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
```

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
```

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 6.1.2	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
	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 6.1.2	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, 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.

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)#
```

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
```

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 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
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

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** 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 6.1.2	This command was 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
```

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
```

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 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.

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
```

kshortest-paths

To set the maximum number of attempts for SR-TE to compute paths that satisfy cumulative metric bounds criteria, use the **kshortest-paths** command in SR-TE configuration mode. To revert to the default number of attempts (100), use the **no** form of the command.

kshortest-paths *max-attempts*

no kshortest-paths

Syntax Description

max-attempts	Maximum number of attempts. Choose a value between 1 and 200.

Command Default 100 attempts are made to compute paths that satisfy the cumulative metric bounds criteria.

Command Modes SR-TE configuration (config-sr-te)

Command History

Release	Modification
Release 7.3.1	This command was introduced.

Usage Guidelines By default, a maximum of 100 attempts are made. To update the value, you can use this command.

You can use the **show segment-routing traffic-eng policy color** command (**Number of K-shortest-paths** field) to see the K-shortest path algorithm computation result. For example, if the **Number of K-shortest-paths** field displays 4, it means that the K-shortest path algorithm took 4 computations to find the right path. The 4 shortest paths that are computed using K-shortest path algorithm did not respect the cumulative bounds, and the fifth shortest path was valid against the bounds.

Example

This example shows how to set the maximum number of attempts for computing paths that satisfy the cumulative metric bounds criteria:

```
Router# configure terminal
Router(config)# segment-routing traffic-eng
Router(config-sr-te)# kshortest-paths 120
Router(config-sr-te)# commit
```

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
```

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
```

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 isis	read, write

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

Command Default   Disabled.

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.

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.

Task ID

Task ID	Operation
ospf. isis	read, write

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
```

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
```

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 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
	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 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
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*] **fast-reroute lfa** | **frr-node-set from** | **to** [**ipv4** *address*] | **label-range min** *value* **max** *value* | **multipath-disable**]

no pce segment-routing traffic-eng p2mp [[**policy** *name*] **fast-reroute lfa** | **frr-node-set from** | **to** [**ipv4** *address*] | **label-range** | **multipath-disable**]

Syntax Description		
policy *name*	(Optional) Specifies the static or dynamic SR multicast policy for which LFA FRR is enabled.	
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 7.3.1	This command was introduced.

Example

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

Label Range Configuration

The configuration species 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
```

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 delay-profile endpoint

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* | computation-interval *interval* | measurement-mode one-way | 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.
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 *microseconds*	Specify the interval for sending probe packet. The range is from 30 to 15000 milliseconds.
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 interval measurement mode.
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.

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 microseconds.

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

Command History

Release	Modification
Release 7.4.1	This command was introduced.

Usage Guidelines

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
```

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* | **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 *microseconds*	Specify the interval for sending probe packet. The range is from 30 to 15000 milliseconds.
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 interval measurement mode.
protocol {**pm-mpls** | **twamp-light**}	
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.

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 microseconds.

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

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.

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 sr-policy

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

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

Syntax Description

name *profile*	(Optional) Specifies the Segment Routing performance measurement delay profile.

Command Default   No user created performance measurement delay profile exists.

Command Modes   Global configuration (config)

Command History

Release	Modification
Release 7.3.1	This command 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 delay profile:

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

performance-measurement endpoint

performance-measurement endpoint ipv4 *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** *source_ip_addr*]

Syntax Description

endpoint_ip_addr	IPv4 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.

Command Default   None

Command Modes

Command History

Release	Modification
Release 7.4.1	This command was introduced.

Usage Guidelines

Example

```
Router(config)# performance-measurement
Router(config-perf-meas)# endpoint ipv4 1.1.1.5
Router(config-pm-ep)# source-address ipv4 1.1.1.1
Router(config-pm-ep)# delay-measurement
```

performance-measurement liveness-detection

To apply an SR performance measurement liveness profile to an SR-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 name** *profile*]
no performance-measurement liveness-detection [**liveness-profile**]

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

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 7.3.1	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 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
```

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* | measurement-mode loopback | 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 *interval*		Specify the interval for sending probe packet. The range is from 30 to 15000 milliseconds.
measurement-mode loopback		Specify the measurement mode. Liveness detection must use loopback mode.
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

Command History

Release	Modification
Release 7.4.1	This command was introduced.

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

When liveness-profile isn't configured, SR Policies use the default values for the liveness-detection profile parameters.

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)# measurement-mode loopback
```

performance-measurement liveness-profile sr-policy

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

performance-measurement liveness-profile sr-policy [**name** *profile*]
no performance-measurement liveness-profile sr-policy [**name** *profile*]

Syntax Description	**name** *profile*	(Optional) Specifies the Segment Routing performance measurement liveness profile.

Command Default   No user created performance measurement liveness profile exists.

Command Modes   Global configuration (config)

Command History

Release	Modification
Release 7.3.1	This command 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 sr-policy name profile1
Router(config)# commit
```

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 6.1.2	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
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.

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 6.1.2	This command was introduced.
	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).

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
```

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 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 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 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 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 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 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
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 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 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 59	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 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 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 isis	read, write

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 59	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 srv6 locators locator

To globally enable SRv6 and configure a locator, use the **segment-routing srv6 locators locator** command in XR Config mode.

segment-routing   **srv6**   **locators**   **locator**   *locator*   **prefix**   *ipv6_prefix* / *length*

Syntax Description

locator *locator*	Globally enables SRv6 and configure the locator.
prefix *ipv6_prefix*	Configures the locator prefix value.

Command Default   None

Command Modes   XR Config

Command History

Release	Modification
Release 7.4.2	This command was introduced.

Usage Guidelines   No specific guidelines impact the use of this command.

Example

The following example shows how to globally enable SRv6 and configure a locator.

```
Router(config)# segment-routing srv6
Router(config-srv6)# locators
Router(config-srv6-locators)# locator myLoc1
Router(config-srv6-locator)# prefix 2001:0:8::/48
```

segment-routing srv6 logging locator status

To enable logging for locator status changes, use the **segment-routing srv6 logging locator status** command in XR Config mode.

segment-routing srv6 logging locator status

Syntax Description   This command has no keywords or arguments.

Command Default   Logging is disabled

Command Modes   XR Config

Command History

Release	Modification
Release 7.4.2	This command was introduced.

Usage Guidelines   No specific guidelines impact the use of this command.

Example

The following example shows how to enable logging for locator status changes.

```
Router(config)# segment-routing srv6
Router(config-srv6)# logging locator status
```

segment-routing srv6 sid holdtime

To configure the holdtime for a stale or freed SID, use the **segment-routing srv6 sid holdtime** command in XR Config mode.

segment-routing   srv6   sid   holdtime   *minutes*

Syntax Description	**holdtime**	*minutes*	The holdtime for a stale or freed SID. The range of *minutes* is from 0 (disabled) to 60 minutes.

Command Default   Holdtime is disabled

Command Modes   XR Config

Command History

Release	Modification
Release 7.4.2	This command was introduced.

Usage Guidelines   No specific guidelines impact the use of this command.

Example

The following example shows how to configure the holdtime for a stale or freed SID.

```
Router(config)# segment-routing srv6
Router(config-srv6)# sid holdtime 10
```

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 59	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 Information	State	On-demand Color
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 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
```

	Command	Description
Related Commands	segment-routing mapping-server, on page 59	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 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 6.2.1	This command was introduced.

Usage Guidelines

Task ID

Task ID	Operation

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
```

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

Router # show pim vrf vpn1 mdt sr-p2mp remote

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 59	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 locator

To verify locator configuration or SRv6 SID allocation information, use the **show segment-routing srv6 locator** command in XR EXEC mode.

show   **segment-routing**   **srv6**   **locator**   *locator*   [**sid**   [*ipv6_sid*]]   [**detail**]

Syntax Description		
locator *locator*	Specifies the locator.	
sid [*ipv6_sid*]	Shows the allocation of all SRv6 local SIDs or a specific SID.	
[**detail**]	Displays detail information regarding an allocated SRv6 local SID.	

Command Default   None

Command Modes   XR EXEC

Command History

Release	Modification
Release 7.4.2	This command was introduced.

Usage Guidelines   No specific guidelines impact the use of this command.

Example

This example shows how to verify the locator configuration and its operational status.

```
Router# show segment-routing srv6 locator myLoc1 detail

Name                 ID      Algo  Prefix                   Status  Flags
-------------------  -------  ----  -----------------------  -------  --------
myLoc1               2        0     2001:0:8::/48            Up      U
  (U): Micro-segment (behavior: uN (shift))
  Interface:
    Name: srv6-myLoc1
    IFH : 0x0800002c
    IPv6 address: 2001:0:8::/48
  Number of SIDs: 1
  Created: Jan 11 14:22:30.141 (2w5d ago)
```

This example shows how to verify the allocation of SRv6 local SIDs off locator(s).

```
Router# show segment-routing srv6 locator myLoc1 sid
SID                  Behavior    Context                  Owner          State  RW
-------------------  ----------  -----------------------  -------------- -----  --
2001:0:8::           uN (shift)  'default':1              sidmgr         InUse  Y
```

The following example shows how to display detail information regarding an allocated SRv6 local SID.

```
Router# show segment-routing srv6 locator myLoc1 sid 2001:0:8:: detail
SID                  Behavior    Context                  Owner          State  RW
```

```
-------------------- ----------- ----------------------   -------------- ----- --
2001:0:8::           uN (shift)  'default':1              sidmgr         InUse Y
  SID Function: 0x1
  SID context: { table-id=0xe0800000 ('default':IPv6/Unicast), opaque-id=1 }
  Locator: 'myLoc1'
  Allocation type: Dynamic
  Created: Jan 11 14:22:30.490 (2w5d ago)
```

show segment-routing srv6 manager

To verify the overall SRv6 state from SRv6 Manager point of view, use the **show segment-routing srv6 manager** command in XR EXEC mode.

show segment-routing srv6 manager

Syntax Description	This command has no keywords or arguments.
Command Default	None
Command Modes	XR EXEC

Command History

Release	Modification
Release 7.4.2	This command was introduced.

Usage Guidelines   No specific guidelines impact the use of this command.

Example

This example shows how to verify the overall SRv6 state from SRv6 Manager point of view. The output displays parameters in use, summary information, and platform specific capabilities.

```
Router# show segment-routing srv6 manager

Parameters:
  SRv6 Enabled: Yes
  SRv6 Operational Mode:
    Micro-segment:
      SID Base Block: 2001::/24
  Encapsulation:
    Source Address:
      Configured: ::
      Default: 1:1:1::1
    Hop-Limit: Default
    Traffic-class: Default
Summary:
  Number of Locators: 5 (5 operational)
  Number of SIDs: 12 (0 stale)
  Max SIDs: 9000
  OOR:
    Thresholds: Green 450, Warning 270
    Status: Resource Available
        History: (0 cleared, 0 warnings, 0 full)
    Block 2001::/32:
        Number of SIDs free: 7674
        Max SIDs: 7680
        Thresholds: Green 384, Warning 231
        Status: Resource Available
            History: (0 cleared, 0 warnings, 0 full)
Platform Capabilities:
  SRv6: Yes
  TILFA: No
  Microloop-Avoidance: No
```

```
Endpoint behaviors:
  uN (shift)
  uA (shift)
Headend behaviors:
  None
Security rules:
  None
Counters:
  None
Signaled parameters:
  Max-SL          : 0
  Max-End-Pop-SRH : 0
  Max-H-Insert    : 0 sids
  Max-H-Encap     : 0 sids
  Max-End-D       : 0
Configurable parameters (under srv6):
  Encapsulation:
    Source Address: No
    Hop-Limit     : value=No, propagate=No
    Traffic-class : value=No, propagate=No
Max SIDs: 9000
SID Holdtime: 3 mins
```

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 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 6.1.2	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: 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 6.1.2	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: 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 6.1.2	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: 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 6.1.2	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: 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
```

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 6.1.2	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
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
```

	Command	Description
Related Commands	ping mpls nil-fec labels	Checks network connectivity and identifying LSP breakages.

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 6.1.2	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, 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 6.1.2	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 6.1.2	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
	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 6.1.2	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
	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 6.1.2	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
	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.

traffic-collector statistics history-timeout