Segment Routing Commands

This chapter describes the commands used to configure and use Segment Routing.

address ipv4 (PCE)

To configure the IPv4 self address for Path Computation Element (PCE), use the **address ipv4** command in PCE configuration mode.

address ipv4 *address*

Syntax Description

ipv4 *address*	Configures the IPv4 address for PCE.

Command Default

No default behavior or values

Command Modes

PCE configuration

Command History

Release	Modification
Release 6.2.1	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

This example shows how to configure the IPv4 address of the PCE:

```
RP/0/RSP0/CPU0:router # configure
RP/0/RSP0/CPU0:router(config)# pce
RP/0/RSP0/CPU0:router(config-pce)# address ipv4 192.168.0.1
```

adjacency-sid

To manually allocate an adjacency segment ID (Adj-SID) on an interface, use the **adjacency-sid** command in IS-IS interface address family configuration mode.

adjacency-sid {**index** *adj-sid-index* | **absolute** *adj-sid-value*} [**protected**]

no adjacency-sid {**index** *adj-sid-index* | **absolute** *adj-sid-value*} [**protected**]

Syntax Description

index *adj-sid-index*	Specifies the Adj-SID for each link based on the lower boundary of the SRLB + the index.
absolute *adj-sid-value*	Specifies the specific Adj-SID for each link within the SRLB.
protected	Specify if the Adj-SID is protected. For each primary path, if the Adj-SID is protected on the primary interface and a backup path is available, a backup path is installed. By default, manual Adj-SIDs are not protected.

Command Default

Adjacency SID is not protected.

Command Modes

IS-IS interface address-family configuration

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.

Segment routing must be configured on the ISIS instance before configuring adjacency SID value.

Manually allocated Adj-SIDs are supported on point-to-point (P2P) interfaces.

Task ID

Task ID	Operations
isis	read, write

Examples

This example shows how to configure an Adj-SID.

```
RP/0/RSP0/CPU0:router # configure
RP/0/RSP0/CPU0:router(config)# router isis 100
RP/0/RSP0/CPU0:router(config-isis)# interface GigabitEthernet0/0/0/7
RP/0/RSP0/CPU0:router(config-isis-if)# point-to-point
RP/0/RSP0/CPU0:router(config-isis-if)# address-family ipv4 unicast
RP/0/RSP0/CPU0:router(config-isis-if-af)# adjacency-sid index 10
```

Related Commands

Command	Description
segment-routing local-block, on page 111	Configures the segment routing local block (SRLB).

advertise-definition

To enable advertisement of the flexible algorithm definition in IS-IS, use the **advertise-definition** command in the flexible algorithm configuration mode.

advertise-definition

Command Default

No default behavior or values.

Command Modes

flex-algo

Command History

Release	Modification
IOS XR Release 6.6.1	This command was introduced.

Example

```
RP/0/RSP0/CPU0:exr2(config)#router isis 1
RP/0/RSP0/CPU0:exr2(config-isis)#flex-algo 128
RP/0/RSP0/CPU0:exr2(config-isis-flex-algo)#priority 100
RP/0/RSP0/CPU0:exr2(config-isis-flex-algo)#advertise-definition
```

affinity (flexible algorithm)

To configure flexible algorithm definition to include or exclude links with a particular affinity, use the **affinity** command in flexible algorithm configuration mode.

router isis *instance* **flex-algo** *algo* **affinity** [**reverse**] { **include-any** | **include-all** | **exclude-any** } *name1* **,** *name2* **,** . . .

router ospf *process* **flex-algo** *algo* **affinity** { **include-any** | **include-all** | **exclude-any** } *name1* **,** *name2* **,** . . .

Syntax Description

instance	Name of the IS-IS routing process. Maximum number of characters is 40.
process	Name that uniquely identifies an OSPF routing process. The process name is any alphanumeric string no longer than 40 characters without spaces.
algo	Flex-algo value. An algorithm is a one octet value. Values from 128 to 255 are reserved for user defined values and are used for Flexible Algorithm representation.
reverse	Specifies the IS-IS Flexible Algorithm link admin group (affinity) constraint to include link colors on links in the reverse direction toward the calculating router.
name1	Name of affinity map.

Command Default

No default behavior or values

Command Modes

Flexible Algorithm configuration

Command History

Release	Modification
Releaes 7.9.1	The **reverse** keyword was added for IS-IS.
Release 7.1.1	The **include-any** and **include-all** keywords were added.
Release 6.6.1	This command was introduced.

Example

The following example shows how to configure IS-IS Flex-Algo:

```
Router#configure
Router(config)#router isis 1
Router(config-isis)#flex-algo 128
Router(config-isis-flex-algo)#affinity exclude-any red
Router(config-isis-flex-algo)#affinity include-any blue
Router(config-isis-flex-algo)#exit
Router(config-isis)#flex-algo 129
Router(config-isis-flex-algo)#affinity exclude-any green
```

```
Router(config-isis-flex-algo)#affinity reverse exclude-any green
```

affinity flex-algo

To advertise the affinity on an interface, use the **affinity flex-algo** command in the IS-IS interface configuration mode.

```
affinity  flex-algo { name | [anomaly name] }
```

Syntax Description

name	Name of affinity map.
anomaly	Advertises flex-algo affinity on performance measurement anomaly.

Command Default

No default behavior or values

Command Modes

IS-IS interface configuration

Command History

Release	Modification
Release 7.8.1	This command was modified
Release 6.6.1	This command was introduced.

Example

The following example shows how ISIS advertises affinity FOO for the adjacency over interface GigabitEthernet0/0/0/0.

```
RP/0/RSP0/CPU0:router#configure
RP/0/RSP0/CPU0:router(config)#router isis 1
RP/0/RSP0/CPU0:router(config-isis)#interface GigabitEthernet0/0/0/0
RP/0/RSP0/CPU0:router(config-isis-if)#affinity flex-algo FOO
```

With the IOS XR Release 7.8.1, the new optional keyword **anomaly** is introduced to the **interface** submode of **affinity flex-algo**. This keyword option helps to advertise flex-algo affinity on PM anomaly. The following command is used to associate the affinity with an interface:

router isis *instance* **interface** *type interface-path-id* **affinity flex-algo anomaly** *name 1, name 2, …*

router ospf *process* **area** *area* **interface** *type interface-path-id* **affinity flex-algo anomaly** *name 1, name 2, …*

name - name of the affinity-map

You can configure both normal and anomaly values. For the following example, the **blue** affinity is advertised. However, if a metric is received with the anomaly flag set, it will change to **red**:

```
Router# configure
Router(config)# router isis 1
Router(config-isis)#flex-algo 128
Router(config-isis-flex-algo)# interface GigabitEthernet0/0/0/2
```

```
Router(config-isis-flex-algo)# affinity flex-algo blue
Router(config-isis-flex-algo)# affinity flex-algo anomaly red
```

affinity-map (flexible algorithm)

To define a name for the bit position, use the **affinity-map** command in the IS-IS configuration mode.

affinity-map *affinity name* { **bit-position** *value* }

Syntax Description

affinity name	Affinity map name.
bit-position	Configures the value of an affinity map for the bit position
value	Bit position value.

Command Default

No default behavior or values

Command Modes

IS-IS configuration

Command History

Release	Modification
Release 6.6.1	This command was introduced.

Example

```
RP/0/RSP0/CPU0:exr2(config)#router isis 1
RP/0/RSP0/CPU0:exr2(config-isis)#affinity-map FOO bit-position 7
```

apply-weight ecmp-only bandwidth

To enable Unequal Cost Multipath (UCMP) functionality locally between Equal Cost Multipath (ECMP) paths based on the bandwidth of the local links, use the **apply-weight ecmp-only bandwidth** command in IS-IS interface address family configuration mode.

apply-weight ecmp-only bandwidth

Syntax Description

bandwidth	Enables UCMP functionality locally between ECMP paths based on the bandwidth of the local links.

Command Default

None.

Command Modes

IS-IS interface address-family configuration

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.

Bandwidth-based local UCMP is performed for prefixes, segment routing Adjacency SIDs, and Segment Routing label cross-connects installed by IS-IS, and is supported on any physical or virtual interface that has a valid bandwidth.

Segment routing must be configured on the ISIS instance before configuring bandwidth-based local UCMP.

Task ID

Task ID	Operations
isis	read, write

Examples

This example shows how to configure bandwidth-based local UCMP.

```
RP/0/RSP0/CPU0:router # configure
RP/0/RSP0/CPU0:router(config)# router isis 100
RP/0/RSP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RSP0/CPU0:router(config-isis-af)# apply-weight ecmp-only bandwidth
```

bandwidth-metric flex-algo

To configure an application specific bandwidth metric for the interface, use the **bandwidth-metric** command in the IS-IS interface address-family submode.

bandwidth-metric **flex-algo** *value*

Syntax Description

bandwidth-metric		Configures an application specific bandwidth metric for the interface.
flex-algo	*value*	Flex-algo bandwidth metric for the interface. The value can range from 1 to 16777214.

Command Default

No default behavior or values

Command Modes

IS-IS interface address-family submode

Command History

Release	Modification
Release 24.4.1	This command was introduced.

Usage Guidelines

None

Task ID

Task ID	Operations
isis	read, write

Example

This example shows how to configure flex-algo bandwidth-mteric for an interface.

```
Router(config)#router isis 1
Router(config-isis)#interface GigabitEthernet 0/2/0/7
Router(config-isis-if)#address-family ipv4 unicast
Router(config-isis-if-af)#bandwidth-metric flex-algo 100
Router(config-isis-if-af)#commit
```

bgp auto-discovery segment-routing

To configure the BGP Auto-Discovery function for transporting IP VPN multicast traffic, use the **bgp auto-discovery segment-routing** command in multicast routing VRF address family configuration mode. To remove the configuration, use the **no** form of the command.

bgp auto-discovery segment-routing

Syntax Description

This command has no keywords or arguments.

Command Default

The BGP Auto-Discovery function is not enabled.

Command Modes

Multicast routing VRF address family configuration

Command History

Release	Modification
Release 7.3.1	This command was introduced.

Usage Guidelines

The **bgp auto-discovery segment-routing** command must be enabled on the PE routers, for *default* MDT, *partitioned* MDT and *data* MDT configuration

Example

The following example shows how to enable the BGP MVPN Auto-Discovery function:

```
Router(config)# multicast-routing vrf cust1
Router(config-mcast-cust1)# address-family ipv4
Router(config-mcast-cust1-ipv4)# bgp auto-discovery segment-routing
Router(config-mcast-cust1-ipv4-bgp-ad)# commit
```

bgp best-path sr-policy

To select the best path, backup, or multipath resolving over nexthop using SR policies, use the **bgp best-path sr-policy** command in BGP configuration mode. To remove the configuration, use the **no** form of the command.

bgp best-path sr-policy { **force** | **prefer** }

Syntax Description

force	When force mode is enabled, only SR policy paths are considered for best path calculation.
prefer	When prefer mode is enabled, SR policy paths and eBGP non-color paths are eligible for best path calculation.

Command Default

None.

Command Modes

BGP configuration mode

Command History

Release	Modification
Release 7.5.2	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Example

The following example shows how to enable the force mode:

```
Router(config)#router bgp 100
Router(config-bgp)#bgp router-id 10.1.1.2
Router(config-bgp)#bgp best-path sr-policy force
```

clear segment-routing local-block discrepancy all

Clears segment routing local block (SRLB) label conflicts.

clear segment-routing local-block discrepancy all

Syntax Description

This command has no keywords or arguments.

Command Default

None

Command Modes

EXEC

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.

When you define a new SRLB range, there might be a label conflict (for example, if labels are already allocated, statically or dynamically, in the new SRLB range). In this case, the new SRLB range will be accepted, but not applied (pending). The previous SRLB range (active) will continue to be in use until one of the following occurs:

- Reload the router to release the currently allocated labels and allocate the new SRLB
- Use the **clear segment-routing local-block discrepancy all** command to clear the label conflicts

Task ID

Task ID	Operation

This example shows how to clear SRLB label conflicts.

```
RP/0/RSP0/CPU0:router(config)# clear segment-routing local-block discrepancy all
```

Related Commands

Command	Description
show segment-routing local-block inconsistencies, on page 160	Displays SRLB label conflicts
segment-routing local-block, on page 111	Configures the SRLB

clear traffic-collector ipv4 counters prefix

Clears all statistical counters of IPv4 prefixes.

clear traffic-collector ipv4 counters prefix [*prefix-ID*]

Syntax Description

prefix-ID	Specifies a particular prefix to clear.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 6.0.1	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
	execute: cef

This example shows how to clear the traffic-collector counter history for the specified prefix.

```
RP/0/RSP0/CPU0:router(config)# clear traffic-collector ipv4 counters prefix 1.1.1.10/32
```

Related Commands

Command	Description
clear traffic-collector ipv4 counters tunnels	Clears all statistical counters for IPv4 tunnels.
show traffic-collector	Retrieves data about traffic routed through the system.
traffic-collector	enable traffic collector and places the router in traffic collector configuration mode.

clear traffic-collector ipv4 counters tunnels

Clears all statistical counters for IPv4 tunnels.

clear traffic-collector ipv4 counters tunnels [*tunnel-ID*]

Syntax Description

tunnel-ID	Specifies a particular tunnel to clear.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 6.0.1	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
	read, write

Example

This example shows how to clear the traffic-collector counter history for the specified tunnel.

```
RP/0/RSP0/CPU0:router(config)# clear traffic-collector ipv4 counters tunnels tunnel-te 1
```

Related Commands

Command	Description
clear traffic-collector ipv4 counters prefix	Clears all statistical counters for IPv4 prefixes.
show traffic-collector	Retrieves data about traffic routed through the system.
traffic-collector	enable traffic collector and places the router in traffic collector configuration mode.

data-plane

To enable participation of the Flexible Algorithm with segment routing (SR/SRv6) or IP data-planes, use the **data-plane** command in the IS-IS Flexible Algorithm configuration mode.

data-plane segment-routing | ip

Syntax Description

segment-routing	Participateswith the segment routing data-plane.
ip	Participates with the IP data-plane.

Command Default

Segment-routing data-plane is enabled.

Command Modes

IS-IS Flexible Algorithm configuration (config-isis-flex-algo)

Command History

Release	Modification
IOS XR Release 7.6.1	This command was introduced.

Usage Guidelines

To use this command, you must specify a data-plane.

Note If you are enabling participation of the IP Flexible Algorithm, data-plane ip must be enabled.

This example shows how to enable IP data-plane to participate with a Flexible Algorithm:

```
Router(config)#router isis 1
Router(config-isis)#flex-algo 128
Router(config-isis-flex-algo)#data-plane ip
```

disjoint-path (PCE)

To enter PCE disjoint configuration mode to configure PCE disjoint policy, use the **timers** command in PCE configuration mode.

disjoint-path

Syntax Description

This command has no keywords or arguments.

Command Default

No default behavior or values

Command Modes

PCE configuration

Command History

Release	Modification
Release 6.2.1	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

This example shows how to enter PCE disjoint configuration mode:

```
RP/0/RSP0/CPU0:router # configure
RP/0/RSP0/CPU0:router(config)# pce
RP/0/RSP0/CPU0:router(config-pce)# disjoint-path
RP/0/RSP0/CPU0:router(config-pce-disjoint)#
```

distribute link-state (IS-IS)

To configure filters for IS-IS advertisements to BGP-LS, use the **distribute link-state** command in the IS-IS configuration mode.

distribute link-state [**exclude-external exclude-interarea route-policy** *name*]

Table 1: Syntax Description:

Syntax	Description
exclude-external	Sets filter to exclude information for external prefixes and specify a route-policy name to filter based on a set of destination prefixes.
exclude-interarea	Sets filter to exclude information for interarea prefixes and specify a route-policy name to filter based on a set of destination prefixes.
route-policy*name*	Distributes prefixes based on the route policy name set.

Command Default

BGP-LS is disabled by default.

Command Modes

IS-IS Configuration

Command History

Release	Modification
Release 7.10.1	New keywords under the command **distribute link-state** was introduced.

Example

This example shows how to configure filters for IS-IS advertisements to BGP-LS:

```
Router#config
Router(config)#router isis 1
Router(config-isis)#distribute link-state exclude-external
Router(config-isis)#commit

Router#config
Router(config)#router isis 1
Router(config-isis)#ddistribute link-state exclude-interarea
Router(config-isis)#commit

Router# config
Router(config)# router isis 1
Router(config-isis)#distribute link-state route-policy isis-rp-1
Router(config-isis)#commit
```

egress-engineering

To configure segment routing egress peer engineering (EPE) on the egress node, use the **egress-engineering** command.

egress-engineering

Syntax Description

This command has no keywords or arguments.

Command Default

No default behavior or values

Command Modes

Neighbor configuration

Command History

Release	Modification
Release 6.1.2	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 configure segment routing EPE on the egress node:

```
RP/0/RSP0/CPU0:router # configure
RP/0/RSP0/CPU0:router(config)# router bgp 1
RP/0/RSP0/CPU0:router(config-bgp)# neighbor 192.168.1.3
RP/0/RSP0/CPU0:router(config-bgp-nbr)# remote-as 3
RP/0/RSP0/CPU0:router(config-bgp-nbr)# egress-engineering
```

evi (bridge-domain)

To associate an EVI instance with an L2VPN bridge domain or enable ELAN bridged unicast traffic over an SRv6 network, use the **evi** command in the L2VPN bridge domain configuration mode. To disable this feature, use the **no** form of this command.

evi *instance* [**segment-routing srv6**]

Syntax Description

instance	EVI instance that is associated with an L2VPN bridge domain.
segment-routing srv6	(Optional) Specifies that SRv6 is associated with the EVI instance.

Command Default

The EVI instance is not associated with an L2VPN bridge domain.

Command Modes

L2VPN bridge domain configuration.

Command History

Release	Modification
Release 6.2.2	The **evi** command was introduced for MPLS bridging.
Release 7.5.2	The **segment-routing srv6** option was added to the command.

Examples

This example shows how to enable EVPN ELAN bridged unicast traffic over an SRv6 network:

```
Router # configure
Router(config)# l2vpn
Router(config-l2vpn)# bridge group bg1
Router(config-l2vpn-bg)# bridge-domain bd1
Router(config-l2vpn-bg-bd)# interface Hu0/0/0/0.1
Router(config-l2vpn-bg-bd-ac)# exit
Router(config-l2vpn-bg-bd)# evi 1 segment-routing srv6
Router(config-l2vpn-bg-bd-evi-srv6)# commit
```

encapsulation-type srv6 relax-sid

To configure the BGP signaling for coexistence of IP routes with or without SRv6 SID over an SRv6-enabled core network use **encapsulation-type srv6 relax-sid** command in Global Configuration mode.

encapsulation-type srv6 relax-sid

Syntax Description

encapsulation-type srv6 relax-sid	Enables coexistence of IP routes with or without SRv6 SID.

Syntax Description

This command has no keywords or arguments.

Command Default

The BGP signaling for coexistence of IP routes with or without SRv6 SID over an SRv6-enabled core network is enabled.

Command Modes

Multicast routing VRF address family configuration

Command History

Release	Modification
Release 24.3.1	This command was introduced.

Task ID

Task ID	Operation
system	read and write

Example

The following example shows how to enable BGP signaling for coexistence of IP routes with or without SRv6 SID over an SRv6-enabled core network:

```
Router(config)# router bgp 2
Router(config-bgp)# neighbor-group srv6-core-relax
Router(config-bgp-nbr)# address-family ipv4 unicast
Router(config-bgp-nbr-af)# encapsulation-type srv6 relax-sid
Router(config-bgp-nbr-af)# exit
```

explicit-path

Configures a fixed path through the network.

explicit-path name *path_name*

Syntax Description

path_name	Specifies a name for an explicit path.

Command Default

None

Command Modes

Global Configuration mode

Command History

Release	Modification
Release 5.3.2	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
mpls-te	read, write

Example

This example shows how to specify a path name and enter explicit-path configuration mode:

```
RP/0/RSP0/CPU0:router(config)# explicit-path name ABCD1_Nodes
RP/0/RSP0/CPU0:router(config-expl-path)#
```

Related Commands

Command	Description
index	Determines the order of path selection.

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 6.1.2	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:

```
RP/0/RSP0/CPU0:router # configure
RP/0/RSP0/CPU0:router(config)# interface tunnel-te1
RP/0/RSP0/CPU0:router(config-if)# ipv4 unnumbered loopback0
RP/0/RSP0/CPU0:router(config-if)# destination 1.1.1.5
RP/0/RSP0/CPU0:router(config-if)# bfd
RP/0/RSP0/CPU0:router(config-tunte-bfd)# fast-detect sbfd
RP/0/RSP0/CPU0:router(config-tunte-bfd)# exit
```

Related Commands

Command	Description
sbfd	Enters seamless BFD (SBFD) mode.

fast-reroute per-prefix ti-lfa

To enable Topology Independent Loop Free Alternate (TI-LFA) path for SR-TE policies using the IP Fast Reroute (FRR) mechanism, use the **fast-reroute per-prefix ti-lfa** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

fast-reroute per-prefix [**ti-lfa** | **tiebreaker** { **node-protecting** | **srlg-disjoint** } **index** *priority*]
no fast-reroute

Syntax Description

per-prefix	Specifies an alternate path for every prefix on the specified interface.
ti-lfa	Enables link-protecting TI-LFA.
tiebreaker	Enables fast reroute tie-breaker.
node-protecting	Enables node-protecting TI-LFA.
srlg-disjoint	Enables SRLG-protecting TI-LFA.
index *priority*	Specifies the priority of the configured tie-breaker. Priority range is from 1 to 255.

Command Default

FRR is disabled.

Link protection is disabled.

Node-protecting TI-LFA is disabled.

SRLG TI-LFA is disabled.

Command Modes

Interface configuration

Command History

Release	Modification
Release 3.7.2	This command was introduced.
Release 5.3.2	The **per-prefix ti-lfa** option was introduced for segment routing.
Release 6.1.2	The **tiebreaker** { **node-protecting** | **srlg-disjoint**} options were introduced.

Usage Guidelines

The goal of TI-LFA is to reduce the packet loss that results while routers converge after a topology change due to a link or node failure. Rapid failure repair (< 50 msec) is achieved through the use of pre-calculated backup paths that are loop-free and safe to use until the distributed network convergence process is completed. The optimal repair path is the path that the traffic will eventually follow after the IGP has converged.

TI-LFA supports the following protection:

- Link protection — The link is excluded during the post-convergence backup path calculation.
- Node protection — The neighbor node is excluded during the post convergence backup path calculation.

- Shared Risk Link Groups (SRLG) protection — SRLG refer to situations in which links in a network share a common fiber (or a common physical attribute). These links have a shared risk: when one link fails, other links in the group might also fail. TI-LFA SRLG protection attempts to find the post-convergence backup path that excludes the SRLG of the protected link. All local links that share any SRLG with the protecting link are excluded.

If the priority associated with the specified tiebreaker is higher than any other tiebreakers, then the specified post-convergence backup path will be selected, if it is available.

Task ID

Task ID	Operations
isis	read, write
ospf	

Examples

The following example shows how to enable FRR on an interface:

```
RP/0/RSP0/CPU0:R1(config)# router isis 1
RP/0/RSP0/CPU0:R1(config-isis)# interface TenGigE0/0/0/2/1
RP/0/RSP0/CPU0:R1(config-isis-if)# point-to-point
RP/0/RSP0/CPU0:R1(config-isis-if)# address-family ipv4 unicast
RP/0/RSP0/CPU0:R1(config-isis-if)# fast-reroute per-prefix
RP/0/RSP0/CPU0:R1(config-isis-if)# fast-reroute per-prefix ti-lfa
RP/0/RSP0/CPU0:R1(config-isis-if)# exit
```

The following example shows how to configure the SRLG-disjoint tiebreaker priority on an interface:

```
RP/0/RSP0/CPU0:R1(config)# router isis 1
RP/0/RSP0/CPU0:R1(config-isis)# interface TenGigE0/0/0/2/1
RP/0/RSP0/CPU0:R1(config-isis-if)# point-to-point
RP/0/RSP0/CPU0:R1(config-isis-if)# address-family ipv4 unicast
RP/0/RSP0/CPU0:R1(config-isis-if)# fast-reroute per-prefix
RP/0/RSP0/CPU0:R1(config-isis-if)# fast-reroute per-prefix ti-lfa
RP/0/RSP0/CPU0:R1(config-isis-if)# fast-reroute per-prefix tiebreaker srlg-disjoint index
100
RP/0/RSP0/CPU0:R1(config-isis-if)# exit
```

flex-algo

To enter into the flexible algorithm configuration sub-mode to configure flexible algorithm, use the **flex-algo** command in the IS-IS interface configuration mode.

flex-algo *algorithm number*

Syntax Description

algorithm number	value from 128 to 255

Command Default

No default behavior or values.

Command Modes

IS-IS interface

Command History

Release	Modification
IOS XR Release 6.6.1	This command was introduced.

Example

This example shows how to enter the flex-algo configuration mode:

```
RP/0/RSP0/CPU0:exr2(config)#router isis 1
RP/0/RSP0/CPU0:exr2(config-isis)#flex-algo 128
```

generic-metric flex-algo

To configure an application-specific user-defined generic metric for IS-IS interfaces, use the **generic-metric flex-algo** command in the IS-IS interface address-family submode.

generic-metric flex-algo type *type value*

Syntax Description

type <*type*>	Specify the generic metric type. The range is 128–255.
<*value*>	Specify the flex-algo generic metric value. The range is 1–16777214.

Command Default

By default, the generic metric is not used.

Command Modes

IS-IS interface address-family submode.

Command History

Release	Modification
Release 24.2.1	This command was introduced.

Usage Guidelines

None.

Task ID

Task ID	Operations
isis	read, write

Example

The following example shows how to configure a user-defined application-specific generic metric for an interface:

```
Router(config)#router isis 1
Router(config-isis)#interface GigabitEthernet 0/2/0/7
Router(config-isis-if)#address-family ipv4 unicast
Router(config-isis-if-af)#generic-metric flex-algo type 128 100
Router(config-isis-if-af)#commit
```

group-id type (PCE)

To configure the disjoint group ID and define the preferred level of disjointness (the type of resources that should not be shared by the two paths), use the **group-id type** command in PCE disjoint configuration mode.

group-id *value* **type** {**link** | **node** | **srlg** | **srlg-node**} [**sub-id** *value*]

Syntax Description

group-id *value*	Defines the disjoint group ID.
link	Specifies that links are not shared on the computed paths.
node	Specifies that nodes are not shared on the computed paths.
srlg	Specifies that links with the same SRLG value are not shared on the computed paths.
srlg-node	Specifies that SRLG and nodes are not shared on the computed paths
sub-id *value*	(Optional) Specifies a sub ID. The range is from 1 to 65535.

Command Default

None

Command Modes

PCE disjoint configuration

Command History

Release	Modification
Release 6.2.1	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.

If a pair of paths meeting the requested disjointness level cannot be found, then the paths will automatically fallback to a lower level (unless **strict** is specified):

- If the requested disjointness level is SRLG or node, then link-disjoint paths will be computed.
- If the requested disjointness level is link, or if the first fallback from SRLG or node disjointness failed, then the lists of segments encoding two shortest paths, without any disjointness constraint, will be computed.

Task ID

Task ID	Operation

This example shows how to configure the PCE disjoint policy:

```
RP/0/RSP0/CPU0:router # configure
RP/0/RSP0/CPU0:router(config)# pce
RP/0/RSP0/CPU0:router(config-pce)# disjoint-path
```

```
RP/0/RSP0/CPU0:router(config-pce-disjoint)# group-id 1 type node
```

group-mode

To enable interface group mode for bandwidth metric computation, use the **group-mode** command in the IS-IS flex-algo auto-cost submode. This command facilitates the cumulative bandwidth metric calculation for parallel links.

group-mode

Syntax Description

group-mode	Enables interface group mode for bandwidth metric computation.

Command Default

Group mode is disabled.

Command Modes

IS-IS flex-algo auto-cost submode

Command History

Release	Modification
Release 24.4.1	This command was introduced.

Usage Guidelines

None

Task ID

Task ID	Operations
isis	read, write

Example

This example shows how to enable group mode for bandwidth metric computation.

```
Router(config)#router isis 1
Router(config-isis)#flex-algo 131
Router(config-isis-flex-algo)#auto-cost reference
Router(config-isis-flex-algo-af-auto-cost)#group-mode
Router(config-isis-flex-algo-af-auto-cost)#commit
```

hw-module profile segment-routing srv6 mode

To enable Segment Routing mode over IPv6, use the **hw-module profile segment-routing srv6 mode** command in XR Configuration mode

hw-module profile segment-routing srv6 mode [{ **base** } | { **micro-segment format 3216** | [**path-mtu**] }]

Note You must reload the router or line card after enabling the command.

Syntax Description

mode	Defines the SRV6 format that are supported: • Base: f1 • Micro-segment: f3216 (represents 32-bit block and 16-bit IDs)
path-mtu	Enables Path MTU Discovery over Ingress, Egress, and P or Transit nodes (with IPv6 role).

Syntax Description This command has no keywords or arguments.

Command Default None

Command Modes XR Configuration

Command History

Release	Modification
Release 7.11.1	The **path-mtu** keyword was introduced.
Release 7.7.1	This command was introduced.

Usage Guidelines The router must be reloaded for the **hw-module profile segment-routing srv6 mode** feature to be functional.

Task ID

Task ID	Operation
system	read, write

Example

The following example shows how to enable Segment Routing over IPv6:

```
Router# configure
Router(config)# hw-module profile segment-routing srv6 mode
  base                Base SRv6 (Format-1) support only
```

```
  micro-segment        Micro-segment support only
Router(config)# hw-module profile segment-routing srv6 mode micro-segment format f3216
```

index

Marks an explicit path. The index determines the order of path selection.

index *index_number* {{**exclude-address** | **exclude-srlg** | **next-address** [**loose** | **strict**]} **ipv4 unicast** *ip_address*} | {**next-label** *label*}

Syntax Description

index_number	Defines priority for the path to be selected. Ranges from 1 to 65535.
exclude-address	Specifies the IP address to be excluded from the path.
exclude-srlg	Specifies the IP address from which Shared Risk Link Groups (SRLGs) are derived for exclusion.
next-address	Specifies the next IP address in the path.
loose	Specifies the next hop in the path as a flexible hop.
strict	Specifies the next hop in the path as a fixed hop
ipv4 unicast *ip_address*	Specifies the the IPv4 unicast address.
next-label *label*	Specifies the next label in the path.

Command Default

None

Command Modes

Explicit path configuration mode

Command History

Release	Modification
Release 5.3.2	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.

You can include multiple addresses, labels, or both. However, once you start configuring labels, you need to continue with labels. You cannot use addresses after you use labels.

Task ID

Task ID	Operation
mpls-te	read, write

This example shows how to insert the next-address and next-label for explicit path ABCD1_Nodes:

```
RP/0/RSP0/CPU0:router(config)# explicit-path name ABCD1_Nodes
RP/0/RSP0/CPU0:router(config-expl-path)# index 10 next-address strict ipv4 unicast
  192.168.0.2
RP/0/RSP0/CPU0:router(config-expl-path)# index 20 next-label 24012
```

Related Commands

Command	Description
explicit-path	Configures a fixed path through the network.

isis prefix-attributes n-flag-clear

To set the N-flag in the Prefix Attribute Flags sub-TLV to 0, use the **isis prefix-attributes n-flag-clear** command.

isis prefix-attributes n-flag-clear [**level-1** | **level-2**]

Syntax Description

level-1	Clears the N-flag for level-1.
level-2	Clears the N-flag for level-2.

Command Default

The N-flag is set to 1 for host prefixes (/32 for IPv4 and /128 for IPv6).

Command Modes

Interface configuration

Command History

Release	Modification
Release 6.2.1	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 Prefix Attributes Flag sub Type Length Value (TLV) supports the advertisement of attribute flags associated with prefix advertisements. By default, the N-flag is set by IS-IS when advertising a SID that is associated with a loopback address. The advertising router may choose to not set this flag. When the N-flag is cleared, the N-flag is set to 0 in the Prefix Attribute Flags sub-TLV.

Prefix attributes are only added when wide metric is used.

Task ID

Task ID	Operation

This example shows how to clear the N-flag:

```
RP/0/RSP0/CPU0:router # configure
RP/0/RSP0/CPU0:router(config)# interface loopback0
RP/0/RSP0/CPU0:router(config-if)# isis prefix-attributes n-flag-clear
```

keepalive (PCE)

To configure a locally generated path computation element protocol (PCEP) keepalive interval, use the **keepalive** command in PCE timer configuration mode. To disable this command, use the **no** form of this command.

keepalive *interval*

Syntax Description

interval	Keepalive interval, in seconds. The range is 0 to 255.

Command Default

30

Command Modes

PCE timers configuration

Command History

Release	Modification
Release 6.2.1	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.

When the keepalive interval is 0, the LSR does not send keepalive messages.

Task ID

Task ID	Operation

Example

This example shows how to configure PCEP keepalive interval for 10 seconds:

```
RP/0/RSP0/CPU0:router # configure
RP/0/RSP0/CPU0:router(config)# pce
RP/0/RSP0/CPU0:router(config-pce)# timers
PP/0/RSP0/CPU0:router(config-pce-timers)# keeplive 10
```

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 6.1.2	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:

```
RP/0/RSP0/CPU0:router(config)# sbfd
RP/0/RSP0/CPU0:router(config-sbfd)# local-discriminator 1.1.1.5
RP/0/RSP0/CPU0:router(config-sbfd)# local-discriminator 987654321
RP/0/RSP0/CPU0:router(config-sbfd)# local-discriminator dynamic
RP/0/RSP0/CPU0:router(config-sbfd)# local-discriminator interface Loopback0
```

Related Commands

Command	Description
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.

Command	Description
sbfd	Enters seamless bidirectional forwarding detection (SBFD) mode.
show bfd label session	Displays the BFD initiator session information.
show bfd reflector	Displays the SBFD reflector configuration.
show bfd target-identifier	Displays the BFD local and remote discriminators.

lsp (PCE)

To add label switched paths (LSPs) to the disjoint group, use the **lsp** command in PCE disjoint configuration mode.

lsp {**1** | **2**} **pcc ipv4** *address* **lsp-name** *name* [**shortest-path**]

Syntax Description

1 | **2**	Specifies the first or second LSP in the association.
address	Specifies the IPv4 address of the path computation client (PCC).
name	Specifies the name of the LSP.
shortest-path	(Optional) Forces one of the disjoint paths to follow the shortest path from the source to the destination. This option can only be applied to the first LSP specified (lsp 1).

Command Default

None

Command Modes

PCE disjoint configuration

Command History

Release	Modification
Release 6.2.1	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.

An LSP that is specified with **shortest-path** will follow the shortest path. The secondary LSP will follow the shortest possible path that is disjoint from the primary LSP.

Task ID

Task ID	Operation

This example shows how to configure the PCE disjoint policy:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# pce
RP/0/RSP0/CPU0:router(config-pce)# disjoint-path
RP/0/RSP0/CPU0:router(config-pce-disjoint)# group-id path1 type node
RP/0/RSP0/CPU0:router(config-pce-disjoint)# lsp 1 pcc ipv4 192.168.0.1 lsp-name LSP1
shortest-path
RP/0/RSP0/CPU0:router(config-pce-disjoint)# lsp 2 pcc ipv4 192.168.0.5 lsp-name LSP2
rtrE_t2
```

maximum-delay

To configure a minimum bandwidth value for computing a Flexible Algorithm path, use the **maximum-delay** command in IS-IS Flexible Algorithm configuration mode.

maximum-delay *delay*

Syntax Description

delay	Specifies the maximum delay value in microseconds. The range is from 1 to 10000000.

Command Default

None

Command Modes

IS-IS Flexible Algorithm configuration (config-isis-flex-algo)

Command History

Release	Modification
Release 7.11.1	This command was introduced.

Usage Guidelines

None

Example

This example shows how configure the maximum delay constraint for Flexible Algorithm 128:

```
router isis 1
 flex-algo 128
  maximum-delay 300
 !
!
```

mdt

To configure a default or partitioned MVPN profile for transporting IP VPN multicast traffic using SR-TE, use the **mdt** command in multicast routing VRF address family configuration mode. To remove the configuration, use the **no** form of the command.

mdt { **default** | **partitioned** } **segment-routing mpls** [**color** *value*] [**fast-reroute lfa**]

Syntax Description

default	Specifies that the MPVN profile is of the type *default*.
partitioned	Specifies that the MPVN profile is of the type *partitioned*.
segment-routing mpls	Specifies that the TE mechanism is Segment Routing, and data plane protocol is MPLS.
color *value*	(Optional) Specifies the on-demand color value that defines TE constraints and optimizations applied to the SR multicast policy.
fast-reroute lfa	(Optional) Enables the LFA FRR function for SR multicast policies that are created for the MDT.

Command Default

An MVPN default or partitioned profile is not configured.

Command Modes

Multicast routing VRF address family configuration.

Command History

Release	Modification
Release 7.3.1	This command was introduced.

Usage Guidelines

The **mdt** configuration is enabled on all the VPN end-points, the PE routers used for MVPN peering.

Example

The following example shows how to configure a *default* MDT MVPN Profile for SR multicast:

```
Router(config)# multicast-routing vrf cust1
Router(config-mcast-cust1)# address-family ipv4
Router(config-mcast-cust1-ipv4)# mdt default segment-routing mpls color 10
Router(config-mcast-cust1-ipv4)# commit
```

Example

The following example shows how to configure a *partitioned* MDT MVPN Profile for SR multicast:

```
Router(config)# multicast-routing vrf cust1
Router(config-mcast-cust1)# address-family ipv4
Router(config-mcast-cust1-ipv4)# mdt partitioned segment-routing mpls color 10
Router(config-mcast-cust1-ipv4)# commit
```

mdt data

To configure an MVPN *data* profile for transporting IP VPN multicast traffic using SR-TE, use the **mdt data** command in multicast routing VRF address family configuration mode. To remove the configuration, use the **no** form of the command.

mdt data segment-routing mpls *max-mdt-nmr* [**color** *value*] [**fast-reroute lfa**] [**route-policy** *name*] [**threshold** *value*] [*ACL*] [**immediate-switch**]

Syntax Description

segment-routing mpls *max-mdt-nmr*	Specifies the maximum number of SR multicast polices to be used for *data* MDTs.
color *value*	(Optional) Specifies the on-demand SR policy color value. The TE constraints and optimizations are associated with the color value.
fast-reroute lfa	(Optional) Enables the LFA FRR function for SR multicast policies that are created for *data* MDTs.
route-policy *name*	(Optional) Specifies the route policy that dictates multicast flow-to-SR multicast policy mapping (with different colors). The route policy option is an alternative to enabling the **color** *value* option.
threshold *value*	(Optional) The traffic rate threshold value in Kbps. When the rate exceeds the specified value, multicast flow is switched to a *data* MDT.
ACL	(Optional) ACL that directs specific multicast flows to be switched to a *data* MDT.
immediate-switch	(Optional) Specifies that the multicast flow be switched to a *data* MDT, without waiting for the threshold limit to be crossed.

Command Default

An MVPN data profile is not configured.

Command Modes

Multicast routing VRF address family configuration

Command History

Release	Modification
Release 7.3.1	This command was introduced.

Usage Guidelines

The **mdt data** command has to be enabled on the ingress PEs where multicast flows need to be steered into the *data* MDT component for SR multicast processing. *Data* MDT can be configured for *default* and *partitioned* profiles.

Example

The following example shows how to configure an MVPN *data* profile.

```
Router(config)# multicast-routing vrf cust1
Router(config-mcast-cust1)# address-family ipv4
Router(config-mcast-cust1-ipv4)# mdt data segment-routing mpls 2 color 10
Router(config-mcast-cust1-ipv4)# commit
```

metric-type bandwidth

To use the bandwidth of the links as a metric for flexible algorithm calculation, use the **metric-type bandwidth** command in the IS-IS flexible algorithm configuration mode.

metric-type bandwidth

Syntax Description

metric-type bandwidth	Use bandwidth metric for flex-algo calculation.

Command Default

No default behavior or values

Command Modes

IS-IS flexible algorithm configuration submode

Command History

Release	Modification
Release 24.4.1	This command was introduced.

Usage Guidelines

None

Task ID

Task ID	Operations
isis	read, write

Example

This example shows how to associate and advertise the bandwidth metric to a Flexible Algorithm Definition.

```
Router(config)#router isis 1
Router(config-isis)#flex-algo 131
Router(config-isis-flex-algo)#metric-type bandwidth
Router(config-isis-flex-algo)#advertise-definition
Router(config-isis-flex-algo)#commit
```

metric-type delay

To use the measured delay on the links as a metric for flexible algorithm calculation, use the **metric-type delay** command in the flexible algorithm configuration mode.

metric-type delay

Command Default

By default, igp metric is used.

Command Modes

flex-algo

Command History

Release	Modification
IOS XR Release 6.6.1	This command was introduced.

Usage Guidelines

By default the regular IGP metric is used. If delay metric is enabled, the advertised delay on the link is used as a metric for flexible algorithm computation. If delay metric is enabled, performance measurement must also be enabled.

Example

```
RP/0/RSP0/CPU0:router(config)#router isis 1
  RP/0/RSP0/CPU0:router(config-isis)#is-type level-2-only
  RP/0/RSP0/CPU0:router(config-isis)#net 49.0001.0000.0000.0001.00
  RP/0/RSP0/CPU0:router(config-isis)#log adjacency changes
  RP/0/RSP0/CPU0:router(config-isis)#flex-algo 128
  RP/0/RSP0/CPU0:router(config-isis-flex-algo)#metric-type delay
  RP/0/RSP0/CPU0:router(config-isis-flex-algo)#advertise-definition
  !


  RP/0/RSP0/CPU0:router(config-isis)#performance-measurement
  RP/0/RSP0/CPU0:router(config-isis)#interface GigabitEthernet0/2/0/3
  RP/0/RSP0/CPU0:router(config-isis-if)#delay-measurement
   !
  !
  RP/0/RSP0/CPU0:router(config-isis)#interface GigabitEthernet0/2/0/4
  RP/0/RSP0/CPU0:router(config-isis-if)#delay-measurement
   !
  !
  RP/0/RSP0/CPU0:router(config-isis)#interface GigabitEthernet0/2/0/7
  RP/0/RSP0/CPU0:router(config-isis-if)#delay-measurement
   !
  !
!
```

metric-type generic

To use the user-defined generic metrics as a metric for Flexible Algorithm Definition (FAD), use the **metric-type generic** command in the IS-IS flexible algorithm configuration mode.

metric-type generic *type*

Syntax Description

<*type*>	Specify the generic metric type. The range is 128–255.

Command Default

By default, the generic metric is not used.

Command Modes

IS-IS Flex Algo.

Command History

Release	Modification
Release 24.2.1	This command was introduced.

Usage Guidelines

If a user-defined generic metric is enabled, the router advertises and uses the metrics for flexible algorithm computation.

Task ID

Task ID	Operations
isis	read, write

Example

The following example shows how to associate or advertise the configured user-defined generic metric to a Flexible Algorithm Definition. The user-defined application-specific generic metric is configured for an interface using the **generic-metric flex-algo** command.

```
Router(config)#router isis 1
Router(config-isis)#flex-algo 128
Router(config-isis-flex-algo)#priority 254
Router(config-isis-flex-algo)#metric-type generic 177
Router(config-isis-flex-algo)#advertise-definition
```

microloop avoidance rib-update-delay

To set the Routing Information Base (RIB) update delay value to avoid microloops in the network, use the **microloop avoidance rib-update-delay** command. To disable the RIB update delay, use the **no** form of this command.

microloop avoidance rib-update-delay *delay-time*

Syntax Description

delay-time	Specifies the amount of time the node uses the microloop avoidance policy before updating its forwarding table. The *delay-time* is in milliseconds. The range is from 1-60000.

Command Default

The default value is 5000 milliseconds.

Command Modes

IPv4 address family configuration

Router configuration

Command History

Release	Modification
Release 6.2.1	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.

Use this command with the **microloop avoidance segment-routing** command to specify how long the SR-TE policy path to the destination is used. After the RIB update delay timer expires, the SR-TE policy is replaced with regular forwarding paths.

Task ID

Task ID	Operation
ospf	read, write
isis	

Example

This example shows how to set the Routing Information Base (RIB) update delay value for OSPF:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# router ospf 1
RP/0/RSP0/CPU0:router(config-ospf)# microloop avoidance segment-routing
RP/0/RSP0/CPU0:router(config-ospf)# microloop avoidance rib-update-delay 3000
```

This example shows how to set the Routing Information Base (RIB) update delay value for IS-IS:

```
RP/0/RSP0/CPU0:router# configure
```

```
RP/0/RSP0/CPU0:router(config)# router isis 1
RP/0/RSP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RSP0/CPU0:router(config-isis-af)# microloop avoidance segment-routing
RP/0/RSP0/CPU0:router(config-isis-af)# microloop avoidance rib-update-delay 3000
```

microloop avoidance segment-routing

To enable the segment routing microloop avoidance and set the Routing Information Base (RIB) update delay value, use the **microloop avoidance** command. To disable segment routing microloop avoidance, use the **no** form of this command.

microloop avoidance segment-routing [**route-policy** *name*]

Syntax Description

route-policy *name*	Specifies the route policy for the destination prefixes for per-prefix filtering.

Command Default

Disabled.

Command Modes

IS-IS IPv4 address family configuration

IS-IS IPv6 address family configuration

OSPF configuration

Command History

Release	Modification
Release 6.2.1	This command was introduced.
Release 7.11.1	The **route-policy** *name* option is added for IS-IS.

Usage Guidelines

The Segment Routing Microloop Avoidance feature detects if microloops are possible following a topology change. If a node computes that a microloop could occur on the new topology, the node creates a loop-free SR-TE policy path to the destination using a list of segments. After the RIB update delay timer expires, the SR-TE policy is replaced with regular forwarding paths.

SR microloop avoidance per-prefix filtering uses route policies to identify the prefixes subjected to microloop avoidance. A route policy must be defined before it can be attached to the SR microloop avoidance configuration. Once a route policy is defined and attached to the SR microloop avoidance configuration, it cannot be modified or removed until the route policy is removed from the SR microloop avoidance configuration.

Task ID

Task ID	Operation
ospf	read, write
isis	

Example

This example shows how to enable Segment Routing Microloop Avoidance for OSPF:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# router ospf 1
RP/0/RSP0/CPU0:router(config-ospf)# microloop avoidance segment-routing
RP/0/RSP0/CPU0:router(config-ospf)# microloop avoidance rib-update-delay 3000
```

This example shows how to enable Segment Routing Microloop Avoidance for IS-IS:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# router isis 1
RP/0/RSP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RSP0/CPU0:router(config-isis-af)# microloop avoidance segment-routing
RP/0/RSP0/CPU0:router(config-isis-af)# microloop avoidance rib-update-delay 3000
```

This example shows how to enable per-prefix filtering for a prefix set defined in "route policy FOO2":

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# router isis 1
RP/0/RSP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RSP0/CPU0:router(config-isis-af)# microloop avoidance segment-routing route-policy
FOO2
```

minimum-bandwidth

To configure a minimum bandwidth value for computing a Flexible Algorithm path, use the **minimum-bandwidth** command in IS-IS Flexible Algorithm configuration mode.

minimum-bandwidth *value*

Syntax Description

value	Specifies the minimum bandwidth value in kbps. The range is from 1 to 4294967295.

Command Default

None

Command Modes

IS-IS Flexible Algorithm configuration (config-isis-flex-algo)

Command History

Release	Modification
Release 7.11.1	This command was introduced.

Usage Guidelines

None

Example

This example shows how configure the minimum bandwidth constraint for Flexible Algorithm 129:

```
router isis 1
 flex-algo 129
  minimum-bandwidth 10000000
 !
!
```

minimum-peer-keepalive

To configure a minimum acceptable path computation element (PCE) peer keepalive interval, use the **minimum-peer-keepalive** command in PCE timer configuration mode. To disable this command, use the **no** form of this command.

minimum-peer-keepalive *interval*

Syntax Description

interval	Keepalive interval, in seconds. The range is 0 to 255.

Command Default

20

Command Modes

PCE timers configuration

Command History

Release	Modification
Release 6.2.1	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

Example

This example shows how to configure a minimum acceptable PCEP peer keepalive interval for 10 seconds:

```
RP/0/RSP0/CPU0:router # configure
RP/0/RSP0/CPU0:router(config)# pce
RP/0/RSP0/CPU0:router(config-pce)# timers
PP/0/RSP0/CPU0:router(config-pce-timers)# minimum-peer-keepalive 10
```

override-rules (PCE)

To configure a Path Computation Element (PCE) override of Path Computation Client (PCC)-Initiated policies, use the **override-rules** command in the PCE configuration mode.

override-rules sequence *sequence number* [[**matching-criteria**] **peer** { **all** | | **access-list ipv4** *ipv4-acl-name* } **lsp** { **all** | **name** *lsp-name in the form of regex* | **colors** *<colors and color ranges> ! "0-50, 55, 70-80"* | }] [[**override**] **metric type** { **igp** | | **te** | | **latency** | | **hopcount** } **Constraints** { **bandwidth** }]

Syntax Description

Matching-criteria {**peer**|**lsp**|**color**}	(Optional) Specifies the matching criteria in the PCC-initiated policies to override. You can use peer, lsp, or color as the matching criteria.
peer{**all**|**access-list ipv4** *ipv4-acl-name*}	Specifies *all* available peers or the *access-list ipv4* name that matches your criteria to override the PCC initiated policies.
LSP{**all**|**name**} *lsp-name in the form of regex*}	Specifies the LSP, the PCE tunnel database by all or specific name as a matching criteria.
color *<colors and color ranges>! "0-50, 55, 70–80"*]	Specifies the color range as a matching criteria.
override	(Optional) Disables load balancing of SR multicast traffic across ECMP paths.
metric	Specifies the override metric for IGP, TE, latency, or hop-count.
constraints	Specifies the override constraints in bandwidth value.

Command Default

No default behavior or values.

Command Modes

PCE configuration

Command History

Release	Modification
Release 7.7.1	This command was introduced.

This example shows PCE override rules

```
router# configure
router(config)# pce
router(config-pce)# Override-rules
router(config-pce-ovr-rule)# Sequence 100
router(config-pce-ovr-rule-seq)# matching-criteria
router(config-pce-ovr-rule-crit)# peer
router(config-pce-ovr-rule-peer)# all
router(config-pce-ovr-rule-peer)# exit
 !
router(config-pce-ovr-rule-crit)# lsp colors 0-50
```

```
router(config-pce-ovr-rule-crit)# exit
    !
router(config-pce-ovr-rule-seq)# override constraints bandwidth 1000
!
!
```

path-option

To configure a path option for an SR-TE policy, use the **path-option** command in tunnel-te interface configuration mode. To return to the default behavior, use the **no** form of this command.

```
path-option path_preference_value {dynamic [attribute-set  | isis | lockdown |
ospf | pce | protected-by] | explicit {identifier path-number | name path-name}
[attribute-set  | isis | lockdown | ospf | protected-by | verbatim]}
segment-routing
```

Syntax Description

path_preference_value	Specifies the preference for an LSP. Range is from 1 to 1000.
dynamic [**attribute-set** | **isis** | **lockdown** | **ospf** | **pce** | **protected-by**]	Configures a dynamically allocated path based on the configured options. See the **attribute-set** statement for a description of all the attributes.
explicit {**identifier** *path-number* | **name** *path-name*} [**attribute-set** | **isis** | **lockdown** | **ospf** | **protected-by** | **verbatim**]	Configures a preset path, based on the configured options. The **verbatim** option is required for disabling loop detection on the path. When you configure this option, the topology database is not referred by the source router while configuring the preset path. See the **attribute-set** statement for a description of all the attributes.
segment-routing	Configures a segment routing path, based on the configured options.

Command Default

None

Command Modes

Tunnel-te interface configuration

Command History

Release	Modification
Release 3.7.2	This command was introduced.
Release 5.2.0	This command was introduced for segment routing.

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
mpls-te	read, write

Example

This example shows how to configure the tunnel to use an explicit path for segment routing:

```
RP/0/RSP0/CPU0:router(config)# interface tunnel-te22
RP/0/RSP0/CPU0:router(config-if)# ipv4 unnumbered loopback0
RP/0/RSP0/CPU0:router(config-if)# destination 192.168.0.2
RP/0/RSP0/CPU0:router(config-if)# path-selection segment-routing adjacency protected
RP/0/RSP0/CPU0:router(config-if)# path-option 1 explicit name ABCD1_Nodes segment-routing
```

Related Commands

Command	Description
attribute-set	Configures the attribute set for an LSP.
index	Determines the order of path selection.

path-selection

Configures the LSP to be selected for the SR-TE tunnel.

path-selection [**cost-limit** *limit* | **hop-limit** *limit* | **invalidation** *timer* [**tear** | **drop**] | **metric** [**igp** | **te**] **segment-routing adjacency** [**protected** | **unprotected**] | **tiebreaker** [**max-fill** | **min-fill** | **random**]]

Syntax Description

cost-limit *limit*	Configures the cost limit for the LSP. Ranges from 1 to 4294967295.
hop-limit *limit*	Configures the hop limit for the LSP. Ranges from 1 to 255.
invalidation *timer* [**tear** | **drop**]	Configures the path invalidation timer. When the timer expires, the path is either torn down or just the segment labeled data is dropped. Ranges from 0 to 60000.
metric [**igp** | **te**]	Configures the type of metric to be used for the LSP.
segment-routing adjacency [**protected** | **unprotected**]	Configures the type of adjacency for segment routing.
tiebreaker [**max-fill** | **min-fill** | **random**]	Configures the tie breaker for path calculation of equal cost multiple paths. **Max-fill** selects the path with the most-utilized links. **Min-fill** selects the path with the least-utilized links. Random selects the path with randomly utilized links.

Command Default

None

Command Modes

Tunnel interface configuration mode

Command History

Release	Modification
Release 5.3.2	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
mpls-te	read, write

This example shows how to set the path-selection for segment routing adjacency protection.

```
RP/0/RSP0/CPU0:router(config)# interface tunnel-te22
RP/0/RSP0/CPU0:router(config-if)# path-selection segment-routing adjacency protected
```

pce

To enable Path Computation Element (PCE) and enter PCE configuration mode, use the **pce** command in global configuration mode.

pce

Syntax Description

This command has no keywords or arguments.

Command Default

No default behavior or values

Command Modes

Global configuration (config)

Command History

Release	Modification
Release 6.2.1	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

This example shows how to enable PCE and enter PCE configuration mode:

```
RP/0/RSP0/CPU0:router # configure
RP/0/RSP0/CPU0:router(config)# pce
RP/0/RSP0/CPU0:router(config-pce)#
```

pce segment-routing traffic-eng p2mp

To configure the SR-PCE server for managing multicast traffic flows, use the **pce segment-routing traffic-eng p2mp** command in global configuration mode. To remove the configuration, use the **no** form of the command.

pce segment-routing traffic-eng p2mp [**policy** *name* [**candidate-paths** [**constraints** [**affinity** { **include-any** | **include-all** | **exclude-any** } *name*] | [**sid-algorithm** *algo*]]]] [**fast-reroute lfa** | **frr-node-set** { **from** | **to** } [**ipv4** *address*]] | [**label-range min** *value* **max** *value*] | [**multipath-disable**]

Syntax Description

policy *name*	(Optional) Specifies the static or dynamic SR multicast policy for which LFA FRR is enabled.
constraints	Configures constraints.
affinity {**include-all** | **include-any** | **exclude-any**} *name*	Configures the affinity constraints and the affinity name.
sid-algorithm *algo*	Flex-algo value. An algorithm is a one octet value. Values from 128 to 255 are reserved for user defined values and are used for Flexible Algorithm representation.
fast-reroute lfa	Specifies that LFA FRR be enabled on all multicast routers of the SR multicast tree.
frr-node-set {**from**|**to**} [**ipv4** *address*]	Specifies the (*from* and *to*) paths on multicast routers that requires FRR protection. The PCE server applies the LFA FRR function for traffic *from* a specific IP address, sent *to* specific IP address(es).
label-range min *value* **max** *value*	Specifies the label range to be used for the multicast traffic LSPs.
multipath-disable	Disables load balancing of SR multicast traffic across ECMP paths.

Command Default

The SR-PCE server parameters are disabled.

Command Modes

Global configuration (config)

Command History

Release	Modification
Release 7.11.1	The **sid-algorithm** *algo* options are introduced.
Release 7.3.1	This command was introduced.

Example

The following example shows how to configure SR-PCE server parameters.

Label Range Configuration

The configuration specifies that labels between 30000 and 60000 be used for multicast traffic LSPs.

```
Router(config)# pce segment-routing traffic-eng p2mp label-range min 30000 max 60000
Router(config)# commit
```

FRR Configuration

The LFA FRR function is configured for all SR policies.

```
Router(config)# pce segment-routing traffic-eng p2mp fast-reroute lfa
```

The LFA FRR function is configured for the SR policy *tree1*.

```
Router(config)# pce segment-routing traffic-eng p2mp policy tree1 fast-reroute lfa
```

FRR protection is configured for traffic from the interface with IP address 192.168.0.3, and traffic being sent to the interface with IP address 192.168.0.4.

```
Router(config)# pce segment-routing traffic-eng p2mp frr-node-set from ipv4 192.168.0.3
Router(config)# pce segment-routing traffic-eng p2mp frr-node-set to ipv4 192.168.0.4
Router(config)# commit
```

Disable Load Balancing

To disable ECMP load splitting of different trees on the SR-PCE server, configure the **multipath-disable** command.

```
Router(config)# pce segment-routing traffic-eng p2mp multipath-disable
Router(config)# commit
```

Flexible Algorithm

The following example shows how to configure a P2MP policy with Flex-Algo constraint:

```
Router(config)# pce
Router(config-pce)# segment-routing traffic-eng
Router(config-pce-sr-te)# p2mp
Router(config-pce-sr-te-p2mp)# policy FOO
Router(config-pce-p2mp-policy)# candidate-paths
Router(config-pce-p2mp-policy-path)# constraints
Router(config-pce-p2mp-path-const)# sid-algorithm 128
Router(config-pce-p2mp-path-const)#
```

pce try-regex

To test whether regex matches the LSP name, use the **pce try-regex** command in EXEC mode.

pce try-regex { *regex* | *name-to-test* }

Syntax Description

regex	Specifies the regular expression to match the LSP
name-to-test	Specifies the regex name that you want to test if it matches the LSP name and to verify the matching criteria.

Command Default

No default behavior or values

Command Modes

EXEC configuration

Command History

Release	Modification
Release 7.7.1	This command was introduced.

This example shows how to verify whether the override-rule for the matching-criteria *lsp name* <*regex*> works:

```
Router# pce try-regex ^cp_c_[0-9]+$ cp_c_5000

Regex verification utility
Regex:       ^cp_c_[0-9]+$
Test string: cp_c_5000
Result:      Matched
```

performance-measurement delay-measurement

To apply an SR performance measurement delay profile to an SR-TE policy, use the **performance-measurement delay-measurement** command in the SR-TE policy configuration mode. To disassociate the profile from the SR-TE policy, use the **no** form of the command.

performance-measurement delay-measurement [**delay-profile name** *profile*]
no performance-measurement delay-measurement [**delay-profile**]

Syntax Description

delay-profile name *profile*	(Optional) Specifies the delay profile that is to be associated with the SR-TE policy.

Command Default

The Default performance measurement delay profile is associated with an SR-TE policy.

Command Modes

SR-TE policy configuration (config-sr-te-policy)
On-Demand SR-TE policy configuration (config-sr-te-color)

Command History

Release	Modification
Release 7.3.1	This command was introduced.

Usage Guidelines

The **performance-measurement** command is also available in global configuration mode. Amongst other configurations, you can use it for creating a Segment Routing performance measurement delay and liveness profiles.

Example

This example shows how to associate a delay profile to an SR-TE policy:

```
Router(config)# segment-routing traffic-eng
Router(config-sr-te)# policy TEST
Router(config-sr-te-policy)# color 4 end-point ipv4 10.10.10.10
Router(config-sr-te-policy)# performance-measurement delay-measurement delay-profile name
profile2
Router(config-sr-te-policy-perf-meas)# commit


Router(config-sr-te)# on-demand color 20
Router(config-sr-te-color)# performance-measurement delay-measurement delay-profile name
profile2
Router(config-sr-te-color)# commit
```

performance-measurement interface

This command helps you configure the target interface with probe packets that transit Interface ID and timestamp templates within a network.

Starting from Cisco IOS XR Release 24.4.1, the command can be used to enable delay measurement for GRE or IP-in-IP interfaces.

performance-measurement interface { **tunnel-ip** *{0-131070}* | **GigE 0 / 1 / 0 / 1** **path-tracing** { **interface-id** *<1-4095>* | **timestamp template** { **st0** | **st1** | **st2** | **st3** } } | **delay-measurement advertise-delay fallback** *<1-16777215>* }

Syntax Description

tunnel-ip	Enable the GRE or IP-in-IP tunnel interface.
{0-131070}	Enter the GRE or IP-in-IP tunnel interface. The range is 0 to 131070.
path-tracing	Enables path-tracing for the interface for tracing short timestamp, interface-id and interface load on source, midpoint and sink nodes in PT probes.
interface-id	Enter interface ID that is between 1-4095. Default value is none. Interface ID value 0 is used internally to indicate PT is disabled on the interface.
delay-measurement	Configure delay measurement on the interface and enter the delay mesurement submode.
advertise-delay fallback	Advertise the configured delay fallback value for interfaces when the computed delay metric is not available.
<1-16777215>	Specify the fallback delay value in microseconds. The range is 1-16777215.
Timestamp template *{st0 | st1 | st2 | st3}*	Enter the Timestamp template you want to configure. You can apply global template type for short timestamp to st1 to overwrite the default value.

Command Default

Path tracing is disabled by default.

The default value for Interface ID is set to None.

The default value for timestamp template is set to st2.

Command Modes

Global Configuration

Command History

Release	Modification
Release 24.4.1	The **advertise-delay fallback** keyword is introduced. The **tunnel-ip** keyword is now supported.
Release 7.8.1	This command was introduced.

Usage Guidelines

Enable path-tracing for the interface for tracing short timestamp, interface-id and interface load on source, midpoint and sink nodes in PT probes.

Examples

This example shows how to configure Path Tracing midpoint with InterfaceID and time-stamp:

```
Router(config)# performance-measurement
Router(config-pm)# interface FourHundredGigE0/0/0/1
Router(config-pm-interf)# path-tracing
Router(config-pm-interf-interf-id)# interface-id 200
Router(config-pm-interf-time)# timestamp template st3
Router(config-pm-interf-time)# exit
```

This example shows how to configure delay measurement for a specific GRE tunnel interface:

```
Router(config)#performance-measurement
Router(config-perf-meas)#interface tunnel-ip 23
Router(config-pm-intf)#delay-measurement
Router(config-pm-intf-dm)#commit
```

The following example shows how to configure and advertise the interface fallback delay value when the computed delay metric is not available.

```
Router#config
Router(config)#performance-measurement
Router(config-perf-meas)#interface GigabitEthernet 0/2/0/0
Router(config-pm-intf)#delay-measurement
Router(config-pm-intf-dm)#advertise-delay fallback 1000
Router(config-pm-intf-dm)#commit
```

performance-measurement delay-profile endpoint

To detect the delay of an endpoint, use the **performance-measurement delay-profile endpoint** command in global configuration. To disable the delay-profile, use the **no** form of the command.

performance-measurement delay-profile endpoint { **default** | **name** *name* } { **advertisement accelerated** { **minimum-change** *value* | **threshold** *value* } | **logging delay-exceeded** | **periodic** { **disabled** | **interval** *value* | **minimum-change** *value* | **threshold** *value* } | **threshold-check** { **average-delay** | **maximum-delay** | **minimum-delay** } | **probe** { **burst-interval** *interval* | **tx-interval** *interval* | **computation-interval** *interval* | **measurement-mode** { **one-way** | **two-way** | **loopback** } | **tos dscp** *value* | **flow-label** { **explicit** *value* | **from** *value* **to** *value* **increment** *value* } } }

Syntax Description

advertisement	Enter interface delay profile advertisement submode
accelerated	Enter interface delay profile advertisement accelerated submode
minimum change *microseconds*	The range is from 0 to 100000 microseconds.
threshold *percent*	Checks the minimum-delay metric change for threshold crossing for accelerated advertisement. The range is from 0 to 100 percent.
logging delay-exceeded	Sends syslog when the delay exceeds the threshold.
periodic	Enter periodic advertisement configuration submode.
disabled	Disables periodic advertisement.
interval *seconds*	Periodic advertisement and metric aggregation interval. The interval range is from 30 to 3600 seconds.
minimum-change *microseconds*	The range is from 0 to 100000 microseconds.
threshold *percent*	Checks the minimum-delay metric change for threshold crossing for periodic advertisement. The range is from 0 to 100 percent.
threshold-check {**average-delay** | **maximum-delay** |**minimum-delay**}	max = default
probe	Enter probe configuration submode.
burst-interval *milliseconds*	Specify the interval for sending probe packet. The range is from 30 to 15000 milliseconds.
tx-interval *microseconds*	Specify the transmission interval. The allowed range is from 30000 to 15000000 micro seconds.
computation-interval *seconds*	Specify the interval for metric computation. The range is from 1 to 3600 seconds.
measurement-mode {**one-way** | **two-way**|**loopback**}	Specify the delay measurement mode.
tos dscp *value*	Type of Service DSCP. The range is from 0 to 63.

flow-labelexplicit *value*	Specify explicit list of flow labels. The range is from 1 to 28 flow labels.
flow-labelfrom *value* **to** *value* **increment**	Specify the flow labels range. The range is from 1 to 28 flow labels.

Command Default

The default advertisement accelerated minimum change is 500 microseconds.

The default advertisement accelerated threshold is 20 percent.

The default advertisement periodic interval is 120 seconds.

The default advertisement periodic minimum-change is 500 microseconds.

The default advertisement periodic threshold is 10 percent.

The default advertisement threshold-check is **maximum-delay**.

The default burst-interval is 3000 milliseconds.

The default computation-interval is 30 seconds.

The default measurement-mode is **one-way**.

The default ToS DSCP value is 48 for IP/UDP.

Command Modes

Global Configuration

Command History

Release	Modification
Release 7.4.1	This command was introduced.
Release 7.6.1	The **name** *name* keyword was deprecated. Use the **performance-measurement delay-profile name** command to create a named profile.
Release 7.10.1	The **burst-interval** *interval* keyword was deprecated.

Note Loopback is not supported on IOS-XR software releases 7.10.x and 7.11.x.

Example

```
Router(config)# performance-measurement
Router(config-perf-meas)# delay-profile endpoint default
Router(config-pm-dm-ep)# probe
Router(config-pm-dm-ep-probe)# measurement-mode one-way
```

The following example shows how to configure flow label for delay profile.

```
RP/0/RSP0/CPU0:ios#configure
RP/0/RSP0/CPU0:ios(config)#performance-measurement
RP/0/RSP0/CPU0:ios(config-perf-meas)#delay-profile endpoint default
RP/0/RSP0/CPU0:ios(config-pm-dm-ep)#probe
RP/0/RSP0/CPU0:ios(config-pm-dm-ep-probe)#flow-label explicit 100 200 300
```

performance-measurement delay-profile interfaces

performance-measurement delay-profile interfaces { **default** | **name** *name* } { **advertisement** { **accelerated** { **minimum-change** *value* | **threshold** *value* } | **anomaly-check upper-bound** *upper_bound* **lower-bound** *lower_bound* | **logging delay-exceeded** | **periodic** { **disabled** | **interval** *value* | **minimum-change** *value* | **threshold** *value* } } | **probe** { **burst-interval** *value* | **tx-interval** *interval* | **computation-interval** *value* | **measurement-mode** { **one-way** | **two-way } | protocol** { **pm-mpls** | **twamp-light** } | **tos dscp** *value* } }

Syntax Description

advertisement	Enter interface delay profile advertisement submode.
accelerated	Enter interface delay profile advertisement accelerated submode.
minimum change *microseconds*	The range is from 0 to 100000 microseconds.
threshold *percent*	Checks the minimum-delay metric change for threshold crossing for accelerated advertisement. The range is from 0 to 100 percent.
anomaly-check upper-bound *upper_bound* **lower-bound** *lower_bound*	Specify the upper and lower bounds of the interface delay profile advertisement anomaly check. The range for *upper_bound* and *lower_bound* is from 1 to 200000 microseconds.
logging delay-exceeded	Sends syslog when the delay exceeds the threshold.
periodic	Enter periodic advertisement configuration submode.
disabled	Disables periodic advertisement.
interval *seconds*	Periodic advertisement and metric aggregation interval. The interval range is from 30 to 3600 seconds.
minimum-change *microseconds*	The range is from 0 to 100000 microseconds.
threshold *percent*	Checks the minimum-delay metric change for threshold crossing for periodic advertisement. The range is from 0 to 100 percent.
probe	Enter probe configuration submode.
burst-interval *milliseconds*	Specify the interval for sending probe packet. The range is from 30 to 15000 milliseconds.
tx-interval *value*	Specify the transmission interval. The allowed range is from 30000 to 15000000 micro seconds.
computation-interval *seconds*	Specify the interval for metric computation. The range is from 1 to 3600 seconds.
measurement-mode {**one-way** | **two-way**}	Specify the delay measurement mode.

protocol {**pm-mpls** | **twamp-light**}	Specify the protocol used. MPLS (using RFC6374 with MPLS encap) or Two-Way Active Measurement Protocol (TWAMP) Light (using RFC 5357 with IP/UDP encap).
tos dscp *value*	Type of Service DSCP. The range is from 0 to 63.

Command Default

The default advertisement accelerated minimum change is 500 microseconds.

Default measurement-mode for interfaces is two-way whereas others is one-way.

The default advertisement accelerated threshold is 20 percent.

The default advertisement periodic interval is 120 seconds.

The default advertisement periodic minimum-change is 500 microseconds.

The default advertisement periodic threshold is 10 percent.

The default burst-interval is 3000 milliseconds.

The default computation-interval is 30 seconds.

The default measurement-mode is **two-way**.

The default protocol is TWAMP-light.

The default ToS DSCP value is 48 for IP/UDP.

Command Modes

Global Configuration

Command History

Release	Modification
Release 7.3.1	This command was introduced.
Release 7.4.1	The **anomaly-check upper-bound** *upper_bound* **lower-bound** *lower_bound* command is introduced.
Release 7.6.1	The **name** *name* keyword was deprecated. Use the **performance-measurement delay-profile name** command to create a named profile.
Release 7.10.1	The **burst-interval** *interval* keyword was deprecated.

Usage Guidelines

Example

This example shows how to configure performance-measurement functionalities for link delay as a global default profile.

```
RP/0/0/CPU0:router(config)# performance-measurement delay-profile interfaces default
RP/0/0/CPU0:router(config-pm-dm-intf)# probe
RP/0/0/CPU0:router(config-pm-dm-intf-probe)# measurement-mode one-way
RP/0/0/CPU0:router(config-pm-dm-intf-probe)# burst-interval 60
RP/0/0/CPU0:router(config-pm-dm-intf-probe)# computation-interval 60
RP/0/0/CPU0:router(config-pm-dm-intf-probe)# exit
RP/0/0/CPU0:router(config-pm-dm-intf)# advertisement periodic
RP/0/0/CPU0:router(config-pm-dm-intf-adv-per)# interval 120
RP/0/0/CPU0:router(config-pm-dm-intf-adv-per)# threshold 20
RP/0/0/CPU0:router(config-pm-dm-intf-adv-per)# minimum-change 1000
```

```
RP/0/0/CPU0:router(config-pm-dm-intf-adv-per)# exit
RP/0/0/CPU0:router(config-pm-dm-intf)# advertisement accelerated
RP/0/0/CPU0:router(config-pm-dm-intf-adv-acc)# threshold 30
RP/0/0/CPU0:router(config-pm-dm-intf-adv-acc)# minimum-change 1000
RP/0/0/CPU0:router(config-pm-dm-intf-adv-per)# exit
```

This example shows how to define thresholds above which delay and loss are considered "anomalous."

```
RP/0/0/CPU0:router(config)# performance-measurement delay-profile interfaces default
RP/0/0/CPU0:router(config-pm-dm-intf)# advertisement
RP/0/0/CPU0:router(config-pm-dm-intf-adv)# anomaly-check upper-bound 5000 lower-bound 1000
RP/0/0/CPU0:router(config-pm-dm-intf-adv)# interval 120
RP/0/0/CPU0:router(config-pm-dm-intf-adv)# threshold 20
RP/0/0/CPU0:router(config-pm-dm-intf-adv)# minimum-change 1000
RP/0/0/CPU0:router(config-pm-dm-intf-adv)# exit
```

performance-measurement delay-profile name

To detect the delay of an name, use the **performance-measurement delay-profile name** command in global configuration. To disable the delay-profile, use the **no** form of the command.

performance-measurement delay-profile name value probe [**flow-label** { **explicit value** | **from value to value increment value** } | **measurement-mode** { **one-way** | **two-way** | **loopback** } | **sweep destination ipv4** *ip-address* **range** *range-value* | **tos** { **dscp value** | **traffic-class value** } | **tx-interval** *value*]

Syntax Description

flow-label{**explicit** *value* | **from** *value* **to** *value* **increment**}	Specify explicit list of flow labels or specify the range. The range is from 1 to 28 flow labels.
measurement-mode {**one-way** | **two-way**|**loopback**}	Specify the delay measurement mode. There are three options: one-way: Measures the one way delay with timestamp 1 and 2. two-way: Measures the one way delay with timestamp 1, 2, 3 and 4 without clock synchronization. loopback: Measures the delay in loopback mode.
sweep destination ipv4*ip-address***range***value*	Specify the sweep IP destination addresses to perform ECMP hashing. The IPv4 adress range is 0 to 128.
tos {**dscp** *value* | **tos traffic-class** *value*}	Specify the delay probe type of service. The allowed range for DSCP is 0 to 63. specify the traffic class value to indicate the TOS level used by protocol PM MPLS. The range is from 0 to 7.
tx-interval *value*	Specify the transmission interval. The allowed range is from 30000 to 15000000 micro seconds.
probe	Enter probe configuration submode.

Command Default

The default measurement-mode is **one-way**.

The default ToS DSCP value is 48 for IP/UDP.

Command Modes

Global Configuration

Command History

Release	Modification
Release 7.4.1	This command was introduced.
Release 7.6.1	The **name** *name* keyword was deprecated. Use the **performance-measurement delay-profile name** command to create a named profile.
Release 24.1.1	The command is modified to include the **flow-label** keyword.

Example

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.

```
Router(config)# performance-measurement
Router(config-perf-meas)# delay-profile endpoint default
Router(config-pm-dm-ep)# probe
Router(config-pm-dm-ep-probe)# measurement-mode one-way
```

The following example shows how to configure flow label for delay profile.

```
RP/0/RSP0/CPU0:ios#configure
RP/0/RSP0/CPU0:ios(config)#performance-measurement
RP/0/RSP0/CPU0:ios(config-perf-meas)#delay-profile endpoint default
RP/0/RSP0/CPU0:ios(config-pm-dm-ep)#probe
RP/0/RSP0/CPU0:ios(config-pm-dm-ep-probe)#flow-label explicit 100 200 300
```

performance-measurement delay-profile

To create a unique Segment Routing performance measurement delay profile, use the **performance-measurement delay-profile** command in global configuration mode.

performance-measurement delay-profile { **sr-policy default** } { **endpoint default** } { **interface default** } { **name** *string name* } **advertisement** { **anomaly-loss** } { **anomaly-check** } **upper-bound** *<1-99>* **lower-bound** *<number lower than the upper bound (0-98)>*

Note Synthetic Loss Measurement is an inbuilt feature of delay measurement. To get the packet loss information for delay-measurement sessions, you only need to configure the delay sessions. No additional configuration is required for Synthetic Loss Measurement.

Syntax Description

name *string name*	(Optional) Specifies the Segment Routing performance measurement delay profile name.
sr-policy default	(Optional) Specifies the Segment Routing performance measurement default sr-policy name.
endpoint default	(Optional) Specifies the Segment Routing performance measurement default endpoint name.
interface default	(Optional) Specifies the Segment Routing performance measurement default interface.
advertisement	Specifies the Segment Routing performance measurement advertisement you want to configure.
anomaly-check	(optional) It checks the delay metrics, for example if the min delay changes exceed the configured threshold, it advertises ANOM-MIN-DYN; if you configured the anomaly-check and the static delay, and the configured static delay exceed the threshold, it advertises ANOM-MIN-STA. You can configure the anomaly loss with **upper-bound** and **lower-bound** values. • **upper-bound** specifies the upper limit for the anomaly check. It must be between 2-200000 • **lower-bound** specifies the lower limit for the anomaly check. It must be between 1-199999 and lower than the **upper-bound** value.

anomaly-loss	(optional) Once the packet loss exceed the configured threshold, it advertises ANOM-PKT-LOSS. You can configure the anomaly loss with **upper-bound** and **lower-bound** values. • **upper-bound** specifies the upper limit for the anomaly loss. It must be between 1-99 • **lower-bound** specifies the lower limit for the anomaly loss. It must be between 0-98 and lower than the **upper-bound** value. If both **anomaly-check** and **anomaly-loss** are triggered, then it advertises for anomaly-check, because it has a higher priority than anomaly-loss • min delay changes = current min delay - previous min delay • packet loss = (expected packet number - received packet number) / expect packet number * 100%

Command Default

No user created performance measurement delay profile exists.

Command Modes

Global configuration (config)

Command History

Release	Modification
Release 24.1.1	The **anomaly-loss** keyword was introduced.
Release 7.6.1	This command was deprecated and replaced with the **performance-measurement delay-profile** command.
Release 7.3.1	This command was introduced.

Task ID

Task ID	Operation
performance-measurement	write/read

Usage Guidelines

The **performance-measurement** command is also available in SR-TE specific configuration.

Example

This example shows how to create a unique Segment Routing performance measurement delay profile:

```
Router(config)# performance-measurement delay-profile sr-policy name profile1
Router(config)# commit
```

Note From release 24.2, the anomaly-loss configuration is modified and removed from sub-mode. Users must configure the upper-bound and lower-bound values before hitting commit.

This example shows the example of anomaly-loss:

```
Router(config)#performance-measurement
Router(config-perf-meas)#delay-profile sr-policy default
Router(config-pm-dm-srpolicy)#advertisement
Router(config-pm-dm-srpolicy-adv)#anomaly-loss upper-bound 30 lower-bound 20
Router(config-pm-dm-srpolicy-adv)#commit
```

Note From release 24.2, the anomaly-check configuration is modified and removed from sub-mode. Users must configure the upper-bound and lower-bound values before hitting commit.

This example shows the example of anomaly-check:

```
Router(config)#performance-measurement
Router(config-perf-meas)#delay-profile sr-policy default
Router(config-pm-dm-srpolicy)#advertisement
Router(config-pm-dm-srpolicy-adv)#anomaly-check upper-bound 2000 lower-bound 20
Router(config-pm-dm-srpolicy-adv)#commit
```

performance-measurement endpoint

To enable endpoint for the performance measurement, use the **performance-measurement endpoint** command in global configuration mode. To disable the endpoint, use the **no** form of the command.

performance-measurement endpoint ipv4 | **ipv6** *endpoint_ip_addr* [**vrf** *name*] [**delay-measurement** [**delay-profile name** *profile_name*] | **description** *description* | **liveness-detection** [**liveness-profile name** *profile_name*] | **segment-list name** *sidlist_name* | **source-address ipv4** | **ipv6** *source_ip_addr*]

Syntax Description

endpoint_ip_addr	IPv4 and IPv6 address of the endpoint.
vrf *name*	The name of the VRF instance.
delay-measurement	Enable delay-measurement on the endpoint.
delay-profile name *profile_name*	Specify an optional delay profile name.
description *description*	Specify a description for the endpoint.
liveness-detection	Enable liveness-detection on the endpoint.
liveness-profile name *profile_name*	Specify an optional liveness profile name.
segment-list name *sidlist_name*	Specify a segment list for the endpoint.
source-address ipv4 *source_ip_addr*	IPv4 address of the sender.
source-address ipv6 *source_ip_addr*	IPv6 address of the sender.

Command Default

None

Command Modes

Global Configuration

Command History

Release	Modification
Release 24.1.1	The command was modified to include IPv6 endpoint.
Release 24.2.1	The command was modified to include IPv6 endpoint.
Release 7.4.1	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 following example show how to enable IPv4 endpoint for the delay measurement.

```
Router(config)# performance-measurement
Router(config-perf-meas)# endpoint ipv4 10.10.1.5
Router(config-pm-ep)# source-address ipv4 10.10.1.1
Router(config-pm-ep)# delay-measurement
```

The following example show how to configure IPv6 endpoint for liveness.

```
Router(config)#performance-measurement
Router(config-perf-meas)#source-address ipv6 FCBB:0:1::
Router(config-perf-meas)#endpoint ipv6 FCBB:0:5::
Router(config-pm-ep)#exit
Router(config-perf-meas)#liveness-profile endpoint default
```

performance-measurement liveness-detection

To apply an SR performance measurement liveness profile to an SR-TE or an SRv6-TE policy, use the **performance-measurement liveness-detection** command in the SR-TE policy configuration mode. To disassociate the profile from the SR-TE policy, use the **no** form of the command.

performance-measurement liveness-detection [**liveness-profile** [**backup**] **name** *profile* | **validation-cp minimum-active segment-lists** [*1-128* | **all**]]

Syntax Description

liveness-profile [**backup**] **name** *profile*	(Optional) Specifies the liveness profile that is to be associated with the SR-TE policy. The **name** *profile* command form specifies the liveness profile, and the **backup name** *profile* command form specifies the backup liveness profile.
validation-cp minimum-active	(Optional) Validates the activeness of the candidate-path based on minimum number of active segment-lists.
segment-lists	Indicates the number of active segment-lists.
1-128 | **all**	• 1-128: Indicates the minimum number of segment-lists to have the PM liveness session up. • all: Indicates that all the segment-lists should be active to have the PM liveness session up.

Command Default

The Default performance measurement liveness profile is associated with an SR-TE policy.

Command Modes

SR-TE policy configuration (config-sr-te-policy)
On-Demand SR-TE policy configuration (config-sr-te-color)

Command History

Release	Modification
Release 7.11.1	The validation-cp minimum-active segment-lists option was introduced.
Release 7.4.2	The **backup** keyword was added to the command.
Release 7.3.1	This command was introduced.

Usage Guidelines

Path protection policies do not fully support PCE reporting of the standby LSP.

Example

This example shows how to associate a liveness profile to an SR-TE policy:

```
Router(config)#segment-routing traffic-eng
Router(config-sr-te)#policy TRST2
Router(config-sr-te-policy)#color 40 end-point ipv4 20.20.20.20
Router(config-sr-te-policy)#performance-measurement liveness-detection liveness-profile
name profile3
```

```
Router(config)#segment-routing traffic-eng
Router(config-sr-te)#on-demand color 30
Router(config-sr-te-color)#performance-measurement liveness-detection liveness-profile name
 profile3
Router(config-sr-te-color)#commit
```

This example shows how to associate a backup liveness profile to an SR-TE policy:

```
RP/0/RSP0/CPU0:ios# configure
RP/0/RSP0/CPU0:ios(config)#segment-routing traffic-eng
RP/0/RSP0/CPU0:ios(config-sr-te)#policy foo
RP/0/RSP0/CPU0:ios(config-sr-te-policy)# color 10 end-point ipv4 192.168.0.3
RP/0/RSP0/CPU0:ios(config-sr-te-policy)# performance-measurement
RP/0/RSP0/CPU0:ios(config-sr-te-policy-perf-meas)# liveness-detection
RP/0/RSP0/CPU0:ios(config-sr-te-policy-live-detect)# liveness-profile name profile-WORKING

RP/0/RSP0/CPU0:ios(config-sr-te-policy-live-detect)# liveness-profile backup name
profile-PROTECT
RP/0/RSP0/CPU0:ios(config-sr-te-policy-live-detect)# commit
```

This example shows how to activate two segment-lists to have the PM liveness session up:

```
Router(config)#segment-routing
Router(config-sr)#traffic-eng
Router(config-sr-te)#policy po-103
Router(config-sr-te-policy)#performance-measurement
Router(config-sr-te-policy-perf-meas)#liveness-detection
Router(config-sr-te-policy-live-detect)#validation-cp minimum-active segment-lists 2
```

performance-measurement liveness-profile endpoint

performance-measurement liveness-profile endpoint { **default** | **name** *name* } { **liveness-detection** { **logging state-change detected** | **multiplier** *value* } | **probe** { **burst-interval** *value* | **tx-interval** *interval* | **tos dscp** *value* } }

Syntax Description

default	The default profile.
name *name*	The name of profile.
liveness-detection	Enter endpoint liveness detection submode.
logging state-change detected	Display a syslog when the liveness state change detected.
multiplier *value*	Specify the number of probe packets sent before the head-end node assumes the candidate path is down.
probe	Enter endpoint liveness detection probe submode.
burst-interval *value*	Specify the interval for sending probe packet. The range is from 30 to 15000 milliseconds.
tx-interval *interval*	Specify the transmission interval. The allowed range is from 30000 to 15000000 micro seconds.
tos dscp *value*	Type of Service DSCP. The range is from 0 to 63.

Command Default

Default burst interval is 3000 milliseconds (3 seconds).

Default ToC DSCP value is 48.

Command Modes

Global Configuration

Command History

Release	Modification
Release 7.4.1	This command was introduced.
Release 7.6.1	The **name** *name* keyword was deprecated. Use the **performance-measurement liveness-profile name** command to create a named profile.
Release 7.10.1	The **burst-interval** *value* keyword was deprecated.

Usage Guidelines

Liveness-detection and delay-measurement aren't supported together

Example

```
Router(config)# performance-measurement
Router(config-perf-meas)# liveness-profile endpoint default
Router(config-pm-ld-ep)# liveness-detection
Router(config-pm-ld-ep-ld)# multiplier 3
```

```
Router(config-pm-ld-ep-ld)# exit
Router(config-pm-ld-ep)# probe
Router(config-pm-ld-ep-probe)#
```

performance-measurement liveness-profile

To create a unique Segment Routing performance measurement liveness profile, use the **performance-measurement liveness-profile** command in global configuration mode. To remove the profile, use the **no** form of the command.

performance-measurement liveness-profile [**name** [**name npu-offload enable**] | **probe flow-label** [**explicit** | **from**] **tx-interval** *value*] [**sr-policy default** [**npu-offload enable**] | **probe flow-label** [**explicit** | **from**]]

Table 2: Syntax Description

Syntax	Description
name *name*	Specifies the Segment Routing performance measurement liveness profile name.
sr-policy default	Specifies the Segment Routing performance measurement liveness policy default.
npu-offload	Enables performance measurement liveness hardware (NPU) offload feature in SR.
probe	Enter the liveness detection probe sub mode.
flow-label	Indicates the flow labels associated with SRv6 header.
explicit | **from**	Specify explicit flow label values or enter a range of flow labels that you want to configure. You can configure flow labels in the 0 to 1048575 range.
tx-interval *value*	Specify the transmission interval. The allowed range for • NPU sessions is from 3300 to 15000000 micro seconds. • CPU sessions is from 30000 to 15000000 micro seconds.

Command Default

No user created performance measurement liveness profile exists.

Command Modes

Global configuration (config)

Command History

Release	Modification
Release 7.11.1	The **flow-label** keyword was introduced.

Release	Modification
Release 7.10.1	**npu-offload** was introduced. Use **performance-measurement liveness-profile name***liveness profile name*. **Note** • **performance-measurement liveness-profile name***name* (named profile) and **performance-measurement liveness-profile sr-policy***default* (default profile) are supported. • **performance-measurement liveness-profile sr-policy***name* is deprecated.
Release 7.6.1	This **performance-measurement liveness-profile sr-policy** was introduced.

Usage Guidelines

The **performance-measurement** command is also available in SR-TE specific configuration.

Example

This example shows how to create a unique Segment Routing performance measurement liveness profile:

```
Router(config)# performance-measurement liveness-profile name profile1
Router(config)# commit
```

This example shows how to configure a range of flow labels in the SRv6 header:

```
Router#configure
Router(config)#performance-measurement
Router(config-perf-meas)#liveness-profile name name1
Router(config-pm-ld-profile)# probe flow-label from 0 to 1000000 increment 10
Routerconfig-pm-ld-profile)#commit
```

This example shows how to explicitly configure flow labels in the SRv6 header:

```
Router#configure
Router(config)#performance-measurement
Router(config-perf-meas)#liveness-profile name name1
Router(config-pm-ld-profile)# probe flow-label explicit 100 200 300 400 500
Routerconfig-pm-ld-profile)#commit
```

performance-measurement protocol twamp-light measurement delay

To configure the querier or responder nodes to accept packets from specific IP addresses on the network, use the **performance-measurement protocol twamp-light measurement delay** command in the global configuration mode. To remove the IP addresses, use the **no** form of the command.

performance-measurement protocol twamp-light measurement delay { **querier allow responder address** { **ipv4** | **ipv6** } | **responder allow querier address** { **ipv4** | **ipv6** } | **unauthenticated** { **ipv4** | **ipv6** | **querier-dst-port** | **querier-src-port** } }

Syntax Description

querier	Enter the querier submode to configure the IP addresses on a querier node.
responder	Enter the responder submode to configure the IP address on a responder node.
allow responder	Specifies the allowed responder address on the querier node. The configuration is applicable to delay measurement sessions.
allow querier	Specifies the allowed querier addresses on the responder node. The configuration is applicable to delay measurement sessions.
address	Specifies the querier or responder IP addresses that are configured.
{ ipv4 | ipv6 }	Configure the allowed querier or responder ipv4 or ipv6 addresses. You can specify the prefix for the IP addresses.
unauthenticated	Enter the unauthenticated submode to configure the IP address timestamp or the source and destination UDP ports.
ipv4 | ipv6	Configure the timestamp for ipv4 or ipv6 addresses.
querier-dst-port	Configure the UDP port to process queries. By default, the TWAMP reserved UDP destination port is 862.
querier-src-port	UDP port on Route Processor used as source port in queries.

Command Default

None.

Command Modes

Global Configuration

Command History

Release	Modification
Release 7.11.1	The **querier** and **responder** keywords were introduced.
Release 7.0.1	This command was introduced.

Usage Guidelines

None.

This example shows how to configure the IP address of a querier on a responder node for delay measurement.

```
Router#configure
Router(config)#performance-measurement
Router(config-perf-meas)#protocol twamp-light
Router(config-pm-protocol)#measurement delay
Router(config-pm-proto-meas)#responder
Router(config-pm-proto-responder)#allow-querier
Router(config-pm-allowed-querier)#address ipv4 10.10.10.1
Router(config-sr-te-color)#commit
```

performance measurment source-address

To configure source-address for the performance measurement, use the **performance-measurement source-address** command in global configuration mode. To disable the endpoint, use the **no** form of the command.

performance-measurement source-address ipv4 | **ipv6** *ip_addr*

Syntax Description

source-address ipv4 *source_ip_addr*	IPv4 address of the sender.
source-address ipv6 *source_ip_addr*	IPv6 address of the sender.

Command Default

None

Command Modes

Global Configuration

Command History

Release	Modification
Release 24.1.1	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 following example shows how to configure global IPv4 source address for an IP endpoint.

```
Router(config)# performance-measurement
Router(config-pm-ep)# source-address ipv4 10.10.1.1
Router(config-perf-meas)# endpoint ipv4 10.10.10.100 vrf green
Router(config-pm-ep)# source-address ipv4 10.1.1.1
Router(config-pm-ep)# delay-measurement
Router(config-pm-ep-dm)# exit
```

The following example shows how to configure global IPv6 source address for an IP endpoint.

```
Router(config)#performance-measurement
Router(config-perf-meas)#source-address ipv6 FCBB:0:1::
Router(config-perf-meas)#endpoint ipv6 FCBB:0:5::
Router(config-pm-ep)#exit
Router(config-perf-meas)#liveness-profile endpoint default
```

ping mpls nil-fec labels

To check network connectivity and identify LSP breakages, use the **ping mpls nil-fec labels** command.

ping mpls nil-fec labels {*label*[**,***label...*]} [**output** {**interface** *tx-interface*} [**nexthop** *next-hop-ip-address*]]

Syntax Description

labels *label*,*label...*	Specifies the label stack. Use commas to separate the each *label*.
ouput interface *tx-interface*	Specifies the output interface.
nexthop *next-hop-ip-address*	(Optional) Causes packets to go through the specified next-hop address.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 6.0.1	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
mpls-te	read, write

Example

This example shows how to check connectivity for a known label stack using a specific output interface and next-hop address:

```
RP/0/RSP0/CPU0:router# ping mpls nil-fec labels 16005,16007 output interface GigabitEthernet
 0/2/0/1 nexthop 10.1.1.4 repeat 1
Sending 1, 72-byte MPLS Echos with Nil FEC labels 16005,16007,
     timeout is 2 seconds, send interval is 0 msec:

Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
  'L' - labeled output interface, 'B' - unlabeled output interface,
  'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
  'M' - malformed request, 'm' - unsupported tlvs, 'N' - no label entry,
  'P' - no rx intf label prot, 'p' - premature termination of LSP,
  'R' - transit router, 'I' - unknown upstream index,
  'd' - see DDMAP for return code,
```

```
  'X' - unknown return code, 'x' - return code 0

Type escape sequence to abort.
!
Success rate is 100 percent (1/1), round-trip min/avg/max = 1/1/1 ms
 Total Time Elapsed 0 ms
```

Related Commands

Command	Description
traceroute mpls nil-fec labels	Checks network connectivity and identifying LSP breakages.

ping sr-mpls

To check the connectivity of segment routing control plane, use the **ping sr-mpls** command in XR EXEC mode.

ping sr-mpls { *ipv4-address/mask* | *ipv6-address/mask* [**fec-type** { **bgp** | **generic** | **igp** { **ospf** | **isis** } }] | **nil-fec** | **dataplane-only** { **labels** { *label1* [**,** *label2...*] *ipv4-address/mask* | *ipv6-address/mask* | **policy** } } { **output** { **interface** *interface-path-id* } } | { **nexthop** *next-hop-ip-address* } }

Syntax Description

ipv4-address/mask or *ipv6-address/mask*	Address prefix of the target and number of bits in the target address network mask.
fec-type	(Optional) Specifies FEC type to be used. Default FEC type is generic. **bgp** Use FEC type as BGP. **generic** Use FEC type as generic **igp** Use FEC type as OSPF or IS-IS.
labels *label1, label2...*	Specifies the label stack. Use commas to separate each label.
dataplane-only	Specifies data plane validation without running actual traffic over LSPs.
output interface *interface-path-id*	Specifies the output interface where echo request packets are sent.
nexthop *next-hop-ip-address*	Causes packets to go through the specified IPv4 or IPv6 next-hop address.

Command Default

fec-type : generic

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 24.2.1	The **dataplane-only** keyword was introduced. Support for IPv6 next-hop address was added.
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.

Task ID

Task ID	Operations
mpls-te	read, write

Example

These examples show how to use segment routing ping to test the connectivity of segment routing control plane. In the first example, FEC type is not specified. You can also specify the FEC type as shown in the second example.

```
RP/0/RSP0/CPU0:router# ping sr-mpls 10.1.1.2/32

Sending 5, 100-byte MPLS Echos to 10.1.1.2/32,
      timeout is 2 seconds, send interval is 0 msec:

Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
  'L' - labeled output interface, 'B' - unlabeled output interface,
  'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
  'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
  'P' - no rx intf label prot, 'p' - premature termination of LSP,
  'R' - transit router, 'I' - unknown upstream index,
  'X' - unknown return code, 'x' - return code 0

Type escape sequence to abort.

!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/5 ms
```

```
RP/0/RSP0/CPU0:router# ping sr-mpls 10.1.1.2/32 fec-type igp ospf

Sending 5, 100-byte MPLS Echos to 10.1.1.2/32,
      timeout is 2 seconds, send interval is 0 msec:

Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
  'L' - labeled output interface, 'B' - unlabeled output interface,
  'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
  'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
  'P' - no rx intf label prot, 'p' - premature termination of LSP,
  'R' - transit router, 'I' - unknown upstream index,
  'X' - unknown return code, 'x' - return code 0

Type escape sequence to abort.

!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/2 ms
```

The following example shows how to use segment routing ping to validate SR-MPLS over IPv6-based LSPs:

```
Router#ping sr-mpls dataplane-only 2001:DB8::1/32
Tue Jan 16 15:05:19.120 EST

Sending 5, 100-byte MPLS Echos with Nil FEC to 2001:DB8::1/32,
      timeout is 2 seconds, send interval is 0 msec:
```

```
Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
  'L' - labeled output interface, 'B' - unlabeled output interface,
  'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
  'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
  'P' - no rx intf label prot, 'p' - premature termination of LSP,
  'R' - transit router, 'I' - unknown upstream index,
  'X' - unknown return code, 'x' - return code 0

Type escape sequence to abort.

!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/8 ms
```

The following example shows how to use segment routing ping for SR-TE policies with IPv6-based LSPs:

```
Router#ping sr-mpls nil-fec policy name srte_c_40_ep_2001:DB8::1
Tue Feb  6 12:08:28.277 EST

Sending 5, 100-byte MPLS Echos with Nil FEC for SR-TE Policy srte_c_40_ep_2001:DB8::1,
      timeout is 2 seconds, send interval is 0 msec:

Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
  'L' - labeled output interface, 'B' - unlabeled output interface,
  'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
  'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
  'P' - no rx intf label prot, 'p' - premature termination of LSP,
  'R' - transit router, 'I' - unknown upstream index,
  'X' - unknown return code, 'x' - return code 0

Type escape sequence to abort.

!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/2/3 ms
```

The following example shows how to use segment routing ping with labels using IPv6 LSPs:

```
Router#ping sr-mpls labels 18004 lsp-end-point 2001:DB8::1
Tue Feb  6 12:11:05.349 EST

Sending 5, 100-byte MPLS Echos with NIL FEC with lsp end point 2001:DB8::1, SID Label(s)
[18004],
      timeout is 2 seconds, send interval is 0 msec:

Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
  'L' - labeled output interface, 'B' - unlabeled output interface,
  'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
  'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
  'P' - no rx intf label prot, 'p' - premature termination of LSP,
  'R' - transit router, 'I' - unknown upstream index,
  'X' - unknown return code, 'x' - return code 0

Type escape sequence to abort.

!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/2/4 ms
```

prefix-sid

To specify or advertise prefix (node) segment ID (SID) on all routers, use the **prefix-sid** command in IS-IS interface address family or OSPF interface configuration mode. To stop advertising prefix SID, use the **no** form of this command.

prefix-sid [**strict-spf**] { **index** *sid-index* | **absolute** *sid-value* } [**n-flag-clear**] [**explicit-null**]

no prefix-sid [**strict-spf**] { **index** *sid-index* | **absolute** *sid-value* } [**n-flag-clear**] [**explicit-null**]

Syntax Description

strict-spf	Specifies that the prefix-SID should use the SPF path instead of the SR-TE policy.
index *sid-index*	Specifies the prefix SID based on the lower boundary of the SRGB + the index.
absolute *sid-value*	Specifies the specific prefix SID value within the SRGB.
n-flag-clear	Specifies that the prefix-SID is not a node-SID by setting the N flag in the prefix-SID sub Type Length Value (TLV) to 0.
explicit-null	Adds an explicit-Null label by setting the E flag in the prefix-SID sub TLV to 1. Automatically disables penultimate-hop-popping (PHP) by setting the P flag (IS-IS) or NP flag (OSPF) to 1.

Command Default

Prefix SID is a node SID (N-flag is set to 1).

Explicit-Null label is not set (E-flag is set to 0).

Command Modes

IS-IS interface address-family configuration

OSPF interface configuration

Command History

Release	Modification
Release 5.2.0	This command was introduced.
Release 6.1.2	The **absolute** *sid-value* option was added for OSPF.
Release 6.2.1	The **strict-spf** keyword was added for IS-IS.

Usage Guidelines

Segment routing must be configured on the ISIS instance or on the OSPF process, area, or interface before configuring prefix SID value.

Strict-SPF SIDs are used to forward traffic strictly along the SPF path. Strict-SPF SIDs are not forwarded to SR-TE policies. IS-IS advertises the SR Algorithm sub Type Length Value (TLV) (in the SR Router Capability SubTLV) to include both algorithm 0 (SPF) and algorithm 1 (Strict-SPF). When the IS-IS area or level is Strict-SPF TE-capable, Strict-SPF SIDs are used to build the SR-TE Strict-SPF policies. Strict-SPF SIDs are also used to program the backup paths for prefixes, node SIDs, and adjacency SIDs.

Note The same SRGB is used for both regular SIDs and strict-SPF SIDs.

Task ID

Task ID	Operations
isis	read, write
ospf	

Examples

This example shows how to configure a prefix SID.

```
RP/0/RSP0/CPU0:router # configure
RP/0/RSP0/CPU0:router(config)# router isis 100
RP/0/RSP0/CPU0:router(config-isis)# interface loopback0
RP/0/RSP0/CPU0:router(config-isis-if)# address-family ipv4 unicast
RP/0/RSP0/CPU0:router(config-isis-if-af)# prefix-sid index 1001
```

This example shows how to configure an absolute prefix SID on an OSPF interface.

```
RP/0/RSP0/CPU0:router # configure
RP/0/RSP0/CPU0:router(config)# router ospf 1
RP/0/RSP0/CPU0:router(config-ospf)# router area 0
RP/0/RSP0/CPU0:router(config-ospf-ar)# interface loopback0
RP/0/RSP0/CPU0:router(config-ospf-ar-if)# prefix-sid absolute 16041
```

Related Commands

Command	Description
segment-routing global-block	Configures the segment routing global block (SRGB).

prefix-sid (flexible algorithm)

To specify or advertise prefix (node) segment ID (SID) on all routers, use the **prefix-sid** command in IS-IS interface address family configuration mode.

prefix-sid [**strict-spf** | **algorithm** *algorithm number*] {**index** *sid-index* | **absolute** *sid-value*}

Syntax Description

strict-spf	Specifies that the prefix-SID should use the SPF path instead of the SR-TE tunnel.
algorithm*algorithm number*	Specifies the flexible algorithm number.
index *sid-index*	Specifies the prefix SID based on the lower boundary of the SRGB + the index.
absolute *sid-value*	Specifies the specific prefix SID value within the SRGB.

Command Default

Prefix SID is a node SID (N-flag is set to 1).

Command Modes

IS-IS interface address-family configuration

Command History

Release	Modification
Release 6.6.1	This command was introduced.

Examples

This example shows how to advertise prefix-SID for flexible algorithm:

```
RP/0/RSP0/CPU0:router # configure
RP/0/RSP0/CPU0:router(config)# router isis 1
RP/0/RSP0/CPU0:router(config-isis)# interface loopback0
RP/0/RSP0/CPU0:router(config-isis-if)# address-family ipv4 unicast
RP/0/RSP0/CPU0:router(config-isis-if-af)# prefix-sid index 4
RP/0/RSP0/CPU0:router(config-isis-if-af)# prefix-sid algorithm 128 index 104
RP/0/RSP0/CPU0:router(config-isis-if-af)# prefix-sid algorithm 129 index 204
```

prefix-unreachable

Use this command for UPA advertisements by enabling individual control parameters.

The new **prefix-unreachable** command under IS-IS address-family submode includes several command-options that control various parameters for UPAs originated by the router.

prefix-unreachable { adv-lifetime <*value*> | **adv-metric** <*value*> | **adv-maximum** <*value*> | **rx-process-enable }**

Syntax Description

Keyword	Details
prefix-unreachable	Lists the control options of UPA.
adv-lifetime	• This command is optional. • Amount of time the UPA will be advertised after the prefix becomes unreachable. Range of values is 30–65535 seconds. • Default value is 180 seconds.
adv-metric	• This command is optional. • Metric used when advertising UPA. Range of values is 4261412865–4294967294 (0xFE000001 to 0xFFFFFFFE). • Default value is 4261412865 (0xFE000001).
adv-maximum	• This command is optional. UPAs that are leaked or propagated are not counted against this limit. • Maximum number of UPAs that the router is allowed to generate to any of its attached areas or domains. UPAs that are leaked, propagate, or redistributed are not counted against this limit. Range of values is 1–65535. • Default value is 32.
rx-process-enable	• This command is optional. • If enabled, the UPA received by the router is sent to RIB and is used to trigger the BGP PIC. • It is disabled by default.

Command Default

None.

Command Modes

IS-IS interface address-family configuration

Command History

Release	Modification
Release 7.8.1	This command was introduced.

Task ID

Task ID	Operations
IS-IS	read, write

Examples

This example shows how to configure UPA.

```
Router(config)#router isis 1
Router(config-isis)#address-family ipv6 un
Router(config-isis-af)#prefix-unreachable
Router(config-isis-prefix-unreachable)#adv-lifetime 500
Router(config-isis-prefix-unreachable)#adv-metric 4261412866
Router(config-isis-prefix-unreachable)#adv-maximum 77
Router(config-isis-prefix-unreachable)#rx-process-enable
Router(config-isis-prefix-unreachable)#commit
```

priority

To set the priority of the flexible algorithm definition adevertisement, use the **priority** command in the flex-algo configuration mode.

priority *priority value*

Syntax Description

priority value	Priority associated with the flexible algorithm definition advertisement.

Command Default

No default behavior or values.

Command Modes

flex-algo

Command History

Release	Modification
IOS XR Release 6.6.1	This command was introduced.

Example

```
RP/0/RSP0/CPU0:exr2(config)#router isis 1
RP/0/RSP0/CPU0:exr2(config-isis)#flex-algo 128
RP/0/RSP0/CPU0:exr2(config-isis-flex-algo)#priority 100
```

reference-bandwidth

To use the automatic bandwidth metric calculation, use the **reference-bandwidth** command in the IS-IS flex-algo auto-cost submode.

reference-bandwidth *bandwidth-value* **granularity** *granularity-value*

Syntax Description

reference-bandwidth*bandwidth-value*	Specifies the reference-bandwidth configuration for auto-cost. The *bandwidth-value* is specified in kbits/s and the value can range from 1 to 4294967295.
granularity*granularity-value*	Specifies the granularity configuration for auto-cost. The *granularity-value* is specified in kbits/s and the value can range from 1 to 4294967295.

Command Default

No default behavior or values

Command Modes

IS-IS flex-algo auto-cost submode

Command History

Release	Modification
Release 24.4.1	This command was introduced.

Usage Guidelines

None

Task ID

Task ID	Operations
isis	read, write

Example

This example shows how to configure the parameters for automatic bandwidth metric calculation using the **reference-bandwidth** command in the IS-IS flex-algo auto-cost submode.

```
Router(config)#router isis 1
Router(config-isis)#flex-algo 131
Router(config-isis-flex-algo)#auto-cost reference
Router(config-isis-flex-algo-af-auto-cost)#reference-bandwidth 10000000 granularity 2000
```

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 6.1.2	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:

```
RP/0/RSP0/CPU0:router(config)# sbfd
RP/0/RSP0/CPU0:router(config-sbfd)# remote-target ipv4 1.1.1.5
RP/0/RSP0/CPU0:router(config-sbfd-nnnn)# remote-discriminator 16843013
```

Related Commands

Command	Description
local-discriminator	Configures a unique local disciminator on the SBFD reflector.
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 reflector	Displays the SBFD reflector configuration.

Command	Description
show bfd target-identifier	Displays the BFD local and remote discriminators.

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 6.1.2	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:

```
RP/0/RSP0/CPU0:router(config)# sbfd
RP/0/RSP0/CPU0:router(config-sbfd)# remote-target ipv4 1.1.1.5
RP/0/RSP0/CPU0:router(config-sbfd-nnnn)#
```

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.
sbfd	Enters seamless bidirectional forwarding detection (SBFD) mode.
show bfd label session	Displays the BFD initiator session information.
show bfd reflector	Displays the SBFD reflector configuration.
show bfd target-identifier	Displays the BFD local and remote discriminators.

reoptimization

To configure a periodic reoptimization timer, use the **reoptimization** command in PCE timer configuration mode. To disable this command, use the **no** form of this command.

reoptimization *value*

Syntax Description

value	Periodic reoptimization timer value, in seconds. The range is 60 to 604800

Command Default

60

Command Modes

PCE timers configuration

Command History

Release	Modification
Release 6.2.1	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

Example

This example shows how to configure a periodic reoptimization timer for 200 seconds:

```
RP/0/RSP0/CPU0:router # configure
RP/0/RSP0/CPU0:router(config)# pce
RP/0/RSP0/CPU0:router(config-pce)# timers
PP/0/RSP0/CPU0:router(config-pce-timers)# reoptimization 200
```

router static

Use **router static** command to configure the sink node

router static [**address-family ipv6 unicast** *ipv6-prefix/64 ipv6-address*

Syntax Description

Keyword	Details
address-family ipv6 unicast	Indicates that the following commands apply to IPv6 unicast routing. *ipv6-prefix/64 segment-routing srv6 endpoint behavior utef controller ipv6-address*

Command Default

None.

Command Modes

Global configuration

Command History

Release	Modification
Release 24.1.1	This command was introduced.

Usage Guidelines

Task ID

Task ID	Operations
Route Static	read, write

Examples

This example shows how to configure Sink node.

```
Router(config)#router static
Router(config-isis)#address-family ipv6 unicast
Router(config-isis-af)#001:0DB8::/64 2001:0DB8:3000::1
```

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 6.1.2	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:

```
RP/0/RSP0/CPU0:router(config)# sbfd
RP/0/RSP0/CPU0:router(config-sbfd)#
```

Related Commands

Command	Description
fast-detect sbfd	Enables SBFD fast-detection on a specified IPv4 destination address.
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.
show bfd label session	Displays the SBFD initiator session information.
show bfd reflector	Displays the SBFD reflector configuration.
show bfd target-identifier	Displays the BFD local and remote discriminators.

segment-routing global-block

To configure the segment routing global block (SRGB), use the **segment-routing global-block** command.

segment-routing global-block *starting_value ending_value*

Syntax Description

starting_value ending_value	Specifies the block of segment routing IDs that are allocated for the routers in the network. Ranges from 16000 to 1048574.

Command Default

Default SRGB range is 16000 to 23999.

Command Modes

Global Configuration mode

Command History

Release	Modification
Release 5.2.0	This command was introduced.

Usage Guidelines

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

To keep the segment routing configuration simple and to make it easier to troubleshoot segment routing issues, we recommend that you use the default SRGB range on each node in the domain. However, there are instances when you might need to define a different range:

- The nodes of another vendor support a label range that is different from the default SRGB, and you want to use the same SRGB on all nodes.
- The default range is too small.
- To specify separate SRGBs for IS-IS and OSPF protocols, as long as the ranges do not overlap.

Because the values assigned from the range have domain-wide significance, we recommend that all routers within the domain be configured with the same range of values.

Task ID

Task ID	Operation
mpls-te	read, write

Example

This example shows how to configure the SRGB range:

```
RP/0/RSP0/CPU0:router(config)# segment-routing global-block 17000 20000
```

Related Commands

Command	Description
prefix-sid	Configures the segment ID (SID).

segment-routing local-block

To configure the segment routing local block (SRLB), use the **segment-routing local-block** command.

segment-routing local-block *starting_value ending_value*

Syntax Description

starting_value ending_value	Specifies the block of labels that are reserved for manual allocation of adjacency segment IDs (Adj-SIDs). Ranges from 15000 to 1048574.

Command Default

Default SRLB range is 15000 to 15999.

Command Modes

Global Configuration mode

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.

When you define a new SRLB range, there might be a label conflict (for example, if labels are already allocated, statically or dynamically, in the new SRLB range). In this case, the new SRLB range will be accepted, but not applied (pending). The previous SRLB range (active) will continue to be in use until one of the following occurs:

- Reload the router to release the currently allocated labels and allocate the new SRLB
- Use the **clear segment-routing local-block discrepancy all** command to clear the label conflicts

The SRLB size cannot be more than 262,143.

To keep the segment routing configuration simple and to make it easier to troubleshoot segment routing issues, we recommend that you use the default SRLB range on each node in the domain. However, there are instances when you might need to define a different range:

- The nodes of another vendor support a label range that is different from the default SRLB, and you want to use the same SRLB on all nodes.
- The default range is too small.

Because the values assigned from the range have domain-wide significance, we recommend that all routers within the domain be configured with the same range of values.

Task ID

Task ID	Operation
mpls-te	read, write

This example shows how to configure the SRLB range:

```
RP/0/RSP0/CPU0:router(config)# segment-routing local-block 18000 19999
```

Related Commands

Command	Description
clear segment-routing local-block discrepancy all, on page 17	Clears SRLB label conflicts
show segment-routing local-block inconsistencies, on page 160	Displays SRLB label conflicts

segment-routing mapping-server

To configure the segment routing mapping server (SRMS), use the **segment-routing mapping-server** command.

segment-routing mapping-server prefix-sid-map address-family {**ipv4** | **ipv6**} *ip_address*/*subnet_mask* *SID_start_value* **range** *range*

Syntax Description

address-family {**ipv4** | **ipv6**}	Configures the address family for IS-IS.
ip_address/*subnet_mask*	Specifies the prefix and mask.
SID_start_value	Specifies the first prefix SID in the range.
range *range*	Specifies the size of the range.

Command Default

None

Command Modes

Global Configuration mode

Command History

Release	Modification
Release 5.2.0	This command was introduced.

Usage Guidelines

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

The position of the mapping server in the network is not important. However, since the mapping advertisements are distributed in IGP using the regular IGP advertisement mechanism, the mapping server needs an IGP adjacency to the network.

The role of the mapping server is crucial. For redundancy purposes, you should configure multiple mapping servers in the networks.

Task ID

Task ID	Operation
mpls-te	read, write

Example

This example shows how to configure the mapping server and add prefix-SID mapping entries in the active local mapping policy:

```
RP/0/RSP0/CPU0:router(config)# segment-routing mapping-server prefix-sid-map address-family
```

```
ipv4 10.1.1.1/32 17000 range 100
```

Related Commands

Command	Description
segment-routing prefix-sid-map advertise-local	Enables the router to advertise the SRMS entries that are locally configured.
segment-routing prefix-sid-map receive disable	Disables mapping client functionality.
show isis segment-routing prefix-sid-map	Displays the active and backup prefix-to-SID mappings for IS-IS.
show ospf segment-routing prefix-sid-map	Displays the active and backup prefix-to-SID mappings for OSPF.
show segment-routing mapping-server prefix-sid-map	Displays the locally configured prefix-to-SID mappings.

segment-routing mpls

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

segment-routing mpls

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

Router configuration

Area configuration

Command History

Release	Modification
Release 5.2.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes 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
mpls-te	read, write

Example

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

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# router isis 100
RP/0/RSP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RSP0/CPU0:router(config-isis-af)# segment-routing mpls
```

segment-routing prefix-sid-map advertise-local

To enable the router to advertise the segment routing mapping server (SRMS) entries that are locally configured, use the **segment-routing prefix-sid-map advertise-local** command. In addition to advertising these local SRMS entries, these mapping entries are also used to calculate segment ID (SID).

segment-routing prefix-sid-map advertise-local

Syntax Description

advertise-local	Advertises the SRMS mapping entries that are locally configured.

Command Default

Disabled.

Command Modes

IPv4 address family configuration

Router configuration

Command History

Release	Modification
Release 5.3.2	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
ospf isis	read, write

Example

This example shows how to enable the router to advertise the locally configured SRMS entries:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# router ospf 1
RP/0/RSP0/CPU0:router(config-ospf)# segment-routing prefix-sid-map advertise-local
```

Related Commands

Command	Description
segment-routing mapping-server, on page 113	Configures the segment routing mapping server (SRMS).
segment-routing prefix-sid-map receive disable	Disables mapping client functionality.

Command	Description
show isis segment-routing prefix-sid-map	Displays the active and backup prefix-to-SID mappings for IS-IS.
show ospf segment-routing prefix-sid-map	Displays the active and backup prefix-to-SID mappings for OSPF.
show segment-routing mapping-server prefix-sid-map	Displays the locally configured prefix-to-SID mappings.

segment-routing prefix-sid-map receive disable

To disable mapping client functionality, use the **segment-routing prefix-sid-map receive disable** command. To reenable client functionality, use the **segment-routing prefix-sid-map receive** command.

segment-routing prefix-sid-map receive [**disable**]

Syntax Description

receive	Only remote SRMS mapping entries are used for SID calculation.
disable	Disable remote SRMS mapping entries received by flooding.

Command Default

Enabled.

Command Modes

IPv4 address family configuration

Router configuration

Command History

Release	Modification
Release 5.3.2	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 mapping client functionality is enabled by default. When you disable client functionality, the SRMS active policy is calculated without remote SRMS entries.

You can use this command with the **segment-routing prefix-sid-map advertise-local** command simultaneously.

Task ID

Task ID	Operation
ospf	read, write
isis	

Example

This example shows how to disable the mapping server client functionality:

```
RP/0/RSP0/CPU0:router(config)# router isis 1
RP/0/RSP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RSP0/CPU0:router(config-isis-af)# segment-routing prefix-sid-map receive disable
```

Related Commands

Command	Description
segment-routing mapping-server, on page 113	Configures the segment routing mapping server (SRMS).
segment-routing prefix-sid-map advertise-local	Enables the router to advertise the SRMS entries that are locally configured.
show isis segment-routing prefix-sid-map	Displays the active and backup prefix-to-SID mappings for IS-IS.
show ospf segment-routing prefix-sid-map	Displays the active and backup prefix-to-SID mappings for OSPF.
show segment-routing mapping-server prefix-sid-map	Displays the locally configured prefix-to-SID mappings.

segment-routing traffic-eng explicit

To detect the liveness of the reverse path of the segment list and the configure the segment list, use the **segment-routing traffic-eng explicit** command in performance measurement configuration mode. To disable the reverse path, use the **no** form of the command.

segment-routing traffic-eng explicit { **reverse-path segment-list name** *segment-list-name* | **segment-list name** *segment-list-name* **reverse-path segment-list name** *segment-list-name* }

Syntax Description

reverse-path	Specifes the return path on the endpoint for liveness detection.
segment-listname *segment-list-name*	Specifes the segment list on the endpoint for liveness detection and delay.

Command Default

None

Command Modes

Performance measurement endpoint submode

Command History

Release	Modification
Release 24.1.1	This command was introduced.

Usage Guidelines

The default reverse path configured under endpoint submode is only used for sessions with segment list. The endpoint session without a segment list does not support reverse path configuration and will not use this reverse path.

The **reverse-path** under the **performance-measurement endpoint** is used as the default reverse path if there are no reverse paths configured under a segment list.

Use the **reverse-path** under the **performance-measurement endpoint segment-routing traffic-eng explicit segment-list name fwd-path** to configure reverse path under a segment list.

The reverse type must be the same as the forward path. Using different types for forward and reverse paths is not supported. For example, uSID forward path and uSID reverse path; MPLS forward path and MPLS reverse path.

User-configured segment-list can also represent the reverse path (reflector to sender) when probe is configured in liveness detection mode. Up to 128 segment-lists can be configured under a probe. An additional PM session is created for each segment-list. Segment-lists are configured under **segment-routing traffic-eng segment-list** submode. See SR-TE Policy with Explicit Path for details about configuring segment lists.

The following example shows how to configure liveness of the reverse path of the segment list:

The following example shows how to configure liveness reverse path under segment list and under endpoint:

```
Router(config)#performance-measurement
Router(config-perf-meas)#endpoint ipv6 ff::2

/* Configure reverse path segment-list with forward segment-list*\
Router(config-pm-ep)#segment-routing traffic-eng explicit segment-list name fwd-path
```

```
Router(config-pm-ep-sl)#reverse-path segment-list name rev-path
Router(config-pm-ep-sl)#exit

/* Configure reverse-path segment list on the endpoint*\
Router(config-pm-ep)# segment-routing traffic-eng explicit reverse-path segment-list name
rev-path-name
```

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 6.1.2	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:

```
RP/0/RSP0/CPU0:router5# 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:

```
RP/0/RSP0/CPU0:router5# 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.
show bfd target-identifier	Displays the BFD local and remote discriminators.

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 6.1.2	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:

```
RP/0/RSP0/CPU0:router5# 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:

```
RP/0/RSP0/CPU0:router5# 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 target-identifier	Displays the BFD local and remote discriminators.

show bfd target-identifier

To display the BFD local and remote discriminators, use the **show bfd target-identifier** command.

show bfd target-identifier {**local** | **remote**}

Syntax Description

local	Displays the local discriminator.
remote	Displays the remote discriminator.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 6.1.2	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.

Seamless BFD (SBFD) uses initiators and reflectors to detect failures in the path between adjacent forwarding engines. The initiator is an SBFD session on a network node that performs a continuity test to a remote entity by sending SBFD packets. The reflector is an SBFD session on a network node that listens for incoming SBFD control packets to local entities and generates response SBFD control packets. The SBFD control packets contain the discriminator of the initiator, which is created dynamically, and the discriminator of the reflector, which is configured as a local discriminator on the reflector, using the **local-discriminator** command.

Use the **show bfd target-identifier local** command on the reflector to display locally configured discriminators.

Use the **show bfd target-identifier remote** command on the initiator to display remote discriminators. The initiator maps a destination address to the remote discriminator using the **remote-discriminator** command.

Task ID

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

Example

This example shows how to display the local discriminators on the BFD reflector (router5):

```
RP/0/RSP0/CPU0:router5# show bfd target-identifier local
Local Target Identifier Table
-----------------------------
Discr       Discr Src   VRF       Status   Flags
                        Name
-----       ---------   -------   -------- --------
16843013    Local       default    enable  -----ia-
2147483649  Local       default    enable  -------d

Legend: TID - Target Identifier
        a   - IP Address mode
        d   - Dynamic mode
        i   - Interface mode
        v   - Explicit Value mode
```

This example shows how to display the remote discriminators on the BFD initiator (router1):

```
RP/0/RSP0/CPU0:router1# show bfd target-identifier remote
Remote Target Identifier Table
------------------------------

Discr       Discr Src   VRF        TID Type   Status
            Target ID   Name
------      ---------   -------    --------   ------
16843013    Remote      default    ipv4       enable
            1.1.1.5
2147483649  Remote      default    dynamic    enable
            1.1.1.5

Legend: TID - Target Identifier
```

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 reflector	Displays the SBFD reflector configuration.

show bgp egress-engineering

To display BGP egress peer engineering (EPE) information, use the **show bgp egress-engineering** command.

show bgp egress-engineering

Syntax Description

This command has no keywords or arguments.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 6.1.2	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

Example

This example shows how to display BGP egress peer engineering (EPE) information:

```
RP/0/RSP0/CPU0:router2# show bgp egress-engineering

Egress Engineering Peer Set: 1.1.1.5/32 (10b48fec)
     Nexthop: 1.1.1.5
     Version: 2, rn_version: 2
       Flags: 0x00000006
   Local ASN: 1
  Remote ASN: 5
   Local RID: 1.1.1.2
  Remote RID: 1.1.1.5
   First Hop: 10.1.1.9
        NHID: 0, 0
       Label: 30025, Refcount: 3
     rpc_set: 10c34c24
. . .
```

show isis segment-routing prefix-sid-map

To verify the active and backup prefix-to-SID mappings for IS-IS, use the **show isis segment-routing prefix-sid-map** command.

show isis segment-routing prefix-sid-map [**active-policy** | **backup-policy**]

Syntax Description

active-policy	(Optional) Specifies the active mapping policy.
backup-policy	(Optional) Specifies the backup mapping policy.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 6.1.2	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
isis	read

Example

The example shows how to verify the active mapping policy on IS-IS:

```
RP/0/0/CPU0:router# show isis segment-routing prefix-sid-map active-policy

IS-IS 1 active policy
Prefix              SID Index    Range        Flags
1.1.1.100/32        100          20
1.1.1.150/32        150          10

Number of mapping entries: 2
```

The example shows how to verify the backup mapping policy on IS-IS:

```
RP/0/0/CPU0:router# show isis segment-routing prefix-sid-map backup-policy

IS-IS 1 backup policy
Prefix              SID Index    Range        Flags
1.1.1.100/32        100          20
1.1.1.150/32        150          10
```

```
Number of mapping entries: 2
```

Related Commands

Command	Description
segment-routing mapping-server, on page 113	Configures the segment routing mapping server (SRMS).
segment-routing prefix-sid-map advertise-local	Enables the router to advertise the SRMS entries that are locally configured.
segment-routing prefix-sid-map receive disable	Disables mapping client functionality.
show ospf segment-routing prefix-sid-map	Displays the active and backup prefix-to-SID mappings for OSPF.
show segment-routing mapping-server prefix-sid-map	Displays the locally configured prefix-to-SID mappings.

show mvpn vrf

To view BGP MVPN configuration information for a VRF, use the **show mvpn vrf** command in EXEC mode.

show mvpn vrf *name* { **context** [**detail**] | **database segment-routing** | **pe** [*address*] }

Syntax Description

vrf *name*	Specifies the VRF for which BGP MVPN information is displayed.
context [**detail**]	Specifies that MVPN information including MDT, Route Distinguisher and Route Target details be displayed.
database segment-routing	Specifies that MDT database information be displayed.
pe [*address*]	Specifies the ingress or egress PE router for which MVPN information is to be displayed.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 7.3.1	This command was introduced.

Example

View Default MDT Configuration Information

This command displays SR multicast tree information, including the MDT details (of *Default* type, etc), and customer VRF information (route target, route distinguisher, etc).

```
Router# show mvpn vrf vpn1 context

MVPN context information for VRF vpn1 (0x9541cf0)

RD: 1:10 (Valid, IID 0x1), VPN-ID: 0:0
Import Route-targets : 2
  RT:192.168.0.4:0, BGP-AD
  RT:192.168.0.4:17, BGP-AD
BGP Auto-Discovery Enabled (I-PMSI added)
SR P2MP Core-tree data:
  MDT Name: TRmdtvpn1, Handle: 0x4150, idb: 0x956fc30
  MTU: 1376, MaxAggr: 255, SW_Int: 30, AN_Int: 60
  RPF-ID: 3, C:0, O:1, D:0, CP:0
  Static Type : - / -
  Def MDT ID: 524289 (0x93993f0), added: 1, HLI: 0x80001, Cfg: 1/0
  Part MDT ID: 0 (0x0), added: 0, HLI: 0x00000, Cfg: 0/0
  Ctrl Trees : 0/0/0, Ctrl ID: 0 (0x0), Ctrl HLI: 0x00000
```

View Partitioned MDT Configuration Information

This command displays SR multicast tree information, including the MDT details (of *Partitioned* type, etc), and customer VRF information (route target, route distinguisher, etc).

```
Router# show mvpn vrf vpn1 context

MVPN context information for VRF vpn1 (0x9541cf0)

RD: 1:10 (Valid, IID 0x1), VPN-ID: 0:0
Import Route-targets : 2
  RT:192.168.0.4:0, BGP-AD
  RT:192.168.0.4:17, BGP-AD
BGP Auto-Discovery Enabled (I-PMSI added) , MS-PMSI sent
SR P2MP Core-tree data:
  MDT Name: TRmdtvpn1, Handle: 0x4210, idb: 0x956fc30
  MTU: 1376, MaxAggr: 255, SW_Int: 30, AN_Int: 60
  RPF-ID: 1, C:0, O:1, D:0, CP:0
  Static Type : - / -
  Def MDT ID: 0 (0x0), added: 0, HLI: 0x00000, Cfg: 0/0
  Part MDT ID: 524292 (0x9399318), added: 1, HLI: 0x80004, Cfg: 1/0
  Ctrl Trees : 0/0/0, Ctrl ID: 0 (0x0), Ctrl HLI: 0x00000
```

View MDT Configuration Information On The Ingress PE Router

This command displays SR multicast tree information on the PE router that receives the multicast traffic on the SP network. The information includes PE router details, MDT details, Tree-SID details, and the specified customer VRF information.

```
Router# show mvpn vrf vpn1 pe

MVPN Provider Edge Router information

VRF : vpn1

PE Address : 192.168.0.3 (0x9570240)
  RD: 0:0:0 (null), RIB_HLI 0, RPF-ID 13, Remote RPF-ID 0, State: 0, S-PMSI: 2
  PPMP_LABEL: 0, MS_PMSI_HLI: 0x00000, Bidir_PMSI_HLI: 0x00000, MLDP-added: [RD 0, ID 0,
Bidir ID 0, Remote Bidir ID 0], Counts(SHR/SRC/DM/DEF-MD): 0, 0, 0, 0, Bidir: GRE RP Count
 0, MPLS RP Count 0RSVP-TE added: [Leg 0, Ctrl Leg 0, Part tail 0 Def Tail 0, IR added:
[Def Leg 0, Ctrl Leg 0, Part Leg 0, Part tail 0, Part IR Tail Label 0
  Tree-SID Added: [Def/Part Leaf 1, Def Egress 0, Part Egress 0, Ctrl Leaf 0]
  bgp_i_pmsi: 1,0/0 , bgp_ms_pmsi/Leaf-ad: 1/1, bgp_bidir_pmsi: 0, remote_bgp_bidir_pmsi:
0, PMSIs: I 0x9570378, 0x0, MS 0x94e29d0, Bidir Local: 0x0, Remote: 0x0, BSR/Leaf-ad 0x0/0,
 Autorp-disc/Leaf-ad 0x0/0, Autorp-ann/Leaf-ad 0x0/0
 IIDs: I/6: 0x1/0x0, B/R: 0x0/0x0, MS: 0x1, B/A/A: 0x0/0x0/0x0

  Bidir RPF-ID: 14, Remote Bidir RPF-ID: 0
  I-PMSI:   Unknown/None (0x9570378)
  I-PMSI rem:  (0x0)
  MS-PMSI:   Tree-SID [524290, 192.168.0.3] (0x94e29d0)
  Bidir-PMSI:  (0x0)
  Remote Bidir-PMSI:  (0x0)
  BSR-PMSI:  (0x0)
  A-Disc-PMSI:  (0x0)
  A-Ann-PMSI:  (0x0)
  RIB Dependency List: 0x0
  Bidir RIB Dependency List: 0x0
    Sources: 0, RPs: 0, Bidir RPs: 0
```

View MDT Configuration Information On The Egress PE Router

This command displays SR multicast tree information on the MVPN egress PE router that sends multicast traffic from the SP network towards multicast receivers. The information includes PE router, Tree-SID, MDT, and the specified customer VRF details.

```
Router# show mvpn vrf vpn1 pe

MVPN Provider Edge Router information
```

```
PE Address : 192.168.0.4 (0x9fa38f8)
  RD: 1:10 (valid), RIB_HLI 0, RPF-ID 15, Remote RPF-ID 0, State: 1, S-PMSI: 2
  PPMP_LABEL: 0, MS_PMSI_HLI: 0x00000, Bidir_PMSI_HLI: 0x00000, MLDP-added: [RD 0, ID 0,
Bidir ID 0, Remote Bidir ID 0], Counts(SHR/SRC/DM/DEF-MD): 1, 1, 0, 0, Bidir: GRE RP Count
 0, MPLS RP Count 0RSVP-TE added: [Leg 0, Ctrl Leg 0, Part tail 0 Def Tail 0, IR added:
[Def Leg 0, Ctrl Leg 0, Part Leg 0, Part tail 0, Part IR Tail Label 0
  Tree-SID Added: [Def/Part Leaf 0, Def Egress 0, Part Egress 1, Ctrl Leaf 0]
  bgp_i_pmsi: 1,0/0 , bgp_ms_pmsi/Leaf-ad: 1/0, bgp_bidir_pmsi: 0, remote_bgp_bidir_pmsi:
0, PMSIs: I 0x9f77388, 0x0, MS 0x9fa2f98, Bidir Local: 0x0, Remote: 0x0, BSR/Leaf-ad 0x0/0,
 Autorp-disc/Leaf-ad 0x0/0, Autorp-ann/Leaf-ad 0x0/0
 IIDs: I/6: 0x1/0x0, B/R: 0x0/0x0, MS: 0x1, B/A/A: 0x0/0x0/0x0

  Bidir RPF-ID: 16, Remote Bidir RPF-ID: 0
  I-PMSI:   Unknown/None (0x9f77388)
  I-PMSI rem:  (0x0)
  MS-PMSI:   Tree-SID [524292, 192.168.0.4] (0x9fa2f98)
  Bidir-PMSI:  (0x0)
  Remote Bidir-PMSI:  (0x0)
  BSR-PMSI:  (0x0)
  A-Disc-PMSI:  (0x0)
  A-Ann-PMSI:  (0x0)
  RIB Dependency List: 0x9f81370
  Bidir RIB Dependency List: 0x0
    Sources: 1, RPs: 1, Bidir RPs: 0
```

View Default or Partitioned MDT Database

```
Router# show mvpn vrf vpn1 database segment-routing

Core Type    Core Source        Tree Core        State  On-demand Color
                                Information

Default           0.0.0.0            0 (0x00000)  Down   10
Part          192.168.0.4       524292 (0x80004)    Up   10
  Leaf AD Leg:  192.168.0.3
Control       192.168.0.4            0 (0x00000)  Down   10
```

show ospf routes flex-algo

To display the OSPF routing table for flexible algorithm, use the **show ospf routes flex-algo** command in the EXEC mode.

show ospf routes flex-algo [**number**] [*IP prefix / prefix_len* | **route-type** { **external** | **inter** | **intra** }] [**backup-path**] [**detail**]

Syntax Description

number	Specifies the flexible algorithm number. The range is from 128 to 255.
IP prefix/prefix_len	Specifies IP address along with the subnet mask.
backup-path	Displays the backup-path information of the OSPF routes.
detail	Displays the detailed information of the OSPF routes.
route-typeexternal	Displays OSPF external routes.
route-typeinter	Display OSPF inter area routes.
route-typeintra	Displays OSPF intra area routes.

Command Default

None

Command Modes

EXEC mode

Command History

Release	Modification
Release 7.5.1	This command was introduced.

Usage Guidelines

Use the **show ospf routes flex-algo** command to display the OSPF private routing table for flexible algorithm (which contains only flexible algorithm routes calculated by OSPF). If there is something wrong with a route in the MPLS forwarding table and RIB, then it is useful to check the OSPF copy of the route to determine if it matches the RIB and MPLS forwarding entries. If it does not match, there is a synchronization problem between OSPF and the MPLS. If the routes match and the route is incorrect, OSPF has made an error in its routing calculation.

Example

This following show output displays the external route type configured:

```
Router#show ospf routes flex-algo 240 route-type external detail
Route Table of ospf-1 with router ID 192.168.0.2 (VRF default)

  Algorithm 240

  Route entry for 192.168.4.3/32, Metric 220, SID 536, Label 16536
   Priority : Medium

     Route type : Extern Type 1
```

```
Last updated : Apr 25 14:30:12.718
     Flags: Inuse

     Prefix Contrib Algo 240 SID 536
      From 192.168.0.4 Route-type 5
      Total Metric : 220 Base metric 20 FAPM 20
      Contrib Flags : Inuse, Reachable
      SID Flags : PHP off, Index, Global, Valid

      Path: 10.1.1.3, from 192.168.0.4, via GigabitEthernet0/2/0/2
       Out Label  : 16536
       Weight     : 0
       Area       : 0

      Path: 10.1.2.3, from 192.168.0.4, via GigabitEthernet0/2/0/3
       Out Label  : 16536
       Weight     : 0
       Area       : 0

      Path: 10.2.1.5, from 192.168.0.4, via GigabitEthernet0/2/0/4
       Out Label  : 16536
       Weight     : 0
       Area       : 0

  Route entry for 192.168.4.5/32, Metric 120, SID 556, Label 16556
   Priority : Medium

     Route type : Extern Type 1
     Last updated : Apr 25 14:30:12.724
     Flags: Inuse

     Prefix Contrib Algo 240 SID 556
      From 192.168.0.3 Route-type 5
      Total Metric : 120 Base metric 1 FAPM 20
      Contrib Flags : Inuse, Reachable
      SID Flags : PHP off, Index, Global, Valid

      Path: 10.1.1.3, from 192.168.0.3, via GigabitEthernet0/2/0/2
       Out Label  : 16556
       Weight     : 0
       Area       : 0

      Path: 10.1.2.3, from 192.168.0.3, via GigabitEthernet0/2/0/3
       Out Label  : 16556
       Weight     : 0
       Area       : 0
```

The following show output displays label information for flexible algorithm and its corresponding metric as added in RIB:

```
RP/0/RP0/CPU0:ios# show route 192.168.0.2/32 detail
Wed Apr  6 16:24:46.021 IST

Routing entry for 192.168.0.2/32
  Known via "ospf 1", distance 110, metric 2, labeled SR, type intra area
  Installed Apr  6 15:51:57.973 for 00:32:48
  Routing Descriptor Blocks
    10.10.10.2, from 192.168.0.2, via GigabitEthernet0/2/0/0, Protected
      Route metric is 2
      Label: 0x3 (3)
      Tunnel ID: None
      Binding Label: None
      Extended communities count: 0
      Path id:1       Path ref count:0
```

```
      NHID:0x1(Ref:1)
      Backup path id:65
      OSPF area: 1
    10.11.11.2, from 192.168.0.2, via GigabitEthernet0/2/0/1, Backup (Local-LFA)
      Route metric is 6
      Label: 0x3 (3)
      Tunnel ID: None
      Binding Label: None
      Extended communities count: 0
      Path id:65              Path ref count:1
      NHID:0x2(Ref:1)
      OSPF area:
  Route version is 0x12 (18)
  Local Label: 0x3ee6 (16102)
  Local Label Algo Set (ID, Label, Metric): (1, 16202, 0),(128, 17282, 2)
  IP Precedence: Not Set
  QoS Group ID: Not Set
  Flow-tag: Not Set
  Fwd-class: Not Set
  Route Priority: RIB_PRIORITY_NON_RECURSIVE_MEDIUM (7) SVD Type RIB_SVD_TYPE_LOCAL
  Download Priority 1, Download Version 38
  No advertising protos.
```

The following example shows the backup path for each path:

```
Router#show ospf routes flex-algo 240 route-type external backup-path


Route Table of ospf-1 with router ID 192.168.0.2 (VRF default)

  Algorithm 240

  192.168.4.3/32, Metric 220, SID 536, Label 16536
      10.1.1.3, from 192.168.0.4, via GigabitEthernet0/2/0/2
           Backup path:
              10.23.2.3, from 192.168.0.4, via GigabitEthernet0/2/0/3,
              Out Label: 16536
              Attributes: Metric: 220, Primary , Downstream, Interface Disjoint, SRLG
Disjoint
      10.1.2.3, from 192.168.0.4, via GigabitEthernet0/2/0/3
           Backup path:
              10.23.1.3, from 192.168.0.4, via GigabitEthernet0/2/0/2,
              Out Label: 16536
              Attributes: Metric: 220, Primary , Downstream, Interface Disjoint, SRLG
Disjoint
      10.1.1.5, from 192.168.0.4, via GigabitEthernet0/2/0/4
           Backup path:
              10.23.1.3, from 192.168.0.4, via GigabitEthernet0/2/0/2,
              Out Label: 16536
               Attributes: Metric: 220, Primary , Downstream, Node Protect, Interface Disjoint,
 SRLG Disjoint
  192.168.4.5/32, Metric 120, SID 556, Label 16556
      10.1.1.3, from 192.168.0.3, via GigabitEthernet0/2/0/2
           Backup path:
              10.23.2.3, from 192.168.0.3, via GigabitEthernet0/2/0/3,
              Out Label: 16556
              Attributes: Metric: 120, Primary , Downstream, Interface Disjoint, SRLG
Disjoint
      10.1.2.3, from 192.168.0.3, via GigabitEthernet0/2/0/3
           Backup path:
              10.1.1.3, from 192.168.0.3, via GigabitEthernet0/2/0/2,
              Out Label: 16556
              Attributes: Metric: 120, Primary , Downstream, Interface Disjoint, SRLG
Disjoint
```

The following example shows details of the route, but not the backup paths:

```
Router#show ospf routes flex-algo 240 route-type external detail

Route Table of ospf-1 with router ID 192.168.0.2 (VRF default)

  Algorithm 240

  Route entry for 192.168.4.3/32, Metric 220, SID 536, Label 16536
   Priority : Medium

     Route type : Extern Type 1
     Last updated : Apr 25 14:30:12.718
     Flags: Inuse

     Prefix Contrib Algo 240 SID 536
      From 192.168.0.4 Route-type 5
      Total Metric : 220 Base metric 20 FAPM 20
      Contrib Flags : Inuse, Reachable
      SID Flags : PHP off, Index, Global, Valid

      Path: 10.1.1.3, from 192.168.0.4, via GigabitEthernet0/2/0/2
       Out Label  : 16536
       Weight     : 0
       Area       : 0

      Path: 10.1.2.3, from 192.168.0.4, via GigabitEthernet0/2/0/3
       Out Label  : 16536
       Weight     : 0
       Area       : 0

      Path: 10.2.1.5, from 192.168.0.4, via GigabitEthernet0/2/0/4
       Out Label  : 16536
       Weight     : 0
       Area       : 0

  Route entry for 192.168.4.5/32, Metric 120, SID 556, Label 16556
   Priority : Medium

     Route type : Extern Type 1
     Last updated : Apr 25 14:30:12.724
     Flags: Inuse

     Prefix Contrib Algo 240 SID 556
      From 192.168.0.3 Route-type 5
      Total Metric : 120 Base metric 1 FAPM 20
      Contrib Flags : Inuse, Reachable
      SID Flags : PHP off, Index, Global, Valid

      Path: 10.1.1.3, from 192.168.0.3, via GigabitEthernet0/2/0/2
       Out Label  : 16556
       Weight     : 0
       Area       : 0

      Path: 10.1.2.3, from 192.168.0.3, via GigabitEthernet0/2/0/3
       Out Label  : 16556
       Weight     : 0
       Area       : 0
```

The following example shows details of the route and backup paths:

```
Router#show ospf routes flex-algo 240 route-type external backup-path detail
```

```
Route Table of ospf-1 with router ID 192.168.0.2 (VRF default)

  Algorithm 240

  Route entry for 192.168.4.3/32, Metric 220, SID 536, Label 16536
   Priority : Medium

     Route type : Extern Type 1
     Last updated : Apr 25 14:30:12.718
     Flags: Inuse

     Prefix Contrib Algo 240 SID 536
      From 192.168.0.4 Route-type 5
      Total Metric : 220 Base metric 20 FAPM 20
      Contrib Flags : Inuse, Reachable
      SID Flags : PHP off, Index, Global, Valid

      Path: 10.1.1.3, from 192.168.0.4, via GigabitEthernet0/2/0/2
       Out Label  : 16536
       Weight     : 0
       Area       : 0

           Backup path:
              10.1.2.3, from 192.168.0.4, via GigabitEthernet0/2/0/3,
              Out Label: 16536
              Attributes: Metric: 220, Primary , Downstream, Interface Disjoint, SRLG
Disjoint

      Path: 23.23.2.3, from 192.168.0.4, via GigabitEthernet0/2/0/3
       Out Label  : 16536
       Weight     : 0
       Area       : 0

           Backup path:
              10.1.1.3, from 192.168.0.4, via GigabitEthernet0/2/0/2,
              Out Label: 16536
              Attributes: Metric: 220, Primary , Downstream, Interface Disjoint, SRLG
Disjoint

      Path: 25.25.1.5, from 192.168.0.4, via GigabitEthernet0/2/0/4
       Out Label  : 16536
       Weight     : 0
       Area       : 0

           Backup path:
              10.1.1.3, from 192.168.0.4, via GigabitEthernet0/2/0/2,
              Out Label: 16536
             Attributes: Metric: 220, Primary , Downstream, Node Protect, Interface Disjoint,
 SRLG Disjoint

  Route entry for 192.168.4.5/32, Metric 120, SID 556, Label 16556
   Priority : Medium

     Route type : Extern Type 1
     Last updated : Apr 25 14:30:12.724
     Flags: Inuse

     Prefix Contrib Algo 240 SID 556
      From 192.168.0.3 Route-type 5
      Total Metric : 120 Base metric 1 FAPM 20
      Contrib Flags : Inuse, Reachable
      SID Flags : PHP off, Index, Global, Valid

      Path: 10.1.1.3, from 192.168.0.3, via GigabitEthernet0/2/0/2
```

```
       Out Label  : 16556
       Weight     : 0
       Area       : 0

           Backup path:
              10.1.2.3, from 192.168.0.3, via GigabitEthernet0/2/0/3,
              Out Label: 16556
              Attributes: Metric: 120, Primary , Downstream, Interface Disjoint, SRLG
Disjoint

      Path: 10.1.2.3, from 192.168.0.3, via GigabitEthernet0/2/0/3
       Out Label  : 16556
       Weight     : 0
       Area       : 0

           Backup path:
              10.1.1.3, from 192.168.0.3, via GigabitEthernet0/2/0/2,
              Out Label: 16556
              Attributes: Metric: 120, Primary , Downstream, Interface Disjoint, SRLG
Disjoint
```

show ospf segment-routing prefix-sid-map

To verify the active and backup prefix-to-SID mappings for OSPF, use the **show ospf segment-routing prefix-sid-map** command.

show ospf segment-routing prefix-sid-map [**active-policy** | **backup-policy**]

Syntax Description

active-policy	(Optional) Specifies the active mapping policy.
backup-policy	(Optional) Specifies the backup mapping policy.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 6.1.2	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
ospf	read

Example

The example shows how to verify the active mapping policy on OSPF:

```
RP/0/0/CPU0:router# show ospf segment-routing prefix-sid-map active-policy

        SRMS active policy for Process ID 1

Prefix               SID Index    Range        Flags
1.1.1.100/32         100          20
1.1.1.150/32         150          10

Number of mapping entries: 2
```

The example shows how to verify the backup mapping policy on OSPF:

```
RP/0/0/CPU0:router# show ospf segment-routing prefix-sid-map backup-policy

        SRMS backup policy for Process ID 1

Prefix               SID Index    Range        Flags
```

```
1.1.1.100/32         100          20
1.1.1.150/32         150          10

Number of mapping entries: 2
```

Related Commands

Command	Description
segment-routing mapping-server, on page 113	Configures the segment routing mapping server (SRMS).
segment-routing prefix-sid-map advertise-local	Enables the router to advertise the SRMS entries that are locally configured.
segment-routing prefix-sid-map receive disable	Disables mapping client functionality.
show isis segment-routing prefix-sid-map	Displays the active and backup prefix-to-SID mappings for IS-IS.
show segment-routing mapping-server prefix-sid-map	Displays the locally configured prefix-to-SID mappings.

show mrib nsf private

To display the state of nonstop forwarding (NSF) operation in the Multicast Routing Information Base (MRIB), use the **show mrib nsf private**command in the appropriate mode.

show mrib nsf private

Syntax Description

show mrib nsf private	Displays the state of NSF operation in the MRIB.

Command Default

None

Command Modes

EXEC mode

Table 3: Release History

Release	Modification
Release 7.10.1	This command was modified.

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 **show mrib nsf** command displays the current multicast NSF state for the MRIB. The state may be normal or activated for NSF. The activated state indicates that recovery is in progress due to a failure in MRIB or Protocol Independent Multicast (PIM). The total NSF timeout and time remaining are displayed until NSF expiration.

Table 4: Task ID

Release	Modification
multicast	read

Example

The example shows how to verify the Non Stop Forwarding:

```
Router#show mrib nsf private
Mon Jul 31 13:27:05.056 UTC
IP MRIB Non-Stop Forwarding Status:
Multicast routing state: Normal
   NSF Lifetime:       00:03:00
   Respawn Count: 6
   Last NSF On triggered: Tue Jul 25 13:20:49 2023, 6d00h
   Last NSF Off triggered: Tue Jul 25 13:22:49 2023, 6d00h
   Last NSF ICD Notification sent: Tue Jul 25 13:22:49 2023, 6d00h
   Last Remote NSF On triggered: Tue Jul 25 13:10:18 2023, 6d00h
   Last Remote NSF Off triggered: Tue Jul 25 13:10:27 2023, 6d00h
   Last Label TE NSF On triggered: Tue Jul 25 13:10:18 2023, 6d00h
   Last Label TE NSF Off triggered: Tue Jul 25 13:10:27 2023, 6d00h
```

```
   Last Label mLDP NSF On triggered: Tue Jul 25 13:10:18 2023, 6d00h
   Last Label mLDP NSF Off triggered: Tue Jul 25 13:10:27 2023, 6d00h
   Last Label PIM NSF On triggered: Tue Jul 25 13:20:49 2023, 6d00h
   Last Label PIM NSF Off triggered: Tue Jul 25 13:22:49 2023, 6d00h
   Last Label PIM6 NSF On triggered: Tue Jul 25 13:31:22 2023, 5d23h
   Last Label PIM6 NSF Off triggered: Tue Jul 25 13:33:22 2023, 5d23h
   Last Label XTC NSF On triggered: Tue Jul 25 13:41:51 2023, 5d23h
   Last Label XTC NSF Off triggered: Tue Jul 25 13:41:52 2023, 5d23h

IP NSF :- Active: N, Assume N
MRIB connect timer: Inactive
NSF statistics:
   Enabled Cnt - 4, Disabled Cnt - 4
   Last Enabled: 6d00h, Last Disabled: 6d00h
Multicast COFO routing state: Normal
Current LMRIB clients: LDP RSVP_TE PIM PIM6 XTC
LMRIB NSF clients: LDP RSVP_TE PIM PIM6 XTC
Converged LMRIB clients: LDP RSVP_TE PIM PIM6 XTC
RP/0/RSP0/CPU0:tb8-R2#
```

show pce ipv4

To display the status of the path computation element (PCE) peer, prefix, tunnel, or topology, use the **show pce ipv4** command in EXEC mode.

show pce ipv4 {**peer** [**detail** | **private**] | **prefix** | **topology** [**summary**]}

Syntax Description

peer	Displays the PCE peer database.
detail	Displays detailed PCE peer information.
private	Displays detailed PCE peer information with additional PCEP events that can be used for troubleshooting.
prefix	Displays detailed PCE prefix information.
topology	Displays detailed PCE topology information.
summary	Displays a summary of the PCE topology information.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 24.4.1	The command is enhanced to include the SR-P2MP capability and the number of SR-P2MP instances.
Release 6.2.1	This command was introduced.

Usage Guidelines

Task ID

Task ID	Operation
basic-services	READ

Example

This example shows how to display the PCE peer information:

```
RP/0/RSP0/CPU0:router# show pce ipv4 peer

PCE's peer database:
--------------------
Peer address: 192.168.0.1
  State: Up
  Capabilities: Stateful, Segment-Routing, Update
```

This example shows how to display detailed PCE peer information:

```
RP/0/RSP0/CPU0:router# show pce ipv4 peer detail
PCE's peer database:
--------------------
Peer address: 192.168.0.1
  State: Up
  Capabilities: Stateful, Segment-Routing, Update
  PCEP has been up for: 00:01:50
  PCEP session ID: local 0, remote 0
  Sending KA every 30 seconds
  Minimum acceptable KA interval: 20 seconds
  Peer timeout after 120 seconds
  Statistics:
    Keepalive messages: rx     4 tx     4
    Request messages:   rx     3 tx     0
    Reply messages:     rx     0 tx     3
    Error messages:     rx     0 tx     0
    Open messages:      rx     1 tx     1
    Report messages:    rx     4 tx     0
    Update messages:    rx     0 tx     2
    Initiate messages:  rx     0 tx     0
```

This example shows how to display the PCE prefix information:

```
RP/0/RSP0/CPU0:router# show pce ipv4 prefix

PCE's prefix database:
----------------------
Node 1
 TE router ID: 192.168.0.1
 Host name: rtrA
 ISIS system ID: 1921.6800.1001 level-1
  Advertised Prefixes:
   192.168.0.1

Node 2
 TE router ID: 192.168.0.2
 Host name: rtrB
 ISIS system ID: 1921.6800.1002 level-2
  Advertised Prefixes:
   192.168.0.2
```

This example shows how to display summary of the PCE topology information:

```
RP/0/RSP0/CPU0:router# show pce ipv4 topology summary

PCE's topology database summary:
--------------------------------

Topology nodes:                4
Prefixes:                      4
  Prefix SIDs:                 4
Links:                        12
  Adjacency SIDs:             24
```

In the following sample output, the **SR-P2MP Num Instances** field indicates the number of distinct paths that are currently active, and the **ASSOC-Type-List** field indicates the types of associations that the PCE has with peer devices. The PCEP extensions enable associating different types of LSPs or services through these association types.

```
Router#show pce ipv4 peer private

PCE's peer database:
--------------------
Peer address: 192.168.0.1
  State: Up
  Capabilities: Stateful, Segment-Routing, Update, Instantiation, SRv6, SR-P2MP
  PCEP has been up for: 06:04:36
  PCEP session ID: local 0, remote 0
  Sending KA every 30 seconds
  Minimum acceptable KA interval: 20 seconds
  Peer timeout after 120 seconds
  Maximum SID Depth: 10
  SR-P2MP Num Instances: 1
  ASSOC-Type-List: [2,3,5,6,9]
  Statistics:
    Keepalive messages: rx 729 tx 729
    Request messages:   rx     0 tx     0
    Reply messages:     rx     0 tx     0
    Error messages:     rx     0 tx     0
    Open messages:      rx     1 tx     1
    Report messages:    rx     3 tx     0
    Update messages:    rx     0 tx     1
    Initiate messages:  rx     0 tx     1
    Tx Queue:           curr   0 max    1
  UID: 5, LSP peer UID: 5
Event history (oldest first):
  No events
  Last PCError:
    Received: None
    Sent: None
```

show pce override-rules detail

To display the status of the path computation element (PCE) override rules, use the **show pce override-rules detail** command in PCE configuration mode.

show pce override-rules [**detail**]

Syntax Description

detail	Displays detailed PCE object override-rules information.

Command Default

No default behavior or values

Command Modes

None

Command History

Release	Modification
Release 7.7.1	This command was introduced.

This example shows two override rules configured and each matched with one LSP

```
Router# show pce override-rules detail

PCE's Override Rule database:
-----------------------------
Sequence number: 1
 Matching criteria:
  Peer:
   IPv4 ACL name: PCC1
  LSP
   Regex: ^cfg_test1_.*$
 Override:
  Metric type: Latency
  Constraints:
 Matching LSPs:
  Peer: 192.168.0.1, Tunnel name: cfg_test1_xxx_discr_5

Sequence number: 2
 Matching criteria:
  Peer:
   IPv4 ACL name: PCC1
  LSP
   Regex: ^cfg_test2_.*$
 Override:
  Metric type: IGP
  Constraints:
 Matching LSPs:
  Peer: 192.168.0.1, Tunnel name: cfg_test2_xxx_discr_5
```

show pce lsp

To display information about the path computation element (PCE) tunnel, use the **show pce lsp** command in EXEC mode.

show pce lsp [**detail** | **private**]

Syntax Description

lsp	Displays the PCE tunnel database.
detail	Displays detailed PCE tunnel information.
private	Displays detailed PCE tunnel information with additional LSP events that can be used for troubleshooting.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 6.2.1	This command was introduced.

Usage Guidelines

Task ID

Task ID	Operation

Example

This example shows how to display the PCE tunnel information:

```
RP/0/RSP0/CPU0:router# show pce lsp

PCE's tunnel database:
----------------------
PCC 192.168.0.1:

Tunnel Name: rtrA_t1
 LSPs:
  LSP[0]:
   source 192.168.0.1, destination 192.168.0.4, tunnel ID 1, LSP ID 2
   State: Admin up, Operation up
   Setup type: Segment Routing
   Binding SID: 24013
```

This example shows how to display detailed PCE tunnel information:

```
RP/0/RSP0/CPU0:router# show pce lsp detail

PCE's tunnel database:
```

```
----------------------
PCC 192.168.0.1:

Tunnel Name: rtrA_t1
 LSPs:
  LSP[0]:
   source 192.168.0.1, destination 192.168.0.4, tunnel ID 1, LSP ID 2
   State: Admin up, Operation up
   Setup type: Segment Routing
   Binding SID: 24013
   PCEP information:
     plsp-id 2, flags: D:1 S:0 R:0 A:1 O:1
   Reported path:
     Metric type: TE, Accumulated Metric 42
      SID[0]: Adj, Label 24000, Address: local 10.10.10.1 remote 10.10.10.2
      SID[1]: Adj, Label 24000, Address: local 14.14.14.2 remote 14.14.14.4
   Computed path:
     Metric type: TE, Accumulated Metric 42
      SID[0]: Adj, Label 24000, Address: local 10.10.10.1 remote 10.10.10.2
      SID[1]: Adj, Label 24000, Address: local 14.14.14.2 remote 14.14.14.4
   Recorded path:
     None
```

This example shows how to display detailed PCE tunnel information with additional LSP events:

```
RP/0/RSP0/CPU0:router# show pce lsp detail

PCE's tunnel database:
----------------------
PCC 192.168.0.1:

Tunnel Name: rtrA_t1
 LSPs:
  LSP[0]:
   source 192.168.0.1, destination 192.168.0.4, tunnel ID 1, LSP ID 2
   State: Admin up, Operation up
   Setup type: Segment Routing
   Binding SID: 24013
   PCEP information:
     plsp-id 2, flags: D:1 S:0 R:0 A:1 O:1
   Reported path:
     Metric type: TE, Accumulated Metric 42
      SID[0]: Adj, Label 24000, Address: local 10.10.10.1 remote 10.10.10.2
      SID[1]: Adj, Label 24000, Address: local 14.14.14.2 remote 14.14.14.4
   Computed path:
     Metric type: TE, Accumulated Metric 42
      SID[0]: Adj, Label 24000, Address: local 10.10.10.1 remote 10.10.10.2
      SID[1]: Adj, Label 24000, Address: local 14.14.14.2 remote 14.14.14.4
   Recorded path:
     None
 Event history (latest first):
  Time                      Event
  June 13 2016 13:28:29     Report
                            Symbolic-name: rtrA_t1, LSP-ID: 2,
                            Source: 192.168.0.1 Destination: 192.168.0.4,
                            D:1, R:0, A:1 O:1, Sig.BW: 0, Act.BW: 0
  June 13 2016 13:28:28     Report
                            Symbolic-name: rtrA_t1, LSP-ID: 2,
                            Source: 192.168.0.1 Destination: 192.168.0.4,
                            D:1, R:0, A:1 O:1, Sig.BW: 0, Act.BW: 0
  June 13 2016 13:28:28     Create
                            Symbolic-name: rtrA_t1, PLSP-ID: 2,
```

```
Peer: 192.168.0.1
```

show pce lsp p2mp

To view IP VPN multicast traffic details (such as LSP details) on the SR-PCE server, use the **show pce lsp p2mp** command in EXEC mode.

show pce lsp p2mp [**root ipv4** *address*] [*tree-ID*]

Syntax Description

root ipv4 *address*	(Optional) The multicast tree's root router IP address. Information will be displayed for the specified router.
tree-ID	(Optional) Multicast tree SID used (by multicast routers and the SR-PCE server) for transporting the IP VPN multicast traffic. Information will be displayed for the specified Tree-SID.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 7.3.1	This command was introduced.

Example

The following example shows how to view IP VPN multicast traffic details on the SR-PCE server. The routes are created and managed by the SR-PCE server.

View SR-PCE Multicast Tree Configuration Information

```
Router# show pce lsp p2mp

Tree: sr_p2mp_root_192.168.0.1_tree_id_524290
 Label:    18000     Operational: up  Admin: up
 Metric Type: TE
 Transition count: 3
 Uptime: 00:00:03 (since Fri Jan 24 14:57:51 PST 2020)
 Source: 192.168.0.1
 Destinations: 192.168.0.4
 Nodes:
  Node[0]: 192.168.0.2 (rtrM)
   Role: Transit
   Hops:
    Incoming: 18000 CC-ID: 4
    Outgoing: 18000 CC-ID: 4 (17.17.17.4) [rtrR]
  Node[1]: 192.168.0.1 (rtrL1)
   Role: Ingress
   Hops:
    Incoming: 18000 CC-ID: 5
    Outgoing: 18000 CC-ID: 5 (12.12.12.2) [rtrM]
  Node[2]: 192.168.0.4 (rtrR)
   Role: Egress
   Hops:
    Incoming: 18000 CC-ID: 6
```

For dynamic SR multicast trees created for MVPN, the **show** command has filters to view root multicast router and Tree-ID information. When the root router is specified, all multicast trees from that root are displayed. When root and Tree-ID are specified, only the specified tree information is displayed.

```
Router# show pce lsp  p2mp root ipv4 1.1.1.1 524289

Tree: sr_p2mp_root_1.1.1.1_tree_id_524289, Root: 1.1.1.1 ID: 524289
 Label:    20000     Operational: up  Admin: up
 PCC: 1.1.1.1

 Local LFA FRR: Disabled
 Metric Type: TE
 Transition count: 11
 Uptime: 00:03:37 (since Mon May 11 12:53:33 PDT 2020)
 Destinations: 1.1.1.3, 1.1.1.4, 1.1.1.5
 Nodes:
  Node[0]: 1.1.1.1 (root1)
   Role: Ingress
   Hops:
    Incoming: 20000 CC-ID: 26
    Outgoing: 20000 CC-ID: 26 (192.168.114.4) [mid-4]
    Outgoing: 20000 CC-ID: 26 (192.168.112.2) [mid-2]
  Node[1]: 1.1.1.4 (mid-4)
   Role: Egress
   Hops:
    Incoming: 20000 CC-ID: 27
  Node[2]: 1.1.1.2 (mid-2)
   Role: Transit
   Hops:
    Incoming: 20000 CC-ID: 28
    Outgoing: 20000 CC-ID: 28 (192.168.123.3) [leaf-3]
    Outgoing: 20000 CC-ID: 28 (192.168.125.5) [leaf-5]
  Node[3]: 1.1.1.3 (leaf-3)
   Role: Egress
   Hops:
    Incoming: 20000 CC-ID: 29
  Node[4]: 1.1.1.5 (leaf-5)
   Role: Egress
   Hops:
    Incoming: 20000 CC-ID: 30
```

The following output shows that LFA FRR is enabled on the hop from rtrR to rtrM. Unlike typical multicast replication where the address displayed is the remote address on the link to a downstream router, the IP address 192.168.0.3 (displayed with an exclamation mark) is the router-ID of the downstream router rtrM. The output also displays the LFA FRR state for the multicast tree.

```
Router# show pce lsp p2mp

Tree: sr_p2mp_root_192.168.0.4_tree_id_524290
 Label:    18000     Operational: up  Admin: up
 LFA FRR: Enabled
 Metric Type: TE
 Transition count: 1
 Uptime: 3d19h (since Thu Feb 13 13:43:40 PST 2020)
 Source: 192.168.0.4
 Destinations: 192.168.0.1, 192.168.0.2
 Nodes:
  Node[0]: 192.168.0.3 (rtrM)
   Role: Transit
   Hops:
    Incoming: 18000 CC-ID: 1
    Outgoing: 18000 CC-ID: 1 (12.12.12.1) [rtrL1]
```

```
  Outgoing: 18000 CC-ID: 1 (15.15.15.2) [rtrL2]
Node[1]: 192.168.0.4 (rtrR)
 Role: Ingress
 Hops:
  Incoming: 18000 CC-ID: 2
  Outgoing: 18000 CC-ID: 2 (192.168.0.3!) [rtrM]
Node[2]: 192.168.0.1 (rtrL1)
 Role: Egress
 Hops:
  Incoming: 18000 CC-ID: 3
Node[3]: 192.168.0.2 (rtrL2)
 Role: Egress
 Hops:
  Incoming: 18000 CC-ID: 4
```

show performance-measurement history

To display the history for delay-measurement, use the **performance-measurement history** show command in EXEC mode.

show performance-measurement history { **probe-computation** | **advertisement** | **aggregation** } { **interfaces** | **endpoint** | **rsvp-te** | **sr-policy** }

Syntax Description

probe-computation	(Optional) Displays information for the delay metric computation result within each probe interval.
advertisement	(Optional) Displays information for the delay metric computation result within each advertisement interval.
aggregation	(Optional) Displays information for the delay metric computation result within each aggregation interval.
interface	(Optional) Displays information on the specified interface.
endpoint	(Optional) Displays information on the specified endpoint.
rsvp-te	(Optional) Displays information on the specified Resource Reservation Protocol - Traffic Engineering (RSVP-TE).
sr-policy	(Optional) Displays information on the specified sr-policy.

Command Default

No default

Command Modes

EXEC

Command History

Release	Modification
Release 24.1.1	This command was updated with synthetic and anomaly loss information.
Release 7.3.1	This command was introduced.

Task ID

Task ID	Operation
performance-measurement	write/read

```
Router# show performance-measurement history probe-computation interfaces
Interface Name: GigabitEthernet0/2/0/0 (ifh: 0x1000020)
Delay-Measurement history (uSec):
  Probe Start Timestamp     Pkt(TX/RX)   Average       Min       Max
  Aug 01 2023 08:04:15.230       10/10       704       651       779
```

```
Router# show performance-measurement history probe-computation endpoint
Endpoint name: IPv4-192.168.0.4-vrf-default
  …
```

```
  Segment-List              : None
    Delay-Measurement history (uSec):
      Probe Start Timestamp     Pkt(TX/RX)   Average       Min       Max
      Aug 01 2023 08:26:48.823       10/10      3399      2962      3808
```

```
Router# show performance-measurement history aggregation rsvp-te
...
Delay-Measurement history (uSec):
      Aggregation Timestamp     Pkt(TX/RX)   Average       Min       Max
      Aug 01 2023 08:37:23.702       40/40      3372      3172      4109
```

```
Router# show performance-measurement history advertisement sr-policy
...
Delay-Measurement history (uSec):
          Advertisement Timestamp   Pkt(TX/RX)   Average       Min       Max         Reason
          Aug 01 2023 10:05:14.072       24/24      3408      3408      3408      ACCEL-MAX
```

Table 5: This table gives show performance-measurement history field descriptions:

Field	Description
TX	Number of packets sent.
RX	Number of packets received.
Average	Average delay of all the delay measures within one probe.
Max	Maximum delay of all the delay measures within one probe.
Min	Minimum delay of all the delay measures within one probe.

Reason	Provides the reason for the delay in packets:" • NONE : No advertisements occurred • PER-AVG : Periodic timer, average delay threshold crossed • PER-MIN : Periodic timer, min delay threshold crossed • PER-MAX : Periodic timer, max delay threshold crossed • ACCEL-AVG : Accelerated threshold crossed, average delay threshold crossed • ACCEL-MIN : Accelerated threshold crossed, min delay threshold crossed • ACCEL-MAX : Accelerated threshold crossed, max delay threshold crossed • ACCEL-UP-AVG : Accelerated threshold crossed, average delay upper-bound crossed • ACCEL-UP-MIN : Accelerated threshold crossed, min delay upper-bound crossed • ACCEL-UP-MAX : Accelerated threshold crossed, max delay upper-bound crossed • ANOM-MIN-DYN : Min delay A flag toggled and dynamic delay is in effect • ANOM-MIN-STA : Min delay A flag toggled and static delay is in effect • FIRST : First advertisement • NEW-SESSION : New child session • ENABLE : Advertisement enabled • DISABLE : Advertisement disabled • DELETE : Session deleted • EXEC-CLEAR : Cleared through exec command • ADV-CFG : Advertise delay config • ADV-UNCFG : Advertise delay unconfig • ERROR : Control code error • LINK-DOWN : Link state changed to down • SESSION-ERROR : Performance measurement session error • DYN-DM : Dynamic delay advertisement is in effect • PT-CFG : Path tracing config • PT-UNCFG : Path tracing unconfig • PT-INTF_READY : Path tracing interface ready • PKT-LOSS : Packet loss detected • ANOM-PKT-LOSS : PM session anomaly due to packet loss • N/A : Invalid advertisement reason

show pim vrf

To view SR multicast tree information for *data* MDTs, including cache, router-local, and remote MDT information, use the **show pim vrf** command in EXEC mode.

show pim vrf *name* **mdt sr-p2mp** { **local tree-id** *value* | **remote** | **cache** [*core-src-ip-add* [*cust-src-ip-add cust-grp-ip-add*]] }

Syntax Description

vrf *name*	VRF for which information is to be displayed.
mdt sr-p2mp	Specifies that the multicast traffic is transported using SR multicast. The MDT-specific information that is to be displayed, has to be provided from the subsequent choices. Based on the chosen option, information is displayed.
local tree-id *value*	Specifies a locally assigned Tree-SID of the *data* MDT core tree.
remote	Specifies a Tree-SID of the *data* MDT tree that is learnt from remote PE routers.
cache [*core-src-ip-add* [*cust-src-ip-add cust-grp-ip-add*]]	Specifies data MDT cache information.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 7.3.1	This command was introduced.

Example

You can view SR multicast tree information for *data* MDTs, including cache, router-local, and remote MDT information, with these commands.

View Data MDT Cache Information

```
Router# show pim vrf vpn1 mdt cache

Core Source      Cust (Source, Group)               Core Data        Expires
192.168.0.3      (26.3.233.1, 232.0.0.1)            [tree-id 524292]  never
192.168.0.4      (27.3.233.6, 232.0.0.1)            [tree-id 524290]  never
   Leaf AD:  192.168.0.3
```

View Local MDT information

```
Router# show pim vrf vpn1 mdt sr-p2mp local

Tree                          MDT            Cache DIP Local VRF Routes  Ondemand
Identifier                    Source         Count     Entry Using Cache Color
[tree-id 524290 (0x80002)]    192.168.0.4    1     N   Y     1           10
   Tree-SID Leaf:  192.168.0.3
```

Remote MDT information

```
Router # show pim vrf vpn1 mdt sr-p2mp remote

Tree                            MDT             Cache DIP Local VRF Routes  On-demand
Identifier                      Source          Count     Entry Using Cache Color
[tree-id 524290 (0x80002)]      192.168.0.4     1     N   N     1           0
```

show segment-routing local-block inconsistencies

Displays any segment routing local block (SRLB) label inconsistencies.

show segment-routing local-block inconsistencies

Syntax Description

This command has no keywords or arguments.

Command Default

None

Command Modes

EXEC

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.

When a new SRLB range is defined, there might be a label conflict (for example, if labels are already allocated, statically or dynamically, in the new SRLB range). In this case, the new SRLB range will be accepted, but not applied (pending). The previous SRLB range (active) will continue to be in use until one of the following occurs:

- Reload the router to release the currently allocated labels and allocate the new SRLB
- Use the **clear segment-routing local-block discrepancy all** command to clear the label conflicts

Task ID

Task ID	Operation

Example

This example shows how to display the SRGB inconsistencies:

```
RP/0/RSP0/CPU0:router(config)# show segment-routing local-block inconsistencies
Tue Aug 15 13:53:30.555 EDT
SRLB inconsistencies range: Start/End: 30000/30009
```

Related Commands

Command	Description
clear segment-routing local-block discrepancy all, on page 17	Clears SRLB label conflicts
segment-routing local-block, on page 111	Configures the SRLB

show segment-routing mapping-server prefix-sid-map

To verify the locally configured prefix-to-SID mappings, use the **show segment-routing mapping-server prefix-sid-map** command.

show segment-routing mapping-server prefix-sid-map [**ipv4** | **ipv6**] [*prefix*] [**detail**]

Syntax Description

ipv4	(Optional) Specifies an IPv4 address family.
ipv6	(Optional) Specifies an IPv6 address family.
prefix	(Optional) Specifies a prefix.
detail	(Optional) Displays detailed information on the prefix-to-SID mappings.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 6.1.2	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
	read

Example

The example shows how to verify the IPv4 prefix-to-SID mappings:

```
RP/0/0/CPU0:router# show segment-routing mapping-server prefix-sid-map ipv4
Prefix               SID Index    Range        Flags
20.1.1.0/24          400          300
10.1.1.1/32          10           200
Number of mapping entries: 2
```

The example shows how to display detailed information on the IPv4 prefix-to-SID mappings:

```
RP/0/0/CPU0:router# show segment-routing mapping-server prefix-sid-map ipv4 detail
Prefix
20.1.1.0/24
    SID Index:      400
```

```
    Range:          300
    Last Prefix:    20.2.44.0/24
    Last SID Index: 699
    Flags:
10.1.1.1/32
    SID Index:      10
    Range:          200
    Last Prefix:    10.1.1.200/32
    Last SID Index: 209
    Flags:
Number of mapping entries: 2
```

Related Commands

Command	Description
segment-routing mapping-server, on page 113	Configures the segment routing mapping server (SRMS).
segment-routing prefix-sid-map advertise-local	Enables the router to advertise the SRMS entries that are locally configured.
segment-routing prefix-sid-map receive disable	Disables mapping client functionality.
show isis segment-routing prefix-sid-map	Displays the active and backup prefix-to-SID mappings for IS-IS.
show ospf segment-routing prefix-sid-map	Displays the active and backup prefix-to-SID mappings for OSPF.

show segment-routing srv6 sid

You can use the **show segment-routing srv6 sid** command to verify the SRv6 global and locator configuration.

show segment-routing srv6 sid

Syntax Description

This command has no keywords or arguments.

Command Default

None

Command Modes

EXEC mode

Command History

Release	Modification
Release 7.8.1	This command output was modified.
Release 7.0.12	This command was introduced.

Usage Guidelines

The command displays SID information across locators. By default, only “active” (i.e. non-stale) SIDs are displayed.

From IOS XR Release 7.8.1, IOS XR nodes with SRv6 Micro-SID F3216 format will accept and allow service SIDs received from non-IOS XR node peers with SRv6 base F128. Non-IOS XR node peers can be without SID Struct TLV (SSTLV), or with an incompatible SSTLV having an SID that is F3216 compatible. This allows for interoperability without any IETF extension or configuration changes on the Non-IOS XR peer node.

The following example shows how to display detailed information on the remote side, with the allocation type:

```
Router# show segment-routing srv6 locator usid sid fccc:ccc1:1:e00f::
 Mon Dec 13 15:58:53.640 EST
 SID                         Behavior          Context                           Owner
           State  RW
 --------------------------  ----------------  ------------------------------
------------------  -----  --
 fccc:ccc1:1:e00f::          uDT46             '**iid'
rib_lib_test_xtf    InUse  Y
   SID Function: 0xe00f
   SID context: { '**iid' }
     App data: [0000000000000000]
   Locator: 'usid'
   Allocation type: Dynamic | Explicit
```

show segment-routing traffic-eng p2mp policy

To view SR-TE multicast policy information that is used for transporting IP VPN multicast traffic, use the **show segment-routing traffic-eng p2mp policy** command in EXEC mode.

show segment-routing traffic-eng p2mp policy [**name** *policy* | **root ipv4** *address* [*tree-ID*]]

Syntax Description

name *policy*	Policy for which information is to be displayed.
root ipv4 *address* [*tree-ID*]	Specifies that information be displayed for the specified multicast tree root router and the Tree-SID.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 7.3.1	This command was introduced.

Example

The following example shows how to view SR-TE multicast policy information.

Multicast Tree Information on Routers

```
Router# show segment-routing traffic-eng p2mp policy

SR-TE P2MP policy database:
---------------------
! - Replications with Fast Re-route

Policy: sr_p2mp_root_192.168.0.1_tree_id_524290  LSM-ID: 0x2
 Role: Leaf
 Replication:
  Incoming label: 18001 CC-ID: 6

Policy: sr_p2mp_root_192.168.0.4_tree_id_524290  LSM-ID: 0x80002 (PCC-initiated)
 Color: 0
 LFA FRR: Disabled
 Role: Root
 Replication:
  Incoming label: 18000 CC-ID: 2
  Interface: None [192.168.0.3!]  Outgoing label: 18000 CC-ID: 2
 Endpoints:
  192.168.0.1, 192.168.0.2
```

For SR multicast policies originated locally on the router (root router of a dynamic MVPN multicast policy) additional policy information is displayed. The information includes color, end points, and whether LFA FRR is requested by the local application. When the SR-PCE server enables LFA FRR on a specific hop, the outgoing information shows the address of the next router with an exclamation mark and None is displayed for the outgoing interface.

For dynamic SR multicast trees created for MVPN, the **show** command has filters for displaying root multicast router and Tree-ID information. When the root router is specified, all multicast trees for that root are displayed. When root and Tree-ID are specified, only the specified tree information is displayed.

```
Router# show segment-routing traffic-eng p2mp policy root ipv4 1.1$

SR-TE P2MP policy database:
---------------------
! - Replications with Fast Re-route, * - Stale dynamic policies/endpoints

Policy: sr_p2mp_root_1.1.1.1_tree_id_524289  LSM-ID: 0x691
 Root: 1.1.1.1, ID: 524289
 Role: Transit
 Replication:
  Incoming label: 20000 CC-ID: 28
  Interface: Bundle-Ether23 [192.168.123.3]  Outgoing label: 20000 CC-ID: 28
  Interface: Bundle-Ether25 [192.168.125.5]  Outgoing label: 20000 CC-ID: 28

Policy: sr_p2mp_root_1.1.1.1_tree_id_524290  LSM-ID: 0x692
 Root: 1.1.1.1, ID: 524290
 Role: Transit
 Replication:
  Incoming label: 19999 CC-ID: 28
  Interface: Bundle-Ether23 [192.168.123.3]  Outgoing label: 19999 CC-ID: 28
  Interface: Bundle-Ether25 [192.168.125.5]  Outgoing label: 19999 CC-ID: 28
```

show segment-routing traffic-eng pcc

To monitor and troubleshoot the Path Computation Client (PCC) in SR-TE, use the **show segment-routing traffic-eng pcc** command in EXEC mode. Use the command to ensure proper operation and management of SR-TE paths in a network where PCC delegates path computation to a PCE.

show segment-routing traffic-eng pcc { *ipv4 ipv6* } **peer**

Syntax Description

pcc	Path computation client configuration details.
ipv4	Specifies that the information displayed includes the source and destination endpoints for SR-TE tunnels using IPv4 addresses.
ipv6	Specifies that the information displayed includes the source and destination endpoints for SR-TE tunnels using IPv6 addresses.
peer	Displays details of the PCE that communicates with the PCC.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 24.4.1	The command is enhanced to include the SR-P2MP capability and the number of SR-P2MP instances.
Release 7.3.1	This command was introduced.

Usage Guidelines

None.

Task ID

Task ID	Operation
basic-services	READ

Example

The following output confirms that both the local and remote PCCs can handle SR-P2MP paths, each with one active instance.

```
Router#show segment-routing traffic-eng pcc ipv4 peer internal

PCC's peer database:
--------------------

PEER                          : 192.168.0.5
  State                       : up
  Handle                      : 1
  PCE group                   : ''
  Precedence                  : 255
  local stateful              : yes
```

```
remote stateful              : yes
local stateful U-flag        : yes
remote stateful U-flag       : yes
local segment-routing        : yes
remote segment-routing       : yes
local srv6                   : yes
remote srv6                  : yes
local instantiation cap      : yes
remote instantiation cap     : yes
local sr p2mp                : yes
remote sr p2mp               : yes
local maximum stack depth    : 10
remote maximum stack depth   : 0
local sr p2mp num instances  : 1
remote sr p2mp num instances : 1
local keepalive interval     : 30
remote keepalive interval    : 30
local deadtime interval      : 120
remote deadtime interval     : 120
Local PCEP session ID        : 1
Remote PCEP session ID       : 0
Remote PCEP conn addr        : 192.168.0.5
Local PCEP conn addr         : 192.168.0.4
KA messages rxed             : 721
KA messages txed             : 721
KA messages fail rxed        : 0
KA messages fail txed        : 0
PCReq messages rxed          : 0
PCReq messages txed          : 0
PCReq messages fail rxed     : 0
PCReq messages fail txed     : 0
PCRep messages rxed          : 0
PCRep messages txed          : 0
PCRep messages fail rxed     : 0
PCRep messages fail txed     : 0
PCRpt messages rxed          : 0
PCRpt messages txed          : 3
PCRpt messages fail rxed     : 0
PCRpt messages fail txed     : 0
PCUpd messages rxed          : 1
PCUpd messages txed          : 0
PCUpd messages fail rxed     : 0
PCUpd messages fail txed     : 0
Open messages rxed           : 1
Open messages txed           : 1
Open messages fail rxed      : 0
Open messages fail txed      : 5
PCErr messages rxed          : 0
PCErr messages txed          : 0
PCErr messages fail rxed     : 0
PCErr messages fail txed     : 0
PCNtf messages rxed          : 0
PCNtf messages txed          : 0
PCNtf messages fail rxed     : 0
PCNtf messages fail txed     : 0
EOS messages txed            : 1
EOS messages fail txed       : 0
Close messages rxed          : 0
Close messages txed          : 0
Close messages fail rxed     : 0
Close messages fail txed     : 0
Unexpected messages rxed     : 0
Corrupted messages rxed      : 0
Average reply time from peer : 0
```

```
Min reply time from peer     : 0
Max reply time from peer     : 0
Requests timed out           : 0
Local OK                     : yes
Remote OK                    : yes
Open retry                   : 0
Ref count                    : 3
Rx state                     : ready
Holddown count               : 0
Socket info
-----------
  file descriptor            : 119
  w_notify                   : no
  r_notify                   : yes
  refcnt                     : 1
  selected                   : no
  owner                      : 0
  client addr                : 192.168.0.4:16437
  server addr                : 192.168.0.5:4189
  Request list
------------
Timers
  Holddown timer             : Not running
  Dead timer                 : Running
  Redelegation timer         : Not running
```

show traffic-collector

To retrieve data about traffic routed through the system, use the **show traffic-collector** command.

show traffic-collector [**external-interface** | **ipv4**]

Syntax Description

external-interface	Use this option to list configured external interfaces.
ipv4	Use this option to access information about the ipv4 address family.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 6.0.1	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
	read: cef

Example

This example shows how to display the L3 interfaces marked as external:

```
RP/0/RSP0/CPU0:router# show traffic-collector external-interface
Fri Nov  6 09:02:13.025 EST
  Interface             Status
  --------------------  ----------------
  Gi0/0/0/1             Enabled
  Gi0/0/0/3             Enabled
```

Related Commands

Command	Description
clear traffic-collector ipv4 counters prefix	Clears all statistical counters for IPv4 prefixes.
traffic-collector interface	Marks an interface as external for traffic matrix counters.
traffic-collector	enable traffic collector and places the router in traffic collector configuration mode.

show traffic-collector ipv4 counters label

To display base and traffic matrix statistics for the specified prefix label, use the **show traffic-collector ipv4 counters label** command.

show traffic-collector ipv4 counters label *label* [**base** | **tm**] [**detail**]

Syntax Description

label	Specifies a label.
base	Displays packet rates for base counters averaged over a defined number of histories.
tm	Displays packet and byte rates for traffic matrix counters (which cover traffic from interfaces marked as external sent to SR prefixes and labels) averaged over a defined number of histories.
detail	Displays packet and byte rates for base traffic matrix counters averaged over a defined number of histories. The histories are also listed. **Note** The **detail** option can be used with the **base** or **tm** options separately to show history information for the respective counter.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 6.0.1	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
	read: cef

Example

This example shows the base counters for label 20001:

```
RP/0/0/CPU0:router# show traffic-collector ipv4 counters label 20001 base
Fri Nov  6 09:09:13.102 EST
Prefix                          Label     Base rate     Base rate     State
                                          (Packet/sec)  (Bytes/sec)
------------------------------  --------  ------------  ------------  ----------
192.168.0.1/32                  20001     0             0             Active
```

This example shows the TM counters for label 20001:

```
RP/0/0/CPU0:router# show traffic-collector ipv4 counters label 20001 tm
Fri Nov  6 09:08:55.537 EST
Prefix                          Label     TM rate       TM rate       State
                                          (Packet/sec)  (Bytes/sec)
------------------------------  --------  ------------  ------------  ----------
192.168.0.1/32                  20001     0             0             Active
```

This example shows detailed information for the base and TM counters for label 20001:

```
RP/0/0/CPU0:router# show traffic-collector ipv4 counters label 20001 detail
Fri Nov  6 09:08:36.201 EST
Prefix: 192.168.0.1/32  Label: 20001 State: Active
Base:
    Average over the last 3 collection intervals:
        Packet rate: 0 pps, Byte rate: 0 Bps

    History of counters:
        09:07 - 09:08: Packets                    0, Bytes:                    0
        09:06 - 09:07: Packets                    0, Bytes:                    0
        09:05 - 09:06: Packets                    0, Bytes:                    0
TM Counters:
    Average over the last 3 collection intervals:
        Packet rate: 0 pps, Byte rate: 0 Bps

    History of counters:
        09:07 - 09:08: Packets                    0, Bytes:                    0
        09:06 - 09:07: Packets                    0, Bytes:                    0
        09:05 - 09:06: Packets                    0, Bytes:                    0
```

This example shows detailed information for the base counters for label 20001:

```
RP/0/0/CPU0:router# show traffic-collector ipv4 counters label 20001 base detail
Fri Nov  6 09:09:51.973 EST
Prefix: 192.168.0.1/32  Label: 20001 State: Active
Base:
    Average over the last 3 collection intervals:
        Packet rate: 0 pps, Byte rate: 0 Bps

    History of counters:
        09:08 - 09:09: Packets                    0, Bytes:                    0
        09:07 - 09:08: Packets                    0, Bytes:                    0
        09:06 - 09:07: Packets                    0, Bytes:                    0
```

This example shows detailed information for the TM counters for label 20001:

```
RP/0/0/CPU0:router# show traffic-collector ipv4 counters label 20001 tm detail
Fri Nov  6 09:09:40.126 EST
Prefix: 192.168.0.1/32  Label: 20001 State: Active
TM Counters:
    Average over the last 3 collection intervals:
        Packet rate: 0 pps, Byte rate: 0 Bps

    History of counters:
        09:08 - 09:09: Packets                    0, Bytes:                    0
        09:07 - 09:08: Packets                    0, Bytes:                    0
        09:06 - 09:07: Packets                    0, Bytes:                    0
```

Related Commands

Command	Description
clear traffic-collector ipv4 counters prefix	Clears all statistical counters for IPv4 prefixes.
show traffic-collector	Retrieves data about traffic routed through the system.
traffic-collector	enable traffic collector and places the router in traffic collector configuration mode.

show traffic-collector ipv4 counters prefix

To display base and traffic matrix statistics for the IPv4 prefixes, use the **show traffic-collector ipv4 counters prefix** command.

show traffic-collector ipv4 counters prefix [*prefix*] [**base** | **tm**] [**detail**]

Syntax Description

prefix	Specifies a prefix.
base	Displays packet and byte rates for base counters averaged over a defined number of histories.
tm	Displays packet and byte rates for traffic matrix counters (which cover traffic from interfaces marked as external sent to SR prefixes and labels) averaged over a defined number of histories.
detail	Displays packet rates for base traffic matrix counters averaged over a defined number of histories. The histories are also listed. **Note** The **detail** option can be used with the **base** or **tm** options separately to show history information for the respective counter.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 6.0.1	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
	read: cef

Example

This example shows the base and TM counters for all prefixes:

```
RP/0/0/CPU0:router# show traffic-collector ipv4 counters prefix
Fri Nov  6 09:10:17.439 EST
Prefix                          Label     Base rate     TM rate       State
                                          (Bytes/sec)   (Bytes/sec)
------------------------------  --------  ------------  ------------  ----------
```

```
192.168.0.1/32                 20001     0             0             Active
192.168.0.3/32                 20003     0             0             Active
192.168.0.4/32                 20004     0             0             Active
```

This example shows the base and TM counters for the specified prefix:

```
RP/0/0/CPU0:router# show traffic-collector ipv4 counters prefix 192.168.0.4/32
Fri Nov  6 09:12:04.116 EST
Prefix                         Label     Base rate     TM rate       State
                                         (Bytes/sec)   (Bytes/sec)
-----------------------------  --------  ------------  ------------  ----------
192.168.0.4/32                 20004     0             0             Active
```

This example shows the base counters for all prefixes:

```
RP/0/0/CPU0:router# show traffic-collector ipv4 counters prefix base
Fri Nov  6 09:10:31.316 EST
Prefix                         Label     Base rate     Base rate     State
                                         (Packet/sec)  (Bytes/sec)
-----------------------------  --------  ------------  ------------  ----------
192.168.0.1/32                 20001     0             0             Active
192.168.0.3/32                 20003     0             0             Active
192.168.0.4/32                 20004     0             0             Active
```

This example shows detailed base and TM counter information for all prefixes:

```
RP/0/0/CPU0:router# show traffic-collector ipv4 counters prefix detail
Fri Nov  6 09:10:55.516 EST
Prefix: 192.168.0.1/32  Label: 20001 State: Active
Base:
    Average over the last 3 collection intervals:
        Packet rate: 0 pps, Byte rate: 0 Bps

    History of counters:
        09:09 - 09:10: Packets                   0, Bytes:                   0
        09:08 - 09:09: Packets                   0, Bytes:                   0
        09:07 - 09:08: Packets                   0, Bytes:                   0
TM Counters:
    Average over the last 3 collection intervals:
        Packet rate: 0 pps, Byte rate: 0 Bps

    History of counters:
        09:09 - 09:10: Packets                   0, Bytes:                   0
        09:08 - 09:09: Packets                   0, Bytes:                   0
        09:07 - 09:08: Packets                   0, Bytes:                   0

Prefix: 192.168.0.3/32  Label: 20003 State: Active
Base:
    Average over the last 3 collection intervals:
        Packet rate: 0 pps, Byte rate: 0 Bps

    History of counters:
        09:09 - 09:10: Packets                   0, Bytes:                   0
        09:08 - 09:09: Packets                   0, Bytes:                   0
        09:07 - 09:08: Packets                   0, Bytes:                   0
TM Counters:
    Average over the last 3 collection intervals:
        Packet rate: 0 pps, Byte rate: 0 Bps

    History of counters:
```

```
        09:09 - 09:10: Packets                    0, Bytes:                    0
        09:08 - 09:09: Packets                    0, Bytes:                    0
        09:07 - 09:08: Packets                    0, Bytes:                    0

Prefix: 192.168.0.4/32  Label: 20004 State: Active
Base:
    Average over the last 3 collection intervals:
        Packet rate: 0 pps, Byte rate: 0 Bps

    History of counters:
        09:09 - 09:10: Packets                    0, Bytes:                    0
        09:08 - 09:09: Packets                    0, Bytes:                    0
        09:07 - 09:08: Packets                    0, Bytes:                    0
TM Counters:
    Average over the last 3 collection intervals:
        Packet rate: 0 pps, Byte rate: 0 Bps

    History of counters:
        09:09 - 09:10: Packets                    0, Bytes:                    0
        09:08 - 09:09: Packets                    0, Bytes:                    0
        09:07 - 09:08: Packets                    0, Bytes:                    0
```

This example shows the TM counters for all prefixes:

```
RP/0/0/CPU0:router# show traffic-collector ipv4 counters prefix tm
Fri Nov  6 09:10:40.859 EST
Prefix                          Label     TM rate       TM rate       State
                                          (Packet/sec)  (Bytes/sec)
------------------------------  --------  ------------  ------------  ----------
192.168.0.1/32                  20001     0             0             Active
192.168.0.3/32                  20003     0             0             Active
192.168.0.4/32                  20004     0             0             Active
```

Related Commands

Command	Description
clear traffic-collector ipv4 counters tunnels	Clears all statistical counters of IPv4 tunnels.
show traffic-collector	Retrieves data about traffic routed through the system.
traffic-collector	Enables traffic collector and places the router in traffic collector configuration mode.

show traffic-collector ipv4 counters tunnels

To display base and traffic matrix statistics for the tunnels, use the **show traffic-collector ipv4 counters tunnels** command.

show traffic-collector ipv4 counters tunnels [**tunnel-te** *interface-name*] [**detail**]

Syntax Description

tunnel-te *interface-name*	Displays records for a specific tunnel interface.
detail	Displays rates and status information for configured tunnels.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 6.0.1	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
	read: cef

This example shows the rates and status information for all tunnels:

```
RP/0/0/CPU0:router# show traffic-collector ipv4 counters tunnels detail
Fri Nov  6 09:17:10.998 EST
Tunnel: tt210 State: Active
    Average over the last 3 collection intervals:
        Packet rate: 0 pps, Byte rate: 0 Bps

    History of counters:
        09:16 - 09:17: Packets                   0, Bytes:                   0
        09:15 - 09:16: Packets                   0, Bytes:                   0
        09:14 - 09:15: Packets                   0, Bytes:                   0

Tunnel: tt211 State: Active
    Average over the last 3 collection intervals:
        Packet rate: 0 pps, Byte rate: 0 Bps

    History of counters:
        09:16 - 09:17: Packets                   0, Bytes:                   0
        09:15 - 09:16: Packets                   0, Bytes:                   0
        00:00 - 00:00: Packets                   0, Bytes:                   0
```

This example shows the rates information for the specified tunnel:

```
RP/0/0/CPU0:router# show traffic-collector ipv4 counters tunnels tunnel-te 210
Fri Nov  6 09:18:06.196 EST
Interface                      Base rate     Base rate     State
                               (Packet/sec)  (Bytes/sec)
------------------------------ ------------  ------------  ----------
tt210                          0             0             Active
```

This example shows the rates and status information for the specified tunnel:

```
RP/0/0/CPU0:router# show traffic-collector ipv4 counters tunnels tunnel-te 210 detail
Fri Nov  6 09:18:19.140 EST
Tunnel: tt210 State: Active
    Average over the last 3 collection intervals:
        Packet rate: 0 pps, Byte rate: 0 Bps

    History of counters:
        09:17 - 09:18: Packets                    0, Bytes:                    0
        09:16 - 09:17: Packets                    0, Bytes:                    0
        09:15 - 09:16: Packets                    0, Bytes:                    0
```

Related Commands

Command	Description
clear traffic-collector ipv4 counters prefix	Clears all statistical counters of IPv4 prefixes.
show traffic-collector	Retrieves data about traffic routed through the system.
traffic-collector	Enables traffic collector and places the router in traffic collector configuration mode.

state-sync ipv4 (PCE)

To configure the IPv4 address of the Path Computation Element (PCE) peer for inter-PCE state synchronization, use the **state-sync ipv4** command in PCE configuration mode.

state-sync ipv4 *address*

Syntax Description

ipv4 *address*	Configures the IPv4 address for the backup PCE peer.

Command Default

No default behavior or values

Command Modes

PCE configuration

Command History

Release	Modification
Release 6.2.1	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.

PCC-PCE communication protocol (PCEP) is used for communication between PCC and PCE, as well as between two PCEs. The **state-sync ipv4** command configures Inter-PCE state synchronization to synchronize the LSP databases between PCEs.

Task ID

Task ID	Operation

This example shows how to configure the IPv4 address of the PCE peer for inter-PCE state synchronization:

```
RP/0/RSP0/CPU0:router # configure
RP/0/RSP0/CPU0:router(config)# pce
RP/0/RSP0/CPU0:router(config-pce)# state-sync ipv4 192.168.0.5
```

strict (PCE)

To prevent the automatic fallback behavior of the disjointness.

strict

Syntax Description

This command has no keywords or arguments.

Command Default

Disabled

Command Modes

PCE disjoint configuration

Command History

Release	Modification
Release 6.2.1	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.

You configure the disjoint group ID and define the preferred level of disjointness (the type of resources that should not be shared by the two paths) using the **group-id type** command. If a pair of paths meeting the requested disjointness level cannot be found, then the paths will automatically fallback to a lower level. The **strict** command prevents the automatic fallback behavior. If a pair of paths meeting the requested disjointness-level cannot be found, the disjoint calculation terminates and no new path is provided. The existing path is not modified.

Task ID

Task ID	Operation

This example shows how to prevent the automatic fallback disjoint behavior:

```
RP/0/RSP0/CPU0:router # configure
RP/0/RSP0/CPU0:router(config)# pce
RP/0/RSP0/CPU0:router(config-pce)# disjoint-path
RP/0/RSP0/CPU0:router(config-pce-disjoint)# group-id path1 type node
RP/0/RSP0/CPU0:router(config-pce-disjoint)# strict
```

summary-prefix

Use the exiting **summary-prefix** command for UPA advertisement.

summary-prefix *prefix/mask* **level** *1or 2* [**tag** *value*] [**adv-unreachable** { **unreachable-component-tag** *value* **partition-repair** }]

Syntax Description

Keyword	Details
level*1or 2*	Enter the border router values 1 or 2. To set the border router level for UPA.
tag*value*	Enter the tag value for which you want to enable the UPA.
adv-unreachable	The new keyword **adv-unreachable** controls the UPA advertisement for the components of the summary. The new **adv-unreachable** keyword is optional and disabled by default.
unreachable-component-tag*value*	The **unreachable-component-tag** is used to limit UPAs to those components of the summary that are advertised with a specific tag value. The **unreachable-component-tag** keyword is disabled by default and UPA is generated for all components of the summary if enabled by the **adv-unreachable** keyword.
partition-repair	In case the area (domain) partition is detected, the summary is suppressed, and more specific prefixes are advertised.

Command Default

None.

Command Modes

IS-IS address-family configuration

Command History

Release	Modification
Release 7.10.1	The **partition-repair** keyword was introduced.
Release 7.8.1	This command was introduced.

Usage Guidelines

New commands are added under the exiting IS-IS address-family sub-mode **summary-prefix** command.

Task ID

Task ID	Operations
IS-IS	read, write

Examples

This example shows how to configure Summary-Prefix for UPA.

```
Router(config)#router isis 1
Router(config)#router isis 1
Router(config-isis)#address-family ipv6 unicast
Router(config-isis-af)#router-id 2001:DB8:4::4
Router(config-isis-af)#summary-prefix 2001:DB8::/32 level 2 partition-repair
Router(config-isis-af)#summary-prefix 2001:DB9::/32 level 2 algorithm 128 partition-repair
```

tcp-buffer (PCE)

To configure the size of the transmit and receive TCP buffer per each PCEP session, use the **tcp-buffer** command in PCE configuration mode.

tcp-buffer *size*

Syntax Description

size	Buffer size, in bytes. The range is from 204800 to 1024000.

Command Default

256000

Command Modes

PCE configuration

Command History

Release	Modification
Release 6.2.1	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.

PCC-PCE communication protocol (PCEP) is a TCP-based protocol used for communication between PCC and PCE, as well as between two PCEs. Depending on the scale and memory requirements, you can modify the TCP buffer size using the **tcp-buffer** command.

Task ID

Task ID	Operation

This example shows how to configure the TCP buffer size:

```
RP/0/RSP0/CPU0:router # configure
RP/0/RSP0/CPU0:router(config)# pce
RP/0/RSP0/CPU0:router(config-pce)# tcp-buffer 1024000
```

timers (PCE)

To enter PCE timer configuration mode to configure PCE timers, use the **timers** command in PCE configuration mode.

timers

Syntax Description

This command has no keywords or arguments.

Command Default

No default behavior or values

Command Modes

PCE configuration

Command History

Release	Modification
Release 6.2.1	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

This example shows how to enter PCE timer configuration mode:

```
RP/0/RSP0/CPU0:router # configure
RP/0/RSP0/CPU0:router(config)# pce
RP/0/RSP0/CPU0:router(config-pce)# timers
RP/0/RSP0/CPU0:router(config-pce-timers)#
```

traceroute mpls nil-fec labels

To check network connectivity and identify LSP breakages, use the **traceroute mpls nil-fec labels** command.

traceroute mpls nil-fec labels {*label*[**,***label...*]} [**output** {**interface** *tx-interface*} [**nexthop** *next-hop-ip-address*]]

Syntax Description

labels *label,label...*	Specifies the label stack. Use commas to separate the each *label*.
ouput interface *tx-interface*	Specifies the output interface.
nexthop *next-hop-ip-address*	(Optional) Causes packets to go through the specified next-hop address.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 6.0.1	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
mpls-te	read, write

Example

This example shows how to check connectivity for a known label stack using a specific output interface and next-hop address:

```
RP/0/RSP0/CPU0:router# traceroute mpls nil-fec labels 16005,16007 output interface
GigabitEthernet 0/2/0/1 nexthop 10.1.1.4
Tracing MPLS Label Switched Path with Nil FEC labels 16005,16007, timeout is 2 seconds

Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
  'L' - labeled output interface, 'B' - unlabeled output interface,
  'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
  'M' - malformed request, 'm' - unsupported tlvs, 'N' - no label entry,
  'P' - no rx intf label prot, 'p' - premature termination of LSP,
  'R' - transit router, 'I' - unknown upstream index,
  'd' - see DDMAP for return code,
  'X' - unknown return code, 'x' - return code 0
```

```
Type escape sequence to abort.
  0 10.1.1.3 MRU 1500 [Labels: 16005/16007/explicit-null Exp: 0/0/0]
L 1 10.1.1.4 MRU 1500 [Labels: implicit-null/16007/explicit-null Exp: 0/0/0] 1 ms
L 2 10.1.1.5 MRU 1500 [Labels: implicit-null/explicit-null Exp: 0/0] 1 ms
! 3 10.1.1.7 1 ms
```

Related Commands

Command	Description
ping mpls nil-fec labels	Checks network connectivity and identifying LSP breakages.

traceroute sr-mpls

To trace the routes to a destination in a segment routing network, use the **traceroute sr-mpls** command in XR EXEC mode.

traceroute sr-mpls { *ipv4-address/mask* | *ipv6-address/mask* [**fec-type** { **bgp** | **generic** | **igp** { **ospf** | **isis** } }] | **multipath** { *ipv4-address/mask* | *ipv6-address/mask* [**fec-type** { **bgp** | **generic** | **igp** { **ospf** | **isis** } } } | **nil-fec** | **dataplane-only** { **labels** { *label1* [**,** *label2...*] *ipv4-address/mask* | *ipv6-address/mask* | **policy** } } { **output** { **interface** *interface-path-id* } } { **nexthop** *next-hop-ip-address* } }

Syntax Description

ipv4 address/mask or *ipv6 address/mask*	Address prefix of the target and number of bits in the target address network mask.
fec-type	(Optional) Specifies FEC type to be used. Default FEC type is generic. **bgp** Use FEC type as BGP. **generic** Use FEC type as generic. **igp** Use FEC type as OSPF or ISIS.
labels *label,label...*	Specifies the label stack. Use commas to separate each label.
dataplane-only	Specifies data plane validation without running actual traffic over LSPs.
output interface *interface-path-id*	Specifies the output interface where echo request packets are sent.
nexthop *next-hop-ip-address*	Causes packets to go through the specified IPv4 or IPv6 next-hop address.

Command Default

fec-type : generic

Command Modes

XR EXEC mode

Command History

Release	Modification
Release 24.2.1	The **dataplane-only** keyword was introduced. Support for IPv6 next-hop address was added.
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.

For SR-TE policies, provide a valid LSP endpoint for non-Nil-FEC traceroute operation.

Task ID

Task ID	Operations
mpls-te	read, write

Example

These examples show how to use segment routing traceroute to trace the LSP for a specified IPv4 prefix segment routing id (SID). In the first example, FEC type is not specified. You can also specify the FEC type as shown in the second example. The third example uses multipath traceroute to discover all the possible paths for a IPv4 prefix SID.

```
RP/0/RSP0/CPU0:router# traceroute sr-mpls 10.1.1.2/32

Tracing MPLS Label Switched Path to 10.1.1.2/32, timeout is 2 seconds

Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
  'L' - labeled output interface, 'B' - unlabeled output interface,
  'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
  'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
  'P' - no rx intf label prot, 'p' - premature termination of LSP,
  'R' - transit router, 'I' - unknown upstream index,
  'X' - unknown return code, 'x' - return code 0

Type escape sequence to abort.

  0 10.12.12.1 MRU 1500 [Labels: implicit-null Exp: 0]
! 1 10.12.12.2 3 ms


RP/0/RSP0/CPU0:router# traceroute sr-mpls 10.1.1.2/32  fec-type  igp ospf

Tracing MPLS Label Switched Path to 10.1.1.2/32, timeout is 2 seconds

Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
  'L' - labeled output interface, 'B' - unlabeled output interface,
  'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
  'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
  'P' - no rx intf label prot, 'p' - premature termination of LSP,
  'R' - transit router, 'I' - unknown upstream index,
  'X' - unknown return code, 'x' - return code 0

Type escape sequence to abort.

  0 10.12.12.1 MRU 1500 [Labels: implicit-null Exp: 0]
! 1 10.12.12.2 2 ms


RP/0/RSP0/CPU0:router# traceroute sr-mpls multipath 10.1.1.2/32

Starting LSP Path Discovery for 10.1.1.2/32

Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
  'L' - labeled output interface, 'B' - unlabeled output interface,
  'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
```

```
  'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
  'P' - no rx intf label prot, 'p' - premature termination of LSP,
  'R' - transit router, 'I' - unknown upstream index,
  'X' - unknown return code, 'x' - return code 0

Type escape sequence to abort.

!
Path 0 found,
 output interface GigabitEthernet0/0/0/2 nexthop 10.13.13.2
source 10.13.13.1 destination 127.0.0.0
!
Path 1 found,
 output interface Bundle-Ether1 nexthop 10.12.12.2
source 10.12.12.1 destination 127.0.0.0

Paths (found/broken/unexplored) (2/0/0)
Echo Request (sent/fail) (2/0)
Echo Reply (received/timeout) (2/0)
Total Time Elapsed 14 ms
```

The following example shows how to use segment routing traceroute to validate SR-MPLS over IPv6-based LSPs:

```
Router#traceroute sr-mpls dataplane-only 2001:DB8::1/32
Tue Jan 16 15:08:54.681 EST

Tracing MPLS Label Switched Path with Nil FEC to 2001:DB8::1/32, timeout is 2 seconds

Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
  'L' - labeled output interface, 'B' - unlabeled output interface,
  'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
  'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
  'P' - no rx intf label prot, 'p' - premature termination of LSP,
  'R' - transit router, 'I' - unknown upstream index,
  'X' - unknown return code, 'x' - return code 0

Type escape sequence to abort.

  0 11:11:11::1 MRU 1500 [Labels: 18004/explicit-null Exp: 0/0]
L 1 11:11:11::2 MRU 1500 [Labels: implicit-null/explicit-null Exp: 0/0] 3 ms
! 2 15:15:15::4 3 ms
```

The following example shows how to use segment routing traceroute for SR-TE policies with IPv6-based LSPs:

```
Router#traceroute sr-mpls nil-fec policy name srte_c_40_ep_2001:DB8::1
Tue Feb  6 12:07:38.295 EST

Tracing MPLS Label Switched Path with Nil FEC for SR-TE Policy srte_c_40_ep_2001:DB8::1,
timeout is 2 seconds

Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
  'L' - labeled output interface, 'B' - unlabeled output interface,
  'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
  'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
  'P' - no rx intf label prot, 'p' - premature termination of LSP,
  'R' - transit router, 'I' - unknown upstream index,
  'X' - unknown return code, 'x' - return code 0

Type escape sequence to abort.

  0 12:12:12::1 MRU 1500 [Labels: 26134/explicit-null Exp: 0/0]
L 1 12:12:12::3 MRU 1500 [Labels: implicit-null/explicit-null Exp: 0/0] 16 ms
! 2 16:16:16::4 16 ms
```

The following example shows how to use segment routing traceroute with labels using IPv6 LSPs:

```
Router#traceroute sr-mpls labels 18004 lsp-end-point 2001:DB8::1
Tue Feb  6 12:10:41.928 EST

Tracing MPLS Label Switched Path to NIL FEC with lsp end point 2001:DB8::1, SID Label(s)
[18004], timeout is 2 seconds

Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
  'L' - labeled output interface, 'B' - unlabeled output interface,
  'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
  'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
  'P' - no rx intf label prot, 'p' - premature termination of LSP,
  'R' - transit router, 'I' - unknown upstream index,
  'X' - unknown return code, 'x' - return code 0

Type escape sequence to abort.

  0 11:11:11::1 MRU 1500 [Labels: 18004/explicit-null Exp: 0/0]
L 1 11:11:11::2 MRU 1500 [Labels: implicit-null/explicit-null Exp: 0/0] 7 ms
! 2 15:15:15::4 3 ms
```

traffic-collector

To enable traffic collector and places the router in traffic collector configuration mode, use the **traffic-collector** command.

traffic-collector
no traffic-collector

Syntax Description

This command has no keywords or arguments.

Command Default

No default behavior or values.

Command Modes

Global configuration

Command History

Release	Modification
Release 6.0.1	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
	read, write

Example

This example shows how to enable traffic collector and place the router in traffic collector configuration mode:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# traffic-collector
RP/0/RSP0/CPU0:router(config-tc)#
```

Related Commands

Command	Description
clear traffic-collector ipv4 counters prefix	Clears all statistical counters of all IPv4 prefixes.
clear traffic-collector ipv4 counters tunnels	Clears all statistical counters for all IPv4 tunnels.
show traffic-collector	Retrieves data about traffic routed through the system.
traffic-collector statistics collection-interval	Sets the interval in which statistics are collected.

Command	Description
traffic-collector statistics history-size	Specifies the number of collected counter intervals to keep in history.
traffic-collector statistics history-timeout	Specifies how long a deleted entry remains visible in history.

traffic-collector interface

Marks an interface as external for traffic matrix counters.

traffic-collector interface *type l3-interface-address*
no traffic-collector interface *type l3-interface-address*

Syntax Description

FastEthernet	Allows you to specify the FastEthernet connector that you want to mark as external for traffic matrix counters. Only one interface can be listed at a time.
FortyGigE	Allows you to specify the 40G connector that you want to mark as external for traffic matrix counters. Only one interface can be listed at a time.
GigabitEthernet	Allows you to specify the 1G connector that you want to mark as external for traffic matrix counters. Only one interface can be listed at a time.
HundredGigE	Allows you to specify the 100G connector that you want to mark as external for traffic matrix counters. Only one interface can be listed at a time.
POS	Allows you to specify the POS connector that you want to mark as external for traffic matrix counters. Only one interface can be listed at a time.
TenGigE	Allows you to specify the 10G connector that you want to mark as external for traffic matrix counters. Only one interface can be listed at a time.

Command Default

No default behavior or values

Command Modes

Global configuration

Command History

Release	Modification
Release 6.0.1	This command was introduced.

Usage Guidelines

Only Layer 3 interfaces can be marked as external.

Task ID

Task ID	Operation
	write:cef

Example

This example shows how to mark a Gigabit Ethernet interface as external for traffic matrix counters:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# traffic-collector interface gigabitEthernet 0/0/0/2
```

Related Commands

Command	Description
show traffic-collector	Retrieves data about traffic routed through the system.
traffic-collector	Enables traffic collector and places the router in traffic collector configuration mode.

traffic-collector statistics collection-interval

Sets the interval in which statistics are collected in whole minutes only.

traffic-collector statistics collection-interval *minutes*

Syntax Description

minutes	Sets the interval in minutes that the statistics are updated. Only a select set of values can be used to set the interval. The following values can be used: 1, 2, 3, 4, 5, 6, 10,12, 15, 20, 30, or 60.

Command Default

The default interval is 1.

Command Modes

Global configuration

Command History

Release	Modification
Release 6.0.1	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
	write:cef

Example

This example shows how to set the traffic collection interval to 5 minutes:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# traffic-colletor statistics collection-interval 5
```

Related Commands

Command	Description
traffic-collector	Enables traffic collector and places the router in traffic collector configuration mode.
traffic-collector statistics history-size	Specifies the number of collected counter intervals to keep in history.
traffic-collector statistics history-timeout	Specifies how long a deleted entry remains visible in history.

traffic-collector statistics history-size

Specifies the number of collected counter intervals to keep in history and to use in calculating the average byte and packet rates.

traffic-collector statistics history-size *number*
no traffic-collector statistics history-size *number*

Syntax Description

number	Specifies the number of records that display in the **show traffic-collector** command. The range is from 1 to 10.

Command Default

The default history size is 5.

Command Modes

Global configuration

Command History

Release	Modification
Release 6.0.1	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
	write:cef

Example

This example shows how to set the number of entries kept in the history database to 8 entries:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# traffic-collector statistics history-size 8
```

Related Commands

Command	Description
traffic-collector	Enables traffic collector and places the router in traffic collector configuration mode.
traffic-collector statistics collection-interval	Sets the interval in which statistics are collected.
traffic-collector statistics history-timeout	Specifies how long a deleted entry remains visible in history.

traffic-collector statistics history-timeout

Specifies how long a deleted entry remains visible in history.

traffic-collector statistics history-timeout *hour*

Syntax Description

hour	Sets the length of time in hours that entries appear for the **show traffic-collector** command before they are deleted. The duration range is from 1 to 720. Enter 0 to disable the history timeout.

Command Default

The default timeout is 48.

Command Modes

Global configuration

Command History

Release	Modification
Release 6.0.1	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
	write:cef

Example

This example shows how to configure the length of time the statistics are retained in the history to 100 hours:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# traffic-collector statistics history-timeout 100
```

Related Commands

Command	Description
traffic-collector	Enables traffic collector and places the router in traffic collector configuration mode.
traffic-collector statistics collection-interval	Sets the interval in which statistics are collected.
traffic-collector statistics history-size	Specifies the number of collected counter intervals to keep in history.

UCMP Disable

To disable Unequal-Cost Multiple Path (UCMP) for specific Flexible Algorithm use this command in ISIS Address Family submode.

UCMP Disable

Syntax Description

UCMP Disable	Disables UCMP functionality.

Command Default

None.

Command Modes

IS-IS interface address-family configuration

Command History

Release	Modification
Release 24.1.1	This command was introduced.

Usage Guidelines

UCMP must be configured at the ISIS Address Family instance.

Task ID

Task ID	Operations
isis	read, write

Examples

Example configuration to disable UCMP of specific Flexible Algorithm. Here, it is Flex-algo 128

```
Router(config)# router isis 1
Router(config-isis-flex-algo)# flex-algo 128
Router(config-isis-flex-algo)# ucmp disable
```