Performance Measurement Using Simple TWAMP for Segment Routing Networks

draft-gandhi-spring-stamp-srpm-04

Rakesh Gandhi - Cisco Systems (rgandhi@cisco.com) - Presenter
Clarence Filsfils - Cisco Systems (cfilsfil@cisco.com)
Daniel Voyer - Bell Canada (daniel.voyer@bell.ca)
Mach(Guoyi) Chen - Huawei (mach.chen@huawei.com)
Bart Janssens - Colt (Bart.Janssens@colt.net)

Agenda

- Requirements and Scope
- Summary of Procedure
- Next Steps

Requirements and Scope

Requirements:

- Delay as well as Synthetic Loss and Direct Measurement
  - ✓ Links and End-to-end P2P/P2MP SR Paths
    - ✓ Links include physical, virtual, LAG (bundle), LAG member, numbered/unnumbered links
  - ✓ Applicable to SR-MPLS/SRv6 data planes
- Handle ECMP for SR paths

Goals:

- Eliminate per session provisioning on Session-Reflector
- No control-channel signaling for sessions

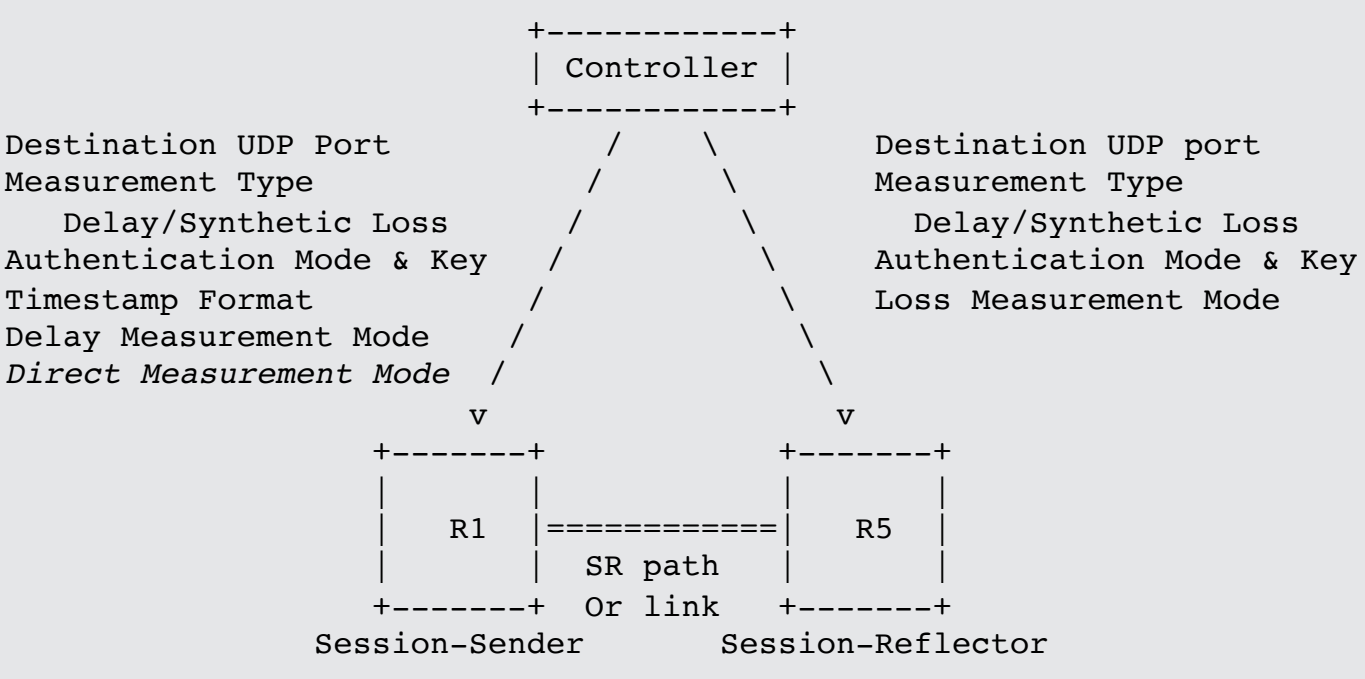
Scope:

- STAMP [RFC 8762]
- STAMP TLVs [draft-ietf-ippm-stamp-option-tlv]
- draft-gandhi-ippm-stamp-srpm

Review Comments

1. Add references for well-known terms “link”, “SR path”. Reword “Congruent paths”
2. Destination UDP port used has zero UDP checksum for IPv6 header
   a) Add Reference for RFC 6936 in Security Section
   b) For IPv4 and IPv6 packets, where the hardware is not capable of re-computing the UDP checksum or adding checksum complement [RFC7820], the sender node **MAY** set the UDP checksum to 0 [RFC8085] **and reflector node MAY accept it as long as it meets requirements specified in [RFC6936]**
3. Add reference for Yang data model draft in provisioning model section
4. Liveness is to compute “connection loss” performance metric
5. Editorial
   a) Indicate packet loss is direct measurement
   b) Use test packet term, Sender as Session-Sender, Reflector as Session-Reflector
   c) H/W timestamps required -> H/W timestamps recommended
   d) IPv6 address ::1/128 or ::FFFF:127/104
   e) Clarify - Section 4.1.4.2 and 4.2.2.2 depict the test packet format with word “as needed” for inner IP Header
   f) UDP destination port when running authenticated and unauthenticated sessions simultaneously

Example Provisioning Model



Session-Sender Test Packet for Links

- User-configured destination UDP **port1** is used for STAMP test packets, using local and remote link addresses
- User-configured destination UDP **port2** is used for direct measurement test packets for packet loss
- Applicable to physical, virtual, LAG, LAG member, numbered/unnumbered links

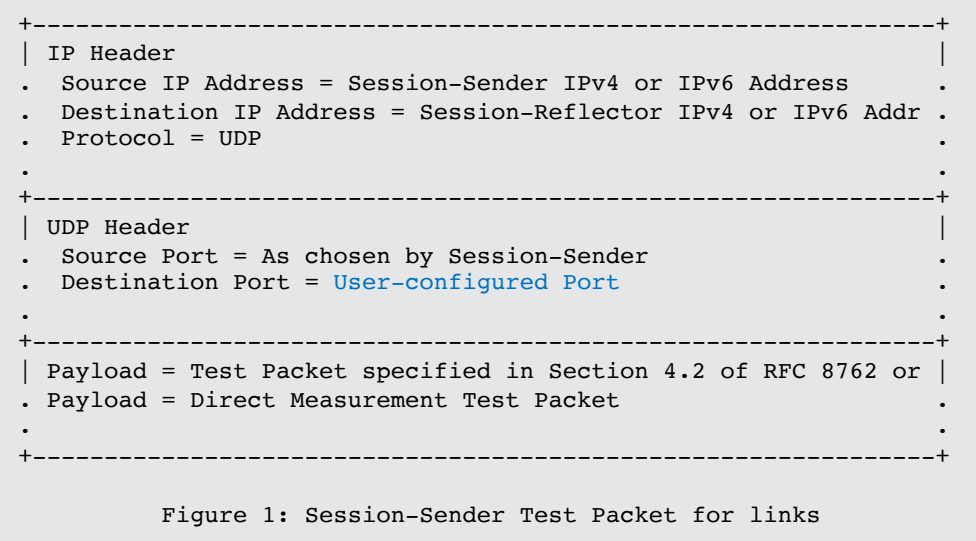


Figure 1: Session-Sender Test Packet for links

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

For performance delay/loss measurement of **end-to-end** SR Policy, the test packet is sent on the SR Policy with:

1. MPLS label stack of SR-MPLS Policy
2. SRv6 SRH [RFC 8754] with Segment List of SRv6 Policy

- User-configured destination UDP **port1** is used for STAMP test packets
- User-configured destination UDP **port2** is used for direct measurement test packets for packet loss

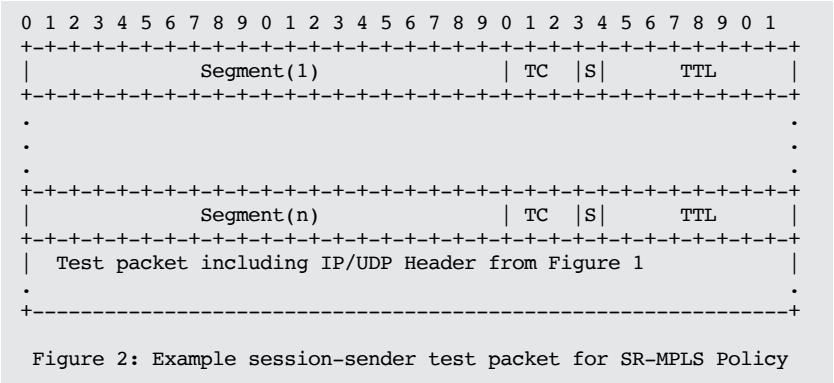


Figure 2: Example session-sender test packet for SR-MPLS Policy

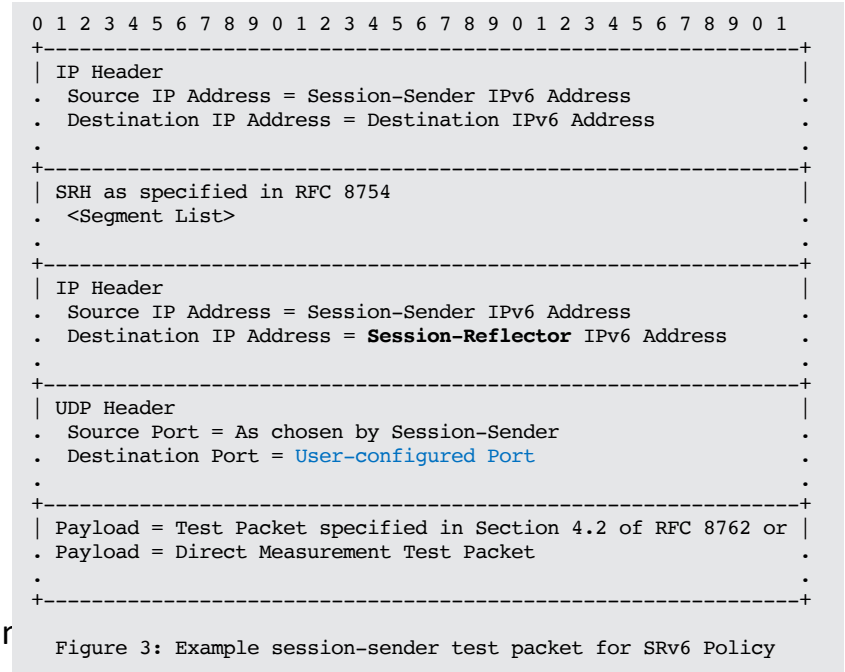


Figure 3: Example session-sender test packet for SRv6 Policy

Session-Reflector Test Packet

- The test packet reply is sent using the IP/UDP information from the received test packet.
- Use Control Code from the received test packet if set.
- Use Segment List from Return Path TLV if present in received test packet.

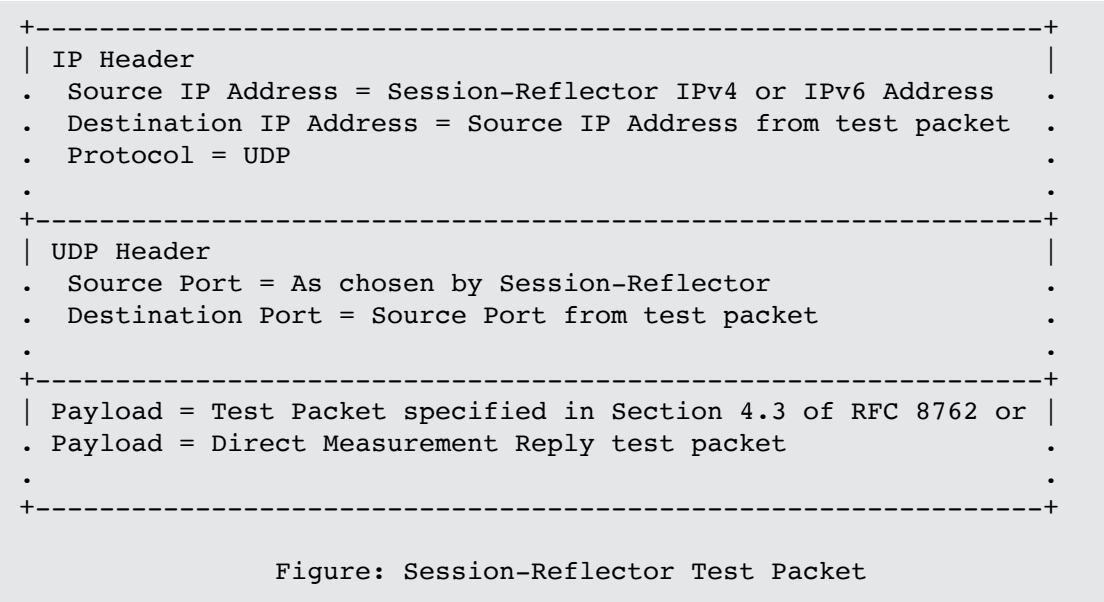


Figure: Session-Reflector Test Packet

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 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

Performance Measurement Modes

- One-way Measurement Mode
  - Test packet reply sent “out of band” on IP/UDP path by default
- Two-way Measurement Mode
  - Test packet reply sent “in-band” on reverse path
    - Use Control Code from the received test packet
    - Use Return Path TLV for STAMP from the received test packet
- Loopback Measurement Mode
  - Test packet carries the return path in the header

Example PM Metrics

- Compute following delay metrics:
  - Minimum delay
  - Maximum delay
  - Average delay
  - Delay variance
- Compute following loss metrics:
  - Synthetic packet loss (aka indirect-mode packet loss)
  - Connection loss (aka liveness heart-beat failure detection)

Next Steps

- Welcome your comments and suggestions
- Requesting WG adoption

Thank you