list 10.0.124.4 HundredGigE 0/3/0/0

  Neighbor 10.0.124.4, interface HundredGigE 0/3/0/0 address fe80::3034:30ff:fe33:3742
```

This table describes the significant fields shown in the display.

Table 91: show ospfv3 retransmission-list 10.0.124.4 HundredGigE 0/3/0/0 Field Descriptions

Field	Description
Neighbor	Router ID of the neighboring router.
interface	Name of the interface that connects to this neighbor.
address	IPv6 address of the neighbor.

show ospfv3 routes

To display the Open Shortest Path First Version 3 (OSPFv3) route table, use the **show ospfv3 routes** command in XR EXEC mode.

show ospfv3 [*process-name*] [**vrf** {**all** *vrf-name*}]**routes** [**external** | **connected**] [*ipv6-prefix*/*prefix-length*]
show ospfv3 [*process-name*] [**vrf** {**all** *vrf-name*}]**routes summary**

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPFv3 routing process. The process name is defined by the **router ospf** command. If this argument is included, only information for the specified routing process is displayed.
external	(Optional) Displays routes redistributed from other protocols.
connected	(Optional) Displays connected routes.
ipv6-prefix	(Optional) IP Version 6 (IPv6) prefix, which limits output to a specific route. This argument must be in the form documented in RFC 2373, in which the address is specified in hexadecimal using 16-bit values between colons.
/ *prefix-length*	(Optional) Length of the IPv6 prefix. A decimal value that indicates how many of the high-order contiguous bits of the address compose the prefix (the network portion of the address). A slash must precede the decimal value.
summary	Displays a summary of the route table.
vrf	Specifies an OSPF VPN routing and forwarding (VRF) instance.
all	Display all the VRFs, excluding the default VRF.
vrf-name	Specifies the name of the of the OSPFv3 VRF.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show ospfv3 routes** command to display the OSPFv3 private routing table (which contains only routes calculated by OSPFv3). If there is something wrong with a route in the Routing Information Base (RIB), check the OSPFv3 copy of the route to determine if it matches the RIB contents. If it does not match, there is a synchronization problem between OSPFv3 and the RIB. If the routes match and the route is incorrect, OSPFv3 has made an error in its routing calculation.

Task ID

Task ID	Operations
ospf	read

Examples

The following sample output shows the route table for OSPFv3 process 1:

```
RP/0/RP0/CPU0:router# show ospfv3 1 routes

  Route Table for OSPFv3 1 with ID 10.3.4.2

  * 3000:11:22::/64, Inter, cost 21/0, area 1
      HundredGigE 0/3/0/0, fe80::3034:30ff:fe33:3742
      10.0.0.207/200
  * 3000:11:22:1::/64, Inter, cost 31/0, area 1
  HundredGigE 0/3/0/0, fe80::3034:30ff:fe33:3742
      10.0.0.207/1
  * 3333::/56, Ext2, cost 20/1, P:0 F:0
  HundredGigE 0/3/0/0, fe80::3034:30ff:fe33:3742
      10.0.0.207/0
  * 6050::/56, Ext2, cost 20/1, P:0 F:0
  HundredGigE 0/3/0/0, fe80::3034:30ff:fe33:3742
      10.0.0.207/1
  * 7002::/56, Intra, cost 10/0, area 0
      HundredGigE 0/0/0/0, connected

  * 3000:11:22::/64, Inter, cost 21/0, area 1
  HundredGigE 0/3/0/0, fe80::3034:30ff:fe33:3742
      10.0.0.207/200
```

This table describes the significant fields shown in the display.

Table 92: show ospfv3 1 route Field Descriptions

Field	Description
3000:11:22::/64	Route prefix to the local router.
Inter	Prefix 3000:11:22::/64 is interarea.
cost 21/0	Sum of the link costs required to reach prefix 3000:11:22::/64. 0. In this example, 20 is the external cost.
HundredGigE 0/3/0/0	Packets destined for prefix 3000:11:22::/64 are sent over the HundredGigE 0/3/0/0 interface.
fe80::3034:30ff:fe33:3742	Next-hop router on the path to prefix 3000:11:22::/64.
10.0.0.207	Router 10.0.0.207 is the router that advertised this route.

show ospfv3 statistics rib-thread

To display RIB thread statistics, use the **show ospfv3 statistics rib-thread** command in XR EXEC mode.

show ospfv3 [*process-name* [*area-id*]] **statistics rib-thread**

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPF routing process. The process name is defined by the **router ospfv3** command. If this argument is included, only information for the specified routing process is displayed.
area id	(Optional) Area number used to define the particular area.

Command Default

None

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
ospf	read

This is sample output from **show ospfv3 statistics rib-thread** command:

```
RP/0/RP0/CPU0:router#show ospfv3 0 statistics rib-thread
Mon May 10 17:48:29.011 CEST
OSPFv3 0 RIB thread statistics
 Queue statistics:
  Last entry dequeue           10127056 msecs ago (14:59:42.171)
  RIB thread active            NO
  Total RIB thread signals     30
  Current queue length         0
  Maximum queue length         2
  Total entries queued         31
  Total entries dequeued       31
  Maximum latency (msec)       5.000
  Average latency (msec)       0.323
 Queue errors:
  Enqueue errors               0
  Dequeue errors               0
 RIB batch statistics:
  Batches sent to RIB          31
  Batch all routes OK          31
  Batch some routes backup     0
 RIB batch errors:
  Batches version mismatch     0
  Batches missing connection   0
```

```
Batches no table             0
Batch route table limit      0
Batch route errors           0
Batch errors                 0
Route table limit            0
Route path errors            0
Route errors                 0
Path table limit             0
Path errors                  0
```

show ospfv3 summary-prefix

To display Open Shortest Path First Version 3 (OSPFv3) aggregated summary address information, use the **show ospfv3 summary-prefix** command in XR EXEC mode.

show ospfv3 [*process-name*] [**vrf** {**all** *vrf-name*}]**summary-prefix**

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPFv3 routing process. The process name is defined by the **router ospfv3** command. If this argument is included, only information for the specified routing process is displayed.
vrf	Specifies an OSPF VPN routing and forwarding (VRF) instance.
vrf-name	Specifies the name of the of the OSPFv3 VRF.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show ospfv3 summary-prefix** command if you configured summarization of external routes with the **summary-prefix** command and you want to display configured summary addresses.

Task ID

Task ID	Operations
ospf	read

Examples

The following sample output shows the summary prefix address for the OSPFv3 1 process:

```
RP/0/RP0/CPU0:router# show ospfv3 1 summary-prefix

  OSPFv3 Process 1, Summary-prefix

  4004:f000::/32 Metric 20, Type 2, Tag 0
```

This table describes the significant fields shown in the display.

Table 93: show ospfv3 1 summary-prefix Field Descriptions

Field	Description
4004:f000::/32	Summary prefix designated for a range of IPv6 prefixes. The length of the IPv6 prefix.
Metric	Metric used to advertise the summary routes.

Field	Description
Type	External link-state advertisements (LSAs) metric type.
Tag	Tag value that can be used as a “match” value for controlling redistribution through route maps.

show ospfv3 virtual-links

To display parameters and the current state of Open Shortest Path First Version 3 (OSPFv3) virtual links, use the **show ospfv3 virtual-links** command in XR EXEC mode.

show ospfv3 [*process-name*] [**vrf** {**all** *vrf-name*}]**virtual-links**

Syntax Description

process-name	(Optional) Name that uniquely identifies an OSPFv3 routing process. The process name is defined by the **router ospfv3** command. If this argument is included, only information for the specified routing process is displayed.
vrf	Specifies an OSPF VPN routing and forwarding (VRF) instance.
vrf-name	Specifies the name of the of the OSPFv3 VRF.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The information displayed in the **show ospfv3 virtual-links** command is useful in debugging OSPFv3 routing operations.

Task ID

Task ID	Operations
ospf	read

Examples

The following sample output shows the virtual links for the OSPFv3 1 process:

```
RP/0/RP0/CPU0:router# show ospfv3 1 virtual-links

  Virtual Links for OSPFv3 1
  Virtual Link to router 172.31.101.2 is up
    Interface ID 16, IPv6 address 3002::206
    Transit area 0.0.0.1, via interface HundredGigE 0/3/0/0, Cost of using 11
    Transmit Delay is 5 sec, State POINT_TO_POINT,
    Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 0:00:08
    Adjacency State FULL
```

This table describes the significant fields shown in the display.

Table 94: show ospfv3 virtual-links Field Descriptions

Field	Description
Virtual Link to router is up	Specifies the OSPFv3 neighbor, and if the link to that neighbor is up or down.
Interface ID	ID of the virtual link interface.
IPv6 address	IPv6 address of virtual link endpoint.
Transit area	Transit area through which the virtual link is formed.
via interface	Interface through which the virtual link is formed.
Cost	Cost of reaching the OSPF neighbor through the virtual link.
Transmit Delay	Transmit delay on the virtual link.
State POINT_TO_POINT	State of the OSPFv3 neighbor.
Timer intervals	Various timer intervals configured for the link.
Hello due in	When the next hello message is expected from the neighbor (in hh:mm:ss).
Adjacency State	Adjacency state between the neighbors.

show protocols (OSPFv3)

To display information about the Open Shortest Path First Version 3 (OSPFv3) process running on the router, use the **show protocols** command in XR EXEC mode.

show protocols [**afi-all** | **ipv4** | **ipv6**] [**all***protocol*]

Syntax Description

afi-all	(Optional) Specifies all address families.
ipv4	(Optional) Specifies an IPv4 address family.
ipv6	(Optional) Specifies an IPv6 address family.
all	(Optional) Specifies all protocols for a given address family.
protocol	(Optional) Specifies a routing protocol. For the IPv4 address family, the options are: • **bgp** • **isis** • **ospf** • **rip** For the IPv6 address family, the options are: • **bgp** • **isis** • **ospfv3**

Command Default

The default address family is IPv4.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ospf	read

Examples

The following example is sample output from the **show protocols** command:

```
RP/0/RP0/CPU0:router# show protocols ipv6 ospfv3

  Routing Protocol OSPFv3 1
    Router Id:10.0.0.1
```

```
Distance:110
Redistribution:
  None
Area 0
  HundredGigE 0/2/0/2
  Loopback1
```

This table describes the significant fields shown in the display.

Table 95: show protocols Field Descriptions

Field	Description
Router Id	Router ID of the OSPFv3 process.
Distance	Administrative distance for the protocol. This distance determines the priority the Routing Information Base (RIB) gives to the routes, as opposed to other protocols, for example, IS-IS.
Redistribution	Protocols from which this OSPFv3 process is redistributing routes.
Area	OSPFv3 areas defined in this process, followed by their associated interfaces.

snmp context (OSPFv3)

To specify an SNMP context for an OSPFv3 instance, use the **snmp context** command in router configuration mode or in VRF configuration mode. To remove the SNMP context, use the **no** form of this command.

snmp context *context_name*
no snmp context *context_name*

Syntax Description

context_name	Specifies name of the SNMP context for OSPFv3 instance.

Command Default

SNMP context is not specified.

Command Modes

Router OSPFv3 configuration

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes the proper task IDs. If you suspect user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The snmp-server commands need to be configured to perform SNMP request for the OSPF instance. Refer *SNMP Server Commands* module in *System Management Command Reference* for information on using the snmp-server commands.

Note To map an SNMP context with a protocol instance, topology or VRF entity, use the **snmp-server context mapping** command. However, the **feature** option of this command does not work with OSPFv3 protocol.

Task ID

Task ID	Operation
ospf	read, write

This example shows how to configure an SNMP context *foo* for OSPFv3 instance *100*:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#router ospfv3 100
RP/0/RP0/CPU0:router(config-ospf)#snmp context foo
```

This example shows how to configure **snmp-server** commands to be used with the **snmp context** command:

```
RP/0/RP0/CPU0:router(config)#snmp-server host 10.0.0.2 traps version 2c public udp-port
1620
RP/0/RP0/CPU0:router(config)#snmp-server community public RW
RP/0/RP0/CPU0:router(config)#snmp-server contact foo
RP/0/RP0/CPU0:router(config)#snmp-server community-map public context foo
```

This is a sample SNMP context configuration for OSPFv3 instance *100*:

```
snmp-server host 10.0.0.2 traps version 2c public udp-port 1620
snmp-server community public RW
snmp-server contact foo

snmp-server community-map public context foo


router ospfv3 100
 router-id 2.2.2.2
 bfd fast-detect
 nsf cisco
snmp context foo
 area 0
  interface Loopback1
  !
 !
 area 1
  interface HundredGigE 0/2/0/1
   demand-circuit enable
  !
  interface POS0/3/0/0
  !
  interface POS0/3/0/1
  !
 !
!
```

snmp trap (OSPFv3)

To enable SNMP trap for an OSPFv3 instance, use the **snmp trap** command in VRF configuration mode. To disable SNMP trap for the OSPFv3 instance, use the **no** form of this command.

snmp trap
no snmp trap

Syntax Description

This command has no keywords or arguments.

Command Default

Disabled.

Command Modes

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
ospf	read, write

This example shows how to enable SNMP trap for OSPFv3 instance *100* under VRF *vrf-1*:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#router ospfv3 100
RP/0/RP0/CPU0:router(config-ospf)#vrf vrf-1
RP/0/RP0/CPU0:router(config-ospf-vrf)#snmp trap
```

snmp trap rate-limit (OSPFv3)

To control the number of traps that OSPFv3 sends by configuring window size and the maximum number of traps during that window, use the **snmp trap rate-limit** command in router OSPFv3 configuration mode or OSPFv3 VRF configuration mode. To disable configuring the window size and maximum number of traps during the window, use the **no** form of this command.

snmp trap rate-limit *window-size max-num-traps*
no snmp trap rate-limit *window-size max-num-traps*

Syntax Description

window-size	Specifies the trap rate limit sliding window size. The range is 2 to 60 windows.
max-num-traps	Specifies the maximum number of traps sent in window time. The range is 0 to 300 traps.

Command Default

None

Command Modes

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
ospf	read, write

This example shows how to set the trap rate limit sliding window size to 50 and the maximum number of traps sent to 250 for OSPFv3 instance *100* under vrf *vrf1*:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#router ospfv3 100
RP/0/RP0/CPU0:router(config-ospfv3)#vrf vrf1
RP/0/RP0/CPU0:router(config-ospfv3-vrf)#snmp trap rate-limit 50 250
```

spf prefix-priority (OSPFv3)

To prioritize OSPFv3 prefix installation into the global Routing Information Base (RIB) during Shortest Path First (SPF) run, use the **spf prefix-priority** command in XR Config mode or VRF configuration mode. To return to the system default value, use the **no** form of this command.

spf prefix-priority route-policy *policy-name* [**disable**]
spf prefix-priority route-policy *policy-name*

Syntax Description

route-policy	Specifies the route-policy to prioritize route installation.
policy-name	Name of the route policy.
disable	Disables SPF prefix priority

Command Default

SPF prefix prioritization is disabled.

Command Modes

XR Config mode

VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
ospf	read, write

This example shows how to configure OSPFv3 SPF prefix prioritization:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# prefix-set ospf3-critical-prefixes
RP/0/RP0/CPU0:router(config-pfx)# 66.0.0.0/16
RP/0/RP0/CPU0:router(config-pfx)# end-set
RP/0/RP0/CPU0:router(config)# route-policy ospf3-spf-priority
RP/0/RP0/CPU0:router(config-rpl)# if destination in ospf-critical-prefixes then set
spf-priority critical
endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy
RP/0/RP0/CPU0:router(config-rpl)# commit
RP/0/RP0/CPU0:router(config-rpl)# exit
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospf)# router-id 66.0.0.1
RP/0/RP0/CPU0:router(config-ospf)# spf prefix-priority route-policy ospf-spf-priority
```

stub (OSPFv3)

To define an area as a stub area for Open Shortest Path First Version 3 (OSPFv3), use the **stub** command in area configuration mode. To disable this function, use the **no** form of this command.

stub [**no-summary**]
no stub

Syntax Description

no-summary	(Optional) Prevents an area border router (ABR) from sending summary link advertisements into the stub area. Areas with this option are known as *totally stubby* areas.

Command Default

No stub area is defined.

Command Modes

Area configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

You must configure the **stub** command on all routers in the stub area. Use the **default-cost area** command on the ABR of a stub area to specify the cost of the default route advertised into the stub area by the ABR.

Two stub area router configuration commands exist: the **stub** and **default-cost** commands. In all routers attached to the stub area, the area should be configured as a stub area using the **stub** command. Use the **default-cost** command only on an ABR attached to the stub area. The **default-cost** command provides the metric for the summary default route generated by the ABR into the stub area.

To further reduce the number of link-state advertisements (LSAs) sent into a stub area, you can configure the **no-summary** keyword on the ABR to prevent it from sending summary LSAs (LSA Type 3) into the stub area.

A stub area does not accept information about routes external to the autonomous system.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to create stub area 5 and specifies a cost of 20 for the default summary route sent into this stub area:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 201
RP/0/RP0/CPU0:router(config-ospfv3)# area 5
RP/0/RP0/CPU0:router(config-ospfv3-ar)# stub
RP/0/RP0/CPU0:router(config-ospfv3-ar)# default-cost 20
```

stub-router

To modify self originated router LSAs when stub router is active, use the **stub-router** command in an appropriate configuration mode. To disable this function, use the **no** form of this command.

stub-router router-lsa [**r-bit** | **v6-bit** | **max-metric**] [**always**] [**on-proc-migration** *interval*] [**on-proc-restart** *interval*] [**on-switchover** *interval*] [**on-startup** [*interval* | **wait-for-bgp**]] [**summary-lsa** [*metric*]] [**external-lsa** [*metric*]] [**include-stub**]
stub-router router-lsa [**r-bit** | **v6-bit** | **max-metric**]

Syntax Description

router-lsa	Specifies that always originate router link-state advertisements (LSAs) with the stub-router.
r-bit	Router-LSAs are originated with R-bit clear (v6 bit set), which means the node does not act as a transit router. Directly connected networks (native to OSPF) are still reachable within the OSPF area.
v6-bit	Router-LSAs are originated with V6 bit clear (and also r-bit clear). That means the node is not willing to receive any ipv6 traffic. Other ospfv3 routers won't install any route to a node with v6-bit clear.
max-metric	Router-LSAs are originated with maximum metric. Unlike the r-bit and v6-bit mode, the router may still act as a transit node, if there is no alternate path.
always	Stub-router mode is activated unconditionally.
on-proc-migration	Stub-router mode is activated for the desired period of time, upon ospfv3 process migration.
on-proc-restart	Stub-router mode is activated for the desired period of time, upon ospfv3 process restart.
on-switchover	Stub-router mode is activated for the desired period of time, upon RP failover.
on-startup	Stub-router mode is activated (for configured time, or until BGP converges) upon router startup (boot).
wait-for-bgp	Stub-router mode is terminated upon BGP convergence in ipv6 unicast address family. This option could only be used in the global routing table, not in a non-default VRF. This option is only supported with the on-startup trigger when the router boots.
summary-lsa	If enabled, summary LSAs are advertised with modified metric when stub-router is active. This configuration is applicable to max-metric mode. In r-bit mode, ABR/ASBR functionality is implicitly disabled and routers will not use this node as an ABR/ASBR, since it declares no transit capability (r-bit clear). If enabled and metric is not explicitly configured, the default metric for summary LSAs when stub-router active is 16711680 (0xFF0000).

external-lsa	If enabled, external LSAs are advertised with modified metric when stub-router is active. This configuration is applicable to max-metric mode. In r-bit mode, ABR/ASBR functionality is implicitly disabled and routers will not use this node as an ABR/ASBR, since it declares no transit capability (r-bit clear). If enabled and metric is not explicitly configured, the default metric for external LSAs when stub-router active is 16711680 (0xFF0000).
include-stub	If enabled, intra-area-prefix LSAs that are referencing router LSA are advertised with maximum metric (0xffff) when stub-router is active. Intra-area-prefix LSAs that are referencing network LSA do not change metric Can be used in r-bit and max-metric modes. /128 prefixes that are normally advertised with LA-bit set and 0 metric are also advertised with maximum metric and LA-bit clear when stub-router is active.

Command Default

Disabled.

Command Modes

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Only one method (r-bit, v6-bit, max-metric) could be activated at a time. Configuring the methods simultaneously, or different method per trigger, is not supported.

Task ID

Task ID	Operation
ospf	read, write

This example shows how to configure router LSAs are originated with R-bit clear under OSPFv3 VRF, *vrf_1*:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)#vrf vrf_1
RP/0/RP0/CPU0:router(config-ospfv3-vrf)#stub-router router-lsa r-bit
```

summary-prefix (OSPFv3)

To create aggregate addresses for routes being redistributed from another routing protocol into Open Shortest Path First Version 3 (OSPFv3) protocol, use the **summary-prefix** command in an appropriate configuration mode. To stop summarizing redistributed routes, use the **no** form of the command.

summary-prefix *ipv6-prefix/prefix-length* [**not-advertise**] **tag** *tag*
no summary-prefix *ipv6-prefix/prefix-length*

Syntax Description

ipv6-prefix	Summary prefix designated for a range of IP Version 6 (IPv6) prefixes. This argument must be in the form documented in RFC 2373, where the address is specified in hexadecimal using 16-bit values between colons.
/ *prefix-length*	Length of the IPv6 prefix. A decimal value that indicates how many of the high-order contiguous bits of the address compose the prefix (the network portion of the address). A slash must precede the decimal value.
not-advertise	(Optional) Suppresses summary routes that match the address and mask pair from being advertised.
tag *tag*	(Optional) Specifies a tag value that can be used as a "match" value for controlling redistribution.

Command Default

When this command is not used in router configuration mode, aggregate addresses are not created for routes being redistributed from another routing protocol into the OSFPv3 protocol.

Command Modes

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **summary-prefix** command to cause an OSPFv3 Autonomous System Boundary Router (ASBR) to advertise one external route as an aggregate for all redistributed routes that are covered by the address. This command summarizes only routes from other routing protocols that are being redistributed into OSPFv3.

You can use this command multiple times to summarize multiple groups of addresses. The metric used to advertise the summary is the lowest metric of all the more specific routes. This command helps reduce the size of the routing table.

If you want to summarize routes between OSPFv3 areas, use the **range** command.

Task ID

Task ID	Operations
ospf	read, write

Examples

In the following example, if summary prefix 4004:f000:132 is configured and routes 4004:f000:1::/64, 4004:f000:2::/64, and 4004:f000:3::/64 are redistributed into OSPFv3; only route 4004:f000::/32 is advertised in an external link-state advertisement:

```
RP/0/RP0/CPU0:router(config-ospfv3)# summary-prefix 4004:f000::/32
```

timers lsa arrival

To set the minimum interval at which the software accepts the same link-state advertisement (LSA) from Open Shortest Path First Version 3 (OSPFv3) neighbors, use the **timers lsa arrival** command in an appropriate configuration mode. To restore the default value, use the **no** form of this command.

timers lsa arrival *milliseconds*
no timers lsa arrival

Syntax Description

milliseconds	Minimum delay (in milliseconds) that must pass between acceptance of the same LSA arriving from neighbors. Range is 0 to 60000 milliseconds.

Command Default

1000 milliseconds

Command Modes

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **timers lsa arrival** command to control the minimum interval for accepting the same LSA. The same LSA is an LSA instance that contains the same LSA ID number, LSA type, and advertising router ID. If an instance of the same LSA arrives sooner than the interval that is set, the LSA is dropped.

We recommended that the *milliseconds* value of the **timers lsa arrival** command be less than or equal to the *hold-interval* value of the **timers throttle lsa all** command for the neighbor.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to set the minimum interval for accepting the same LSA at 2000 milliseconds:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# timers throttle lsa all 200 10000 45000
RP/0/RP0/CPU0:router(config-ospfv3)# timers lsa arrival 2000
```

timers pacing flood

To configure link-state advertisement (LSA) flood packet pacing, use the **timers pacing flood** command in an appropriate configuration mode. To restore the default flood packet pacing value, use the **no** form of this command.

timers pacing flood *milliseconds*
no timers pacing flood

Syntax Description

milliseconds	Time (in milliseconds) at which LSAs in the flooding queue are paced in between updates. Range is 5 milliseconds to 100 milliseconds.

Command Default

milliseconds: 33

Command Modes

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Configuring OSPFv3 flood pacing timers allows you to control interpacket spacing between consecutive link-state update packets in the OSPF transmission queue. Use the **timers pacing flood** command to control the rate at which LSA updates occur, thereby preventing high CPU or buffer utilization that can result when an area is flooded with a very large number of LSAs.

The default settings for OSPFv3 packet pacing timers are suitable for the majority of OSPFv3 deployments. Do not change the packet pacing timers unless all other options to meet OSPFv3 packet flooding requirements have been exhausted. Specifically, network operators should prefer summarization, stub area usage, queue tuning, and buffer tuning before changing the default flood timers. Furthermore, no guidelines exist for changing timer values; each OSPFv3 deployment is unique and should be considered on a case-by-case basis. The network operator assumes risks associated with changing the default flood timer values.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure LSA flood packet-pacing updates to occur in 55-millisecond intervals for OSPFv3 routing process 1:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# timers pacing flood 55
```

timers pacing lsa-group

To change the interval at which Open Shortest Path First Version 3 (OSPFv3) link-state advertisements (LSAs) are collected into a group and refreshed, checksummed, or aged, use the **timers pacing lsa-group** command in an appropriate configuration mode. To restore the default value, use the **no** form of this command.

timers pacing lsa-group *seconds*
no timers pacing lsa-group

Syntax Description

seconds	Interval (in seconds) at which LSAs are grouped and refreshed, checksummed, or aged. Range is 10 to 1800 seconds.

Command Default

seconds : 240

OSPFv3 LSA group pacing is enabled by default.

Command Modes

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **timers pacing lsa-group** command to control the rate at which LSA updates occur so that high CPU or buffer utilization that can occur when an area is flooded with a very large number of LSAs can be reduced. The default settings for OSPFv3 packet pacing timers are suitable for the majority of deployments. Do not change the packet pacing timers unless all other options to meet OSPFv3 packet flooding requirements have been exhausted. Specifically, network operators should prefer summarization, stub area usage, queue tuning, and buffer tuning before changing the default flooding timers. Furthermore, no guidelines exist for changing timer values; each OSPFv3 deployment is unique and should be considered on a case-by-case basis. The network operator assumes the risks associated with changing the default timer values.

Cisco IOS XR software groups the periodic refresh of LSAs to improve the LSA packing density for the refreshes in large topologies. The group timer controls the interval used for group refreshment of LSAs; however, this timer does not change the frequency that individual LSAs are refreshed (the default refresh rate is every 30 minutes).

The duration of the LSA group pacing is inversely proportional to the number of LSAs the router is handling. For example, if you have about 10,000 LSAs, decreasing the pacing interval would benefit you. If you have a very small database (40 to 100 LSAs), increasing the pacing interval to 10 to 20 minutes might benefit you slightly.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure OSPFv3 group packet-pacing updates between LSA groups to occur in 60-second intervals for OSPFv3 routing process 1:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# timers pacing lsa-group 60
```

timers pacing retransmission

To configure link-state advertisement (LSA) retransmission packet pacing, use the **timers pacing retransmission** command in an appropriate configuration mode. To restore the default retransmission packet pacing value, use the **no** form of this command.

timers pacing retransmission *milliseconds*
no timers pacing retransmission

Syntax Description

milliseconds	Time (in milliseconds) at which LSAs in the retransmission queue are paced. Range is 5 milliseconds to 100 milliseconds.

Command Default

milliseconds : 66

Command Modes

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **timers pacing retransmission** command to control interpacket spacing between consecutive link-state update packets in the OSPFv3 retransmission queue. This command controls the rate at which LSA updates occur. When an area is flooded with a very large number of LSAs, the LSA updates can result in high CPU or buffer utilization. Using this command reduces CPU or buffer utilization.

The default settings for OSPFv3 packet retransmission pacing timers are suitable for the majority of deployments. Do not change the packet retransmission pacing timers unless all other options to meet OSPFv3 packet flooding requirements have been exhausted. Specifically, network operators should prefer summarization, stub area usage, queue tuning, and buffer tuning before changing the default flooding timers. Furthermore, no guidelines exist for changing timer values; each OSPFv3 deployment is unique and should be considered on a case-by-case basis. The network operator assumes risks associated with changing the default packet retransmission pacing timer values.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure LSA flood pacing updates to occur in 55-millisecond intervals for OSPFv3 routing process 1:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# timers pacing retransmission 55
```

timers throttle lsa all (OSPFv3)

To set rate-limiting values for Open Shortest Path First Version 3 (OSPFv3) link-state advertisement (LSA) generation, use the **timers throttle lsa all** command in an appropriate configuration mode. To restore the default values, use the **no** form of this command.

timers throttle lsa all *start-interval hold-interval max-interval*
no timers throttle lsa all

Syntax Description

start-interval	Minimum delay (in milliseconds) for the generation of LSAs. The first instance of LSA is always generated immediately upon a local OSPFv3 topology change. The generation of the next LSA is not before the start interval. Range is 0 to 600000 milliseconds.
hold-interval	Incremental time (in milliseconds). This value is used to calculate the subsequent rate limiting times for LSA generation. Range is 1 to 600000 milliseconds.
max-interval	Maximum wait time (in milliseconds) between generation of the same LSA. Range is 1 to 600000 milliseconds.

Command Default

start-interval : 500 milliseconds 50 milliseconds

hold-interval : 5000 milliseconds 200 milliseconds

max-interval : 5000 milliseconds

Command Modes

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The “same LSA” is defined as an LSA instance that contains the same LSA ID number, LSA type, and advertising router ID. We recommend that you keep the *milliseconds* value of the **timers lsa arrival** command less than or equal to the *hold-interval* value of the **timers throttle lsa all** command.

Task ID

Task ID	Operations
ospf	read, write

Examples

This example shows how to customize OSPFv3 LSA throttling so that the start interval is 200 milliseconds, the hold interval is 10,000 milliseconds, and the maximum interval is 45,000 milliseconds. The minimum interval between instances of receiving the same LSA is 2000 milliseconds.

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
```

```
RP/0/RP0/CPU0:router(config-ospfv3)# timers throttle lsa all 200 10000 45000
RP/0/RP0/CPU0:router(config-ospfv3)# timers lsa arrival 2000
```

timers throttle spf (OSPFv3)

To turn on Open Shortest Path First Version 3 (OSPFv3) shortest path first (SPF) throttling, use the **timers throttle spf** command in an appropriate configuration mode. To turn off SPF throttling, use the **no** form of this command.

timers throttle spf *spf-start spf-hold spf-max-wait*
no timers throttle spf *spf-start spf-hold spf-max-wait*

Syntax Description

spf-start	Initial SPF schedule delay (in milliseconds). Range is 1 to 600000 milliseconds.
spf-hold	Minimum hold time (in milliseconds) between two consecutive SPF calculations. Range is 1 to 600000 milliseconds.
spf-max-wait	Maximum wait time (in milliseconds) between two consecutive SPF calculations. Range is 1 to 600000 milliseconds.

Command Default

spf-start : 5000 milliseconds50 milliseconds

spf-hold: 10000 milliseconds200 milliseconds

spf-max-wait: 10000 milliseconds5000 milliseconds

Command Modes

Router OSPFv3 configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The first wait interval between SPF calculations is the amount of time (in milliseconds) specified by the *spf-start* argument. Each consecutive wait interval is twice the current hold level (in milliseconds) until the wait time reaches the maximum time (in milliseconds) as specified by the *spf-max-wait* argument. Subsequent wait times remain at the maximum until the values are reset or a link-state advertisement (LSA) is received between SPF calculations.

Tip Setting a low *spf-start* time and *spf-hold* time causes routing to switch to the alternate path more quickly if a failure occurs. However, it consumes more CPU processing time.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to change the start, hold, and maximum wait interval values to 5, 1000, and 90,000 milliseconds, respectively:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# timers throttle spf 5 1000 90000
```

trace (OSPFv3)

To specify the Open Shortest Path First Version 3 (OSPFv3) buffer size, use the **trace** command in router ospfv3 configuration mode. To return to the default value, use the **no** form of this command.

trace size *buffer_name size*
no trace size *buffer_name size*

Syntax Description

size	Deletes existing buffer and creates one with *N* entries.
buffer_name	Specifies a buffer from one of the 15 listed buffers. Refer Table 96: Buffer Types, on page 618 table for details on the buffers.
size	Specifies allowed size for the selected buffer. Options are: 0, 256, 1024, 2048, 4096, 8192, 16384, 32768, and 65536. Select 0 to disable traces.

Command Default

No default behavior or values

Command Modes

Router ospfv3 configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Trace buffers are used to store various traffic and processing events during the runtime. Large buffers can store more events. If the buffer becomes full, old entries are overwritten by the latest entries. In a large network, user may want to increase the trace buffer size to accommodate more events.

Table 96: Buffer Types

Name	Description
adj	adjacency
adj_cycle	dbd/flood events/pkts
config	config events
errors	errors
events	mda/rtrid/bfd/vrf
ha	startup/HA/NSF
hello	hello events/pkts
idb	interface
pkt	I/O packets
rib	rib batching

Name	Description
spf	spf/topology
spf_cycle	spf/topology detail
te	mpls-te
test	testing info
mq	message queue info

Task ID

Task ID	Operations
ospf	read, write

Examples

This example shows how to set 1024 error trace entries:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#router ospfv3 osp3
RP/0/RP0/CPU0:router(config-ospfv3)#trace size errors ?
  0       disable trace
  256     trace entries
  512     trace entries
  1024    trace entries
  2048    trace entries
  4096    trace entries
  8192    trace entries
  16384   trace entries
  32768   trace entries
  65536   trace entries
RP/0/RP0/CPU0:router(config-ospfv3)#trace size errors 1024
```

transmit-delay (OSPFv3)

To set the estimated time required to send a link-state update packet on the interface, use the **transmit-delay** command in an appropriate configuration mode. To return to the default value, use the **no** form of this command.

transmit-delay *seconds*
no transmit-delay *seconds*

Syntax Description

seconds	Time (in seconds) required to send a link-state update. Range is 1 to 65535 seconds.

Command Default

1 second

Command Modes

Process configuration

Area configuration

Interface configuration

Virtual-link configuration

OSPFv3 VRF configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Link-state advertisements (LSAs) in the update packet must have their ages incremented by the amount specified in the *seconds* argument before transmission. The value assigned should take into account the transmission and propagation delays for the interface.

If the delay is not added before transmission over a link, the time in which the LSA propagates over the link is not considered. This setting has more significance on very low-speed links.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to configure a transmit delay of 3 seconds for HundredGigE interface 0/3/0/0:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 1
RP/0/RP0/CPU0:router(config-ospfv3)# area 0
RP/0/RP0/CPU0:router(config-ospfv3-ar)# interface HundredGigE 0/3/0/0
RP/0/RP0/CPU0:router(config-ospfv3-ar-if)# transmit-delay 3
```

virtual-link (OSPFv3)

To define an Open Shortest Path First Version 3 (OSPFv3) virtual link, use the **virtual-link** command in area configuration mode. To remove a virtual link, use the **no** form of this command.

virtual-link *router-id*
no virtual-link

Syntax Description

router-id	Router ID associated with the virtual link neighbor. The router ID appears in the **show ospfv3** display. This value must be entered in 32-bit dotted-decimal notation, similar to an IP Version 4 (IPv4) address. There is no default.

Command Default

No virtual links are defined.

Command Modes

Area configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

In OSPFv3, when there exists a path through another non-backbone area over which the virtual link can function, all areas must be connected to a backbone area. If the connection to the backbone is lost, it can be repaired by establishing a virtual link.

Virtual links, which are defined in the submode of the area they transit, are in effect virtual point-to-point interfaces belonging to area 0 (the backbone). The virtual links inherit parameter values from the backbone area, rather than the transit area in which they are defined.

Each virtual link neighbor must include the router ID of the virtual link neighbor for the link to be properly established. Use the **show ospfv3** command to display the router ID of an OSPFv3 process.

Use the **virtual-link** command to place the router in virtual-link configuration mode (config-router-ar-vl), from which you can configure virtual-link-specific settings. Commands configured under this mode (such as the **transmit-delay** command) are automatically bound to that virtual link.

Task ID

Task ID	Operations
ospf	read, write

Examples

The following example shows how to establish a virtual link with default values for all optional parameters:

```
RP/0/RP0/CPU0:router(config)# router ospfv3 201
RP/0/RP0/CPU0:router(config-ospfv3)# area 1
RP/0/RP0/CPU0:router(config-ospfv3-ar)# virtual-link 10.3.4.5
```

vrf (OSPFv3)

To configure an Open Shortest Path First Version 3 (OSPFv3) VPN routing and forwarding (VRF) instance and enter OSPFv3 VRF configuration submode, use the **vrf** command in XR Config mode. To terminate an OSPFv3 VRF, use the **no** form of this command.

vrf *vrf-name*
no vrf *vrf-name*

Syntax Description

vrf-name	Specifies a name for the OSPFV3 vrf. If a name is not specified, the default vrf is assumed.

Command Default

No OSPFv3 VRF is configured.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **vrf** command to explicitly configure a VRF. This command creates a separate instance of OSPFv3 within the process. Commands configured under the VRF configuration mode (such as the **interface** [OSPFv3] and **authentication** [OSPFv3] commands) are automatically bound to that VRF.

To modify or remove the VRF, the *vrf-name* argument format must be the same as the format used when creating the VRF.

Task ID

Task ID	Operation
ospf	read, write

This example shows how to configure VRF *vrf_1* and enter OSPFv3 VRF configuration submode:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#router ospfv3 osp3
RP/0/RP0/CPU0:router(config-ospfv3)#vrf vrf_1
RP/0/RP0/CPU0:router(config-ospfv3-vrf)#
```

RIB Commands

Note All commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 540 Series Router that is introduced from Cisco IOS XR Release 6.3.2. References to earlier releases in Command History tables apply to only the Cisco NCS 5500 Series Router.

Note

- Starting with Cisco IOS XR Release 6.6.25, all commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 560 Series Routers.
- Starting with Cisco IOS XR Release 6.3.2, all commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 540 Series Router.
- References to releases before Cisco IOS XR Release 6.3.2 apply to only the Cisco NCS 5500 Series Router.
- Cisco IOS XR Software Release 7.0.1 specific updates are not applicable for the following variants of Cisco NCS 540 Series Routers:
  - N540-28Z4C-SYS-A
  - N540-28Z4C-SYS-D
  - N540X-16Z4G8Q2C-A
  - N540X-16Z4G8Q2C-D
  - N540X-16Z8Q2C-D
  - N540-12Z20G-SYS-A
  - N540-12Z20G-SYS-D
  - N540X-12Z16G-SYS-A
  - N540X-12Z16G-SYS-D

This module describes the commands used to display and clear information in the Routing Information Base (RIB).

For detailed information about RIB concepts, configuration tasks, and examples, see the Implementing RIB on Cisco NCS 5500 Series Routers module in *Routing Configuration Guide for Cisco NCS 5500 Series Routers*.

- address-family next-hop dampening disable, on page 625
- clear route, on page 626
- hw-module profile tcam fib ipv4 unicast, on page 628
- hw-module profile tcam fib ipv6 unicast, on page 629
- maximum prefix (RIB), on page 630
- lcc, on page 631
- rcc, on page 632
- recursion-depth-max, on page 633
- router rib, on page 634
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address-family next-hop dampening disable

To disable Routing Information Base (RIB) next-hop dampening, use the **address-family next-hop dampening disable** command in XR Config mode. To enable RIB next-hop dampening, use the **no** form of this command.

address-family {**ipv4** | **ipv6**} **next-hop dampening disable**
no address-family {**ipv4** | **ipv6**} **next-hop dampening disable**

Syntax Description

ipv4	Specifies IP Version 4 (IPv4) address prefixes.
ipv6	Specifies IP Version 6 (IPv6) address prefixes.

Command Default

RIB next-hop dampening is enabled.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
rib	read, write

Examples

The following example shows how to disable RIB next-hop dampening for IPv6 address families:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router rib
RP/0/RP0/CPU0:router(config-rib)# address-family ipv6 next-hop dampening disable
```

clear route

To clear routes from the IP routing table, use the **clear route** command in XR EXEC mode.

clear route [**vrf** {*vrf-name* | **all**}] {**ipv4** | **ipv6** | **afi-all** | **safi-all**} {**unicast** | **multicast** | **safi-all**} [**topology** *topo-name*] [*ip-address* *mask*]

Syntax Description

vrf { *vrf-name* | **all** }	(Optional) Specifies a particular VPN routing and forwarding (VRF) instance or all VRF instances.
ipv4	Specifies IP Version 4 address prefixes.
ipv6	Specifies IP Version 6 address prefixes.
afi -all **safi -all**	Specifies IP Version 4 and IP Version 6 address prefixes.
safiunicast	Specifies unicast address prefixes.
multicast	Specifies multicast address prefixes.
safi-all	Specifies unicast and multicast address prefixes.
topology *topo-name*	(Optional) Specifies topology table information and name of the topology table.
ip-address *node-id*	(Optional) Clears hardware resource counters from the designated node. The *node-id* argument is entered in the *rack/slot/module* notation.
ip-address	Network IP address about which routing information should be displayed.
mask	Network mask specified in either of two ways: Network mask can be a four-part, dotted-decimal address. For example, 255.0.0.0 indicates that each bit equal to 1 means the corresponding address bit is a network address. Network mask can be indicated as a slash (/) and number. For example, /8 indicates that the first 8 bits of the mask are 1s, and the corresponding bits of the address are the network address.

Command Default

If a **vrf** *vrf-name* is not specified, routes are cleared from the default IPv4 unicast VRF.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **clear route** command to clear routes from an IP routing table to a specific network, a matching subnet address, or all routes.

The topology keyword must be accompanied by the ipv4 multicast keywords, except when the afi-all keyword or the safi-all keyword is specified.

Task ID

Task ID	Operations
rib	read, write

Examples

The following example shows how to remove all routes matching the subnet address 192.168.2.0 and mask 255.255.255.0 from the IPv4 unicast routing table:

```
RP/0/RP0/CPU0:router# clear route ipv4 unicast 192.168.2.0 255.255.255.0
```

The following example shows how to remove all routes from the IPv4 unicast routing table:

```
RP/0/RP0/CPU0:router# clear route ipv4 unicast
```

hw-module profile tcam fib ipv4 unicast

To configure IPv4 unicast routes in external TCAM, use the **hw-module profile tcam fib ipv4 unicast** command in the XR Config mode. To return to the default value, use the **no** form of the command.

Note To configure IPv6 multicast routes in external TCAM, use the **hw-module profile tcam fib ipv6 unicast**.

hw-module profile tcam fib ipv4 unicast { **prefix** *prefix-value* | **percent** *percent-value*}

Syntax Description

prefix	Specifies the IPv4 prefix length.
prefix-value	Prefix length in the range <0-32>.
percent	Specifies the percentage configuration.
percent-value	Percentage value in the range <0-100>.

Command Modes

XR Config mode

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
multicast	read, write

Examples

The following example shows how to configure IPv4 unicast routes in external TCAM.

```
Router#config
Router(config)#hw-module profile tcam fib ipv4 unicast prefix 24 percent 56
Router(config)#commit
Router(config)#exit
Router#admin
Router(admin)#reload location all
```

hw-module profile tcam fib ipv6 unicast

To configure IPv6 unicast routes in external TCAM, use the **hw-module profile tcam fib ipv6 unicast** command in the XR Config mode. To return to the default value, use the **no** form of the command.

Note To configure IPv4 multicast routes in external TCAM, use the **hw-module profile tcam fib ipv4 unicast**.

hw-module profile tcam fib ipv6 unicast { **prefix** *prefix-value* | **percent** *percent-value}*

Syntax Description

prefix	Specifies the IPv6 prefix length.
prefix-value	Prefix length in the range <0-128>.
percent	Specifies the percentage configuration.
percent-value	Percentage value in the range <0-100>.

Command Modes

XR Config mode

Command History

Release	Modification
Release 7.0.12	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
multicast	read, write

Examples

The following example shows how to configure IPv6 unicast routes in external TCAM.

```
Router#config
Router(config)#hw-module profile tcam fib ipv6 unicast prefix 120 percent 69
Router(config)#commit
Router(config)#exit
Router#admin
Router(admin)#reload location all
```

maximum prefix (RIB)

To set the prefix limit for the VPN routing and forwarding (VRF) instance, use the **maximum prefix** command in global VRF address family configuration mode. To set the prefix limits to the default values, use the **no** form of this command.

maximum prefix *maximum* [*mid-threshold*]
no maximum prefix

Syntax Description

maximum	Maximum number of prefixes allowed in the VRF instance. Range is 32 to 2000000.
mid-threshold	(Optional) Integer specifying at what percentage of the *maximum* argument value the software starts to generate a Simple Network Management Protocol (SNMP) trap. Range is 1 to 100.

Command Default

No default behavior or values

Command Modes

Global VRF address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **maximum prefix** command to configure a maximum number of prefixes that a VRF instance is allowed to receive.

Task ID

Task ID	Operations
rib	read, write

Examples

The following example shows how to set the maximum number of prefixes allowed to 1000:

```
RP/0/RP0/CPU0:router(config)# vrf vrf-A
RP/0/RP0/CPU0:router(config-vrf)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-vrf-af)#  maximum prefix 1000
```

A maximum number of routes is applicable to dynamic routing protocols as well as static or connected routes. When maximum prefix is configured, an **syslog** message is generated in the following conditions:

1. if the number of routes is above the threshold when“maximum prefix” configuration has been committed
2. if the number routes reaches the configured “maximum prefix” values for the VRF

lcc

To enable Label Consistency Checker (lcc) background scan for IPv6 or IPv4 labels, use the **lcc enable** command in XR Config mode. To disable lcc background scan, use the **no** for of this command.

lcc {**ipv4** | **ipv6**} **unicast** {**enable** | **period** *milliseconds*}
no lcc {**ipv4** | **ipv6**} **unicast** {**enable** | **period** *milliseconds*}

Syntax Description

ipv4	Specifies IP Version 4 address prefixes.
ipv6	Specifies IP Version 6 address prefixes.
unicast	Specifies unicast address prefixes.
period *milliseconds*	Specifies the period between scans in milliseconds. Range is 100 to 600000 milliseconds.

Command Default

Label consistency checker is disabled.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
ipv4	read, write
ipv6	read, write

This example shows how to enbale lcc for IPv6 lables:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#lcc ipv6 unicast enable
```

rcc

To enable Route Consistency Checker (rcc) background scan for IPv6 or IPv4 routes, use the **rcc enable** command in XR Config mode. To disable rcc background scan, use the **no** form of this command.

rcc {**ipv4** | **ipv6**} **unicast** {**enable** | **period** *milliseconds*}
no rcc {**ipv4** | **ipv6**} **unicast** {**enable** | **period** *milliseconds*}

Syntax Description

ipv4	Specifies IP Version 4 address prefixes.
ipv6	Specifies IP Version 6 address prefixes.
unicast	Specifies unicast address prefixes.
period *milliseconds*	Specifies the period between scans in milliseconds. Range is 100 to 600000 milliseconds.

Command Default

Route consistency checker is disabled.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **period** option to control how often the scan be triggered. Each time the scan is triggered, the background scan process resumes verification from where it was left out and sends one buffer's worth of routes to the forwarding information base (FIB).

Task ID

Task ID	Operation
ipv4	read, write
ipv6	read, write

This example shows how to configure rcc for IPv6 unicast:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#rcc ipv6 unicast enable
```

This example shows how to enable rcc with a scan period of 500 milliseconds for IPv6 unicast:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#rcc ipv6 unicast period 500
```

recursion-depth-max

To set the maximum depth for route recursion checks, use the **recursion-depth-max** command in XR Config mode. To set the recursion checks to the default value, use the **no** form of this command.

recursion-depth-max *maximum*
no recursion-depth-max *maximum*

Syntax Description

maximum	Maximum depth for recursion checks. Range is 5 to 16.

Command Default

The default recursion depth is 128.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **recursion-depth-max** command to configure a specific maximum number of recursion checks in the range of 5 to 16.

Task ID

Task ID	Operations
rib	read, write

Examples

The following example shows how to set the maximum depth for route recursion checks to 12:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router rib
RP/0/RP0/CPU0:router(config-rib)# recursion-depth-max 12
```

router rib

To enter Routing Information Base (RIB) configuration mode, use the **router rib** command in XR Config mode. To remove all RIB configurations and terminate the RIB routing process, use the **no** form of this command.

router rib
no router rib

Syntax Description

This command has no arguments or keywords.

Command Default

Router configuration mode is not enabled.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
bgp	read, write
ospf	read, write
hsrp	read, write
isis	read, write

Examples

The following example shows how to enter RIB configuration mode:

```
RP/0/RP0/CPU0:router(config)# router rib
```

rump always-replicate

To enable replication from uRIB to muRIB as usual even after features such as MTR are configured, use the **rump always-replicate** command in XR Config mode. To diable replication from uRIB to muRIB, use the **no** form of this command.

rump always-replicate [*access-list*]
no rump always-replicate [*access-list*]

Syntax Description

access-list-name	(Optional) Name of the access list.

Command Default

Replication from uRIB to muRIB is enabled.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Configuring the **rump always-replicate** command allows routers in a network to be upgraded to multitopology routing gradually without a flag day where all routers need to be configured at the same time without major service disruption. When **rump always-replicate** is configured, replicated routes are added into the muRIB with the lowest admin distance. So if protocols are populating the muRIB, they continue to do so. For the same route, protocol routes win over replicated routes because of higher admin distance.

If an unwanted more specific route comes from the uRIB, optionally provide an access list through which the replicated routes are run. If the route passes the access list, the route is replicated by RUMP.

Task ID

Task ID	Operations
rib	read, write

Examples

The following example shows how to enale replication from uRIB to muRIB:

```
RP/0/RP0/CPU0:router(config)# router rib
RP/0/RP0/CPU0:router(config-rib)# address-family ipv4
RP/0/RP0/CPU0:router(config-rib-afi)# rump always-replicate
```

show lcc statistics

To view results of a label consistency checker (lcc) background scan, use the **show lcc statistics** command in XR EXEC mode.

show lcc {**ipv4** | **ipv6**} **unicast statistics** {**scan-id** | **summary**}

Syntax Description

ipv4	IPv4 address prefix.
ipv6	IPv6 address prefix.
unicast	Specifies unicast address prefix.
scan-id *scan-id-value*	Specifies the scan ID value. The range is between <0-100000>.
summary	Displays a summary of the BG route consistency check statistics.

Command Default

None

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
ipv4	read
ipv6	read

This example shows background scan statistics for AFI-SAFI mplsv6-unicast:

```
RP/0/RP0/CPU0:router#show lcc ipv6 unicast statistics

Background Scan Statistics for AFI-SAFI mplsv6-unicast:
=======================================================

Scan enabled:           False
Current scan-id:        0                Scan triggered:        False
Configured period:      60               Current period:        0

Paused by range scan: False
Paused by route churn: False
Paused by error scan: False

Last data sent: 0 entries                Damping percent:       70
Default route churn:    10               Current route churn:   0
Route churn last calculated at           Dec 31 16:00:00.000
```

```
Logs stored for background scan ids:

Log for AFI-SAFI mplsv6-unicast:
================================

End Of Logs
```

This example shows background scan statistics for AFI-SAFI mplsv4-unicast:

```
RP/0/RP0/CPU0:router#show lcc ipv4 unicast statistics


Background Scan Statistics for AFI-SAFI mplsv4-unicast:
=======================================================

Scan enabled:           False
Current scan-id:        0                Scan triggered:        False
Configured period:      60               Current period:        0

Paused by range scan: False
Paused by route churn: False
Paused by error scan: False

Last data sent: 0 entries                Damping percent:       70
Default route churn:    10               Current route churn:   0
Route churn last calculated at           Dec 31 16:00:00.000

Logs stored for background scan ids:

Log for AFI-SAFI mplsv4-unicast:
================================

End Of Logs
```

show rcc

To display route consistency checker (RCC) information, use the **show rcc** command in XR EXEC mode.

show rcc {**ipv4** | **ipv6**} **unicast** [*prefix netmask* **vrf** *vrf-name*]

Syntax Description

ipv4	Specifies IP Version 4 address prefixes.
ipv6	Specifies IP Version 6 address prefixes.
unicast	Specifies unicast address prefixes.
prefix	(Optional) Starting prefix.
netmask	(Optional) Network mask.
vrf *vrf-name*	(Optional) Specifies a particular VPN routing and forwarding (VRF) instance or all VRF instances.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ipv4	read

Examples

The following is sample output from the **show rcc** command:

```
  RP/0/RP0/CPU0:router# show rcc ipv4 unicast statistics
Thu Mar 26 13:47:28.391 IST

Background Scan Summary
=======================

Scan enabled:          False            Last scan-id:  0
Configured period:     15000            Current period:        0

Paused By:
  route churn:False  on-demand scan:False  error scan:False

Last data sent: 0 entries                Damping percent:     69
Default route churn:    100              Current route churn: 0
Route churn last calculated at           Never
```

```
Logs last cleared at                    Never

Scan paused by ISSU                     False

Logs stored for background scan ids:

Scan Logs
=========
Legend:
        ? - Currently Inactive Node, ! - Non-standard SVD Role
        * - Node did not reply

End of Logs
```

show rcc statistics

To view results of a route consistency checker (rcc) background scan, use the **show rcc statistics** command in XR EXEC mode.

show rcc {**ipv4** | **ipv6**} **unicast statistics** {**scan-id** | **summary**}

Syntax Description

ipv4	IPv4 address prefix.
ipv6	IPv6 address prefix.
unicast	Specifies unicast address prefixes.
scan-id *scan-id-value*	Specifies the scan ID value. The range is between <0-100000>.
summary	Displays a summary of the BG route consistency check statistics.

Command Default

None

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
ipv4	read
ipv6	read

This example shows background scan statistics for AFI-SAFI IPv6 unicast:

```
RP/0/RP0/CPU0:router#show rcc ipv6 unicast statistics

Background Scan Statistics for AFI-SAFI ipv6-unicast:
=====================================================

Scan enabled:           False
Current scan-id:        0                Scan triggered:        False
Configured period:      60               Current period:        0

Paused by range scan: False
Paused by route churn: False
Paused by error scan: False

Last data sent: 0 entries                Damping percent:       70
Default route churn:    10               Current route churn:   0
Route churn last calculated at           Dec 31 16:00:00.000
```

```
Logs stored for background scan ids:

Log for AFI-SAFI ipv6-unicast:
================================

End Of Logs
```

This example shows background scan statistics for AFI-SAFI Ipv4 unicast:

```
RP/0/RP0/CPU0:router#show rcc ipv4 unicast statistics

Background Scan Statistics for AFI-SAFI ipv4-unicast:
=====================================================

Scan enabled:           False
Current scan-id:        0                Scan triggered:        False
Configured period:      60               Current period:        0

Paused by range scan: False
Paused by route churn: False
Paused by error scan: False

Last data sent: 0 entries                Damping percent:       70
Default route churn:    10               Current route churn:   0
Route churn last calculated at           Dec 31 16:00:00.000

Logs stored for background scan ids:

Log for AFI-SAFI ipv4-unicast:
================================

End Of Logs
```

show rcc vrf

To run on-demand route consistency checker (rcc) scan on AFI, SAFI, table, and prefix or the entire set of prefixes in the table, use the **show rcc vrf** command in XR EXEC mode.

show rcc {**ipv4** | **ipv6**} **unicast** *prefix/mask* **vrf** *vrfname*

Syntax Description

ipv4	IPv4 address prefix.
ipv6	IPv6 address prefix.
prefix /mask	Specifies unicast address prefix.
vrf	Specifies VPN routing and forwarding (VRF) instance.
vrfname	Name of the VRF.

Command Default

None.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
ipv4	read
ipv6	read

This example shows how to run on-demand rcc scan for an IPv6 prefix:

```
RP/0/RP0/CPU0:router#show rcc ipv6 unicast 2001:DB8::/32 vrf vrf_1
```

This example shows how to run on-demand rcc scan for an Ipv4 prefix:

```
RP/0/RP0/CPU0:router#show rcc ipv4 unicast 10.2.3.4/32 vrf vrf-1
```

show rib

To display Routing Information Base (RIB) data, use the **show rib** command in XR EXEC mode.

show rib {**ipv4** | **ipv6**} {**unicast** | **multicast**}[**firsthop** | [*type interface-path-id*] | **next-hop** | [*type interface-path-id*] | **opaques** | {**attribute** | **ip-nexthop** | **ipfrr** | **safi-tunnel** | **summary** | **tunnel-nexthop**} | **protocols** | [**standby**] | **statistics** | [*name*] | [**standby**] | **topology** | {*topo-name* | **all**}]

Syntax Description

ipv4	(Optional) Specifies IP Version 4 address prefixes.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
unicast	(Optional) Specifies unicast address prefixes. This is the default.
multicast	(Optional) Specifies multicast address prefixes.
firsthop	(Optional) Specifies registered first-hop notification addresses.
type	Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Identifies a physical interface or a virtual interface. **Note** Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
next-hop	(Optional) Specifies registered next-hop notification addresses.
opaques	(Optional) Specifies opaque data installed in the RIB.
attribute	(Optional) Specifies opaque attributes installed in the RIB.
ip-nexthop	(Optional) Specifies P next-hop data installed in the RIB.
ipfrr	(Optional) Specifies IP fast reroute (IPFRR) opaque data installed in the RIB.
safi-tunnel	(Optional) Specifies subaddress family (SAFI) tunnel opaque data installed in the RIB.
summary	(Optional) Specifies a summary of opaque data installed in the RIB.
tunnel-nexthop	(Optional) Specifies tunnel next-hop opaque data installed in the RIB.
protocols	(Optional) Specifies registered protocols.
statistics *name*	(Optional) Specifies RIB statistics of a given name.
standby	(Optional) Specifies standby information.
topology *topo-name*	(Optional) Specifies topology table information and name of the topology table.
all	(Optional) Specifies that all topology table information should be displayed.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ipv4	read

Examples

The following example illustrates the **show rib** command:

```
RP/0/RSP0RP0/CPU0:router# show rib

            ipv4 multicast


            topology
          BLUE

RP/0/RSP0RP0/CPU0:router# show rib topology BLUE ipv4 multicast protocols
Protocol   Handle   Instance
isis         0      mt
```

show rib afi-all

To display Routing Information Base (RIB) data for both IPv4 and IPv6 address families, use the **show rib afi-all** command in XR EXEC mode.

show rib afi-all [**attributes**] [**client-id**] [**clients**] [**extcomms**] [**firsthop**] [**history**] [**multicast**] [**next-hop**] [**opaques**] [**protocols**] [**recursion-depth-max**] [**safi-all**] [**statistics**] [**tables**] [**trace**] [**unicast**] [**vpn-attributes**]

Syntax Description

attributes	(Optional) Displays all BGP attributes installed in RIB.
client-id	(Optional) Displays RIB client ID for longer history of redistributed routes sent to the client.
clients	(Optional) Displays RIB clients.
extcomms	(Optional) Displays all extended communities installed in RIB.
firsthop	(Optional) Displays registered firsthop notification addresses.
history	(Optional) Displays redistributed routes sent to RIB clients.
multicast	(Optional) Displays multicast commands.
next-hop	(Optional) Displays registered next-hop notification addresses.
opaques	(Optional) Displays opaquae data installed in RIB.
protocols	(Optional) Displays registered protocols.
recursion-depth-max	(Optional) Displays maximum recursion depth in RIB.
safi-all	(Optional) Displays unicast and multicast commands.
statistics	(Optional) Displays RIB statistics.
tables	(Optional) Displays a list of tables known to RIB.
trace	(Optional) Displays RIB trace entries.
unicast	(Optional) Displays unicast commands.
vpn-attributes	(Optional) Displays all VPN attributes installed in RIB.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ipv4	read

Examples

The following example illustrates the **show rib afi-all attributes** command:

```
RP/0/RP0/CPU0:router# show rib afi-all attributes

BGP attribute data in IPv4 RIB:

0 Attributes, for a total of 0 bytes.

BGP attribute data in IPv6 RIB:

0 Attributes, for a total of 0 bytes.
```

show rib attributes

To display Border Gateway Protocol (BGP) attributes installed in the Routing Information Base (RIB), use the **show rib attributes** command in XR EXEC mode.

show rib attributes [**summary**] [**standby**]

Syntax Description

summary	(Optional) Displays a summary of BGP attribute data installed in the RIB.
standby	(Optional) Displays standby information.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show rib attributes** command:

```
RP/0/RP0/CPU0:router# show rib attributes

BGP attribute data in IPv4 RIB:

Attribute ID (0x2):size (68)
Attribute ID (0x3):size (52)
Attribute ID (0x4):size (68)
Attribute ID (0x5):size (52)

4 Attributes, for a total of 240 bytes.

Attribute ID : ID assigned for the attribute by BGP
size : size of the attribute data.
```

show rib client-id

To display Routing Information Base (RIB) redistribution histories, use the **show rib client-id** command in XR EXEC mode.

show rib client-id *id* **redistribution history** [**standby**]

Syntax Description

id	ID of the client. Range is 0 to 4294967295.
redistribution history	Displays longer history of redistributed routes sent to RIB clients.
standby	(Optional) Displays standby information.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rib client-id** command to display a history of the route additions, deletions, and updates sent from RIB to the client across VRFs.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show rib client-id** command:

```
RP/0/RP0/CPU0:router# show rib client-id 13 redistribution history

PID     JID   Client             Location
151630  113   bcdl_agent         node0_5_CPU0
  Table ID: 0xe0000000
     S 80.80.80.0/24[1/0]            update, 5 path(s), 0x0   Jan 31 09:54:57.224
     S 80.80.80.0/24[1/0]            update, 6 path(s), 0x0   Jan 31 09:53:39.736
     S 140.140.140.0/24[1/0]         update, 1 path(s), 0x0   Jan 31 09:53:39.729
     S 80.80.80.0/24[1/0]            update, 5 path(s), 0x0   Jan 30 22:08:38.551
     S 140.140.140.0/24              deleted,                 Jan 30 22:08:38.543
     S 80.80.80.0/24[1/0]            update, 6 path(s), 0x0   Jan 30 22:03:05.889
     S 100.100.100.0/24[1/0]         update, 1 path(s), 0x0   Jan 30 22:03:05.880
```

This table describes the significant fields shown in the display.

Table 97: show rib client-id Field Descriptions

Field	Description
PID	Process ID of the client.
JID	Job ID of the client.
Client	Client name.
Location	Location node on which the client is present.

show rib clients

To display Routing Information Base (RIB) clients, use the **show rib clients** command in XR EXEC mode.

show rib [**afi-all** | **ipv4** | **ipv6**] **clients** [**protocols** | **redistribution** [**history**]] [**standby**]

Syntax Description

afi-all	(Optional) Specifies all address families.
ipv4	(Optional) Specifies IP Version 4 address prefixes. This is the default.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
protocols	(Optional) Specifies client protocols.
redistribution	(Optional) Specifies protocols redistributed by clients
history	(Optional) Specifies redistributed routes sent to RIB clients.
standby	(Optional) Displays standby information.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rib clients** command to display the list of clients who have registered with RIB, what protocol routes they are redistributing, and a history of the routes sent to the client.

The maximum number of redistribution entries is 5000 for Bulk Content Downloader (BCDL) and 500 for other protocols.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show rib clients** command:

```
RP/0/RP0/CPU0:router# show rib clients

Process              Location         Client ID  Redist   Proto
isis                 node0_5_CPU0     0           insync   insync
ospf                 node0_5_CPU0       2         insync   insync

RP/0/RP0/CPU0:router# show rib clients redistribution

isis node0_5_CPU0
```

```
   ipv4  uni        vrf default   insync         route
      static                      insync
ospf node0_5_CPU0
   ipv4  uni        vrf default   insync         route
      static                      insync
      local                       insync
bgp node0_5_CPU0
   ipv4  uni        vrf abc       insync         route
      static                      insync
bcdl_agent node0_5_CPU0
   ipv4  uni        vrf default   insync         rib_fib
   ipv4  uni        vrf bar       insync         rib_fib
   ipv4  uni        vrf abc       insync         rib_fib
   ipv4  uni        vrf test      insync         rib_fib
```

This table describes the significant fields shown in the display.

Table 98: show rib clients Field Descriptions

Field	Description
Process	Client process name.
Location	Location where the client process in running.
Client ID	ID assigned to the client by RIB.
Redist	Whether the client is redistributing any protocols or not and whether it has read all routes from RIB or not. • insync—read • outsync—not read.
Proto	Whether the protocol has sent all its routes to RIB and signaled update complete or not. • insync—read • outsync—not read.

show rib extcomms

To display all extended communities installed in the Routing Information Base (RIB), use the **show rib extcomms** command in XR EXEC mode.

show rib [**afi-all** | **ipv4** | **ipv6**] **extcomms** [**summary**] [**standby**]

Syntax Description

afi-all	(Optional) Specifies all address families.
ipv4	(Optional) Specifies IP Version 4 address prefixes. This is the default.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
summary	(Optional) Specifies a summary of all extended communities in the RIB.
standby	(Optional) Displays standby information.

Command Default

No default behavior or values

Command Modes

System Admin EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show rib extcomms** command:

```
RP/0/RP0/CPU0:router# show rib extcomms

Extended community data in RIB:

Extended community                        Ref count
COST:128:128:41984                           1
```

This table describes the significant fields shown in the display.

Table 99: show rib extcomms Field Descriptions

Field	Description
Extended Community	Type of extended communities. Different protocols can add different extended communities.
Ref Count	Number of routes referring to the Extended community.

show rib firsthop

To display registered first-hop notification addresses, use the **show rib firsthop** command in System Admin EXEC mode.

show rib [**vrf** {*vrf-name* | **all**}] [**afi-all** | **ipv4** | **ipv6**] [**unicast** | **multicast** | **safi-all**] **firsthop** [*client-name*] [*type interface-path-id* | *ip-address / prefix-length* | *ip-address mask* | **resolved** | **unresolved** | **damped**] [**summary**] [**standby**]

Syntax Description

vrf { *vrf-name* | **all** }	(Optional) Specifies a particular VPN routing and forwarding (VRF) instance or all VRF instances.
afi-all	(Optional) Specifies all address families.
ipv4	(Optional) Specifies IP Version 4 address prefixes. This is the default.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
unicast	(Optional) Specifies unicast address prefixes. This is the default.
multicast	(Optional) Specifies multicast address prefixes.
safi-all	(Optional) Specifies unicast and multicast address prefixes.
client-name	(Optional) Name of the RIB client.
type	Interface type. For more information, use the question mark (**?**) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (**?**) online help function.
ip-address	(Optional) Network that BGP advertises.
/ *prefix-length*	(Optional) Length of the IP address prefix. A decimal value that indicates how many of the high-order contiguous bits of the address compose the prefix (the network portion of the address). A slash (/) must precede the decimal value.
ip-address mask	(Optional) Network mask applied to the *ip-address* argument.
resolved	(Optional) Specifies resolved next-hops.
unresolved	(Optional) Specifies unresolved next-hops.
damped	(Optional) Specifies next-hops that are damped.
summary	(Optional) Specifies a summary of the next-hop information.
standby	(Optional) Displays standby information.

Command Default

If a **vrf** *vrf-name* is not specified, routes are cleared from the default IPv4 unicast VRF.

Command Modes

System Admin EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rib firsthop** command to display the list of first hops registered by various clients with RIB and the address and interface through which they are resolved.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show rib firsthop** command:

```
RP/0/RP0/CPU0:router# show rib firsthop

Registered firsthop notifications:
0.0.0.0/0 via 1.1.0.1 - MgmtEth0/5/CPU0/0, ospf/node0_5_CPU0
1.1.0.1/32 via 1.1.0.1 - MgmtEth0/5/CPU0/0, ipv4_static/node0_5_CPU0
1.1.1.1/32 via 1.1.1.1 - MgmtEth0/5/CPU0/0, ipv4_static/node0_5_CPU0
10.10.10.1/32 via 10.10.10.1 - Loopback0, ipv4_static/node0_5_CPU0
10.10.10.3/32 via 10.10.10.3 - Loopback0, ipv4_static/node0_5_CPU0
15.15.15.1/32 via 10.10.10.1 - Loopback0, ipv4_static/node0_5_CPU0
20.20.20.1/32 via 1.1.1.1 - MgmtEth0/5/CPU0/0, ipv4_static/node0_5_CPU0
30.30.30.1/32 via 1.1.1.2 - MgmtEth0/5/CPU0/0, ipv4_static/node0_5_CPU0
```

show rib history

To display history information for Routing Information Base (RIB) clients, use the **show rib history** command in XR EXEC mode.

show rib [**afi-all** | **ipv4** | **ipv6**] **history** [**client-id** *client-id*] [**standby**]

Syntax Description

afi-all	(Optional) Specifies all address families.
ipv4	(Optional) Specifies IP Version 4 address prefixes. This is the default.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
client-id *client-id*	(Optional) Specifies the ID of the client. Range for *client-id* argument is 0 to 4294967295.
standby	(Optional) Displays standby information.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rib history** command to display the list of routes that RIB has sent to various clients.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show rib history** command:

```
RP/0/RP0/CPU0:router# show rib history

JID   Client             Location
229   isis               node0_5_CPU0
  Table ID: 0xe0000000
     S 80.80.80.0/24[1/0]        update, 6 path(s),     04:32:09
     S 100.100.100.0/24[1/0]     update, 1 path(s),     04:32:09
     S 40.40.40.0/24[1/0]        update, 1 path(s),     04:32:09
     S 15.15.15.0/24[1/0]        update, 1 path(s),     04:32:09
JID   Client             Location
260   ospf               node0_5_CPU0
  Table ID: 0xe0000000
     S 80.80.80.0/24[1/0]        update, 6 path(s),     04:32:09
     S 100.100.100.0/24[1/0]     update, 1 path(s),     04:32:09
     S 40.40.40.0/24[1/0]        update, 1 path(s),     04:32:09
     S 15.15.15.0/24[1/0]        update, 1 path(s),     04:32:09
```

This table describes the significant fields shown in the display.

Table 100: show rib history Field Descriptions

Field	Description
JID	Job ID of the client process.
Client	Name of the client process.
Location	Information about where the client process is running.

show rib next-hop

To display registered next-hop notification addresses, use the **show rib next-hop** command in XR EXEC mode.

show rib [**vrf** {*vrf-name* | **all**}] [**afi-all** | **ipv4** | **ipv6**] [**unicast** | **multicast** | **safi-all**] **next-hop** [*client-name*] [*type interface-path-id* | *ip-address / prefix-length* | *ip-address mask* | **resolved** | **unresolved** | **damped**] [**summary**] [**standby**]

Syntax Description

vrf { *vrf-name* | **all** }	(Optional) Specifies a particular VPN routing and forwarding (VRF) instance or all VRF instances.
afi-all	(Optional) Specifies all address families.
ipv4	(Optional) Specifies IP Version 4 address prefixes. This is the default.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
unicast	(Optional) Specifies unicast address prefixes. This is the default.
multicast	(Optional) Specifies multicast address prefixes.
safi-all	(Optional) Specifies unicast and multicast address prefixes.
client-name	(Optional) Name of the RIB client.
type	Interface type. For more information, use the question mark (**?**) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (**?**) online help function.
ip-address	(Optional) Network IP address about which routing information should be displayed.
mask	(Optional) Network mask specified in either of two ways: • Network mask can be a four-part, dotted-decimal address. For example, 255.0.0.0 indicates that each bit equal to 1 means the corresponding address bit is a network address. • Network mask can be indicated as a slash (/) and number. For example, /8 indicates that the first 8 bits of the mask are 1s, and the corresponding bits of the address are the network address.
/ *prefix-length*	(Optional) Length of the IP address prefix. A decimal value that indicates how many of the high-order contiguous bits of the address compose the prefix (the network portion of the address). A slash (/) must precede the decimal value.
resolved	(Optional) Specifies resolved next-hops.

unresolved	(Optional) Specifies unresolved next-hops.
damped	(Optional) Specifies next-hops that are damped.
summary	(Optional) Specifies a summary of the next-hop information.
standby	(Optional) Displays standby information.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rib next-hop** command to display the list of next-hops registered by various clients with the RIB and the address and interface through which they are resolved.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show rib next-hop** command:

```
RP/0/RP0/CPU0:router# show rib next-hop

Registered nexthop notifications:

0.0.0.0/0 via 172.29.52.1 - MgmtEth0/RP1/CPU0/0, ospf/node0_RP0_CPU0
172.29.52.1/32 via 172.29.52.1 - MgmtEth0/RP1/CPU0/0, ipv4_static/node0_RP0_CPU0
```

show rib opaques

To display opaque data installed in the Routing Information Base (RIB), use the **show rib opaques** command in XR EXEC mode.

show rib [**vrf** {*vrf-name* | **all**}] [**afi-all** | **ipv4** | **ipv6**] [**unicast** | **multicast** | **safi-all**] **opaques** {**attribute** | **ip-nexthop** | **ipfrr** | **safi-tunnel** | **summary** | **tunnel-nexthop**} [*rib-client-name*] [**standby**]

Syntax Description

vrf { *vrf-name* | **all** }	(Optional) Specifies a particular VPN routing and forwarding (VRF) instance or all VRF instances.
afi-all	(Optional) Specifies all address families.
ipv4	(Optional) Specifies IP Version 4 address prefixes. This is the default.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
unicast	(Optional) Specifies unicast address prefixes. This is the default.
multicast	(Optional) Specifies multicast address prefixes.
safi-all	(Optional) Specifies unicast and multicast address prefixes.
attribute	Displays opaque attributes installed in the RIB.
ip-nexthop	Displays IP next-hop data installed in the RIB.
ipfrr	Displays IP fast reroute (IPFRR) opaque data installed in the RIB. **Note** Since the IP/LDP per-prefix LFA-FRR feature was introduced in IOS XR Software Release 4.0.1, the **show rib opaques ipfrr** command has been deprecated. Use **show route** command as part of the per-prefix LFA-FRR feature to determine backup paths. • **show route** output displays all FRR Backup paths. The FRR Backup paths are indicated with a (!). • **show route detail** output displays path ID and backup-path ID to identify if a path is protected and if so by which path.
safi-tunnel	Displays subaddress family (SAFI) tunnel opaque data installed in the RIB.
summary	Displays a summary of opaque data installed in the RIB.
tunnel-nexthop	Displays tunnel next-hop opaque data installed in the RIB.
rib-client-name	(Optional) Name of the RIB client.
standby	(Optional) Displays standby information.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

If information is not used by the RIB server process, it is viewed as opaque data. Use the **show rib opaques** command to display opaque data installed in the RIB.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show rib opaques** command:

```
RP/0/RP0/CPU0:router# show rib opaques safi-tunnel

Summary of safi tunnel opaque data in IPv4 RIB:

Opaque key: 1:10.1.0.2
Opaque data:
Tunnel Encap - ifhandle=0x1000180, type=L2TPv3, Params=[Session-id=0x1EB1127C, `
Cookielen=8, Cookie=0xA73A3E0AFCD419A6] Opaque key: 65535:10.0.101.1 Opaque data:


RP/0/RP0/CPU0:router# show rib ipv6 opaques tunnel-nexthop

Summary of 6PE/6VPE IP over tunnel nexthop opaque data in IPv6 RIB:

Opaque key: 1:::ffff:10.1.0.2
Opaque key: 65535:::ffff:10.0.101.1
Opaque key: 65535:::ffff:10.0.101.2
Opaque key: 65535:::ffff:10.0.101.3
Opaque key: 65535:::ffff:10.0.101.4
Opaque key: 65535:::ffff:10.0.101.5
```

This table describes the significant fields shown in the display.

Table 101: show rib opaques Field Descriptions

Field	Description
Opaque key	Unique key for the opaque data as populated by the protocol client.
Opaque data	Data for the given key.

show rib protocols

To display protocols registered for route addition, use the **show rib protocols** command in XR EXEC mode.

show rib [**vrf** {*vrf-name* | **all**}] [**afi-all** | **ipv4** | **ipv6**] [**unicast** | **multicast** | **safi-all**] **protocols** [**standby**]

Syntax Description

vrf { *vrf-name* | **all** }	(Optional) Specifies a particular VPN routing and forwarding (VRF) instance or all VRF instances.
afi-all	(Optional) Specifies all address families.
ipv4	(Optional) Specifies IP Version 4 address prefixes. This is the default.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
unicast	(Optional) Specifies unicast address prefixes. This is the default.
multicast	(Optional) Specifies multicast address prefixes.
safi-all	(Optional) Specifies unicast and multicast address prefixes.
standby	(Optional) Displays standby information.

Command Default

If a **vrf** *vrf-name* is not specified, the registered first-hop notification addresses are displayed for the default IPv4 unicast VRF.

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show rib protocols** command:

```
RP/0/RP0/CPU0:router# show rib protocols

Protocol   Handle   Instance
isis         0       rib
connected    1
static       2
local        3
bgp          4       102
ospf         5       1
```

This table describes the significant fields shown in the display.

Table 102: show rib protocols Field Descriptions

Field	Description
Protocol	Name of the protocol.
Handle	Handle assigned to the protocol instance.
Instance	Protocol instance.

show rib recursion-depth-max

To display the maximum recursion depth in the Routing Information Base (RIB), use the **show rib recursion-depth-max** command in XR EXEC mode.

show rib [**afi-all** | **ipv4** | **ipv6**] **recursion-depth-max** [**standby**]

Syntax Description

afi-all	(Optional) Specifies all address families.
ipv4	(Optional) Specifies IP Version 4 address prefixes. This is the default.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
standby	(Optional) Displays standby information.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rib recursion-depth-max** command to display the maximum recursion depth for RIB. Recursion depth is the number of next-hops that can be specified.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show rib recursion-depth-max** command:

```
RP/0/RP0/CPU0:router# show rib recursion-depth-max

IPv4:
-----
Maximum recursion depth in RIB:

    Configured: 12
        In Use: 128



IPv6:
-----
Maximum recursion depth in RIB:

    Configured: 12
        In Use: 128
```

This table describes the significant fields shown in the display.

Table 103: show rib recursion-depth-max Field Descriptions

Field	Description
Configured	Value of maximum recursion depth currently configured.
In Use	Value of maximum recursion depth RIB is using. This value can be different from the configured value because RIB has to be restarted after the configuration is changed for the new configuration to be effective.

show rib statistics

To display Routing Information Base (RIB) statistics, use the **show rib statistics** command in XR EXEC mode.

show rib [**vrf** {*vrf-name* | **all**}] [**afi-all** | **ipv4** | **ipv6**] [**unicast** | **multicast** | **safi-all**] **statistics** [*client-name*] [**standby**]

Syntax Description

vrf { *vrf-name* | **all** }	(Optional) Specifies a particular VPN routing and forwarding (VRF) instance or all VRF instances.
afi-all	(Optional) Specifies all address families.
ipv4	(Optional) Specifies IP Version 4 address prefixes. This is the default.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
unicast	(Optional) Specifies unicast address prefixes. This is the default.
multicast	(Optional) Specifies multicast address prefixes.
safi-all	(Optional) Specifies unicast and multicast address prefixes.
client-name	(Optional) Name of the RIB client.
standby	(Optional) Displays standby information.

Command Default

If a **vrf** *vrf-name* is not specified, routes are cleared from the default IPv4 unicast VRF.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rib statistics** command to display RIB statistics. The statistics include requests sent from the clients to the RIB and the information redistributed to the client.

RIB maintains counters for all requests sent from a client including:

- Route operations
- Table registrations
- Next-hop registrations
- Redistribution registrations
- Attribute registrations
- Synchronization completion

RIB also maintains the results of the requests.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show rib statistics** command:

```
RP/0/RP0/CPU0:router# show rib statistics

RIB Statistics:
 Received 142 batch messages
          137 route operations, 0 attribute operations
          0 opaque operations
          11 complete operations, 0 convergent operations
  Results of the batch message received:
   142 successes
   0 forward references, 0 invalid client id, 0 unknown errors
   0 memory allocation errors, 0 client lookup errors, table lookup errors 0
   0 proto lookup errors, 0 client proto lookup errors
   ipv4_connected/node0_RP0_CPU0 last performed route operation
    with status BATCH_SUCESS at Jun 26 21:43:33.601

 Received 217422 light weight messages
  4 route add requests, 2 route delete requests
  10 protocol registered, 1 protocol unregistered
  0 protocol modify, 0 protocol purged
  14 protocol redistributions, 0 unregistered protocol redistributions
  0 reset protocol redistributions
  3 first hop registered, 1 first hop unregistered
  3 advertisements, 0 unregistered advertisement
  57 bind data, 97 update completes, 217230 other requests
   udp/node0_RP0_CPU0 last performed firsthop lookup operation
    with status success at Jun 27 10:09:59.990

 Received 0 nexthop batch messages
    0 successes
    0 inits
    0 registers, 0 unregisters
    0 register complete, 0 sync unregistered, 0 batch finished
```

This table describes the significant fields shown in the display.

Table 104: show rib statistics Field Descriptions

Field	Description
Received	Statistics received including batch messages and route, attribute, complete, and convergent operations.
Results of the batch message received	Batch message results.
Received *n* light weight messages	Number of lightweight API messages sent from RIB clients.
Received *n* nexthop batch messages	Number of batch API messages sent from RIB clients received by the RIB.

show rib tables

To display all tables known to the Routing Information Base (RIB), use the **show rib tables** command in XR EXEC mode.

show rib [**afi-all** | **ipv4** | **ipv6**] **tables** [**summary**] [**standby**]

Syntax Description

afi-all	(Optional) Specifies all address families.
ipv4	(Optional) Specifies IP Version 4 address prefixes. This is the default.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
summary	(Optional) Displays summary table information.
standby	(Optional) Displays standby information.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rib tables** command to display all tables known to the RIB, including table attributes. Attributes include VPN routing and forwarding (VRF) instance, address family, and maximum prefix information.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show rib tables** command when entered without an address:

```
RP/0/RP0/CPU0:router# show rib tables

Codes: N - Prefix Limit Notified, F - Forward Referenced
       D - Table Deleted, C - Table Reached Convergence

VRF             SAFI  Table ID     PrfxLmt   PrfxCnt TblVersion  N F D C
default         uni   0xe0000000   2000000        72        137  N N N Y
default         multi 0xe0100000   2000000         0          0  N N N Y
```

This table describes the significant fields shown in the display.

Table 105: show rib tables Field Descriptions

Field	Description
VRF	Name of the VRF instance.
SAFI	Subaddress family instance.
Table ID	ID of the RIB table.
PrfxLmt	Configured prefix limit for the RIB table.
PrfxCnt	Number of configured prefixes in the RIB table.
TblVersion	Tables version number.
N	Message sent when prefix limit is exceeded.
F	Forward referenced. If Y is indicated, a table has been created by RIB because a client has registered for the table, but RIB has not heard from the router space infrastructure (RSI) about the table. RSI manages the tables.
D	If Y is indicated, the table has been deleted in the RSI but RIB has not cleared the information.
C	Table reached convergence.

show rib trace

To display all Routing Information Base (RIB) library call tracer (ltrace) entries, use the **show rib trace** command in XR EXEC mode.

show rib [**afi-all** | **ipv4** | **ipv6**] **trace** [**clear** | **counts** | **event-manager** | **startup** | **sync** | **timing**] [**unique** | **wrapping**] [**last** *entries*] [**hexdump**] [**reverse**] [**tailif**] [**stats**] [**verbose**] [**file** *name* **original location** *node-id* | **location** {**all***node-id*}]

Syntax Description

afi-all	(Optional) Specifies all address families.
ipv4	(Optional) Specifies IP Version 4 address prefixes. This is the default.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
counts clear	(Optional) Displays route clear trace entries.
counts	(Optional) Displays counts trace entries.
event-manager	(Optional) Displays RIB event manager trace entries.
startup	(Optional) Displays RIB startup trace entries.
sync	(Optional) Displays client synchronization trace entries.
timing	(Optional) Displays timing trace entries.
unique	(Optional) Displays unique entries with counts.
wrapping	(Optional) Displays wrapping entries.
last *entries*	(Optional) Displays a specified number of the last entries. Range is 1 to 4294967295.
hexdump	(Optional) Displays traces in hexadecimal format.
reverse	(Optional) Displays the latest traces first.
tailif	(Optional) Displays new traces as they are added.
stats	(Optional) Displays statistics.
verbose	(Optional) Displays internal debugging information.
file *name* **original location** *node-id*	(Optional) Displays trace entries for a specific file for the designated node. The *node-id* argument is entered in the *rack/slot/module* notation.
location { **all** | *node-id* }	(Optional) Displays ltrace entries for the designated node. The *node-id* argument is entered in the *rack/slot/module* notation. The **all** keyword displays ltrace entries for all nodes.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show rib trace** command

```
RP/0/RP0/CPU0:router# show rib trace

1784 wrapping entries (13312 possible, 0 filtered, 1784 total)
Mar 16 14:59:27.947 rib/ipv4_rib/rib-startup 0/RSP0RP0/CPU0 t1  Create: Management thread

Mar 16 14:59:27.959 rib/ipv4_rib/rib-startup 0/RSP0RP0/CPU0 t2  Create: Management event
 manager
Mar 16 14:59:28.346 rib/ipv4_rib/rib-io 0/RSP0RP0/CPU0 t1  Initialise: RIB server
Mar 16 14:59:28.346 rib/ipv4_rib/rib-io 0/RSP0RP0/CPU0 t1  Initialise: Client collection
Mar 16 14:59:28.676 rib/ipv4_rib/rib-io 0/RSP0RP0/CPU0 t1  Initialise: DB collection
Mar 16 14:59:28.693 rib/ipv4_rib/rib-io 0/RSP0RP0/CPU0 t1  Initialise: Timer tree
Mar 16 14:59:28.694 rib/ipv4_rib/rib-io 0/RSP0RP0/CPU0 t1  RUMP: Bind to sysdb
/ipc/gl/ipv4-rib/ for protocol notification
Mar 16 14:59:29.102 rib/ipv4_rib/rib-startup 0/RSP0RP0/CPU0 t2  Initialise: Debugging
routine
Mar 16 14:59:29.128 rib/ipv4_rib/rib-io 0/RSP0RP0/CPU0 t1  Register: read, select cb
functions
Mar 16 14:59:29.137 rib/ipv4_rib/rib-startup 0/RSP0RP0/CPU0 t1  Register: cerrno DLL name
 lib_rib_error.dll
.
.
.
```

show rib vpn-attributes

To display all VPN attributes installed in the Routing Information Base (RIB), use the **show rib vpn-attributes** command in XR EXEC mode.

show rib [**afi-all** | **ipv4** | **ipv6**] **vpn-attributes** [**summary**] [**standby**]

Syntax Description

afi-all	(Optional) Specifies all address families.
ipv4	(Optional) Specifies IP Version 4 address prefixes.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
summary	(Optional) Displays VPN attribute information.
standby	(Optional) Displays standby information.

Command Default

The default is IPv4 address prefixes.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show rib vpn-attributes** command:

```
RP/0/RP0/CPU0:router# show rib vpn-attributes

Extended community data in RIB:

Extended community                              Ref count
COST:128:128:41984                                      2
COST:128:129:42240                                      2
COST:128:129:44544                                      1
COST:128:129:169984                                     2
COST:128:129:307200                                     1

MVPN attribute data in RIB:

MVPN Attribute                                     Ref count
0:0:1:f4:0:0:0:1:1:1:1:1                                   1
0:0:2:bc:0:0:0:1:3:3:3:3                                  10
```

```
0:0:2:bc:0:0:0:1:3:3:3:4                                    2
```

This table describes the significant fields shown in the display.

Table 106: show rib vpn-attributes Field Descriptions

Field	Description
Extended Community	Extended community added by the protocol clients.
Ref Count	Number of routes referring to the same extended community.
MVPN Attribute	Connector attribute added by BGP to support MVPNs.
Ref Count	Number of routes referring to the same extended community.

show rib vrf

To display all VRF table information in the Routing Information Base (RIB), use the **show rib vrf** command in XR EXEC mode.

show rib vrf {*vrf-name* | **all**} [**ipv4**] [**ipv6**] [**afi-all**] [**firsthop**] [**next-hop**] [**opaques**] [**protocols**] [**statistics** *name*]

Syntax Description

vrf { *vrf-name* | **all** }	(Optional) Specifies a particular VPN routing and forwarding (VRF) instance or all VRF instances.
ipv4	(Optional) Specifies IP Version 4 address prefixes.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
afi-all	(Optional) Specifies all address families.
firsthop	(Optional) Specifies registered first-hop notification addresses
next-hop	(Optional) Specifies registered next-hop notification addresses.
opaques	(Optional) Specifies opaque data installed in the RIB.
protocols	(Optional) Specifies registered protocols.
statistics *name*	(Optional) Specifies RIB statistics for the given name.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
ipv4	read

Examples

The following example shows output from the **show rib vrf all statistics** command:

```
RP/0/RP0/CPU0:router# show rib vrf all statistics
RP/0/RP0/CPU0:router#
```

show route

To display the current routes in the Routing Information Base (RIB), use the **show route** command in XR EXEC mode.

show route [**vrf** {*vrf-name* | **all**}] [**afi-all** | **ipv4** | **ipv6**] [**unicast** | **multicast** **topology** *topo-name* | **safi-all**] [**protocol** [*instance*] | *ip-address* [*mask*] | *ip-address/prefix-length*] [**standby**] [**detail**]

Syntax Description

vrf { *vrf-name* | **all** }	(Optional) Specifies a particular VPN routing and forwarding (VRF) instance or all VRF instances.
afi-all	(Optional) Specifies all address families.
ipv4	(Optional) Specifies IP Version 4 address prefixes. This is the default.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
unicast	(Optional) Specifies unicast address prefixes. This is the default.
multicast	(Optional) Specifies multicast address prefixes.
topology *topo-name*	(Optional) Specifies topology table information and name of the topology table.
safi-all	(Optional) Specifies unicastand multicast address prefixes.
protocol	(Optional) Name of a routing protocol. If you specify a routing protocol, use one of the following keywords: • **bgp** • **isis** • **ospf** • **rip** • **static** • **local** • **connected**
instance	(Optional) Number or name used to identify an instance of the specified protocol.
ip-address	(Optional) Network IP address about which routing information should be displayed.
mask	(Optional) Network mask specified in either of two ways: • Network mask can be a four-part, dotted-decimal address. For example, 255.0.0.0 indicates that each bit equal to 1 means the corresponding address bit is a network address. • Network mask can be indicated as a slash (/) and number. For example, /8 indicates that the first 8 bits of the mask are 1s, and the corresponding bits of the address are the network address.
/prefix-length	(Optional) Length of the IP address prefix. A decimal value that indicates how many of the high-order contiguous bits of the address compose the prefix (the network portion of the address). A slash (/) must precede the decimal value.

standby	(Optional) Displays standby information.
detail	(Optional) Displays detailed information for the specified prefix.

Command Default

If a **vrf** *vrf-name* is not specified, routes are cleared from the default IPv4 unicast VRF.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

When the **afi-all** keyword is used, the *ip-address* and *mask* arguments are not available.

The **topology** keyword must be accompanied by the **ipv4 multicast** keywords, except when the **afi-all** keyword or the **safi-all** keyword is specified.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show route** command when entered without an address:

```
RP/0/RP0/CPU0:router# show route

 Codes: C - connected, S - static, R - RIP, B - BGP
      O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - ISIS, L1 - IS-IS level-1, L2 - IS-IS level-2
      ia - IS-IS inter area, su - IS-IS summary null, * - candidate default
      U - per-user static route, o - ODR, L - local, G  - DAGR
      A - access/subscriber, (!) - FRR Backup path

 Gateway of last resort is 1.0.0.1 to network 0.0.0.0

 S*   0.0.0.0/0 [1/0] via 1.0.0.1, 13:14:59
 C    1.0.0.0/16 is directly connected, 13:14:59, MgmtEth0/5/CPU0/0
 L    1.0.14.15/32 is directly connected, 13:14:59, MgmtEth0/5/CPU0/0
 C    3.2.3.0/24 is directly connected, 00:04:39, HundredGigE 0/3/0/0
 L    3.2.3.2/32 is directly connected, 00:04:39, HundredGigE 0/3/0/0
 O E2 5.2.5.0/24 [110/20] via 3.3.3.1, 00:04:20, HundredGigE 0/3/0/0
 O E2 6.2.6.0/24 [110/20] via 3.3.3.1, 00:04:20, HundredGigE 0/3/0/0
 C    7.2.7.0/24 is directly connected, 00:04:20, HundredGigE 0/3/0/7
 L    7.2.7.2/32 is directly connected, 00:04:20, HundredGigE 0/3/0/7
 O E2 8.2.8.0/24 [110/20] via 3.3.3.1, 00:04:20, HundredGigE 0/3/0/0

 C    10.3.0.0/16 is directly connected, 13:14:59, HundredGigE 0/0/0/0
 L    10.3.0.2/32 is directly connected, 13:14:59, HundredGigE 0/0/0/0
```

This table describes the significant fields shown in the display.

Table 107: show route Field Descriptions

Field	Description
S*	Code indicating how the route was derived. See the code legend preceding the output. In this case, the route was derived from a static (candidate default).
[1/0]	First number in the brackets is the administrative distance of the information source; the second number is the metric for the route.
1.0.0.0/16	Address and prefix length of the remote network.
MgmtEthernet 0/5/CPU0/0	Specifies the interface through which the specified network can be reached.
C	Code indicating how the route was derived. See the code legend preceding the output. In this case, the route was connected.
L	Code indicating how the route was derived. See the code legend preceding the output. In this case, the route was local.
O	Code indicating how the route was derived. See the code legend preceding the output. In this case, the route was on-demand routing (ODR).
E2	Code indicating how the route was derived. See the code legend preceding the output. In this case, the route was OSPF external type 2.
8.2.8.0/24	Address and prefix length of the remote network connected to the static route.
via 3.3.3.1	Specifies the address of the next router to the remote network.
13:14:59	Specifies the last time the route was updated.
(!)	Code indicating fast re-route (FRR) backup path information.

When you specify that you want information about a particular network, more detailed statistics are displayed. The following is sample output from the **show route** command when entered with an IP address:

```
RP/0/RP0/CPU0:router# show route 10.0.0.0

 Routing entry for 10.0.0.0/16
   Known via "connected", distance 0, metric 0 (connected)
   Installed Mar 22 22:10:20.906
   Routing Descriptor Blocks
     directly connected, via HundredGigE 0/0/0/0
       Route metric is 0
   No advertising protos.
```

Intermediate System-to-Intermediate System (IS-IS) includes an IP address typed length value (TLV) in its link-state packet (LSP) that helps identify the node injecting the route into the network. The IS-IS node uses one of its own interface addresses in this TLV. A loopback address is preferred

among interfaces configured under IS-IS. When other networking devices calculate IP routes, they can store the IP address as the originator address with each route in the routing table.

The following example shows the output from the **show route** command for a specific IP address on a router configured with IS-IS. Each path that is shown under the Routing Descriptor Blocks report displays two IP addresses. The first address (10.0.0.9) is the next-hop address; the second is the originator IP address from the advertising IS-IS router.

```
RP/0/RP0/CPU0:router# show route 10.0.0.1

 Routing entry for 10.0.0.0/8
 Known via "isis", distance 115, metric 10, type level-2
      Installed Jan 22 09:26:56.210
      Routing Descriptor Blocks:
      * 10.0.0.9, from 10.0.0.9, via HundredGigE 2/1
       Route metric is 10
    No advertising protos.
```

This table describes the significant fields shown in the display.

Table 108: show route with IP Address Field Descriptions

Field	Description
Routing entry for	Network address and mask.
Known via	Indicates how the route was derived.
distance	Administrative distance of the information source.
metric	Route value assigned by the routing protocol.
type	IS-IS type level.
Routing Descriptor Blocks:	Displays the next-hop IP address followed by the information source.
from ... via ...	First address is the next-hop IP address, and the other is the information source. This report is followed by the interface for this route.
Route metric	Best metric for this Routing Descriptor Block.

No advertising protos.	Indicates that no other protocols are advertising the route to their redistribution consumers. If the route is being advertised, protocols are listed in the following manner:
	`Redist Advertisers:`
	`  isis p`
	`  ospf 43`

The following example illustrates the **show route** command with the **topology** *topo-name* keyword and argument specified:

```
RP/0/RP0/CPU0:router# show route ipv4 multicast topology green

  Codes: C - connected, S - static, R - RIP, B - BGP
```

```
       O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - ISIS, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, su - IS-IS summary null, * - candidate default
       U - per-user static route, o - ODR, L - local, G  - DAGR
       A - access/subscriber, (!) - FRR Backup path

  Gateway of last resort is not set

  i L1 10.1.102.0/24 [115/20] via 10.1.102.41, 1w4d, HundredGigE 0/1/0/0.1
  i L1 10.3.3.0/24 [115/20] via 10.1.102.41, 1w4d, HundredGigE 0/1/0/0.1
  i L1 192.168.0.40/32 [115/20] via 10.1.102.41, 1w4d, HundredGigE 0/1/0/0.1
```

This example is a sample **show route summary** command output that displays fast-reroute (FRR) Backup path information. The FRR Backup paths are indicated with a (!).

```
RP/0/RP0/CPU0:router#show route summary

Codes: C - connected, S - static, R - RIP, B - BGP
       O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - ISIS, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, su - IS-IS summary null, * - candidate default
       U - per-user static route, o - ODR, L - local, G  - DAGR
       A - access/subscriber, (!) - FRR Backup path

Gateway of last resort is not set

B    1.2.3.4/32 [200/0] via 10.10.1.3, 00:01:40
C    2.0.0.0/30 is directly connected, 03:28:47, ServiceApp40
L    2.0.0.1/32 is directly connected, 03:28:47, ServiceApp40
C    2.0.1.0/30 is directly connected, 03:13:05, ServiceApp43
L    2.0.1.1/32 is directly connected, 03:13:05, ServiceApp43
C    2.4.1.0/24 is directly connected, 03:11:35, HundredGigE 0/4/0/0
L    2.4.1.2/32 is directly connected, 03:11:35, HundredGigE 0/4/0/0
C    3.1.0.0/30 is directly connected, 03:33:48, ServiceInfra1
L    3.1.0.2/32 is directly connected, 03:33:48, ServiceInfra1
C    3.1.3.0/30 is directly connected, 03:18:14, ServiceInfra2
L    3.1.3.2/32 is directly connected, 03:18:14, ServiceInfra2
C    5.3.0.0/16 is directly connected, 03:58:29, MgmtEth0/RP0/CPU0/0
                is directly connected, 03:58:29, MgmtEth0/RP1/CPU0/0
L    5.3.16.10/32 is directly connected, 03:59:07, MgmtEth0/RP1/CPU0/0
L    5.3.16.12/32 [0/0] via 5.3.16.12, 03:58:29, MgmtEth0/RP0/CPU0/0
L    5.3.16.16/32 is directly connected, 03:58:29, MgmtEth0/RP0/CPU0/0
B    5.4.0.0/16 [200/0] via 10.1.1.10, 00:01:36
S    5.10.0.0/16 [1/0] via 5.3.0.1, 03:59:07
O    10.1.1.3/32 [110/11] via 40.1.10.1, 00:00:17, Bundle-Ether10
                 [110/11] via 200.40.1.101, 00:00:17, Bundle-Ether1.1
                 [110/0] via 100.100.2.1, 00:00:17, HundredGigE 0/2/0/3.1 (!)
L    10.1.1.6/32 is directly connected, 03:58:29, Loopback0
O    10.1.1.9/32 [110/22] via 40.1.10.1, 00:00:17, Bundle-Ether10
                 [110/22] via 200.40.1.101, 00:00:17, Bundle-Ether1.1
                 [110/0] via 100.100.2.1, 00:00:17, HundredGigE 0/2/0/3.1 (!)
O    10.1.1.10/32 [110/111] via 40.1.10.1, 00:00:17, Bundle-Ether10
                  [110/111] via 200.40.1.101, 00:00:17, Bundle-Ether1.1
                  [110/0] via 100.100.2.1, 00:00:17, HundredGigE 0/2/0/3.1 (!)
O    10.1.1.11/32 [110/0] via 40.1.1.1, 00:01:33, Bundle-Ether1 (!)
                  [110/101] via 40.3.3.2, 00:01:33, HundredGigE 0/5/0/9
O    10.1.1.12/32 [110/111] via 40.1.10.1, 00:00:17, Bundle-Ether10
```

```
                  [110/111] via 200.40.1.101, 00:00:17, Bundle-Ether1.1
                  [110/0] via 100.100.2.1, 00:00:17, HundredGigE 0/2/0/3.1 (!)
O    10.1.1.16/32 [110/21] via 40.1.10.1, 00:00:17, Bundle-Ether10
                  [110/21] via 200.40.1.101, 00:00:17, Bundle-Ether1.1
                  [110/0] via 100.100.2.1, 00:00:17, HundredGigE 0/2/0/3.1 (!)
```

This example is a sample **show route detail** command output that displays path ID and backup-path ID information:

```
RP/0/RP0/CPU0:router#show route 10.1.1.3 detail
Routing entry for 10.1.1.16/32
  Known via "ospf 2", distance 110, metric 21, type intra area
  Installed Oct 28 16:07:05.752 for 00:01:56
  Routing Descriptor Blocks
    40.1.10.1, from 10.1.1.16, via Bundle-Ether10, Protected
      Route metric is 21
      Label: None
      Tunnel ID: None
      Extended communities count: 0
      Path id:2       Path ref count:0
      Backup path id:33
    200.40.1.101, from 10.1.1.16, via Bundle-Ether1.1, Protected
      Route metric is 21
      Label: None
      Tunnel ID: None
      Extended communities count: 0
      Path id:1       Path ref count:0
      Backup path id:33
    100.100.2.1, from 10.1.1.16, via HundredGigE 0/2/0/3.1, Backup
      Route metric is 0
      Label: None
      Tunnel ID: None
      Extended communities count: 0
      Path id:33       Path ref count:2
  Route version is 0xe (14)
  No local label
  IP Precedence: Not Set
  QoS Group ID: Not Set
  Route Priority: RIB_PRIORITY_NON_RECURSIVE_LOW (6) SVD Type RIB_SVD_TYPE_LOCAL
  No advertising protos.
```

This example is a sample **show route ipv6** command output:

```
RP/0/RP0/CPU0:router#show route ipv6
Fri May 18 14:00:10.996 EDT
Codes: C - connected, S - static, R - RIP, B - BGP
O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - ISIS, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, su - IS-IS summary null, * - candidate default
U - per-user static route, o - ODR, L - local, G - DAGR
A - access/subscriber, (!) - FRR Backup path
Gateway of last resort is not set
C 1111:2222::abcd/128 is directly connected,
06:20:02, HundredGigE 0/0/0/4
```

This example is a sample **show route ipv6 detail** command output:

```
RP/0/RP0/CPU0:router#show route ipv6 1111:2222::abcd/128 detail
Fri May 18 14:00:20.798 EDT
```

```
Routing entry for 1111:2222::abcd/128
Known via "connected l2tpv3_xconnect", distance 0, metric 0 (connected)
Installed May 18 07:40:08.522 for 06:20:12
Routing Descriptor Blocks
1111:2222::abcd directly connected, via HundredGigE 0/0/0/4
Route metric is 0
Label: 0x2 (2)
Tunnel ID: None
Extended communities count: 0
Route version is 0xd (13)
No local label
IP Precedence: Not Set
QoS Group ID: Not Set
Route Priority: RIB_PRIORITY_CONNECTED (2) SVD Type RIB_SVD_TYPE_LOCAL
Download Priority 0, Download Version 13
No advertising protos.
```

This example is a sample **show route ipv6 summary** command output:

```
RP/0/RP0/CPU0:router#show route ipv6 summary
Fri May 18 14:00:28.988 EDT
Route Source Routes Backup Deleted Memory (bytes)
local 0 0 0 0
connected l2tpv3_xconnect 1 0 0 160
connected 0 0 0 0
Total 1 0 0 160
```

show route backup

To display backup routes from the Routing Information Base (RIB), use the **show route backup** command in XR EXEC mode.

show route [**vrf** {*vrf-name* | **all**}] [**afi-all** | **ipv4** | **ipv6**] [**unicast** | **multicast** | {**topology** *topo-name*} | **safi-all**] **backup** [*ip-address [mask] ip-address /prefix-length]*][**standby**]

Syntax Description

vrf { *vrf-name* | **all** }	(Optional) Specifies a particular VPN routing and forwarding (VRF) instance or all VRF instances.
afi-all	(Optional) Specifies all address families.
ipv4	(Optional) Specifies IP Version 4 address prefixes.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
unicast	(Optional) Specifies unicast address prefixes.
multicast	(Optional) Specifies multicast address prefixes.
topology *topo-name*	(Optional) Specifies topology table information and name of the topology table.
safi-allsafi-all	(Optional) Specifies unicast and multicast address prefixes.
ip-address	(Optional) Network IP address about which backup routing information should be displayed.
mask	(Optional) Network mask specified in either of two ways: • Network mask can be a four-part, dotted decimal address. For example, 255.0.0.0 indicates that each bit equal to 1 means the corresponding address bit is a network address. • Network mask can be indicated as a slash (/) and number. For example, /8 indicates that the first 8 bits of the mask are ones, and the corresponding bits of the address are the network address.
/prefix-length	(Optional) Length of the IP address prefix. A decimal value that indicates how many of the high-order contiguous bits of the address compose the prefix (the network portion of the address). A slash (/) must precede the decimal value.
standby	(Optional) Displays standby information.

Command Default

If a **vrf** *vrf-name* is not specified, routes are cleared from the default IPv4 unicast VRF.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show route backup** command to display information about routes that have been installed into the RIB as backup routes. This command also displays information about the currently selected active route for which there is a backup.

When the **afi-all** keyword is used, the *ip-address* and *mask* arguments are not available.

The **topology** keyword must be accompanied by the **ipv4 multicast** keywords, except when the **afi-all** keyword or the **safi-all** keyword is specified.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show route backup** command:

```
RP/0/RP0/CPU0:router# show route backup

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - ISIS, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, su - IS-IS summary null, * - candidate default
       U - per-user static route, o - ODR, L - local
S    172.73.51.0/24 is directly connected, 2d20h, HundredGigE 4/0/0/1
                 Backup  O E2 [110/1] via 10.12.12.2, HundredGigE 3/0/0/1
```

This table describes the significant fields shown in the display.

Table 109: show route backup Field Descriptions

Field	Description
S	Code indicating how the route was derived. See the legend of the codes preceding the output.
172.73.51.0/24	IP address and length of the route.
2d20h	Time (in hh:mm:ss) since the route was installed in the RIB.
HundredGigE4/0/0/1	Outbound interface for the route.
Backup	Identifies the entry as a backup version of the route, typically installed by a different routing protocol.
O	Code indicating how the route was derived. See the code legend preceding the output.

Field	Description
E2	Code for the type of route. This code is relevant only for OSPF and IS-IS routes. The codes for an OSPF route can be: none—intra-area route IA—interarea route E1—external type 1 E2—external type 2 N1—NSSA external type 1 N2—NSSA external type 2 The codes for an IS-IS route can be: L1—level 1 L2—level 2 ia—interarea su—summary route
[110/1]	Distance and metric for the route.
10.12.12.2	IP address of next-hop on the route.
HundredGigE 3/0/0/1	Outbound interface for the OSPF version of the route.

show route best-local

To display the best local address to use for return packets from the given destination, use the **show route best-local** command in XR EXEC mode.

show route [**vrf** {*vrf-name* | **all**}] [**ipv4** | **ipv6**] [**unicast** | **multicast** | {**topology** *topo-name*} | **safi-all**] **best-local** *ip-address* [**standby**]

Syntax Description

vrf { *vrf-name* | **all** }	(Optional) Specifies a particular VPN routing and forwarding (VRF) instance or all VRF instances.
ipv4	(Optional) Specifies IP Version 4 address prefixes.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
unicast	(Optional) Specifies unicast address prefixes.
multicast	(Optional) Specifies multicast address prefixes.
topology *topo-name*	(Optional) Specifies topology table information and name of the topology table.
safi-all	(Optional) Specifies unicast and multicast address prefixes.
ip-address	IP address about which best local information should be displayed.
standby	(Optional) Displays standby information.

Command Default

If a **vrf** *vrf-name* is not specified, routes are cleared from the default IPv4 unicast VRF.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show route best-local** command to display information about the best local routes in the routing table.

The **topology** keyword must be accompanied by the **ipv4 multicast** keywords, except when the **afi-all** keyword or the **safi-all** keyword is specified.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show route best-local** command:

```
RP/0/RP0/CPU0:router# show route best-local 10.12.12.1/32
```

```
Routing entry for 10.12.12.1/32
  Known via "local", distance 0, metric 0 (connected)
  Routing Descriptor Blocks
    10.12.12.1 directly connected, via HundredGigE 3/0/0/1
      Route metric is 0
```

This table describes the significant fields shown in the display.

Table 110: show route best-local Field Descriptions

Field	Description
Routing entry for	Identifies the requested IP address.
Known via	Indicates how the route was derived.
distance	Administrative distance of the information source.
metric	Route value assigned by the routing protocol.
Routing Descriptor Blocks:	Displays the next-hop IP address followed by the information source.
10.12.12.1 Directly connected ... via ...	First address is the next-hop IP address, followed by a report that it is directly connected. This report is followed by the interface for this route.

show route connected

To display the current connected routes of the routing table, use the **show route connected** command in XR EXEC mode.

show route [**vrf** {*vrf-name* | **all**}] [**afi-all** | **ipv4** | **ipv6**] [**unicast** | **multicast** | {**topology** *topo-name*} | **safi-all**] **connected** [**standby**]

Syntax Description

vrf { *vrf-name* | **all** }	(Optional) Specifies a particular VPN routing and forwarding (VRF) instance or all VRF instances.
afi-all	(Optional) Specifies all address families.
ipv4	(Optional) Specifies IP Version 4 address prefixes.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
unicast	(Optional) Specifies unicast address prefixes.
multicast	(Optional) Specifies multicast address prefixes.
topology *topo-name*	(Optional) Specifies topology table information and name of the topology table.
safi-all	(Optional) Specifies unicast and multicast address prefixes.
standby	(Optional) Displays standby information.

Command Default

If a **vrf** *vrf-name* is not specified, routes are cleared from the default IPv4 unicast VRF.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show route connected** command to display information about connected routes in the routing table.

The topology keyword must be accompanied by the ipv4 multicast keywords, except when the afi-all keyword or the safi-all keyword is specified.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show route connected** command:

```
RP/0/RP0/CPU0:router# show route connected
```

```
C    1.68.0.0/16 is directly connected, 13:43:40, MgmtEth0/5/CPU0/0
C    3.3.3.0/24 is directly connected, 00:23:23, HundredGigE 0/3/0/0
C    7.7.7.0/24 is directly connected, 00:33:00, HundredGigE 0/3/0/7
C    10.0.0.0/16 is directly connected, 13:43:40, HundredGigE 0/0/0/0
C    10.10.10.0/30 is directly connected, 13:43:40, Loopback0
C    11.11.11.0/24 is directly connected, 13:43:40, Loopback11
```

This table describes the significant fields shown in the display.

Table 111: show route connected Field Descriptions

Field	Description
C	Code to indicate the route is connected.
1.68.0.0/16	IP address and length of the route.
13:43:40	Time (in hh:mm:ss) since the route was installed in the RIB.
MgmtEth0/5/CPU0/0	Outbound interface for the route.

show route local

To display local routes receiving routing updates from the Routing Information Base (RIB), use the **show route local** command in XR EXEC mode.

show route [**vrf** {*vrf-name* | **all**}] [**afi-all** | **ipv4** | **ipv6**] [**unicast** | **multicast** | {**topology** *topo-name*} | **safi-all**] **local** [*type interface -path-id*] [**standby**]

Syntax Description

vrf { *vrf-name* | **all** }	(Optional) Specifies a particular VPN routing and forwarding (VRF) instance or all VRF instances.
afi-all	(Optional) Specifies all address families.
ipv4	(Optional) Specifies IP Version 4 address prefixes.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
unicast	(Optional) Specifies unicast address prefixes.
multicast	(Optional) Specifies multicast address prefixes.
topology *topo-name*	(Optional) Specifies topology table information and name of the topology table.
safi-all	(Optional) Specifies unicast and multicast address prefixes.
type	Interface type. For more information, use the question mark (**?**) online help function.
interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (**?**) online help function.
standby	(Optional) Displays standby information.

Command Default

If a **vrf** *vrf-name* is not specified, routes are cleared from the default IPv4 unicast VRF.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show route local** command to display information about local routes in the routing table.

The topology keyword must be accompanied by the ipv4 multicast keywords, except when the afi-all keyword or the safi-all keyword is specified.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show route local** command:

```
RP/0/RP0/CPU0:router# show route local

L    10.10.10.1/32 is directly connected, 00:14:36, Loopback0
L    10.91.36.98/32 is directly connected, 00:14:32, HundredGigE6/0/0/1
L    172.22.12.1/32 is directly connected, 00:13:35, HundredGigE3/0/0/1
L    192.168.20.2/32 is directly connected, 00:13:27, HundredGigE4/0/0/1
L    10.254.254.1/32 is directly connected, 00:13:26, HundredGigE5/0/0/1
```

This table describes the significant fields shown in the display.

Table 112: show route local Field Descriptions

Field	Description
L	Code to indicate the route is local.
10.10.10.1/32	IP address and length of the route.
00:14:36	Time (in hh:mm:ss) since the route was installed in the RIB.
Loopback0	Outbound interface for the route.

show route longer-prefixes

To display the current routes in the Routing Information Base (RIB) that share a given number of bits with a given network, use the **show route longer-prefixes** command in XR EXEC mode.

show route [**vrf** {*vrf-name* | **all**}] [**ipv4** | **ipv6**] [**unicast** | **multicast** | {**topology** *topo-name*} | **safi-all**] **longer-prefixes** {*ip-address mask ip-address/prefix-length*} [**standby**]

Syntax Description

vrf { *vrf-name* | **all** }	(Optional) Specifies a particular VPN routing and forwarding (VRF) instance or all VRF instances.
ipv4	(Optional) Specifies IP Version 4 address prefixes.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
unicast	(Optional) Specifies unicast address prefixes.
multicast	(Optional) Specifies multicast address prefixes.
topology *topo-name*	(Optional) Specifies topology table information and name of the topology table.
safi-all	(Optional) Specifies unicast and multicast address prefixes.
ip-address	Network IP address about which routing information should be displayed.
mask	Network mask specified in either of two ways: • Network mask can be a four-part, dotted-decimal address. For example, 255.0.0.0 indicates that each bit equal to 1 means the corresponding address bit is a network address. • Network mask can be indicated as a slash (/) and number. For example, /8 indicates that the first 8 bits of the mask are 1s, and the corresponding bits of the address are the network address.
/ *prefix-length*	Length of the IP address prefix. A decimal value that indicates how many of the high-order contiguous bits of the address compose the prefix (the network portion of the address). A slash (/) must precede the decimal value.
standby	(Optional) Displays standby information.

Command Default

If a **vrf** *vrf-name* is not specified, routes are cleared from the default IPv4 unicast VRF.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show route longer-prefixes** command to troubleshoot forwarding problems whose cause may be a long prefix.

The topology keyword must be accompanied by the ipv4 multicast keywords, except when the afi-all keyword or the safi-all keyword is specified.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show route longer-prefixes** command:

```
RP/0/RP0/CPU0:router# show route longer-prefixes 172.16.0.0/8

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - ISIS, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, su - IS-IS summary null, * - candidate default
       U - per-user static route, o - ODR, L - local

L    172.29.52.70/32 is directly connected, 4d15h, MgmtEth0/RSP0RP0/CPU0/0
L    172.29.52.71/32 is directly connected, 4d15h, MgmtEth0/RP1/CPU0/0
L    172.29.52.72/32 [0/0] via 172.29.52.72, 4d15h, MgmtEth0/RSP0RP0/CPU0/0
```

This table describes the significant fields shown in the display.

Table 113: show route longer-prefixes Field Descriptions

Field	Description
172.29.52.70/32	IP address and length of the route.
4d15h	Time (in hh:mm:ss or *nd*nh) since the route was installed in the RIB.
MgmtEth0/RSP0 RP0/CPU0/0	Outbound interface for the route.

show route next-hop

To filter routes by the next-hop address or interface, use the **show route next-hop** command in XR EXEC mode.

show route [**vrf** {*vrf-name* | **all**}] [**ipv4** | **ipv6**] [**unicast** | **multicast** | {**topology** *topo-name*} | **safi-all**] **next-hop** [*ip-address*][[**standby**]]

Syntax Description

vrf { *vrf-name* | **all** }	(Optional) Specifies a particular VPN routing and forwarding (VRF) instance or all VRF instances.
ipv4	(Optional) Specifies IP Version 4 address prefixes.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
unicast	(Optional) Specifies unicast address prefixes.
multicast	(Optional) Specifies multicast address prefixes.
topology *topo-name*	(Optional) Specifies topology table information and name of the topology table.
safi-all	(Optional) Specifies unicast and multicast address prefixes.
ip-address	(Optional) IP address about which next-hop information is to be displayed.
standby	(Optional) Displays standby information.

Command Default

If a **vrf** *vrf-name* is not specified, routes are cleared from the default IPv4 unicast VRF.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show route next-hop** command to find all routes going through a next-hop address or interface.

The topology keyword must be accompanied by the ipv4 multicast keywords, except when the afi-all keyword or the safi-all keyword is specified.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show route next-hop** command filtering routes on the next-hop address:

```
RP/0/RP0/CPU0:router# show route next-hop  1.68.0.1
```

```
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - ISIS, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, su - IS-IS summary null, * - candidate default
U - per-user static route, o - ODR, L - local

Gateway of last resort is 1.68.0.1 to network 0.0.0.0

S* 0.0.0.0/0 [1/0] via 1.68.0.1, 15:01:49
S 223.255.254.254/32 [1/0] via 1.68.0.1, 15:01:49
```

The following is sample output from the **show route next-hop** command filtering routes on the next-hop interface:

```
RP/0/RP0/CPU0:router# show route next-hop HundredGigE 0/1/0/2

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - ISIS, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, su - IS-IS summary null, * - candidate default
U - per-user static route, o - ODR, L - local

Gateway of last resort is 1.68.0.1 to network 0.0.0.0

C 11.1.1.0/24 is directly connected, 15:01:46, HundredGigE 0/1/0/2
L 11.1.1.2/32 is directly connected, 15:01:46, HundredGigE 0/1/0/2
```

This table describes the significant fields shown in the display.

Table 114: show route next-hop Field Descriptions

Field	Description
11.1.1.0/24	IP address and length of the route.
15:01:46	Time (in hh:mm:ss or *n*d*n*h) since the route was installed in the RIB.
HundredGigE0/1/0/2	Outbound interface for the route.

show route quarantined

To display mutually recursive (looping) routes, use the **show route quarantined** command in XR EXEC mode.

show route [**vrf** {*vrf-name* | **all**}] [**ipv4** | **ipv6**] [**unicast** | **multicast** | {**topology** *topo-name*} | **safi-all**] **quarantined** [*ip-address/prefix-length]ip-address mask*] [**standby**]

Syntax Description

vrf { *vrf-name* | **all** }	(Optional) Specifies a particular VPN routing and forwarding (VRF) instance or all VRF instances.
ipv4	(Optional) Specifies IP Version 4 address prefixes.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
unicast	(Optional) Specifies unicast address prefixes.
multicast	(Optional) Specifies multicast address prefixes.
topology *topo-name*	(Optional) Specifies topology table information and name of the topology table.
safi-all	(Optional) Specifies unicast and multicast address prefixes.
ip-address	(Optional) IP address about which looping routes information is to be displayed.
/ *prefix-length*	(Optional) Length of the IP address prefix. A decimal value that indicates how many of the high-order contiguous bits of the address compose the prefix (the network portion of the address). A slash (/) must precede the decimal value.
ip-address mask	(Optional) Network mask applied to the *ip-address* argument.
standby	(Optional) Displays standby information.

Command Default

If a **vrf** *vrf-name* is not specified, routes are cleared from the default IPv4 unicast VRF.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

RIB quarantining detects mutually recursive routes and quarantines the last route that actually completes the mutual recursion. The quarantined route is periodically evaluated to see if the mutual recursion has gone away. If the recursion still exists, the route remains quarantined. If the recursion has gone away, the route is released from quarantine.

Use the **show route quarantined** command to display mutually recursive (looping) routes.

The topology keyword must be accompanied by the ipv4 multicast keywords, except when the afi-all keyword or the safi-all keyword is specified.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show route quarantined** command:

```
RP/0/RP0/CPU0:routerr# show route quarantined

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - ISIS, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, su - IS-IS summary null, * - candidate default
       U - per-user static route, o - ODR, L - local

S    10.10.109.1/32 [1/0] via 10.10.34.1, 00:00:01 (quarantined)
                    [1/0] via 10.10.37.1, 00:00:01 (quarantined)
                    [1/0] via 10.10.60.1, 00:00:01 (quarantined)
                    [1/0] via 10.10.68.1, 00:00:01 (quarantined)
                    [1/0] via 10.10.91.1, 00:00:01 (quarantined)
                    [1/0] via 10.10.93.1, 00:00:01 (quarantined)
                    [1/0] via 10.10.97.1, 00:00:01 (quarantined)
S    10.0.0.0/8 [1/0] via 11.11.11.11, 00:01:29 (quarantined)
S    10.10.0.0/16 [1/0] via 11.11.11.11, 00:01:29 (quarantined)
S    10.10.10.0/24 [1/0] via 11.11.11.11, 00:01:29 (quarantined)
S    10.10.10.10/32 [1/0] via 11.11.11.11, 00:00:09 (quarantined)
```

This table describes the significant fields shown in the display.

Table 115: show route quarantined Field Descriptions

Field	Description
10.10.109.1/32	IP address and length of the route.
[1/0]	Distance and metric for the route.
via 10.10.34.1	IP address of next-hop on the route.
00:00:01	Time (in hh:mm:ss or *n*d*n*h) since the route was installed in the RIB.
(quarantined)	Shows that the route is quarantined.

show route resolving-next-hop

To display the next-hop gateway or host to a destination address, use the **show route resolving-next-hop** command in XR EXEC mode.

show route [**vrf** {*vrf-name* | **all**}] [**ipv4** | **ipv6**] [**unicast** | **multicast** | {**topology** *topo-name*} | **safi-all**] **resolving-next-hop** *ip-address* [**standby**]

Syntax Description

vrf { *vrf-name* | **all** }	(Optional) Specifies a particular VPN routing and forwarding (VRF) instance or all VRF instances.
ipv4	(Optional) Specifies IP Version 4 address prefixes.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
unicast	(Optional) Specifies unicast address prefixes.
multicast	(Optional) Specifies multicast address prefixes.
topology *topo-name*	(Optional) Specifies topology table information and name of the topology table.
safi-all	(Optional) Specifies unicast and multicast address prefixes.
ip-address	IP address about which resolved next-hop information is to be displayed.
standby	(Optional) Displays standby information.

Command Default

If a **vrf** *vrf-name* is not specified, routes are cleared from the default IPv4 unicast VRF.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show route resolving-next-hop** command to perform a recursive route lookup on the supplied destination address and return information on the next immediate router (next hop) to the destination.

The topology keyword must be accompanied by the ipv4 multicast keywords, except when the afi-all keyword or the safi-all keyword is specified.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show route resolving-next-hop** command:

```
RP/0/RP0/CPU0:router# show route resolving-next-hop 10.1.1.1
```

```
Nexthop matches 10.1.1.1/32
  Known via "local", distance 0, metric 0 (connected)
  Installed Aug 22 01:57:08.514
  Directly connected nexthops
    10.1.1.1 directly connected, via Loopback0
      Route metric is 0
```

This table describes the significant fields shown in the display.

Table 116: show route resolving-next-hop Field Descriptions

Field	Description
Known via	Name of the routing protocol that installed the matching route.
Route metric is	Metric of the route.

show route static

To display the current static routes of the Routing Information Base (RIB), use the **show route static** command in XR EXEC mode.

show route [**vrf** {*vrf-name* | **all**}] [**afi-all** | **ipv4** | **ipv6**] [**unicast** | **multicast** | {**topology** *topo-name*} | **safi-all**] **static** [**standby**]

Syntax Description

vrf { *vrf-name* | **all** }	(Optional) Specifies a particular VPN routing and forwarding (VRF) instance or all VRF instances.
afi-all	(Optional) Specifies all address families.
ipv4	(Optional) Specifies IP Version 4 address prefixes.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
unicast	(Optional) Specifies unicast address prefixes.
multicast	(Optional) Specifies multicast address prefixes.
topology *topo-name*	(Optional) Specifies topology table information and name of the topology table.
safi-all	(Optional) Specifies unicast and multicast address prefixes.
standby	(Optional) Displays standby information.

Command Default

If a **vrf** *vrf-name* is not specified, routes are cleared from the default IPv4 unicast VRF.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show route static** command to display information about static routes in the routing table.

The topology keyword must be accompanied by the ipv4 multicast keywords, except when the afi-all keyword or the safi-all keyword is specified.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show route static** command:

```
RP/0/RP0/CPU0:router# show route static
```

```
S    10.1.1.0/24 is directly connected, 00:54:05, HundredGigE3/0/0/1
S    192.168.99.99/32 [1/0] via 10.12.12.2, 00:54:04
```

This table describes the significant fields shown in the display.

Table 117: show route static Field Descriptions

Field	Description
S	Code to indicate the route is static.
10.1.1.0/24	IP address and distance for the route.
00:54:05	Time (in hh:mm:ss) since the route was installed in the RIB.
HundredGigE3/0/0/1	Outbound interface for the route.
[1/0]	Distance and metric for the route.

show route summary

To display the current contents of the Routing Information Base (RIB), use the **show route summary** command in XR EXEC mode mode.

show route [**vrf** {*vrf-name* | **all**}] [**afi-all** | **ipv4** | **ipv6**] [**unicast** | **multicast** | {**topology** *topo-name*} | **safi-all**] **summary** [**detail**] [**standby**]

Syntax Description

vrf { *vrf-name* | **all** }	(Optional) Specifies a particular VPN routing and forwarding (VRF) instance or all VRF instances.
afi-all	(Optional) Specifies all address families.
ipv4	(Optional) Specifies IP Version 4 address prefixes.
ipv6	(Optional) Specifies IP Version 6 address prefixes.
unicast	(Optional) Specifies unicast address prefixes.
multicast	(Optional) Specifies multicast address prefixes.
topology *topo-name*	(Optional) Specifies topology table information and name of the topology table.
safi-all	(Optional) Specifies unicast and multicast address prefixes.
detail	(Optional) Displays a detailed summary of the contents of the RIB, including the number of paths and some protocol-specific route attributes.
standby	(Optional) Displays standby information.

Command Default

If a **vrf** *vrf-name* is not specified, routes are cleared from the default IPv4 unicast VRF.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show route summary** command to display information about routes in the routing information base.

When a route summary is needed frequently—for instance, in a polling situation—use the **show route summary** command without the **detail** keyword. The **detail** keyword is used less frequently for verification purposes, because it is much more expensive (in bandwidth), requiring a scan of the entire routing database.

The topology keyword must be accompanied by the ipv4 multicast keywords, except when the afi-all keyword or the safi-all keyword is specified.

Task ID

Task ID	Operations
rib	read

Examples

The following is sample output from the **show route summary** command:

```
RP/0/RP0/CPU0:router# show route summary

Route Source    Routes      Backup      Deleted      Memory (bytes)
static          1           0           0            136
connected       2           1           0            408
local           3           0           0            408
ospf            1673        2           0            272
isis            2           0           0            272
Total           10          1           0            1496
```

This table explains fields in the output of the **show route summary** command.

Table 118: show route summary Field Descriptions

Field	Description
Route Source	Routing protocol name.
Routes	Number of selected routes that are present in the routing table for each route source.
Backup	Number of routes that are not selected (are backup to a selected route).
Deleted	Number of routes that have been marked for deletion in the RIB, but have not yet been purged.
Memory	Number of bytes allocated to maintain all routes for the particular route source.

The following is sample output from the **show route summary** command with the **detail** keyword:

```
RP/0/RP0/CPU0:router# show route summary detail

Route Source    Active Route     Active Path     Backup Route     Backup Path
static          1                1               0                0
connected       2                2               1                1
local           3                3               0                0
isis            1                1               1                1
Level 1:        0                0               1                1
Level 2:        1                1               0                0
ospf 1673       6                12              0                0
Intra-Area:     3                6               0                0
Inter-Area:     3                6               0                0
External-1:     0                0               0                0
External-2:     0                0               0                0
bgp 100         10               20              4                8
External:       5                10              4                8
Internal:       5                10              0                0
local:          0                0               0                0
Total           7                7               2                2
```

This table explains fields in the output of the **show route summary detail** command.

Table 119: show route summary detail Field Descriptions

Field	Description
Route Source	Source of the route. Routing protocol name and type.
Active Route	Number of active routes present in the routing table for each route source.
Active Path	Number of active paths present in the routing table for each route source.
Backup Route	Number of routes that are backup to a selected route for each route source.
Backup Path	Number of paths that are backup to a selected path for each route source.

RIP Commands

Note All commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 540 Series Router that is introduced from Cisco IOS XR Release 6.3.2. References to earlier releases in Command History tables apply to only the Cisco NCS 5500 Series Router.

Note

- Starting with Cisco IOS XR Release 6.6.25, all commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 560 Series Routers.
- Starting with Cisco IOS XR Release 6.3.2, all commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 540 Series Router.
- References to releases before Cisco IOS XR Release 6.3.2 apply to only the Cisco NCS 5500 Series Router.
- Cisco IOS XR Software Release 7.0.1 specific updates are not applicable for the following variants of Cisco NCS 540 Series Routers:
  - N540-28Z4C-SYS-A
  - N540-28Z4C-SYS-D
  - N540X-16Z4G8Q2C-A
  - N540X-16Z4G8Q2C-D
  - N540X-16Z8Q2C-D
  - N540-12Z20G-SYS-A
  - N540-12Z20G-SYS-D
  - N540X-12Z16G-SYS-A
  - N540X-12Z16G-SYS-D

This module describes the commands used to display and clear information in the Routing Information Base (RIB).

For detailed information about RIB concepts, configuration tasks, and examples, see the Implementing RIB on Cisco NCS 5500 Series Routers module in *Routing Configuration Guide for Cisco NCS 5500 Series Routers*.

- authentication keychain mode (RIP), on page 707
- clear rip , on page 709
- interface (RIP), on page 711
- redistribute (RIP), on page 715
- router rip, on page 718
- show protocols (RIP), on page 724
- show rip, on page 725

authentication keychain mode (RIP)

To enable an authentication keychain mechanism on RIP interfaces, use the **authentication keychain mode** command in interface configuration mode. To disable authentication keychain configuration on RIP interfaces, use the **no** form of this command.

authentication keychain *name* **mode** { **md5** | **text** }
no authentication

Syntax Description

name	Specifies the name of the keychain configured using the keychain command. **Note** All keychains need to be configured in Cisco IOS XR keychain database using the keychain configuration commands described in *Implementing Keychain Management* module of *System Security Configuration Guide for Cisco NCS 5500 Series RoutersSystem Security Configuration Guide for Cisco NCS 540 Series RoutersSystem Security Configuration Guide*
md5	Specifies that the authentication keychain mode is keyed message digest (md5).
text	Specifies that the authentication keychain mode is clear text.

Command Default

Keychain authentication is disabled.

Command Modes

Interface configuration

Command History

Usage Guidelines

All keychains need to be configured in Cisco IOS XR keychain database using the keychain configuration commands described in *Implementing Keychain Management* module of *System Security Configuration Guide for Cisco NCS 5500 Series RoutersSystem Security Configuration Guide for Cisco NCS 540 Series RoutersSystem Security Configuration Guide*

This example shows how to configure an authentication keychain in md5 mode on a RIP VRF interface:

```
Router# configure
Router(config)# router rip
Router(config-rip)# vrf vrf_rip_auth
Router(config-rip-vrf)# interface POS 0/6/0/0
Router(config-rip-vrf-if)# authentication keychain key1 mode md5
```

This example shows how to configure an authentication keychain in clear text mode on a RIP interface:

```
Router# configure
Router(config)# router rip
Router(config-rip)# interface POS 0/6/0/1
Router(config-rip-if)# authentication keychain key2 mode text
```

Related Commands

Command	Description
router rip	Configures a routing process and enters RIP router configuration mode.

Command	Description
key chain (key chain)	Creates or modifies a keychain. Refer *System Security Command Reference for Cisco NCS 5500 Series Routers and Cisco NCS 540 and NCS 560 Series Routers* for complete command reference information.

clear rip

To clear VRF and interface-related information for Routing Information Protocol (RIP) such as database entries and statistics, use the **clear rip** command in EXEC configuration mode.

clear rip [**vrf** { *name* | **all** }] [**database** | **out-of-memory** | **statistics**] [**interface** *type number*]

Syntax Description

vrf {*name*|**all**}	(Optional) Clears RIP-associated VRF information. You can specify a VRF, or clear all VRF information.
database	(Optional) Clears database entries from the RIP topology table.
out-of-memory	(Optional) Clears RIP out-of-memory state information.
statistics	(Optional) Clears RIP statistics information.
interface *type number*	(Optional) Clears RIP interface information.

Command Default

No default behavior or values

Command Modes

EXEC configuration

Command History

Release	Modification
Release 7.4.1	This command was introduced.

Usage Guidelines

RIP VRFs and interfaces that are forcibly deactivated by the software because of a severe memory state are not activated again until the out-of-memory state is cleared by using the **clear rip** , **clear rip interface** , or **clear rip out-of-memory** command. Use the **clear rip out-of-memory** command to clear the out-of-memory state completely and allow the RIP process to force the VRF or interface to shut down.

When the router begins to run out of memory, the RIP process can transition through different memory states defined as Normal, Minor, Severe, and Critical:

- In Normal state, RIP VRFs and interfaces function normally.
- In Minor state, RIP VRFs and interfaces that are currently active are allowed to remain active. VRFs and interfaces that are not currently active are not allowed to become active until the RIP process transitions to Normal state.
- In Severe state, a few VRFs and interfaces are forcibly brought down periodically until the RIP process transitions to another state.
- In Critical state, the RIP process is forcibly shut down.

Examples

The following example shows how to clear all database, interface, and VRF entries in RIP:

```
Router# clear rip vrf all
```

The following example shows how to clear only database entries from the topology table for the GigabitEthernet 0/1/0/0 interface:

```
Router# clear rip database interface GigabitEthernet 0/1/0/0
```

interface (RIP)

To define the interfaces on which the Routing Information Protocol (RIP) runs and to associate a RIP interface to a VRF, use the **interface** command in RIP router configuration or RIP VRF configuration mode. To disable RIP routing for interfaces, use the **no** form of this command.

interface *type number* [**broadcast-for-v2** | **metric-zero-accept** | **passive-interface** | **poison-reverse** | { **receive** | **send** } **version** *RIP-version* | **route-policy** *name* [*parameter-value*] { **in** | **out** } | **site-of-origin** *ID* | **split-horizon** **disable**]
no interface *type number* [**broadcast-for-v2** | **metric-zero-accept** | **passive-interface** | **poison-reverse** | { **receive** | **send** } **version** | **route-policy** *name* [*parameter-value*] { **in** | **out** } | **site-of-origin** | **split-horizon** **disable**]

Syntax Description

type number	(Optional) Interface type and number. For more information, use the question mark (**?**) online help function. The specified interface is associated with the RIP process.
broadcast-for-v2	(Optional) Specifies that RIPv2 messages are sent to the broadcast address on the specified interface.
metric-zero-accept	(Optional) Specifies that RIP accept routing entries from RIP updates with a metric set to zero (0) on the specified interface.
passive-interface	(Optional) Specifies that RIP routing updates are suppressed on the specified interface.
poison-reverse	(Optional) Enables poison reverse processing of RIP router updates on the specified interface.
{**receive** | **send**} **version** *RIP-version*	(Optional) Configures the RIP interface to accept and send RIP v1 or RIP v2 packets on the specified interface. For the *RIP-version* argument, enter **1** for RIP v1, **2** for RIP v2, and **1 2** for both versions.
route-policy *name* [*(parameter-value)*] {**in**|**out**}	(Optional) Applies a routing policy with specific parameter values on a RIP interface, on inbound and outbound routes.

site-of-origin *ID*	(Optional) Configures the Site of Origin (SoO) filtering on a RIP interface. You can enter the *ID* in one of these formats: *as-number : number* *ip-address : number* AS number (ASN) range - 1 to 65535 for a 2-byte ASN, 1 to 4294967295 for a 4-byte ASN in asplain format, and 1.0 to 65535.6553 for a 4-byte ASN in asdot format. Network number range - 0 to 4294967295 for a 2-byte ASN, and 0 to 65535 for a 4-byte ASN. A colon separates the ASN and network number, or the IP address and network number.
split-horizon disable	(Optional) Disables split horizon function for the RIP process.

Command Default

When you do not specify this command in configuration mode, RIP routing for interfaces is not enabled.

Command Modes

RIP Router configuration

Command History

Release	Modification
Release 7.4.1	This command was introduced.

Usage Guidelines

Use the **interface** command to associate a specific interface with a RIP process. The interface remains associated with the process even when the IPv4 address of the interface changes. This command places the router in RIP interface configuration mode or RIP VRF interface configuration mode, from which you can configure interface-specific settings. Commands configured under this mode are automatically bound to that interface. Pointers:

- **metric-zero-accept** - After this command is configured on routing entries from RIP updates, RIP accepts these routes and then sets the metric to one (1).
- **passive-interface** - While RIP stops sending routing updates to the multicast (or broadcast) address on a passive interface, RIP continues to receive and process routing updates from its neighbors on that interface.
- **poison-reverse** - Route poisoning prevents routing loops by communicating to other routers that a route is no longer reachable, effectively removing these routes from other router's routing tables. The system default, split horizon, provides that routes learned through RIP are not advertised from the interface over which they were learned.

  The **poison-reverse** command enables poison reverse processing of RIP router updates. A router that receives route poisoning information sends the poisoning information back to the sending router, a process called poison reverse. This process ensures that all routers on the same interface have received the poisoned route information.

  If both poison reverse and split horizon functions are configured, then simple split horizon behavior (suppression of routes from the interface over which they were learned) is replaced by poison reverse behavior. If split horizon is disabled, the poison reverse configuration is ignored.

receive version and **send version** - Overrides the default behavior of RIP. This command applies only to the interface being configured.

route-policy - The policy can be used to filter routes or modify route attributes. If a route policy is configured on the interface and a VRF, the interface route policy is applied.

site-of-origin - A RIP process must be capable of retrieving the SoO attribute on routes redistributed from BGP when required to support complex topologies that include MPLS VPN links between sites with backdoor links. Use this command to set an SoO BGP extended community attribute that is used to identify routes that have originated from a site so that the readvertisement of that prefix back to the source site can be prevented. The SoO extended community uniquely identifies the site from which a provider edge (PE) router has learned a route.

split-horizon disable - If split horizon is disabled, the poison reverse configuration is ignored. We recommend that you do not change the default state of split horizon unless you are certain that your application requires the change to properly advertise routes.

Examples

The following example shows how to enter interface configuration mode for a RIP process, and send RIP Version 2 messages to the broadcast address on the GigabitEthernet interface 0/1/0/0:

```
Router(config)# router rip
Router(config-rip)# interface GigabitEthernet 0/1/0/0
Router(config-rip-if)# broadcast-for-v2\
Router(config-rip-if)# commit
```

The following example shows how to set the RIP interface to accept metric zero on routing entries:

```
Router(config)# router rip
Router(config-rip)# interface GigabitEthernet 0/1/0/0
Router(config-rip-if)# metro-zero-accept
Router(config-rip-if)# commit
```

The following example shows that GigabitEthernet interface 0/1/0/0 stops multicasting (or broadcasting) RIP updates while continuing to receive RIP updates normally. GigabitEthernet interface 0/1/0/3 sends and receives updates normally. Also RIP updates are unicast to neighbor 172.168.1.2 over the appropriate interface:

```
Router(config)# router rip
Router(config-rip)# neighbor 172.16.1.2
Router(config-rip)# interface GigabitEthernet 0/1/0/0
Router(config-rip-if)# passive-interface
Router(config-rip-if)# commit
Router(config-rip-if)# exit
Router(config-rip)# interface GigabitEthernet 0/1/0/3
Router(config-rip-if)# exit
```

The following example shows how to enable poison reverse processing for an interface running RIP:

```
Router(config)# router rip
Router(config-rip)# interface GigabitEthernet 0/1/0/0
Router(config-rip-if)# poison-reverse
Router(config-rip-if)# commit
```

The following example shows how to configure an interface to accept both RIP Version 1 and 2 packets:

```
Router(config)# router rip
Router(config-rip)# interface GigabitEthernet 0/1/0/0
```

```
Router(config-rip-if)# receive version 1 2
Router(config-rip-if)# commit
```

The following example shows how to filter routing updates received on an interface:

```
Router(config)# router rip
Router(config-rip)# interface GigabitEthernet 0/1/0/0
Router(config-rip-if)# route-policy updpol-1 in
Router(config-rip-if)# commit
```

The following example shows how to configure SoO filtering on a RIP interface:

```
Router(config)# router rip
Router(config-rip)# interface GigabitEthernet 0/1/0/0
Router(config-rip-if)# site-of-origin 10.0.0.1:20
Router(config-rip-if)# commit
```

The following example shows how to disable split horizon on a Packet-over-SONET/SDH link:

```
Router(config)# router rip
Router(config-rip)# interface GigabitEthernet 0/1/0/0
Router(config-rip-if)# split-horizon disable
Router(config-rip-if)# commit
```

redistribute (RIP)

To redistribute routes from another routing domain into Routing Information Protocol (RIP), use the **redistribute** command in the appropriate configuration mode. To remove the **redistribute** command from the configuration file and restore the system to its default condition in which the software does not redistribute routes, use the **no** form of this command.

Border Gateway Protocol (BGP)
redistribute bgp *process-id* [**route-policy** *name*] [**external** | **internal** | **local**]
no redistribute bgp *process-id*

Connected Interface Routes
redistribute connected [**route-policy** *name*]
no redistribute connected

Enhanced Interior Gateway Routing Protocol (EIGRP)
redistribute eigrp *process-id* [**route-policy** *name*]
no redistribute eigrp *process-id*

Intermediate System-to-Intermediate System (ISIS)
redistribute isis *process-id* [**route-policy** *name*] [**level-1** | **level-1-2** | **level-2**]
no redistribute isis *process-id*

Open Shortest Path First (OSPF)
redistribute ospf *process-id* [**route-policy** *name*] [**match** { **external** [**1** | **2**] | **internal** | **nssa-external** [**1** | **2**] }]
no redistribute ospf *process-id*

IP Static Routes
redistribute static [**route-policy** *name*]
no redistribute static

Syntax Description

bgp	Distributes routes from the BGP protocol.

process-id	• For the **bgp** keyword:
	  • Range for 2-byte Autonomous system numbers (ASNs) is 1 to 65535.
	  • Range for 4-byte Autonomous system numbers (ASNs) in asplain format is 1 to 4294967295.
	  • Range for 4-byte Autonomous system numbers (ASNs) is asdot format is 1.0 to 65535.65535.
	• For the **eigrp** keyword, an EIGRP instance name from which routes are to be redistributed. The value takes the form of a string. A decimal number can be entered, but it is stored internally as a string.
	• For the **isis** keyword, an IS-IS instance name from which routes are to be redistributed. The value takes the form of a string. A decimal number can be entered, but it is stored internally as a string.
	• For the **ospf** keyword, an OSPF instance name from which routes are to be redistributed. The value takes the form of a string. A decimal number can be entered, but it is stored internally as a string.

external	(Optional) Specifies BGP external routes only.
internal	(Optional) Specifies BGP internal routes only.
local	(Optional) Specifies BGP local routes only.
route-policy *name*	(Optional) Specifies the identifier of a configured policy. A policy is used to filter the importation of routes from this source routing protocol to RIP.
level-1	(Optional) Redistributes Level 1 IS-IS routes into other routing protocols independently.
level-1-2	(Optional) Distributes both Level 1 and Level 2 IS-IS routes into other routing protocols.
level-2	(Optional) Distributes Level 2 IS-IS routes into other routing protocols independently.
[**match** { **external** [**1** | **2**] | **internal** | **nssa-external** [**1** | **2**]]} [**route-policy** *name*]	(Optional) Specifies the criteria by which OSPF routes are redistributed into other routing domains. It can be one or more of the following: • **internal** —Routes that are internal to a specific autonomous system (intra- and inter-area OSPF routes). • **external** [**1** | **2**]—Routes that are external to the autonomous system, but are imported into OSPF as Type 1 or Type 2 external routes. • **nssa-external** [**1** | **2**]—Routes that are external to the autonomous system, but are imported into OSPF as Type 1 or Type 2 not-so-stubby area (NSSA) external routes. For the external and nssa-external options, if a type is not specified, then both Type 1 and Type 2 are assumed. If no match is specified, the default is no filtering.
static	Redistributes IP static routes.

Command Default

Route redistribution is disabled.

Command Modes

Router configuration

Command History

Release	Modification
Release 7.4.1	This command was introduced.

Usage Guidelines

Note When you are redistributing routes (into RIP) using both command keywords for setting or matching of attributes and a route policy, the routes are run through the route policy first, followed by the keyword matching and setting.

Redistributed routing information may be filtered by the **route-policy** *name* keyword and argument. This filtering ensures that only those routes intended by the administrator are redistributed by RIP.

The RIP metric used for redistributed routes is determined by the route policy. If a route policy is not configured or the route policy does not set the RIP metric, the metric is determined based on the redistributed protocol.

In all other cases (BGP, IS-IS, OSPF, EIGRP, connected, static), the metric set by the **default-metric** command is used. If a valid metric cannot be determined, then redistribution does not happen.

For information about routing policies, see the *Routing Policy Commands on* module of the *Routing Command Reference*.

Examples

The following example shows how to cause BGP routes to be redistributed into a RIP process:

```
RP/0/RP0/CPU0:router(config)# router rip
RP/0/RP0/CPU0:router(config-rip)# redistribute bgp 100
RP/0/RP0/CPU0:router(config-rip)# commit
```

Related Commands

Command	Description
router rip	Configures the RIP routing process.

router rip

To configure a routing process and enter router configuration mode for a Routing Information Protocol (RIP) process, use the **router rip** command in mode. To turn off the RIP routing process, use the **no** form of this command.

router rip [**vrf** *name*] [**auto-summary** | **broadcast-for-v2** | **default-information originate** [**route-policy** *name* [**parameter-value**]] | **route-policy** *name* [**parameter-value**] { **in** | **out** } | { **default-metric** | **maximum-paths** | **output-delay** } *value* | **distance** *value* [*IP-address*] | **neighbor** *IP-address* | **nsf** | **timers basic** *timer-values* | **validate-update-source disable**]
no router rip [**vrf** *name*] [**auto-summary** | **broadcast-for-v2** | **default-information originate** | **route-policy** *name* [**parameter-value**] { **in** | **out** } | **default-metric** [*value*] | **maximum-paths** | **output-delay** *value* | **distance** *value* [*IP-address*] | **neighbor** *IP-address* | **nsf** | **timers basic** | **validate-update-source disable**]

Syntax Description

auto-summary	(Optional) Enables the automatic summarization of subnet routes into network-level routes. By default, this option is disabled.
broadcast-for-v2	(Optional) Sends RIPv2 messages to the broadcast address. By default, RIPv2 output packets are not broadcasted.
default-information originate [**route-policy** *name* [*parameter-value*]]	(Optional) Generates a default route into the RIP process. The route policy indicates the criteria for the default route. By default, this option is disabled.
route-policy *name* [*(parameter-value)*] {**in**|**out**}	(Optional) Applies a routing policy with specific parameter values on inbound and outbound routes.
default-metric *value*	(Optional) Set default metric values for routes redistributed from other protocols into RIP. By default, metrics are not set.
maximum-paths *value*	(Optional) Configures the maximum number of equal cost parallel routes that RIP installs into the routing table.
output-delay *value*	(Optional) Updates the interpacket delay duration for outgoing RIP updates. For *value*, enter a delay value of 8 to 50 (milliseconds') duration. The delay is applied between consecutive packets in a multiple-packet RIP update. By default, delay duration is not enabled.
distance *value* [*IP-address*]	(Optional) Defines the administrative distance assigned to routes discovered by RIP. By default, an administrative distance value of 120 is configured.

neighbor *IP-address*	(Optional) Defines a neighboring router with which to exchange RIP information. For *IP address*, enter the IP address of the peer router with which routing information is exchanged. By default, no RIP neighbor or peer is configured.
nsf	(Optional) Configures nonstop forwarding (NSF) on RIP routes after a RIP process shutdown or restart. By default, this option is disabled.
timers basic *timer-values*	(Optional) Adjusts RIP network timers. For the *timer-values* argument, you can use these 4 timer values: • *update* - This is the rate, in seconds, at which updates are sent, and the fundamental timing parameter of the routing protocol. Range is 5 to 50000, and default value is 30. • *invalid* - This is the interval, in seconds, after which a route is declared invalid. It should be at least three times the value of the *update* value. A route becomes invalid when there is an absence of updates that refresh the route. The route then enters the holddown state. The route is marked inaccessible and is advertised as unreachable. Range is 15 to 200000, and default value is 180. • *holddown* - This is the interval, in seconds, during which routing information regarding better paths is suppressed. It should be at least three times the value of the *update* argument. A route enters into a holddown state when an update packet is received that indicates that the route is unreachable. The route is marked inaccessible and is advertised as unreachable. When holddown expires, routes advertised by other sources are accepted, and the route is no longer inaccessible. Range is 15 to 200000 and default value is 180. • *flush* - This is the time, in seconds, that must pass before the route is removed from the routing table; the interval specified should be greater than the value of the *invalid* argument. If it is less than the invalid timer value, the proper holddown interval cannot elapse, which results in a new route being accepted before the holddown interval expires. Range is 16 to 250000 and default value is 240.
validate-update-source disable	(Optional) Stops the Cisco IOS XR software from validating the source IP address of incoming RIP routing updates. By default, the source IP address of incoming RIP updates is validated.

Command Default

No router process is defined.

Command Modes

Command History

Release	Modification
Release 7.4.1	This command was introduced.

Usage Guidelines

Use the **router rip** command to enable RIP protocol parameters. This command places the router in RIP configuration mode or RIP VRF configuration mode (for the **router rip vrf** *name* command form), where you can configure RIP-specific settings. Pointers:

Note The **interface** and **redistribute** parameters within the **router rip** command are documented as separate commands.

- **auto-summary** - Use this option to turn on route summarization. Route summarization reduces the amount of routing information in the routing tables. Disable automatic summarization if you must perform routing between disconnected subnets. When automatic summarization is off, subnets are advertised. Automatic summarization is disabled by default.
- **broadcast-for-v2** - Use this option to broadcast RIPv2 broadcast updates to hosts that do not listen to multicasts. RIPv2 requests and responses are sent to the IP broadcast address 255.255.255.255 instead of the IP multicast address 244.0.0.9.
- **route-policy** - Use this command to specify a routing policy for an inbound or outbound route. The policy can be used to filter routes or modify route attributes. If a route policy is configured both on the interface and on the VRF, the interface route policy is applied.
- **default-metric** - Use this option with the **redistribute** command to cause RIP to use the same metric value for all redistributed routes. A default metric helps solve the problem of redistributing routes with incompatible metrics by providing a reasonable substitute and enables redistribution to proceed. If you want to set different metrics for other redistributed protocols, use the **route-policy** option in the **redistribute** command.

  The RIP metric used for redistributed routes is determined by the route policy. If a route policy is not configured or the route policy does not set the RIP metric, the metric is determined based on the redistributed protocol. For VPNv4 routes redistributed by BGP, the RIP metric set at the remote PE router is used, if valid.

  In all other cases (BGP, IS-IS, OSPF, EIGRP, connected, static), the metric set by the **default-metric** command is used. If a valid metric cannot be determined, then redistribution does not happen.
- **output-delay** - Use this command if traffic is sent to a low-speed router that might not be able to receive high speed updates. Configuring this command helps prevent the routing table from losing information.
- **distance** - Use this command to change the preference of RIP routes over other protocol routes. When administrative distance and redistribution features are used together, routing behavior may be affected for routes accepted from and advertised to RIP neighbors.

  Numerically, an administrative distance is an integer from 0 to 255. In general, the higher the value, the lower the trust rating. An administrative distance of 255 means that the routing information source cannot be trusted at all and should be ignored. The order in which you enter distance commands can affect the assigned administrative distances in unexpected ways.

This table lists default administrative distances.

Table 120: Default Administrative Distances of Routing

Routing Protocol	Administrative Distance Value
Connected interface	0
Static route out an interface	0
Static route to next-hop	1
EIGRP Summary Route	5
External BGP	20
Internal EIGRP	90
OSPF	110
IS-IS	115
RIP Versions 1 and 2	120
External EIGRP	170
Internal BGP	200
Unknown	255

- **neighbor** - Use this option to permit the point-to-point (nonbroadcast) exchange of routing information. When the **neighbor** command is used in combination with **passive-interface** in RIP router configuration mode, routing information can be exchanged between a subset of routers and access servers on a LAN.

  You can specify multiple neighbors or peers.

- **nsf** - When you use this command, NSF lifetime is automatically set to two times the update time (with a minimum value of 60 seconds). The RIP process must reconverge within this time. If the convergence exceeds the NSF lifetime, routes are purged from the Routing Information Base (RIB) and NSF may fail.

- **timers basic** - The basic timing parameters for RIP are adjustable. Because RIP is running a distributed, asynchronous routing algorithm, these timers must be the same for all routers in the network.

  Use the **show rip** command to view the current and default timer values.

- **validate-update-source disable** - When the **validate-update-source disable** command is used, validation is not performed.

  By default, the software ensures that the source IP address of incoming routing updates is on the same IP network as one of the addresses defined for the receiving interface. For unnumbered IP interfaces (interfaces configured as IP unnumbered), no checking is performed.

Examples

The following example shows how to turn on RIP auto-summarization:

```
Router(config)# router rip
Router(config-rip)# auto-summary
Router(config-rip)# commit
```

The following example shows how to send RIP v2 output messages to a broadcast address for all RIP interfaces:

```
Router(config)# router rip
Router(config-rip)# broadcast-for-v2
Router(config-rip)# commit
```

The following example shows how to originate a default route in RIP updates based on the result of running the route policy on the routing table:

```
Router(config)# router rip
Router(config-rip)# default-information originate route-policy policy1
Router(config-rip)# commit
```

The following example shows how to filter routing updates received on an interface:

```
Router(config)# router rip
Router(config-rip)# interface GigabitEthernet 0/1/0/0
Router(config-rip-if)# route-policy updpol-1 in
Router(config-rip-if)# commit
```

The following example shows how a router in autonomous system 109 uses both the RIP and the Open Shortest Path First (OSPF) routing protocols. The example advertises OSPF-derived routes using RIP and assigns the OSPF-derived routes a RIP metric of 10:

```
Router(config)# router rip
Router(config-rip)# vrf vpn-1
Router(config-rip-vrf)# default-metric 10
Router(config-rip-vrf)# redistribute ospf 109
Router(config-rip-vrf)# commit
```

The following example shows how to allow a maximum of 16 equal cost paths to a destination:

```
Router(config)# router rip
Router(config-rip)# maximum-paths 16
Router(config-rip)# commit
```

The following example shows how to set the administrative distance for a particular prefix:

```
Router(config)# router rip
Router(config-rip)# distance 85 192.168.10.0/24
Router(config-rip)# commit
```

The following example shows how to configure RIP NSF:

```
Router(config)# router rip
Router(config-rip)# vrf vpn-1
Router(config-rip-vrf)# nsf
Router(config-rip-vrf)# commit
```

The following example shows how to permit the sending of RIP updates to specific neighbors. One copy of the update is generated per neighbor:

```
Router(config)# router rip
Router(config-rip)# vrf vpn-1
```

```
Router(config-rip-vrf)# neighbor 172.16.1.2
Router(config-rip-vrf)# commit
```

The following example shows how to set updates to be broadcast every 5 seconds. If a router is not heard from in 15 seconds, the route is declared unusable. Further information is suppressed for an additional 15 seconds. At the end of the flush period, the route is flushed from the routing table.

```
Router(config)# router rip
Router(config-rip)# timers basic 5 15 15 30
Router(config-rip)# commit
```

The following example shows how to disable source validation:

```
Router(config)# router rip
Router(config-rip)# validate-update-source disable
Router(config-rip)# commit
```

show protocols (RIP)

To display information about the Routing Information Protocol (RIP) process configuration, use the **show protocols** command in mode.

show protocols [**ipv4** | **afi-all**] [**all** *protocol*] [**default-context**] [**private**]

Syntax Description

ipv4	(Optional) Specifies an IPv4 address family.
afi-all	(Optional) Specifies all address families.
all	(Optional) Specifies all protocols for a given address family.
protocol	(Optional) Specifies a routing protocol. • For the IPv4 address family, the options are **eigrp** , **bgp** , **isis** , **ospf** , and **rip** .
default-context	(Optional) Displays default context information. This keyword is available when the **eigrp** or **rip** protocol is specified.
private	(Optional) Displays private EIGRP data. This keyword is available when the **eigrp** protocol is specified.

Command Modes

Command History

Release	Modification
Release 7.4.1	This command was introduced.

Usage Guidelines

Use the **show protocols** command to get information about the protocols running on the router and to quickly determine which protocols are active. The command summarizes the important characteristics of the running protocol, and command output varies depending on the specific protocol selected.

For RIP, the command output lists the instance number, default AS context, router ID, default networks, distance, maximum paths, and so on.

Examples

The following is sample output from the **show protocols rip** command:

```
Router# show protocols rip
Routing Protocol RIP
  2 VRFs (including default) configured, 2 active
  25 routes, 16 paths have been allocated
  Current OOM state is "Normal"
  UDP socket descriptor is 37
    VRF              Active   If-config If-active Routes     Paths      Updates
    default          Active   3         3         11         7              30s
```

show rip

To display configuration and status of Routing Information Protocol (RIP), use the **show rip** command in mode.

show rip [**vrf** { **name** | **all** }] [**database** [*IP-address*] | **interface** [*type number*] | **statistics**]

Syntax Description

vrf { *name* | **all** }	(Optional) Specifies a specific VRF instance or all VRF instances associated with the RIP process.
database [*IP-address*]	(Optional) Displays RIP topology table information.
interface [*type number*]	(Optional) Displays RIP interface information for all interfaces, or a specific interface.
statistics	(Optional) Displays RIP statistics information.

Command Default

No default behavior or values

Command Modes

Command History

Release	Modification
Release 7.4.1	This command was introduced.

Usage Guidelines

Pointers on **show rip** command's options:

- **database** *IP-address* - Summary address entries appear in the database only if relevant child routes are summarized. When the last child route for a summary address becomes invalid, the summary address is also removed from the routing table.

Examples

The following example shows sample output from the **show rip** command form:

```
Router# show rip

RIP config:
Active?:                    Yes
Added to socket?:           Yes
Out-of-memory state:        Normal
Version:                    2
Default metric:             Not set
Maximum paths:              4
Auto summarize?:            No
Broadcast for V2?:          No
Packet source validation?:  Yes
NSF:                        Disabled
Timers: Update:             30 seconds (25 seconds until next update)
        Invalid:            180 seconds
        Holddown:           180 seconds
        Flush:              240 seconds
```

This table describes the significant fields shown in the display.

Table 121: show rip Field Descriptions

Field	Description
Active?	Active state setting.
Out-of-memory state	Out-of-memory state for RIP can be one of the following: Normal, Minor, Severe, or Critical.
Version	Version number is 2.
Default metric	Default metric value, if configured. Otherwise Not set.
Maximum paths	Number of maximum paths allowed per RIP route.
Auto summarize?	Auto-summarize state setting.
Broadcast for V2?	RIP Version 2 broadcast setting.
Packet source validation?	Validation setting for the source IP address of incoming routing updates to RIP.
Timers	RIP network timer settings.

The following is sample output from the **show rip database** command form:

```
Router# show rip database

  Routes held in RIP's topology database:
      10.0.0.0/24
          [0]    directly connected, GigabitEthernet0/6/0/0
      10.0.0.0/8    auto-summary
      12.0.0.0/24
          [5] distance: 20    redistributed
      12.0.0.0/8    auto-summary
      50.50.0.0/24
          [1] via 10.0.0.20, next-hop 10.0.0.20, Uptime: 1s, GigabitEthernet0/6/0/0
      50.50.1.0/24 (inactive)
          [1] via 10.0.0.20, next-hop 10.0.0.20, Uptime: 1s, GigabitEthernet0/6/0/0
      50.0.0.0/8    auto-summary
      90.90.0.0/24
          [5] distance: 20    redistributed
      90.90.1.0/24
          [5] distance: 20    redistributed
```

This table describes the significant fields shown in the display.

Table 122: show rip database Field Descriptions

Field	Description
10.0.0.0/24 [0] directly connected, GigabitEthernet0/6/0/0	Prefix and prefix length for a RIP connected route. 10.0.0.0/24 is directly connected to GigabitEthernet 0/6/0/0. The [0] represents the metric.
12.0.0.0/24 [5] distance: 20 redistributed	12.0.0.0/24 is a redistributed route. The metric is 5, and the distance is 20.

Field	Description
50.50.0.0/24 [1] via 10.0.0.20, next-hop 10.0.0.20, Uptime: 1s, GigabitEthernet0/6/0/0	The destination route 50.50.0.0/24 is learned through RIP, and the source 10.0.0.20 advertised it from GigabitEthernet 0/6/0/0. The route was last updated one second ago.
50.50.1.0/24 (inactive) [1] via 10.0.0.20, next hop 10.0.0.20, Uptime: 1s, GigabitEthernet0/6/0/0	The destination route 50.50.1.0/24 is not active in the routing table.

This example is sample output from the **show rip interface** command form:

```
Router# show rip interface

  GigabitEthernet0_6_0_0
  Rip enabled?:               Yes
  Out-of-memory state:        Normal
  Broadcast for V2:           No
  Accept Metric 0?:           No
  Send versions:              2
  Receive versions:           2
  Interface state:            Up
  IP address:                 10.0.0.12/24
  Metric Cost:                0
  Split horizon:              Enabled
  Poison Reverse:             Disabled
  Joined multicast group?:    Yes

  GigabitEthernet0_6_0_2
  Out-of-memory state:        Normal
  Rip enabled?:               Yes
  Broadcast for V2:           No
  Accept Metric 0?:           No
  Send versions:              2
  Receive versions:           2
  Interface state:            Up
  IP address:                 12.0.0.12/24
  Metric Cost:                0
  Split horizon:              Enabled
  Poison Reverse:             Disabled
  Joined multicast group?:    Yes

  RIP peers attached to this interface:
      12.0.0.13
          uptime: 3    version: 2
          packets discarded: 0    routes discarded: 402
```

This table describes the significant fields shown in the display.

Table 123: show rip interface Field Descriptions

Field	Description
Out-of-memory state	Specifies the current out-of-memory state on the interface.
Accept Metric 0?	Specifies whether this interface accepts routing entries from RIP updates with a metric set to zero (0).

Field	Description
Send versions: Receive versions:	Specifies the RIP version used to send and receive packets on the interface.
Joined multicast group?:	Specifies whether the interface has joined the RIP multicast group 224.0.0.9.
RIP peers attached to this interface	Lists the RIP neighbors on this interface, and corresponding details.

Authentication Keychain Configuration for RIP Interface on Default VRF

These examples are output of the **show rip interface** command to display authentication keychain configuration for RIP interface on default VRF.

When an existing keychain with MD5 cryptographic algorithm was configured on the RIP interface:

```
GigabitEthernet0/3/0/3 (Forward Reference)
Rip enabled?:               No
Out-of-memory state:        Normal
Broadcast for V2:           No
Accept Metric 0?:           No
Send versions:              2
Receive versions:           2
Interface state:            Unknown State
IP address:                 0.0.0.0/0
Metric Cost:                0
Split horizon:              Enabled
Poison Reverse:             Disabled
Socket set options:
Joined multicast group?:    No
LPTS filter set?:           No
 Authentication mode: MD5  Key chain: <key-chain-name>
 Current active send  key id: <send key id>
 Current active receive key id: <recv key id>
 Packets received: <num-rx-packets>
 Authenticated packets received: <num-auth-rx-packets>
 Packets dropped due to wrong keychain config: <num-rx-wrong-auth-cfg-pkts>
 Packets received without authentication data: <num-rx-auth-missing-pkt>
 Packets received with invalid authentication: <num-rx-invalid-auth-pkt>
```

When the keychain configured on the RIP interface does not exists or does not have any active keys:

```
GigabitEthernet0/3/0/3 (Forward Reference)
Rip enabled?:               No
Out-of-memory state:        Normal
Broadcast for V2:           No
Accept Metric 0?:           No
Send versions:              2
Receive versions:           2
Interface state:            Unknown State
IP address:                 0.0.0.0/0
Metric Cost:                0
Split horizon:              Enabled
Poison Reverse:             Disabled
Socket set options:
Joined multicast group?:    No
LPTS filter set?:           No

 Authentication mode: MD5  Key chain: <key-chain-name>
 No active key found  in keychain database.
 Packets received: <num-rx-packets>
```

```
 Authenticated packets received: <num-auth-rx-packets>
 Packets dropped due to wrong keychain config: <num-rx-wrong-auth-cfg-pkts>
 Packets received without authentication data: <num-rx-auth-missing-pkt>
 Packets received with invalid authentication: <num-rx-invalid-auth-pkt>
```

When an active key exists in the keychain configured on the RIP interface, but not configured with MD5 cryptographic algorithm:

```
GigabitEthernet0/3/0/3 (Forward Reference)
Rip enabled?:               No
Out-of-memory state:        Normal
Broadcast for V2:           No
Accept Metric 0?:           No
Send versions:              2
Receive versions:           2
Interface state:            Unknown State
IP address:                 0.0.0.0/0
Metric Cost:                0
Split horizon:              Enabled
Poison Reverse:             Disabled
Socket set options:
Joined multicast group?:    No
LPTS filter set?:           No

 Authentication mode: MD5  Key chain: <key-chain-name>
 Key(s) not configured with MD5 cryptographic algorithm.
 Packets received: <num-rx-packets>
 Authenticated packets received: <num-auth-rx-packets>
 Packets dropped due to wrong keychain config: <num-rx-wrong-auth-cfg-pkts>
 Packets received without authentication data: <num-rx-auth-missing-pkt>
 Packets received with invalid authentication: <num-rx-invalid-auth-pkt>
```

When no authentication keychain was configured on the RIP interface:

```
GigabitEthernet0/3/0/3 (Forward Reference)
Rip enabled?:               No
Out-of-memory state:        Normal
Broadcast for V2:           No
Accept Metric 0?:           No
Send versions:              2
Receive versions:           2
Interface state:            Unknown State
IP address:                 0.0.0.0/0
Metric Cost:                0
Split horizon:              Enabled
Poison Reverse:             Disabled
Socket set options:
Joined multicast group?:    No
 LPTS filter set?:           No

Authentication mode is not set.
 Packets received: <num-rx-packets>
```

Authentication keychain Configuration for RIP Interface on Non-default VRF

These examples are output of the **show rip vrf interface** command to display authentication keychain configuration for RIP interface on a non- default VRF.

When an existing keychain with MD5 cryptographic algorithm has been configured on the RIP interface:

```
GigabitEthernet0/3/0/3 (Forward Reference)
Rip enabled?:               No
Out-of-memory state:        Normal
Broadcast for V2:           No
```

```
Accept Metric 0?:           No
Send versions:                2
Receive versions:           2
Interface state:             Unknown State
IP address:                   0.0.0.0/0
Metric Cost:                0
Split horizon:                Enabled
Poison Reverse:             Disabled
Socket set options:
Joined multicast group?:    No
LPTS filter set?:           No

 Authentication mode: MD5  Key chain: <key-chain-name>
 Packets received: <num-rx-packets>
 Authenticated packets received: <num-auth-rx-packets>
 Packets dropped due to wrong keychain config: <num-rx-wrong-auth-cfg-pkts>
 Packets received without authentication data: <num-rx-auth-missing-pkt>
 Packets received with invalid authentication: <num-rx-invalid-auth-pkt>
```

When the keychain configured on the RIP interface does not exist or does not have any active keys:

```
GigabitEthernet0/3/0/3 (Forward Reference)
Rip enabled?:               No
Out-of-memory state:        Normal
Broadcast for V2:           No
Accept Metric 0?:           No
Send versions:              2
Receive versions:           2
Interface state:            Unknown State
IP address:                 0.0.0.0/0
Metric Cost:                0
Split horizon:              Enabled
Poison Reverse:             Disabled
Socket set options:
Joined multicast group?:    No
LPTS filter set?:           No

 Authentication mode: MD5  Key chain: <key-chain-name>
 No active key found  in keychain database.
 Packets received: <num-rx-packets>
 Authenticated packets received: <num-auth-rx-packets>
 Packets dropped due to wrong keychain config: <num-rx-wrong-auth-cfg-pkts>
 Packets received without authentication data: <num-rx-auth-missing-pkt>
 Packets received with invalid authentication: <num-rx-invalid-auth-pkt>
```

When an active key exists in the keychain configured on the RIP interface, but not configured with MD5 cryptographic algorithm:

```
GigabitEthernet0/3/0/3 (Forward Reference)
Rip enabled?:               No
Out-of-memory state:        Normal
Broadcast for V2:           No
Accept Metric 0?:           No
Send versions:              2
Receive versions:           2
Interface state:            Unknown State
IP address:                 0.0.0.0/0
Metric Cost:                0
Split horizon:              Enabled
Poison Reverse:             Disabled
Socket set options:
Joined multicast group?:    No
LPTS filter set?:           No

 Authentication mode: MD5  Key chain: <key-chain-name>
```

```
 Key(s) not configured with MD5 cryptographic algorithm.
 Packets received: <num-rx-packets>
 Authenticated packets received: <num-auth-rx-packets>
 Packets dropped due to wrong keychain config: <num-rx-wrong-auth-cfg-pkts>
 Packets received without authentication data: <num-rx-auth-missing-pkt>
 Packets received with invalid authentication: <num-rx-invalid-auth-pkt>
```

When no authentication keychain has been configured on the RIP interface:

```
GigabitEthernet0/3/0/3 (Forward Reference)
Rip enabled?:               No
Out-of-memory state:        Normal
Broadcast for V2:           No
Accept Metric 0?:           No
Send versions:              2
Receive versions:           2
Interface state:            Unknown State
IP address:                 0.0.0.0/0
Metric Cost:                0
Split horizon:              Enabled
Poison Reverse:             Disabled
Socket set options:
Joined multicast group?:    No
LPTS filter set?:           No

 Authentication mode is not set.
 Packets received: <num-rx-packets>
```

The following is sample output from the **show rip statistics** command form:

```
Router# show rip statistics

  RIP statistics:
      Total messages sent:        5597
      Message send failures:      0
      Regular updates sent:       5566
      Queries responsed to:       0
      RIB updates:                6
      Total packets received:     5743
      Discarded packets:          0
      Discarded routes:           0
      Number of routes allocated: 18
      Number of paths allocated:  14

      Route malloc failures:      0
      Path malloc failures:       0
```

This table describes the significant fields shown in the display.

Table 124: show rip statistics Field Descriptions

Field	Description
RIB updates	Number of route addition and deletion messages sent to RIB.
Number of routes allocated Number of paths allocated	Number of routes or paths allocated for the RIP internal topology database.
Route malloc failures Path malloc failures	Number of route and path failures during route allocation.

Routing Policy Language Commands

Note All commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 540 Series Router that is introduced from Cisco IOS XR Release 6.3.2. References to earlier releases in Command History tables apply to only the Cisco NCS 5500 Series Router.

Note

- Starting with Cisco IOS XR Release 6.6.25, all commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 560 Series Routers.
- Starting with Cisco IOS XR Release 6.3.2, all commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 540 Series Router.
- References to releases before Cisco IOS XR Release 6.3.2 apply to only the Cisco NCS 5500 Series Router.
- Cisco IOS XR Software Release 7.0.1 specific updates are not applicable for the following variants of Cisco NCS 540 Series Routers:
  - N540-28Z4C-SYS-A
  - N540-28Z4C-SYS-D
  - N540X-16Z4G8Q2C-A
  - N540X-16Z4G8Q2C-D
  - N540X-16Z8Q2C-D
  - N540-12Z20G-SYS-A
  - N540-12Z20G-SYS-D
  - N540X-12Z16G-SYS-A
  - N540X-12Z16G-SYS-D

This module describes the Cisco IOS XR software routing policy language (RPL) commands used to create, modify, monitor, and maintain routing policies.

For detailed information about RPL concepts, configuration tasks, and examples, see the Implementing Routing Policy on Cisco NCS 5500 Series Routers module in the *Routing Configuration Guide for Cisco NCS 5500 Series Routers*.

- abort (RPL), on page 738
- add, on page 740
- apply, on page 741
- as-path in, on page 743
- as-path is-local, on page 745
- as-path length, on page 746
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- as-path originates-from, on page 749
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- community is-empty, on page 757
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- extcommunity rt is-empty, on page 785
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abort (RPL)

To discard a route policy or set definition and return to XR Config mode, use the **abort** command in the appropriate configuration mode.

abort

Syntax Description

This command has no keywords or arguments.

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Prefix set configuration

Route distinguisher set configuration

AS path set configuration

Community set configuration

Extended community set configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following example shows how to discard a route policy definition that was started and return to XR Config mode:

```
RP/0/RP0/CPU0:router(config)# route-policy policy_1
RP/0/RP0/CPU0:router(config-rpl)# if as-path is-local then
RP/0/RP0/CPU0:router(config-rpl-if)# abort
RP/0/RP0/CPU0:router(config)#
```

The following example shows how to discard a prefix set definition that was started and return to XR Config mode:

```
RP/0/RP0/CPU0:router(config)# prefix-set legal-ipv4-prefix-examples
RP/0/RP0/CPU0:router(config-pfx)# 10.0.1.1,
RP/0/RP0/CPU0:router(config-pfx)# 10.0.2.0/24,
```

```
RP/0/RP0/CPU0:router(config-pfx)# abort
RP/0/RP0/CPU0:router(config)#
```

add

To add a value to an Routing Information Protocol (RIP) existing metric, use the **add** command in route-policy configuration mode.

add {**rip-metric** {*numberparameter*}}

Syntax Description

rip-metric	Specifies an RIP metric attribute.
number	Value assigned to a four-bit unsigned integer. Range is from 0 to 16.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

If the add value is greater than the maximum allowed value, the metric is added. If the resulting metric exceeds the maximum for the routing protocol, then the route is dropped (by the client routing protocol).

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following example shows how to offset the RIP metric value:

```
RP/0/RP0/CPU0:router(config)# route-policy policy_1
RP/0/RP0/CPU0:router(config-rpl)# add rip-metric 4
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

apply

To execute a parameterized or unparameterized policy from within another policy, use the **apply** command in route-policy configuration mode.

apply *policy_name* [*argument1, argument2, . . . , argumentN*]

Syntax Description

policy_name	Name of a route policy.
argument	(Optional) Parameter name. The *argument* can be a value (for example, '100') or a parameter (for example, '$parameter')

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **apply** command to execute a policy (either parameterized or unparameterized) from within another policy, which allows for the reuse of common blocks of policy.

Wildcards can be used in apply policy names. This supports the nested wildcard apply scenario. A wildcard is specified by inserting an asterisk (*) in place of one of the portions of the apply policy name; the wildcard indicates that any value for that portion of the apply policy name matches. The nested wildcard apply policy allows wildcard (*) based apply nesting. The wildcard operation permits declaration of a generic apply statement that calls all policies that contain a specific defined set of alphanumeric characters, defined on the router.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the policy CustomerIn applies the route-policy SetLocalPref to conditionally set the local preference on a route. The parameters 20, 30, 40, and 50 are passed to the parameterized policy SetLocalPref, where the local preference is set to:

- 20, if the community 217:20 is present in the route
- 30, if the community 217:30 is present in the route
- 40, if the community 217:40 is present in the route
- 50, if the community 217:50 is present in the route

```
RP/0/RP0/CPU0:router(config)# route-policy SetLocalPref ($lp0, $lp1, $lp2, $lp3, $lp4)
RP/0/RP0/CPU0:router(config-rpl)# if community matches-any ($lp0:$lp1)then
RP/0/RP0/CPU0:router(config-rpl-elseif)# set local-preference $lp1
RP/0/RP0/CPU0:router(config-rpl-elseif)# elseif community matches-any ($lp0:$lp2) then
```

```
RP/0/RP0/CPU0:router(config-rpl-elseif)# set local-preference $lp2
RP/0/RP0/CPU0:router(config-rpl-elseif)# elseif community matches-any ($lp0:$lp3) then
RP/0/RP0/CPU0:router(config-rpl-elseif)# set local-preference $lp3
RP/0/RP0/CPU0:router(config-rpl-elseif)# elseif community matches-any ($lp0:$lp4) then
RP/0/RP0/CPU0:router(config-rpl-elseif)# set local-preference $lp4
RP/0/RP0/CPU0:router(config-rpl-elseif)# endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy

RP/0/RP0/CPU0:router(config)# route-policy CustomerIn($cust)
RP/0/RP0/CPU0:router(config-rpl)# apply SetLocalPref ($cust, 20, 30, 40, 50)
RP/0/RP0/CPU0:router(config-rpl)# end-policy

RP/0/RP0/CPU0:router(config)# route-policy Cust_217
RP/0/RP0/CPU0:router(config-rpl)# apply CustomerIn(217)
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

as-path in

To match the AS path of a route to an AS path set, use the **as-path in** command in route-policy configuration mode.

as-path in {*as-path-set-nameinline-as-path-setparameter*}

Syntax Description

as-path-set-name	Name of an AS path set.
inline-as-path-set	Inline AS path set. The inline AS path set must be enclosed in parentheses.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **as-path in** command as a conditional expression within an **if** statement to match the AS path of a route to an AS path set. The AS path is a sequence of autonomous system numbers traversed by a route.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

The **as-path in** command evaluates to true if at least one of the regular expressions defined in the associated AS path set matches the AS path attribute of the route.

In the case where the AS path set is defined but contains no elements in it, the **as-path in** conditional expression command returns false.

Task ID

Task ID	Operations
route-policy	read, write

Examples

For example, assume we have an AS path set named my-as-set defined as follows:

```
RP/0/RP0/CPU0:router(config)# as-path-set my-as-set
RP/0/RP0/CPU0:router(config-as)# ios-regex '_12$',
RP/0/RP0/CPU0:router(config-as)# ios-regex '_13$'
RP/0/RP0/CPU0:router(config-as)# end-set
```

and the following policy excerpt using an *as-path-set-name* argument:

```
RP/0/RP0/CPU0:router(config-rpl)# if as-path in my-as-set then
RP/0/RP0/CPU0:router(config-rpl-if)# set local-preference 100
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)#
```

The AS path in condition evaluates to true if one or more of the regular expression matches in the set my-as-set match the AS path associated with the route. In the case of a defined but empty AS path set, this operator returns false.

The preceding policy excerpt is equivalent to the following version, which uses an *inline-as-path* set variable:

```
RP/0/RP0/CPU0:router(config-rpl)# if as-path in (ios-regex '_12$,ios-regex '_13$') then
RP/0/RP0/CPU0:router(config-rpl-if)# set local-preference 100
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)#
```

as-path is-local

To determine if this router or another router within this autonomous system or confederation originated a Border Gateway Protocol (BGP) route, use the **as-path is-local** command in route-policy configuration mode.

as-path is-local

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **as-path is-local** command as a conditional expression within an **if** statement to determine if this router (or another router within this autonomous system or confederation) originated the route.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

Routes that are locally originated within the autonomous system or confederation carry an empty AS path. For the Border Gateway Protocol (BGP) specification, when a route is advertised across the autonomous system boundary or a confederation boundary, the local autonomous system number or confederation ID is appended to the autonomous system path. The AS path of a locally originated aggregate is also empty unless it has been modified by policy.

The **is-local** operator evaluates to true for autonomous system paths that are empty. An empty AS path is how an AS path that is local to our autonomous system is represented in BGP.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, if the AS path is local, then the local preference is set to 100:

```
RP/0/RP0/CPU0:router(config-rpl)# if as-path is-local then
RP/0/RP0/CPU0:router(config-rpl-if)# set local-preference 100
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)#
```

as-path length

To compare the number of ASN in the AS path of a Border Gateway Protocol (BGP) route, use the **as-path length** command in route-policy configuration mode.

as-path length {**eq** | **is** | **ge** | **le**} {*numberparameter*}

Syntax Description

eq | **is** | **ge** | **le**	Equal to; greater than or equal to; less than or equal to.
number	Value assigned to an 11-bit unsigned integer. Range is from 0 to 2047.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **as-path length** command as a conditional expression within an **if** statement to perform a conditional check based on the length of the AS path.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

This command takes either a specific integer value or a range of integer values specified with the **ge** and **le** operators. Any or all these integers can be parameterized. The operator counts one for each autonomous system in the path. In the case where the route may be aggregated and contain one or more AS sets, the length operator adds one for each set present, the occurrence of an AS set typically indicates that this route is an aggregated route, and the aggregated route had a component route that contained one of the autonomous systems in the set. Likewise, in the case of confederations, a count of one is added for each confederation in the path or each confederation set in the path. A null AS path has a length of zero.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, if the AS path length equals 10, then the local preference is set to 100:

```
RP/0/RP0/CPU0:router(config-rpl)# if as-path length eq 10 then
RP/0/RP0/CPU0:router(config-rpl-if)# set local-preference 100
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)#
```

as-path neighbor-is

To test autonomous system numbers at the head of the AS path against a sequence of one or more values or parameters, use the **as-path neighbor-is** command in route-policy configuration mode.

as-path neighbor-is *as-number-list* [**exact**]

Syntax Description

as-number-list	Numbers or parameters, enclosed in single quotation marks, that represent a sequence of autonomous system numbers. • Range for 2-byte Autonomous system numbers (ASNs) is 1 to 65535. • Range for 4-byte Autonomous system numbers (ASNs) in asplain format is 1 to 4294967295. • Range for 4-byte Autonomous system numbers (ASNs) is asdot format is 1.0 to 65535.65535.
exact	(Optional) Specifies that with the **exact** keyword, the *as-number-list* value must identically match the AS path for the route; without the **exact** keyword, any element in the *as-number-list* argument matches one or more occurrences of that element in the AS path for the route.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **as-path neighbor-is** command as a conditional expression within an **if** statement to test the autonomous system number or numbers at the head of the AS path against a sequence of one or more integral values or parameters. In other words, to test to learn if the sequence of autonomous system numbers matches the path beginning with the neighboring autonomous system from which this route was heard.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

This command has an equivalent regular expression (ios-regex). For example, AS path neighbor-is '**1**' would be '**^1_**'.

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following are incomplete configuration examples:

```
RP/0/RP0/CPU0:router(config-rpl)# if as-path neighbor-is '10' then
RP/0/RP0/CPU0:router(config-rpl-if)# if as-path neighbor-is '$asnum' then
RP/0/RP0/CPU0:router(config-rpl-if)# if as-path neighbor-is '10 20' then
```

These statements evaluate to true when the first autonomous system numbers on the AS path match, in the same order, the supplied parameters or integer values in the **neighbor-is** statement. If the neighboring autonomous system location happens to be an AS-set, the operator evaluates to true if the corresponding argument to the **neighbor-is** operator is an element of the AS-set.

Without the **exact** keyword, repeated autonomous system numbers in the AS path are ignored. For example,

```
RP/0/RP0/CPU0:router(config-rpl)# if as-path neighbor-is '10 20' then
```

matches an AS path beginning

```
10 10 10 20 ...
```

and an AS path beginning:

```
10 20 ....
```

With the **exact** keyword, repetitions are not ignored, therefore

```
RP/0/RP0/CPU0:router(config-rpl)# if as-path neighbor-is '10 20' exact then
```

matches the second of these AS paths but not the first.

as-path originates-from

To compare an AS path against the AS sequence beginning with the AS number that originated a route, use the **as-path originates-from** command in route-policy configuration mode.

as-path originates-from *as-number-list* [**exact**]

Syntax Description

as-number-list	Numbers or parameters, enclosed in single quotation marks, that represent a sequence of autonomous system numbers. • Range for 2-byte Autonomous system numbers (ASNs) is 1 to 65535. • Range for 4-byte Autonomous system numbers (ASNs) in asplain format is 1 to 4294967295. • Range for 4-byte Autonomous system numbers (ASNs) is asdot format is 1.0 to 65535.65535.
exact	(Optional) Specifies that with the **exact** keyword, the *as-number-list* value must identically match the AS path for the route; without the **exact** keyword, any element in the *as-number-list* argument matches one or more occurrences of that element in the AS path for the route.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **as-path originates-from** command as a conditional expression within an **if** statement to compare an AS path to the autonomous system sequence.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

The **originates-from** operator is similar to the **neighbor-is** operator, except that it looks at the autonomous system number at the opposite end of the AS path. In other words, it is comparing to the autonomous system that originated the route. It can take numbers or parameters, enclosed in single quotation marks, that represent a sequence of autonomous system numbers. When more than one number is specified in the list, the sequence of autonomous system numbers listed must appear as a subsequence in the AS path, with the last number corresponding to the autonomous system that originated the route.

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following are incomplete configuration examples:

```
RP/0/RP0/CPU0:router(config-rpl)# if as-path originates-from '10 11' then
RP/0/RP0/CPU0:router(config-rpl-if)# if as-path originates-from '$asnum 11' then
```

The first line of the preceding example evaluates to true if autonomous system 11 originated the route and then advertised it to autonomous system 10, from which the route was eventually propagated to us. In the case where the route has been aggregated, and the location of the originating autonomous system contains an AS-set, the **originates-from** operator evaluates to true if the argument to the **originates-from** operator is contained in the AS-set.

Without the **exact** keyword, repeated autonomous system numbers in the AS path are ignored. For example,

```
RP/0/RP0/CPU0:router(config-rpl)# if as-path originates-from '10 11' then
```

matches an autonomous system path ending

```
...10 10 10 11
```

and an autonomous system path ending

```
...10 11
```

With the **exact** keyword, repetitions are not ignored, therefore

```
RP/0/RP0/CPU0:router(config-rpl)# if as-path originates-from '10 11' exact then
```

matches the second of these autonomous system paths but not the first.

as-path passes-through

To verify if the supplied integer or parameter appears anywhere in the AS path or if the supplied sequence of integers and parameters appears, in the same order, anywhere in the AS path, use the **as-path passes-through** command in route-policy configuration mode.

as-path passes-through *as-number-list* [**exact**]

Syntax Description

as-number-list	Numbers or parameters, enclosed in single quotation marks, that represent a sequence of autonomous system numbers. • Range for 2-byte Autonomous system numbers (ASNs) is 1 to 65535. • Range for 4-byte Autonomous system numbers (ASNs) in asplain format is 1 to 4294967295. • Range for 4-byte Autonomous system numbers (ASNs) is asdot format is 1.0 to 65535.65535.
exact	(Optional) Specifies that with the **exact** keyword, the *as-number-list* value must identically match the AS path for the route; without the **exact** keyword, any element in the *as-number-list* argument matches one or more occurrences of that element in the AS path for the route.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **as-path passes-through** command as a conditional expression within an **if** statement to verify if the specified integer or parameter appears anywhere in the AS path or if the sequence of integers and parameters appears.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

The **passes-through** operator takes a sequence of integers or parameters, enclosed in single quotation marks, as an argument. It can also take a single integer or parameter as an argument. It evaluates to true if the supplied integer or parameter appears anywhere in the AS path, or if the supplied sequence of integers and parameters appears, in the same order, anywhere in the AS path. This includes the **originates-from** or **neighbor-is** location in the AS path.

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following are incomplete configuration examples:

```
RP/0/RP0/CPU0:router(config-rpl)# if as-path passes-through '10' then
RP/0/RP0/CPU0:router(config-rpl-if)# if as-path passes-through '$asnum' then
RP/0/RP0/CPU0:router(config-rpl-if)# if as-path passes-through '10 11' then
RP/0/RP0/CPU0:router(config-rpl-if)# if as-path passes-through '10 $asnum 12' then
```

Without the **exact** keyword, repeated autonomous system numbers in the AS path are ignored. For example:

```
RP/0/RP0/CPU0:router(config-rpl)# if as-path passes-through '9 10 11' then
```

matches an AS path containing

```
...9 10 10 10 11 ....
```

and an AS path containing:

```
...9 10 11...
```

With the **exact** keyword, repetitions are not ignored. Therefore:

```
RP/0/RP0/CPU0:router(config-rpl)# if as-path passes-through '9 10 11' exact then
```

matches the second of these AS paths but not the first.

as-path-set

To create a named AS path set, use the **as-path-set** command in XR Config mode. To remove the named AS path set, use the **no** form of this command.

as-path-set *name*
no **as-path-set** *name*

Syntax Description

name	Name of the AS path set.

Command Default

No default behavior or values

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **as-path-set** command to create a named AS path set.

An AS path set comprises operations for matching an AS path attribute.

This command enters AS path set configuration mode, in which you can use any of the below option to specify an operation.

Options	Description
dfa-regex	Indicates the DFA (deterministic finite automata) style regular expression. It performs better for complex regular expressions. Single quotation marks are required around the regular expression.
ios-regex	Indicates the traditional IOS style regular expression. It performs better with simpler regular expressions. Single quotation marks are required around the regular expression.
length	Indicates the number of ASN (Autonomous System Number) in the AS path of a Border Gateway Protocol (BGP) route.
neighbor-is	Indicates the neighbor's AS-path number that can be matched with.
originates-from	Indicates the BGP AS from which the route originated.
passes-through	Indicates if the supplied integer or parameter appears anywhere in the AS path, or if the supplied sequence of integers and parameters appear, in the same order, anywhere in the AS path.

Options	Description
unique-length	Indicates the length of BGP AS-path, ignoring duplicates.

The above options can also be used as an inline set in a parenthesized list of comma-separated expressions.

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following is a sample definition of an AS path set named aset1. This AS path set is composed of two elements. When used in a matching operation, this AS path set matches any route whose AS path ends with either the autonomous system number 42 or 127.

```
RP/0/RP0/CPU0:router(config)# as-path-set aset1
RP/0/RP0/CPU0:router(config-as)# ios-regex '_42$',
RP/0/RP0/CPU0:router(config-as)# ios-regex '_127$'
RP/0/RP0/CPU0:router(config-as)# end-set
```

The following is a sample of the as-path options used as an inline set.

```
RP/0/RP0/CPU0:router(config-rpl)# if as-path in (ios-regex '_42$', ios-regex$ '_127$')
RP/0/RP0/CPU0:router(config-rpl-if)# pass
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)#
```

as-path unique-length

To perform specific checks based on the length of the AS path (match against the number of unique ASNs in the AS path), use the **as-path unique-length** command in route-policy configuration mode.

as-path unique-length {**eq** | **is** | **ge** | **le**} {*numberparameter*}

Syntax Description

eq | **is** | **ge** | **le**	Equal to; greater than or equal to; less than or equal to.
number	Value assigned to an 11-bit unsigned integer. Range is from 0 to 2047.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **as-path unique-length** command as a conditional expression within an **if** statement to perform a match based on the length of the AS path.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

The **unique-length** operator is similar to the length operator, except that when an AS path has been padded with the same autonomous system number multiple times, the operator counts only one when the route is padded. Therefore, given an AS path of 333 333 111 222 123 444 444 444, the **unique-length** operator would return a value of 5, whereas the length operator would return a value of 8.

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following example shows show to perform checks based on the AS path length. If the AS path matches the specified values, the local preference is set to 100:

```
RP/0/RP0/CPU0:router(config-rpl)# if as-path unique-length eq 10 then
RP/0/RP0/CPU0:router(config-rpl-if)# if as-path unique-length ge 10 then
RP/0/RP0/CPU0:router(config-rpl-if)# if as-path unique-length le 10 then

RP/0/RP0/CPU0:router(config-rpl)# if as-path unique-length eq $integerparam then
RP/0/RP0/CPU0:router(config-rpl-if)# if as-path unique-length ge $geparam then
RP/0/RP0/CPU0:router(config-rpl-if)# if as-path unique-length le $leparam then
```

```
RP/0/RP0/CPU0:router(config-rpl)# set local-preference 100
RP/0/RP0/CPU0:router(config-rpl)# endif
```

community is-empty

To check if a route has no community attributes associated with it, use the **community is-empty** command in route-policy configuration mode.

community is-empty

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **community is-empty** command as a conditional expression within an **if** statement to check if a route has community attributes associated with it.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

This command takes no arguments and evaluates to true only if the route has no community attributes associated with it.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, if the route has no community attributes associated with it, then the local preference is set to 100:

```
RP/0/RP0/CPU0:router(config-rpl)# if community is-empty then
RP/0/RP0/CPU0:router(config-rpl-if)# set local-preference 100
RP/0/RP0/CPU0:router(config-rpl-if)# endif
```

community matches-any

To match any elements of a community set, use the **community matches-any** command in route-policy configuration mode.

community matches-any {*community-set-nameinline-community-setparameter*}

Syntax Description

community-set-name	Name of a community set.
inline-community-set	Inline community set. The inline community set must be enclosed in parentheses.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **community matches-any** command as a conditional expression within an **if** statement to match any element of a community set.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

A simple condition using the **matches-any** operator evaluates as true if at least one community element of the community attribute for the route matches an element in the community set operand. If no community in the route matches any of the specifications in the named or inline set, then the condition evaluates to false. Likewise, when there is no community at all in the route, the condition evaluates to false.

Matching of a community in the route to a specification in a named or an inline set is intuitive. If the community specification in a set is the familiar colon-separated decimal 16-bit numbers specification, or one of the well-known communities, the community matches the specification if the specification denotes the same 32-bit number as that in the route. If the community specification uses a wildcard, then the community in the route matches if it is one of the many communities denoted by the wildcard specification. In inline sets, community specifications may be parameterized, in which case the relevant matching is done when the value of the parameter has been supplied.

Communities may also be matched using range and regular expression operators. Range specifications are entered as follows: [*low-value* .. *high-value*]. Either or both colon-separated halves of a community value may contain a range. The following are valid range specifications:

```
10:[100..1000]
[10..100]:80
[10..100]:[100..2000]
```

In addition, the **private-as** keyword may be used to specify the range from 64512 to 65534. Regular expressions are specified as the **ios-regex** keyword followed by a valid regular expression string.

Community values from the route are matched one at a time to the match specifications. Therefore, regex match specifications are expected to represent one individual community value and not a sequence of community values.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, a named community set called my-community-set and a route policy called community-matches-any-example are created. The policy sets the local-preference to 100 for any route that has one or more of the communities in the my-community-set community set. If the route does not have any of these communities, the policy checks whether it has any communities whose first half is in the range from 10 to 25 and whose second half is the value 35, in which case it sets the local-preference to 200. Otherwise, it checks for a community value in the range of 30:100 to 30:500, in which case it sets the local-preference to 300.

```
RP/0/RP0/CPU0:router(config)# community-set my-community-set
RP/0/RP0/CPU0:router(config-comm)# 10:20,
RP/0/RP0/CPU0:router(config-comm)# 10:30,
RP/0/RP0/CPU0:router(config-comm)# 10:40
RP/0/RP0/CPU0:router(config-comm)# end-set

RP/0/RP0/CPU0:router(config)# route-policy community-matches-any-example
RP/0/RP0/CPU0:router(config-rpl)# if community matches-any my-community-set then
RP/0/RP0/CPU0:router(config-rpl-if)# set local-preference 100
RP/0/RP0/CPU0:router(config-rpl-if)# elseif community matches-any ([10..25]:35) then
RP/0/RP0/CPU0:router(config-rpl-elseif)# set local-preference 200
RP/0/RP0/CPU0:router(config-rpl-elseif)# elseif community matches-any (30:[100..500])
then
RP/0/RP0/CPU0:router(config-rpl-elseif)# set local-preference 300
RP/0/RP0/CPU0:router(config-rpl-elseif)# endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

community matches-every

To match every element of a community set, use the **community matches-every** command in route-policy configuration mode.

community matches-every {*community-set-nameinline-community-setparameter*}

Syntax Description

community-set-name	Name of a community set.
inline-community-set	Inline community set. The inline community set must be enclosed in parentheses.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **community matches-every** command as a conditional expression within an **if** statement to match every element of a community set.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

A simple condition using the **matches-every** operator evaluates as true if every specification in the named set or inline set specified matches at least one community value in the route. If any community specification in the named or inline set is not matched, then the operation evaluates to false.

Matching of a community in the route to a specification in a named or an inline set is intuitive. If the community-specification in a set is the familiar colon-separated decimal 16-bit numbers specification, or one of the well-known communities, the community matches the specification if the specification denotes the same 32-bit number as that in the route. If the community specification uses a wildcard, then the community in the route matches if it is one of the many communities denoted by the wildcard specification. In inline sets, community specifications may be parameterized, in which case the relevant matching is done when the value of the parameter has been supplied.

Communities may also be matched using range and regular expression operators. Range specifications are entered as follows: [*low-value* .. *high-value*]. Either or both colon-separated halves of a community value may contain a range. The following are valid range specifications:

```
10:[100..1000]
[10..100]:80
[10..100]:[100..2000]
```

Therefore, a **matches-every** operation with two community range specifications means that a community must be present in the route that corresponds to each range. For example, in the following statement:

```
if community matches-every (10:[100..200],20:[100..200]) then
```

the statement evaluates as true if one or more communities in the route lie in the range 10:[100.200] and one or more communities in the route lie in the range 20:[100..200].

In addition, the **private-as** keyword may be used to specify the range from 64512 to 65534.

Regular expressions are specified as the **ios-regex** keyword followed by a valid single-quoted regular expression string. Community values from the route are matched one at a time against the match specifications. Therefore, regex match specifications are expected to represent one individual community value and not a sequence of community values.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the route policy named community-matches-every-example sets the local-preference value to 100 for all routes that have all three communities in the my-community-set community set. Routes that do not have all three communities but have a community that matches the first regular expression match have the local-preference value set to 200. Finally, any remaining routes that match the last regular expression have the local-preference values set to 300.

```
RP/0/RP0/CPU0:router(config)# community-set my-community-set
RP/0/RP0/CPU0:router(config-comm)# 10:20,
RP/0/RP0/CPU0:router(config-comm)# 10:30,
RP/0/RP0/CPU0:router(config-comm)# 10:40
RP/0/RP0/CPU0:router(config-comm)# end-set

RP/0/RP0/CPU0:router(config)# route-policy community-matches-every-example
RP/0/RP0/CPU0:router(config-rpl)# if community matches-every my-community-set then
RP/0/RP0/CPU0:router(config-rpl-if)# set local-preference 100
RP/0/RP0/CPU0:router(config-rp-elseif)# elseif community matches-every (ios-regex
'_10:[0-9]0_') then
RP/0/RP0/CPU0:router(config-rpl-elseif)# set local-preference 200
RP/0/RP0/CPU0:router(config-rpl-elseif)# elseif community matches-every
(ios-regex'_20:[0-9]0_') then
RP/0/RP0/CPU0:router(config-rpl-elseif)# set local-preference 300
RP/0/RP0/CPU0:router(config-rpl-elseif)# endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

community matches-within

To configure a route policy to match within a community set, use the **community matches-within** command in route-policy configuration mode.

`community matches-within` { *community-set-name or inline-community-set* | `parameter` }

Syntax Description

community-set-name	Name of a community set.
inline-community-set	Inline community set. The inline community set must be enclosed in parentheses.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Task ID

Task ID	Operations
route-policy	read, write

Command History

Release	Modification
Release 6.3.1	This command was introduced.

Usage Guidelines

This command is similar to the **community matches-any** command, but every community in the route must match at least one match specification. If the route has no communities, then it matches.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

Task ID

Task ID	Operations
route-policy	read, write

The following example shows how to configure a route policy to match within the elements of a community set.

```
RP/0/RP0/CPU0:router#config
RP/0/RP0/CPU0:router(config)#route-policy bob
RP/0/RP0/CPU0:router(config-rpl)#if community matches-within (*:3, 5:*) then
RP/0/RP0/CPU0:router(config-rpl)#set local-preference 94
RP/0/RP0/CPU0:router(config-rpl)#endif
RP/0/RP0/CPU0:router(config-rpl)#end-policy
```

For example, routes with these sets of communities return TRUE:

- (1:3, 5:10)
- (5:3)
- (2:3, 6:3, 4:3)

Routes with the following set of communities return FALSE:

(1:3, 5:10, 6:5) —The community (6:5) does not match

community-set

To define a community set, use the **community-set** command in XR Config mode. To remove the community set, use the **no** form of this command.

community-set *name*
no community-set *name*

Syntax Description

name	Name of the community set.

Command Default

No default behavior or values

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Regular expressions and ranges can be specified to match the communities. An attempt to use a community set that contains a range or regular expression to set a community value is rejected when an attempt to attach such a policy is made.

A community set holds community values for matching against the Border Gateway Protocol (BGP) community attribute. A community is a 32-bit quantity. For notational convenience, each community value must be split in half and expressed as two unsigned decimal integers in the range from 0 to 65535, separated by a colon.

The inline form of a community set also supports parameterization. Each 16-bit portion of the community may be parameterized.

The routing policy language (RPL) provides symbolic names for the standard well-known community values: **accept-own** is 0xFFFF0001, **internet** is 0:0, **no-export** is 65535:65281, **no-advertise** is 65535:65282, and **local-as** is 65535:65283.

RPL also provides a facility for using wildcards in community specifications. A wildcard is specified by inserting an asterisk (*) in place of one of the 16-bit portions of the community specification, which indicates that any value for that portion of the community matches.

Every community set must contain at least one community value. An empty community set is invalid and the policy configuration system rejects it.

Community sets can be entered in these formats:

Format	Description
#-remark	Remark beginning with '#'
*****	Wildcard (any community or part thereof)
0-65535	16-bit half-community number
[	Left bracket to begin range
accept-own	Accept-Own (BGP well-known community)

Format	Description
dfa-regex	DFA (deterministic finite automata) style regular expression
internet	Internet (BGP well-known community)
ios-regex	Traditional IOS style regular expression
local-AS	Do not send outside local AS (BGP well-known community)
no-advertise	Do not advertise to any peer (BGP well-known community)
no-export	Do not export to next AS (BGP well-known community)
private-as	Match within BGP private AS range [64512..65534]

Note The dfa-regex and ios-regex syntax for community set is *"[']*[^':&<>]*:[^':&<>]*[']"*. This means that regex starts with a single-quote (') followed by a string of any character (that does not include single-quote, colon, ampersand, less-than, greater-than, or space) followed by a colon, and a string of any characters (that does not include single-quote, colon, ampersand, less-than, greater-than, or space) followed by single-quote.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, a community set named cset_accept_own is created:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#community-set cset_accept_own
RP/0/RP0/CPU0:router(config-comm)#accept-own
RP/0/RP0/CPU0:router(config-comm)#end-set
```

In the following example, a community set named cset1 is created:

```
RP/0/RP0/CPU0:router(config)# community-set cset1
RP/0/RP0/CPU0:router(config-comm)# 12:34,
RP/0/RP0/CPU0:router(config-comm)# 12:56,
RP/0/RP0/CPU0:router(config-comm)# 12:78,
RP/0/RP0/CPU0:router(config-comm)# internet
RP/0/RP0/CPU0:router(config-comm)# end-set
```

In the following example, a community set named cset2 is created:

```
RP/0/RP0/CPU0:router(config)# community-set cset2
RP/0/RP0/CPU0:router(config-comm)# 123:456,
RP/0/RP0/CPU0:router(config-comm)# no-advertise,
```

```
RP/0/RP0/CPU0:router(config-comm)# end-set
```

In the following example, a community set named cset3 is created. This policy uses wildcards and matches all communities where the autonomous system part of the community is 123.

```
RP/0/RP0/CPU0:router(config)# community-set cset3
RP/0/RP0/CPU0:router(config-comm)# 123:*
RP/0/RP0/CPU0:router(config-comm)# end-set
```

delete community

To delete community attributes associated with a Border Gateway Protocol (BGP) route, use the **delete community** command in route-policy configuration mode.

delete community {**all** | **in** {*community-set-nameinline-community-setparameter*} | **not in** {*community-set-nameinline-community-setparameter*}}

Syntax Description

all	Removes all communities except the well-known communities.
in	Removes any communities associated with the route that are listed in either the named community set or the inline community set.
community-set-name	Name of a community set.
inline-community-set	Inline community set. The inline community set must be enclosed in parentheses.
parameter	Parameter name. The parameter name must be preceded with a "$."
not in	Removes all communities that are not listed in either the named community set or the inline community set, and are not well-known communities.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **delete community** command to delete community attributes associated with a BGP route.

Note The **delete community** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

Communities are 32-bit values carried in Border Gateway Protocol (BGP) routes. Each route may have zero or more communities in an unordered list.

You can remove a well-known community (internet, no-export, no-advertise, or local-as) from a route, but this removal must be done explicitly. This command should be used with a degree of caution. In general, few circumstances exist in which you would need to remove a well-known community.

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following example shows how to delete any communities associated with the routes that are listed in either the named community set or inline community set, respectively.

```
RP/0/RP0/CPU0:router(config-rpl)# delete community in my_community_set
RP/0/RP0/CPU0:router(config-rpl)# delete community in (10:[0..50],20:[60..80])
```

The following example shows how to remove all communities including well-known communities.

```
RP/0/RP0/CPU0:router(config-rpl)# delete community in (internet, no-export, no-advertise,
local- as, *:*)
```

The following example shows how to remove all communities except for the well-known communities.

```
RP/0/RP0/CPU0:router(config-rpl)# delete community all
```

The following example shows how to delete the well-known community value internet from a route:

```
RP/0/RP0/CPU0:router(config-rpl)# delete community in (internet)
```

delete extcommunity rt

To delete route target (RT) extended community attributes associated with a Border Gateway Protocol (route), use the **delete extcommunity rt** command in route-policy configuration mode.

delete extcommunity rt {**all** | **in** {*extcommunity-set-nameinline-extcommunity-setparameter*} | **not in** {*extcommunity-set-nameinline-extcommunity-setparameter*}}

Syntax Description

all	Removes all extended communities.
in	Removes any extended communities associated with the routes that are listed in either the named extended community set or the inline extended community set.
extcommunity-set-name	Name of an extended community set.
inline-extcommunity-set	Inline extended community set. The inline extended community set must be enclosed in parentheses.
parameter	Parameter name. The parameter name must be preceded with a "$."
not in	Removes all extended communities that are not listed in either the named extended community set or the inline extended community set, and are not well-known extended communities.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **delete extcommunity rt** command to delete extended community values from a BGP route target extended community list in a route.

Note The **delete extcommunity rt** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

Extended communities are similar to regular Border Gateway Protocol (BGP) communities but contain more data and have a richer structure for encoding information in them.

Extended communities can be in the following forms: SoO:AS:tag, SoO:IP:tag, RT:AS:tag, or RT:IP:tag.

Wildcards (*) and regular expressions are allowed for extended community set elements.

The forms of this command that take a named extended community set or an inline extended community set value as arguments are equivalent. They delete any extended communities that are listed in either the named set or the inline set, respectively.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, all extended communities are deleted:

```
RP/0/RP0/CPU0:router(config-rpl)# delete extcommunity rt all
```

In this example, any extended communities that are listed in my-extcommunity-set are deleted:

```
RP/0/RP0/CPU0:router(config-rpl)# delete extcommunity rt in my-extcommunity-set
```

In this example, extended communities associated with the route listed in the named inline extended community sets are deleted:

```
RP/0/RP0/CPU0:router(config-rpl)# delete extcommunity rt in (67:29, 67:55)
```

delete large-community

To delete the specified large-communities from a route policy, use the **delete large-community** command in the route-policy configuration mode.

```
delete large-community {all |[not] in {named or inline-large-community-set |
parameter}}
```

Syntax Description

all	Removes all large communities.
in	Removes any large communities associated with the route that are listed in either the named large community set or the inline large community set.
large-community-set-name	Name of a large community set.
inline-large-community-set	Inline large community set. The inline community set must be enclosed in parentheses.
parameter	Parameter name. The parameter name must be preceded with a "$."
not	Removes all communities that are not listed in either the named large community set or the inline large community set.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.3.1	This command was introduced.

Usage Guidelines

The large communities are specified as three non negative decimal integers separated by colons. For example, 1:2:3. Each integer is stored in 32 bits. The possible range for each integer is 0 to 4294967295.

In route-policy statements, each integer in the BGP large community can be replaced by any of the following expressions:

- [x..y] — This expression specifies a range between x and y, inclusive.
- * — This expression stands for any number.
- peeras — This expression is replaced by the AS number of the neigbhor from which the community is received or to which the community is sent, as appropriate.
- not-peeras — This expression matches any number other than the peeras.
- private-as — This expression specifies any number in the private ASN range: [64512..65534] and [4200000000..4294967294].

Note The peeras and not-peeras expressions can only be used in delete statements that appear in route policies that are applied at the neighbor-in or neighbor-out attach points.

IOS regular expression (ios-regex) and DFA style regular expression (dfa-regex) can be used in the delete statements. For example, the IOS regular expression ios-regex '^5:.*:7$' is equivalent to the expression 5:*:7.

Task ID

Task ID	Operations
route-policy	read, write

The following example shows how to delete specified BGP large-community from a route policy using the delete large-community command.

```
RP/0/RP/0/RP0/CPU0:router#config
RP/0/RP0/CPU0:router(config)#route-policy lrg_comm_rp2S
RP/0/RP0/CPU0:router(config-rpl)#delete large-community in (ios-regex '^100000:')
RP/0/RP0/CPU0:router(config-rpl)#delete large-community not in (peeras:*:*, 41289:*:*)
RP/0/RP0/CPU0:router(config-rpl)#delete large-community in catbert
RP/0/RP0/CPU0:router(config-rpl)#end-policy
```

destination in

To match a destination entry in a named prefix set or inline prefix set, use the **destination in** command in route-policy configuration mode.

destination in {*prefix-set-nameinline-prefix-setparameter*}

Syntax Description

prefix-set-name	Name of a prefix set.
inline-prefix-set	Inline prefix set. The inline prefix set must be enclosed in parentheses.
parameter parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **destination in** command as a conditional expression within an **if** statement to match a destination entry in a named prefix set or inline prefix set.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

This command takes either a named prefix set or an inline prefix set value as an argument. The condition returns true if the destination entry matches any entry in the prefix set or inline prefix set. An attempt to match a destination using a prefix set that is defined but contains no elements returns false.

The routing policy language (RPL) provides the ability to test destinations for a match to a list of prefix match specifications using the **in** operator. The **destination in** command is protocol-independent.

In Border Gateway Protocol (BGP), the destination of a route is also known as its network-layer reachability information (NLRI). It comprises a prefix value and a mask length.

RPL supports both 32-bit IPv4 prefixes, specified in dotted-decimal format, and 128-bit IPv6 prefixes, specified in colon-separated hexadecimal format.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, a prefix set named my-prefix-set is defined and a route policy named use-destination-in is created. Within the use-destination-in route policy, the **destination in** command

is used within an **if** statement to learn if the destination is in the prefix-set named my-prefix-set. If it is, then local preference is set to 100. If it is not in my-prefix-set but does match the next prefix specifications, then local preference is set to 200.

```
RP/0/RP0/CPU0:router(config)# prefix-set my-prefix-set
RP/0/RP0/CPU0:router(config-pfx)# 10.0.0.1/32,
RP/0/RP0/CPU0:router(config-pfx)# fe80::203:0:0:0/64,
RP/0/RP0/CPU0:router(config-pfx)# 10.0.0.2/24 le 32
RP/0/RP0/CPU0:router(config-pfx)# end-set

RP/0/RP0/CPU0:router(config)# route-policy use-destination-in
RP/0/RP0/CPU0:router(config-rpl)# if destination in my-prefix-set then
RP/0/RP0/CPU0:router(config-rpl-if)# set local-preference 100
RP/0/RP0/CPU0:router(config-rpl-if)# elseif destination in (10.0.0.1/32, 10.0.0.2/24 le
32) then
RP/0/RP0/CPU0:router(config-rpl-elseif)# set local-preference 200
RP/0/RP0/CPU0:router(config-rpl-elseif)# endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

In the following example, a prefix set named ipv6-prefix-set is defined and a route policy named ipv6-destination-in is created. Within the ipv6-destination-in route policy, the **destination in** command is used within an **if** statement to learn if the destination is in the prefix-set named ipv6-prefix-set. If it is, then the next-hop is set to 2001:abcd:fedc::1. If it is not in ipv6-prefix-set but does match the next prefix specifications, then the next-hop is set to 1111:2222:3333:4444:5555:6666:7777:8888.

```
RP/0/RP0/CPU0:router(config)# prefix-set ipv6-prefix-set
RP/0/RP0/CPU0:router(config-pfx)# 2001:0:0:1::/64,
RP/0/RP0/CPU0:router(config-pfx)# 2001:0:0:2::/64,
RP/0/RP0/CPU0:router(config-pfx)# 2001:0:0:3::/64,
RP/0/RP0/CPU0:router(config-pfx)# 2001:0:0:4::/64
RP/0/RP0/CPU0:router(config-pfx)# end-set

RP/0/RP0/CPU0:router(config)# route-policy ipv6-destination-in
RP/0/RP0/CPU0:router(config-rpl)# if destination in ipv6-prefix-set then
RP/0/RP0/CPU0:router(config-rpl-if)# set next-hop 2001:abcd:fedc::1
RP/0/RP0/CPU0:router(config-rpl-if)# elseif destination in (2001::1, 2002:1:2:3::/64)
then
RP/0/RP0/CPU0:router(config-rpl-elseif)# set next-hop
1111:2222:3333:4444:5555:6666:7777:8888
RP/0/RP0/CPU0:router(config-rpl-elseif)# endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

done

To stop executing a policy and accept the route, use the **done** command in route-policy configuration mode.

done

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **done** command to stop executing the policy and accept the route.

Note The **done** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

When encountering a **done** statement the route is passed and no further policy statements are executed. All modifications made to the route prior to the **done** statement are still valid.

Note The default action of a route policy is to drop or discard any routes that have not been either explicitly passed or for which no attempt has been made to modify with an action. The routing policy language (RPL) does not have specific "match clauses," which means the default drop behavior is controlled by whether a route has been explicitly passed or an attempt has been to modify the route using an action statement.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, if the destination match succeeds for 29.0.0.0/8 le 32, the execution continues past set community 102:12 and onto the next statement. If the destination match succeeds for 39.0.0.0/8 le 32 execution, then the policy execution stops when in encounters the *done* statement.

```
RP/0/RP0/CPU0:router(config)# route-policy done_st_example
RP/0/RP0/CPU0:router(config-rpl)# if destination in (29.0.0.0/8 le 32) then
RP/0/RP0/CPU0:router(config-rpl-if)# set community 102:12
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)# if destination in (39.0.0.0/8 le 32) then
RP/0/RP0/CPU0:router(config-rpl-if)# set community 102:39
RP/0/RP0/CPU0:router(config-rpl-if)# done
```

```
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)# if destination in (49.0.0.0/8 le 32) then
RP/0/RP0/CPU0:router(config-rpl-if)# set community 102:49
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)# if destination in (59.0.0.0/8 le 32) then
RP/0/RP0/CPU0:router(config-rpl-if)# set community 102:59
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

drop

To discard a route, use the **drop** command in route-policy configuration mode.

drop

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **drop** command within a route policy to drop a route.

Note The **drop** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

This command causes the route to be dropped. After a route is dropped, no further execution of policy occurs. Therefore, if after executing the first two statements of a policy the **drop** statement is encountered, the route is discarded and execution stops immediately even when the policy contains further statements.

Note The default action of a route policy is to drop or discard any routes that have not been either explicitly passed or attempted to be modified with an action. The routing policy language (RPL) does not have specific "match clauses," which means the default drop behavior is controlled by whether a route has been explicitly passed or an attempt has been to modify the route using an action statement.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, any route with a destination address contained within the prefix set pset1 is dropped:

```
RP/0/RP0/CPU0:router(config-rpl)# if destination in pset1 then
RP/0/RP0/CPU0:router(config-rpl-if)# drop
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)#
```

edit

To edit the contents of a route policy, a prefix set, an AS path set, a community set, or an extended community set, use the **edit** command in XR EXEC mode.

edit {**route-policy** | **prefix-set** | **as-path-set** | **community-set** | **extcommunity-set** {**rt** | **soo**} | **policy-global** | **rd-set**} *name* [**nano** | **emacs** | **vim** | **inline** {**add** | **prepend** | **remove**} *set-element*]

Syntax Description

route-policy	Edits the contents of a route policy.
prefix-set	Edits the contents of a prefix set.
as-path-set	Edits the contents of an AS path set.
community-set	Edits the contents of a community set.
extcommunity-set	Edits the contents of an extended community set of the specified type.
rt	Edits the BGP route target (RT) extended community.
soo	Edits the BGP site of origin (SoS) extended community.
policy-global	Edits the contents of policy-global definitions.
rd-set	Edits the contents of a route-distinguisher set.
name	Name of a route policy, a prefix set, an AS path set, a community set, or an extended community set, RD set, or global parameters.
nano	(Optional) Uses GNU Nano text editor.
emacs	(Optional) Uses Micro Emacs editor.
vim	(Optional) Uses VI Improved editor.
inline	(Optional) Uses the command line.
add	Appends the element to the set.
prepend	Prepends the element to the set.
remove	Removes the element from the set.
set-element	Value of the set element. **Note** To inline edit multiple set elements separated with comma, use quotes to club the entries as a single argument. Example: `edit extcommunity-set rt rt_set inline add "4:4,5:4"`

Command Default

Default editor is GNU vim text editor

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.
Release 7.11.1	The **Nano** and **Emacs** keyword was deprecated.

Usage Guidelines

Use the **edit** command to edit the contents of a route policy, a prefix set, an AS path set, a community set, an extended community set, a global policy, or a route destination set.

After editing with Nano, save the edit buffer and exit the editor using the Ctrl-X keystroke.

After editing with Emacs, save the editor buffer by using the Ctrl-X and Ctrl-S keystrokes. To save and exit the editor, use the Ctrl-X and Ctrl-C keystrokes.

After editing with VIM, to write to a current file and exit use the :wq or :x or ZZ keystrokes. To quit and confirm, use the :q keystrokes. To quit and discard changes, use the :q! keystrokes.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the policy_A policy is opened in the editor:

```
RP/0/RP0/CPU0:router# edit route-policy policy_A

----------------------------------------
== MicroEMACS 3.8b () == rpl_edit.139281 ==
  if destination in (2001::/8) then
    drop
  endif
end-policy
!

== MicroEMACS 3.8b () == rpl_edit.139281 ==
Parsing.
83 bytes parsed in 1 sec (82)bytes/sec
Committing.
1 items committed in 1 sec (0)items/sec
Updating.
Updated Commit database in 1 sec
```

If there are parse errors, you are asked whether editing should continue:

```
RP/0/RP0/CPU0:router#edit route-policy policy_B
== MicroEMACS 3.8b () == rpl_edit.141738
route-policy policy_B
 set metric-type type_1
 if destination in (2001::/8) then
    drop
  endif
end-policy
!
== MicroEMACS 3.8b () == rpl_edit.141738 ==
Parsing.
```

```
105 bytes parsed in 1 sec (103)bytes/sec

% Syntax/Authorization errors in one or more commands.!! CONFIGURATION
FAILED DUE TO SYNTAX/AUTHORIZATION ERRORS
 set metric-type type_1
 if destination in (2001::/8) then
    drop
  endif
end-policy
!

Continue editing? [no]:
```

If you answer **yes** , the editor continues on the text buffer from where you left off. If you answer **no**, the running configuration is not changed and the editing session is ended.

After the policy is opened, it may be manipulated using normal editor commands, then saved and committed to the running configuration.

end-global

To end the definition of global parameters and exit global parameter configuration mode, use the **end-global** command in global parameter configuration mode.

end-global

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

Global parameter configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **end-global** command to end the definition of global parameters and exit global parameter configuration mode.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the **end-global** command ends the definition of global parameters:

```
RP/0/RP0/CPU0:router(config)#policy-global
RP/0/RP0/CPU0:router(config-rp-gl)# glbpathtype 'ebgp'
RP/0/RP0/CPU0:router(config-rp-gl)# glbtag '100'
RP/0/RP0/CPU0:router(config-rp-gl)# end-global
```

end-policy

To end the definition of a route policy and exit route-policy configuration mode, use the **end-policy** command in route-policy configuration mode.

end-policy

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **end-policy** command to end the definition of a route policy and exit route-policy configuration mode.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the **end-policy** command ends the definition of a route policy:

```
RP/0/RP0/CPU0:router(config)#route-policy med-to-local-pref
RP/0/RP0/CPU0:router(config-rpl)#if med eq 150 then
RP/0/RP0/CPU0:router(config-rpl-if)# set local-preference 10
RP/0/RP0/CPU0:router(config-rpl-if)# elseif med eq 200 then
RP/0/RP0/CPU0:router(config-elseif)# set local-preference 60
RP/0/RP0/CPU0:router(config-elseif)# elseif med eq 250 then
RP/0/RP0/CPU0:router(config-elseif)# set local-preference 0

RP/0/RP0/CPU0:router(config-elseif)# endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

end-set

To end the definition of an AS path set, a prefix set, a community set, an extended community set, or an RD set and return to XR Config mode, use the **end-set** command in route-policy configuration mode.

end-set

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

AS path set configuration

Prefix set configuration

Community set configuration

Extended community set configuration

Route distinguisher set configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **end-set** command to end the definition of an AS path set, a prefix set, a community set, or an extended community set.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the **end-set** command ends the definition of an AS path set named aset1:

```
RP/0/RP0/CPU0:router(config)# as-path-set aset1
RP/0/RP0/CPU0:router(config-as)# ios-regex '_42$',
RP/0/RP0/CPU0:router(config-as)# ios-regex '_127$'

RP/0/RP0/CPU0:router(config-as)# end-set
RP/0/RP0/CPU0:router(config)#
```

The following example shows how to create an RD set called my_rd_set and use the **end-set** command to end the definition:

```
RP/0/RP0/CPU0:router(config)# rd-set my_rd_set
RP/0/RP0/CPU0:router(config-rd)# 172.16.0.0/16:*,
RP/0/RP0/CPU0:router(config-rd)# 172.17.0.0/16:100,
RP/0/RP0/CPU0:router(config-rd)# 192:*,
RP/0/RP0/CPU0:router(config-rd)# 192:100
```

```
RP/0/RP0/CPU0:router(config-rd)# end-set
```

extcommunity rt is-empty

To check if a Border Gateway Protocol (BGP) route has route target (RT) extended community attributes associated with it, use the **extcommunity rt is-empty** command in route-policy configuration mode.

extcommunity rt is-empty

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or value

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **extcommunity rt is-empty** command as a conditional expression within an **if** statement to check if a BGP route has extended community attributes associated with it.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

The **is-empty** operator takes no arguments and evaluates to true if the route has no extended community attributes associated with it.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, if the extended community is empty, then the local preference is set to 100:

```
RP/0/RP0/CPU0:router(config)# route-policy extcommunity-is-empty-example
RP/0/RP0/CPU0:router(config-rpl)# if extcommunity rt is-empty then
RP/0/RP0/CPU0:router(config-rpl-if)# set local-preference 100

RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

extcommunity rt matches-any

To match any element of a Border Gateway Protocol (BGP) route target (RT) extended community set, use the **extcommunity rt matches-any** command in route-policy configuration mode.

extcommunity rt matches-any {*extcommunity-set-nameinline-extcommunity-setparameter*}

Syntax Description

extcommunity-set-name	Name of an RT extended community set.
inline-extcommunity-set	Inline RT extended community set. The inline extended community set must be enclosed in parentheses.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **extcommunity rt matches-any** command as a conditional expression within an **if** statement to match elements of an extended community set.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

A simple condition using the **matches-any** operator evaluates as true if at least one extended community in the route matches an extended community specification in the named or inline set. If no extended community in the route matches any of the specifications in the named or inline set, then this simple condition evaluates to false. Likewise, when there is no extended community at all in the route, the condition evaluates to false.

Matching an extended community in the route to a specification in a named or an inline set is intuitive. In inline sets, extended community specifications may be parameterized, in which case the relevant matching is done when the value of the parameter has been supplied.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, an extended community set named my-extcommunity-set and a parameterized route-policy named my-extcommunity-set-example($tag,$ip) are defined. The **extcommunity rt matches-any** command is used in an if statement such that if at least one extended community in the route matches an extended community specification in the named set, then the local preference is set to 100. If there is no extended community in the route that matches any of the

specifications in the named set, then the condition evaluates as false and the extended community is compared to the inline extended sets.

```
RP/0/RP0/CPU0:router(config)# extcommunity-set rt my-extcommunity-set
RP/0/RP0/CPU0:router(config-ext)# 10:615,
RP/0/RP0/CPU0:router(config-ext)# 10:6150,
RP/0/RP0/CPU0:router(config-ext)# 15.15.15.15:15
RP/0/RP0/CPU0:router(config-ext)# end-set

RP/0/RP0/CPU0:router(config)# route-policy my-extcommunity-set-example($tag,$ip)
RP/0/RP0/CPU0:router(config-rpl)# if extcommunity rt matches-any my-extcommunity-set then
RP/0/RP0/CPU0:router(config-rpl-if)# set local-preference 100
RP/0/RP0/CPU0:router(config-rpl-if)# elseif extcommunity rt matches-any (10:20, 10:$tag)
then
RP/0/RP0/CPU0:router(config-rpl-elseif)# set local-preference 200
RP/0/RP0/CPU0:router(config-rpl-elseif)# elseif extcommunity rt matches-any ($ip:$tag) then
RP/0/RP0/CPU0:router(config-rpl-elseif)# set local-preference 300
RP/0/RP0/CPU0:router(config-rpl-elseif)# elseif extcommunity rt matches-any (2.3.4.5:$tag)
 then
RP/0/RP0/CPU0:router(config-rpl-elseif)# set local-preference 400
RP/0/RP0/CPU0:router(config-rpl-elseif)# endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

extcommunity rt matches-every

To match every element of a Border Gateway Protocol (BGP) route target (RT) extended community set, use the **extcommunity rt matches-every** command in route-policy configuration mode.

extcommunity rt matches-every {*extcommunity-set-nameinline-extcommunity-setparameter*}

Syntax Description

extcommunity-set-name	Name of an RT extended community set.
inline-extcommunity-set	Inline RT extended community set. The inline extended community set must be enclosed in parentheses.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **extcommunity rt matches-every** command as a conditional expression within an **if** statement to match every element of an RT extended community set.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

A simple condition using the **matches-every** operator evaluates as true if every extended community value in the extended community attribute for the route matches at least one element of the extended community set or inline set. If no extended community in the route matches any of the specifications in the named or inline set, then this simple condition evaluates to false. Likewise, when there is no extended community at all in the route, the condition evaluates to false.

Matching an extended community in the route to a specification in a named or an inline set is intuitive. In inline sets, extended community specifications may be parameterized, in which case the relevant matching is done when the value of the parameter has been supplied.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, an extended community set named my-extcommunity-set and a parameterized route policy named extcommunity-matches-every-example ($as, $tag) are defined. The condition extcommunity rt matches-every is used in an if statement in this policy. If it evaluates to true, the local-preference value is set to 100. If it evaluates to false, the extended community is

evaluated using an inline set. If that condition evaluates to true, the local-preference value is set to 200. If it evaluates to false, the local-preference value is set to 300.

```
RP/0/RP0/CPU0:router(config)# extcommunity-set rt my-extcommunity-set
RP/0/RP0/CPU0:router(config-ext)# 10:20,
RP/0/RP0/CPU0:router(config-ext)# 10:30,
RP/0/RP0/CPU0:router(config-ext)# 10:40
RP/0/RP0/CPU0:router(config-ext)# end-set
RP/0/RP0/CPU0:router(config)# route-policy extcommunity-matches-every-example($as,$tag)
RP/0/RP0/CPU0:router(config-rpl)# if extcommunity rt matches-every my-extcommunity-set then
RP/0/RP0/CPU0:router(config-rpl-if)# set local-preference 100
RP/0/RP0/CPU0:router(config-rpl-if)# elseif extcommunity rt matches-every (10:20, 10:$tag,
 $as:30) then
RP/0/RP0/CPU0:router(config-rpl-elseif)# set local-preference 200
RP/0/RP0/CPU0:router(config-rpl-elseif)# elseif
RP/0/RP0/CPU0:router(config-rpl-elseif)# set local-preference 300
RP/0/RP0/CPU0:router(config-rpl-elseif)# endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

extcommunity rt matches-within

To match at least one element of an extended community set of a Border Gateway Protocol (BGP) route target (RT), use the **extcommunity rt matches-within** command in route-policy configuration mode.

extcommunity rt matches-within {*rt-type-extcommunity-set-nameinline-extcommunity-setparameter*}

Syntax Description

rt-type-extcommunity-set-name	Name of an RT extended community set.
inline-extcommunity-set	Inline RT extended community set, enclosed in parentheses.
parameter	Parameter name preceded with a “$” symbol.

Command Default

None

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the extcommunity rt matches-within command as a conditional expression within an if statement to match elements of an extended community set.

Note For a list of all conditional expressions available within an if statement, see the if command.

A simple condition using the matches-within operator evaluates as true if all the elements in extended community from the route match any element in the extended community set. For example, let 'c' be the RTs from the route and 'm' be the RT set from the policy. With the **extcommunity rt matches-within** configuration, each value in 'c' must match any (or at least one) value in 'm'.

Matching an extended community in the route to a specification in a named or an inline set is intuitive. In inline sets, extended community specifications may be parameterized, in which case the relevant matching is done when the value of the parameter has been supplied.

Task ID

Task ID	Operation
route-policy	read, write

In the following example, an extended community set named *my-extcommunity-set* and a parameterized route-policy named *my-extcommunity-set-example($tag,$ip)* are defined. The **extcommunity rt matches-within** command is used in an if statement such that if all extended community values in the route match any element of the extended community specification in the named set, then the local preference is set to 100.

```
RP/0/RP0/CPU0:router(config)#extcommunity-set rt my-extcommunity-set
```

```
RP/0/RP0/CPU0:router(config-ext)#10:615,
RP/0/RP0/CPU0:router(config-ext)#10:6150,
RP/0/RP0/CPU0:router(config-ext)#15.15.15.15:15
RP/0/RP0/CPU0:router(config-ext)#end-set
RP/0/RP0/CPU0:router(config)#route-policy my-extcommunity-set-example($tag,$ip)
RP/0/RP0/CPU0:router(config-rpl)#if extcommunity rt matches-within my-extcommunity-set then
RP/0/RP0/CPU0:router(config-rpl-if)#set local-preference 100
```

extcommunity-set cost

To define a cost extended community set, use the **extcommunity-set cost** command in XR Config mode. To remove the cost extended community set, use the **no** form of this command.

extcommunity-set cost *name*
no extcommunity-set cost *name*

Syntax Description

name Name of a cost extended community set. The *name* argument is case sensitive, can contain any alphanumeric characters, and can be up to 63 characters in length.

Command Default

No default behavior or values

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **extcommunity-set cost** command to define a cost extended community set.

An extended community set is analogous to a community set except that it contains extended community values instead of regular community values. Extended community values are 64-bit structured values. An extended community set also supports named forms and inline forms.

Cost extended communities can be entered in these formats:

- *#-remark* ---Remark beginning with '#'
- *0-255*---Decimal number
- **abort** ---Discard RPL definition and return to top level config
- **end-set** ---End of set definition
- **exit** ---Exit from the submode
- **igp:**---Cost Community with IGP as point of insertion
- **pre-bestpath:** ---Cost Community with Pre-Bestpath as point of insertion
- **show** ---Show partial RPL configuration

Multiple cost community set clauses can be configured in each route policy block or sequence. Each cost community set clause must have a different ID (0-255). The cost community set clause with the lowest cost-value is preferred by the best path selection process when all other attributes are equal.

As with community sets, the inline form supports parameterization within parameterized policies. Either portion of the extended community value can be parameterized.

Every extended community set must contain at least one extended community value. Empty extended community sets are invalid and the policy configuration system rejects them.

Wildcards (*) and regular expressions are allowed for extended community set elements.

Examples

In the following example, a cost extended community set named extcomm-cost is defined:

```
RP/0/RP0/CPU0:router(config)# extcommunity-set cost extcomm-cost
RP/0/RP0/CPU0:router(config-ext)# IGP:90:914,
RP/0/RP0/CPU0:router(config-ext)# Pre-Bestpath:91:915
RP/0/RP0/CPU0:router(config-ext)# end-set
```

extcommunity-set rt

To define a Border Gateway Protocol (BGP) route target (RT) extended community set, use the **extcommunity-set rt** command in XR Config mode. To remove the RT community set, use the **no** form of this command.

extcommunity-set rt *name*
no extcommunity-set rt *name*

Syntax Description

name	Name of an RT extended community set.

Command Default

No default behavior or values

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **extcommunity-set rt** command to define an RT extended community set for BGP.

Regular expressions and ranges can be specified to match the extended communities. Regular expressions and ranges can be specified in an extended community set to support the matching of communities. An attempt to use an extended community set that contains a range or regular expression to set an extended community set value is rejected when an attempt to attach such a policy is made.

An extcommunity set RT holds RT extended community values to match against the Border Gateway Protocol (BGP) RT extended community attribute. RT extended communities can be entered in these formats:

- *#-remark* ---Remark beginning with '#'
- *****--- Wildcard (any community or part thereof)
- *1-4294967295*---32-bit decimal number
- *1-65535* ---16-bit decimal number
- *A.B.C.D/M:N* ---Extended community - IPv4 prefix format
- *A.B.C.D:N*---Extended community - IPv4 format
- *ASN:N* ---Extended community - ASPLAIN format
- *X.Y:N* ---Extended community - ASDOT format
- **dfa-regex** ---DFA (deterministic finite automata) style regular expression
- **ios-regex** ---Traditional IOS style regular expression

Note The dfa-regex and ios-regex syntax for community set is *"[']*[^':&<>]*:[^':&<>]*[']"*. This means that regex starts with a single-quote (") followed by a string of any character (that does not include single-quote, colon, ampersand, less-than, greater-than, or space) followed by a colon, and a string of any characters (that does not include single-quote, colon, ampersand, less-than, greater-than, or space) followed by single-quote.

N is a number within the range of 1 to 65535.

Examples

In the following example, an RT extended community set named extcomm-rt is defined:

```
RP/0/RP0/CPU0:router(config)# extcommunity-set rt extcomm-rt
RP/0/RP0/CPU0:router(config-ext)# 10002:666
RP/0/RP0/CPU0:router(config-ext)# 10.0.0.2:666
RP/0/RP0/CPU0:router(config-ext)# end-set
```

extcommunity-set soo

To define a Border Gateway Protocol (BGP) Site-of-Origin (SoO) extended community set, use the **extcommunity-set soo** command in XR Config mode mode. To remove the SoO extended community set, use the **no** form of this command.

extcommunity-set soo *name*
no extcommunity-set soo *name*

Syntax Description

name	Name of an SoO extended community set.

Command Default

No default behavior or values

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **extcommunity-set soo** command to define an SoO extended community set.

An extcommunity set soo holds SoO extended community values to match against the Border Gateway Protocol (BGP) SoO extended community attribute. SoO extended communities can be entered in these formats:

- *#-remark* ---Remark beginning with '#'
- *****--- Wildcard (any community or part thereof)
- *1-4294967295*---32-bit decimal number
- *1-65535* ---16-bit decimal number
- *A.B.C.D/M:N* ---Extended community - IPv4 prefix format
- *A.B.C.D:N*---Extended community - IPv4 format
- *ASN:N* ---Extended community - ASPLAIN format
- *X.Y:N* ---Extended community - ASDOT format
- **abort** ---Discard RPL definition and return to top level config
- **dfa-regex** ---DFA style regular expression
- **end-set** ---End of set definition
- **exit** ---Exit from the submode
- **ios-regex** ---Traditional IOS style regular expression
- **show** ---Show partial RPL configuration

N is a site-specific number.

Examples

In the following example, a SoO extended community set named extcomm-soo is defined:

```
RP/0/RP0/CPU0:router(config)# extcommunity-set soo extcomm-soo
RP/0/RP0/CPU0:router(config-ext)# 66:60001,
RP/0/RP0/CPU0:router(config-ext)# 77:70001,
RP/0/RP0/CPU0:router(config-ext)# 88:80001,
RP/0/RP0/CPU0:router(config-ext)# 99:90001,

RP/0/RP0/CPU0:router(config-ext)# 100.100.100.1:153
RP/0/RP0/CPU0:router(config-ext)# end-set
```

extcommunity soo is-empty

To determine if a Border Gateway Protocol (BGP) route has any Site-of-Origin (SoO) extended communities associated with it, use the **extcommunity soo is-empty** command in route-policy configuration mode.

extcommunity soo is-empty

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **extcommunity soo is-empty** command as a conditional expression within an **if** statement to check if a BGP SoO route has extended community attributes associated with it.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

The **is-empty** operator takes no arguments and evaluates to true if the route has no SoO extended community attributes associated with it.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, if a route has no SoO extended communities associated with it, the local preference is set to 100:

```
RP/0/RP0/CPU0:router(config)# route-policy extcommunity-is-empty-example
RP/0/RP0/CPU0:router(config-rpl)# if extcommunity soo is-empty then
RP/0/RP0/CPU0:router(config-rpl-if)# set local-preference 100
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

extcommunity soo matches-any

To match any element of a Border Gateway Protocol (BGP) Site-of-Origin (SoO) extended community set, use the **extcommunity soo matches-any** command in route-policy configuration mode.

extcommunity soo matches-any {*extcommunity-set-nameinline-extcommunity-setparameter*}

Syntax Description

extcommunity-set-name	Name of a SoO extended community set.
inline-extcommunity-set	Inline SoO extended community set. The inline extended community set must be enclosed in parentheses.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **extcommunity soo matches-any** command as a conditional expression within an **if** statement to match elements of an extended community set.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

A simple condition using the **matches-any** operator evaluates as true if at least one extended community in the route matches an extended community specification in the named or inline set. If no extended community in the route matches any of the specifications in the named or inline set, then this simple condition evaluates to false. Likewise, when there is no extended community at all in the route, the condition evaluates to false.

Matching an extended community in the route to a specification in a named or an inline set is intuitive. In inline sets, extended community specifications may be parameterized, in which case the relevant matching is done when the value of the parameter has been supplied.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, an SoO extended community set named extcomm-soo and a parameterized route policy named my-extcommunity-set-example($tag,$ip) are defined.

The condition route policy named extcommunity soo matches-any is used in an if statement in this policy. If it evaluates to true, the local preference value is set to 100.

If it evaluates to false, the SoO extended community is evaluated using an inline set. If it evaluates to true, the local preference value is set to 200.

If it evaluates to false, the SoO extended community is evaluated using a different inline set. If it evaluates to true, the local preference value is set to 300.

If it evaluates to false, the SoO extended community is evaluated using a different inline set. If it evaluates to true, the local preference value is set to 400.

```
RP/0/RP0/CPU0:router(config)# extcommunity-set soo extcomm-soo
RP/0/RP0/CPU0:router(config-ext)# 66:60001,
RP/0/RP0/CPU0:router(config-ext)# 77:70001,
RP/0/RP0/CPU0:router(config-ext)# 88:80001,
RP/0/RP0/CPU0:router(config-ext)# 99:90001,
RP/0/RP0/CPU0:router(config-ext)# 100.100.100.1:153
RP/0/RP0/CPU0:router(config-ext)# end-set

RP/0/RP0/CPU0:router(config)# route-policy my-extcommunity-set-example($tag,$ip)
RP/0/RP0/CPU0:router(config-rpl)# if extcommunity soo matches-any extcomm-soo then
RP/0/RP0/CPU0:router(config-rpl-if)# set local-preference 100
RP/0/RP0/CPU0:router(config-rpl-if)# elseif extcommunity soo matches-any (10:20, 10:$tag)
then
RP/0/RP0/CPU0:router(config-rpl-elseif)# set local-preference 200
RP/0/RP0/CPU0:router(config-rpl-elseif)# elseif extcommunity soo matches-any ($ip:$tag)
then
RP/0/RP0/CPU0:router(config-rpl-elseif)# set local-preference 300
RP/0/RP0/CPU0:router(config-rpl-elseif)# elseif extcommunity soo matches-any (2.3.4.5:$tag)
 then
RP/0/RP0/CPU0:router(config-rpl-elseif)# set local-preference 400
RP/0/RP0/CPU0:router(config-rpl-elseif)# endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

extcommunity soo matches-every

To match every element of a Border Gateway Protocol (BGP) Site-of-Origin (SoO) extended community set, use the **extcommunity soo matches-every** command in route-policy configuration mode.

extcommunity soo matches-every {*extcommunity-set-nameinline-extcommunity-setparameter*}

Syntax Description

extcommunity-set-name	Name of a SoO extended community set.
inline-extcommunity-set	Inline SoO extended community set. The inline extended community set must be enclosed in parentheses.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **extcommunity soo matches-every** command as a conditional expression within an **if** statement to match every element of a SoO extended community set.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

A simple condition using the **matches-every** operator evaluates as true if every extended community value in the extended community attribute for the route matches at least one element of the extended community set or inline set. If no extended community in the route matches any of the specifications in the named or inline set, then this simple condition evaluates to false. Likewise, when there is no extended community at all in the route, the condition evaluates to false.

Matching an extended community in the route to a specification in a named or an inline set is intuitive. In inline sets, extended community specifications may be parameterized, in which case the relevant matching is done when the value of the parameter has been supplied.

Examples

In the following example, an extended community set named my-extcomm-rt-set and a parameterized route policy named extcommunity-matches-every-example($as, $tag) are defined. The condition extcommunity soo matches-every is used in an if statement in this policy and if it evaluates to true, the local-preference value is set to 100. If it evaluates to false, the extended community is evaluated using an inline set. If that condition evaluates to true, the local-preference value is set to 200. If it evaluates to false, the local-preference value is set to 300.

```
RP/0/RP0/CPU0:router(config)# extcommunity-set soo my-extcomm-rt-set
RP/0/RP0/CPU0:router(config-ext)# 10:20,
RP/0/RP0/CPU0:router(config-ext)# 10:30,
```

```
RP/0/RP0/CPU0:router(config-ext)# 10:40
RP/0/RP0/CPU0:router(config-ext)# end-set

RP/0/RP0/CPU0:router(config)# route-policy extcommunity-matches-every-example($as, $tag)
RP/0/RP0/CPU0:router(config-rpl)# if extcommunity soo matches-every my-extcomm-rt-set then
RP/0/RP0/CPU0:router(config-rpl-if)# set local-preference 100
RP/0/RP0/CPU0:router(config-rpl-if)# elseif extcommunity soo matches-every (10:20, 10:$tag,
 $as:30) then
RP/0/RP0/CPU0:router(config-rpl-elseif)# set local-preference 200
RP/0/RP0/CPU0:router(config-rpl-elseif)# else
RP/0/RP0/CPU0:router(config-rpl-elseif)# set local-preference 300
RP/0/RP0/CPU0:router(config-rpl-elseif)# endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

if

To decide which actions or dispositions should be taken for a given route, use the **if** command in route-policy configuration mode.

if *conditional-expression* **then** *action-statement* [*action-statement*] [**elseif** *conditional-expression* **then** *action-statement* [*action-statement*]] [**else** *action-statement* [*action-statement*]] **endif**

Syntax Description

conditional-expression	Expression to decide which actions or dispositions should be taken for the given route.
then	Executes an action statement if the **if** condition is true.
elseif	Strings together a sequence of tests.
else	Executes an action statement if the **if** condition is false.
endif	Ends the **if** statement.
action-statement	Sequence of operations that modify a route.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The **if** command uses a conditional expression to decide which actions or dispositions should be taken for a given route. Table 125: Conditional Expressions, on page 804 lists the conditional expressions.

An action statement is a sequence of operations that modify a route, most of which are distinguished by the **set** keyword. In a route policy, these operations can be grouped. Table 126: Action Statements, on page 805 lists the action statements.

Apply Condition policies allow usage of a route-policy in an "if" statement of another route-policy.

```
Route-policy policy_name
If apply policyA and apply policyB then
Set med 100
Else if not apply policyD then
Set med 200
Else
Set med 300
Endif
End-policy
```

Table 125: Conditional Expressions

Command	Description
as-path in, on page 743	Matches the AS path of a route to an AS path set. The AS path is a sequence of autonomous system numbers traversed by a route.
as-path is-local, on page 745	Determines if the router (or another router within this autonomous system or confederation) originated the route.
as-path length, on page 746	Performs a conditional check based on the length of the AS path.
as-path neighbor-is, on page 747	Tests the autonomous system number or numbers at the head of the AS path against a sequence of one or more integral values or parameters.
as-path originates-from, on page 749	Tests an AS path against the AS sequence beginning with the AS number that originated a route.
as-path passes-through, on page 751	Tests to learn if the specified integer or parameter appears anywhere in the AS path or if the sequence of integers and parameters appears.
as-path unique-length, on page 755	Performs specific checks based on the length of the AS path.
community is-empty, on page 757	Learns if a route has community attributes associated with it.
community matches-any, on page 758	Matches any element of a community set.
community matches-every, on page 760	Matches every element of a community set.
destination in, on page 773	Matches a destination entry in a named prefix set or inline prefix set.
extcommunity rt is-empty, on page 785	Learns if a route has RT extended community attributes associated with it.
extcommunity rt matches-any, on page 786	Matches elements of an RT extended community set.
extcommunity rt matches-every, on page 788	Matches every element of an RT extended community set.
extcommunity rt matches-within, on page 790	Matches at least one element of a Border Gateway Protocol (BGP) route target (RT) extended community set.
extcommunity soo is-empty, on page 798	Learns if a route has SoO extended community attributes associated with it.
extcommunity soo matches-any, on page 799	Matches elements of an SoO extended community set.
extcommunity soo matches-every, on page 801	Matches every element of an SoO extended community set.

Command	Description
local-preference, on page 814	Specifies BGP local-preference attribute
med, on page 823	Compares the MED to an integer value or a parameterized value.
next-hop in, on page 824	Compares the next-hop associated with the route to data contained in either a named or an inline prefix set.
orf prefix in, on page 825	Matches a prefix in a prefix set or an inline prefix set.
origin is, on page 827	Tests the value of the origin attribute.
path-type is, on page 832	Tests the path type.
protocol, on page 839	Checks if a protocol is installing the route.
rd in, on page 841	Compares the RD associated with the route to data contained in either a named or an inline RD set.
rib-has-route, on page 847	Checks if a route is in the RIB.
route-has-label, on page 848	Checks if a route has a Multiprotocol Label Switching (MPLS) label.
route-type is, on page 851	Compares route types when redistribution is being performed into BGP, OSPF, or IS-IS.
source in, on page 980	Tests the source of the route against the data in either a named or an inline prefix set.
tag, on page 983	Matches a specific tag value.
tag in, on page 984	Conditionally compares tag-route against tag-set.
vpn-distinguisher is, on page 988	Compares the VPN distinguisher against a specified value.

Table 126: Action Statements

Command	Description
abort (RPL), on page 738	Discards a route policy definition and returns to XR Config mode.
add, on page 740	Adds an offset to an existing value.
apply, on page 741	Executes a parameterized or an unparameterized policy from within another policy.
delete community, on page 767	Deletes community values from a community list in a route.
delete extcommunity rt, on page 769	Deletes extended community values from an extended community list in a route.
done, on page 775	Accepts this route with no further processing

Command	Description
drop, on page 777	Drops a route.
end-policy, on page 782	Ends the definition of a route policy and exits route-policy configuration mode.
pass, on page 831	Signifies that even though the route has not been modified, the user wants to continue executing in the policy block.
prepend as-path, on page 837	Prepends the AS path with additional autonomous system numbers.
replace as-path, on page 844	Replaces a sequence of AS numbers or private AS numbers in the AS path with the configured local AS.
set community, on page 857	Sets the BGP community attribute.
set dampening, on page 860	Configures BGP route dampening.
set extcommunity cost, on page 862	Replaces or adds the extended communities for a cost on the route.
set extcommunity rt, on page 864	Replaces or adds the extended communities for an RT on the route.
set ip-precedence, on page 866	Sets the IP precedence to classify packets.
set isis-metric, on page 867	Sets the IS-IS metric attribute value.
set label, on page 868	Sets the BGP label attribute value.
set level, on page 873	Configures the IS-IS level in which redistributed routes should be sent.
set local-preference, on page 874	Specifies a preference value for the autonomous system path.
set med, on page 875	Sets the MED value.
set metric-type (IS-IS), on page 877	Controls whether IS-IS treats the metric as an internal or external metric.
set metric-type (OSPF), on page 879	Controls whether OSPF treats the cost as a Type 1 or Type 2 metric.
set next-hop, on page 880	Replaces the next-hop associated with a given route.
set origin, on page 882	Changes the origin attribute.
set ospf-metric, on page 883	Sets an OSPF protocol metric attribute value.
set qos-group (RPL), on page 885	Sets the QoS group to classify packets.
set rib-metric, on page 886	Sets a RIB metric attribute value for a table policy.
set rip-metric, on page 887	Sets RIP metric attributes.
set rip-tag, on page 888	Sets route tag attribute.
set tag, on page 893	Sets the tag attribute.

Command	Description
set traffic-index, on page 894	Sets the traffic index attribute.
set weight, on page 897	Sets the weight value for BGP routes.
suppress-route, on page 982	Indicates that a given component of an aggregate should be suppressed, that is, not advertised.
unsuppress-route, on page 987	Indicates that a given component of an aggregate should be unsuppressed.
set vpn-distinguisher, on page 896	Sets the VPN distinguisher value.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, any route whose AS path is in the set as-path-set-1 is dropped:

```
RP/0/RP0/CPU0:router(config-rpl)# if as-path in as-path-set-1 then
RP/0/RP0/CPU0:router(config-rpl-if)# drop
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)#
```

The contents of the **then** clause may be an arbitrary sequence of action statements.

The following example shows an **if** statement with two action statements:

```
RP/0/RP0/CPU0:router(config-rpl)# if origin is igp then
RP/0/RP0/CPU0:router(config-rpl-if)# set med 42
RP/0/RP0/CPU0:router(config-rpl-if)# prepend as-path 73 5
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)#
```

The **if** command also permits an **else** clause to be executed if the expression is false, as follows:

```
RP/0/RP0/CPU0:router(config-rpl)# if med eq 200 then
RP/0/RP0/CPU0:router(config-rpl-if)# set community (12:34) additive
RP/0/RP0/CPU0:router(config-rpl-if)# else
RP/0/RP0/CPU0:router(config-rpl-else)# set community (12:56) additive
RP/0/RP0/CPU0:router(config-rpl-else)# endif
RP/0/RP0/CPU0:router(config-rpl)#
```

The routing policy language (RPL) also provides syntax using the **elseif** command to string together a sequence of tests, as shown in the following example:

```
RP/0/RP0/CPU0:router(config-rpl)# if med eq 150 then
RP/0/RP0/CPU0:router(config-rpl-if)# set local-preference 10
RP/0/RP0/CPU0:router(config-rpl-if)# elseif med eq 200 then
RP/0/RP0/CPU0:router(config-rpl-elseif)# set local-preference 60
```

```
RP/0/RP0/CPU0:router(config-rpl-elseif)# elseif med eq 250 then
RP/0/RP0/CPU0:router(config-rpl-elseif)# set local-preference 110
RP/0/RP0/CPU0:router(config-rpl-elseif)# else
RP/0/RP0/CPU0:router(config-rpl-else)# set local-preference 0
RP/0/RP0/CPU0:router(config-rpl-else)# endif
RP/0/RP0/CPU0:router(config-rpl)#
```

The statements within an **if** statement may themselves be **if** statements, as shown in this example:

```
RP/0/RP0/CPU0:router(config-rpl)# if community matches-any (12:34, 56:78) then
RP/0/RP0/CPU0:router(config-rpl-if)# if med eq 150 then
RP/0/RP0/CPU0:router(config-rpl-if)# drop
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl-if)# set local-preference 100
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)#
```

The policy configuration shown sets the value of the local preference attribute to 100 on any route that has a community value of 12:34 or 56:78 associated with it. However, if any of these routes has a Multi Exit Descriminator (MED) value of 150, then each route with both the community value of 12:34 or 56:78 and a MED of 150 is dropped.

if route-aggregated

To match the aggregated routes from the other routes, use the **if route-aggregated** command in route policy configuration mode.

if route-aggregated

Syntax Description

route-aggregated	Checks if route is an aggregation of multiple routes.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
route-policy	read, write

Examples

This example shows how to match the aggregated routes from other routes:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# route-policy  route-policy atomic_agg
RP/0/RP0/CPU0:router(config-rpl)# if route-aggregated then
RP/0/RP0/CPU0:router(config-rpl-if)# set extcommunity rt (1:1)
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

if track is

To track whether the state of the object is up or down, use the **if track is** command in route-policy configuration mode.

if track *track-id* **is** { **up** | **down** }

Syntax Description

If track *track-id* **is up**	Evaluates to TRUE if the track status is UP.
If track *track-id* **is down**	Evaluates to TRUE if the track status is DOWN.
is {**up** | **down**}	Specifies the state of the object which evaluates to TRUE.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 7.2.1	This command was introduced.

Usage Guidelines

None

Task ID

Task ID	Operations
route-policy	read, write

Examples

```
Router#configure
Router(configl)#route-policy rpl
Router(config-rpl)# if track bgp-nbrl is up
```

is-best-path

To tag the path selected as the best path use the**is-best-path** command in route policy configuration mode.

is-best-path

Syntax Description

is-best-path	Checks and tags the path selected as best-path.

Command Default

No default behavior or values.

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
route-policy	read, write

Example

```
  RP/0/RSP0RP00/CPU0:router(config)# route-policy
  WORD  Route Policy name
  RP/0/RSP0RP00/CPU0:router(config)# route-policy sample
  RP/0/RSP0RP00/CPU0:router(config-rpl)# if destination i
  in   is-backup-path  is-best-external  is-best-path

  if destination is-best-path then
    set community community
  endif
end-policy
!
RP/0/RSP0RP00/CPU0:router# sh version
Wed Jul  8 16:08:34.286 IST
Cisco IOS XR Software, Version 5.3.2.14I[EnXR]
Copyright (c) 2015 by Cisco Systems, Inc.
    Built on Fri Jun 26 17:35:45 IST 2015
    By router in RP/0/RSP0RP00/CPU0
```

is-backup-path

To tag all the paths equal to the back up path use, **is-backup-path** command in route policy configuration mode.

is-backup-path

Syntax Description

is-backup-path	Checks and tags the path selected as backup path.

Command Default

No default behavior or values.

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
route-policy	read, write

Example

```
RP/0/RSP0RP00/CPU0:router(config)# route-policy
  WORD  Route Policy name
RP/0/RSP0RP00/CPU0:router(config)# route-policy sample
RP/0/RSP0RP00/CPU0:router(config-rpl)# if destination i
in      is-backup-path  is-best-external  is-best-path

RP/0/RSP0RP00/CPU0:router(config)# route-policy
WORD  Route Policy name
RP/0/RSP0RP00/CPU0:router(config)# route-policy sample
RP/0/RSP0RP00/CPU0:router(config-rpl)# if destination i
in     is-backup-path  is-best-external  is-best-path
```

is-multi-path

To tag all the paths equal to the best path based on multi-path context use, **is-multi-path** command in route policy configuration mode.

is-multi-path

Syntax Description

is-multi-path	Checks and tag all the path equal to the as best-path.

Command Default

No default behavior or values.

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
route-policy	read, write

Example

```
RP/0/RSP0RP00/CPU0:router(config)#route-policy
WORD  Route Policy name
RP/0/RSP0RP00/CPU0:router(config)#route-policy sample
RP/0/RSP0RP00/CPU0:router(config-rpl)#if destination i
in             is-backup-path  is-best-external  is-best-path

is-multi-path
RP/0/RSP0RP00/CPU0:router(config-rpl)#if destination is-
is-backup-path  is-best-external  is-best-path  is-multi-path
RP/0/RSP0RP00/CPU0:router(config-rpl)#if destination is-best-path then
RP/0/RSP0RP00/CPU0:router(config-rpl-if)#set l
label             label-index  label-mode  level
community  lsm-root
RP/0/RSP0RP00/CPU0:router(config-rpl-if)#set community community
RP/0/RSP0RP00/CPU0:router(config-rpl-if)#endif
RP/0/RSP0RP00/CPU0:router(config-rpl)#end-policy
RP/0/RSP0RP00/CPU0:router(config)#commit
Wed Jul  8 16:08:23.436 IST
```

local-preference

To compare the local-preference attribute of a BGP route to an integer value or a parameterized value, use the local-preference command in route-policy configuration mode.

local-preference {**eq** | **is** | **ge** | **le**} {*numberparameter*}

Syntax Description

eq | **is** | **ge** | **le**	Equal to; exact match; greater than or equal to; less than or equal to.
number	Value assigned to a 32-bit unsigned integer. Range is 0 to 4294967295.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **local- preference** command as a conditional expression within an **if** statement to compare the local-preference attribute to an integer value or a parameterized value.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

The MED is a 32-bit unsigned integer. The **eq** operation compares the local-preference to either a static value or a parameterized value passed to a parameterized policy for equality with that value. A greater than or equal to comparison can also be done with the **ge** operator, and a less than or equal to comparison can be performed using the **le** operator.

Examples

The following example shows that if the **local-preference** is 10, local-preference is set to 100:

```
RP/0/RSP0RP0/CPU0:router(config-rpl)# if local-preference eq 10 then
RP/0/RSP0RP0/CPU0:router(config-rpl-if)# set weight 100
RP/0/RSP0RP0/CPU0:router(config-rpl-if)# endif
RP/0/RSP0RP0/CPU0:router(config-rpl)#
```

large-community is-empty

To check if a route has no large community attributes associated with it, use the **large-community is-empty** command in route-policy configuration mode.

large-community is-empty

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Task ID

Task ID	Operations
route-policy	read, write

Command History

Release	Modification
Release 6.3.1	This command was introduced.

Usage Guidelines

Use the **large community is-empty** command as a conditional expression within an **if** statement to check if a route has community attributes associated with it.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

This command takes no arguments and evaluates to true only if the route has no community attributes associated with it.

Task ID

Task ID	Operations
route-policy	read, write

The following example shows using the **large-community is-empty** clause to filter routes that do not have the large-community attribute set.

```
RP/0/RP0/CPU0:router#config
RP/0/RP0/CPU0:router(config)#route-policy lrg_comm_rp4
RP/0/RP0/CPU0:router(config-rpl)#if large-community is-empty then
RP/0/RP0/CPU0:router(config-rpl)#set local-preference 104
RP/0/RP0/CPU0:router(config-rpl)#endif
RP/0/RP0/CPU0:router(config-rpl)#end-policy
```

large-community matches-any

To configure the route policy to match any elements of a large-community set, use the **large-community matches-any** command in route-policy configuration mode.

`large-community matches-any` { *large-community-set-name or inline-large-community-set* | `parameter` }

Syntax Description

large-community-set-name	Name of a large community set.
inline-large-community-set	Inline large community set. The inline large community set must be enclosed in parentheses.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Task ID

Task ID	Operations
route-policy	read, write

Command History

Release	Modification
Release 6.3.1	This command was introduced.

Usage Guidelines

Use the **large-community matches-any** command as a conditional expression within an **if** statement in the route policy statements to match any element of a large-community set.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

The large communities are specified as three non negative decimal integers separated by colons. For example, 1:2:3. Each integer is stored in 32 bits. The possible range for each integer is 0 to 4294967295.

In route-policy statements, each integer in the BGP large community can be replaced by any of the following expressions:

- [x..y] — This expression specifies a range between x and y, inclusive.
- * — This expression stands for any number.
- peeras — This expression is replaced by the AS number of the neigbhor from which the community is received or to which the community is sent, as appropriate.
- not-peeras — This expression matches any number other than the peeras.

- private-as — This expression specifies any number in the private ASN range: [64512..65534] and [4200000000..4294967294].

Note The peeras and not-peeras expressions can only be used in large-community match statements that appear in route policies that are applied at the neighbor-in or neighbor-out attach points.

IOS regular expression (ios-regex) and DFA style regular expression (dfa-regex) can be used in any of the large-community policy match statements. For example, the IOS regular expression ios-regex '^5:.*:7$' is equivalent to the expression 5:*:7.

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following example shows how to configure a route policy to match any element of a large -community set. This is a boolean condition and returns true if any of the large communities in the route match any of the large communities in the match condition.

```
RP/0/RP0/CPU0:router#config
RP/0/RP0/CPU0:router(config)#route-policy elbonia
RP/0/RP0/CPU0:router(config-rpl)#if large-community matches-any (1:2:3, 4:5:*) then
RP/0/RP0/CPU0:router(config-rpl)#set local-preference 94
RP/0/RP0/CPU0:router(config-rpl)#endif
RP/0/RP0/CPU0:router(config-rpl)#end-policy
```

large-community matches-every

To configure the route policy to match every element of a large-community set, use the **large-community matches-every** command in route-policy configuration mode.

`large-community matches-every` { *large-community-set-name or inline-large-community-set* | `parameter` }

Syntax Description

large-community-set-name	Name of a large community set.
inline-large-community-set	Inline large community set. The inline large community set must be enclosed in parentheses.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Task ID

Task ID	Operations
route-policy	read, write

Command History

Release	Modification
Release 6.3.1	This command was introduced.

Use the **large-community matches-every** command as a conditional expression within an **if** statement in the route policy statements to match every element of a large-community set.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

The large communities are specified as three non negative decimal integers separated by colons. For example, 1:2:3. Each integer is stored in 32 bits. The possible range for each integer is 0 to 4294967295.

In route-policy statements, each integer in the BGP large community can be replaced by any of the following expressions:

- [x..y] — This expression specifies a range between x and y, inclusive.
- * — This expression stands for any number.
- peeras — This expression is replaced by the AS number of the neigbhor from which the community is received or to which the community is sent, as appropriate.
- not-peeras — This expression matches any number other than the peeras.

- private-as — This expression specifies any number in the private ASN range: [64512..65534] and [4200000000..4294967294].

Note The peeras and not-peeras expressions can only be used in large-community match statements that appear in route policies that are applied at the neighbor-in or neighbor-out attach points.

IOS regular expression (ios-regex) and DFA style regular expression (dfa-regex) can be used in any of the large-community policy match statements. For example, the IOS regular expression ios-regex '^5:.*:7$' is equivalent to the expression 5:*:7.

Task ID

Task ID	Operations
route-policy	read, write

The following example shows how to configure a route policy where every match specification in the statement must be matched by at least one large community in the route.

```
RP/0/RP0/CPU0:router#config
RP/0/RP0/CPU0:router(config)#route-policy bob
RP/0/RP0/CPU0:router(config-rpl)#if large-community matches-any (*:*:3, 4:5:*) then
RP/0/RP0/CPU0:router(config-rpl)#set local-preference 94
RP/0/RP0/CPU0:router(config-rpl)#endif
RP/0/RP0/CPU0:router(config-rpl)#end-policy
```

In this example, routes with these sets of large communities return TRUE:

- (1:1:3, 4:5:10)
- (4:5:3) —This single large community matches both specifications.
- (1:1:3, 4:5:10, 7:6:5)

Routes with the following set of large communities return FALSE:

(1:1:3, 5:5:10)—The specification (4:5:*) is not matched.

large-community matches-within

To configure a route policy to match within a large community set, use the **large-community matches-within** command in route-policy configuration mode.

`large-community matches-within` { *large-community-set-name or inline-large-community-set* | `parameter` }

Syntax Description

large-community-set-name	Name of a large community set.
inline-large-community-set	Inline large community set. The inline large community set must be enclosed in parentheses.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Task ID

Task ID	Operations
route-policy	read, write

Command History

Release	Modification
Release 6.3.1	This command was introduced.

Usage Guidelines

This command is similar to the **large-community matches-any** command but every large community in the route must match at least one match specification. Note that if the route has no large communities, then it matches.

When large communities are specified in other commands, they are specified as three non negative decimal integers separated by colons. For example, 1:2:3. Each integer is stored in 32 bits. The possible range for each integer is 0 to 4294967295.

In route-policy statements, each integer in the BGP large community can be replaced by any of the following expressions:

- [x..y] — This expression specifies a range between x and y, inclusive.
- * — This expression stands for any number.
- peeras — This expression is replaced by the AS number of the neigbhor from which the community is received or to which the community is sent, as appropriate.
- not-peeras — This expression matches any number other than the peeras.
- private-as — This expression specifies any number in the private ASN range: [64512..65534] and [4200000000..4294967294].

Note The peeras and not-peeras expressions can only be used in large-community match statements that appear in route policies that are applied at the neighbor-in or neighbor-out attach points.

IOS regular expression (ios-regex) and DFA style regular expression (dfa-regex) can be used in any of the large-community policy match statements. For example, the IOS regular expression ios-regex '^5:.*:7$' is equivalent to the expression 5:*:7.

Task ID

Task ID	Operations
route-policy	read, write

The following example shows how to configure a route policy to match within a large community set.

```
RP/0/RP0/CPU0:router#config
RP/0/RP0/CPU0:router(config)#route-policy bob
RP/0/RP0/CPU0:router(config-rpl)#if large-community matches-within (*:*:3, 4:5:*) then
RP/0/RP0/CPU0:router(config-rpl)#set local-preference 103
RP/0/RP0/CPU0:router(config-rpl)#endif
RP/0/RP0/CPU0:router(config-rpl)#end-policy
```

In this example, routes with these sets of large communities return TRUE:

- (1:1:3, 4:5:10)
- (4:5:3)
- (1:2:3, 6:6:3, 9:4:3)

Routes with the following set of large communities return FALSE:

(1:1:3, 4:5:10, 7:6:5) —The large community (7:6:5) does not match

large-community-set

To define a set of large-communities, use the **large-community-set** command in XR Config mode. To remove the large-community set, use the **no** form of this command.

large-community-set *name*
no large-community-set *name*

Syntax Description

name Name of the large-community set. Named large-community sets are used in route-policy match and set statements.

Command Default

No default behavior or values

Command Modes

XR Config

Command History

Release	Modification
Release 6.3.1	This command was introduced.

Usage Guidelines

The large communities are specified as three non negative decimal integers separated by colons. For example, 1:2:3. Each integer is stored in 32 bits. The possible range for each integer is 0 to 4294967295.

In route-policy statements, each integer in the BGP large community can be replaced by any of the following expressions:

- [x..y] — This expression specifies a range between x and y, inclusive.
- * — This expression stands for any number.
- private-as — This expression specifies any number in the private ASN range: [64512..65534] and [4200000000..4294967294].

Task ID

Task ID	Operations
route-policy	read, write

Examples

This example shows how to create a named large-community set:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#large-community-set catbert
RP/0/RP0/CPU0:router(config-largecomm)#1:2:3,
RP/0/RP0/CPU0:router(config-largecomm)#[5..9]:2:3
RP/0/RP0/CPU0:router(config-largecomm)#1:3:*
RP/0/RP0/CPU0:router(config-largecomm)#end-set
```

med

To compare the Multi Exit Discriminator (MED) to an integer value or a parameterized value or compare the MED attribute of a BGP route to an integer value, use the **med** command in route-policy configuration mode.

med {**eq** | **is** | **ge** | **le**} {*numberparameter*}

Syntax Description

eq | **is** | **ge** | **le**	Equal to; exact match; greater than or equal to; less than or equal to.
number	Value assigned to a 32-bit unsigned integer. Range is 0 to 4294967295.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **med** command as a conditional expression within an **if** statement to compare the MED to an integer value or a parameterized value.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

The MED is a 32-bit unsigned integer. The **eq** operation compares the MED to either a static value or a parameterized value passed to a parameterized policy for equality with that value. A greater than or equal to comparison can also be done with the **ge** operator, and a less than or equal to comparison can be performed using the **le** operator.

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following example shows that if the **med** commands match, the local preference is set to 100:

```
RP/0/RP0/CPU0:router(config-rpl)# if med eq 10 then
RP/0/RP0/CPU0:router(config-rpl-if)# set local-preference 100
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)#
```

next-hop in

To compare the next-hop associated with the route to data contained in either an inline or a named prefix set, use the **next-hop in** command in route-policy configuration mode.

next-hop in {*prefix-set-nameinline-prefix-setparameter*}

Syntax Description

prefix-set-name	Name of a prefix set.
inline-prefix-set	Inline prefix set. The inline prefix set must be enclosed in parentheses.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **next-hop in** command as a conditional expression within an **if** statement to compare the next-hop associated with the route to data contained in either an inline or a named prefix set. The result is true if any value in the prefix set matches the next-hop of the route. A comparison that refers to a named prefix set that has no elements in it returns false.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

The next-hop is an IPv4 address entered as a dotted-decimal or an IPv6 address entered as a colon-separated hexadecimal.

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following example shows that if the **next-hop in** commands match, the local preference is set to 100

```
RP/0/RP0/CPU0:router(config-rpl)# if next-hop in some-prefix-set then
RP/0/RP0/CPU0:router(config-rpl-if)# if next-hop in (10.0.0.5, fe80::230/64) then
RP/0/RP0/CPU0:router(config-rpl-if)# set local-preference 0
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)#
```

orf prefix in

To configure an outbound route filter (ORF), use the **orf prefix in** command in route-policy configuration mode.

orf prefix in {*prefix-set-nameinline-prefix-set*}

Syntax Description

prefix-set-name	Name of a prefix set.
inline-prefix-set	Inline prefix set. The inline prefix set must be enclosed in parentheses.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **orf prefix in** command to match a prefix in a prefix set or an inline prefix set.

This command takes either a named prefix set or an inline prefix set value as an argument. It returns true if the destination NLRI matches any entry in the prefix set. An attempt to match destination using a prefix set that is defined but contains no elements returns false.

This command is used in the context of the orf route-policy attach point in BGP. The destination of a route is also known in Border Gateway Protocol (BGP) as its network-layer reachability information (NLRI). It comprises a prefix value and a mask length. The routing policy language (RPL) provides one operation on prefixes, testing them for matching against a list of prefix-match specifications using the **in** operator.

Examples

In the following example, the prefix set orfpreset1 and the route policy named orfpolicy are defined. Next, the orfpolicy is applied to the neighbor orf attach point.

If the prefix of the route matches any of the prefixes specified in orfpreset1 (211.105.1.0/24, 211.105.5.0/24, 211.105.11.0/24), then the prefix is dropped. If the prefix matches in(211.105.3.0/24, 211.105.7.0/24, 211.105.13.0/24), then the prefix is accepted. In addition to this inbound filtering, BGP sends these prefix entries to the upstream neighbor indicating a permit or deny so that the neighbor can make the same filter updates.

```
RP/0/RP0/CPU0:router(config)# prefix-set orfpreset1
RP/0/RP0/CPU0:router(config-pfx)# 211.105.1.0/24,
RP/0/RP0/CPU0:router(config-pfx)# 211.105.5.0/24,
RP/0/RP0/CPU0:router(config-pfx)# 211.105.11.0/24
RP/0/RP0/CPU0:router(config-pfx)# end-set
!
!
RP/0/RP0/CPU0:router(config)# route-policy orfpolicy
RP/0/RP0/CPU0:router(config-rpl)# if orf prefix in orfpreset1 then
RP/0/RP0/CPU0:router(config-rpl-if)# drop
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)# if orf prefix in (211.105.3.0/24, 211.105.7.0/24,
```

```
211.105.13.0/24) then
RP/0/RP0/CPU0:router(config-rpl-if)# pass
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy
!
!
RP/0/RP0/CPU0:router(config)# router bgp 2
RP/0/RP0/CPU0:router(config-bgp)# neighbor 1.1.1.1
RP/0/RP0/CPU0:router(config-bgp-nbr)# remote-as 3
RP/0/RP0/CPU0:router(config-bgp-nbr)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-bgp-nbr-af)# orf route-policy orfpolicy
```

origin is

To match a specific origin type, use the **origin is** command in route-policy configuration mode.

origin is {**igp** | **egp** | **incomplete***parameter*}

Syntax Description

igp	Specifies Interior Gateway Protocol.
egp	Specifies Exterior Gateway Protocol.
incomplete	Specifies that Border Gateway Protocol (BGP) first learned the route by means other than BGP or Interior Gateway Protocol (IGP); for example, the route is learned through configuration.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **origin is** command as a conditional expression within an **if** statement to test the value of the origin attribute.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

The origin of a BGP route is an enumeration; it is **igp** , **egp** , or **incomplete** .

This command can be parameterized.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the origin is tested within an **if** statement to learn if it is either **igp** or **egp** :

```
RP/0/RP0/CPU0:router(config-rpl)# if origin is igp or origin is egp then
```

In the following example, a parameter is used to match a specific origin type:

```
RP/0/RP0/CPU0:router(config)# route-policy bar($origin)
RP/0/RP0/CPU0:router(config-rpl)# if origin is $origin then
```

```
RP/0/RP0/CPU0:router(config-rpl-if)# set med 20
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)#
```

ospf-area

To match a specific ospf area, use the **ospf-area** command in route-policy configuration mode.

ospf-area [**all-paths**] {**in** | **is**}

Syntax Description

is	Specify the explicit *area-id* .
in	Specify a list of *area-id* or *area-set*. Multiple areas can be specified separated by a comma (,).
all-paths	Used for routes with multiple paths. A match is made if area for every path of the route is configured in the route-policy.

Command Default

None

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The route policy define by using **ospf-area** is useful in redistributing routes from a specific area of a routing domain into OSPF. After the route policy is crated, use the **redistribute ospf route-policy** command for route redistribution.

Task ID

Task ID	Operations
route-policy	read, write

Example

In the following example, an explicit area is specified as the matching criteria.

```
RP/0/RP0/CPU0:router(config-rpl)# if ospf-area is 10 then pass else drop endif
```

In the following example, a collection of areas is specified as the matching criteria.

```
RP/0/RP0/CPU0:router(config-rpl)# if ospf-area in (5,6,255.255.10.2) then pass else drop
endif
```

In the following example, an area set is specified as the matching criteria. As a pre-requisite, the area set must be defined.

```
RP/0/RP0/CPU0:router(config)# ospf-area-set S1
RP/0/RP0/CPU0:router(config-ospf-area)# 1 , 2.2.2.2 end-set
RP/0/RP0/CPU0:router(config)# route-policy P1
```

```
RP/0/RP0/CPU0:router(config-rpl)# if ospf-area in S1 then pass else drop endif
```

pass

To pass a route for further processing, use the **pass** command in route-policy configuration mode.

pass

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **pass** command to signify that even though this route has not been modified, the user wants to continue executing in this policy block.

Note The **pass** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

When a policy block has finished executing, any route that has been modified in this policy block or has received a pass disposition in this policy block passes the policy and execution finishes for that policy. If this policy block is applied from within another policy block and the route is either passed or modified, then execution continues in the policy block that applied this policy block.

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following example shows how to accept the route unconditionally without modifying it:

```
RP/0/RP0/CPU0:router(config-rpl)# pass
```

This example accepts the route unconditionally, without modifying it, if the destination is in prefix-set permitted:

```
RP/0/RP0/CPU0:router(config-rpl)# if destination in permitted then
RP/0/RP0/CPU0:router(config-rpl-if)# pass
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)#
```

path-type is

To match path types, use the **path-type is** command in route-policy configuration mode.

path-type is {**ibgp** | **ebgp***parameter*}

Syntax Description

ibgp	Specifies an internal BGP path.
ebgp	Specifies an external BGP path.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **path-type is** command as a conditional expression within an **if** statement to match path types.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, if the path is an external BGP path the route is accepted:

```
RP/0/RP0/CPU0:router(config)# route-policy policy_A
RP/0/RP0/CPU0:router(config-rpl)# if path-type is ebgp then
RP/0/RP0/CPU0:router(config-rpl-if)# pass
RP/0/RP0/CPU0:router(config-rpl-if)# else
RP/0/RP0/CPU0:router(config-rpl-else)# drop
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

policy-global

To define global parameters and enter global parameter configuration mode, use the **policy-global** command in XR Config mode. To remove global parameters, use the **no** form of this command.

policy-global
no policy-global

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **policy-global** command to define global parameters and enter global parameter configuration mode.

RPL supports the definition of systemwide global parameters that can be used inside a policy definition. The global parameter values can be used directly inside a policy definition similar to the local parameters of parameterized policy. When a parameterized policy has a parameter name "collision" with a global parameter name, parameters local to policy definition take precedence, effectively 'masking off' global parameters. In addition, a validation mechanism is in place to prevent the deletion of a particular global parameter if it is referred by any policy. For more information on global parameters and parameterization, see the *Implementing Routing Policy* module of the *Routing Configuration Guide for Cisco NCS 5500 Series RoutersRouting Configuration Guide for Cisco NCS 540 Series RoutersRouting Configuration Guide*

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following example shows how to configure global parameters:

```
RP/0/RP0/CPU0:router(config)# policy-global
RP/0/RP0/CPU0:router(config-rp-gl)# glbpathtype 'ebgp'
RP/0/RP0/CPU0:router(config-rp-gl)# glbtag '100'
RP/0/RP0/CPU0:router(config-rp-gl)# end-global
```

In the following example, the *globalparam* argument makes use of the global parameters gbpathtype and glbtag defined above and is defined for a nonparameterized policy:

```
RP/0/RP0/CPU0:router(config)# route-policy globalparam
RP/0/RP0/CPU0:router(config-rpl)# if path-type is $glbpathtype then
RP/0/RP0/CPU0:router(config-rpl)# set tag $glbtag
RP/0/RP0/CPU0:router(config-rpl)# endif
```

```
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

prefix-set

To enter prefix set configuration mode and define a prefix set for contiguous and non-contiguous set of bits, use the **prefix-set** command in XR Config mode. To remove a named prefix set, use the **no** form of this command.

prefix-set *name*
no prefix-set *name*

Syntax Description

name	Name of a prefix set.

Command Default

None

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **prefix-set** command to enter prefix set configuration mode and define a prefix set.

A prefix set is a comma-separated list of prefix match specifications. It holds IPv4 or IPv6 prefix match specifications, each of which has four parts: an address, a mask length, a minimum matching length, and a maximum matching length. The address is required, but the other three parts are optional. The address is a standard four-part, dotted-decimal numeric IPv4 address or a colon-separated hexadecimal IPv6 address. The mask length, if present, is a nonnegative decimal integer in the range from 0 to 32 for IPv4 prefixes or 0 to 128 for IPv6 prefixes following the address and separated from it by a slash. The optional minimum matching length follows the address and optional mask length and is expressed as the keyword **ge** (mnemonic for **g**reater than or **e**qual to), followed by a nonnegative decimal integer in the range from 0 to 32 for IPv4 or 0 to 128 for IPv6. The optional maximum matching length follows the rest and is expressed by the keyword **le** (mnemonic for **l**ess than or **e**qual to), followed by yet another nonnegative decimal integer in the range from 0 to 32 for IPv4 or 0 to 128 for IPv6. A syntactic shortcut for specifying an exact length for prefixes to match is the **eq** keyword, mnemonic for **eq**ual to.

If a prefix match specification has no mask length, then the default mask length is 32 for IPv4 or 128 for IPv6. The default minimum matching length is the mask length. If a minimum matching length is specified, then the default maximum matching length must be less than 32 for IPv4 prefixes or 128 for IPv6 prefixes. Otherwise, if neither a minimum nor maximum length is specified, the default maximum length is the mask length.

A prefix set is a list of prefix match specifications. It holds IPv4 or IPv6 prefix match specifications, each of which has two parts: an address and a mask. The address and mask is a standard dotted-decimal IPv4 or colon-separated hexadecimal IPv6 address. The prefix set allows the specifying of contiguous and non-contiguous set of bits that mus be matched in any route. The set of bits to be matched are provided in the form of a mask in which a binary 0 means a mandatory match and a binary 1 means a 'do not match' condition.

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following example shows a prefix set named legal-ipv4-prefix-examples:

```
RP/0/RP0/CPU0:router(config)# prefix-set legal-ipv4-prefix-examples
RP/0/RP0/CPU0:router(config-pfx)# 10.0.1.1,
RP/0/RP0/CPU0:router(config-pfx)# 10.0.2.0/24,
RP/0/RP0/CPU0:router(config-pfx)# 10.0.3.0/24 ge 28,
RP/0/RP0/CPU0:router(config-pfx)# 10.0.4.0/24 le 28,
RP/0/RP0/CPU0:router(config-pfx)# 10.0.5.0/24 ge 26 le 30,
RP/0/RP0/CPU0:router(config-pfx)# 10.0.6.0/24 eq 28
RP/0/RP0/CPU0:router(config-pfx)# end-set
```

The first element of the prefix set matches only one possible value, 10.0.1.1/32 or the host address 10.0.1.1. The second element matches only one possible value, 10.0.2.0/24. The third element matches a range of prefix values, from 10.0.3.0/28 to 10.0.3.255/32. The fourth element matches a range of values, from 10.0.4.0/24 to 10.0.4.240/28. The fifth element matches prefixes in the range from 10.0.5.0/26 to 10.0.5.252/30. The sixth element matches any prefix of length 28 in the range from 10.0.6.0/28 through 10.0.6.240/28.

The following prefix set consists entirely of invalid prefix match specifications:

```
RP/0/RP0/CPU0:router(config)# prefix-set INVALID-PREFIX-EXAMPLES
RP/0/RP0/CPU0:router(config-pfx)# 10.1.1.1 ge 16,
RP/0/RP0/CPU0:router(config-pfx)# 10.1.2.1 le 16,
RP/0/RP0/CPU0:router(config-pfx)# 10.1.3.0/24 le 23,
RP/0/RP0/CPU0:router(config-pfx)# 10.1.4.0/24 ge 33,
RP/0/RP0/CPU0:router(config-pfx)# 10.1.5.0/25 ge 29 le 28
RP/0/RP0/CPU0:router(config-pfx)# end-set
```

Neither the minimum length nor the maximum length is legal without a mask length. The maximum length must be at least the mask length. The minimum length must be less than 32, the maximum length of an IPv4 prefix. The maximum length must be equal to or greater than the minimum length.

The following example shows a valid IPv6 prefix set named legal-ipv6-prefix-examples:

```
RP/0/RP0/CPU0:router(config)# prefix-set legal-ipv6-prefix-examples
RP/0/RP0/CPU0:router(config-pfx)# 2001:0:0:1::/64,
RP/0/RP0/CPU0:router(config-pfx)# 2001:0:0:2::/64,
RP/0/RP0/CPU0:router(config-pfx)# 2001:0:0:3::/64,
RP/0/RP0/CPU0:router(config-pfx)# 2001:0:0:4::/64
RP/0/RP0/CPU0:router(config-pfx)# end-set
```

This example shows a prefix set named legal-ipv4-prefix:

```
RP/0/RP0/CPU0:router(config)# prefix-set legal-ipv4-prefix
RP/0/RP0/CPU0:router(config-pfx)# 10.1.1.1  0.255.0.255
RP/0/RP0/CPU0:router(config-pfx)# 10.2.2.2 0.0.0.0
RP/0/RP0/CPU0:router(config-pfx)# 10.3.3.3 255.255.255.254
RP/0/RP0/CPU0:router(config-pfx)# 10.4.4.4 255.255.255.255
```

In the above example, In the above example, the command defines the prefix-set named acl-prefix-set. The first element specifies to match all routes having 10 in first octet and 1 in third octet. The second element matches all routes having prefix as 10.2.2.2 (that is, matches all conditions). The third element matches all routes having odd numbers in the last octets and the fourth element matches all routes with any prefix.

prepend as-path

To prepend the AS path with additional autonomous system numbers, use the **prepend as-path** command in route-policy configuration mode.

prepend as-path {*as-numberparameter* | **most-recent**} [*numberparameter*]

Syntax Description

as-number	Autonomous system number to prepend to the path. • Range for 2-byte Autonomous system numbers (ASNs) is 1 to 65535. • Range for 4-byte Autonomous system numbers (ASNs) in asplain format is 1 to 4294967295. • Range for 4-byte Autonomous system numbers (ASNs) is asdot format is 1.0 to 65535.65535.
parameter	Parameter name. The parameter name must be preceded with a "$."
most-recent	Specifies that the most recent autonomous system number should be prepended.
number	(Optional) Number of times the autonomous system number should be prepended. Range is 1 to 63.

Command Default

The default *number* is 1.

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **prepend as-path** command to prepend the AS path with additional autonomous system numbers.

Note The **prepend as-path** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

This command can take one or two arguments. The first argument (either a number or parameter) is the autonomous system number to prepend to the path. The optional second argument (either a number or parameter) is the number of times the autonomous system number should be prepended.

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following example shows how to prepend the autonomous system number 666.1 to the AS path three times:

```
RP/0/RP0/CPU0:router(config-rpl)# prepend as-path 666.1 3
```

The following example shows how to prepend the autonomous system number 666.0 to the AS path one time:

```
RP/0/RP0/CPU0:router(config-rpl)# prepend as-path 666.0 1
```

protocol

To check the protocol that installs the route, use the **protocol** command in route-policy configuration mode.

protocol {**in***(protocol-set)* | **is***protocol-name*}

Syntax Description

in (*protocol-set*)	Specifies a member of a set. The *protocol-set* argument accepts the following keywords within parentheses: • **bgp** —Border Gateway Protocol (BGP) • **connected** —Connected routes • **isis** —ISO Intermediate System-to-Intermediate System (IS-IS) • **ospf** —Open Shortest Path First (OSPF) • **ospfv3** —Open Shortest Path First version 3 (OSPFv3) • **rip** —Routing Information Protocol (RIP) • **static** —Static routes Keywords must be separated by a comma.
is *protocol-name*	Specifies a single protocol name, and accepted keywords are similar to the *protocol-set* argument.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **protocol** command as a conditional expression within an if statement to specify a protocol to install a route.

Use the **in** keyword to determine if a protocol listed in the *protocol-set* is the originator of the route being filtered.

Use the **is** keyword to determine if *protocol-name* is an exact match.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following example shows how to use the **protocol** command as a conditional expression within if statements:

```
RP/0/RP0/CPU0:router(config)# route-policy rip1
RP/0/RP0/CPU0:router(config-rpl)# if protocol in (connected, static) then
RP/0/RP0/CPU0:router(config-rpl-if)# add rip-metric 2
RP/0/RP0/CPU0:router(config-rpl-if)# elseif protocol is bgp 1 then
RP/0/RP0/CPU0:router(config-rpl-elseif)# add rip-metric 3
RP/0/RP0/CPU0:router(config-rpl-elseif)# elseif protocol is ospf 2 then
RP/0/RP0/CPU0:router(config-rpl-elseif)# add rip-metric 4
RP/0/RP0/CPU0:router(config-rpl-elseif)# else
RP/0/RP0/CPU0:router(config-rpl-else)# add rip-metric 5
RP/0/RP0/CPU0:router(config-rpl-else)# endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy

RP/0/RP0/CPU0:router(config)# router rip
RP/0/RP0/CPU0:router(config-rip)# interface HundredGigE 0/1/0/1
RP/0/RP0/CPU0:router(config-rip-if)# route-policy rip1 out
```

rd in

To compare the route distinguisher (RD) associated with the route to RDs contained in either a named or an inline RD set, use the **rd in** command in route-policy configuration mode.

rd in {*rd-set-nameinline-rd-setparameter*}

Syntax Description

rd-set-name	Name of an RD set.
inline-rd-set	Inline RD set. The inline RD set must be enclosed in parentheses.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **rd in** command as a conditional expression within an **if** statement to match a destination entry in a named prefix set or inline prefix set.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

This command takes either a named RD set or an inline RD set value as an argument. The condition returns true if the destination entry matches any entry in the RD set or inline RD set. An attempt to match an RD using an RD set that is defined but contains no elements returns false.

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following example shows the **rd in** command with an inline RD set value as an argument:

```
RP/0/RP0/CPU0:router(config)# route-policy
RP/0/RP0/CPU0:router(config-rpl)# if rd in (128.1.0.0/16:100) then
RP/0/RP0/CPU0:router(config-rpl-if)# pass
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

rd-set

To define a route distinguisher (RD) set and enter RD configuration mode, use the **rd-set** command in XR Config mode.

rd-set *name*
no rd-set *name*

Syntax Description

name	Name of an RD community set.

Command Default

No default behavior or values

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **rd-set** command to create a set with RD elements and enter RD configuration mode. An RD set is a 64-bit value prepended to an IPv4 address to create a globally unique Border Gateway Protocol (BGP) VPN IPv4 address.

Note For *m*, the mask length is supported.

You can define RD values with the following commands:

- *a.b.c.d/m:**—BGP VPN RD in IPv4 format with a wildcard character. For example, 10.0.0.2/24.0:*.
- *a.b.c.d/m:n*—BGP VPN RD in IPv4 format with a mask. For example, 10.0.0.2/24:666.
- *a.b.c.d:** —BGP VPN RD in IPv4 format with a wildcard character. For example, 10.0.0.2:*.
- *a.b.c.d:n*—BGP VPN RD in IPv4 format. For example, 10.0.0.2:666.
- *asn:**—BGP VPN RD in ASN format with a wildcard character. For example, 10002:*.
- *asn:n*—BGP VPN RD in ASN format. For example, 10002:666.
- *x.y:**—BGP VPN RD in 4-byte ASN format with a wildcard character. For example, 10002.101:*.
- *x.y:n*—BGP VPN RD in 4-byte ASN format. For example, 10002.101:666.

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following example shows how to create an RD set called my_rd_set:

```
RP/0/RP0/CPU0:router(config)# rd-set my_rd_set
RP/0/RP0/CPU0:router(config-rd)# 172.16.0.0/16:*,
RP/0/RP0/CPU0:router(config-rd)# 172.17.0.0/16:100,
```

```
RP/0/RP0/CPU0:router(config-rd)# 192:*,
RP/0/RP0/CPU0:router(config-rd)# 192:100
RP/0/RP0/CPU0:router(config-rd)# end-set
```

replace as-path

To replace a sequence of AS numbers or private AS numbers in the AS path with the configured local AS number, use the **replace as-path** command in route-policy configuration mode.

replace as-path {[*as-number-list* *parameter*] | **private-as**}

Syntax Description

as-number-list	(Optional) Sequence of AS numbers to replace. The sequence must be enclosed in single quotes (‘ ’). You can use 2-byte or 4-byte AS numbers. • The 2-byte value is entered as a 16-bit unsigned decimal value. The range is 0 to 65535. • The 4-byte value is entered as two 16-bit unsigned decimal values separated by a period. The range is 1.0 to 65535.65535.
parameter	(Optional) Parameter name. The parameter name must be preceded with a “$.”
private-as	Matches within the BGP private AS range. Range is from 64512 to 65534.

Command Default

None.

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **replace as-path** command to replace a sequence of AS numbers or private AS numbers in the AS path with the local AS numbers. For example, if the AS path is ‘67 65534 100 65533 5 78 89 90’ and the local AS number is 900, then:

```
replace as-path ‘5 78’
```

replaces‘5 78’ in the AS path with 900 (from the local AS), and the new path would be‘67 65534 100 65533 900 89 90’.

Consider following statement:

```
replace as-path private-as
```

Because 65534 and 65533 are within the private AS range, they are replaced with 900. The path is ‘67 900 100 900 5 78 89 90’. The length of the path remains the same.

The **replace as-path** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

Caution The **replace as-path** command changes the AS path content which can lead to routing loops.

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following example shows how to use the **replace as-path** command to replace AS numbers in the AS path:

```
RP/0/RP0/CPU0:router(config)# route-policy drop-as-1234
RP/0/RP0/CPU0:router(config-rpl)# replace as-path '90 78 45 $asnum'
RP/0/RP0/CPU0:router(config-rpl)# replace as-path private-as
RP/0/RP0/CPU0:router(config-rpl)# replace as-path '9.9 7.89 14.15 $asnum'
RP/0/RP0/CPU0:router(config-rpl)# replace as-path '9 89 14.15 $asnum'
```

remove as-path private-as

To remove BGP private AS numbers from as-path structure used by BGP, use the **remove as-path private-as** command under route policy configuration mode.

remove as-path private-as [entire-aspath]

Syntax Description

entire-aspath	(Optional) Removes the entire private autonomous system numbers from an autonomous system path only if all the autonomous systems in the path are private.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
route-policy	read, write

Examples

This example shows how to remove BGP private AS numbers from as-path structure:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# route-policy rm_private_as
RP/0/RP0/CPU0:router(config-rpl)# remove as-path private-as entire-aspath
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

rib-has-route

To check if a route listed in the prefix set exists in the Routing Information Base (RIB), use the **rib-has-route** command in route-policy configuration mode.

rib-has-route in {*prefix-set-nameinline-prefix-setparameter*}

Syntax Description

prefix-set-name	Name of a prefix set.
inline-prefix-set	Inline prefix set. The inline prefix set must be enclosed in parentheses.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

If routes are active, then they are advertised. Routes are considered active if they are already installed in the Routing Information Base (RIB).

The prefix sets used in the **rib-has-route** command contain two match specifications. The first is where an exact route match is requested (for example, 10.10.0.0/16 will match exactly one route) and the second is where a route match or any more-specific route match is allowed (for example, 10.10.0.0/16 le 32 will match the 10.10.0.0/16 route and any longer prefix).

Use the **rib-has-route** command as a conditional expression within an **if** statement to check if there is an active route with a specific prefix contained in the RIB. If the statement reveals an active route that meets that criteria, additional actions are executed.

For a list of all conditional expressions available within an **if** statement, see the **if** command.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, an **if** statement is used to learn if a route contained in a prefix set 10.10.0.0/16 is in the RIB:

```
RP/0/RP0/CPU0:router(config-rpl)# if rib-has-route in (10.10.0.0/16 ge 16) then
RP/0/RP0/CPU0:router(config-rpl-if)# pass
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)#
```

route-has-label

To check if there is a Multiprotocol Label Switching (MPLS) label in a route during redistribution, use the **route-has-label** command in route-policy configuration mode.

route-has-label

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **route-has-label** command as a conditional expression within an **if** statement to check if there is an MPLS label in a route during redistribution.

For a list of all conditional expressions available within an **if** statement, see the **if** command.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, an **if** statement learns if an MPLS label is present in a route:

```
RP/0/RP0/CPU0:router(config-rpl)# if route-has-label then
RP/0/RP0/CPU0:router(config-rpl-if)# pass
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)#
```

route-policy (RPL)

To define a route policy and enter route-policy configuration mode, use the **route-policy** command in XR Config mode. To remove a policy definition, use the **no** form of this command.

route-policy *name* [*(parameter1, parameter2, . . . , parameterN)*]
no route-policy *name*
(parameter1, parameter2, . . . , parameterN)

Syntax Description

name	Name of a route policy.
parameter	(Optional) Parameter name. The parameter name must be preceded with a "$." The *parameters* must be enclosed in parenthesis "()".

Command Default

No default behavior or values

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **route-policy** command to define a route policy and enter route-policy configuration mode.

Policy definitions create named bundles of policy statements. A policy definition consists of the **route-policy** command followed by a name, a group of policy statements, and the **end-policy** command.

The policy name serves as a handle for binding the policy to protocols.

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following example shows a simple policy named drop-everything that drops any route it encounters:

```
RP/0/RP0/CPU0:router(config)# route-policy drop-everything
RP/0/RP0/CPU0:router(config-rpl)# drop
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

Policies may also refer to other policies such that common blocks of policy can be reused. This reference to other policies is accomplished by using the **apply** command. The following is a simple example:

```
RP/0/RP0/CPU0:router(config)# route-policy drop-as-1234
RP/0/RP0/CPU0:router(config-rpl)# if as-path passes-through '1234' then
RP/0/RP0/CPU0:router(config-rpl-if)# apply check-communities
```

```
RP/0/RP0/CPU0:router(config-rpl-if)# else
RP/0/RP0/CPU0:router(config-rpl-else)# pass
RP/0/RP0/CPU0:router(config-rpl-else)# endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

The **apply** command indicates that the policy check-communities should be executed if the route under consideration passed through autonomous system 1234 before it was received. If so, the communities of the route are checked, and based on the findings the route may be accepted unmodified, accepted with changes, or dropped.

route-type is

To match route types when redistribution is being performed into Border Gateway Protocol (BGP), Open Shortest Path First (OSPF), or Integrated Intermediate System-to-Intermediate System (IS-IS), use the **route-type is** command in route-policy configuration mode.

route-type is {**local** | **interarea** | **internal** | **type-1** | **type-2** | **level-l** | **level-2***parameter*}

Syntax Description

local	Uses a local value to match locally generated BGP routes.
interarea	Uses an interarea value to match IS-IS interarea routes.
internal	Uses an internal value to match OSPF intra- and interarea routes.
type-1	Uses a Type 1 value to match Type 1 OSPF routes.
type-2	Uses a Type 2 value to match Type 2 OSPF routes.
level-1	Uses a Level 1 value to match Level 1 IS-IS routes.
level-2	Uses a Level 2 value to match Level 2 IS-IS routes.
parameter	Parameter name. The parameter name must be preceded with a “$.”

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **route-type is** command as a conditional expression within an **if** statement to compare route types when redistribution is being performed into BGP, OSPF, or IS-IS.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

The valid keywords are **local** , **internal** , **interarea** , **type-1** , **type-2** , **level-1** , and **level-2** . A parameterized value that fills in one of these values may also be used. The **local** value is used to match locally generated BGP routes. The internal value is used to match OSPF intra- and interarea routes. The **type-1** and **type-2** values are used to match Type 1 and Type 2 OSPF external routes. The **level-1** , **level-2** , and **interarea** values are used to match IS-IS routes of those respective types.

Because the route type is a matching operator, it appears in conditional clauses of **if** and **then** statements.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, non-local routes are dropped:

```
RP/0/RP0/CPU0:router(config)# route-policy policy_A
RP/0/RP0/CPU0:router(config-rpl)# if route-type is local then
RP/0/RP0/CPU0:router(config-rpl-if)# pass
RP/0/RP0/CPU0:router(config-rpl-if)# else
RP/0/RP0/CPU0:router(config-rpl-else)# drop
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

rpl editor

To set the default routing policy language (RPL) editor, use the **rpl editor** command in XR Config mode.

rpl editor {**nano** | **emacs** | **vim**}

Syntax Description

nano	Sets the default RPL editor to GNU nano.
emacs	Sets the default RPL editor to EMACS.
vim	Sets the default RPL editor to VIM.

Command Default

The Vim editor is the default.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.
Release 7.11.1	This command was deprecated.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the default RPL editor is set to Nano:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rpl editor nano
```

In the following example, the default RPL editor is set to EMACS:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rpl editor emacs
```

In the following example, the default RPL editor is set to VIM:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rpl editor vim
```

rpl maximum

To configure system limits on the routing policy subsystem, use the **rpl maximum** command in XR Config mode.

rpl maximum {**lines** | **policies**} *number*

Syntax Description

lines *number*	Configures the number of lines of configuration limit. Range is from 1 to 131072.
policies *number*	Configures the number of policies limit. Range is from 1 to 5000.

Command Default

lines *number* : 65536

policies *numbers* : 3500

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **rpl maximum** command to configure system limits on the routing policy subsystem. As such, **rpl maximum** configuration lines do not appear as statements within a routing policy. This command places resource limits on the routing policy subsystem. Use the **rpl maximum** command to configure the maximum number of lines of configuration and number of policies.

The number of lines of configuration includes the beginning and ending statements **,** for example, **route-policy** and **end-policy** . Each line of configuration for sets is also counted.

A line of configuration is counted only once; it is not counted each time it is used. Similarly, any multiple use of policy in an apply statement counts only as one policy.

A user can change the default values for lines and policies but cannot exceed the maximum value, nor can the value for lines and policies be configured lower than the number of lines or policies that are currently configured.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the maximum number of RPL system limits are modified:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rpl maximum lines 50
RP/0/RP0/CPU0:router(config)# rpl maximum policies 6
```

rpl set-exit-as-abort

To change the default exit behavior under RPL configuration mode to abort from the RPL configuration mode without saving the configuration, use the **rpl set-exit-as-abort** command in XR Config mode.

rpl set-exit-as-abort

Syntax Description

This command has no keywords or arguments.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The default **exit** command acts as end-policy, end-set, or end-if. If the **exit** command is executed under route policy configuration mode, the changes are applied and configuration is updated. This destructs the existing policy. The **rpl set-exit-as-abort** command allows to overwrite the default behavior of the **exit** command under the route policy configuration mode.

Task ID

Task ID	Operations
route-policy	read, write

Examples

This example shows how change the default exit behavior:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rpl set-exit-as-abort
```

set administrative-distance

To set a route with lower administrative distance such that it is preferred to a route with higher administrative distance, use the **set administrative-distance** command in route policy configuration mode.

set administrative-distance [**number** | **parameter**]

Syntax Description

number	Value assigned to a 8-bit unsigned integer. Range is from 1 to 255.
parameter	Parameter name. The parameter name must be preceded with a "$".

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
route-policy	read, write

Examples

This example shows how to set a route with an administrative value such that it is preferred to a route with higher administrative distance.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# route-policy sample
RP/0/RP0/CPU0:router(config-rpl)# set administrative-distance 34
RP/0/RP0/CPU0:router(config-rpl)# end-policy
RP/0/RP0/CPU0:router(config-rpl)# exit
RP/0/RP0/CPU0:router(config)# route bgp 100
RP/0/RP0/CPU0:router(config-bgp)# address family ipv4 unicast
RP/0/RP0/CPU0:router(config-bgp-af)# table-policy sample
RP/0/RP0/CPU0:router(config-bgp-af)# exit
RP/0/RP0/CPU0:router(config-bgp)# exit
RP/0/RP0/CPU0:router(config)# end
```

set community

To set the Border Gateway Protocol (BGP) community attributes in a route, use the **set community** command in route-policy configuration mode.

set community {*community-set-nameinline-community-setparameter*} [**additive**]

Syntax Description

community-set-name	Community set name.
inline-community-set	Inline community set. The inline community set must be enclosed in parentheses.
parameter	Parameter name. The parameter name must be preceded with a "$."
additive	(Optional) Adds communities to communities in the route.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **set community** command to set the BGP community attribute.

Note The **set community** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

Communities are 32-bit values carried in BGP routes. Each route may have zero or more communities in an unordered list.

Use this command to replace the communities in a route or add to them using the optional **additive** keyword.

As with the other community forms that support inline sets, either or both 16-bit portions of the community can be parameterized. Likewise, the names of the well-known communities **internet** (0:0), **no-advertise** (65535:65281), **no-export** (65535:65282), and **local-AS** (65535:65283) can also be used. In an inline community set, each 16-bit portion can also be specified as the **peeras** to express the AS number of the neighbor from which the route was received. If the neighbor AS employs a 4-byte ASN, the IANA-assigned 16-bit value 23456 (AS_TRANS) is used as **peeras** instead.

Without the **additive** keyword, any existing communities (other than the well-known communities) are removed and replaced with the given communities. The **additive** keyword specifies that all communities already present in the route be maintained and the list of communities be added to them.

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following are incomplete configuration examples using the **set community** command:

```
RP/0/RP0/CPU0:router(config-rpl)# set community (10:24)
RP/0/RP0/CPU0:router(config-rpl)# set community (10:24, $as:24, $as:$tag)
RP/0/RP0/CPU0:router(config-rpl)# set community (10:24, internet) additive
RP/0/RP0/CPU0:router(config-rpl)# set community (10:24, $as:24) additive
RP/0/RP0/CPU0:router(config-rpl)# set community (10:24, peeras:24) additive
```

set core-tree

To set a Multicast Distribution Tree (MDT) type, use the **set core-tree** command in route-policy configuration mode.

set core-tree {**gre-rosen** | **mldp-inband** | **mldp-partitioned-mp2mp** | **mldp-partitioned-p2mp** | **mldp-rosen** | **rsvp-te-partitioned-p2mp***parameter*}

Syntax Description

gre-rosen	Specifies the IP GRE Rosen core MDT type
mldp-inband	Specifies the MLDP InBand core MDT type
mldp-partitioned-mp2mp	Specifies theMLDP Partitioned MP2MP core MDT type
mldp-partitioned-p2mp	Specifies the MLDP Partitioned P2MP core MDT type
mldp-rosen	Specifies the MLDP Rosen core MDT type
rsvp-te-partitioned-p2mp	Specifies the RSVP TE core core MDT type
parameter	Parameter name. The parameter name must be preceded with a “$.”

Command Default

None

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
route-policy	read, write

In this example, the Multicast Distribution Tree type is set to IP GRE Rosen core:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#route-policy policy_mdt_type
RP/0/RP0/CPU0:router(config-rpl)#set core-tree gre-rosen
```

set dampening

To configure Border Gateway Protocol (BGP) route dampening, use the **set dampening** command in route-policy configuration mode.

set dampening {**halflife** {*minutesparameter*} | **max-suppress** {*minutesparameter*} | **reuse** {*secondsparameter*} | **suppress** {*penalty-unitsparameter*} | **others default**}

Syntax Description

halflife *minutes*	Specifies the time (in minutes) after which a penalty is decreased. After the route has been assigned a penalty, the penalty is decreased by half after the half-life period. The process of reducing the penalty happens every 5 seconds. Range is 1 to 45 minutes.
parameter	Parameter name. The parameter name must be preceded with a "$."
max-suppress *minutes*	Specifies the maximum time (in minutes) a route can be suppressed. Range is 1 to 20000. If the half-life value is allowed to default, the maximum suppress time defaults to 60 minutes.
reuse *seconds*	Unsuppresses a route if the penalty for flapping the route decreases enough to fall below the configured value (in seconds). The process of unsuppressing routes occurs at 10-second increments. Range is 1 to 20000.
suppress *penalty-units*	Specifies a penalty of 1000 each time a route flaps. When a route penalty exceeds the configured limit, it is suppressed. Range is 1 to 20000.
others default	If all four keyword values are not specified in the command, then the command *must* end with **others default** . This designation indicates that any keyword not defined is set to its default.

Command Default

half-life : 15 minutes

max-suppress : 60 minutes (four times the half-life)

reuse : 750 seconds

suppress : 2000 penalty units

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

The BGP protocol supports route dampening using an exponential backoff algorithm. The algorithm is controlled by setting the four supported BGP values: half-life, max-suppress, reuse, and suppress. Use the **set dampening** command to configure BGP route dampening.

Note The **set dampening** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

A value for at least one of the four keywords must be set. If the **set dampening** command defines values for three or fewer of the supported keywords, then the configuration must end with the **others default** , which indicates that any keyword value not defined in the command is set to its default value.

The keywords may appear in the command in any order.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following examples, the half-life is set to 20 minutes and the maximum suppress time is set to

90 minutes. Each command must end with **others default** because three or fewer keywords are defined.

```
RP/0/RP0/CPU0:router(config-rpl)# set dampening halflife 20 others default
RP/0/RP0/CPU0:router(config-rpl)# set dampening max-suppress 90 others default
```

In this example, all four keywords are defined, which means the command does not use **others default** .

```
RP/0/RP0/CPU0:router(config-rpl)# set dampening halflife 15 max-suppress 60 reuse 750
suppress 2000
```

The following command is invalid because it is missing **others default.**

```
RP/0/RP0/CPU0:router(config-rpl)# set dampening reuse 700
```

In the following example, the parameters are used.

```
RP/0/RP0/CPU0:router(config-rpl)# set dampening halflife $p1 suppress $p4 reuse $p3
max-suppress $p2
```

set extcommunity cost

To set the Border Gateway Protocol (BGP) cost extended community attributes, use the **set extcommunity cost** command in route-policy configuration mode.

set extcommunity cost {*cost-extcommunity-set-namecost-inline-extcommunity-setparameter*} [**additive**]

Syntax Description

cost-extcommunity-set-name	Cost extended community set name.
cost-inline-extcommunity-set	Inline cost extended community set. The inline cost extended community set must be enclosed in parentheses.
parameter	Parameter name. The parameter name must be preceded with a "$."
additive	(Optional) Adds extended communities for cost to extended communities in the route.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **set extcommunity cost** command to either replace the extended communities on the route or add to them using the optional **additive** keyword. Cost community is an extended community used to tie break the best path selection process in BGP so as to have a localized custom decision for packet forwarding. The extended community format defines generic points of insertion (POI) that influence the decision at different points of the bestpath algorithm.

Note The **set extcommunity cost** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

As with the other extended community forms that support inline sets, either or both portions of the community can be parameterized. Similarly to regular communities, the **additive** keyword can be used to signify adding these extended communities to those that are already present, as opposed to replacing them. Without the **additive** keyword, any existing extended communities for cost (other than the well-known communities) are removed and replaced with the given communities. The **additive** keyword specifies that all extended communities for cost already present in the route be maintained and the set of extended communities be added to them. Well-known communities include internet, local-AS, no-advertise, and no-export.

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following are incomplete configuration examples using the **set extcommunity cost** command:

```
RP/0/RP0/CPU0:router(config-rpl)# set extcommunity cost (IGP:10:20)
RP/0/RP0/CPU0:router(config-rpl)# set extcommunity cost (Pre-Bestpath:33:44)
RP/0/RP0/CPU0:router(config-rpl)# set extcommunity cost (IGP:11:21)
```

set extcommunity rt

To set the Border Gateway Protocol (BGP) route target (RT) extended community attributes, use the **set extcommunity rt** command in route-policy configuration mode.

set extcommunity rt {*rt-extcommunity-set-namert-inline-extcommunity-setparameter*} **additive**

Syntax Description

rt-extcommunity-set-name	Route target extended community set name.
rt-inline-extcommunity-set	Inline route target extended community set. The inline route target extended community set must be enclosed in parentheses.
parameter	Parameter name. The parameter name must be preceded with a "$."
additive	(Optional) Adds extended communities for an RT to extended communities in the route.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **set extcommunity rt** command to either replace the extended communities on the route or add to them using the optional **additive** keyword.

Note The **set extcommunity rt** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

As with the other extended community forms that support inline sets, either or both portions of the community can be parameterized. Similarly to regular communities, the **additive** keyword can be used to signify adding these extended communities to those that are already present, as opposed to replacing them.

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following are incomplete configuration examples using the **set extcommunity rt** command:

```
RP/0/RP0/CPU0:router(config-rpl)# set extcommunity rt (10:24)
RP/0/RP0/CPU0:router(config-rpl)# set extcommunity rt (10:24, $as:24, $as:$tag)
RP/0/RP0/CPU0:router(config-rpl)# set extcommunity rt (10:24, internet) additive
```

```
RP/0/RP0/CPU0:router(config-rpl)# set extcommunity rt (10:24, $as:24) additive
```

Without the **additive** keyword, any existing extended communities for cost (other than the well-known communities) are removed and replaced with the given communities. The **additive** keyword specifies that all extended communities for cost already present in the route be maintained and the list of extended communities be added to them.

set ip-precedence

To set the IP precedence, use the **set ip-precedence** command in route-policy configuration mode.

set ip-precedence {*numberparameter*}

Syntax Description

number	Value of the precedence. The precedence value can be a number from 0 to 7: • **7** —network (set packets with network control precedence) • **6** —internet (set packets with internetwork control precedence) • **5** —critical (set packets with critical precedence) • **4** —flash-override (set packets with flash override precedence) • **3** —flash (set packets with flash precedence) • **2** —immediate (set packets with immediate precedence) • **1** —priority (set packets with priority precedence) • **0** —routine (set packets with routine precedence)
parameter	Parameter name. The parameter name must be preceded with a “$.”

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **set ip-precedence** command to set the IP precedence to classify packets. This command is supported at the BGP table-policy attachpoint. Prefixes are marked for subsequent processing in the forwarding plane. After QoS Policy Propagation through Border Gateway Protocol (BGP) (QPPB) is enabled on an interface, corresponding traffic shaping and policing is completed using packet classification based on the IP precedence or QoS group ID. See *Modular QoS Configuration Guide for Cisco NCS 5500 Series RoutersModular QoS Configuration Guide for Cisco NCS 540 Series RoutersModular QoS Configuration Guide for Cisco NCS 560 Series Routers* for information on QPPB.

Task ID

Task ID	Operations
route-policy	read, write

Examples

This example shows how use **set ip-precedence** command:

```
RP/0/RP0/CPU0:router(config)# route-policy policy_1
RP/0/RP0/CPU0:router(config-rpl)# set ip-precedence 3
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

set isis-metric

To set the Intermediate System-to-Intermediate System (IS-IS) metric attribute value, use the **set is-is metric** command in route-policy configuration mode.

set isis-metric {*numberparameter*}

Syntax Description

number	24-bit integer number. Range is from 0 to 16777215.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **set isis-metric** command to set the IS-IS metric attribute value for routes that are redistributed into IS-IS.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the IS-IS metric attribute value is set to 1000:

```
RP/0/RP0/CPU0:router(config)# route-policy policy_1
RP/0/RP0/CPU0:router(config-rpl)# set isis-metric 1000
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

set label

To set the Border Gateway Protocol (BGP) label attribute value, use the **set label** command in route-policy configuration mode.

set label {**explicit-null** | **implicit-null***parameter*}

Syntax Description

explicit-null	Sets the label to the well-known explicit value of 0.
implicit-null	Sets the label to the well-known implicit value of 3.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **set label** command in a route policy at the allocate label attachpoint to set the label to explicit-null or implicit-null based on deployment preference. During inter-AS operation, the ASBR sends some of its own loopbacks to other its peers and labels them either implicit null or explicit null.

Examples

The following example shows how to set the labels:

```
RP/0/RP0/CPU0:router(config)# route-policy labelpolicy
RP/0/RP0/CPU0:router(config-rpl)# if destination in (206.141.1.0/24) then
RP/0/RP0/CPU0:router(config-rpl)# set label explicit-null
RP/0/RP0/CPU0:router(config-rpl)# elseif destination in (206.141.3.0/24) then
RP/0/RP0/CPU0:router(config-rpl)# drop
RP/0/RP0/CPU0:router(config-rpl)# elseif destination in (206.141.4.0/24) then
RP/0/RP0/CPU0:router(config-rpl)# set label explicit-null
RP/0/RP0/CPU0:router(config-rpl)# endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

set label-mode

To set the type of Border Gateway Protocol (BGP) label mode, use the **set label-mode** command in route-policy configuration mode. This command does not have a **no** form.

set label-mode {**per-ce** | **per-vrf** | **per-prefix**}

Syntax Description

per-ce	Specifies that the same label is used for all routes advertised from a unique customer edge (CE) peer or router.
per-vrf	Specifies that the same label is used for all routes advertised from a unique VRF.
per-prefix	Specifies that the same label is used for all routes advertised from a unique prefix.

Command Default

Per-prefix label mode.

If a policy attached at label-mode attachpoint evaluates to pass and a **label mode** is not explicitly set, **per-prefix** is used as a default label mode.

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **set label-mode** command in a route policy at the label-mode attachpoint to set the type of label mode to per-ce or per-vrf or per-prefix, based on deployment preference.

Per-vrf label mode is not supported for Carrier Supporting Carrier (CSC) network with internal and external BGP multipath setup.

Task ID

Task ID	Operation
route-policy	read, write

This example shows how to set the type of label-mode to per-ce:

```
RP/0/RP0/CPU0:router(config)# route-policy set_label_mode
RP/0/RP0/CPU0:router(config-rpl)# set label-mode per-ce
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

This example shows how to set the type of label-mode to per-vrf:

```
RP/0/RP0/CPU0:router(config)# route-policy set_label_mode
RP/0/RP0/CPU0:router(config-rpl)# set label-mode per-vrf
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

This example shows how to set the type of label-mode to per-prefix:

```
RP/0/RP0/CPU0:router(config)# route-policy set_label_mode
RP/0/RP0/CPU0:router(config-rpl)# set label-mode per-prefix
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

set large-community

To set the Border Gateway Protocol (BGP) large-community attributes in a route, use the **set large-community** command in route-policy configuration mode.

set large-community { *large-community-set-name inline-large-community-set parameter* } [**additive**]

Syntax Description

large-community-set-name	Large-community set name.
inline-large-community-set	Inline large-community set. The inline large-community set must be enclosed in parentheses.
parameter	Parameter name. The parameter name must be preceded with a "$."
additive	(Optional) Adds large-communities to large-communities in the route.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.3.1	This command was introduced.

Usage Guidelines

The large communities are specified as three non negative decimal integers separated by colons. For example, 1:2:3. Each integer is stored in 32 bits. The possible range for each integer is 0 to 4294967295.

In route-policy statements, each integer in the BGP large community can be replaced by the following expression:

- peeras — This expression is replaced by the AS number of the neigbhor from which the community is received or to which the community is sent, as appropriate.

Note The **set large-community** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

Without the **additive** keyword, any existing large communities are removed and replaced with the given large communities. The **additive** keyword specifies that all communities already present in the route be maintained and the list of communities be added to them. However the **additive** keyword does not result in duplicate entries. If a particular large community is attached to a route and you specify the same large community again with the **additive** keyword in the set statement, then the specified large community is not added again. The merging operation removes duplicate entries. This also applies to the **peeras** keyword.

Task ID

Task ID	Operations
route-policy	read, write

The peeras expression in this example is replaced by the AS number of the neighbor from which the BGP large community is received or to which the community is sent, as appropriate.

In this example, if the route-policy mordac is applied to a neighbor, the ASN of which is 1, then the large community (1:2:3) is set only once.

```
RP/0/RP/0/RP0/CPU0:router#config
RP/0/RP0/CPU0:router(config)#route-policy mordac
RP/0/RP0/CPU0:router(config-rpl)#set large-community (1:2:3, peeras:2:3)
RP/0/RP0/CPU0:router(config-rpl)#end-set
RP/0/RP0/CPU0:router(config)#large-community-set catbert
RP/0/RP0/CPU0:router(config-largecomm)#1:2:3,
RP/0/RP0/CPU0:router(config-largecomm)#5:2:3
RP/0/RP0/CPU0:router(config-largecomm)#end-set
RP/0/RP0/CPU0:router(config)#route-policy wally
RP/0/RP0/CPU0:router(config-rpl)#set large-community catbert additive
RP/0/RP0/CPU0:router(config-rpl)#end-set
```

Note You should configure the **send-community-ebgp** command to send large communities to ebgp neighbors.

set level

To configure the Intermediate System-to-Intermediate System (IS-IS) link-state packet (LSP) level advertised to redistributed routes, use the **set level** command in route-policy configuration mode.

set level {**level-1** | **level-2** | **level-1-2***parameter*}

Syntax Description

level-1	Specifies that redistributed routes are advertised in the Level 1 LSP of the router.
level-2	Specifies that redistributed routes are advertised in the Level 2 LSP of the router.
level-1-2	Specifies that redistributed routes are advertised in Level 1 and Level 2 LSPs of the router.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the IS-IS **set level** command to configure the LSP level advertised to redistributed routes.

Note The **set level** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

This command supports parameterization of the **level** keyword.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the level is set to Level 2:

```
RP/0/RP0/CPU0:router(config)# route-policy bgp_isis_redist
RP/0/RP0/CPU0:router(config-rpl)# if destination in (172.2.0.0/16 ge 16) then
RP/0/RP0/CPU0:router(config-rpl)# set level level-2
RP/0/RP0/CPU0:router(config-rpl)# endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

set local-preference

To set the Border Gateway Protocol (BGP) local preference attribute in a route, use the **set local-preference** command in route-policy configuration mode.

set local-preference {*numberparameter*}

Syntax Description

number	Value assigned to a 32-bit unsigned integer. Range is 0 to 4294967295.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

Default value is 100.

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **set local-preference** command to specify a preference value for the autonomous system path. Local preference is a nontransitive (does not cross autonomous system boundaries) attribute and is the second metric considered in the BGP best path calculation (the highest local preference is chosen). Weight is the first metric evaluated for best path, but it is local to the router and propagates only to iBGP peers. See the *Implementing BGP* module of the *Routing Configuration Guide for Cisco NCS 5500 Series RoutersRouting Configuration Guide for Cisco NCS 540 Series RoutersRouting Configuration Guide* for information on the BGP best path calculation.

Note The **set local-preference** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

The local preference is a 32-bit unsigned integer.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the local preference value is set to 10:

```
RP/0/RP0/CPU0:router(config-rpl)# set local-preference 10
```

set med

To set the Border Gateway Protocol (BGP) Multi Exit Discriminator (MED) attribute, use the **set med** command in route-policy configuration mode.

set med {*numberparameter* | **igp-cost** | {+ | {*numberparameter*} | - | {*numberparameter*}} | **max-reachable**}

Syntax Description

number	Value assigned to a 32-bit unsigned integer. Range is 0 to 4294967295.
parameter	Parameter name. The parameter name must be preceded with a "$."
igp-cost	Sets the MED value to the cost for the Interior Gateway Protocol (IGP) route to resolve the next-hop of the BGP route.
+ | -	Sets the MED to the MED plus or minus a static offset. An integer or parameter must follow the plus or minus.
max-reachable	Sets the MED value to the maximum possible value of 4294967295.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **set med** command to set the MED value, which is a 32-bit unsigned integer.

Note The **set med** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

This command can take the following as argument values: an integer, a parameter, the **igp-cost** keyword, or a mathematical operator (either plus or minus) followed by an integer or a parameter. Setting the MED to the IGP cost is supported on outbound BGP policies only. The MED cannot be set to the IGP cost in policies applied to other BGP attach points.

The **max-reachable** keyword sets the MED to the maximum value while leaving the route reachable.

The plus or minus variants allow the user to set the MED to the MED plus or minus a static offset. The variants that allow a user to add or subtract offsets to the MED value are also range checked for underflow or overflow. If the value underflows as a result of subtraction, then the MED value is set to zero. If the value overflows, the value is set to 4294967295, which is the maximum value for MED. when MED is set to 4294967295, the route is unreachable.

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following two examples show how to set the MED to a value that is either specified directly (using the integer 156) or passed to the policy as a parameter:

```
RP/0/RP0/CPU0:router(config-rpl)# set med 156
RP/0/RP0/CPU0:router(config-rpl)# set med $med_param
```

The following example shows how to instruct BGP to automatically set the MED value to the cost of the IGP route that resolves the next-hop of the BGP route:

```
RP/0/RP0/CPU0:router(config-rpl)# set med igp-cost
```

set metric-type (IS-IS)

To configure the integrated Intermediate System-to-Intermediate System (IS-IS) metric type, use the **set metric-type** command in route-policy configuration mode.

set metric-type {**internal** | **external** | **rib-metric-as-internal** | **rib-metric-as-external***parameter*}
set metric-type {**internal** | **external***parameter*}

Syntax Description

internal	Sets metric type to internal.
external	Sets the metric type to external.
parameter	Parameter name. The parameter name must be preceded with a "$."

Syntax Description

internal	Sets metric type to internal.
external	Sets the metric type to external.
rib-metric-as-internal	Uses RIB metric and sets IS-IS internal metric type.
rib-metric-as-external	Uses RIB metric and sets IS-IS external metric type.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the IS-IS **set metric-type** command to control whether IS-IS treats the metric as an internal or external metric.

Use the **rib-metric-as-external** and **rib-metric-as-internal** keywords to preserve RIB metrics when redistributing routes from another ISIS router instance or another protocol.

Note The **set metric-type** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

This command does not support parameterization.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the IS-IS metric type is set to internal:

```
RP/0/RP0/CPU0:router(config-rpl)# set metric-type internal
```

set metric-type (OSPF)

To control how Open Shortest Path First (OSPF) computes the cost for a route, use the **set metric-type** command in route-policy configuration mode.

set metric-type {**type-1** | **type-2***parameter*}

Syntax Description

type-1	Uses the cost set on the route plus the topology-related costs in the calculation for Type 1 metrics.
type-2	Uses only the cost set on the route in the calculation for Type 2 metrics.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the OSPF **set metric-type** command to control whether OSPF treats the cost as a Type 1 or Type 2 metric.

Note The **set metric-type** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

The value of Type 1 or Type 2 controls how OSPF computes the cost for this route. For Type 2 metrics, only the cost set on the route is used. For Type 1 metrics, the cost set on the route plus the topology- related costs are used in the calculation.

This command does not support parameterization.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the OSPF metric type is set to Type 1:

```
RP/0/RP0/CPU0:router(config-rpl)# set metric-type type-1
```

set next-hop

To replace the next-hop associated with a given route, use the **set next-hop** command in route-policy configuration mode.

set next-hop {*ipv4-address [destination-vrf] ipv6-address [destination-vrf]* | **discard** *parameter* | **peer-address** | **self**}

Syntax Description

ipv4-address	Valid IPv4 address.
ipv6-address	Valid IPv6 address.
discard	Sets next-hop as Null0 interface.
destination-vrf	(Optional) Specifies that the next-hop of the route should be resolved in destination VRF context. This keyword is available when an IPv4 or IPv6 address or parameter is used.
peer-address	Sets the next-hop to the IP address of the remote Border Gateway Protocol (BGP) peer.
parameter	Parameter name. The parameter name must be preceded with a “$.”
self	Sets itself as the next-hop.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **set next-hop** command to replace the next-hop associated with a specific address.

The next hop destination is selected according to the address family. Example: for ipv4 address-family, the IPv4 address is used and for ipv6 address-family, the IPv6 address is used.

Note The **set next-hop** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

Use the **set next-hop peer-address** command to set the next-hop to the address of the BGP neighbor, where this policy is attached.

The next-hop is a valid IPv4 address entered as a dotted decimal or an IPv6 address entered as a colon-separated hexadecimal.

It is not possible to use this command to set the BGP IPv6 link-local next-hop.

The **destination-vrf** keyword is used mainly in Layer 3 VPN networks when importing routes.

The below address families support the selective setting of 'next-hop-self' via the RPL statement 'set next-hop self' starting in 4.2.1. Previous to this the setting of next-hop-self via an RPL was for all prefixes in the address family or none of the prefixes.

- IPv4 unicast
- IPv4 labeled-unicast
- IPv4 multicast
- IPv6 unicast
- IPv6 multicast

The **set next-hop discard** configuration is used in the neighbor inbound policy. When this config is applied to a path, the primary next-hop is still be associated with the actual path but the RIB is updated with next-hop set to Null0. Even if the primary received nexthop is unreachable, the Remotely Triggered Blackhole (RTBH) path will be considered reachable and will be a candidate in the bestpath selection process. The RTBH path is readvertised to other peers with either the received next-hop or nexthop-self based on normal BGP advertisement rules.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the next-hop is set to a valid IPv4 address:

```
RP/0/RP0/CPU0:router(config-rpl)# set next-hop 10.0.0.5
```

In this example, the next-hop is set to a parameter value $nexthop:

```
RP/0/RP0/CPU0:router(config-rpl)# set next-hop $nexthop
```

In this example, the next-hop is set to a valid IPv4 address with a destination VRF context:

```
RP/0/RP0/CPU0:router(config-rpl)# set next-hop 10.0.0.5 destination-vrf
```

set origin

To change the Border Gateway Protocol (BGP) origin attribute, use the **set origin** command in route-policy configuration mode.

set origin {**igp** | **incomplete** | **egp***parameter*}

Syntax Description

igp	Sets the origin type to Interior Gateway Protocol (IGP).
incomplete	Sets the origin type to incomplete.
egp	Sets the origin type to Exterior Gateway Protocol (EGP).
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **set origin** command to change the origin attribute.

Note The **set origin** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

The origin of a Border Gateway Protocol (BGP) route is **igp** , **egp** , or **incomplete** .

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the origin attribute is set to EGP:

```
RP/0/RP0/CPU0:router(config-rpl)# set origin egp
```

set ospf-metric

To set an Open Shortest Path First (OSPF) protocol metric attribute value, use the **set ospf-metric** command in route-policy configuration mode.

set ospf-metric {*numberparameter*}

Syntax Description

number	Value assigned to a 24-bit unsigned integer. Range is 0 to 4294967295.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **set ospf-metric** command to set the metric for routes that are redistributed into OSPF. The OSPF metric operator accepts either an integer value or a parameter.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the OSPF metric attribute value is set to 1000:

```
RP/0/RP0/CPU0:router(config)# route-policy policy_1
RP/0/RP0/CPU0:router(config-rpl)# set ospf-metric 1000
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

set path-selection

To set path selection criteria and install or advertise the path for the Border Gateway Protocol, use the **set path-selection** command in route-policy configuration mode.

set path-selection {**backup** *number* | **group-best** | **all** | **best-path**} [**install**] [**multipath-protect**] [**advertise**]

Syntax Description

backup	Specifies the BGP backup path.
number	Specifies the BGP backup path number. 3 bit decimal number. Range is 0-7.
group-best	Specifies the BGP group best path.
all	Specifies all BGP paths.
best-path	Specifies the BGP best path.
install	Installs the path.
multipath-protect	Installs and advertises the multipath protect.
advertise	Advertises the path.

Command Default

None

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
route-policy	read, write

Examples

The following example shows how to set the path selection as **advertise backup path 3** for route-polcicy *path_selection_plcy*:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# route-policy path_selection_plcy
RP/0/RP0/CPU0:router(config-rpl)# set path-selection backup 3 advertise
```

set qos-group (RPL)

To set the quality of service (QoS) group, use the **set qos-group** command in route-policy configuration mode:

set qos-group {*numberparameter*}

Syntax Description

number	QoS group ID. Range is from 0 to 31.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **set qos-group** command to set the QoS group to classify packets.

This command is supported at the BGP table-policy attachpoint. Prefixes are marked for subsequent processing in the forwarding plane. After QoS Policy Propagation through Border Gateway Protocol (BGP) (QPPB) is enabled on an interface, corresponding traffic shaping and policing is completed using packet classification based on the IP precedence or QoS group ID. See the *Modular QoS Configuration Guide for Cisco NCS 5500 Series RoutersModular QoS Configuration Guide for Cisco NCS 540 Series RoutersModular QoS Configuration Guide for Cisco NCS 560 Series Routers* for information on QPPB.

Task ID

Task ID	Operations
route-policy	read, write

Examples

This example shows how to use **set qos-group** command:

```
RP/0/RP0/CPU0:router(config)# route-policy policy_1
RP/0/RP0/CPU0:router(config-rpl)# set qos-group 12
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

set rib-metric

To set the Routing Information Base (RIB) metric attribute value for a table policy, use the **set rib-metric** command in route-policy configuration mode:

set rib-metric {*numberparameter*}

Syntax Description

number	Value assigned to a 32-bit unsigned integer. Range is 0 to 4294967295.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **set rib-metric** command set the RIB metric attribute value for BGP routes.

Every route in the RIB has a metric associated with it, signifying the cost to reach a specific destination based on link characteristics. The **set rib-metric** command modifies the RIB metric while installing BGP routes into RIB, enabling the upgrading or downgrading of the BGP route installed in RIB.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the RIB metric attribute is set to 1000:

```
RP/0/RP0/CPU0:router(config)# route-policy policy_1
RP/0/RP0/CPU0:router(config-rpl)# set rib-metric 1000
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

set rip-metric

To set Routing Information Protocol (RIP) metric attributes, use the **set rip-metric** command in route-policy configuration mode.

set rip-metric {*numberparameter*}

Syntax Description

number	Value assigned to a 4-bit unsigned integer. Range is from 0 to 16.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **set rip-metric** command to set the cost attribute for routes that are redistributed into RIP.

You can use the **add** command to increment the RIP metric value.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the RIP metric number is adjusted for route policy policy_1:

```
RP/0/RP0/CPU0:router(config)# route-policy policy_1
RP/0/RP0/CPU0:router(config-rpl)# set rip-metric 10
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

set rip-tag

To set a route tag attribute for Routing Information Protocol (RIP) routes, use the **set rip-tag** command in route-policy configuration mode.

set rip-tag {*numberparameter*}

Syntax Description

number	Value assigned to a 16-bit unsigned integer. Range is from 0 to 65535.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **set rip-tag** command to set the RIP tag attribute for routes that are redistributed into RIP. The RIP tag operator accepts either an integer value or a parameter.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the RIP tag is adjusted for route policy policy_1:

```
RP/0/RP0/CPU0:router(config)# route-policy policy_1
RP/0/RP0/CPU0:router(config-rpl)# set rip-tag 1000
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

set rt-set route-limit

To set the VPN route limit, use the **set rt-set route-limit** *limit-value* command in route-policy configuration mode.

set rt-set route-limit *limit-value*

Syntax Description

limit-value	VPN route limit value.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 4.3.1	This command was introduced.

Task ID

Task ID	Operations
route-policy	read, write

This example shows how to set the VPN route limit using the **set rt-set route-limit** command.

```
Router# config
Router(config)# route-policy extcom
Router(config-rpl)# if extcommunity rt matches-any (111:1) then
Router(config-rpl-if)# set rt-set route-limit 5
Router(config-rpl-if)# else
Router(config-rpl-else)# set rt-set route-limit 6
Router(config-rpl-else)# endif
Router(config-rpl)# end-policy
```

set rpf-topology

To set reverse-path forwarding (RPF) to any default or nondefault tables for particular sources and groups, use the **set rpf-topology** command in routing policy configuration mode.

set rpf-topology [**vrf** *vrf-name*] {**ipv4** | **ipv6**} {**unicast** | **multicast***parameter*} **topology** *table-name*

Syntax Description

vrf *vrf-name*	[Optional] Specifies a VPN routing and forwarding (VRF) instance. Required when configuring extranet topologies
ipv4	[Optional] Specifies IPv4 address prefixes.
ipv6	[Optional] Specifies IPv6 address prefixes.
unicast	Specifies unicast address prefixes.
multicast	Specifies multicast address prefixes.
parameter	Parameter name. The parameter name must be preceded with a "$."
topology	Specifies the default or non-default topology table for the source or group.
table-name	Alphanumeric name string.

Command Default

Default or current topology setting.

Command Modes

Routing policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

When using this command for MVPN extranet routing configuration, only the **vrf** *vrf-name* keyword and argument are required.

When using this command in the context of multitopology routing, all keywords and arguments with the exception of **vrf** *vrf-name* keyword and argument are required.

Task ID

Task ID	Operations
multicast	read

Examples

The following example shows how to execute the **set rpf-topology** command:

```
RP/0/RP0/CPU0:router# config
RP/0/RP0/CPU0:router(config)# route-policy green
RP/0/RP0/CPU0:router(config-rpl)# set rpf-topology ipv6 multicast topology t12
```

The following example shows the use of **set rpf-topology** command in the context of creating an RPF for a topology table in multiple topologies:

```
route-policy mt4-p1
  if destination in (225.0.0.1, 225.0.0.11) then
    set rpf-topology ipv4 multicast topology t201
  elseif destination in (225.0.0.2, 225.0.0.12) then
    set rpf-topology ipv4 multicast topology t202
  elseif destination in (225.0.0.3, 225.0.0.13) then
    pass
  endif
end-policy
!


route-policy mt4-p3
  if destination in (225.0.0.8) then
    set rpf-topology ipv4 multicast topology t208
  elseif destination in (225.0.0.9) then
    set rpf-topology ipv4 multicast topology t209
  elseif destination in (225.0.0.10) then
    set rpf-topology ipv4 multicast topology t210
  else
    drop
  endif
end-policy
!
```

set spf-priority

To set OSPF Shortest Path First (SPF) priority, use the set spf-priority command in route-policy configuration mode.

set spf-priority {**critical** | **high** | **medium**}

Syntax Description

critical	Sets critical priority for SPF
high	Sets high priority for SPF
medium	Sets medium priority for SPF

Command Default

None

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operation
route-policy	read, write

This example sets SPF priority as critical:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)#route-policy policy_spf_priority
RP/0/RP0/CPU0:router(config-rpl)#set spf-priority critical
```

set tag

To set the tag attribute, use the **set tag** command in route-policy configuration mode.

set tag {*numberparameter*}

Syntax Description

number	Value assigned to a 32-bit unsigned integer. Range is from 0 to 4294967295.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **set tag** command to set the tag attribute.

Note The **set tag** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

Tags are routing-protocol independent 32-bit integers that can be associated with a given route in the Routing Information Base (RIB).

For the Border Gateway Protocol (BGP), the tag attribute can be set only at the table-policy attach point.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the tag attribute is set to 10:

```
RP/0/RP0/CPU0:router(config-rpl)# set tag 10
```

In this example, the tag attribute is set to a parameter value $tag_param:

```
RP/0/RP0/CPU0:router(config-rpl)# set tag $tag_param
```

set traffic-index

To set the traffic index attribute, use the **set traffic-index** command in route-policy configuration mode.

set traffic-index {*numberparameter* | **ignore**}

Syntax Description

number	Integer value assigned to the traffic index attribute. Range is 1 to 63.
parameter	Parameter name. The parameter name must be preceded with a "$."
ignore	Specifies that Border Gateway Protocol (BGP) policy accounting is not done.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **set traffic-index** command to set the traffic index attribute.

Note The **set traffic-index** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

Traffic index is a special attribute for BGP. It is used as an index to a set of counters that are maintained by forwarding hardware. It is also used to track packet and byte counters that are forwarded using routes with specific attributes. These counters can be enabled and disabled on an individual interface basis.

The traffic index attribute can be set only at the table-policy attach point, and can take a value from 1 to 63, or a value of **ignore** . If the traffic index is set to **ignore** , then BGP policy accounting is not done. Parameterization of this value is also supported.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, a policy is created in which the traffic index is set to 10 for all routes that originated in autonomous system 1234:

```
RP/0/RSP0RP0/CPU0:router(config)# route-policy count-as-1234
RP/0/RSP0RP0/CPU0:router(config-rpl)# if as-path originates-from '1234' then
RP/0/RSP0RP0/CPU0:router(config-rpl-if)# set traffic-index 10
RP/0/RSP0RP0/CPU0:router(config-rpl-if)# else
RP/0/RSP0RP0/CPU0:router(config-rpl-if)# pass
RP/0/RSP0RP0/CPU0:router(config-rpl-if)# endif
```

```
RP/0/RSP0RP0/CPU0:router(config-rpl)# end-policy
```

This policy could then be attached using the BGP **table-policy** command. The counters could then be enabled on various interfaces with the appropriate commands.

set vpn-distinguisher

To change the Border Gateway Protocol (BGP) VPN distinguisher attribute, use the **set vpn-distinguisher** command in route-policy configuration mode.

set vpn-distinguisher {*numberparameter*}

Syntax Description

number	Value assigned to a 32-bit unsigned integer. Range is from 1 to 4294967295.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **set vpn-distinguisher** command to change the VPN distinguisher attribute.

Note The **set origin** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

A VPN distinguisher is used in Layer 3 VPN networks for enhanced individual VPN control and to avoid route target mapping at AS boundaries in inter-AS VPN networks. Route target extended communities are removed at neighbor outbound, and the VPN distinguisher value is applied on the BGP route as an extended community. When the route is received on a neighboring router in another AS, the VPN distinguisher is removed and mapped to a route target extended community.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the VPN distinguisher attribute is set to 456:

```
RP/0/RP0/CPU0:router(config-rpl)# set vpn-distinguisher 456
```

set weight

To set the weight value for Border Gateway Protocol (BGP) routes, use the **set weight** command in route-policy configuration mode.

set weight {*numberparameter*}

Syntax Description

number	Number assigned to the weight value for BGP routes. Weight is 16 bits. Range is 0 to 65535.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **set weight** command to set the weight value for BGP routes.

Note The **set weight** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

A weight is a value that can be applied to a route to override the BGP local preference. This is not a BGP attribute announced to BGP peer routers. RPL can be used to set the weight value.

Given two BGP routes with the same network layer reachability information (NLRI), a route with a higher weight is selected, no matter what the values of other BGP attributes may be. However, weight only has significance on the local router. It is not sent from one BGP speaker to another, even within the same autonomous system.

On Cisco routers, if a BGP route is sourced by the local router, its weight is automatically set to 32768; if the BGP route is learned from another router, its weight is automatically set to 0. Thus, by default, locally sourced routes are preferred over BGP learned routes.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the weight of the route is set to 10 and then to a parameter value $weight_param:

```
RP/0/RP0/CPU0:router(config-rpl)# set weight 10
RP/0/RP0/CPU0:router(config-rpl)# set weight $weight_param
```

show rpl

To display system-wide RPL configuration, use the **show rpl** command in XR EXEC mode.

show [**running-config**] **rpl** [**maximum** {**lines** *configuration-limit* | **policies** *policies-limit*} | **editor** {**emacs** | **nano** | **vim**}]

Syntax Description

running-config	(Optional) Displays configuration-limit argument.
maximum	(Optional) Displays the maximum number of lines of configuration and number of policies.
lines *configuration-limit*	(Optional) Displays the number of lines to which configuration is limited. Range is 1 to 131072. The *configuration-limit* argument is available if the **running-config** keyword is specified.
policies *policies-limit*	(Optional) Displays the limit on the number of policies. Range is 1 to 5000. The *configuration-limit* argument is available if the **running-config** keyword is specified.
editor	(Optional) Specifies the default RPL editor. This keyword is available if the **running-config** keyword is specified.
emacs	(Optional) Displays the default RPL editor to Micro Emacs.
nano	(Optional) Displays the default RPL editor to nano.
vim	(Optional) Displays the default RPL editor to Vim.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.
Release 7.11.1	The **Nano** and **Emacs** keyword was deprecated.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
route-policy	read, write

Examples

The following shows the output of the **show running-config rpl** command:

```
RP/0/RP0/CPU0:router# show running-config rpl

extcommunity-set rt ext_comm_set_rt_ex1
  1.2.3.4:34
end-set
!
prefix-set prefix_set_ex1
  10.0.0.0/16 ge 16 le 32,
  0.0.0.0/0 ge 25 le 32,
  0.0.0.0/0
end-set
!
route-policy policy_2
  if destination in prefix_set_ex1 then
    if (community matches-any com_set_ex1) then
      set community (10:666) additive
    endif
    if (extcommunity rt matches-any ext_comm_set_rt_ex1) then
      set community (10:999) additive
    endif
  endif
end-policy
!
```

show rpl active as-path-set

To display the AS path sets that are referenced by at least one policy that is being used at an attach point, use the **show rpl active as-path-set** command in XR EXEC mode.

show rpl active as-path-set [**detail**]

Syntax Description

detail	(Optional) Displays the content of the object and all referenced objects for active AS path sets.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl active as-path-set** command to display all AS path sets that are in use in the system and referenced either directly or indirectly at a policy attach point.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
router bgp 2
 address-family ipv4 unicast
 !
 neighbor 10.0.101.2
  remote-as 100
  address-family ipv4 unicast
   route-policy policy_1 in
  !
 !
 neighbor 10.0.101.3
  remote-as 12
  address-family ipv4 unicast
   route-policy policy_2 in
  !
 !
!
RP/0/RP0/CPU0:router# show rpl route-policy policy_2 detail

prefix-set prefix_set_ex1
  10.0.0.0/16 ge 16 le 32,
  0.0.0.0/0 ge 25 le 32,
  0.0.0.0/0
end-set
!
community-set comm_set_ex1
  65500:1,
```

```
  65500:2,
  65500:3
end-set
!
extcommunity-set rt ext_comm_set_rt_ex1
   1.2.3.4:34
end-set
!
route-policy policy_2
   if destination in prefix_set_ex1 then
     if (community matches-any comm_set_ex1) then
       set community (10:666) additive
     endif
     if (extcommunity rt matches-any ext_comm_set_rt_ex1) then
       set community (10:999) additive
     endif
   endif
end-policy
!
```

```
RP/0/RP0/CPU0:router# show rpl route-policy policy_1 detail

prefix-set prefix_set_ex1
  10.0.0.0/16 ge 16 le 32,
  0.0.0.0/0 ge 25 le 32,
  0.0.0.0/0
end-set
!
as-path-set as_path_set_ex1
  ios-regex '^_655--$',
  ios-regex '^_65501_$'
end-set
!
route-policy policy_1
  if (destination in prefix_set_ex1) then
    set local-preference 100
  endif
  if (as-path in as_path_set_ex1) then
    set community  (10:333) additive
  endif
end-policy
!
```

Given this sample configuration, the **show rpl active as-path-set** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl active as-path-set

ACTIVE -- Referenced by at least one policy which is attached
INACTIVE -- Only referenced by policies which are not attached
UNUSED -- Not attached (directly or indirectly) and not referenced

The following as-path-sets are ACTIVE
-------------------------------------
as_path_set_ex1
```

show rpl active community-set

To display the community sets that are referenced by at least one policy that is being used at an attach point, use the **show rpl active community-set** command in XR EXEC mode.

show rpl active community-set [**detail**]

Syntax Description

detail	(Optional) Displays the content of the object and all referenced objects for active community sets.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl active community-set** command to display all community sets that are in use in the system and referenced either directly or indirectly at a policy attach point.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
router bgp 2
 address-family ipv4 unicast
 !
 neighbor 10.0.101.2
  remote-as 100
  address-family ipv4 unicast
   route-policy policy_1 in
  !
 !
 neighbor 10.0.101.3
  remote-as 12
  address-family ipv4 unicast
   route-policy policy_2 in
  !
 !
!

RP/0/RP0/CPU0:router# show rpl route-policy policy_2 detail

prefix-set prefix_set_ex1
  10.0.0.0/16 ge 16 le 32,
  0.0.0.0/0 ge 25 le 32,
  0.0.0.0/0
end-set
!
community-set comm_set_ex1
```

```
  65500:1,
  65500:2,
  65500:3
end-set
!
extcommunity-set rt ext_comm_set_rt_ex1
   1.2.3.4:34
end-set
!

route-policy policy_2
   if destination in prefix_set_ex1 then
     if (community matches-any comm_set_ex1) then
       set community (10:666) additive
     endif
     if (extcommunity rt matches-any ext_comm_set_rt_ex1) then
       set community (10:999) additive
     endif
   endif
end-policy
!

RP/0/RP0/CPU0:router# show rpl route-policy policy_1 detail

prefix-set prefix_set_ex1
  10.0.0.0/16 ge 16 le 32,
  0.0.0.0/0 ge 25 le 32,
  0.0.0.0/0
end-set
!
as-path-set as_path_set_ex1
  ios-regex '^_655--$',
  ios-regex '^_65501_$'
end-set
!
route-policy policy_1
  if (destination in prefix_set_ex1) then
    set local-preference 100
  endif
  if (as-path in as_path_set_ex1) then
    set community  (10:333) additive
  endif
end-policy
!
```

Given this sample configuration, the **show rpl active community-set** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl active community-set

ACTIVE -- Referenced by at least one policy which is attached
INACTIVE -- Only referenced by policies which are not attached
UNUSED -- Not attached (directly or indirectly) and not referenced

The following community-sets are ACTIVE
---------------------------------------
comm_set_ex1
```

show rpl active extcommunity-set

To display the extended community sets for cost, route target (RT), and Site-of-Origin (SoO) that are referenced by at least one route policy used at an attach point, use the **show rpl active extcommunity-set** command in XR EXEC mode.

show rpl active extcommunity-set [**cost** | **rt** | **soo**] [**detail**]

Syntax Description

cost	(Optional) Displays all extended community cost sets.
rt	(Optional) Displays all extended community RT sets.
soo	(Optional) Displays all extended community SoO sets.
detail	(Optional) Displays the content of the object and all referenced objects for active extended community sets.

Command Default

All extended community sets are displayed.

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl active extcommunity-set** command to display all extended community sets that are in use in the system and referenced either directly or indirectly at a policy attach point.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
router bgp 2
 address-family ipv4 unicast
 !
 neighbor 10.0.101.2
  remote-as 100
  address-family ipv4 unicast
   route-policy policy_1 in
  !
 !
 neighbor 10.0.101.3
  remote-as 12
  address-family ipv4 unicast
   route-policy policy_2 in
  !
 !
!
```

```
RP/0/RP0/CPU0:router# show rpl route-policy policy_2 detail

prefix-set prefix_set_ex1
  10.0.0.0/16 ge 16 le 32,
  0.0.0.0/0 ge 25 le 32,
  0.0.0.0/0
end-set
!
community-set comm_set_ex1
  65500:1,
  65500:2,
  65500:3
end-set
!
extcommunity-set rt ext_comm_set_rt_ex1
   1.2.3.4:34
end-set
!

route-policy policy_2
   if destination in prefix_set_ex1 then
     if (community matches-any comm_set_ex1) then
       set community (10:666) additive
     endif
     if (extcommunity rt matches-any ext_comm_set_rt_ex1) then
       set community (10:999) additive
     endif
   endif
end-policy
!

RP/0/RP0/CPU0:router# show rpl route-policy policy_1 detail

prefix-set prefix_set_ex1
  10.0.0.0/16 ge 16 le 32,
  0.0.0.0/0 ge 25 le 32,
  0.0.0.0/0
end-set
!
as-path-set as_path_set_ex1
  ios-regex '^_655--$',
  ios-regex '^_65501_$'
end-set
!
route-policy policy_1
  if (destination in prefix_set_ex1) then
    set local-preference 100
  endif
  if (as-path in as_path_set_ex1) then
    set community  (10:333) additive
  endif
end-policy
!
```

Given this sample configuration, the **show rpl active extcommunity-set** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl active extcommunity-set

ACTIVE -- Referenced by at least one policy which is attached
INACTIVE -- Only referenced by policies which are not attached
```

```
UNUSED -- Not attached (directly or indirectly) and not referenced

The following extcommunity-sets are ACTIVE
-----------------------------------------
ext_comm_set_rt_ex1
```

show rpl active prefix-set

To display the prefix sets that are referenced by at least one policy that is being used at an attach point, use the **show rpl active prefix-set** command in XR EXEC mode.

show rpl active prefix-set [**detail**]

Syntax Description

detail	(Optional) Displays the content of the object and all referenced objects for active prefix sets.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl active prefix-set** command to display all prefix sets that are in use in the system and referenced either directly or indirectly at a policy attach point.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
router bgp 2
 address-family ipv4 unicast
 !
 neighbor 10.0.101.2
  remote-as 100
  address-family ipv4 unicast
   route-policy policy_1 in
  !
 !
 neighbor 10.0.101.3
  remote-as 12
  address-family ipv4 unicast
   route-policy policy_2 in
  !
 !
!

RP/0/RP0/CPU0:router# show rpl route-policy policy_2 detail

prefix-set prefix_set_ex1
  10.0.0.0/16 ge 16 le 32,
  0.0.0.0/0 ge 25 le 32,
  0.0.0.0/0
end-set
!
```

```
community-set comm_set_ex1
  65500:1,
  65500:2,
  65500:3
end-set
!
extcommunity-set rt ext_comm_set_rt_ex1
   1.2.3.4:34
end-set
!

route-policy policy_2
   if destination in prefix_set_ex1 then
     if (community matches-any comm_set_ex1) then
       set community (10:666) additive
     endif
     if (extcommunity rt matches-any ext_comm_set_rt_ex1) then
       set community (10:999) additive
     endif
   endif
end-policy
!

RP/0/RP0/CPU0:router# show rpl route-policy policy_1 detail

prefix-set prefix_set_ex1
  10.0.0.0/16 ge 16 le 32,
  0.0.0.0/0 ge 25 le 32,
  0.0.0.0/0
end-set
!
as-path-set as_path_set_ex1
  ios-regex '^_655--$',
  ios-regex '^_65501_$'
end-set
!
route-policy policy_1
  if (destination in prefix_set_ex1) then
    set local-preference 100
  endif
  if (as-path in as_path_set_ex1) then
    set community  (10:333) additive
  endif
end-policy
!
```

The following example displays active prefix sets:

```
RP/0/RP0/CPU0:router# show rpl active prefix-set

ACTIVE -- Referenced by at least one policy which is attached
INACTIVE -- Only referenced by policies which are not attached
UNUSED -- Not attached (directly or indirectly) and not referenced

The following prefix-sets are ACTIVE
------------------------------------
prefix_set_1
```

show rpl active rd-set

To display the route distinguisher (RD) sets that are referenced by at least one policy that is being used at an attach point, use the **show rpl active rd-set** command in XR EXEC mode.

show rpl active rd-set [**detail**]

Syntax Description

detail	(Optional) Displays the content of the object and all referenced objects for active route policies.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl active rd-set** command to display all RD sets that are in use in the system and that are referenced either directly or indirectly at a policy attach point.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
rd-set rdset1
   10:151,
   100.100.100.1:153,
   100.100.100.62/31:63
end-set
!
rd-set rdset2
   10:152,
   100.100.100.1:154,
   100.100.100.62/31:89
end-set
!
route-policy rdsetmatch
   if rd in rdset1 then
     set community (10:112)
   elseif rd in rdset2 then
     set community (10:223)
   endif
end-policy
!
router bgp 10
  bgp router-id 10.0.0.1
  address-family vpnv4 unicast
neighbor 10.10.10.1
   remote-as 10
   address-family ipv4 unicast
```

```
    route-policy rdsetmatch in
   !
  !
```

Given this sample configuration, the **show rpl active rd-set** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl active rd-set

ACTIVE -- Referenced by at least one policy which is attached INACTIVE -- Only referenced
by policies which are not attached UNUSED -- Not attached (directly or indirectly) and not
 referenced

The following rd-sets are ACTIVE
----------------------------------------
     rdset1
     rdset2
```

show rpl active route-policy

To display the route policies that are referenced by at least one policy that is being used at an attach point, use the **show rpl active route-policy** command in XR EXEC mode.

show rpl active route-policy [**detail**]

Syntax Description

detail	(Optional) Displays the content of the object and all referenced objects for active route policies.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl active route-policy** command to display all policies that are in use in the system and that are referenced either directly or indirectly at a policy attach point.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
router bgp 2
 address-family ipv4 unicast
 !
 neighbor 10.0.101.2
  remote-as 100
  address-family ipv4 unicast
   route-policy policy_1 in
  !
 !
 neighbor 10.0.101.3
  remote-as 12
  address-family ipv4 unicast
   route-policy policy_2 in
  !
 !
!

RP/0/RP0/CPU0:router# show rpl route-policy policy_1

route-policy policy_1
  if (destination in prefix_set_ex1) then
    set local-preference 100
  endif
  if (as-path in as_path_set_ex1) then
    set community  (10:333) additive
  endif
```

```
end-policy
!
RP/0/RP0/CPU0:router# show rpl route-policy policy_2

route-policy policy_2
   if destination in prefix_set_ex1 then
     if (community matches-any comm_set_ex1) then
       set community (10:666) additive
     endif
     if (extcommunity rt matches-any ext_comm_set_rt_ex1) then
       set community (10:999) additive
     endif
   endif
end-policy
!
```

Given this sample configuration, the **show rpl active route-policy** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl active route-policy

ACTIVE -- Referenced by at least one policy which is attached
INACTIVE -- Only referenced by policies which are not attached
UNUSED -- Not attached (directly or indirectly) and not referenced

The following policies are (ACTIVE)
-----------------------------------
policy_1
policy_2
```

show rpl as-path-set

To display the contents of AS path sets, use the **show rpl as-path-set** command in XR EXEC mode.

show rpl as-path-set [*name* | **states** | **brief**]

Syntax Description

name	(Optional) Name of the AS path set.
states	(Optional) Displays all unused, inactive, and active states.
brief	(Optional) Limits the display to a list of the names of all AS path sets without their configurations.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the optional **brief** keyword to limit the display to a list of the names of all AS path sets without their configurations.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
RP/0/RP0/CPU0:router# show rpl route-policy policy_1

route-policy policy_1
  if (destination in prefix_set_ex1) then
    set local-preference 100
  endif
  if (as-path in as_path_set_ex1) then
    set community  (10:333) additive
  endif
end-policy
```

Given this sample configuration, the **show rpl as-path-set as_path_set_ex1** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl as-path-set as_path_set_ex1

as-path-set as_path_set_ex1
  ios-regex '^_65500_$',
  ios-regex '^_65501_$'
end-set
```

show rpl as-path-set attachpoints

To display all of the policies used at an attach point that reference the named AS path set, use the **show rpl as-path-set attachpoints** command in XR EXEC mode.

show rpl as-path-set *name* **attachpoints**

Syntax Description

name	Name of an AS path set.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl as-path-set attachpoints** command to display all policies used at an attach point that reference the named set either directly or indirectly.

The AS path set name is required.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
router bgp 2
 address-family ipv4 unicast
 !
 neighbor 10.0.101.2
  remote-as 100
  address-family ipv4 unicast
   route-policy policy_1 in
  !
 !
 neighbor 10.0.101.3
  remote-as 12
  address-family ipv4 unicast
   route-policy policy_2 in
  !
 !
!

RP/0/RP0/CPU0:router# show rpl route-policy policy_1

route-policy policy_1
  if (destination in prefix_set_ex1) then
    set local-preference 100
  endif
  if (as-path in as_path_set_ex1) then
```

```
    set community  (10:333) additive
  endif
end-policy
!
RP/0/RP0/CPU0:router# show rpl route-policy policy_2

route-policy policy_2
  if (destination in prefix_set_ex1) then
    if (community matches-any comm_set_ex1) then
      set community  (10:666) additive
    endif
    if (extcommunity matches-any ext_comm_set_rt_ex1) then
      set community  (10:999) additive
    endif
  endif
end-policy
!
```

Given this sample configuration, the **show rpl as-path-set as_path_set_ex1 attachpoints** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl as-path-set as_path_set_ex1 attachpoints

BGP Attachpoint:Neighbor

Neighbor/Group  type  afi/safi   in/out     referring policy attached policy
-------------------------------------------------------------------------------
10.0.101.2      --    IPv4/uni    in         policy_1         policy_1
10.0.101.3      --    IPv4/uni    in         policy_2         policy_2
```

This table describes the significant fields shown in the display.

Table 127: show rpl as-path-set attachpoints Field Descriptions

Field	Description
BGP Attachpoint	Location of the attach point.
Neighbor/Group	IP address of the attach point on the neighbor.
type	Displays the address family mode.
afi/safi	Address family identifier or subsequent address family identifier.
in/out	Import or export policy.
referring policy	Policy that refers to the AS path set.
attached policy	Policy used at the attach point.

show rpl as-path-set references

To list all of the policies that reference the named AS path set, use the **show rpl as-path-set references** command in XR EXEC mode.

show rpl as-path-set *name* **references** [**brief**]

Syntax Description

name	Name of the prefix set.
brief	(Optional) Limits the output to just the brief table and not the detailed information for the named AS path set.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl as-path-set references** command to display all policies that reference the named AS path set either directly or indirectly.

Use the optional **brief** keyword to limit the output to just a summary table and not the detailed information for the AS path set.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
router bgp 2
 address-family ipv4 unicast
 !
 neighbor 10.0.101.2
  remote-as 100
  address-family ipv4 unicast
   route-policy policy_1 in
  !
 !
RP/0/RP0/CPU0:router# show rpl route-policy policy_1

route-policy policy_1
  if (destination in prefix_set_ex1) then
    set local-preference 100
  endif
  if (as-path in as_path_set_ex1) then
    set community  (10:333) additive
  endif
```

```
end-policy
```

Given this sample configuration, the **show rpl as-path-set as_path_set_ex1 references** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl as-path-set as_path_set_ex1 references

Usage Direct -- Reference occurs in this policy
Usage Indirect -- Reference occurs via an apply statement

Status UNUSED -- Policy is not in use at an attachpoint (unattached)
Status ACTIVE -- Policy is actively used at an attachpoint
Status INACTIVE -- Policy is applied by an unattached policy

     Usage/Status         count
-----------------------------------------------------------------
     Direct               1
     Indirect             0

     ACTIVE               1
     INACTIVE             0
     UNUSED               0

     route-policy         usage      policy status
-----------------------------------------------------------------
    policy_1             Direct     ACTIVE
```

This table describes the significant fields shown in the display.

Table 128: show rpl as-path-set references Field Descriptions

Field	Description
Usage/Status	Displays the usage and status of all policies that reference the AS path set. Values for usage are Direct or Indirect. Values for policy status are ACTIVE, INACTIVE, or UNUSED.
count	Number of policies that match each usage and status option.
route-policy	Name of the route policies that reference the AS path set.
usage	Type of usage for the policy.
policy status	Status of the policy.

show rpl community-set

To display the configuration of community sets, use the **show rpl community-set** command in XR EXEC mode.

show rpl community-set [*name* | **states** | **brief**]

Syntax Description

name	(Optional) Name of the community set.
states	(Optional) Shows all unused, inactive, and active states.
brief	(Optional) Limits the display to a list of the names of all community sets without their configurations.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the optional **brief** keyword to limit the display to a list of the names of community sets without their configurations.

Task ID

Task ID	Operations
route-policy	read

The following is the sample output of the show rpl community-set command with graceful maintenance feature attributes displayed:

```
RP/0/0/CPU0:R5#show rpl community-set
Thu Jan 29 17:55:04.792 PST
Listing for all Community Set objects

community-set gshut
  graceful-shutdown
end-set
```

Examples

This example shows the following sample configuration:

```
route-policy policy_4
  if (destination in prefix_set_ex2) then
    if (community matches-any comm_set_ex2) then
      set community  (10:666) additive
    endif
    if (extcommunity matches-any ext_comm_set_rt_ex2) then
      set community  (10:999) additive
    endif
  endif
```

```
end-policy
```

Given this sample configuration, the **show rpl community-set comm_set_ex2** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl community-set comm_set_ex2

community-set comm_set_ex2
  65501:1,
  65501:2,
  65501:3
end-set
```

show rpl community-set attachpoints

To display all the policies used at an attach point that reference the named community set, use the **show rpl community-set attachpoints** command in XR EXEC mode.

show rpl community-set *name* **attachpoints**

Syntax Description

name	Name of a community set.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl community-set attachpoints** command to display all the policies used at an attach point that reference the named community set either directly or indirectly.

The community set name is required.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
router bgp 2
 address-family ipv4 unicast
 !
 neighbor 10.0.101.3
  remote-as 12
  address-family ipv4 unicast
   route-policy policy_2 in
  !
 !
!
!
route-policy policy_2
   if destination in prefix_set_ex1 then
     if (community matches-any comm_set_ex1) then
       set community (10:666) additive
     endif
     if (extcommunity rt matches-any ext_comm_set_rt_ex1) then <<<<<
       set community (10:999) additive
     endif
   endif
end-policy
!
```

Given this sample configuration, the **show rpl community-set attachpoints** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl community-set ext_comm_set_rt_ex1 attachpoints

BGP Attachpoint:Neighbor

Neighbor/Group  type  afi/safi   in/out     referring policy attached policy
-------------------------------------------------------------------------------
10.0.101.3      --    IPv4/uni   in         policy_2         policy_2
```

This table describes the significant fields shown in the display.

Table 129: show rpl community-set attachpoints Field Descriptions

Field	Description
BGP Attachpoint	Location of the attach point.
Neighbor/Group	IP address of the attach point on the neighbor.
type	Displays the address family mode.
afi/safi	Address family identifier or subsequent address family identifier.
in/out	Import or export policy.
referring policy	Policy that refers to the AS path set.
attached policy	Policy used at the attach point.

show rpl community-set references

To list all the policies that reference the named community set, use the **show rpl community-set references** command in XR EXEC mode.

show rpl community-set *name* **references** [**brief**]

Syntax Description

name	Name of a community set.
brief	(Optional) Limits the output to just the summary table and not the detailed information for the community set.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl community-set references** command to display all the policies that reference the named community set.

Use the optional **brief** keyword to limit the output to just a summary table and not the detailed information for the community set.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
router bgp 2
 address-family ipv4 unicast
 !
 neighbor 10.0.101.3
  remote-as 12
  address-family ipv4 unicast
   route-policy policy_2 in
  !
 !
!
route-policy policy_2
  if (destination in prefix_set_ex1) then
    if (community matches-any comm_set_ex1) then
      set community  (10:666) additive
    endif
    if (extcommunity matches-any ext_comm_set_rt_ex1) then
      set community  (10:999) additive
    endif
  endif
```

```
end-policy
```

Given this sample configuration, the **show rpl extcommunity-set comm_set_ex1 references** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl extcommunity-set comm_set_ex1 references

Usage Direct -- Reference occurs in this policy
Usage Indirect -- Reference occurs via an apply statement

Status UNUSED -- Policy is not in use at an attachpoint (unattached)
Status ACTIVE -- Policy is actively used at an attachpoint
Status INACTIVE -- Policy is applied by an unattached policy

     Usage/Status         count
----------------------------------------------------------------
     Direct               1
     Indirect             0

     ACTIVE               1
     INACTIVE             0
     UNUSED               0


     route-policy         usage      policy status
----------------------------------------------------------------
    policy_2             Direct     ACTIVE
```

This table describes the significant fields shown in the display.

Table 130: show rpl community-set references Field Descriptions

Field	Description
Usage/Status	Displays the usage and status of all policies that reference the community set. Values for usage are Direct or Indirect. Values for status are ACTIVE, INACTIVE, and UNUSED.
count	Number of policies that match each usage and status option.
route-policy	Name of the route policies that reference the community set.
usage	Type of usage for the policy.
policy status	Status of the policy.

show rpl extcommunity-set

To display the configuration of extended community sets, use the **show rpl extcommunity-set** command in XR EXEC mode.

show rpl extcommunity-set [*name* [**attachpoints** | **references**]] [**cost** | **rt** | **soo**] [*name*] [**brief**] [**states**]

Syntax Description

name	(Optional) Name of the community set.
attachpoints	(Optional) Displays all attach points for this community set.
references	(Optional) Displays all policies that use this community set.
cost	(Optional) Displays all extended community cost sets.
rt	(Optional) Displays all extended community RT sets.
soo	(Optional) Displays all extended community SoO sets.
brief	(Optional) Limits the display to a list of the names of all extended community sets without their configurations.
states	(Optional) Displays all unused, inactive, and active states.

Command Default

If an attachpoint or reference is not specified, all configured extended community sets are displayed

If a cost, RT, or SoO sets is not specified, all configured extended community sets are displayed

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the optional **brief** keyword to limit the display to a list of the names of extended community sets without their configurations.

Task ID

Task ID	Operations
route-policy	read

Examples

In the following example, the configuration of an extended community is displayed for the RT community set named ext_comm_set_rt_ex1:

```
RP/0/RP0/CPU0:router# show rpl extcommunity-set rt ext_comm_set_rt_ex1

ext_comm_set_rt_ex1
   1.2.3.4:34
end-set
```

```
!
```

In the following example, the configuration of an extended community is displayed with all RT set objects:

```
RP/0/RP0/CPU0:router# show rpl extcommunity-set rt

Listing for all Extended Community RT Set objects

extcommunity-set rt extrt1
  66:60001
end-set
!
extcommunity-set rt rtset1
  10:615,
  10:6150,
  15.15.15.15:15
end-set
!
extcommunity-set rt rtset3
  11:11,
  11.1.1.1:3
end-set
!
extcommunity-set rt extsoo1
  66:70001
end-set
!
extcommunity-set rt rtsetl1
  100:121,
  100:122,
  100:123,
  100:124,
  100:125,
  100:126,
  100:127,
  100:128,
  7.7.7.7:21
end-set
!
```

In the following example, the configuration of an extended community is displayed with all cost set objects:

```
RP/0/RP0/CPU0:router# show rpl extcommunity-set cost

Listing for all Extended Community COST Set objects

extcommunity-set cost costset1
  IGP:90:914,
  Pre-Bestpath:91:915
end-set
!
extcommunity-set cost costset2
  IGP:92:916,
  Pre-Bestpath:93:917,
  IGP:94:918,
  Pre-Bestpath:95:919
end-set
!
```

In the following example, the configuration of an extended community is displayed with all SoO set objects:

```
Extended Community SOO Set objects

extcommunity-set soo sooset1
  10:151,
  100.100.100.1:153
end-set
!
extcommunity-set soo sooset3
  11:11,
  11.1.1.1:3
end-set
!
```

show rpl inactive as-path-set

To display the AS path sets that are referenced by a policy but not in any policy that is used at an attach point, use the **show rpl inactive as-path-set** command in XR EXEC mode.

show rpl inactive as-path-set [**detail**]

Syntax Description

detail	(Optional) Displays the content of the object and all referenced objects for inactive AS path sets.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl inactive as-path-set** command to display all AS path sets that are not in use at an attach point either directly or indirectly but are referenced by at least one policy in the system.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
router bgp 2
 address-family ipv4 unicast
 !
 neighbor 10.0.101.2
  remote-as 100
  address-family ipv4 unicast
   route-policy policy_1 in
  !
 !
 neighbor 10.0.101.3
  remote-as 12
  address-family ipv4 unicast
   route-policy policy_2 in
  !
 !
!
route-policy sample
  if (destination in sample) then
    drop
  endif
end-policy
!
route-policy policy_1
  if (destination in prefix_set_ex1) then
    set local-preference 100
  endif
```

```
  if (as-path in as_path_set_ex1) then
    set community  (10:333) additive
  endif
end-policy
!
route-policy policy_2
   if destination in prefix_set_ex1 then
     if (community matches-any comm_set_ex1) then
       set community (10:666) additive
     endif
     if (extcommunity rt matches-any ext_comm_set_rt_ex1) then
       set community (10:999) additive
     endif
   endif
end-policy
!
route-policy policy_3
  if (destination in prefix_set_ex2) then
    set local-preference 100
  endif
  if (as-path in as_path_set_ex2) then
    set community  (10:333) additive
  endif
end-policy
!
route-policy policy_4
  if (destination in prefix_set_ex2) then
    if (community matches-any comm_set_ex2) then
      set community  (10:666) additive
    endif
    if (extcommunity matches-any ext_comm_set_rt_ex2) then
      set community  (10:999) additive
    endif
  endif
end-policy
!
route-policy policy_5
  apply sample1
  apply policy_3
end-policy
```

Given this sample configuration, the **show rpl inactive as-path-set** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl inactive as-path-set

ACTIVE -- Referenced by at least one policy which is attached
INACTIVE -- Only referenced by policies which are not attached
UNUSED -- Not attached (directly or indirectly) and not referenced

The following as-path-sets are INACTIVE
---------------------------------------
as_path_set_ex2
```

show rpl inactive community-set

To display the community sets that are referenced by a policy but not any policy that is used at an attach point, use the **show rpl inactive community-set** command in XR EXEC mode.

show rpl inactive community-set [**detail**]

Syntax Description

detail	(Optional) Displays the content of the object and all referenced objects for inactive community sets.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl inactive community-set** command to display all community sets that are not in use at an attach point either directly or indirectly but are referenced by at least one policy in the system.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
router bgp 2
 address-family ipv4 unicast
 !
 neighbor 10.0.101.2
  remote-as 100
  address-family ipv4 unicast
   route-policy policy_1 in
  !
 !
 neighbor 10.0.101.3
  remote-as 12
  address-family ipv4 unicast
   route-policy policy_2 in
  !
 !
!
route-policy sample2
  if (destination in sample2) then
    drop
  endif
end-policy
!
route-policy policy_1
  if (destination in prefix_set_ex1) then
    set local-preference 100
  endif
```

```
  if (as-path in as_path_set_ex1) then
    set community  (10:333) additive
  endif
end-policy
!
route-policy policy_2
   if destination in prefix_set_ex1 then
     if (community matches-any comm_set_ex1) then
       set community (10:666) additive
     endif
     if (extcommunity rt matches-any ext_comm_set_rt_ex1) then
       set community (10:999) additive
     endif
   endif
end-policy
!
route-policy policy_3
  if (destination in prefix_set_ex2) then
    set local-preference 100
  endif
  if (as-path in as_path_set_ex2) then
    set community  (10:333) additive
  endif
end-policy
!
route-policy policy_4
  if (destination in prefix_set_ex2) then
    if (community matches-any comm_set_ex2) then
      set community  (10:666) additive
    endif
    if (extcommunity matches-any ext_comm_set_rt_ex2) then
      set community  (10:999) additive
    endif
  endif
end-policy
!
route-policy policy_5
  apply sample2
  apply policy_3
end-policy
```

Given this sample configuration, the **show rpl inactive community-set** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl inactive community-set

ACTIVE -- Referenced by at least one policy which is attached
INACTIVE -- Only referenced by policies which are not attached
UNUSED -- Not attached (directly or indirectly) and not referenced

The following community-sets are INACTIVE
-----------------------------------------
comm_set_ex2
```

show rpl inactive extcommunity-set

To display the extended community sets that are referenced by a policy but not in any policy that is used at an attach point, use the **show rpl inactive extcommunity-set** command in XR EXEC mode.

show rpl inactive extcommunity-set [**detail**]

Syntax Description

detail	(Optional) Displays the content of the object and all referenced objects for inactive extended community sets.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl inactive extcommunity-set** command to display all extended community sets that are not in use at an attach point either directly or indirectly but are referenced by at least one policy in the system.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
router bgp 2
 address-family ipv4 unicast
 !
 neighbor 10.0.101.2
  remote-as 100
  address-family ipv4 unicast
   route-policy policy_1 in
  !
 !
 neighbor 10.0.101.3
  remote-as 12
  address-family ipv4 unicast
   route-policy policy_2 in
  !
 !
!
route-policy sample3
  if (destination in sample3) then
    drop
  endif
end-policy
!
route-policy policy_1
  if (destination in prefix_set_ex1) then
    set local-preference 100
```

```
  endif
  if (as-path in as_path_set_ex1) then
    set community  (10:333) additive
  endif
end-policy
!
route-policy policy_2
   if destination in prefix_set_ex1 then
     if (community matches-any comm_set_ex1) then
       set community (10:666) additive
     endif
     if (extcommunity rt matches-any ext_comm_set_rt_ex1) then
       set community (10:999) additive
     endif
   endif
end-policy
!
route-policy policy_3
  if (destination in prefix_set_ex2) then
    set local-preference 100
  endif
  if (as-path in as_path_set_ex2) then
    set community  (10:333) additive
  endif
end-policy
!
route-policy policy_4
  if (destination in prefix_set_ex2) then
    if (community matches-any comm_set_ex2) then
      set community  (10:666) additive
    endif
    if (extcommunity matches-any ext_comm_set_rt_ex2) then
      set community  (10:999) additive
    endif
  endif
end-policy
!
route-policy policy_5
  apply sample3
  apply policy_3
end-policy
```

Given this sample configuration, the **show rpl inactive extcommunity-set** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl inactive extcommunity-set

ACTIVE -- Referenced by at least one policy which is attached
INACTIVE -- Only referenced by policies which are not attached
UNUSED -- Not attached (directly or indirectly) and not referenced

The following extcommunity-sets are INACTIVE
--------------------------------------------
ext_comm_set_rt_ex2
```

show rpl inactive prefix-set

To display the prefix sets that are referenced by a policy but not in any policy that is used at an attach point, use the **show rpl inactive prefix-set** command in XR EXEC mode.

show rpl inactive prefix-set [**detail**]

Syntax Description

detail	(Optional) Displays the content of the object and all referenced objects for inactive prefix sets.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl inactive prefix-set** command to display all prefix sets that are not in use at an attach point either directly or indirectly but are referenced by at least one policy in the system.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
router bgp 2
 address-family ipv4 unicast
 !
 neighbor 10.0.101.2
  remote-as 100
  address-family ipv4 unicast
   route-policy policy_1 in
  !
 !
 neighbor 10.0.101.3
  remote-as 12
  address-family ipv4 unicast
   route-policy policy_2 in
  !
 !
!
route-policy sample4
  if (destination in sample4) then
    drop
  endif
end-policy
!
route-policy policy_1
  if (destination in prefix_set_ex1) then
    set local-preference 100
  endif
```

```
  if (as-path in as_path_set_ex1) then
    set community  (10:333) additive
  endif
end-policy
!
route-policy policy_2
   if destination in prefix_set_ex1 then
     if (community matches-any comm_set_ex1) then
       set community (10:666) additive
     endif
     if (extcommunity rt matches-any ext_comm_set_rt_ex1) then
       set community (10:999) additive
     endif
   endif
end-policy
!
route-policy policy_3
  if (destination in prefix_set_ex2) then
    set local-preference 100
  endif
  if (as-path in as_path_set_ex2) then
    set community  (10:333) additive
  endif
end-policy
!
route-policy policy_4
  if (destination in prefix_set_ex2) then
    if (community matches-any comm_set_ex2) then
      set community  (10:666) additive
    endif
    if (extcommunity matches-any ext_comm_set_rt_ex2) then
      set community  (10:999) additive
    endif
  endif
end-policy
!
route-policy policy_5
  apply sample4
  apply policy_3
end-policy
```

Given this sample configuration, the **show rpl inactive prefix-set** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl inactive prefix-set

ACTIVE -- Referenced by at least one policy which is attached
INACTIVE -- Only referenced by policies which are not attached
UNUSED -- Not attached (directly or indirectly) and not referenced

The following prefix-sets are INACTIVE
--------------------------------------
sample4
prefix_set_ex2
```

show rpl inactive rd-set

To display the route distinguisher (RD) sets that are referenced by a policy but not in any policy that is used at an attach point, use the **show rpl inactive rd-set** command in XR EXEC mode.

show rpl inactive rd-set [**detail**]

Syntax Description

detail	(Optional) Displays the content of the object and all referenced objects for inactive RD sets.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl inactive rd-set** command to display all RD sets that are not in use at an attach point either directly or indirectly but are referenced by at least one policy in the system.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
rd-set rdset1
  10:151,
  100.100.100.1:153,
  100.100.100.62/31:63
end-set
!
rd-set rdset2
  10:152,
  100.100.100.1:154,
  100.100.100.62/31:89
end-set
!
```

Given this sample configuration, the **show rpl inactive rd-set** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl inactive rd-set

ACTIVE -- Referenced by at least one policy which is attached INACTIVE -- Only referenced
by policies which are not attached UNUSED -- Not attached (directly or indirectly) and not
 referenced

The following rd-sets are INACTIVE
-----------------------------------------
    rdset1
```

```
rdset2
```

show rpl inactive route-policy

To display the route policies that are referenced by a policy but not in any policy that is used at an attach point, use the **show rpl inactive route-policy** command in XR EXEC mode.

show rpl inactive route-policy [**detail**]

Syntax Description

detail	(Optional) Displays the content of the object and all referenced objects for inactive route policies.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl inactive route-policy** command to display all policies that are not in use at an attach point either directly or indirectly but are referenced by at least one other policy in the system.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
router bgp 2
 address-family ipv4 unicast
 !
 neighbor 10.0.101.2
  remote-as 100
  address-family ipv4 unicast
   route-policy policy_1 in
  !
 !
 neighbor 10.0.101.3
  remote-as 12
  address-family ipv4 unicast
   route-policy policy_2 in
  !
 !
!
route-policy sample3
  if (destination in sample3) then
    drop
  endif
end-policy
!
route-policy policy_1
  if (destination in prefix_set_ex1) then
    set local-preference 100
  endif
```

```
  if (as-path in as_path_set_ex1) then
    set community  (10:333) additive
  endif
end-policy
!
route-policy policy_2
   if destination in prefix_set_ex1 then
     if (community matches-any comm_set_ex1) then
       set community (10:666) additive
     endif
     if (extcommunity rt matches-any ext_comm_set_rt_ex1) then
       set community (10:999) additive
     endif
   endif
end-policy
!
route-policy policy_3
  if (destination in prefix_set_ex2) then
    set local-preference 100
  endif
  if (as-path in as_path_set_ex2) then
    set community  (10:333) additive
  endif
end-policy
!
route-policy policy_4
  if (destination in prefix_set_ex2) then
    if (community matches-any comm_set_ex2) then
      set community  (10:666) additive
    endif
    if (extcommunity matches-any ext_comm_set_rt_ex2) then
      set community  (10:999) additive
    endif
  endif
end-policy
!
route-policy policy_5
  apply sample3
  apply policy_3
end-policy
```

Given this sample configuration, the **show rpl inactive route-policy** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl inactive route-policy

ACTIVE -- Referenced by at least one policy which is attached
INACTIVE -- Only referenced by policies which are not attached
UNUSED -- Not attached (directly or indirectly) and not referenced

The following policies are (INACTIVE)
-------------------------------------
sample3
policy_3
```

show rpl maximum

To display the maximum limits for lines of configuration and number of policies, use the **show rpl maximum** command in XR EXEC mode.

show rpl maximum [**lines** | **policies**]

Syntax Description

lines	(Optional) Displays the number of lines of configuration limit.
policies	(Optional) Displays the number of policies limit.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl maximum** command to display the current total, current limit, and maximum limit for lines of configuration and policies.

Use the optional **lines** keyword to limit the display to the number of lines of configuration limits. Use the optional **policies** keyword to limit the display to the number of policies limits.

Task ID

Task ID	Operations
route-policy	read

Examples

The following example shows sample output from the **show rpl maximum** command:

```
RP/0/RP0/CPU0:router# show rpl maximum
                              Current    Current       Max
                               Total      Limit       Limit
-------------------------------------------------------------
Lines of configuration             3      65536     131072
Policies                           1       3500       5000
Compiled policies size (kB)        0
```

Table 131: show rpl maximum Field Descriptions, on page 939 describes the significant fields shown in the display.

Table 131: show rpl maximum Field Descriptions

Field	Description
Lines of configuration	Displays the current total, current limit, and maximum limit of lines for the policy.

Field	Description
Policies	Displays the current total, current limit, and maximum limit of policies.
Compiled policies size (kB)	Displays the current compiled total for policies in kilobytes.

show rpl policy-global references

To display policy-global definitions, use the **show rpl policy-global references** command in XR EXEC mode.

show rpl policy-global references [**brief**]

Syntax Description

brief	(Optional) Limits the display to a list of the policy names.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
policy-global
   infinity '16'
end-global
!
route-policy set-rip-unreachable
   set rip-metric $infinity
end-policy
!
```

Given this sample configuration, the **show rpl policy-global references** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl policy-global references

Usage Direct -- Reference occurs in this policy Usage Indirect -- Reference occurs via an
apply statement

Status UNUSED -- Policy is not in use at an attachpoint (unattached) Status ACTIVE -- Policy
 is actively used at an attachpoint Status INACTIVE -- Policy is applied by an unattached
policy

      Usage/Status         count
-------------------------------------------------------------
      Direct               1
      Indirect             0
```

```
      ACTIVE               0
      INACTIVE             0
      UNUSED               1


      Usage      Status     Route-policy
-----------------------------------------------------------------

      Direct     UNUSED     set-rip-unreachable
```

show rpl prefix-set

To display the configuration of prefix sets, use the **show rpl prefix-set** command in XR EXEC mode.

show rpl prefix-set [*name* | **states** | **brief**]

Syntax Description

name	(Optional) Name of the prefix set.
states	(Optional) Shows all unused, inactive, and active states.
brief	(Optional) Limits the display to a list of the names of all extended community sets without their configurations.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Because sets cannot hierarchically reference other sets or policies, no **detail** keyword exists as with the **show rpl policy** command.

Task ID

Task ID	Operations
route-policy	read

Examples

In the following example, the configuration of prefix set pset1 is displayed:

```
RP/0/RP0/CPU0:router# show rpl prefix-set pset1
!
prefix-set pset1
 10.0.0.1/0,
 10.0.0.2/0 ge 25 le 32,
 10.0.0.5/8 ge 8 le 32,
 10.168.0.0/16 ge 16 le 32,
 172.16.0.9/20 ge 20 le 32,
 192.168.0.5/20 ge 20 le 32
end-set
```

show rpl prefix-set attachpoints

To display all the policies used at an attach point that reference the named prefix set, use the **show rpl prefix-set attachpoints** command in XR EXEC mode.

show rpl prefix-set *name* **attachpoints**

Syntax Description

name	Name of a prefix set.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl prefix-set attachpoints** command to display all the policies used at an attach point that reference the named prefix set either directly or indirectly.

The prefix set name is required.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
router bgp 2
 address-family ipv4 unicast
 !
 neighbor 10.0.101.2
  remote-as 100
  address-family ipv4 unicast
   route-policy policy_1 in
  !
 !
 neighbor 10.0.101.3
  remote-as 12
  address-family ipv4 unicast
   route-policy policy_2 in
  !
 !
!
route-policy policy_1
  if (destination in prefix_set_ex1) then
    set local-preference 100
  endif
  if (as-path in as_path_set_ex1) then
    set community  (10:333) additive
  endif
end-policy
```

```
!
route-policy policy_2
  if (destination in prefix_set_ex1) then
    if (community matches-any comm_set_ex1) then
      set community  (10:666) additive
    endif
    if (extcommunity matches-any ext_comm_set_rt_ex1) then
      set community  (10:999) additive
    endif
  endif
end-policy
```

Given this sample configuration, the **show rpl prefix-set prefix_set_ex1 attachpoints** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl prefix-set prefix_set_ex1 attachpoints

BGP Attachpoint:Neighbor

Neighbor/Group  type  afi/safi   in/out     referring policy attached policy
-------------------------------------------------------------------------------
10.0.101.2      --    IPv4/uni   in         policy_1         policy_1
10.0.101.3      --    IPv4/uni   in         policy_2         policy_2
```

This table describes the significant fields shown in the display.

Table 132: show rpl prefix-set attachpoints Field Descriptions

Field	Description
BGP Attachpoint	Location of the attach point.
Neighbor/Group	IP address of the attach point on the neighbor.
type	Address family mode.
afi/safi	Address family identifier or subsequent address family identifier.
in/out	Import or export policy.
referring policy	Policy that refers to the AS path set.
attached policy	Policy used at the attach point.

show rpl prefix-set references

To list all the policies that reference the named prefix set, use the **show rpl prefix-set references** command in XR EXEC mode.

show rpl prefix-set *name* **references** [**brief**]

Syntax Description

name	Name of the prefix set.
brief	(Optional) Limits the output to just a summary table and not the detailed information for the named prefix set.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl prefix-set references** command to list all the policies that reference the named prefix set.

Use the optional **brief** keyword to limit the output to just a summary table and not the detailed information for the named prefix set.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
prefix-set ten-net
 10.0.0.0/16 le 32
end-set
prefix-set too-specific
 0.0.0.0/0 ge 25 le 32
end-set
route-policy example-one
 if destination in ten-net then
  drop
 else
  set local-preference 200
  apply set-comms
 endif
end-policy
route-policy set-comms
 set community (10:1234) additive
end-policy

route-policy example-three
 if destination in too-specific then
```

```
  drop
 else
  apply example-one
  pass
 endif
end-policy
```

The following example displays information showing the usage and status of each policy that references the prefix set ten-net. The **brief** keyword limits the display to just a summary table and not the detailed information for the prefix set.

```
RP/0/RP0/CPU0:router# show rpl prefix-set ten-net references brief

Usage Direct -- Reference occurs in this policy
Usage Indirect -- Reference occurs via an apply statement

Status UNUSED -- Policy is not in use at an attachpoint (unattached)
Status ACTIVE -- Policy is actively used at an attachpoint
Status INACTIVE -- Policy is applied by an unattached policy

     Usage/Status         count
------------------------------------------------------------
     Direct                 1
     Indirect               1

     ACTIVE                 0
     INACTIVE               1
     UNUSED                 1
```

This table describes the significant fields shown in the display.

Table 133: show rpl prefix-set name references Field Descriptions

Field	Description
Usage/Status	Displays the usage and status of all policies that reference the prefix set.
count	Number of policies that match each usage and status option.

show rpl rd-set

To display the configuration of route distinguisher (RD) sets, use the **show rpl rd-set** command in XR EXEC mode.

show rpl rd-set [*name* | **states** | **brief**]

Syntax Description

name	(Optional) Name of the RD set.
states	(Optional) Shows all unused, inactive, and active states.
brief	(Optional) Limits the display to a list of the names of all RD sets without their configurations.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Because sets cannot hierarchically reference other sets or policies, no **detail** keyword exists as with the **show rpl policy** command.

Task ID

Task ID	Operations
route-policy	read

Examples

In the following example, the configuration of RD set rdset1 is displayed:

```
RP/0/RP0/CPU0:router# show rpl rd-set rdset1

rd-set rdset1
  10:151,
  100.100.100.1:153,
  100.100.100.62/31:63
end-set
```

show rpl rd-set attachpoints

To display all the policies used at an attach point that reference the named route distinguisher (RD) set, use the **show rpl rd-set attachpoints** command in XR EXEC mode.

show rpl rd-set *name* **attachpoints**

Syntax Description

name	Name of an RD set.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl rd-set attachpoints** command to display all the policies used at an attach point that reference the named RD set either directly or indirectly.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
route-policy rdsetmatch
  if rd in rdset1 then
    set community (10:112)
  elseif rd in rdset2 then
    set community (10:223)
  endif
end-policy

router bgp 10
address-family vpnv4 unicast
 exit
 neighbor 10.0.101.1
  remote-as 11
  address-family vpnv4 unicast
   route-policy rdsetmatch in
!
```

Given this sample configuration, the **show rpl rd-set rdset1 attachpoints** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl rd-set rdset attachpoints

BGP Attachpoint: Neighbor

Neighbor/Group  type  afi/safi   in/out   vrf name
```

```
-------------------------------------------------
10.0.101.1      --    IPv4/vpn   in         default
```

This table describes the significant fields shown in the display.

Table 134: show rpl rd-set attachpoints Field Descriptions

Field	Description
Neighbor/Group	BGP neighbor or neighbor group where the specified RD is used.
afi/safi	BGP address family or subaddress family where the RD set is used.
in/out	Direction
vrf name	VRF name where the RD set is used.

show rpl rd-set references

To list all the policies that reference the named route distinguisher (RD) set, use the **show rpl rd-set references** command in XR EXEC mode.

show rpl rd-set *name* **references** [**brief**]

Syntax Description

name	Name of the RD set.
brief	(Optional) Limits the output to just a summary table and not the detailed information for the RD set.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl rd-set references** command to list all the policies that reference the named RD set.

Use the optional **brief** keyword to limit the output to just a summary table and not the detailed information for the named RD set.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
route-policy rdsetmatch
  if rd in rdset1 then
    set community (10:112)
  elseif rd in rdset2 then
    set community (10:223)
  endif
end-policy
!
router bgp 10
 address-family vpnv4 unicast
 !
 neighbor 10.0.101.1
  remote-as 11
  address-family vpnv4 unicast
   route-policy rdsetmatch in
  !
```

Given this sample configuration, the **show rpl rd-set rdset1 references** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl rd-set rdset1 references

Usage Direct -- Reference occurs in this policy
Usage Indirect -- Reference occurs via an apply statement

Status UNUSED -- Policy is not in use at an attachpoint (unattached)
Status ACTIVE -- Policy is actively used at an attachpoint
Status INACTIVE -- Policy is applied by an unattached policy

     Usage/Status         count
----------------------------------------------------------------
     Direct               1
     Indirect             0

     ACTIVE               1
     INACTIVE             0
     UNUSED               0


     route-policy         usage      policy status
----------------------------------------------------------------
    rdsetmatch           Direct     ACTIVE
```

This table describes the significant fields shown in the display.

Table 135: show rpl rd-set name references Field Descriptions

Field	Description
route-policy	Name of the route policy.
usage	Type of reference usage for the route policy.
policy status	Status of the route policy.

show rpl route-policy

To display the configuration of route policies, use the **show rpl route-policy** command in XR EXEC mode.

show rpl route-policy [*name* [**detail**] | **states** | **brief**]

Syntax Description

name	(Optional) Name of a route policy.
detail	(Optional) Displays the configuration of all policies and sets that a policy uses.
states	(Optional) Shows all unused, inactive, and active states.
brief	(Optional) Limits the display to a list of the names of all extended community sets without their configurations.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the optional **brief** keyword to limit the display to a list of the names of policies without their configurations.

Task ID

Task ID	Operations
route-policy	read

Examples

In the following example, the configuration of a route policy named policy_1 is displayed.

```
RP/0/RP0/CPU0:router# show rpl route-policy policy_1

route-policy policy_1
  if destination in prefix_set_1 and not destination in sample1 then
    if as-path in aspath_set_1 then
      set local-preference 300
      set origin igp
    elseif as-path in as_allowed then
      set local-preference 400
      set origin igp
    else
      set origin igp
    endif
  else
    drop
  endif
  set med 120
  set community (8660:612) additive
  apply set_lpref_from_comm
```

```
end-policy
```

If the optional **detail** keyword is used, all routing policy language (RPL) policies and sets that route policy policy_1 uses are displayed, as shown in the following example.

```
RP/0/RP0/CPU0:router# show rpl route-policy policy_1 detail

!
prefix-set sample1
  0.0.0.0/0,
  0.0.0.0/0 ge 25 le 32,
  10.0.0.0/8 ge 8 le 32,
  192.168.0.0/16 ge 16 le 32,
  224.0.0.0/20 ge 20 le 32,
  240.0.0.0/20 ge 20 le 32
end-set
!
prefix-set prefix_set_1
 10.0.0.1/24 ge 24 le 32,
 10.0.0.5/24 ge 24 le 32,
 172.16.0.1/24 ge 24 le 32,
 172.16.5.5/24 ge 24 le 32,
 172.16.20.10/24 ge 24 le 32,
 172.30.0.1/24 ge 24 le 32,
 10.0.20.10/24 ge 24 le 32,
 172.18.0.5/24 ge 24 le 32,
 192.168.0.1/24 ge 24 le 32,
 192.168.20.10/24 ge 24 le 32,
 192.168.200.10/24 ge 24 le 32,
 192.168.255.254/24 ge 24 le 32
end-set
!
as-path-set as_allowed
  ios-regex '.* _1239_ .*',
  ios-regex '.* _3561_ .*',
  ios-regex '.* _701_ .*',
  ios-regex '.* _666_ .*',
  ios-regex '.* _1755_ .*',
  ios-regex '.* _1756_ .*'
end-set
!
as-path-set aspath_set_1
  ios-regex '_9148_',
  ios-regex '_5870_',
  ios-regex '_2408_',
  ios-regex '_2531_',
  ios-regex '_197_',
  ios-regex '_2992_'
end-set
!
route-policy set_lpref_from_comm
  if community matches-any (2:50) then
    set local-preference 50
  elseif community matches-any (2:60) then
    set local-preference 60
  elseif community matches-any (2:70) then
    set local-preference 70
  elseif community matches-any (2:80) then
    set local-preference 80
  elseif community matches-any (2:90) then
    set local-preference 90
  endif
```

```
end-policy
!
route-policy policy_1
  if destination in prefix_set_1 and not destination in sample1 then
    if as-path in aspath_set_1 then
      set local-preference 300
      set origin igp
    elseif as-path in as_allowed then
      set local-preference 400
      set origin igp
    else
      set origin igp
    endif
  else
    drop
  endif
  set med 120
  set community (8660:612) additive
  apply set_lpref_from_comm
end-policy
```

show rpl route-policy attachpoints

To display all the policies used at an attach point that reference the named policy, use the **show rpl route-policy attachpoints** command in XR EXEC mode.

show rpl route-policy *name* **attachpoints**

Syntax Description

name	Name of a policy.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl route-policy attachpoints** command to display all the policies used at an attach point that reference the named policy either directly or indirectly.

The policy name is required.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
router bgp 2
 address-family ipv4 unicast
 !
 neighbor 10.0.101.2
  remote-as 100
  address-family ipv4 unicast
   route-policy policy_1 in
  !
 !
 neighbor 10.0.101.3
  remote-as 12
  address-family ipv4 unicast
   route-policy policy_2 in
  !
 !
!

RP/0/RP0/CPU0:router# show rpl route-policy policy_1

route-policy policy_1
  if (destination in prefix_set_ex1) then
    set local-preference 100
  endif
```

```
  if (as-path in as_path_set_ex1) then
    set community  (10:333) additive
  endif
end-policy
!
RP/0/RP0/CPU0:router# show rpl route-policy policy_2

route-policy policy_2
  if (destination in prefix_set_ex1) then
    if (community matches-any comm_set_ex1) then
      set community  (10:666) additive
    endif
    if (extcommunity matches-any ext_comm_set_rt_ex1) then
      set community  (10:999) additive
    endif
  endif
end-policy
!
```

The following command displays the route policy attach points for policy_2:

```
RP/0/RP0/CPU0:router# show rpl route-policy policy_2 attachpoints

BGP Attachpoint: Neighbor

Neighbor/Group  type  afi/safi   in/out   vrf name
--------------------------------------------------
10.0.101.2      --    IPv4/uni   in         default
10.0.101.2      --    IPv4/uni   out        default
```

This table describes the significant fields shown in the display.

Table 136: show rpl route-policy attachpoints Field Descriptions

Field	Description
BGP Attachpoint	Location of the attach point.
Neighbor/Group	IP address of the attach point on the neighbor.
type	Displays the address family mode.
afi/safi	Address family identifier or subsequent address family identifier.
vrf name	Name of the VPN routing and forwarding (VRF) instance.

show rpl route-policy inline

To display all policies and sets that a policy uses expanded inline, use the **show rpl route-policy inline** command in XR EXEC mode.

show rpl route-policy *name* **inline**

Syntax Description

name	Name of a policy.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl route-policy inline** command to examine the configuration of a specified route policy. All policies and sets that a policy uses are gathered together and displayed expanded inline.

The policy name is required.

Task ID

Task ID	Operations
route-policy	read

Examples

The following command displays the route policy policy_1:

```
RP/0/RP0/CPU0:router# show rpl route-policy policy_1

!
route-policy policy_1
  if destination in prefix_set_1 and not destination in martians then
    if as-path in aspath_set_1 then
      set local-preference 300
      set origin igp
    elseif as-path in as_allowed then
      set local-preference 400
      set origin igp
    else
      set origin igp
    endif
  else
    drop
  endif
  set med 120
  set community (8660:612) additive
  apply set_lpref_from_comm
end-policy
```

The following command displays the route policy policy_1 and all the other sets or policies it refers too inline. Adding the inline keyword causes the configuration to be displayed inline for all RPL objects that the route-policy policy_1 uses.

```
RP/0/RP0/CPU0:router#show rpl policy policy_1 inline

route-policy policy_1
  if destination in (91.5.152.0/24 ge 24 le 32, 91.220.152.0/24 ge 24 le 32, 61.106.52.0/24
 ge 24 le 32, 222.168.199.0/24
  ge 24 le 32, 93.76.114.0/24 ge 24 le 32, 41.195.116.0/24 ge 24 le 32, 35.92.152.0/24 ge
24 le 32, 143.144.96.0/24 ge 24
  le 32, 79.218.81.0/24 ge 24 le 32, 75.213.219.0/24 ge 24 le 32, 178.220.61.0/24 ge 24 le
 32, 27.195.65.0/24 ge 24 le 32)
  and  not destination in (0.0.0.0/0, 0.0.0.0/0 ge 25 le 32, 10.0.0.0/8 ge 8 le 32,
192.168.0.0/16 ge 16 le 32, 224.0.0.0/20
  ge 20 le 32, 240.0.0.0/20 ge 20 le 32) then
    if as-path in (ios-regex '_9148_', ios-regex '_5870_', ios-regex '_2408_', ios-regex
'_2531_', ios-regex '_197_',
 ios-regex '_2992_') then
      set local-preference 300
      set origin igp
    elseif as-path in
 (ios-regex '.* _1239_ .*', ios-regex '.* _3561_ .*', ios-regex '.* _701_ .*', ios-regex
'.* _666_ .*', ios-regex '.* _1755_ .*',
 ios-regex '.* _1756_ .*') then
      set local-preference 400
      set origin igp
    else
      set origin igp
    endif
  else
    drop
  endif
  set med 120
  set community (8660:612) additive
  # apply set_lpref_from_comm
  if community matches-any (2:50) then
    set local-preference 50
  elseif community matches-any (2:60) then
    set local-preference 60
  elseif community matches-any (2:70) then
    set local-preference 70
  elseif community matches-any (2:80) then
    set local-preference 80
  elseif community matches-any (2:90) then
    set local-preference 90
  endif
  # end-apply set_lpref_from_comm
end-policy
```

show rpl route-policy references

To list all the policies that reference the named policy, use the **show rpl route-policy references** command in XR EXEC mode.

show rpl route-policy *name* **references** [**brief**]

Syntax Description

name	Name of a prefix set.
brief	(Optional) Limits the output to just a summary table and not the detailed information for the named policy.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl route-policy references** command to list all the policies that reference the named policy.

Use the optional **brief** keyword to limit the output to just a summary table and not the detailed information for the policy.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
prefix-set ten-net
 10.0.0.0/16 le 32
end-set
prefix-set too-specific
 0.0.0.0/0 ge 25 le 32
end-set
route-policy example-one
 if destination in ten-net then
  drop
 else
  set local-preference 200
  apply set-comms
 endif
end-policy
route-policy set-comms
 set community (10:1234) additive
end-policy
route-policy example-three
 if destination in too-specific then
  drop
```

```
 else
  apply example-one
  pass
 endif
end-policy
```

The following command displays information about the policy set-comms and how it is referenced:

```
RP/0/RP0/CPU0:router# show rpl route-policy set-comms references

Usage Direct -- Reference occurs in this policy
Usage Indirect -- Reference occurs via an apply statement

Status UNUSED -- Policy is not in use at an attachpoint (unattached)
Status ACTIVE -- Policy is actively used at an attachpoint
Status INACTIVE -- Policy is applied by an unattached policy

     Usage/Status         count
-------------------------------------------------------------
     Direct               1
     Indirect             1

     ACTIVE               0
     INACTIVE             1
     UNUSED               1

     route-policy         usage  policy status
-------------------------------------------------------------
    example-one          Direct  INACTIVE
    example-three        Indirect UNUSED
```

The direct usage indicates that the route policy example-one directly applies the policy set-comms, that is, example-one has a line in the form apply set-comms. The usage Indirect indicates that the route policy example-three does not directly apply the route policy set-comms. However, the route policy example-three does apply the policy example-one, which in turn applies the policy set-comms, so there is an indirect reference from example-three to the route policy set-comms.

The status column indicates one of three states. A policy is active if it is in use at an attach point. In the example provided, neither example-one nor example-three is in use at an attach point, which leaves two possible states: UNUSED or INACTIVE. The route policy example-one is inactive because it has some other policy (example-three) that references it, but neither example-one nor any of the policies that reference it (example-one) are in use at an attach point. The route policy example-three has a status of unused because it is not used at an attach point and no other route policies in the system refer to it.

This table describes the significant fields shown in the display.

Table 137: show rpl route-policy references Field Descriptions

Field	Description
Usage/Status	Displays the usage and status of all policies that reference the specified policy. Values for usage are Direct or Indirect. Values for status are ACTIVE, INACTIVE, and UNUSED.
count	Number of policies that match each usage and status option.

Field	Description
route-policy	One name for multiple policies that reference the specified policy.
usage	Type of usage for the policy.
policy status	Status of the policy.

show rpl route-policy uses

To display information about a specified named policy, use the **show rpl route-policy uses** command in XR EXEC mode.

show rpl route-policy *name* **uses** {**policies** | **sets** | **all**} [**direct**]

Syntax Description

name	Name of a policy.
policies	Generates a list of all policies that the named policy uses.
sets	Lists all named sets that are used by the policy.
all	Generates a list of both sets and policies that the named policy references.
direct	(Optional) Lists only the policies or sets used directly in the named policy block. Set or policy references that occur as a result of an **apply** statement are not listed.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl route-policy uses** command to display information about a specified named policy.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
prefix-set ten-net
 10.0.0.0/16 le 32
end-set
prefix-set too-specific
 0.0.0.0/0 ge 25 le 32
end-set
route-policy example-one
 if destination in ten-net then
  drop
 else
  set local-preference 200
  apply set-comms
 endif
end-policy
route-policy set-comms
 set community (10:1234) additive
end-policy
```

```
route-policy example-three
 if destination in too-specific then
  drop
 else
  apply example-one
  pass
 endif
end-policy
```

The following command lists the policies one and set-comms. It also lists the prefix sets too-specific and ten-net.

```
RP/0/RP0/CPU0:router# show rpl route-policy example-three uses all

Policies directly and indirectly applied by this policy:
---------------------------------------------------------
    example-one set-comms

Sets referenced directly and indirectly
 ----------------------------------------
(via applied policies) in this policy:

type prefix-set:
    ten-net too-specific
```

The sets example-one and set-comms are listed as policies that are used by the policy example-three. The policy example-one is listed because route policy example-three uses it in an **apply** statement. The policy set-comms is also listed because example-one applies it. Similarly, the prefix-set too-specific is used directly in the **if** statement in the policy example-three, and the prefix-set ten-net is used in the policy example-one. The optional **direct** keyword can be used to limit the output to just those sets and policies that are used within the example-three block itself, as shown in the following example:

```
RP/0/RP0/CPU0:router# show rpl route-policy example-three uses all direct

Policies directly applied by this policy:
-----------------------------------------
    example-one

Sets used directly in this policy
-------------------------------------
type prefix-set:
    too-specific
```

As can be seen in the output, the route policy set-comms and the prefix set ten-net are no longer included in the output when the **direct** keyword is used. The **direct** form of the command considers only those sets or policies used in the specified route policy and any additional policies or sets that may be used if you follow the hierarchy of **apply** statements.

This table describes the significant fields shown in the display.

Table 138: show rpl route-policy uses Field Descriptions

Field	Description
type	Displays the type used in the policy configuration. Values for type are prefix-set, community-set, extcommunity-set, and as-path-set.

show rpl unused as-path-set

To display the AS path sets that are defined but not used by a policy at an attach point or referenced in a policy using an **apply** statement, use the **show rpl unused as-path-set** command in XR EXEC mode.

show rpl unused as-path-set [**detail**]

Syntax Description

detail	(Optional) Displays the content of the object and all referenced objects for unused AS path sets.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl unused as-path-set** command to display all AS path sets that are not used in a policy at an attach point either directly or indirectly and are not referenced by any policies in the system.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
router bgp 2
 address-family ipv4 unicast
 !
 neighbor 10.0.101.2
  remote-as 100
  address-family ipv4 unicast
   route-policy policy_1 in
  !
 !
 neighbor 10.0.101.3
  remote-as 12
  address-family ipv4 unicast
   route-policy policy_2 in
  !
 !
!
as-path-set as_path_set_ex1
  ios-regex '^_65500_$',
  ios-regex '^_65501_$'
end-set
!
as-path-set as_path_set_ex2
  ios-regex '^_65502_$',
  ios-regex '^_65503_$'
end-set
!
```

```
as-path-set as_path_set_ex3
  ios-regex '^_65504_$',
  ios-regex '^_65505_$'
end-set
!
route-policy sample
  if (destination in sample) then
    drop
  endif
end-policy
!
route-policy policy_1
  if (destination in prefix_set_ex1) then
    set local-preference 100
  endif
  if (as-path in as_path_set_ex1) then
    set community  (10:333) additive
  endif
end-policy
!
route-policy policy_2
  if (destination in prefix_set_ex1) then
    if (community matches-any comm_set_ex1) then
      set community  (10:666) additive
    endif
    if (extcommunity matches-any ext_comm_set_rt_ex1) then
      set community  (10:999) additive
    endif
  endif
end-policy
!
route-policy policy_3
  if (destination in prefix_set_ex2) then
    set local-preference 100
  endif
  if (as-path in as_path_set_ex2) then
    set community  (10:333) additive
  endif
end-policy
!
route-policy policy_4
  if (destination in prefix_set_ex2) then
    if (community matches-any comm_set_ex2) then
      set community  (10:666) additive
    endif
    if (extcommunity matches-any ext_comm_set_rt_ex2) then
      set community  (10:999) additive
    endif
  endif
end-policy
!
route-policy policy_5
  apply sample
  apply policy_3
end-policy
```

Given this sample configuration, the **show rpl unused as-path-set** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl unused as-path-set

ACTIVE -- Referenced by at least one policy which is attached
```

```
INACTIVE -- Only referenced by policies which are not attached
UNUSED -- Not attached (directly or indirectly) and not referenced

The following as-path-sets are UNUSED
-------------------------------------
as_path_set_ex3
```

show rpl unused community-set

To display the community sets that are defined but not used by a policy at an attach point or referenced in a policy using an **apply** statement, use the **show rpl unused community-set** command in XR EXEC mode.

show rpl unused community-set [**detail**]

Syntax Description

detail	(Optional) Displays the content of the object and all referenced objects for unused community sets.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl unused community-set** command to display all the community sets that are not used in a policy at an attach point either directly or indirectly and are not referenced by any policies in the system.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
router bgp 2
 address-family ipv4 unicast
 !
 neighbor 10.0.101.2
  remote-as 100
  address-family ipv4 unicast
   route-policy policy_1 in
  !
 !
 neighbor 10.0.101.3
  remote-as 12
  address-family ipv4 unicast
   route-policy policy_2 in
  !
 !
!

community-set comm_set_ex1
  65500:1,
  65500:2,
  65500:3
end-set
!
community-set comm_set_ex2
  65501:1,
  65501:2,
```

```
  65501:3
end-set
!
community-set comm_set_ex3
  65502:1,
  65502:2,
  65502:3
end-set
!
route-policy sample
  if (destination in sample) then
    drop
  endif
end-policy
!
route-policy policy_1
  if (destination in prefix_set_ex1) then
    set local-preference 100
  endif
  if (as-path in as_path_set_ex1) then
    set community  (10:333) additive
  endif
end-policy
!
route-policy policy_2
  if (destination in prefix_set_ex1) then
    if (community matches-any comm_set_ex1) then
      set community  (10:666) additive
    endif
    if (extcommunity matches-any ext_comm_set_rt_ex1) then
      set community  (10:999) additive
    endif
  endif
end-policy
!
route-policy policy_3
  if (destination in prefix_set_ex2) then
    set local-preference 100
  endif
  if (as-path in as_path_set_ex2) then
    set community  (10:333) additive
  endif
end-policy
!
route-policy policy_4
  if (destination in prefix_set_ex2) then
    if (community matches-any comm_set_ex2) then
      set community  (10:666) additive
    endif
    if (extcommunity matches-any ext_comm_set_rt_ex2) then
      set community  (10:999) additive
    endif
  endif
end-policy
!
route-policy policy_5
  apply sample
  apply policy_3
end-policy
```

Given this sample configuration, the **show rpl unused community-set** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl unused community-set

ACTIVE -- Referenced by at least one policy which is attached
INACTIVE -- Only referenced by policies which are not attached
UNUSED -- Not attached (directly or indirectly) and not referenced

The following community-sets are UNUSED
---------------------------------------
comm_set_ex3
```

show rpl unused extcommunity-set

To display the extended community sets that are defined but not used by a policy at an attach point or referenced in a policy using an **apply** statement, use the **show rpl unused extcommunity-set** command in XR EXEC mode.

show rpl unused extcommunity-set [**cost** | **detail** | **rt** | **soo**]

Syntax Description

cost	(Optional) Displays the unused extended-community cost objects.
rt	(Optional) Displays the unused extended community RT objects.
soo	(Optional) Displays the unused extended-community SoO objects.
detail	(Optional) Displays the content of the object and all referenced objects for unused extended community sets.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl unused extcommunity-set** command to display all extended community sets that are not used in a policy at an attach point either directly or indirectly and are not referenced by any policies in the system.

Task ID

Task ID	Operations
route-policy	read

Examples

The following is sample output for the **show rpl unused extcommunity-set** command:

```
RP/0/RP0/CPU0:router:router# show rpl unused extcommunity-set

ACTIVE -- Referenced by at least one policy which is attached
INACTIVE -- Only referenced by policies which are not attached
UNUSED -- Not attached (directly or indirectly) and not referenced

The following extcommunity-sets are UNUSED
------------------------------------------
ext_comm_set_ex3
```

show rpl unused prefix-set

To display the prefix sets that are defined but not used by a policy at an attach point or referenced in a policy using an **apply** statement, use the **show rpl unused prefix-set** command in XR EXEC mode.

show rpl unused prefix-set [**detail**]

Syntax Description

detail	(Optional) Displays the content of the object and all referenced objects for unused prefix sets.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl unused prefix-set** command to display all prefix sets that are not used in a policy at an attach point either directly or indirectly and are not referenced by any policies in the system.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
router bgp 2
 address-family ipv4 unicast
 !
 neighbor 10.0.101.2
  remote-as 100
  address-family ipv4 unicast
   route-policy policy_1 in
  !
 !
 neighbor 10.0.101.3
  remote-as 12
  address-family ipv4 unicast
   route-policy policy_2 in
  !
 !
!

prefix-set sample
  0.0.0.0/0,
  0.0.0.0/0 ge 25 le 32,
  10.0.0.0/8 ge 8 le 32,
  192.168.0.0/16 ge 16 le 32,
  224.0.0.0/20 ge 20 le 32,
  240.0.0.0/20 ge 20 le 32
end-set
!
```

```
prefix-set prefix_set_ex1
  10.0.0.0/16 ge 16 le 32,
  0.0.0.0/0 ge 25 le 32,
  0.0.0.0/0
end-set
!
prefix-set prefix_set_ex2
  220.220.220.0/24 ge 24 le 32,
  220.220.120.0/24 ge 24 le 32,
  220.220.130.0/24 ge 24 le 32
end-set
!
prefix-set prefix_set_ex3
  221.221.220.0/24 ge 24 le 32,
  221.221.120.0/24 ge 24 le 32,
  221.221.130.0/24 ge 24 le 32
end-set
!
route-policy sample
  if (destination in sample) then
    drop
  endif
end-policy
!
route-policy policy_1
  if (destination in prefix_set_ex1) then
    set local-preference 100
  endif
  if (as-path in as_path_set_ex1) then
    set community  (10:333) additive
  endif
end-policy
!
route-policy policy_2
  if (destination in prefix_set_ex1) then
    if (community matches-any comm_set_ex1) then
      set community  (10:666) additive
    endif
    if (extcommunity matches-any ext_comm_set_rt_ex1) then
      set community  (10:999) additive
    endif
  endif
end-policy
!
route-policy policy_3
  if (destination in prefix_set_ex2) then
    set local-preference 100
  endif
  if (as-path in as_path_set_ex2) then
    set community  (10:333) additive
  endif
end-policy
!
route-policy policy_4
  if (destination in prefix_set_ex2) then
    if (community matches-any comm_set_ex2) then
      set community  (10:666) additive
    endif
    if (extcommunity matches-any ext_comm_set_rt_ex2) then
      set community  (10:999) additive
    endif
  endif
end-policy
!
```

```
route-policy policy_5
  apply sample
  apply policy_3
end-policy
--------------------------
ext_comm_set_ex3
```

Given this sample configuration, the **show rpl unused prefix-set** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl unused prefix-set

ACTIVE -- Referenced by at least one policy which is attached
INACTIVE -- Only referenced by policies which are not attached
UNUSED -- Not attached (directly or indirectly) and not referenced

The following prefix-sets are UNUSED
------------------------------------
prefix_set_ex3
```

show rpl unused rd-set

To display the route distinguisher (RD) sets that are defined but not used by a policy at an attach point or referenced in a policy using an **apply** statement, use the **show rpl unused rd-set** command in XR EXEC mode.

show rpl unused rd-set [**detail**]

Syntax Description

detail	(Optional) Displays the content of the object and all referenced objects for unused RD sets.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl unused rd-set** command to display all of the RD sets that are not used in a policy at an attach point either directly or indirectly and are not referenced by any policies in the system.

Task ID

Task ID	Operations
route-policy	read

Examples

The **show rpl unused rd-set** command displays the following information:

```
RP/0/RP0/CPU0:router# show rpl unused rd-set

ACTIVE -- Referenced by at least one policy which is attached
INACTIVE -- Only referenced by policies which are not attached
UNUSED -- Not attached (directly or indirectly) and not referenced

The following rd-sets are UNUSED
----------------------------------------
None found with this status.
```

show rpl unused route-policy

To display the route policies that are defined but not used at an attach point or referenced using an **apply** statement, use the **show rpl unused route-policy** command in XR EXEC mode.

show rpl unused route-policy [**detail**]

Syntax Description

detail	(Optional) Displays the content of the object and all referenced objects for unused route policies.

Command Default

No default behavior or values

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **show rpl unused route-policy** command to display route policies that are defined but not used at an attach point or referenced from another policy using an **apply** statement.

Task ID

Task ID	Operations
route-policy	read

Examples

This example shows the following sample configuration:

```
RP/0/RP0/CPU0:router# show run | begin prefix-set

Building configuration...
prefix-set prefix_set_ex1
  10.0.0.0/16 ge 16 le 32,
  0.0.0.0/0 ge 25 le 32,
  0.0.0.0/0
end-set
!
prefix-set prefix_set_ex2
  220.220.220.0/24 ge 24 le 32,
  220.220.120.0/24 ge 24 le 32,
  220.220.130.0/24 ge 24 le 32
end-set
!
as-path-set as_path_set_ex1
  ios-regex '^_65500_$',
  ios-regex '^_65501_$'
end-set
!
as-path-set as_path_set_ex2
  ios-regex '^_65502_$',
  ios-regex '^_65503_$'
end-set
!
as-path-set as_path_set_ex3
```

```
  ios-regex '^_65504_$',
  ios-regex '^_65505_$'
end-set
!
community-set comm_set_ex1
  65500:1,
  65500:2,
  65500:3
end-set
!
community-set comm_set_ex2
  65501:1,
  65501:2,
  65501:3
end-set
!
extcommunity-set rt ext_comm_set_rt_ex1
  1.2.3.4:34
end-set
!
extcommunity-set rt ext_comm_set_rt_ex2
  2.3.4.5:36
end-set
!
route-policy sample
  if (destination in sample) then
    drop
  endif
end-policy
!
route-policy policy_1
  if (destination in prefix_set_ex1) then
    set local-preference 100
  endif
  if (as-path in as_path_set_ex1) then
    set community (10:333) additive
  endif
end-policy
!
route-policy policy_2
  if (destination in prefix_set_ex1) then
    if (community matches-any comm_set_ex1) then
      set community (10:666) additive
    endif
    if (extcommunity rt matches-any ext_comm_set_rt_ex1) then
      set community (10:999) additive
    endif
  endif
end-policy
!
route-policy policy_3
  if (destination in prefix_set_ex2) then
    set local-preference 100
  endif
  if (as-path in as_path_set_ex2) then
    set community (10:333) additive
  endif
end-policy
!
route-policy policy_4
  if (destination in prefix_set_ex2) then
    if (community matches-any comm_set_ex2) then
      set community (10:666) additive
    endif
```

```
    if (extcommunity rt matches-any ext_comm_set_rt_ex2) then
      set community (10:999) additive
    endif
  endif
end-policy
!
route-policy policy_5
  apply sample
  apply policy_3
end-policy
!
route ipv4 0.0.0.0/0 10.91.37.129
route ipv4 10.91.36.0/23 10.91.37.129
route ipv4 10.91.38.0/24 10.91.37.129
end
```

In the following example, route policies that are defined but not used at an attach point or referenced from another policy using an **apply** statement are displayed using the **show rpl unused route-policy** command.

```
RP/0/RP0/CPU0:router# show rpl unused route-policy

ACTIVE -- Referenced by at least one policy which is attached
INACTIVE -- Only referenced by policies which are not attached
UNUSED -- Not attached (directly or indirectly) and not referenced

The following policies are (UNUSED)
-----------------------------------
policy_1
policy_2
policy_4
policy_5
```

source in

To test the source of a Border Gateway Protocol (BGP) route against the address contained in either a named or an inline prefix set, use the **source in** command in route-policy configuration mode.

source in {*prefix-set-nameinline-prefix-setparameter*}

Syntax Description

prefix-set-name	Name of a prefix set.
inline-prefix-set	Inline prefix set. The inline prefix set must be enclosed in parentheses.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **source in** command as a conditional expression within an **if** statement to test the source of the route against the data in either a named or an inline prefix set. A comparison that references a prefix set with zero elements in it returns false.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

The source of a BGP route is the IP peering address of the neighboring router from which the route was received.

The prefix set can contain both IPv4 and IPv6 prefix specifications.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the source of a BGP route is tested against the data in the prefix set my-prefix-set:

```
RP/0/RP0/CPU0:router(config)# route-policy policy-A
RP/0/RP0/CPU0:router(config-rpl)# if source in my-prefix-set then
```

In this example, the source of a BGP route is tested against the data in an inline IPv4 prefix set:

```
RP/0/RP0/CPU0:router(config)# route-policy policy-B
```

```
RP/0/RP0/CPU0:router(config-rpl)# if source in (10.0.0.8, 10.0.0.20) then
```

In this example, the source of a route is tested against the data in an inline IPv6 prefix set:

```
RP/0/RP0/CPU0:router(config)# route-policy policy-C
RP/0/RP0/CPU0:router(config-rpl)# if source in (2001:0:0:1::/64, 2001:0:0:2::/64) then
```

suppress-route

To indicate that a given component of a BGP aggregate should be suppressed, use the **suppress-route** command in route-policy configuration mode.

suppress-route

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **suppress-route** command to indicate that a given component of an aggregate should be suppressed, that is, not advertised by BGP. See the unsuppress-route, on page 987 command for information on overriding the **suppress-route** command for individual neighbors.

The **suppress-route** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, if the destination is in 10.1.0.0/16, then the route is not advertised:

```
RP/0/RP0/CPU0:router(config)# oute-policy check-aggregater
RP/0/RP0/CPU0:router(config-rpl)# if destination in (10.1.0.0/16) then
RP/0/RP0/CPU0:router(config-rpl-if)# suppress-route

RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl-if)# end-policy
```

tag

To match a specific tag value, use the **tag** command in route-policy configuration mode.

tag {**eq** | **ge** | **le** | **is**} {*integerparameter*}

Syntax Description

eq | **ge** | **le** | **is**	Equal to; greater than or equal to; less than or equal to.
integer	Integer value. Range is 0 to 4294967295.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **tag** command as a conditional expression within an **if** statement to match a specific tag value.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

A tag is a 32-bit integer that can be associated with a given route within the RIB.

The **eq** operator matches either a specific tag value or a parameter value. Its variants **ge** and **le** match a range of tag values that are either greater than or equal to or less than or equal to the supplied value or parameter.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, if the tag equals 10, then the condition returns true:

```
RP/0/RSP0RP0/CPU0:router(config-rpl)# if tag eq 10 then
```

tag in

To match a tag entry in a named tag set or inline tag set, use the **tag in** command in route-policy configuration mode.

tag in {*tag-set-nameinline-tag-setparameter*}

Syntax Description

tag-set-name	Name of a tag set. The tag-set accepts 32-bit Integer value. Range is 0 to 4294967295.
inline-tag-set	Inline tag set. The inline tag set must be enclosed in parentheses.
parameter parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0.0	This command was introduced.

Usage Guidelines

Use the **tag in** command as a conditional expression within an **if** statement to match a tag entry in a named tag set or inline tag set.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

This command takes either a named tag set or an inline tag set value as an argument. The condition returns true if the tag entry matches any entry in the tag set or inline tag set. An attempt to match a tag using a tag set that is defined but contains no elements returns false.

The routing policy language (RPL) provides the ability to test tags for a match to a list of tag match specifications using the **in** operator. The **tag in** command is protocol-independent.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, a tag set named `my-tag-set` is defined and a route policy named `use-tag-in` is created. Within the `use-tag-in` route policy, the **tag in** command is used within an **if** statement to learn if the tag is in the tag-set named `my-tag-set`. If it is, then local preference is set to 100. If it is not in `my-tag-set` but does match the next tag specifications, then local preference is set to 200.

```
RP/0/RP0/CPU0:router(config)#tag-set my-tag-set
RP/0/RP0/CPU0:router(config-tag)#1000
```

```
RP/0/RP0/CPU0:router(config-tag)#3000
RP/0/RP0/CPU0:router(config-tag)#end-set

RP/0/RP0/CPU0:router(config)#route-policy use-tag-in
RP/0/RP0/CPU0:router(config-rpl)#if tag in my-tag-set then
RP/0/RP0/CPU0:router(config-rpl-if)#set local-preference 100
RP/0/RP0/CPU0:router(config-rpl-if)#elseif tag in (2000, 4000) then
RP/0/RP0/CPU0:router(config-rpl-elseif)#set local-preference 200
RP/0/RP0/CPU0:router(config-rpl-elseif)#endif
RP/0/RP0/CPU0:router(config-rpl)#end policy
```

tag-set

To enter tag set configuration mode and define a tag set, use the **tag-set** command in XR Config mode. To remove a named tag set, use the **no** form of this command.

tag-set *name*
no tag-set *name*

Syntax Description

name	Name of a tag set.

Command Default

None

Command Modes

XR Config

Command History

Release	Modification
Release 6.0.0	This command was introduced.

Usage Guidelines

Use the **tag-set** command to enter tag set configuration mode and define a tag set. A tag-set is a 32-bit integer that can be associated with a given route within the RIB.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, a tag set named `my-tag-set` is defined and a route policy named `use-tag-in` is created. Within the `use-tag-in` route policy, the **tag in** command is used within an **if** statement to learn if the tag is in the tag-set named `my-tag-set`. If it is, then local preference is set to 100. If it is not in `my-tag-set` but does match the next tag specifications, then local preference is set to 200.

```
RP/0/RP0/CPU0:router(config)#tag-set my-tag-set
RP/0/RP0/CPU0:router(config-tag)#1000
RP/0/RP0/CPU0:router(config-tag)#3000
RP/0/RP0/CPU0:router(config-tag)#end-set

RP/0/RP0/CPU0:router(config)#route-policy use-tag-in
RP/0/RP0/CPU0:router(config-rpl)#if tag in my-tag-set then
RP/0/RP0/CPU0:router(config-rpl-if)#set local-preference 100
RP/0/RP0/CPU0:router(config-rpl-if)#elseif tag in (2000, 4000) then
RP/0/RP0/CPU0:router(config-rpl-elseif)#set local-preference 200
RP/0/RP0/CPU0:router(config-rpl-elseif)#endif
RP/0/RP0/CPU0:router(config-rpl)#end policy
```

unsuppress-route

To indicate that a given component of a BGP aggregate should be unsuppressed, use the **unsuppress-route** command in route-policy configuration mode.

unsuppress-route

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **unsuppress-route** command to indicate that a given component of an aggregate should be unsuppressed, that is, allowed to be advertised by BGP again. This command affects routes that have been suppressed in the generation of BGP aggregates. If the request to unsuppress a route is encountered in a policy at a neighbor-out attach point, it guarantees that the routes that it affects are advertised to that neighbor even if that route was suppressed using the **suppress-route** command in a policy at the aggregation attach point.

The **unsuppress-route** command can be used as an action statement within an **if** statement. For a list of all action statements available within an **if** statement, see the **if** command.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, if the destination is in 10.1.0.0/16, then the route is not advertised:

```
RP/0/RP0/CPU0:router(config)# route-policy check-aggregate
RP/0/RP0/CPU0:router(config-rpl)# if destination in (10.1.0.0/16) then
RP/0/RP0/CPU0:router(config-rpl-if)# unsuppress-route

RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)# end-policy
```

Assuming that the policy is attached at a neighbor-out attach point, if the route 10.1.0.0/16 was suppressed in a policy at an aggregation attach point, 10.1.0.0/16 is advertised to the neighbor. Routes continue to be suppressed in advertisements to other BGP neighbors unless a specific policy is attached to unsuppress the route.

vpn-distinguisher is

To match a specific Border Gateway Protocol (BGP) VPN distinguisher, use the **vpn-distinguisher is** command in route-policy configuration mode.

vpn-distinguisher is {*numberparameter*}

Syntax Description

number	Value assigned to a 32-bit unsigned integer. Range is from 1 to 4294967295.
parameter	Parameter name. The parameter name must be preceded with a "$."

Command Default

No default behavior or values

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **vpn-distinguisher is** command as a conditional expression within an **if** statement to test the value of the origin attribute.

A VPN distinguisher is used in Layer 3 VPN networks for enhanced individual VPN control and to avoid route target mapping at AS boundaries in inter-AS VPN networks. Route target extended communities are removed at neighbor outbound and the VPN distinguisher value is applied on the BGP route as an extended community. When the route is received on a neighboring router in another AS, the VPN distinguisher is removed and mapped to a route target extended community.

Note For a list of all conditional expressions available within an **if** statement, see the **if** command.

This command can be parameterized.

Task ID

Task ID	Operations
route-policy	read, write

Examples

In the following example, the origin is tested within an **if** statement to learn if it is either **igp** or **egp** :

```
RP/0/RP0/CPU0:router(config-rpl)# if origin is igp or origin is egp then
```

In the following example, a parameter is used to match a specific origin type:

```
RP/0/RP0/CPU0:router(config)# route-policy bar($origin)
```

```
RP/0/RP0/CPU0:router(config-rpl)# if origin is $origin then
RP/0/RP0/CPU0:router(config-rpl-if)# set med 20
RP/0/RP0/CPU0:router(config-rpl-if)# endif
RP/0/RP0/CPU0:router(config-rpl)#
```

set algorithm

To advertise the routes to a particular flex algorithm from IS-IS protocol, configure **set algorithm** in the redistribution routing policy in route-policy configuration mode.

set algorithm *algorithm*

Syntax Description

algorithm	Set an algorithm in RPL. The algorithm range is from 0 to 255. IS-IS protocol handles algorithm 0 and starting from 128 to 255. Algorithms from 1 to 127 are treated as 0.

Command Default

None

Command Modes

Route-policy configuration

Command History

Release	Modification
Release 7.9.1	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
route-policy	read, write

Define the route-policy using set algorithm to set Flex-Algorithm 128 for prefix-set *PFX_ALGO128*.

```
Router(config)#route-policy BGP_TO_ISIS
Router(config-rpl)# if destination in PFX_ALGO128 then
Router(config-rpl-if)# set tag 200
Router(config-rpl-if)# set algorithm 128
Router(config-rpl-if)# pass
Router(config-rpl-if)# else
Router(config-rpl-else)# drop
Router(config-rpl-else)# endif
Router(config-rpl)#end-policy
Router(config)#commit
```

Static Routing Commands

Note All commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 540 Series Router that is introduced from Cisco IOS XR Release 6.3.2. References to earlier releases in Command History tables apply to only the Cisco NCS 5500 Series Router.

Note

- Starting with Cisco IOS XR Release 6.6.25, all commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 560 Series Routers.
- Starting with Cisco IOS XR Release 6.3.2, all commands applicable for the Cisco NCS 5500 Series Router are also supported on the Cisco NCS 540 Series Router.
- References to releases before Cisco IOS XR Release 6.3.2 apply to only the Cisco NCS 5500 Series Router.
- Cisco IOS XR Software Release 7.0.1 specific updates are not applicable for the following variants of Cisco NCS 540 Series Routers:
  - N540-28Z4C-SYS-A
  - N540-28Z4C-SYS-D
  - N540X-16Z4G8Q2C-A
  - N540X-16Z4G8Q2C-D
  - N540X-16Z8Q2C-D
  - N540-12Z20G-SYS-A
  - N540-12Z20G-SYS-D
  - N540X-12Z16G-SYS-A
  - N540X-12Z16G-SYS-D

This module describes the commands used to establish static routes on Cisco NCS 5500 Series Routers.

For detailed information about static routing concepts, configuration tasks, and examples, see the Implementing Static Routes on Cisco NCS 5000 Series Routers module in the *Routing Configuration Guide for Cisco NCS 5500 Series Routers*.

- address-family (static), on page 993
- maximum path (static), on page 994
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address-family (static)

To enter various address family configuration modes while configuring static routes, use the **address-family** command in the appropriate configuration mode. To disable support for an address family, use the **no** form of this command.

address-family {**ipv4** | **ipv6**} {**unicast** | **multicast**}
no address-family {**ipv4** | **ipv6**} {**unicast** | **multicast**}

Syntax Description

ipv4	Specifies IP Version 4 address prefixes.
ipv6	Specifies IP Version 6 address prefixes. This option is available only in static router configuration mode.
unicast	Specifies unicast address prefixes.
multicast	Specifies multicast address prefixes. This option is available only in static router configuration mode.

Command Default

All static routes belong to the default VRF if you enter address family configuration mode without entering VRF configuration mode.

Command Modes

Router static configuration

VRF router static configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **address-family** command to enter various address family configuration modes while configuring static routing sessions. From address family configuration mode, you can configure static routes using the **route** command.

Task ID

Task ID	Operations
static	read, write

Examples

The following example shows how to enter IPv6 unicast address family mode:

```
RP/0/RP0/CPU0:router(config)# router static
RP/0/RP0/CPU0:router(config-static)# address-family ipv6 unicast
RP/0/RP0/CPU0:router(config-static-afi)#
```

maximum path (static)

To change the maximum number of allowable static routes, use the **maximum path** command in static router configuration mode. To remove the **maximum path** command from the configuration file and restore the system to its default condition, use the **no** form of this command.

maximum path {**ipv4** | **ipv6**} *value*
no maximum path {**ipv4** | **ipv6**} *value*

Syntax Description

ipv4 | **ipv6**	Specifies IP Version 4 (IPv4) or IP Version 6 (IPv6) address prefixes.
value	Maximum number of static routes for the given AFI. The range is 1 to 140000.

Command Default

value : 4000

Command Modes

Static router configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

If you use the **maximum path** command to reduce the configured maximum allowed number of static routes for a given table below the number of static routes currently configured, the change is rejected. In addition, if you commit a batch of routes that would, when grouped, push the number of static routes configured above the maximum allowed, the first *n* routes in the batch and the number previously configured are accepted, and the remainder rejected. The *n* argument is the difference between the maximum number allowed and the number previously configured.

Task ID

Task ID	Operations
static	read, write

Examples

The following example shows how to set the maximum number of static IPv4 routes to 100000:

```
RP/0/RP0/CPU0:router(config-static)# maximum path ipv4 100000
```

The following example shows how to remove the preceding configuration and set the maximum number of static IPv4 routes back to the default:

```
RP/0/RP0/CPU0:router(config-static)# no maximum path ipv4 100000
```

route (static)

To establish static routes, use the **route** command in address family configuration mode. To remove the **route** command from the configuration, use the **no** form of this command.

prefix / mask [**vrf** *vrf-name*] {*ip-address* | *type* *interface-path-id* [*ip-address* | *type* *interface-path-id*] [**track** *track-object-name*] [**tunnel-id** *tunnel-id*] [**vrflabel** *vrf-label*] [*distance*] [**description** *text*] [**tag** *tag*] [**permanent**]}
no *prefix / mask* [**vrf** *vrf-name*] {*ip-address* | *type* *interface-path-id* [*ip-address* | *type* *interface-path-id*] [**track** *track-object-name*] [**tunnel-id** *tunnel-id*] [**vrflabel** *vrf-label*] [*distance*] [**description** *text*] [**tag** *tag*] [**permanent**]}

Syntax Description

prefix / mask	IP route prefix and prefix mask for the destination. The network mask can be specified in either of two ways: • The network mask can be a four-part, dotted-decimal address. For example, 255.0.0.0 indicates that each bit equal to 1 means the corresponding address bit is a network address. • The network mask can be indicated as a slash (/) and number. For example, /8 indicates that the first 8 bits of the mask are 1s, and the corresponding bits of the address are the network address.

vrf *vrf-name*	(Optional) Specifies a destination VRF. This option is available when IPv4 address families are specified.
	The following names cannot be used: all, default, and global.
	The following example shows how to configure IPv4 VRF:
	`router static`
	` address-family ipv4 unicast`
	`  10.1.1.0/24 vrf vrf_a 192.168.1.1`
	`router static`
	` vrf vrf_a`
	`  address-family ipv4 unicast`
	`  10.1.1.0/24 192.168.1.1`

ip-address	IP address of the next hop that can be used to reach that network. • For IPv4 address–the IP address is required, not optional, if the interface type and interface-path-id arguments are not specified. You can specify an IP address and an interface type and interface path. • For IPv6 link-local address–the interface type and interface-path-id arguments are required. The route is not valid, if the interface type and interface-path-id arguments are not specified. **Note** A forwarding router's IP address or an interface or virtual interface path ID can be configured, in any order.
type	Interface type. For more information, use the question mark (?) online help function.

interface-path-id	Physical interface or virtual interface. **Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (**?**) online help function. **Note** A forwarding router's IP address or an interface or virtual interface path ID can be configured, in any order.
distance	(Optional) Administrative distance. Range is 1 to 254.
description *text*	(Optional) Specifies a description of the static route.
tag *tag*	(Optional) Specifies a tag value that can be used as a match for controlling redistribution using route policies. Range is 1 to 4294967295.
permanent	(Optional) Specifies that the route is not removed from the routing table, even if the next-hop interface shuts down or next-hop IP address is not reachable.
track *track-object-name*	Enables object tracking for static route.
tunnel-id *tunnel-id*	Specifies a Tunnel ID.
vrflabel *vrf-label*	Specifies a VRF label.

Command Default

No static route is established.

vrf *vrf-name* : If no VRF is specified, the vrf where the configuration takes place is used.

Command Modes

Address family configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

A static route is appropriate when the software cannot dynamically build a route to the destination.

Static routes have a default administrative distance of 1, in which a low number indicates a preferred route. By default, static routes are preferred to routes learned by routing protocols. You can configure an administrative distance with a static route if you want the static route to be overridden by dynamic routes. For example, you could have routes installed by the Open Shortest Path First (OSPF) protocol with an administrative distance of 120. To have a static route that would be overridden by an OSPF dynamic route, specify an administrative distance greater than 120.

The routing table considers the static routes that point to an interface as “directly connected.” Directly connected networks are advertised by IGP routing protocols if a corresponding **interface** command is contained under the router configuration stanza of that protocol.

A static route is always associated with a VPN routing and forwarding (VRF) instance. The VRF can be the default VRF or a specified VRF. Specifying a VRF allows you to enter VRF configuration mode where you can configure a static route. If you do not specify a VRF you can configure a default VRF static route.

Use the **router static** command to configure static routes. To configure a static route, you must enter router static configuration mode and then enter an address family configuration mode or VRF configuration mode. See the **vrf (static)** command for information on configuring a static route in VRF configuration mode. After you enter an address family mode, you can enter multiple static routes. The following example shows how to configure multiple static routes in IPv4 and IPv6 address family configuration modes:

Note You cannot create a VRF named default, but you can reference the default VRF.

Task ID

Task ID	Operations
static	read, write

Examples

The following example shows how to configure IPv6 unicast address family static routes:

```
RP/0/RP0/CPU0:router(config)# router static
RP/0/RP0/CPU0:router(config-static)# address-family ipv6 unicast
RP/0/RP0/CPU0:router(config-static-afi)# 2b11::327a:7b00/120 HundredGigE 0/2/0/7
RP/0/RP0/CPU0:router(config-static-afi)# 2b11::327a:7b00/120 HundredGigE 0/6/0/0
RP/0/RP0/CPU0:router(config-static-afi)# 2b11::327a:7b00/120 2b11::2f01:4c
RP/0/RP0/CPU0:router(config-static-afi)# 2b11::327a:7b00/120 2b11::2f01:4d
RP/0/RP0/CPU0:router(config-static-afi)# 2b11::327a:7b00/120 2b11::2f01:4e
RP/0/RP0/CPU0:router(config-static-afi)# 2b11::327a:7b00/120 2b11::2f01:4f
RP/0/RP0/CPU0:router(config-static-afi)# 2b11::327a:7b00/120 2b11::2f01:50
```

router static

To enter static router configuration mode, use the **router static** command in XR Config mode. To remove all static route configurations and terminate the static routing process, use the **no** form of this command.

router static
no router static

Syntax Description

This command has no arguments or keywords.

Command Default

No static routing process is enabled.

Command Modes

XR Config mode

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
static	read, write
bgp, ospf, isis, hsrp, vrrp, multicast, or network	read, write

Examples

The following example shows how to enter static router configuration mode:

```
RP/0/RP0/CPU0:router(config)# router static
RP/0/RP0/CPU0:router(config-static)#
```

vrf (static)

To configure a VPN routing and forwarding (VRF) instance and enter VRF configuration mode, use the **vrf** command in router configuration mode. To remove the VRF instance from the configuration file and restore the system to its default condition, use the **no** form of this command.

vrf *vrf-name*
no vrf *vrf-name*

Syntax Description

vrf-name	Name of the VRF instance. The following names cannot be used: all, default, and global.

Command Default

No default behavior or values

Command Modes

Static router configuration

Command History

Release	Modification
Release 6.0	This command was introduced.

Usage Guidelines

Use the **vrf** command to configure a VRF instance. A VRF instance is a collection of VPN routing and forwarding tables maintained at the provider edge (PE) router.

A static route is always associated with a VRF, which is entirely user configurable. Static route is unique within a VRF. A static route can point to a next-hop interface, next-hop IP address, or both, which can be resided in the same VRF configured for the static route or in a different VRF. For example, routes 172.168.40.0/24 and 172.168.50.0/24 are configured as follows:

```
router static
vrf vrf_A
address ipv4 unicast
172.168.40.0/24 loopback 1
172.168.50.0/24 vrf vrf_B 192.168.1.2
```

Routes 172.168.40.0/24 and 172.168.50.0/24 belong to vrf_A. Route 172.168.50.0/24 is not installed in vrf_A until next-hop 192.168.1.2 (a vrf_B route) is reachable.

If you are configuring a default VRF route, you do not need to enter VRF configuration mode. For example, routes 192.168.1.0/24 and 192.168.2.0/24 are configured as follows:

```
router static
 address ipv4 unicast
  192.168.1.0/24 loopback 5
  192.168.2.0/24 10.1.1.1
```

Routes 192.168.1.0/24 and 192.168.2.0/24 are default VRF routes.

Note You cannot create a VRF named default, but you can reference the default VRF.

You must remove IPv4/IPv6 addresses from an interface prior to assigning, removing, or changing a VRF on an IP interface. If this is not done in advance, any attempt to change the VRF on an IP interface is rejected.

Task ID

Task ID	Operations
static	read, write

Examples

The following example shows how to configure a VRF instance and enter VRF configuration mode:

```
RP/0/RP0/CPU0:router(config)# router static
RP/0/RP0/CPU0:router(config-static)# vrf vrf-1
RP/0/RP0/CPU0:router(config-static-vrf)#
```

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