

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

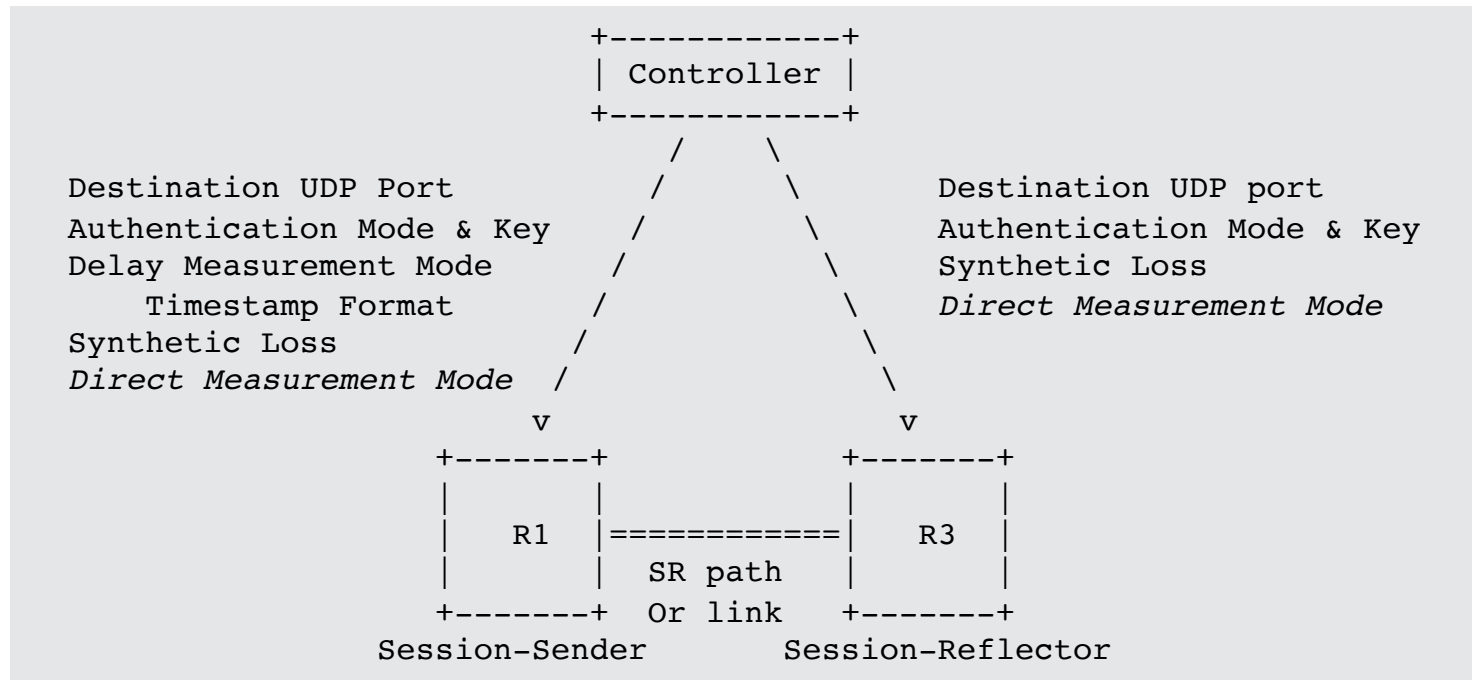
Scope:

- 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

```
+-----+
| IP Header |
. Source IP Address = Session-Sender IPv4 or IPv6 Address .
. Destination IP Address = Session-Reflector IPv4 or IPv6 Addr .
. Protocol = UDP .
. .
+-----+
| UDP Header |
. Source Port = As chosen by Session-Sender .
. Destination Port = User-configured Port .
. .
+-----+
| Payload = Test Packet specified in Section 4.2 of RFC 8762 or |
. Payload = Direct Measurement Test Packet .
. .
+-----+
```

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

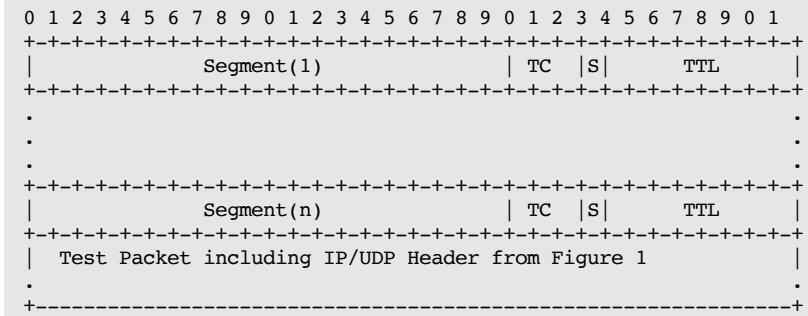


Figure 2: Example session-sender test packet for SR-MPLS Policy

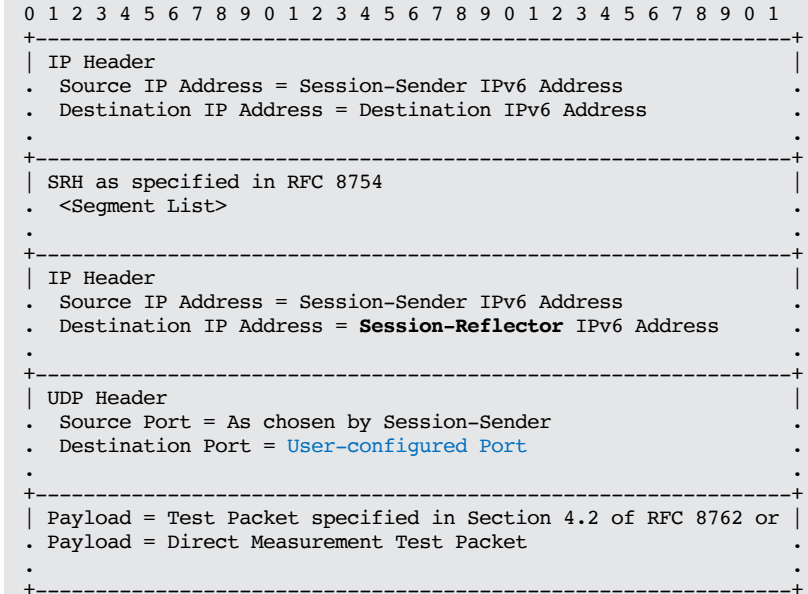


Figure 3: Example session-sender test packet for SRv6 Policy

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.

```
+-----+
| IP Header                                     |
| . Source IP Address = Session-Reflector IPv4 or IPv6 Address . |
| . Destination IP Address = Source IP Address from Test Packet . |
| . Protocol = UDP . |
| . |
+-----+
| UDP Header                                   |
| . Source Port = As chosen by Session-Reflector . |
| . Destination Port = Source Port from Test Packet . |
| . |
+-----+
| Payload = Test Packet specified in Section 4.3 of RFC 8762 or |
| . Payload = Direct Measurement Reply 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 example delay metrics:
 - Minimum delay
 - Maximum delay
 - Average delay
 - Delay variance
- Compute following example 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