Configure Segment Routing Tree Segment Identifier (Tree-SID)

Tree Segment Identifier (Tree-SID) is a tree-building solution that uses a controller (SR-PCE using PCEP) to calculate the point-to-multipoint (P2MP) tree using SR policies. Tree-SID uses a single MPLS label for building a multicast replication tree in an SR network. Tree-SID does not require multicast control protocols such as RSVP, mLDP, and PIM.

A P2MP SR policy provides an SR-based TE solution for transporting multicast traffic. It works on existing data-plane (MPLS and IP) and supports TE capabilities and single/multi routing domains. At each node of the tree, the forwarding state is represented by the same segment (using a global Tree-SID specified from the SRLB range of labels). P2MP SR policy prevents transient loop and packet loss when updating the path of a P2MP SR policy.

A P2MP SR policy request contains the following:

- Policy name
- SID for the P2MP Tree (Tree-SID)
- Address of the root-node
- Addresses of the leaf-nodes
- TE optimization criteria (for example, TE or IGP metric) and constraints

- Configuration Steps, on page 1
- Configuring P2MP SR Policy with Tree-SID: Example, on page 3

Configuration Steps

To configure Segment Routing Tree-SID for Point-to-Multipoint (P2MP) SR policies, complete the following configurations

1. Configure Path Computation Element Protocol (PCEP) Path Computation Client (PCC) on all nodes involved in the Tree-SID path (root, mid-point, leaf)
2. Configure Affinity Maps on the SR-PCE
3. Configuring P2MP SR Policy on SR-PCE
4. Configuring Multicast on the Root and Leaf Nodes

Configuring PCEP PCC on All Nodes in Tree-SID Path
Configure all nodes involved in the Tree-SID path (root, mid-point, leaf) as PCEP PCC. For detailed PCEP PCC configuration information, see the Configure the Head-End Router as PCEP PCC section.

Configure Affinity Maps on the SR-PCE
Use the `affinity bit-map COLOR bit-position` command in PCE SR-TE sub-mode to define affinity maps. The bit-position range is from 0 to 255.

```
Router# configure
Router(config)# pce
Router(config-pce)# segment-routing traffic-eng
Router(config-pce-sr-te)# affinity bit-map NAME bit-position
```

Configuring P2MP SR Policy on SR-PCE
Configure the end-point name and addresses, Tree-SID label, and constraints for the P2MP policy.

Use the `endpoint-set NAME` command in SR-PCE P2MP sub-mode to enter the name of the end-point set and to define the set of end-point addresses.

```
Router(config-pce-sr-te)# p2mp
Router(config-pce-sr-te-p2mp)# endpoint-set NAME
Router(config-pce-p2mp-ep-set)# ipv4 address
Router(config-pce-p2mp-ep-set)# exit
Router(config-pce-sr-te-p2mp)#
```

Use the `policy policy` command to configure the P2MP policy name and enter P2MP Policy sub-mode. Configure the source address, endpoint-set color, Tree-SID label, affinity constraints, and metric type.

```
Router(config-pce-sr-te-p2mp)# policy p2mp-policy
Router(config-pce-p2mp-policy)# source ipv4 address
Router(config-pce-p2mp-policy)# color color endpoint-set NAME
Router(config-pce-p2mp-policy)# treesid mpls label
Router(config-pce-p2mp-policy)# candidate-paths
Router(config-pce-p2mp-policy-p2mp-policy-path)# constraints
Router(config-pce-p2mp-policy-p2mp-policy-path-affinity)# affinity
Router(config-pce-p2mp-policy-p2mp-policy-path-affinity)# exclude | include-all | include-any color
Router(config-pce-p2mp-policy-p2mp-policy-path-affinity)# exit
Router(config-pce-p2mp-policy-p2mp-policy-path)# exit
Router(config-pce-p2mp-policy-p2mp-policy-path)# preference 100
Router(config-pce-p2mp-policy-p2mp-policy-path-preference)# dynamic
Router(config-pce-p2mp-policy-p2mp-policy-path-info)# metric type [igp | te]
Router(config-pce-p2mp-policy-p2mp-policy-path-info)# root
Router(config-pce-sr-te-p2mp)#
```

Configuring Multicast on the Root and Leaf Nodes
On the root node of the SR P2MP segment, use the `router pim` command to enter Protocol Independent Multicast (PIM) configuration mode to statically steer multicast flows into an SR P2MP policy.

```
Note
Enter this configuration only on an SR P2MP segment. Multicast traffic cannot be steered into a P2P policy.
```
On the root and leaf nodes of the SR P2MP tree, use the `mdt static segment-routing` command to configure the multicast distribution tree (MDT) core as Tree-SID from the multicast VRF configuration submode.

```
Router(config)# multicast-routing
Router(config-mcast)# vrf name
Router(config-mcast-name)# address-family ipv4
Router(config-mcast-name-ipv4)# mdt static segment-routing
```

On the leaf nodes of an SR P2MP segment, use the `static sr-policy p2mp-policy` command to configure the static SR P2MP Policy from the multicast VRF configuration submode to statically decapsulate multicast flows.

```
Router(config)# multicast-routing
Router(config-mcast)# vrf name
Router(config-mcast-name)# address-family ipv4
Router(config-mcast-name-ipv4)# static sr-policy p2mp-policy
```

### Configuring P2MP SR Policy with Tree-SID: Example

The following example shows how to configure the end point addresses and P2MP SR policy with affinity constraints on SR-PCE.

```
pce
    segment-routing
    traffic-eng
    affinity bit-map
        RED 23
        BLUE 24
        CROSS 25
    !
p2mp
    endpoint-set BAR
        ipv4 1.1.1.2
        ipv4 1.1.1.3
        ipv4 1.1.1.4
    !
policy FOO
    source ipv4 1.1.1.6
    color 10 endpoint-set BAR
treesid mpls 15200
candidate-paths
    preference 100
dynamic
    metric
type te
    !
    !
    constraints
```
The following example shows how to statically decapsulate multicast flows on the leaf nodes.

```
multicast-routing
vrf TEST
  address-family ipv4
    static sr-policy FOO

```

The following example shows to configure the multicast distribution tree (MDT) core as Tree-SID on the root and leaf nodes.

```
multicast-routing
vrf TEST
  address-family ipv4
    mdt static segment-routing

```

The following example shows how to steer traffic to the SR P2MP policy on the root node.

```
router pim
vrf TEST
  address-family ipv4
    sr-p2mp-policy FOO
      static-group 232.1.1.5 1.1.1.6

```