Enhanced Performance and Liveness Monitoring in Segment Routing Networks

draft-gandhi-spring-sr-enhanced-plm-04

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Agenda

- Requirements and Scope
- History and Summary of Updates
- Review of the Procedure
- Next Steps

Requirements and Scope

Requirements:

- Performance & Liveness Monitoring in SR networks
  - ✓ End-to-end SR paths
  - ✓ Applicable to SR-MPLS/SRv6 data planes
- Running single protocol in SR networks
  - ✓ Simplify implementations and reduce development cost
  - ✓ Simplify deployment and reduce operational complexity
- No Session-Reflector dependency
  - ✓ Session-Reflector unaware of the monitoring protocol
    - ✓ State is in the test packet - spirit of SR
  - ✓ Higher test session scale and faster failure detection interval

Scope:

- Leverage RFC 8762 (Simple TWAMP (STAMP)) hardware implementation

History of the Draft

- March 2020
  - Draft was published
- April 2020
  - Presented version 00 in IETF 107 Virtual MPLS WG Meeting
- July 2020
  - Presented version 02 in IETF 108 Online SPRING WG meeting
- September 2020
  - Presented version 02 in MPLS WG Interim meeting

Updates Since IETF-108 (Version-02)

Updates:

- ✓ Updated terminology – test packets, consistent terms for MPLS Timestamp Label and SRv6 Timestamp Endpoint
- ✓ Added authentication mode
- ✓ Added SRv6 Timestamp Endpoint function assignment and Node Capability
- ✓ Added synthetic packet loss
- ✓ Updated IANA section
- ✓ Various editorial changes

Open Items:

- None

Loopback Mode for SR Policy

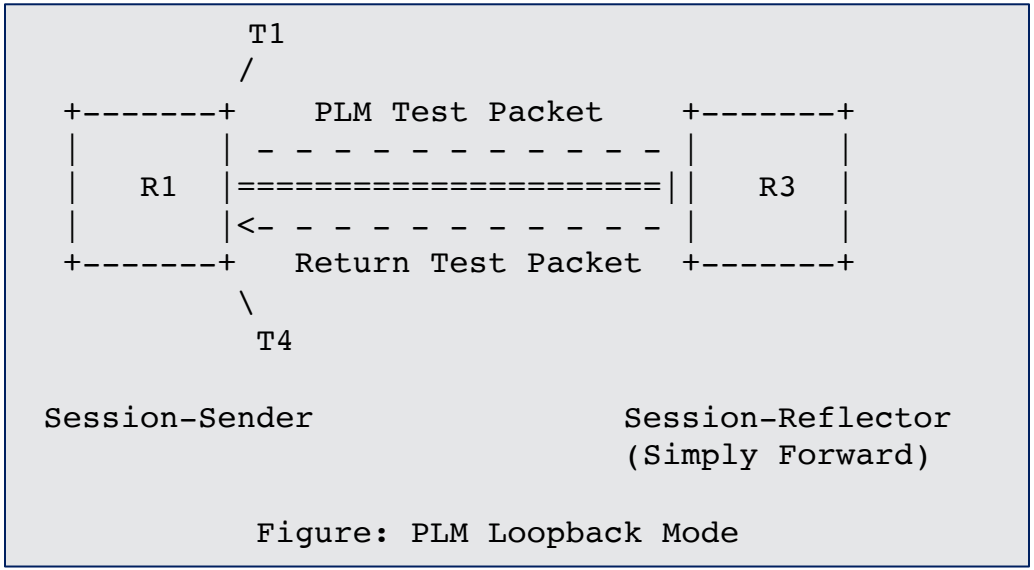
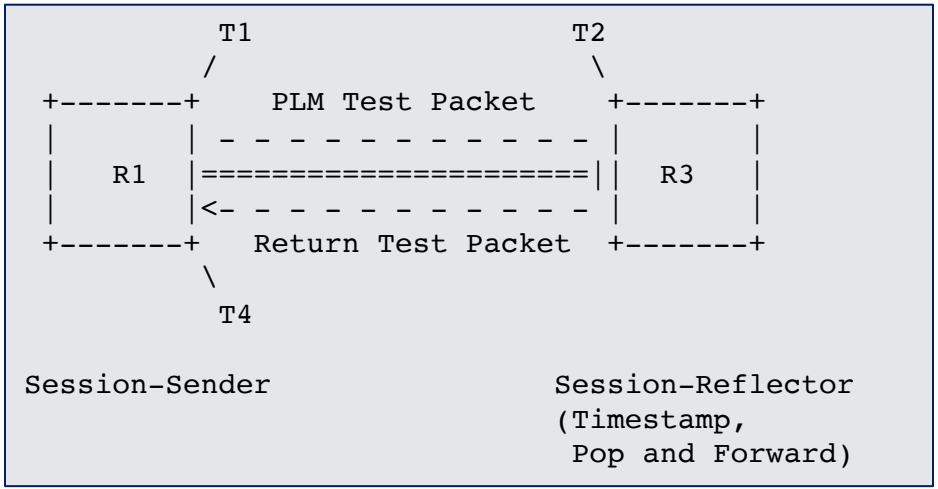


Figure: PLM Loopback Mode

- PLM test packets in Loopback Mode
- PLM test packets are transmitted using Segment List(s) of the SR Policy Candidate Path(s)
- PLM test packets are forwarded in fast-path just like data traffic on Session Reflector - not punted to slow-path
- Session-Reflector is agnostic to the performance monitoring protocol
- Round-trip delay = (T4 - T1)

Loopback Mode Enabled with Network Programming Function



- PLM test packets transmitted in loopback mode enabled with network programming function
  - The network programming function optimizes the "operations of punt and inject the test packet" on Session-Reflector
  - As PLM test packets are forwarded in fast-path, higher session scale with faster failure detection interval is possible
- Session-Reflector adds receive timestamp at a specific location in the payload of the received test packet in fast-path
  - Only adds the receive timestamp if the source address or destination address in the test packet matches the local node address
  - Ensure loopback PLM test packets return from the intended Session-Reflector
- One-way delay = (T2 – T1)

Example Provisioning Model

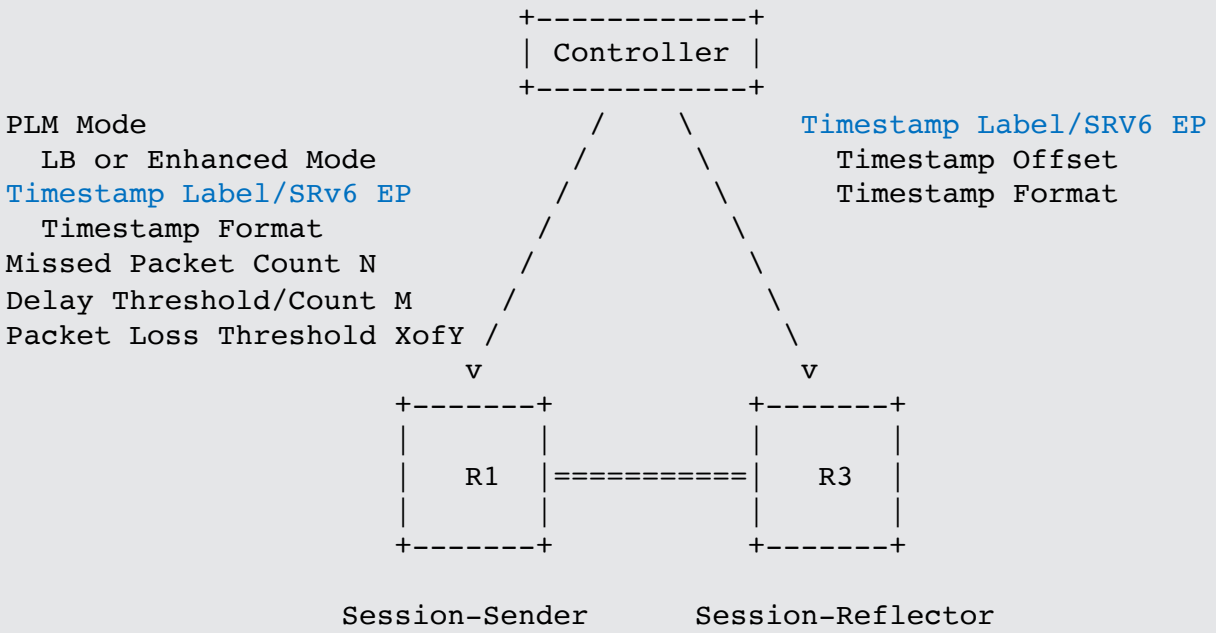
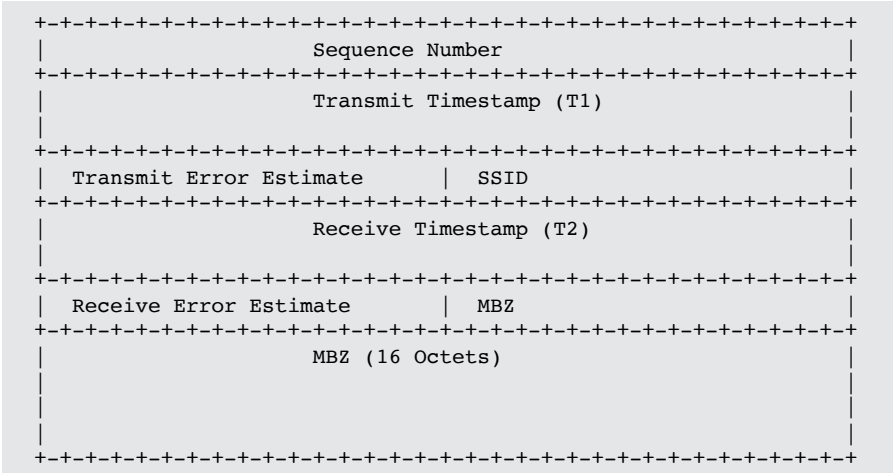


Figure: Example Provisioning Model

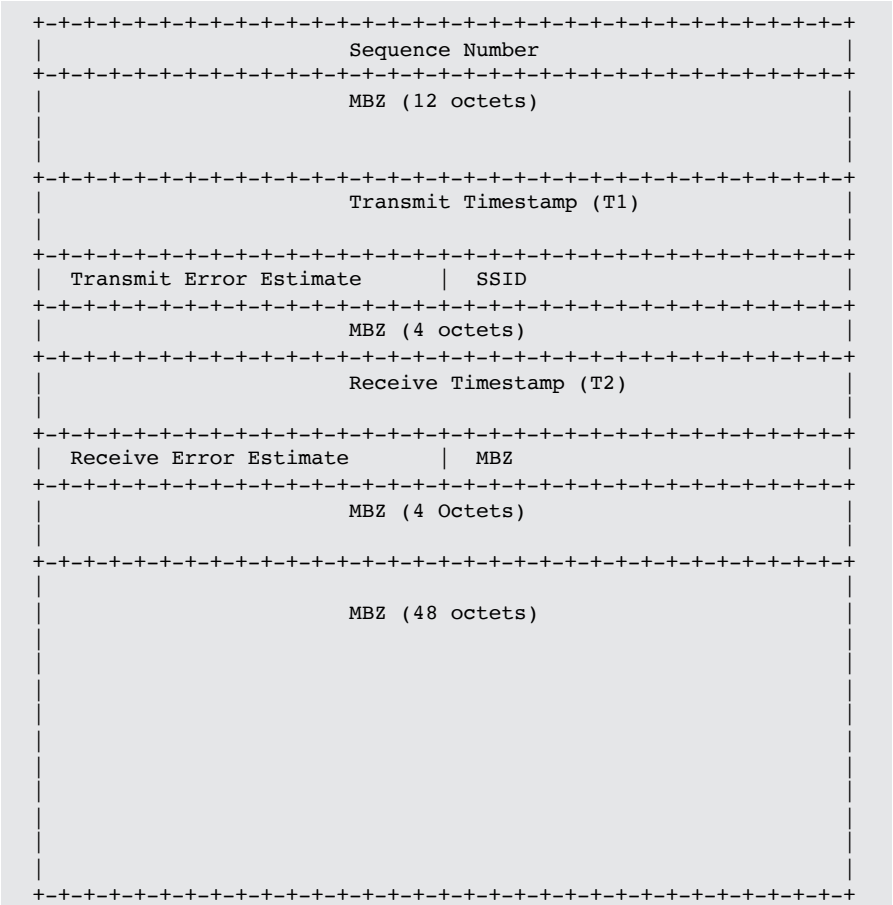
* Provisioned, Flooded/Signaled or IANA Allocated

PLM Test Packet Formats

- Leverage existing STAMP implementations in hardware
- Session-Sender adds Transmit Timestamp (T1)
- Session-Reflector adds Receive Timestamp (T2) at offset-byte location in payload, for example,
  - offset-byte 16 from the start of the payload in unauthenticated mode, or
  - offset-byte 32 from the start of the payload in authenticated mode, or
  - locally provisioned location (consistently in the network)

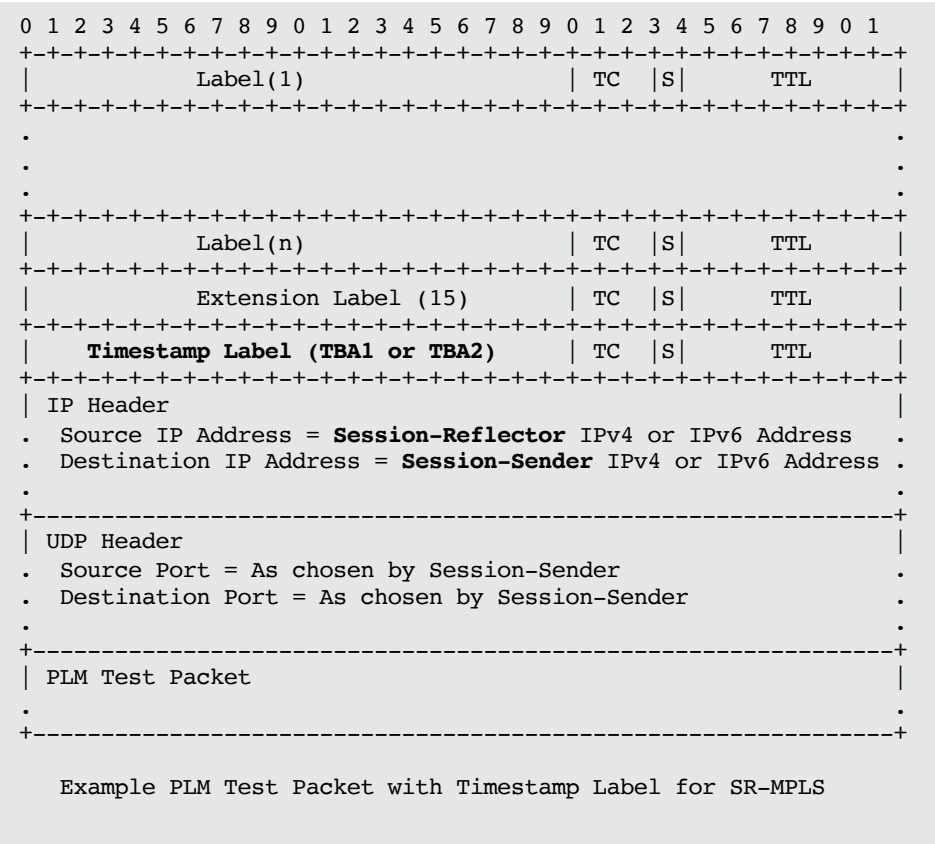


PLM Test Packet Format in Unauthentication Mode



PLM Test Packet Format in Authentication Mode

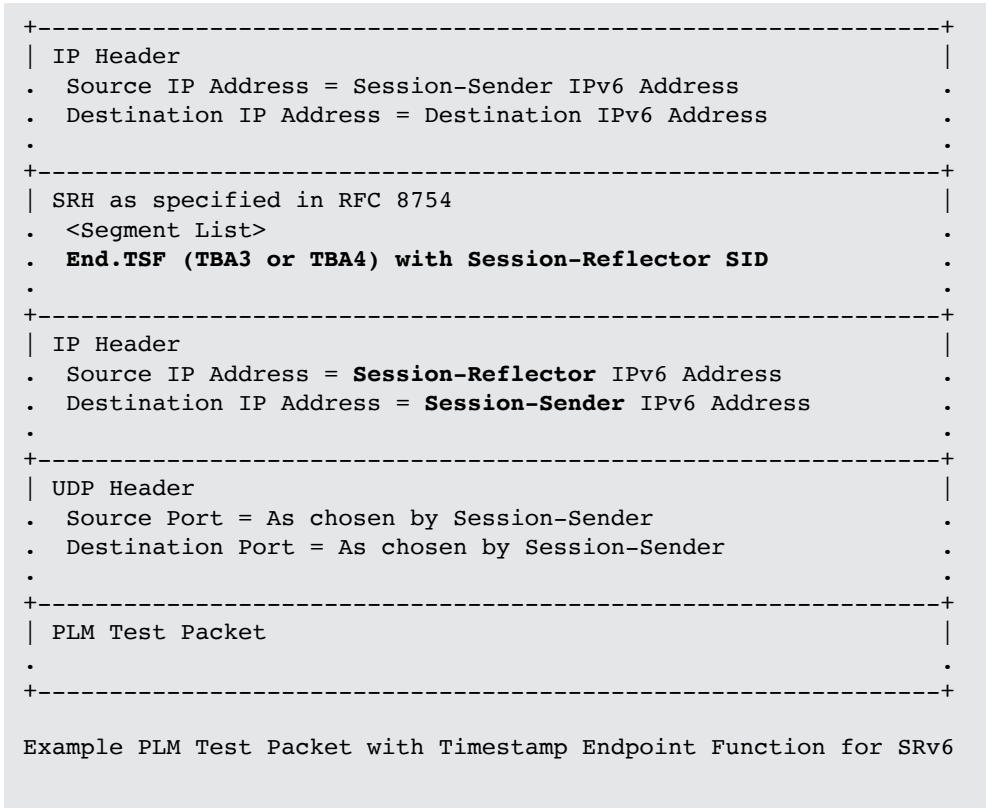
SR-MPLS with Timestamp Label



Example PLM Test Packet with Timestamp Label for SR-MPLS

- Timestamp label (TBA1) is defined for Timestamp, Pop and Forward function
- Reverse Path can be IP or SR-MPLS
- Source and Destination Addresses are swapped that represent the Reverse direction path

SRv6 with Timestamp Endpoint Function



Example PLM Test Packet with Timestamp Endpoint Function for SRv6

- Timestamp Endpoint Function End.TSF (TBA3) is defined for Timestamp and Forward and is carried with the Session-Reflector node SID
- Reverse path can be IP
  - Session-Reflector removes SRH
- Reverse path can be SR
  - Reverse direction SR path Segment-list carried in SRH
  - Session-Reflector does not remove the SRH
- Source and Destination Addresses are swapped that represent the Reverse direction path in the inner IPv6 header

Performance Metric Notifications

- Liveness success (connectivity Up - success of heart beats) initially is notified as soon as one or more PLM return test packets are received at the Session-Sender
- Liveness failure (connectivity loss - loss of heart beats) is notified when consecutive N number of PLM return test packets are not received at the Session-Sender
- Synthetic packet loss is notified when X number of PLM return test packets not received at the Session-Sender out of last Y PLM test packets transmitted
- Delay metrics are notified as an example, when consecutive M number of PLM test packets have delay values exceed the configured thresholds (absolute/percentage)

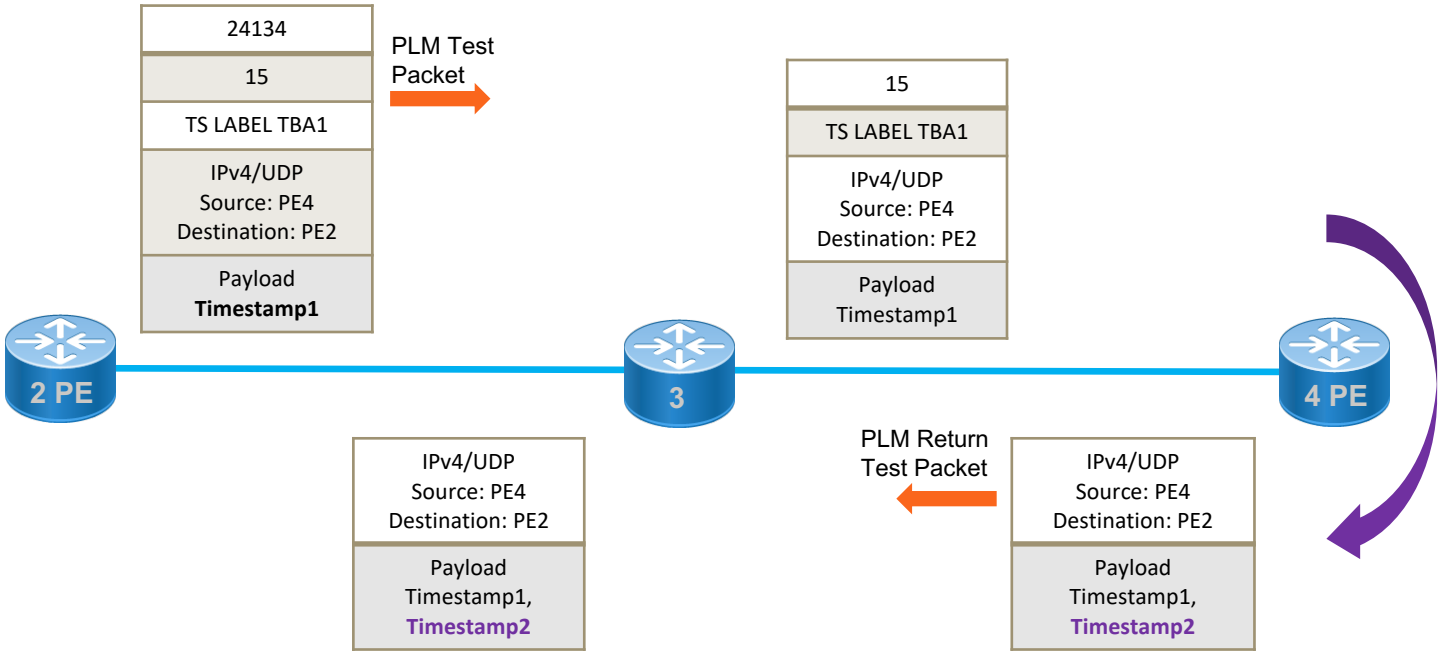
Next Steps

- Welcome your comments and suggestions
- Requesting SPRING WG adoption

Thank you

Backup

Loopback Mode with Timestamp and Forward for SR-MPLS Policy



Thank you