



## Dynamic Path Computation Client

Effective Cisco IOS XE Everest 16.6.1, the Stateful Path Computation Element Protocol (PCEP) enables a router to report and delegate Label Switched Paths (LSPs) that are established using Resource Reservation Protocol (RSVP) protocol to a stateful Path Computation Element (PCE). An LSP delegated to a PCE can be updated by the PCE and a stateful PCE can initiate an LSP on a Path Computation Client (PCC).

RSVP-TE LSPs require link-state routing protocols such as OSPF or IS-IS to distribute and learn traffic engineering topology. A stateful PCE can learn the traffic engineering topology through BGP Link-State (BGP-LS) protocol. The IGP instance running on a router feeds the traffic engineering topology information into BGP which passes that information to stateful PCE.



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**Note** Dynamic PCC is available only on the Cisco RSP2 Module.

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**Note** Path Computation Element is not supported on the Cisco RSP2 Module.

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- [Information About Dynamic PCC](#) , on page 1
- [Configure Dynamic PCC Globally](#), on page 2
- [Configure Dynamic PCE Delegated SR Policy](#), on page 2
- [Verify Dynamic PCC](#), on page 2

## Information About Dynamic PCC

### PCEP functions

A PCEP session is a TCP session between a PCC and a PCE with protocol messages. The PCEP functions are verified based on the PCC functions. The configuration and verification show that the request is accepted and path computation is provided based on PCReq message from the client. The passive reporting enables a router to report a tunnel instead of delegating it to a PCE. The PCE is aware of the tunnel even though it cannot modify the tunnel.

PCEP functions are useful when a network has both router-controlled and PCE delegated tunnels. The PCE is aware of both the tunnels and can make an accurate decision on path computation.

## Configure Dynamic PCC Globally

To configure dynamic PCC globally:

```
enable
configure terminal
segment-routing traffic-eng
pcc
pce address 12.12.12.12 source-address 196.196.196.196 ----- (12.12.12.12 is the PCE
server address)
end
```

## Configure Dynamic PCE Delegated SR Policy

To configure dynamic PCE delegated SR policy:

```
on-demand color 100000
authorize
candidate-paths
  preference 100
  constraints
    segments
      dataplane mpls
    !
    !
  dynamic
    pcep ----- PCE Delegated SR Policy
    metric
      type delay
    !
    !
  !
  !
```

## Verify Dynamic PCC

Use the **show pce client peer detail** command to verify the PCE client peer details.

```
Router#show pce client peer detail
Load for five secs: 6%/1%; one minute: 6%; five minutes: 6%
Time source is NTP, 14:26:41.700 IST Thu Feb 10 2022
```

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

```
Peer address: 12.12.12.12 (best PCE)
State up
Capabilities: Stateful, Update, Segment-Routing, Instantiation
PCEP has been up for: 01:41:50
PCEP session ID: local 1, remote: 0
Sending KA every 30 seconds
Minimum acceptable KA interval: 20 seconds
Peer timeout after 120 seconds
Statistics:
  Keepalive messages: rx      198 | tx      146
  Request messages:   rx       0 | tx       0
```

```

Reply messages:    rx      4 | tx      0
Error messages:   rx      0 | tx      0
Open messages:    rx      1 | tx      1
Report messages:  rx      0 | tx     51
Update messages:  rx     36 | tx      0
Reply time: avg = 0ms, min = 0ms, max = 0ms

```

Use the **show segment-routing traffic-eng policy name** command to verify the policy name.

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

```
*203.203.203.203|100000 detail
```

```
Load for five secs: 4%/1%; one minute: 5%; five minutes: 5%
Time source is NTP, 14:32:10.942 IST Thu Feb 10 2022
```

```
Name: *203.203.203.203|100000 (Color: 100000 End-point: 203.203.203.203)
```

```
Owners : BGP
```

```
Status:
```

```
Admin: up, Operational: up for 00:00:25 (since 02-10 14:49:31.296)
```

```
Candidate-paths:
```

```
Preference 100 (BGP):
```

```
Dynamic (pce 12.12.12.12) (active)
```

```
Metric Type: DELAY, Path Accumulated Metric: 158
```

```
35 [Adjacency-SID, 170.50.63.2 - 170.50.63.1]
```

```
Attributes:
```

```
Binding SID: 3095
```

```
Allocation mode: dynamic
```

```
State: Programmed
```

```
IPv6 caps enabled
```

```
Tunnel ID: 65543 (Interface Handle: 0x57)
```

```
Per owner configs:
```

```
BGP
```

```
Binding SID: dynamic
```

```
Stats:
```

```
5 minute output rate 0 bits/sec, 0 packets/sec
```

```
Packets: 10 Bytes: 744
```

```
Event history:
```

Timestamp	Client	Event type	Context:
-----	-----	-----	-----:
-----			
02-10 14:49:31.297	BGP	Policy created	Name: BGP
02-10 14:49:31.299	BGP	Set colour	Colour:
100000			
02-10 14:49:31.299	BGP	Set end point	End-point:
203.203.203.203			
02-10 14:49:31.426	BGP	Set dynamic	Path option:
dynamic			
02-10 14:49:31.496	BGP	BSID allocated	FWD: label
3095			
02-10 14:49:31.510	BGP	Set dynamic pce	Path option:
dynamic pce			
02-10 14:49:32.152	FH Resolution	Policy state UP	Status:
PATH RESOLVED CP: 100			
02-10 14:49:32.450	FH Resolution	REOPT triggered	Status:
REOPTIMIZED CP: 100			

Use the **show pce client lsp detail** command to verify PCC's tunnel database.

```
Router#show pce client lsp detail
```

```
Load for five secs: 5%/1%; one minute: 5%; five minutes: 5%
```

```
Time source is NTP, 14:36:15.835 IST Thu Feb 10 2022
```

```

PCC's tunnel database:
-----
Tunnel Name: bgp_color_100000_ep_203.203.203.203_discr_100
LSPs:
LSP[0]:
  source 206.206.206.206, destination 203.203.203.203, tunnel ID 1, LSP ID 0
  State: Admin up, Operation active
  Binding SID: 1906
  Setup type: SR
  Bandwidth: requested 0, used 0
  LSP object:
    PLSP-ID 0x80001, flags: D:0 S:0 R:0 A:1 O:2
    Metric type: Latency, Accumulated Metric 158
  ERO:
    SID[0]: Node, Label 16350, NAI: 203.203.203.203
PLSP Event History (most recent first):
  Thu Feb 10 12:44:55.002: PCRpt update LSP-ID:0, SRP-ID:1, PST:1, METRIC_TYPE:12, REQ_BW:0,
  USED_BW:0
  Thu Feb 10 12:44:54.962: PCUpd SRP-ID:1, METRIC_TYPE:12, METRIC_VALUE:158
  Thu Feb 10 12:44:54.262: PCRpt update LSP-ID:0, SRP-ID:0, PST:1, METRIC_TYPE:12, REQ_BW:0,
  USED_BW:0
  Thu Feb 10 12:44:54.258: PCRpt create LSP-ID:0, SRP-ID:0, PST:1, METRIC_TYPE:12, REQ_BW:0,
  USED_BW:0

```

Use the **show pce lsp detail** command to verify that the tunnel is delegated.

```

Router#show pce lsp detail
Thu Feb 10 14:34:57.852 IST

```

```

PCE's tunnel database:
-----
PCC 196.196.196.196:

Tunnel Name: bgp_color_100000_ep_203.203.203.203_discr_100
Color: 100000
Interface Name: Tunnel65536
LSPs:
LSP[0]:
  source 206.206.206.206, destination 203.203.203.203, tunnel ID 1, LSP ID 0
  State: Admin up, Operation active
  Setup type: Segment Routing
  Binding SID: 1906
  Maximum SID Depth: 2
  Preference: 100
  Protection type: protected-preferred
  Invalidated traffic dropped: Yes
  PCEP information:
    PLSP-ID 0x80001, flags: D:1 S:0 R:0 A:1 O:2 C:0
  LSP Role: Single LSP
  State-sync PCE: None
  PCC: 196.196.196.196
  LSP is subdelegated to: None
  Reported path:
    Metric type: Latency, Accumulated Metric 158
    SID[0]: Node, Label 16350, Address 203.203.203.203
  Computed path: (Local PCE)
    Computed Time: Thu Feb 10 14:14:35 IST 2022 (00:20:22 ago)
    Metric type: Latency, Accumulated Metric 158
    SID[0]: Node, Label 16350, Address 203.203.203.203
  Recorded path:
    None
  Disjoint Group Information:
    None

```