Enhanced Performance Measurement Using Simple TWAMP in Segment Routing Networks

draft-gandhi-spring-enhanced-srpm-00

Rakesh Gandhi - Cisco Systems (rgandhi@cisco.com) - Presenter
Clarence Filsfils - Cisco Systems (cfilsfil@cisco.com)
Navin Vaghamshi - Reliance (Navin.Vaghamshi@ril.com)
Moses Nagarajah - Telstra (Moses.Nagarajah@team.telstra.com)
Richard Foote - Nokia (footer.foote@nokia.com)
Mach(Guoyi) Chen - Huawei (mach.chen@huawei.com)

Agenda

- Requirements and Scope
- History and Summary
- Next Steps

Requirements and Scope

Requirements:

- Performance Measurement in SR networks
  - ✓ End-to-end SR paths
  - ✓ Applicable to SR-MPLS/SRv6 data planes

Goals:

- No Session-Reflector dependency for one-way delay measurement
  - ✓ Session-Reflector unaware of the measurement protocol
    - ✓ State is in the packet - spirit of SR
- Higher test session scale and faster detection interval

Scope:

- Using RFC 8762 (Simple TWAMP (STAMP))
- Further extension of *[draft-ietf-spring-stamp-srpm]*

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
- March 2021
  - Presented version 04 in IETF 110 Online SPRING WG meeting

Loopback Mode for SR Policy [draft-ietf-spring-stamp-srpm]

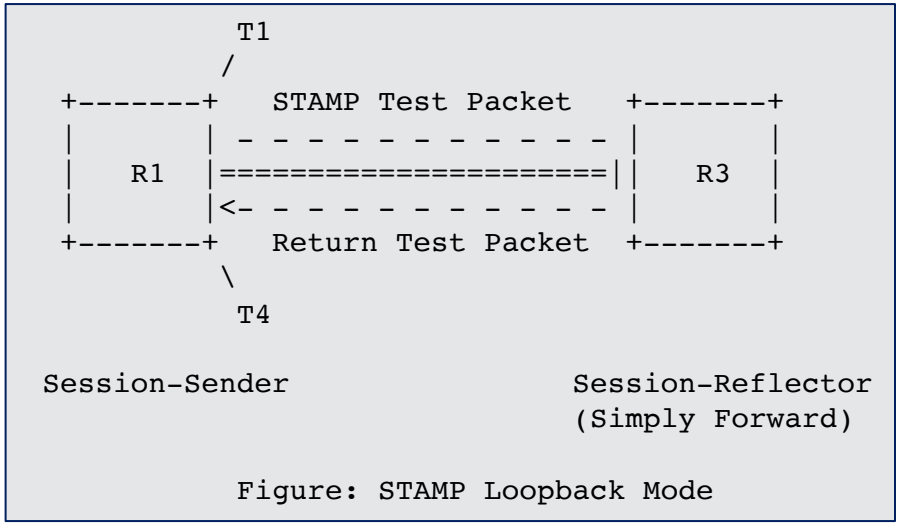
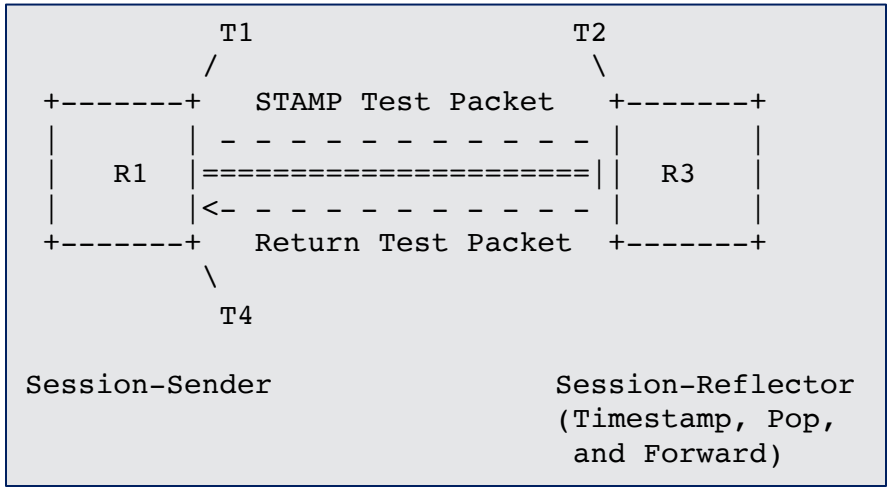


Figure: STAMP Loopback Mode

- STAMP test packets in Loopback Mode as defined in [*draft-ietf-spring-stamp-srpm*]
- STAMP test packets are transmitted for each Segment List(s) of the SR Policy Candidate Path(s)
- STAMP test packets are forwarded in fast-path just like data traffic on Session-Reflector
- Session-Reflector is agnostic to the STAMP protocol
- Round-trip delay = (T4 - T1)

Enhanced Loopback Mode Enabled with Network Programming Function



- STAMP test packets transmitted in enhanced loopback mode
  - The network programming function optimizes the "operations of punt and generate the reply test packet" on Session-Reflector
  - As STAMP test packets are forwarded in fast-path, higher session scale with faster detection interval is achieved
- 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 in the received test packet matches the local node address
  - Ensure loopback STAMP test packets return from the intended Session-Reflector
- One-way delay = (T2 – T1) (Note: assumes the clocks on the Session-Sender and Session-Reflector are synchronized)

Example Provisioning Model

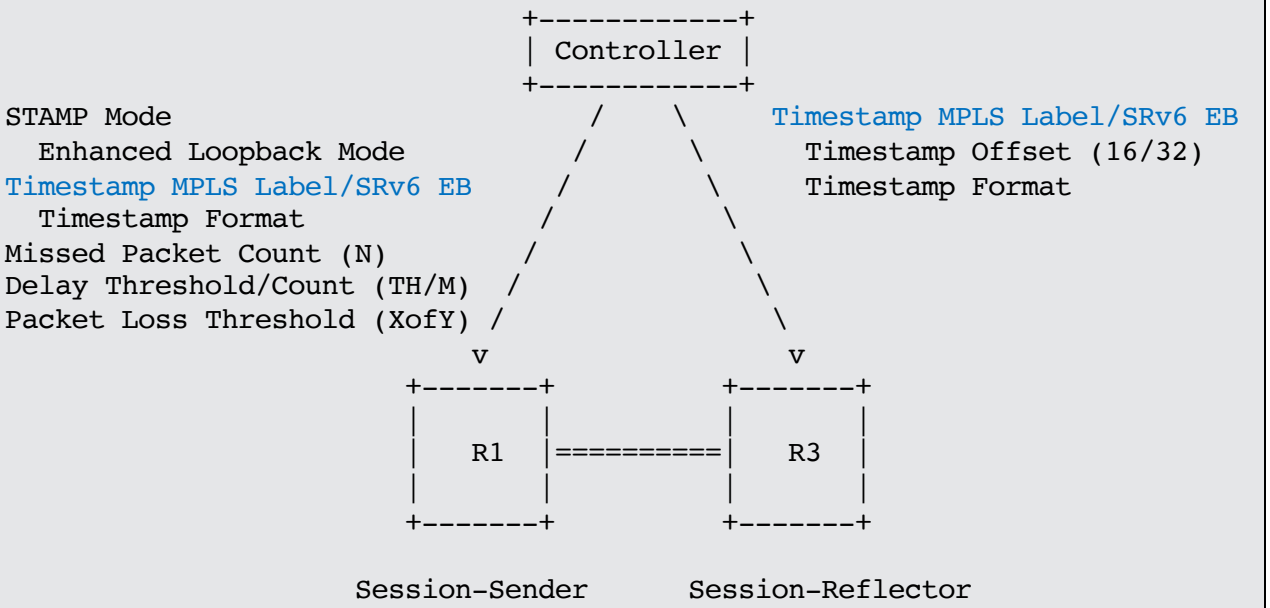
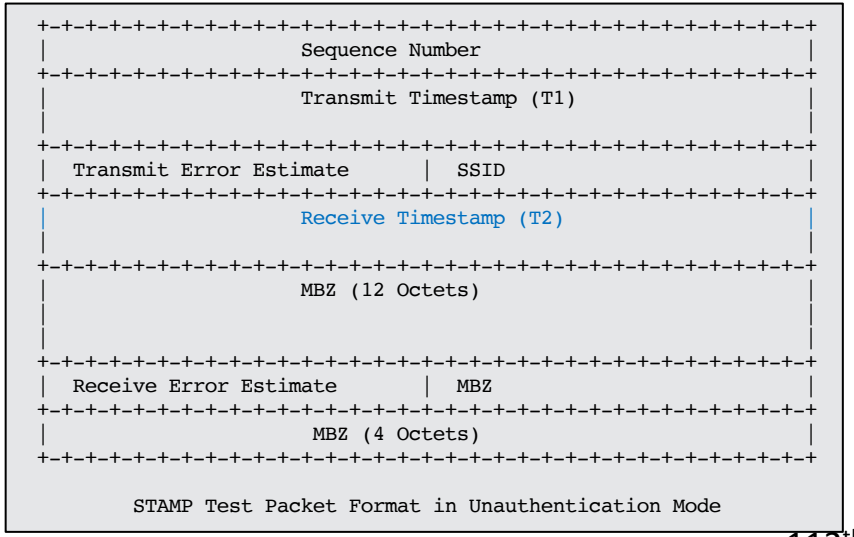


Figure: Example Provisioning Model

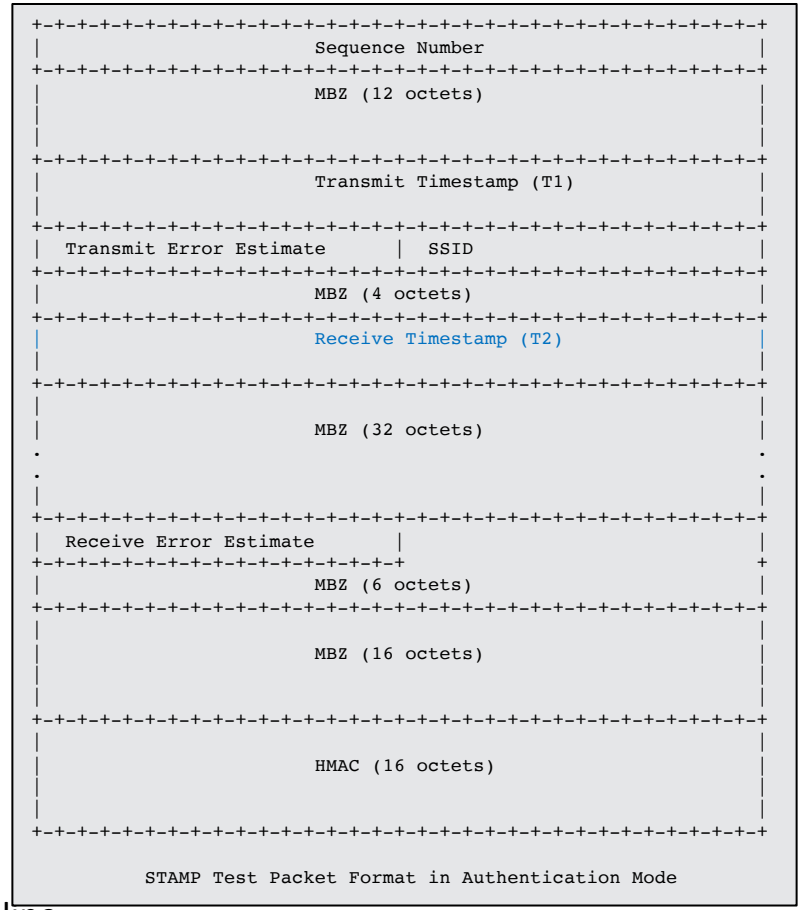
* Provisioned, Flooded/Signaled or IANA Allocated

STAMP Test Packets

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

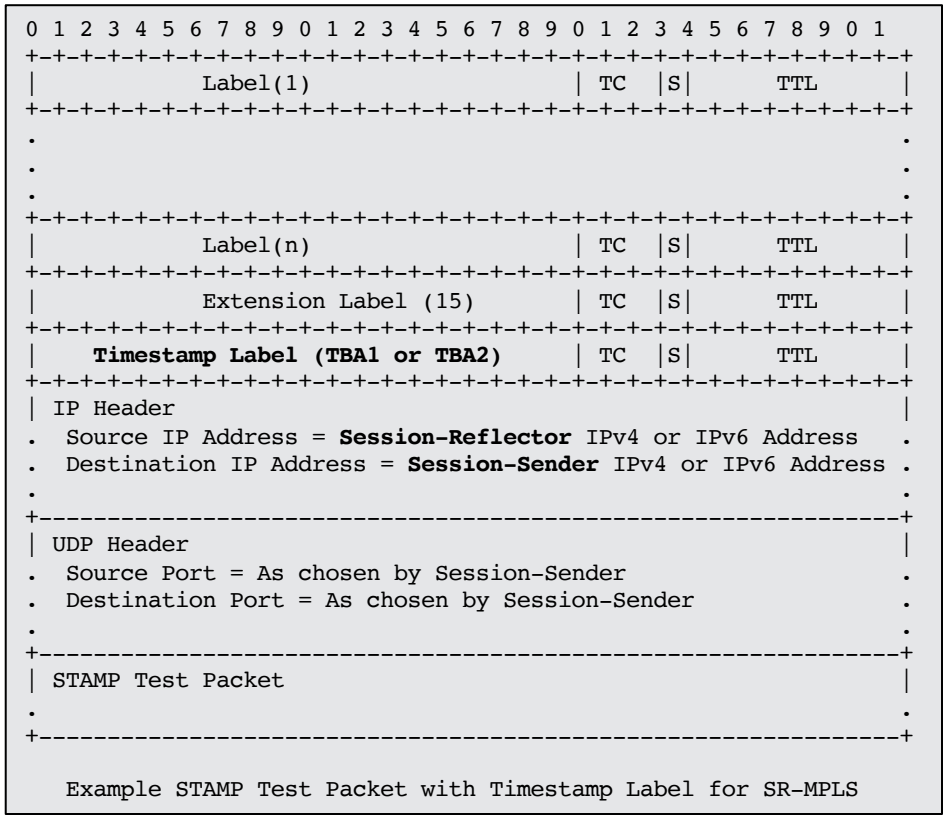


STAMP Test Packet Format in Unauthentication Mode



STAMP Test Packet Format in Authentication Mode

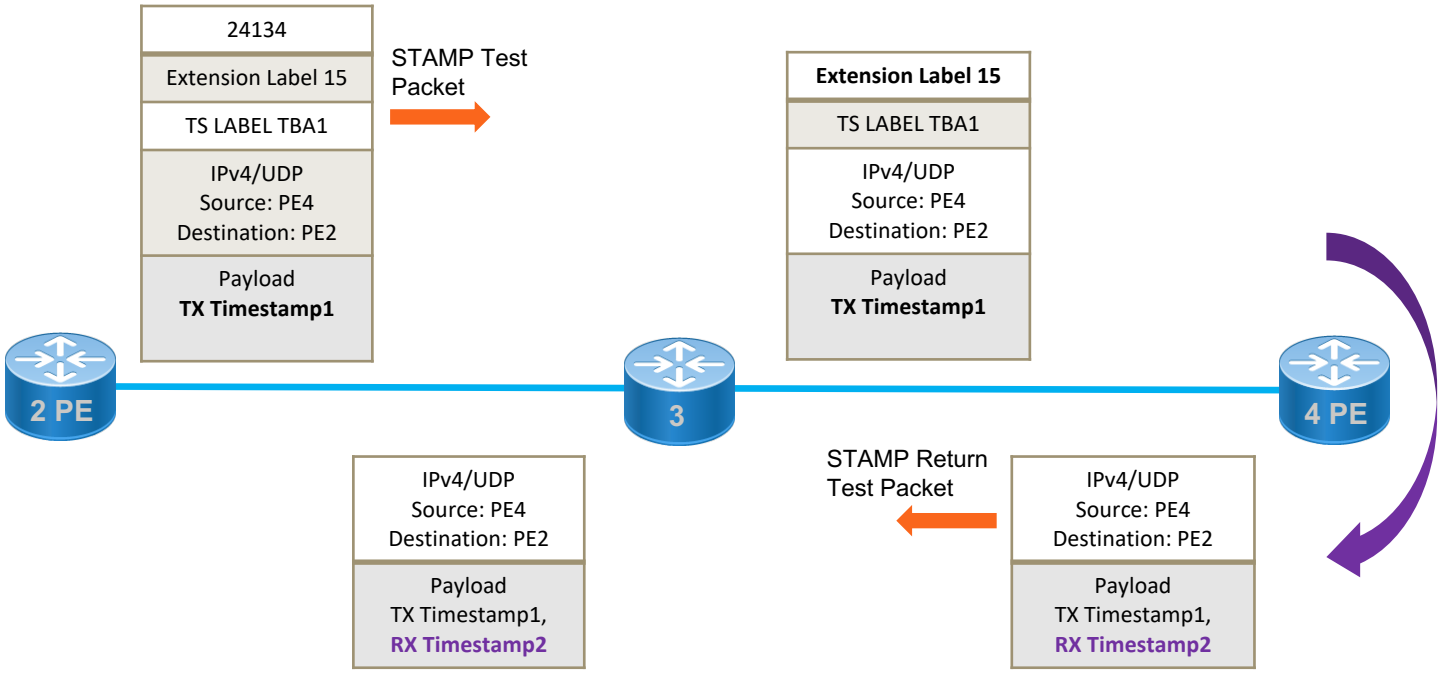
SR-MPLS with Timestamp MPLS Label



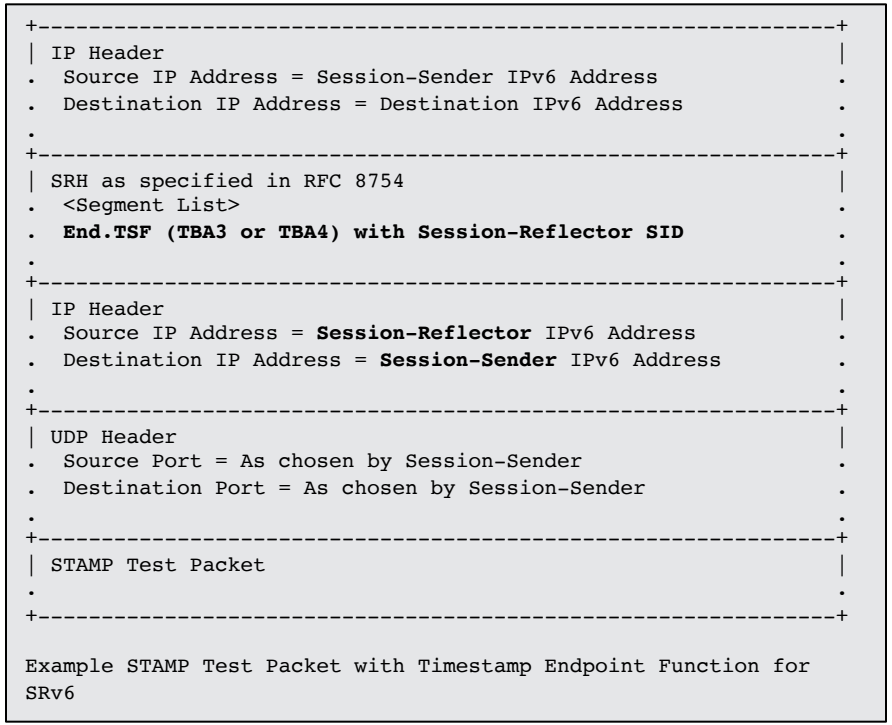
Example STAMP Test Packet with Timestamp Label for SR-MPLS

- Timestamp MPLS labels (TBA1 for offset-16 and TBA2 for offset-32) defined for Timestamp and Forward function
- Source and Destination Addresses are swapped in the IP header that represent the Reverse direction path
- Reverse path can be IP
  - Session-Reflector removes MPLS Header
- Reverse path can be SR-MPLS
  - Reverse direction SR-MPLS path label stack carried in MPLS Header
  - Session-Reflector does not remove the MPLS Header

Loopback Mode with Timestamp and Forward for SR-MPLS Policy



SRv6 with Timestamp Endpoint Function



Example STAMP Test Packet with Timestamp Endpoint Function for SRv6

- Timestamp Endpoint Functions End.TSF (TBA3 for offset-16 and TBA4 for offset-32) defined for Timestamp and Forward and carried with the Session-Reflector node SID
- Reverse path can be IP
  - Inner IPv6 header is required
  - Source and Destination Addresses are swapped that represent the Reverse direction path in the inner IPv6 header
  - Session-Reflector removes SRH
- Reverse path can be SRv6
  - Inner IPv6 header not required
  - Reverse direction SRv6 path segment-list carried in SRH
  - Session-Reflector does not remove the SRH

Performance Metric Notifications

- Delay metrics are notified as an example, when consecutive M number of STAMP test packets have delay values exceed the configured thresholds (absolute/percentage)
- Synthetic packet loss is notified when X number of STAMP return test packets not received at the Session-Sender out of last Y STAMP test packets transmitted (with configured XofY threshold)
- Session state Up is initially notified as soon as one or more STAMP return test packets are received at the Session-Sender
- Session state Down is notified when consecutive N number of STAMP return test packets are not received at the Session-Sender

Next Steps

- Welcome your comments and suggestions
- Requesting SPRING WG adoption

Thank you