Segment Routing OAM Support

This chapter describes how to verify the operation with Segment Routing OAM label switched protocol ping and traceroute (SR OAM LSPV).

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Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Restrictions for Segment Routing OAM Support

- Ping and traceroute does not display proper output over SR-TE tunnels using verbatim path option.
- Ping and traceroute are unsupported with SR-TE Static auto tunnel, BGP Dynamic TE, and On-demand next hop auto tunnels.
Information About Segment Routing-OAM Support

Segment Routing-OAM Support

The Segment Routing-OAM Support feature provides support for Nil-FEC LSP Ping/Trace functionality. Nil-FEC LSP Ping/Trace functionality support Segment Routing and MPLS Static. It also act as an additional diagnostic tool for all other LSP types. This feature allows operators to provide the ability to freely test any label stack by allowing them to specify the following:

- label stack
- outgoing interface
- next hop address

In the case of segment routing, each segment nodal label and adjacent label along the routing path is put into the label stack of an echo request message from initiator Label Switch Router (LSR); MPLS data plane forward this packet to the label stack target, and the label stack target reply the echo message back.

LSP Ping Operation for Nil FEC target

The LSP Ping/Traceroute is used in identifying LSP breakages. The nil-fec target type can be used to test the connectivity for a known label stack. Follow the existing LSP ping procedure (for more information, refer MPLS LSP Ping/Traceroute), with the following modifications:

- Build the echo request packet with the given label stack;
- Append explicit null label at the bottom of the label stack;
- Build echo request FTS TLV with target FEC Nil FEC and label value set to the bottom label of the label stack, which is explicit-null.

How to Diagnose Segment Routing with LSP Ping and Trace Route Nil FEC Target

Use LSP Ping for Nil FEC Target

The Nil-FEC LSP ping and traceroute operation are simply extension of regular MPLS ping and trace route. nil-fec labels <label, label...> is added to the ping mpls command. This command sends an echo request message with MPLS label stack as specified, and add another explicit null at bottom of the stack.

```
ping mpls
{{ipv4 <target>/<mask> [fec-type {bgp | generic | ldp}] | 
pseudowire <peer addr> <vc-id> [segment<segment-number>]} | 
{traffic-eng {tunnel interface} | 
 [p2p <sender> <endpoint> 
 <tun-id> <ex-tun-id> <lspid>]} | 
[p2mp <p2mp-id> <sender> 
 <tun-id><ex-tun-id> <lspid>}} | 
```
Use LSP Traceroute for Nil FEC Target

```bash
trace mpls
```

For more information, refer ping mpls.
Example: LSP Ping Nil_FEC Target Support

Node loopback IP address: 1.1.1.3 1.1.1.4 1.1.1.5
1.1.1.7
Node label: 16004 16005
16007
Nodes: Arizona --------------- Utah --------------- Wyoming
Nodes: Arizona --------------- Utah --------------- Wyoming
Interface: Eth1/0 Eth1/0
Interface IP address: 30.1.1.3 30.1.1.4
SR232-utah#sh mpls forwarding-table
Local Outgoing Prefix Bytes Label Outgoing Next Hop
Label Label or Tunnel Id Switched interface
16 Pop Label 3333.3333.0000-Et1/0-30.1.1.3 \ 0 Et1/0 30.1.1.3
17 Pop Label 5555.5555.5555-Et1/1-90.1.1.5 \ 0 Et1/1 90.1.1.5
18 Pop Label 3333.3333.0253-Et0/2-102.102.102.2 \ 0 Et0/2 102.102.102.2
19 Pop Label 9.9.9.4/32 0 Et0/2 102.102.102.2
20 Pop Label 1.1.1.5/32 0 Et1/1 90.1.1.5
21 Pop Label 1.1.1.3/32 0 Et1/0 30.1.1.3
22 Pop Label 16.16.16.16/32 0 Et1/0 30.1.1.3
23 Pop Label 16.16.16.17/32 0 Et1/0 30.1.1.3
24 Pop Label 17.17.17.17/32 0 Et1/0 30.1.1.3
25 20 9.9.9.3/32 0 Et1/0 30.1.1.3
26 21 1.1.1.6/32 0 Et1/0 30.1.1.3
27 24 1.1.1.2/32 0 Et1/0 30.1.1.3
28 28 1.1.1.2/32 0 Et1/1 90.1.1.5
29 27 9.9.9.7/32 0 Et1/1 90.1.1.5
30 Pop Label 55.1.1.0/24 0 Et1/0 90.1.1.5
31 Pop Label 19.1.1.0/24 0 Et1/0 30.1.1.3
32 Pop Label 100.1.1.0/24 0 Et1/0 30.1.1.3
33 Pop Label 100.100.100.0/24 0 Et1/0 30.1.1.3
34 Pop Label 110.1.1.0/24 0 Et1/0 30.1.1.3
35 28 10.1.1.0/24 0 Et1/0 30.1.1.3
36 29 101.101.101.0/24 0 Et1/0 30.1.1.3
37 29 65.1.1.0/24 0 Et1/1 90.1.1.5
38 33 104.104.104.0/24 0 Et1/0 30.1.1.3
39 39 104.104.104.0/24 0 Et1/0 90.1.1.5
30 30 103.103.103.0/24 0 Et1/1 90.1.1.5
16005 Pop Label 1.1.1.5/32 1782 Et1/1 90.1.1.5
16006 16006 1.1.1.6/32 0 Et1/0 30.1.1.3
16007 16007 1.1.1.7/32 0 Et1/1 90.1.1.5
16017 16017 17.17.17.17/32 0 Et1/0 30.1.1.3
16250 16250 9.9.9.3/32 0 Et1/0 30.1.1.3
16252 16252 9.9.9.7/32 0 Et1/1 90.1.1.5
16253 Pop Label 9.9.9.4/32 0 Et0/2 102.102.102.2
17000 17000 16.16.16.16/32 0 Et1/0 30.1.1.3
17002 17002 1.1.1.2/32 0 Et1/0 30.1.1.3
17002 17002 1.1.1.2/32 0 Et1/1 90.1.1.5
SR231-arizona#ping mpls nil-fec labels 16005,16007 output interface ethernet 1/0 nexthop 30.1.1.4 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, 'U' - unlabeled output interface,
'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
'M' - malformed request, 'm' - unsupported tlvs, 'N' - no label entry,
SR231-arizona#traceroute mpls nil-fec labels 16005,16007 output interface ethernet 1/0
nexthop 30.1.1.4
Tracing MPLS Label Switched Path with Nil FEC labels 16005,16007, timeout is 2 seconds


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

0 30.1.1.3 MRU 1500 [Labels: 16005/16007/explicit-null Exp: 0/0/0] 1 ms
L 1 30.1.1.4 MRU 1500 [Labels: implicit-null/16007/explicit-null Exp: 0/0] 1 ms
L 2 90.1.1.5 MRU 1500 [Labels: implicit-null/explicit-null Exp: 0/0] 1 ms
! 3 55.1.1.7 1 ms

**Additional References for Segment Routing-OAM Support**

**Related Documents**

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<td>Cisco IOS commands</td>
<td><strong>Cisco IOS Master Commands List, All Releases</strong></td>
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**Technical Assistance**

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<td>The Cisco Support and Documentation website provides online resources to</td>
<td><a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a></td>
</tr>
<tr>
<td>download documentation, software, and tools. Use these resources to install</td>
<td></td>
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<td>and configure the software and to troubleshoot and resolve technical issues</td>
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<tr>
<td>with Cisco products and technologies. Access to most tools on the Cisco</td>
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<tr>
<td>Support and Documentation website requires a Cisco.com user ID and password.</td>
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Feature Information for Segment Routing-OAM Support

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

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Table 1: Feature Information for Segment Routing-OAM Support

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