



SR-TE PM: Liveness of SR Policy Endpoint

Table 1: Feature History

Feature Name	Release Information	Description
SR-TE PM: Liveness of SR Policy Endpoint	Cisco IOS XE Bengaluru 17.5.1	<p>This feature enables Performance Measurement (PM) liveness detection and delay measurement for an SR policy on all the segment lists of every candidate path that are present in the forwarding table using PM probes. Thus, you can easily monitor the traffic path and efficiently detect any drop of traffic due to cable or hardware or configuration failures.</p> <p>This feature provides the following benefits:</p> <ul style="list-style-type: none"> • End-to-end liveness is verified before activating the candidate path in the forwarding table. • End-to-end liveness failure can trigger re-optimization to another path by deactivating the current path.

Metrics such as packet loss, delay, delay variation (jitter) and bandwidth utilization help you evaluate the performance of your network. You can use these metrics as input for Traffic Engineering (TE) and direct the flow of traffic through the network to conform to Service Level Agreements (SLAs). Network operators can use the performance measurement (PM) feature to monitor the network metrics for links. An SR-TE policy uses one or more candidate paths. A candidate path is a single segment list (SID-list) or a set of weighted SID-lists (for weighted equal cost multi-path [WECMP]). A candidate path is either dynamic or explicit.

Prior to Cisco IOS XE Bengaluru Release 17.5.1, PM could only measure delay for active candidate paths.

Starting with Cisco IOS XE Bengaluru Release 17.5.1, the liveness of SR policy endpoint configuration enables Performance Measurement (PM) liveness detection and delay measurement for an SR policy on all the segment lists of every candidate path that are present in the forwarding table using PM probes. Also,

SR-TE retains the existing traffic paths till PM liveness monitors and validates the new paths. Thus, you can easily monitor the traffic path and efficiently detect any drop of traffic due to cable or hardware or configuration failures.

PM sessions are created to the endpoint address of SR policy. If a candidate path has multiple segment-lists, PM sessions are created for each segment list. The probe query messages are sent using the segment-list SIDs (or labels) of the SR policy and SR-TE resolves the outgoing interface. SR-TE uses the First Hop Resolution (FHR) Equal Cost Multi Path Protocol (ECMP) feature.

Also, starting with this release, the default measurement mode for delay profile is changed from one-way mode to two-way mode.



Note By default, a packet is sent every 3 seconds per session. With the default liveness detection multiplier, which is 3, a session goes down in approximately 9 seconds. The maximum PPS rate considered is approximately 30 PPS per session.

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Benefits

This feature provides the following benefits:

- End-to-end liveness is verified before activating the candidate path in the forwarding table.
- End-to-end liveness failure can trigger re-optimization to another path by deactivating the current path.

Restrictions

- A maximum of 500 SR-TE PM and 1000 SR-TE PM liveness session SR policies are supported for Cisco ASR RSP2 module and Cisco ASR RSP3 modules, respectively.
- A maximum of 10 CP per SR-TE policy is recommended.
- You must maintain a maximum of 500 (for Cisco ASR RSP2 module) and a maximum of 1000 (for Cisco ASR RSP3 module) PM PPS (PPS = PM Sessions X Burst Interval). The burst interval is 3 seconds by default.
- Liveness PCE-initiated policy is not supported.

Probe Query Message

The probe messages defined in RFC5357 are used for delay measurement for links and end-to-end SR paths including SR policies. The probe query messages for performance measurement of an end-to-end SR Policy is sent using its SR-MPLS header containing the MPLS segment list. The sender IPv4 or IPv6 address is used as the source address. The endpoint IPv4 or IPv6 address is used as the destination address.

PM probes can allow both liveness monitoring and delay measurement using the same set of probes. This reduces the operational complexity in the network.

Starting with Cisco IOS XE Bengaluru Release 17.5.1, the default measurement mode for delay profile is changed from one-way mode to two-way mode. In two-way measurement mode, when using a bidirectional path, the probe response message as defined in Figure 6 is sent back to the sender node on the congruent path of the data traffic on the same reverse direction Link or associated reverse SR Policy.

Probe Message Throughput

Probe messages run in asynchronous pipeline mode, where the querier does not wait for a reply message before sending the next query message. This allows to send probe queries at a faster rate and hence the liveness failure can be detected faster.

When a PM session starts, the query messages are received for that particular PM session. The liveness module waits until the pipe is full and then starts counting the missed consecutive packets after the. Once message counting has started, any delayed message (for example, due to queuing) is dropped.

SR-TE Re-optimization (Make-Before-Break)

Prior to Cisco IOS XE Bengaluru Release 17.5.1, during SR-TE reoptimization, after each Path Calculation (PCALC), the algorithm to calculate the best path from the head end LSR to the tail end LSR, SR-TE used to destroy the existing traffic paths before forwarding the new ones.

Starting with Cisco IOS XE Bengaluru Release 17.5.1, SR-TE retains the existing traffic paths till PM liveness monitors and validates the new paths. Thus, you can easily monitor the traffic path and efficiently detect any drop of traffic due to cable or hardware or configuration failures.

Performance Measurement Named Profile

Performance Measurement (PM) named profile provides an ability to create a number of profiles for a given transport mode (for example, interface or SR policy). The implementation provides only a global profile for each type of transport mode. This prevents from having different configuration for a transport mode. Since PM named profile enables the ability to have unique configuration for each instance of a transport mode, when a particular policy is configured with a particular configuration, rest of the policies also have the same configuration.

Configure SR-TE PM: Liveness of SR Policy Endpoint

To configure SR-TE PM liveness:

On Router 1:

```

policy FAST
  color 100 end-point 11.11.11.11
  performance-measurement
    delay-measurement
      profile FAST
      liveness-detection
        invalidation-action down
  candidate-paths
  preference 100
  explicit segment-list SRTE1
  !
  constraints
    segments
      dataplane mpls
  !
  preference 2
  explicit segment-list SRTE11.11.11.11
  !
  constraints
    segments
      dataplane mpls

```

On Router 2:

```
Performance-measurement
```

Configuration Example: Default Delay Profile for Liveness

Liveness Detection Multiplier

Liveness detection multiplier is referred to the number of consecutive missed probe packets before PM session is declared as down. The default value is 3. The PM requires at least one probe packet to declare a PM session as us.

The following example shows the configuration of default delay profile for liveness:

1. Profile Type for SR Policies Configuration:

```
Router#performance-measurement
delay-profile sr-policy
```

2. SR-MPLS Policy Configuration:

```
probe
computation-interval [3-3600sec]
burst-interval [30-15000msec]
sweep
destination ipv4 127.x.x.x [1-128]
```

3. Liveness Detection Multiplier Configuration:

```
liveness-detection multiplier [2-10]
```

Configuration Example: PM Named Profiles

The following example shows the configuration of PM names profiles:

1. SR Policy Delay Profile Configuration:

```
Router#performance-measurement
delay-profile sr-policy [policy name]
```

2. SR Policy Delay Profile Configuration Under Policy Bar:

```
Router#
!
segment-routing traffic-eng
policy bar
performance-measurement
delay-measurement
profile [profile name]
```

3. Interface Delay Profile Configuration:

```
Router#performance-measurement
delay-profile interface [interface name]
```

4. Interface Delay Profile Configuration Under Interface Ethernet 0/0:

```
Router#performance-measurement
interface Ethernet 0/0
delay-measurement
profile [profile name]
```



Note The name of the profile must be unique for a given transport mode and the same name can be used for different transport modes. Also, in absence of a profile, the probe will stop transmitting.

Configuration Example: SR Policy for Liveness Detection

The following example shows the configuration of SR policy for liveness detection:

1. End-to-End Delay for All Candidate Paths:

```
Router# segment-routing traffic-eng
policy [policy-name]
color 4 endpoint ipv4 1.1.1.5
performance-measurement
delay-measurement
```

2. End-to-End Liveness Detection:

```
liveness-detection
invalidation-action [Down|None]
```

Bidirectional Forwarding Detection (BFD) mechanisms are specified to monitor the unidirectional MPLS Label Switched Paths (LSPs) via BFD MPLS. Use the **invalidation-action** {*down* | *none*} command to set the action to be taken when BFD session is invalidated.

Table 2: Syntax Description

Keyword	Description
None	This is the default option. When the PM session goes down, use this option to record the failure without modifying the SR policy operational state.

Keyword	Description
Down	When the PM session liveness state is up, use this option to configure the LSP to operational up state. When the PM session goes down, the LSP state is immediately brought down.

Verification of SR-TE PM: Liveness of SR Policy Endpoint Configuration

Use the **show segment-routing traffic-eng policy name [policy-name] detail** command to verify the SR-TE policy name configuration:

```
Router#show segment-routing traffic-eng policy name policy-name detail
Name: FAST (Color: 100 End-point: 11.11.11.11)
Owners : CLI
Status:
  Admin: up, Operational: up for 01:12:44 (since 01-11 17:17:00.092)
Candidate-paths:
  Preference 100 (CLI):
    PM State: Up
    Explicit: segment-list SRTE1 (active)
      Weight: 1, Metric Type: TE
      16006 [Prefix-SID, 6.6.6.6]
      16008 [Prefix-SID, 8.8.8.8]
      16011 [Prefix-SID, 11.11.11.11]
    Preference 2 (CLI):
      PM State: Up
      Explicit: segment-list SRTE11.11.11.11 (inactive)
      Weight: 1, Metric Type: TE
      16011 [Prefix-SID, 11.11.11.11]
Attributes:
  Binding SID: 16
  Allocation mode: dynamic
  State: Programmed
Tunnel ID: 65536 (Interface Handle: 0x20)
Per owner configs:
  CLI
  Binding SID: dynamic
Stats:
  5 minute output rate 0 bits/sec, 0 packets/sec
  Packets: 0 Bytes: 0
  PM profile: FAST
Router#
Event history:
  Timestamp                Client      Event type      Context:
Value                      -----
-----
01-11 17:17:00.092        CLI        Policy created  Name: CLI
01-11 17:17:00.096        CLI        Set colour      Colour: 100

01-11 17:17:00.096        CLI        Set end point   End-point:
11.11.11.11
01-11 17:17:00.129        CLI        Set delay measure status:
Enabled
01-11 17:17:00.130        CLI        PM Profile name config:
FAST
```

```

01-11 17:17:00.131      CLI      Set Live Detection      status:
Enabled
01-11 17:17:00.131      CLI      Set Live Invalidation   action:
down
01-11 17:17:00.134      CLI      Set explicit path       Path option:
SRTE1
01-11 17:17:00.139      CLI      Set explicit path       Path option:
SRTE11.11.11.11
01-11 17:17:11.033      CLI      BSID allocated          FWD: label
16
01-11 17:22:25.510      FH Resolution           Liveness                CP: 100,
SL1 is Waiting
01-11 17:24:27.038      PM              Liveness                CP: 100,
SL1 is Down
01-11 18:16:36.368      FH Resolution           Liveness                CP: 2, SL2
is Waiting
01-11 18:16:39.048      PM              Liveness                CP: 2, SL2
is Up
01-11 18:16:39.048      PM              Liveness                CP: 100,
SL1 is Up
01-11 18:16:39.053      FH Resolution           Policy state UP         Status:
PATH RESOLVED CP: 100

```

Use the **show performance-measurement summary** command to verify the performance measurement summary information:

```

Router#show performance-measurement summary
Total interfaces                : 0
Total SR Policies               : 1
Maximum PPS                     : 1000 pkts/sec

Interface Delay-Measurement:
Total sessions                  : 0
Counters:
  Packets:
    Total sent                   : 0
    Total received                : 0
  Errors:
    Total sent errors            : 0
    Total received errors        : 0
  Probes:
    Total started                 : 0
    Total completed               : 0
    Total incomplete              : 0
    Total advertisements          : 0
SR Policy Delay-Measurement:
Total sessions                  : 2-CP configured
Counters:
  Packets:
    Total sent                   : 2
    Total received                : 2
  Errors:
    Total sent errors            : 0
    Total received errors        : 0
  Probes:
    Total started                 : 0
    Total completed               : 0
    Total incomplete              : 0
    Total advertisements          : 0
Global Delay Counters:
Total packets sent              : 2
Total query packets received    : 2
Total invalid session id        : 0
Total no session                : 0

```

```

HW Support for MPLS-GAL [RFC6374] timestamp : No
HW Support for IPv4 TWAMP [RF5357] timestamp : Yes
HW Support for IPv6 TWAMP [RF5357] timestamp : No
HW Support for 64 bit timestamp : Yes
HW Support for IPv4 UDP Cheksum : No

```

Use the **show performance-measurement sr-policy name** [*sr-policy name*] command to verify the performance measurement SR policy name configuration:

```

Router#show performance-measurement sr-policy name sr-policy name
SR Policy name: FAST
  Color : 100
  Endpoint : 11.11.11.11
  Source : 2.2.2.2
  Profile name : FAST
  Policy Update Timestamp : 18:16:39 11 2021
  Number of candidate-paths : 2

Candidate-Path:
  Preference : 2
  Protocol-origin : Configured
  Discriminator : 0
  Active: : No
  Number of segment-lists : 1
  Number of atomic paths : 1
  Number of live UP atomic paths: 1
  Number of live Unknown atomic : 0
Max Pkts per Burst : 1500
  Max Pkts per Probe : 15000
  AP Min Run per Probe : 3
  Round-robin bursts : 1
  Round-robin probes : 1
  Last advertisement:
    Advertised at: 18:18:56 11 2021 (1073 seconds ago)
    Advertised delays (uSec): avg: 520, min: 450, max: 893, variance: 70
  Next advertisement:
    Check scheduled at the end of the current probe (roughly every 120 seconds)
    Aggregated delays (uSec): avg: 485, min: 421, max: 602, variance: 64
  Last probe:
    Packets Sent: 10, received: 10
    Measured delays (uSec): avg: 488, min: 459, max: 550, variance: 29
  Current probe:
    Packets Sent: 8, received: 8
    Measured delays (uSec): avg: 478, min: 447, max: 511, variance: 31

```

Use the **show performance-measurement sr-policy detail private verbose** command to verify the performance measurement SR policy detail configuration:

```

Router#show performance-measurement sr-policy detail private verbose
SR Policy name: FAST
  Color : 100-----□policy color
  Endpoint : 11.11.11.11
  Source : 2.2.2.2
  Profile name : FAST -----□policy Name
  Policy Update Timestamp : 22:31:38 12 2021
  Number of candidate-paths : 2

Candidate-Path:
  Preference : 2
  Protocol-origin : Configured
  Discriminator : 0
  Active: : No
  Number of segment-lists : 1
  Number of atomic paths : 1
  Number of live UP atomic paths: 1
  Number of live Unknown atomic : 0

```



```

Max Pkts per Burst      : 6
Max Pkts per Probe     : 60
AP Min Run per Probe   : 3
Round-robin bursts     : 1
Round-robin probes     : 1
Last advertisement:
  Advertised at: 11:41:37 13 2021 (1879 seconds ago)
  Advertised delays (uSec): avg: 500, min: 435, max: 924, variance: 65
Next advertisement:
  Check scheduled in 1 more probe (roughly every 120 seconds)
  Aggregated delays (uSec): avg: 702, min: 437, max: 3940, variance: 265
Last probe:
  Packets Sent: 10, received: 10
  Measured delays (uSec): avg: 527, min: 441, max: 686, variance: 86
Current probe:
  Packets Sent: 7, received: 7
  Measured delays (uSec): avg: 452, min: 436, max: 475, variance: 16
Segment-List:
  Name                  : SL2
  Number of atomic paths : 1
Last advertisement:
  Advertised at: 11:41:37 13 2021 (1879 seconds ago)
  Advertised delays (uSec): avg: 500, min: 435, max: 924, variance: 65
Next advertisement:
  Aggregated delays (uSec): avg: 702, min: 437, max: 3940, variance: 265
Last probe:
  None
Current probe:
  None
Atomic path:
  Hops                  : 11.11.11.11
  Labels                : 16011
  Outgoing Interface   : GigabitEthernet0/5/1
  Next Hop              : 102.0.0.1
  Destination          : 11.11.11.11
  Session ID           : 409
Last advertisement:
  Advertised at: 11:41:37 13 2021 (1879 seconds ago)
  Advertised reason: Periodic timer, avg delay threshold crossed
  Advertised delays (uSec): avg: 500, min: 435, max: 924, variance: 61
Next advertisement:
  Aggregated delays (uSec): avg: 702, min: 437, max: 3940, variance: 263
  Rolling average (uSec): 625
Last probe:
  None
Current probe:
  Packets Sent: 7, received: 7
  Measured delays (uSec): avg: 452, min: 436, max: 475, variance: 16
Probe samples:
  Packet Rx Timestamp Measured Delay
  12:12:55 13 2021 441680
  12:12:52 13 2021 475040
  12:12:49 13 2021 436400
  12:12:46 13 2021 438320
  12:12:43 13 2021 443120
  12:12:40 13 2021 471200
  12:12:37 13 2021 461800
Liveness Detection:
  Session Creation Timestamp: 22:31:34 12 2021
  Session State: Up
  Last State Change Timestamp: 22:31:35 12 2021
  Missed count [consecutive]: 0
  Received count [consecutive]: 16427
  Backoff : 0

```

```

Unique Path Name           : Path-3
Candidate-Path:
  Preference                : 100
  Protocol-origin           : Configured
  Discriminator             : 0
  Active:                   : Yes
  Number of segment-lists  : 1
  Number of atomic paths   : 1
  Number of live UP atomic paths: 1
  Number of live Unknown atomic : 0
  Max Pkts per Burst       : 6
  Max Pkts per Probe       : 60
  AP Min Run per Probe     : 3
  Round-robin bursts       : 1
  Round-robin probes       : 1
  Last advertisement:
    Advertised at: 01:35:36 13 2021 (38240 seconds ago)
    Advertised delays (uSec): avg: 507, min: 430, max: 1053, variance: 77
  Next advertisement:
    Check scheduled in 1 more probe (roughly every 120 seconds)
    Aggregated delays (uSec): avg: 533, min: 443, max: 846, variance: 90
  Last probe:
    Packets Sent: 10, received: 10
    Measured delays (uSec): avg: 541, min: 443, max: 846, variance: 98
Current probe:
  Packets Sent: 7, received: 7
  Measured delays (uSec): avg: 478, min: 444, max: 502, variance: 34

Segment-List:
  Name                      : SL1
  Number of atomic paths   : 1
  Last advertisement:
    Advertised at: 01:35:36 13 2021 (38240 seconds ago)
    Advertised delays (uSec): avg: 507, min: 430, max: 1053, variance: 77
  Next advertisement:
    Aggregated delays (uSec): avg: 533, min: 443, max: 846, variance: 90
  Last probe:
    None
  Current probe:
    None
Atomic path:
  Hops                      : 6.6.6.6, 8.8.8.8, 11.11.11.11
  Labels                    : 16006, 16008, 16011
  Outgoing Interface       : GigabitEthernet0/5/1
  Next Hop                  : 102.0.0.1
  Destination               : 11.11.11.11
  Session ID                : 408
Candidate-Path:
  Preference                : 100
  Protocol-origin           : Configured
  Discriminator             : 0
  Active:                   : Yes
  Number of segment-lists  : 1
  Number of atomic paths   : 1
  Number of live UP atomic paths: 1
  Number of live Unknown atomic : 0
  Max Pkts per Burst       : 6
  Max Pkts per Probe       : 60
  AP Min Run per Probe     : 3
  Round-robin bursts       : 1
  Round-robin probes       : 1
  Last advertisement:
    Advertised at: 01:35:36 13 2021 (38240 seconds ago)
    Advertised delays (uSec): avg: 507, min: 430, max: 1053, variance: 77

```

```

Next advertisement:
  Check scheduled in 1 more probe (roughly every 120 seconds)
  Aggregated delays (uSec): avg: 533, min: 443, max: 846, variance: 90
Last probe:
  Packets Sent: 10, received: 10
  Measured delays (uSec): avg: 541, min: 443, max: 846, variance: 98
Last advertisement:
  Advertised at: 01:35:36 13 2021 (38240 seconds ago)
  Advertised reason: Periodic timer, avg delay threshold crossed
  Advertised delays (uSec): avg: 507, min: 430, max: 1053, variance: 60
Next advertisement:
  Aggregated delays (uSec): avg: 533, min: 443, max: 846, variance: 85
  Rolling average (uSec): 533
Last probe:
  None
Current probe:
  Packets Sent: 7, received: 7
  Measured delays (uSec): avg: 478, min: 444, max: 502, variance: 34
Probe samples:
Packet Rx Timestamp Measured Delay
          12:12:56 13 2021 491200
          12:12:53 13 2021 488440
          12:12:50 13 2021 444280
          12:12:47 13 2021 466360
          12:12:44 13 2021 455160
          12:12:41 13 2021 502480
          12:12:38 13 2021 500720
Liveness Detection:
  Session Creation Timestamp: 22:31:34 12 2021
  Session State: Up
  Last State Change Timestamp: 22:31:35 12 2021
  Missed count [consecutive]: 0
  Received count [consecutive]: 16427
  Backoff : 0
  Unique Path Name : Path-4

```

SR-PM Delay Deduction (Loopback Mode)

Table 3: Feature History

Feature Name	Release Information	Description
SR-PM Delay Deduction (Loopback Mode)	Cisco IOS XE Bengaluru 17.5.1	This feature improves the SR-PM detection time as the PM probes are not punted on the remote nodes. Also, it does not require a third-party support for interoperability.

Prior to Cisco IOS XE Bengaluru Release 17.5.1, you could not configure loopback mode for SR-PM detection.

Starting with Cisco IOS XE Bengaluru Release 17.5.1, you can configure the loopback mode at the head nodes of the router while the remote nodes can be used for any third-party configuration. As the PM probes are not punted on the remote nodes, the SR-PM detection time is enhanced and improved. Also, third-party support for interoperability is not required.

Configuration Example: SR-PM Delay Deduction (Loopback Mode)

Use the **reverse-path** command to configure reverse path configuration before you configure loopback mode. This configuration enables an MPLS label configuration that is pushed in PM probe messages above the existing label list received from the SR policy manager for the particular path.

The following example shows the configuration of SR-PM delay deduction (loopback mode):

```

policy FAST
  color 100 end-point 11.11.11.11
  performance-measurement
    delay-measurement
      profile FAST
      liveness-detection
      invalidation-action down
      reverse-path
      label 16002
  candidate-paths
    preference 100
    explicit segment-list SRTE1
    !
    constraints
      segments
      dataplane mpls
    !
    !
  preference 2
  explicit segment-list SRTE11.11.11.11
  !
  constraints
    segments
    dataplane mpls
  !
  !
  !

performance-measurement
!
delay-profile sr-policy name FAST
  probe
    measurement-mode loopback

```

Verify SR-PM Delay Deduction (Loopback Mode) Configuration

Use the **show performance-measurement profile sr-policy *policy-name*** command to verify the performance measurement SR policy configuration using the loopback mode:

```

Router#show performance-measurement profile sr-policy policy-name
FAST SR Policy Delay Measurement:
Profile configuration:
  Measurement Type                : Loopback
  Computation interval            : 30 (effective : 30) seconds
  Burst interval                  : 3000 mSec
  Burst count                     : 10
  Protocol                       : TWAMP-Lite Unauth
  Destination sweeping mode      : Disabled
  Periodic advertisement         : Enabled
  Interval                       : 120 (effective: 120) sec
  Threshold                      : 10%
  Minimum-Change                 : 500 uSec
  Accelerated advertisement      : Disabled

```

```

Threshold crossing check           : Average-delay
Liveness-detection multiplier     : 3

```

Use the **show segment-routing traffic-eng policy name** *[policy-name]* **detail** command to verify the SR-TE policy name configuration using loopback mode:

```

Router#show segment-routing traffic-eng policy name policy-name detail
Name: FAST (Color: 100 End-point: 11.11.11.11)
Owners : CLI
Status:
  Admin: up, Operational: up for 183:26:26 (since 01-28 20:10:24.628)
Candidate-paths:
  Preference 100 (CLI):
    PM State: Up
    Explicit: segment-list SRTE1 (active)
      Weight: 1, Metric Type: TE
      16006 [Prefix-SID, 6.6.6.6]
      16008 [Prefix-SID, 8.8.8.8]
      16011 [Prefix-SID, 11.11.11.11]
    Preference 2 (CLI):
      PM State: Up
      Explicit: segment-list SRTE11.11.11.11 (inactive)
        Weight: 1, Metric Type: TE
        16011 [Prefix-SID, 11.11.11.11]
Attributes:
  Binding SID: 16
  Allocation mode: dynamic
  State: Programmed
Tunnel ID: 65536 (Interface Handle: 0x20)
Per owner configs:
  CLI
  Binding SID: dynamic
Stats:
  5 minute output rate 0 bits/sec, 0 packets/sec
  Packets: 0 Bytes: 0
PM profile: FAST

Event history:
  Timestamp                Client                Event type            Context:
Value
-----
-----
-----:
-----
01-20 08:50:22.483        FH Resolution         Liveness              CP: 2, SL2
is Waiting
01-20 08:50:22.492        PM                    Liveness              CP: 100,
SL1 is Up
01-20 08:50:22.492        PM                    Liveness              CP: 2, SL2
is Up
01-20 08:50:22.494        FH Resolution         REOPT triggered       Status:
REOPTIMIZED CP: 100
01-20 08:51:54.426        FH Resolution         REOPT triggered       Status:
REOPTIMIZED CP: 100
01-20 08:52:00.964        FH Resolution         REOPT triggered       Status:
REOPTIMIZED CP: 100
01-20 08:55:10.264        FH Resolution         REOPT triggered       Status:
REOPTIMIZED CP: 100
01-20 12:04:06.663        FH Resolution         Liveness              CP: 100,
SL1 is Waiting
01-20 12:04:06.664        FH Resolution         Liveness              CP: 2, SL2
is Waiting
01-20 12:04:08.773        PM                    Liveness              CP: 2, SL2
is Up
01-20 12:04:08.836        FH Resolution         REOPT triggered       Status:

```

Verify SR-PM Delay Deduction (Loopback Mode) Configuration

REOPTIMIZED CP: 2			
01-20 12:04:08.954	PM	Liveness	CP: 100,
SL1 is Up			
01-20 12:04:09.001	FH Resolution	REOPT triggered	Status:
REOPTIMIZED CP: 100			
01-20 14:31:41.138	FH Resolution	Liveness	CP: 100,
SL1 is Waiting			
01-20 14:31:41.138	FH Resolution	Liveness	CP: 2, SL2
is Waiting			
01-20 14:31:44.292	PM	Liveness	CP: 2, SL2
is Up			
01-20 14:31:44.430	FH Resolution	REOPT triggered	Status:
REOPTIMIZED CP: 2			
01-20 14:31:45.099	PM	Liveness	CP: 100,
SL1 is Up			
01-20 14:31:45.232	FH Resolution	REOPT triggered	Status:
REOPTIMIZED CP: 100			
01-21 16:17:05.118	FH Resolution	REOPT triggered	Status:
REOPTIMIZED CP: 100			
01-21 16:58:34.741	FH Resolution	REOPT triggered	Status:
REOPTIMIZED CP: 100			
01-22 08:13:05.533	FH Resolution	REOPT triggered	Status:
REOPTIMIZED CP: 100			
01-22 08:17:51.393	FH Resolution	REOPT triggered	Status:
REOPTIMIZED CP: 100			
01-22 13:10:38.098	FH Resolution	REOPT triggered	Status:
REOPTIMIZED CP: 100			
01-28 12:04:30.402	FH Resolution	REOPT triggered	Status:
REOPTIMIZED CP: 100			
01-28 12:07:29.883	FH Resolution	Liveness	CP: 100,
SL1 is Waiting			
01-28 12:07:29.883	FH Resolution	Liveness	CP: 2, SL2
is Waiting			
01-28 12:07:29.961	PM	Liveness	CP: 100,
SL1 is Up			
01-28 12:07:29.962	PM	Liveness	CP: 2, SL2
is Up			
01-28 12:07:30.323	FH Resolution	REOPT triggered	Status:
REOPTIMIZED CP: 100			
01-28 12:44:13.208	FH Resolution	Policy state DOWN	Status:
PATH NOT RESOLVED			
01-28 12:44:13.392	PM	Liveness	CP: 100,
SL1 is Unknown			
01-28 12:44:13.392	PM	Liveness	CP: 2, SL2
is Unknown			
01-28 19:40:14.414	FH Resolution	Liveness	CP: 2, SL2
is Waiting			
01-28 19:40:16.137	PM	Liveness	CP: 2, SL2
is Up			
01-28 19:40:16.277	FH Resolution	Policy state UP	Status:
PATH RESOLVED CP: 2			
01-28 20:10:24.628	FH Resolution	Policy state DOWN	Status:
PATH NOT RESOLVED			
01-28 20:10:24.971	PM	Liveness	CP: 2, SL2
is Unknown			
01-28 20:10:27.656	FH Resolution	Liveness	CP: 2, SL2
is Waiting			
01-28 20:10:30.219	PM	Liveness	CP: 2, SL2
is Up			
01-28 20:10:30.311	PM	Liveness	CP: 2, SL2
is Unknown			
02-05 11:27:57.404	CLI	Set PM delay loopbac	:
02-05 11:34:48.918	FH Resolution	Liveness	CP: 100,
SL1 is Waiting			

```

02-05 11:35:42.025      FH Resolution      Liveness          CP: 2, SL2
is Waiting
02-05 11:35:44.792      PM                 Liveness          CP: 100,
SL1 is Up
02-05 11:35:45.030      PM                 Liveness          CP: 2, SL2
is Up
02-05 11:35:45.031      FH Resolution      Policy state UP    Status:
PATH RESOLVED CP: 2
02-05 11:35:46.701      FH Resolution      REOPT triggered    Status:
REOPTIMIZED CP: 2
02-05 11:35:47.937      PM                 Liveness          CP: 100,
SL1 is Up
02-05 11:35:47.938      FH Resolution      REOPT triggered    Status:
REOPTIMIZED CP: 100

```

Use the **show performance-measurement counters sr-policy name** *sr-policy name* to display the PM link-delay session counters.

```

Router#show performance-measurement counters sr-policy name sr-policy name
SR Policy name: FAST
Candidate-Path:
  Preference          : 2
  Protocol-origin     : Configured
  Discriminator       : 0
  Active              : No
  Packets:
    Total sent        : 55
    Total received    : 55
  Errors:
    Total sent errors : 0
    Total received errors : 0
  Probes:
    Total started     : 5
    Total completed   : 5
    Total incomplete  : 0
    Total advertisements : 1
Segment-list:
  Name                : SL2
  Packets:
    Total sent        : 55
    Total received    : 55
  Errors:
    Total sent errors : 0
    Total received errors : 0
  Probes:
    Total started     : 5
    Total completed   : 5
    Total incomplete  : 0
    Total advertisements : 1
Candidate-Path:
  Preference          : 100
  Protocol-origin     : Configured
  Discriminator       : 0
  Active              : Yes
  Packets:
    Total sent        : 56
    Total received    : 56
  Errors:
    Total sent errors : 0
    Total received errors : 0
  Probes:
    Total started     : 5
    Total completed   : 5

```

Verify SR-PM Delay Deduction (Loopback Mode) Configuration

```
Total incomplete           : 0
Total advertisements        : 0
Segment-list:
  Name                       : SL1
  Packets:
    Total sent               : 56
    Total received           : 56
  Errors:
    Total sent errors        : 0
    Total received errors    : 0
  Probes:
    Total started            : 5
    Total completed          : 5
    Total incomplete         : 0
    Total advertisements     : 0
```