Performance Measurement Using Simple TWAMP for Segment Routing Networks

draft-gandhi-spring-stamp-srpm-05

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Agenda

- Requirements and Scope
- Summary of Procedure
- Next Steps

Requirements, Goals and Scope

Requirements:

- In-band Performance Delay and Loss Measurement
  - ✓ Links and end-to-end P2P/P2MP SR paths
    - ✓ Links include physical, virtual, LAG, LAG member links
  - ✓ Applicable to SR-MPLS/SRv6 data planes
- One-way, two-way, round-trip delay and packet loss metrics

Goals:

- Avoid provisioning and maintaining test sessions on Session-Reflector - Stateless mode
- Avoid control protocol for signaling dynamic parameters

Scope:

- STAMP [RFC 8762]
- STAMP Extensions [RFC 8972]
- STAMP Extensions for SR [draft-gandhi-ippm-stamp-srpm]

Updates Since Version-02

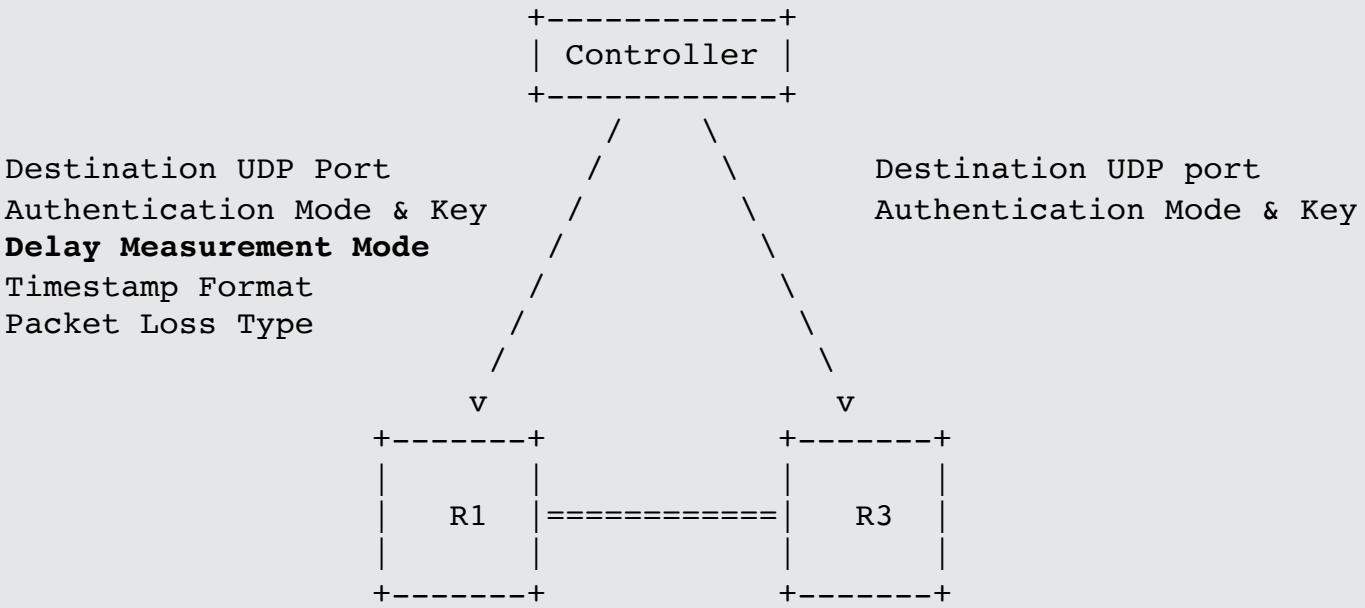
Updates:

- ✓ Replaced TWAMP Light draft with STAMP draft
- ✓ Draft status - Informational
- ✓ Updated terminology to align with STAMP
- ✓ Added (synthetic) packet loss section
- ✓ Removed stand-alone direct measurement messages
- ✓ Removed text for IPv6/UDP test packet with zero checksum
- ✓ Various editorial changes to address review comments

Open Items:

- None

Example STAMP Reference Model



STAMP Session-Sender Test Packet for Links

- For links, STAMP Session-Sender test packets are transmitted over the links using local and remote link addresses
- User-configured destination UDP port is used for STAMP test packets (or port 862)
- IPv4 TTL /IPv6 Hop-limit is set to 1
- Applicable to physical, virtual, LAG, LAG member links

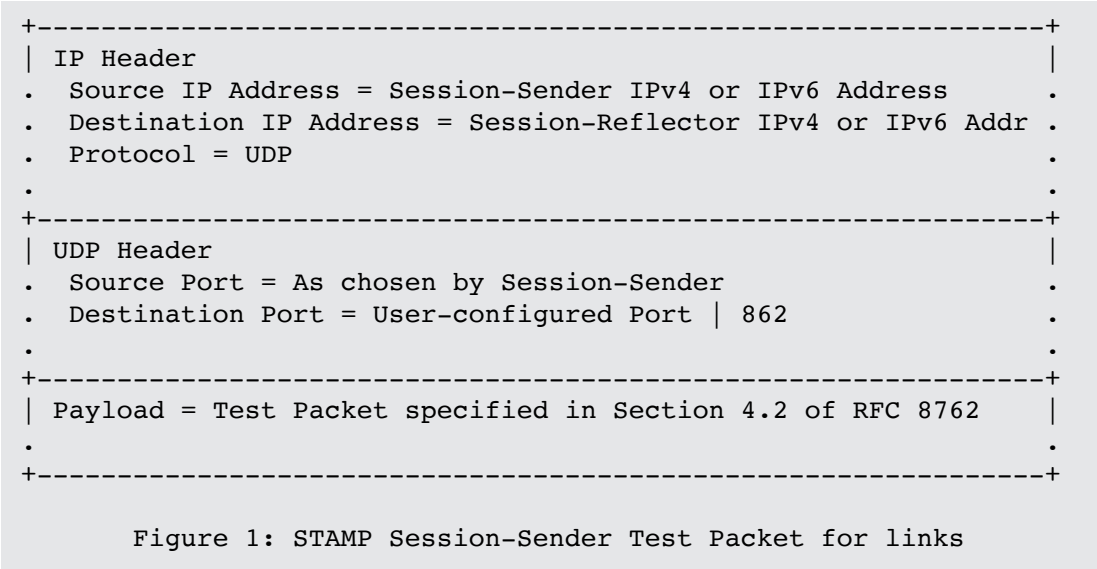


Figure 1: STAMP Session-Sender Test Packet for links

STAMP Session-Sender Test Packet for SR-MPLS and SRv6 Policy

- For end-to-end SR Policy, STAMP Session-Sender test packets are transmitted with:
  1. MPLS label stack of SR-MPLS Policy
  2. SRv6 SRH [RFC 8754] with Segment List of SRv6 Policy
     - Using upper-layer processing defined in SRv6 network programming
- User-configured destination UDP port is used for STAMP test packets (or port 862)
- IPv4 TTL/IPv6 Hop-limit is set to 255
- Color-Only Destination Steering:
  - IPv4
    - Destination Address in 127/8 range
    - TTL is set to 1
  - IPv6
    - Destination Address set to ::1/128
    - Hop Limit is set to 1

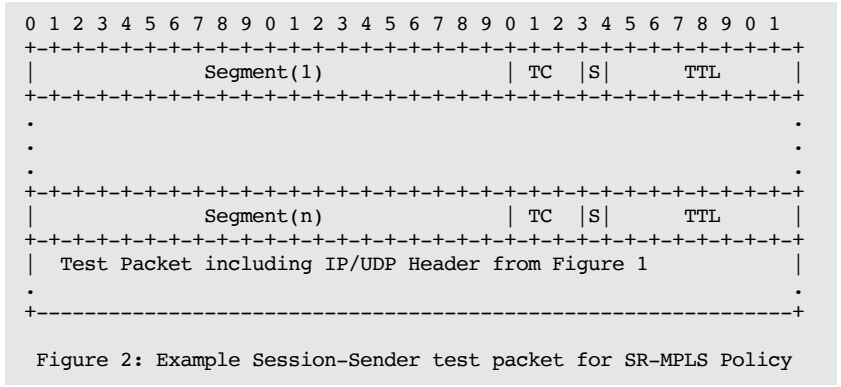


Figure 2: Example Session-Sender test packet for SR-MPLS Policy

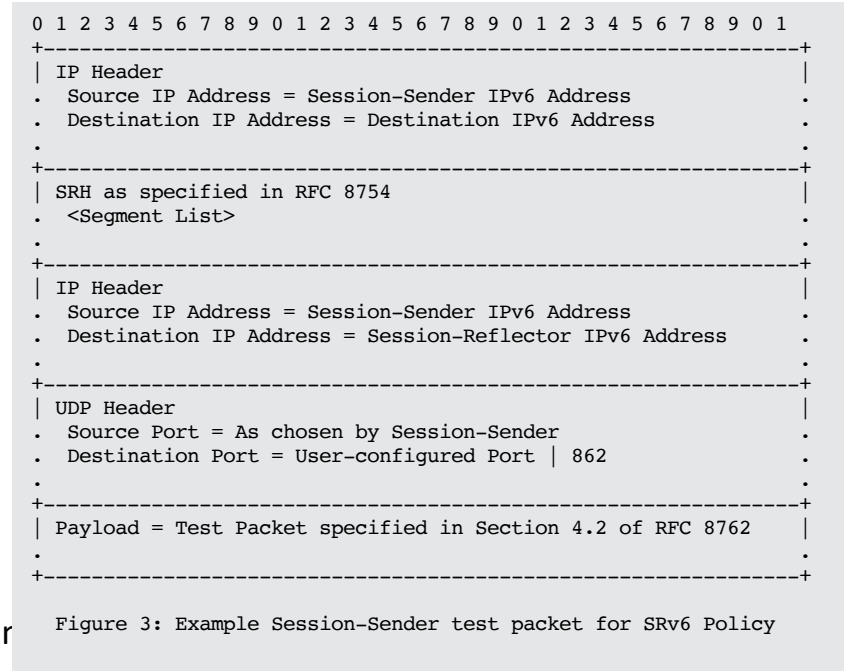


Figure 3: Example Session-Sender test packet for SRv6 Policy

STAMP Session-Sender Test Packet for P2MP SR-MPLS Policy

- For end-to-end P2MP SR-MPLS Policy, STAMP Session-Sender test packets are transmitted with:
  - Tree-SID of the P2MP SR-MPLS Policy
  - IPv4 destination address selected from 127/8 range
  - IPv4 TTL is set to 1

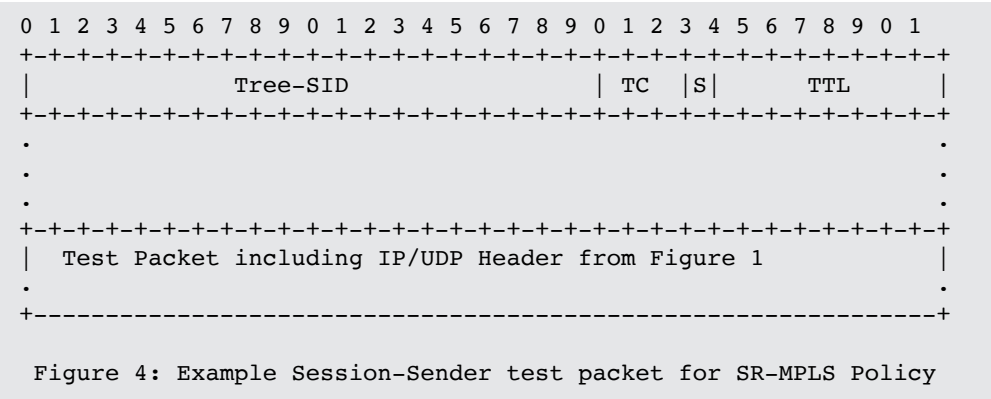


Figure 4: Example Session-Sender test packet for SR-MPLS Policy

STAMP Session-Reflector Test Packet

- STAMP Session-Reflector reply test packet is sent using the IP/UDP information from the received test packet.

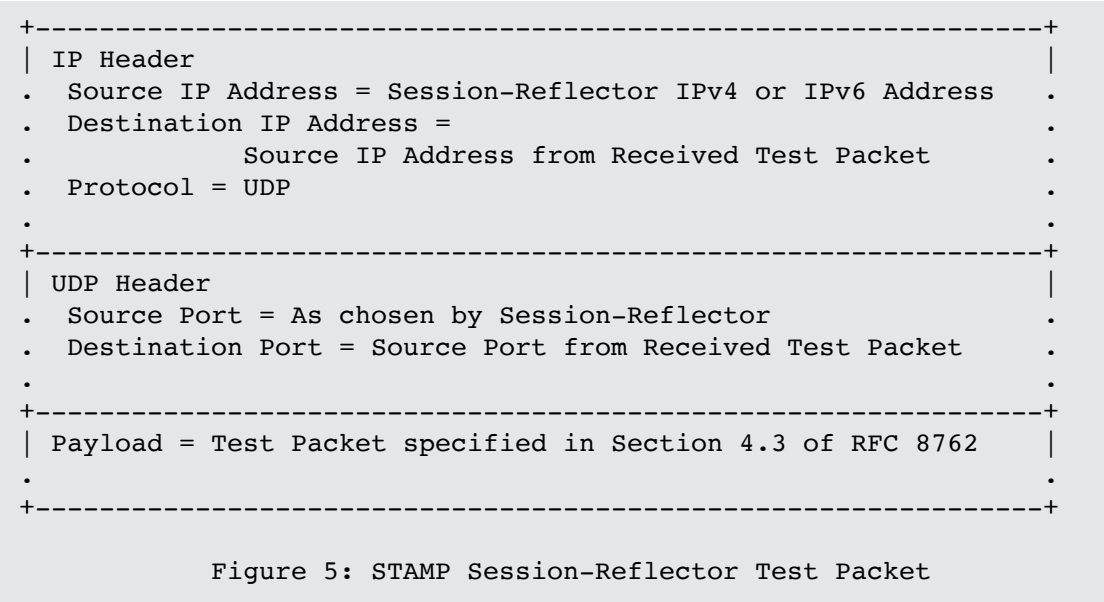


Figure 5: STAMP Session-Reflector Test Packet

Performance Measurement Modes

- Need to measure in-band one-way, two-way and round-trip delay metrics in SR networks
- One-way Delay Measurement Mode
  - Existing (default) behavior
- Two-way Delay Measurement Mode
  - STAMP Session-Reflector test packet sent “in-band” on reverse path
  - Stateless mode of Session-Reflector
  - Link: Use Control Code Sub-TLV in the Return Path TLV from the received test packet.
  - E2E SR path: Use Segment List Sub-TLV in the Return Path TLV from the received test packet.
- Round-trip Delay Measurement Mode
  - STAMP Session-Sender test packet sent in loopback mode, carries the return path in the packet header

ECMP Support for SR Path

- SR Path can have ECMP between the ingress and transit nodes, between transit nodes and between transit and egress nodes
- Sending STAMP test packets that can take advantage of the hashing function in forwarding plane
- Existing forwarding mechanisms are applicable to test packets. Examples are:
  - For IPv4
    - Sweeping destination address in IPv4 header (e.g. 127/8)
    - Identify intended actual destination node in “Destination Node Address TLV”
  - For IPv6
    - Sweeping flow label in IPv6 header

Example PM Metrics

- Compute following example (one-way, two-way, round-trip) delay metrics:
  - Minimum delay
  - Maximum delay
  - Average delay
  - Delay variance
- Compute following example loss metrics:
  - Packet loss (i.e., synthetic packet loss)
  - Direct measurement packet counters
  - Session status succeeded/failed (i.e., measurement is active)

Next Steps

- Welcome your comments and suggestions
- Requesting WG adoption

Thank you