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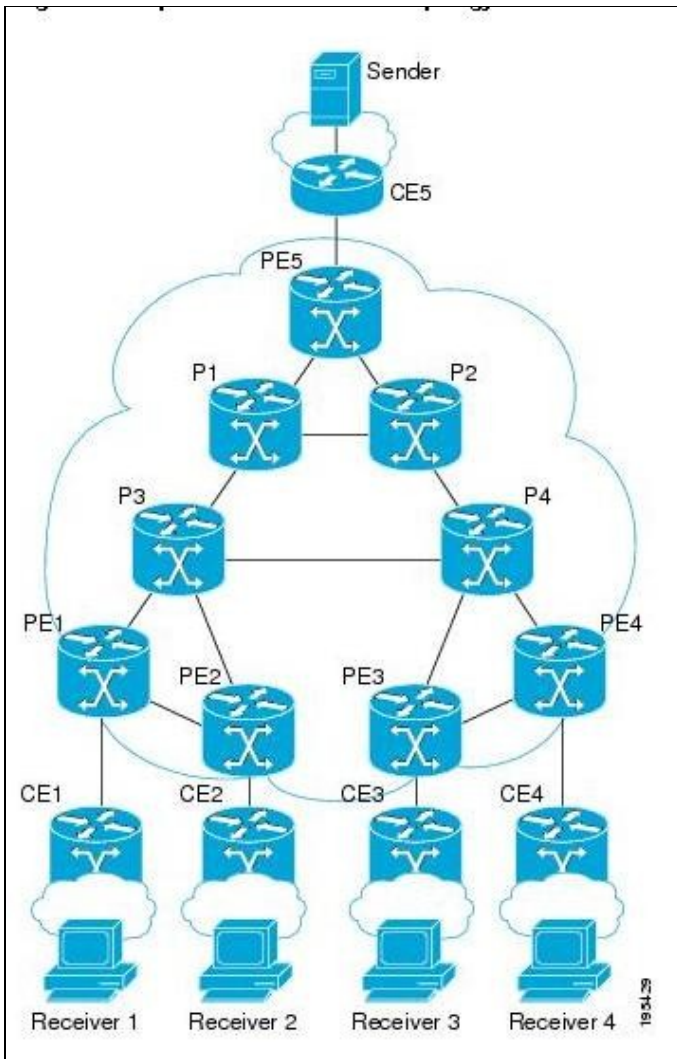
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## Introduction

The following examples show point-to-multipoint traffic engineering configurations on the following routers:

- Headend router (PE5)
- Midpoint router (P1)
- Tailend router (PE1)

## Design



## Configuration

### Configuration of the Headend Router (PE5): Example

In the following example configuration of the headend router, note the following:

- IPv4 multicast routing is enabled with the **ip multicast-routing** command.
- Two destination lists are specified, one for dynamic paths and one for explicit paths. The destination list specifies one path-option per destination.
- The **tunnel mode mpls traffic-eng point-to-multipoint** command enables the P2MP tunnel.
- On the tunnel interfaces, the **ip pim passive** command is used.
- On the non-MPLS interfaces, the **ip pim sparse-mode** command is used.
- The **ip igmp static-group** commands map the multicast groups to the P2MP tunnel.
- Fast Reroute is enabled on the router, with tunnel 3 as the backup path. An explicit path called PE5->P1-BKUP provides the alternative path.

## MPLS\_Point-to-Multipoint\_Traffic\_Engineering\_Configuration\_Example

```
hostname [PE5]

boot-start-marker
boot-end-marker

no aaa new-model
clock timezone PST -8
ip subnet-zero
ip source-route
ip cef
no ip domain lookup
ip multicast-routing

no ipv6 cef

mpls traffic-eng tunnels

mpls traffic-eng destination list name P2MP-DYN-DST-LIST
 ip 172.16.255.1 path-option 10 dynamic
 ip 172.16.255.2 path-option 10 dynamic
 ip 172.16.255.3 path-option 10 dynamic
 ip 172.16.255.4 path-option 10 dynamic

mpls traffic-eng destination list name P2MP-EXCIT-DST-LIST
 ip 172.16.255.1 path-option 10 explicit identifier 101
 ip 172.16.255.2 path-option 10 explicit identifier 102
 ip 172.16.255.3 path-option 10 explicit identifier 103
 ip 172.16.255.4 path-option 10 explicit identifier 104

multilink bundle-name authenticated

interface Tunnel1
 description PE5->PE1,PE2,PE3,PE4-DYN
 ip unnumbered Loopback0
 ip pim passive
 ip igmp static-group 232.0.1.4 source 192.168.5.255
 ip igmp static-group 232.0.1.3 source 192.168.5.255
 ip igmp static-group 232.0.1.2 source 192.168.5.255
 ip igmp static-group 232.0.1.1 source 192.168.5.255
 tunnel mode mpls traffic-eng point-to-multipoint
 tunnel destination list mpls traffic-eng name P2MP-DYN-DST-LIST
 tunnel mpls traffic-eng priority 7 7
 tunnel mpls traffic-eng bandwidth 10000

interface Tunnel2
 description PE5->PE1,PE2,PE3,PE4-EXCIT
 ip unnumbered Loopback0
 ip pim passive
 ip igmp static-group 232.0.1.8 source 192.168.5.255
 ip igmp static-group 232.0.1.7 source 192.168.5.255
 ip igmp static-group 232.0.1.6 source 192.168.5.255
 ip igmp static-group 232.0.1.5 source 192.168.5.255
 tunnel mode mpls traffic-eng point-to-multipoint
 tunnel destination list mpls traffic-eng name P2MP-EXCIT-DST-LIST
 tunnel mpls traffic-eng priority 7 7
 tunnel mpls traffic-eng bandwidth 20000
 tunnel mpls traffic-eng fast-reroute

interface Tunnel3
 description PE5->P1
 ip unnumbered Loopback0
 tunnel mode mpls traffic-eng
 tunnel destination 172.16.255.201
 tunnel mpls traffic-eng path-option 10 explicit name PE5->P1-BKUP
```

## MPLS\_Point-to-Multipoint\_Traffic\_Engineering\_Configuration\_Example

```
interface Loopback0
  ip address 172.16.255.5 255.255.255.255

interface Ethernet0/0
  description CONNECTS to CE5
  ip address 192.168.5.1 255.255.255.252
  ip pim sparse-mode

interface Ethernet1/0
  description CONNECTS TO P1
  bandwidth 1000000
  ip address 172.16.0.13 255.255.255.254
  ip router isis
  mpls traffic-eng tunnels
  mpls traffic-eng backup-path Tunnel3
  isis network point-to-point
  ip rsvp bandwidth percent 100

interface Ethernet2/0
  description CONNECTS TO P2
  bandwidth 1000000
  ip address 172.16.0.14 255.255.255.254
  ip router isis
  mpls traffic-eng tunnels
  isis network point-to-point
  ip rsvp bandwidth percent 100

router isis
  net 49.0001.1720.1625.5005.00
  is-type level-2-only
  metric-style wide
  passive-interface Loopback0
  mpls traffic-eng router-id Loopback0
  mpls traffic-eng level-2

ip classless

no ip http server

ip pim ssm default

ip explicit-path identifier 101 enable
  next-address 172.16.0.12
  next-address 172.16.192.0
  next-address 172.16.0.0

ip explicit-path identifier 102 enable
  next-address 172.16.0.12
  next-address 172.16.192.0
  next-address 172.16.0.3

ip explicit-path identifier 103 enable
  next-address 172.16.0.12
  next-address 172.16.192.0
  next-address 172.16.192.6
  next-address 172.16.0.6

ip explicit-path identifier 104 enable
  next-address 172.16.0.12
  next-address 172.16.192.0
  next-address 172.16.192.6
  next-address 172.16.0.9
```

## MPLS\_Point-to-Multipoint\_Traffic\_Engineering\_Configuration\_Example

```
ip explicit-path name PE5->P1-BKUP enable
next-address 172.16.0.15
next-address 172.16.192.2
```

### Configuration of the Midpoint Router (P1): Example

In the following example configuration of the midpoint router, note the following:

- MPLS Traffic Engineering is enabled both globally and on the interface connecting to other core routers.
- MPLS TE extensions are enabled through the **mpls traffic-eng router-id** and **mpls traffic-eng level** commands.

```
hostname [P1]

no aaa new-model
clock timezone PST -8
ip subnet-zero
ip source-route
ip cef
no ip domain lookup

no ipv6 cef
mpls traffic-eng tunnels
multilink bundle-name authenticated

interface Loopback0
 ip address 172.16.255.201 255.255.255.255

interface Ethernet0/0
 description CONNECTS TO P2
 bandwidth 1000000
 ip address 172.16.192.2 255.255.255.254
 ip router isis
 mpls traffic-eng tunnels
 isis network point-to-point
 ip rsvp bandwidth percent 100

interface Ethernet0/1
 no ip address
 shutdown

interface Ethernet0/2
 no ip address
 shutdown

interface Ethernet0/3
 no ip address
 shutdown

interface Ethernet1/0
 description CONNECTS TO P3
 bandwidth 1000000
 ip address 172.16.192.1 255.255.255.254
 ip router isis
 mpls traffic-eng tunnels
 isis network point-to-point
 ip rsvp bandwidth percent 100

interface Ethernet2/0
```

## MPLS\_Point-to-Multipoint\_Traffic\_Engineering\_Configuration\_Example

```
description CONNECTS TO PE5
bandwidth 1000000
ip address 172.16.0.12 255.255.255.254
ip router isis
mpls traffic-eng tunnels
isis network point-to-point
ip rsvp bandwidth percent 100

router isis
net 49.0001.1720.1625.5201.00
is-type level-2-only
metric-style wide
passive-interface Loopback0
mpls traffic-eng router-id Loopback0
mpls traffic-eng level-2

ip classless
no ip http server
```

### Configuration of the Tailend Router (PE1): Example

In the following example configuration of the tailend router, note the following:

- IPv4 multicast routing is enabled with the **ip multicast-routing** command.
- On the non-MPLS interfaces, the **ip pim sparse-mode** command is used.
- The **ip multicast mpls** commands enable multicast routing of traffic.

```
hostname [PE1]

no aaa new-model
clock timezone PST -8
ip subnet-zero
ip source-route
ip cef
no ip domain lookup

ip multicast-routing

no ipv6 cef
mpls traffic-eng tunnels
multilink bundle-name authenticated

interface Loopback0
 ip address 172.16.255.1 255.255.255.255

interface Ethernet0/0
 description CONNECTS TO CE1
 ip address 192.168.1.1 255.255.255.252
 ip pim sparse-mode

interface Ethernet0/3
 description CONNECTS TO P3
 bandwidth 155000
 no ip address
 shutdown
 mpls traffic-eng tunnels
 ip rsvp bandwidth 155000

interface Ethernet1/0
```

## MPLS\_Point-to-Multipoint\_Traffic\_Engineering\_Configuration\_Example

```
description CONNECTS TO PE2
bandwidth 1000000
ip address 172.16.0.5 255.255.255.254
ip router isis
mpls traffic-eng tunnels
isis network point-to-point
ip rsvp bandwidth percent 100

interface Ethernet2/0
description CONNECTS TO P3
bandwidth 1000000
ip address 172.16.0.0 255.255.255.254
ip router isis
mpls traffic-eng tunnels
isis network point-to-point
ip rsvp bandwidth percent 100

router isis
net 49.0001.1720.1625.5001.00
is-type level-2-only
metric-style wide
passive-interface Loopback0
mpls traffic-eng router-id Loopback0
mpls traffic-eng level-2

ip classless

no ip http server

ip multicast mpls traffic-eng
ip pim ssm default
ip mroute 192.168.5.0 255.255.255.0 172.16.255.5
```

## Related Information

[Technical Support & Documentation - Cisco Systems](#)

[MPLS Point-to-Multipoint Traffic Engineering](#)