

Performance Measurement Using Simple TWAMP for Segment Routing Networks

draft-gandhi-spring-stamp-srpm-05

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:

- 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
- Handle ECMP for SR paths

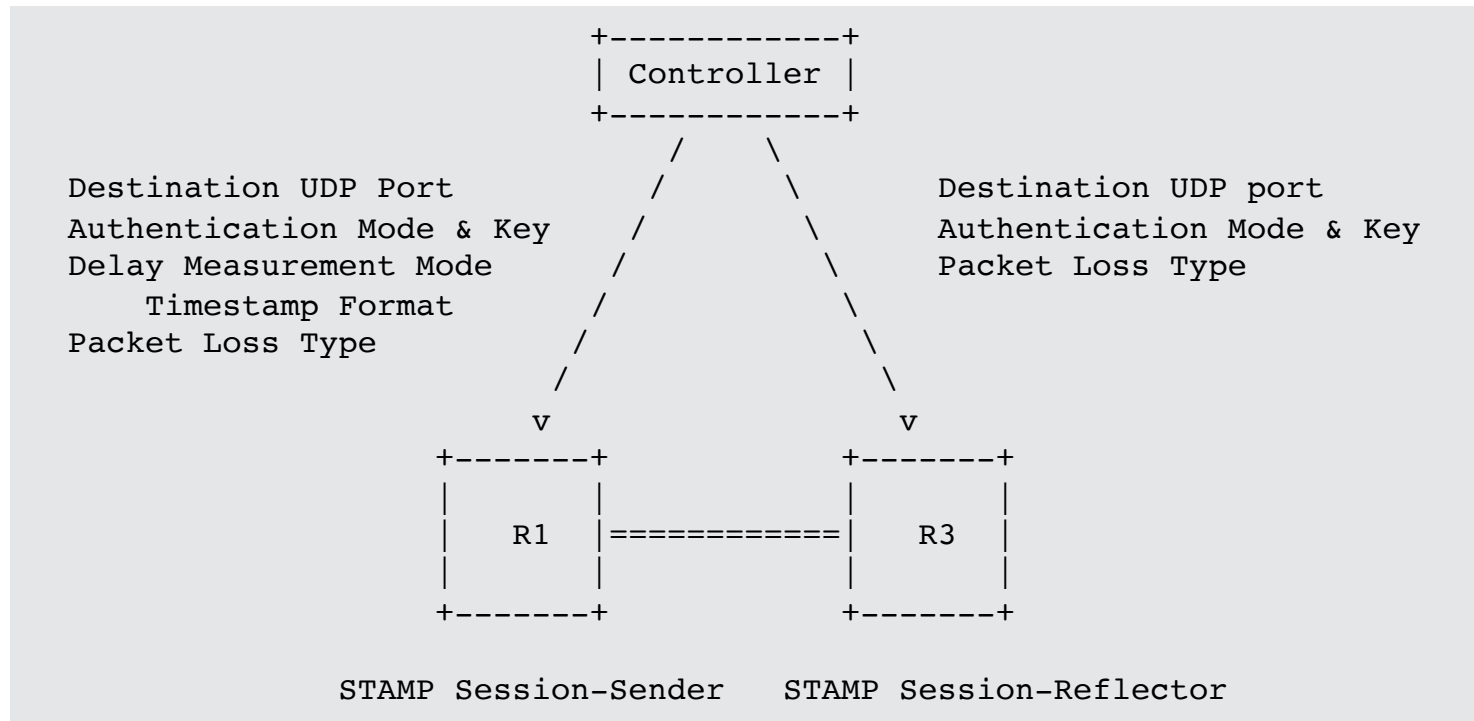
Goals:

- Avoid provisioning test sessions on Session-Reflector - Stateless mode
- Avoid control protocol for signaling dynamic parameters
- Very high scale for number of test sessions and faster detection interval
 - Support hardware implementation

Scope:

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

Example STAMP Reference Model



Session-Sender Test Packet for Links

- For links, the 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)
- TTL is set to 1
- Applicable to physical, virtual, LAG, LAG member 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 | 862 .
. . .
+-----+
| Payload = Test Packet specified in Section 4.2 of RFC 8762 |
. . .
+-----+
```

Figure 1: Session-Sender Test Packet for links

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

For end-to-end SR Policy, the STAMP Session-Sender test packets are transmitted on the SR Policy 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)
- TTL is set to 255
- Color only SR-MPLS Policy:
 - Destination Address in 127/8 address
 - TTL is set 1

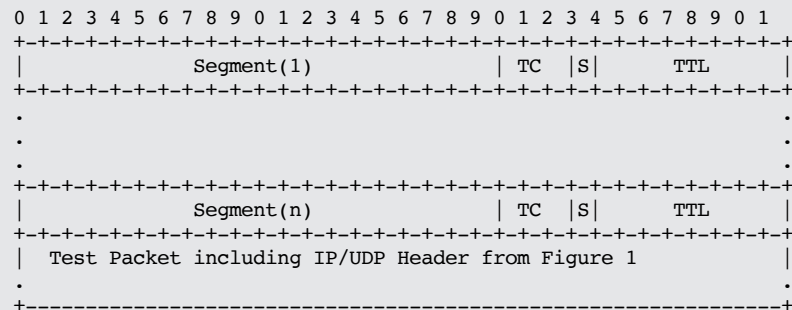


Figure 2: Example Session-Sender test packet for SR-MPLS Policy

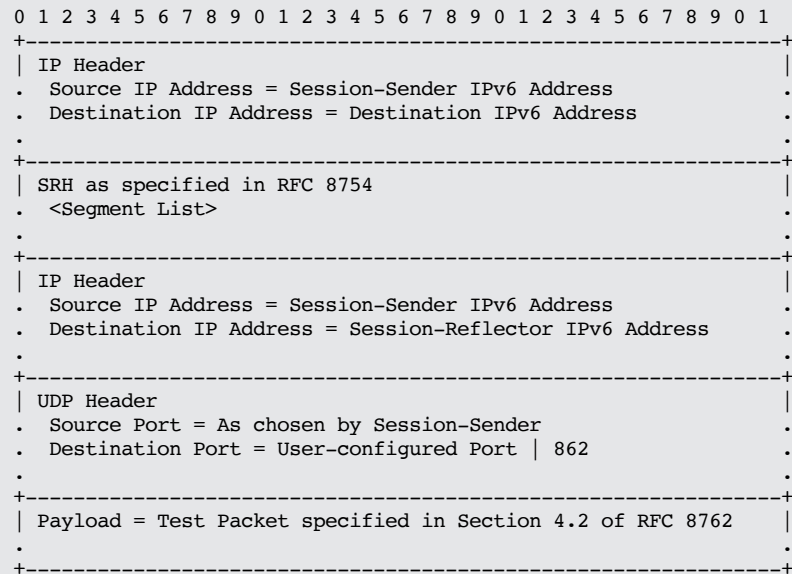


Figure 3: Example Session-Sender test packet for SRv6 Policy

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

For end-to-end P2MP SR-MPLS Policy, the STAMP Session-Sender test packet is sent with:

- Tree-SID of the SR-MPLS Policy
- IPv4 destination address selected from 127/8 range
- TTL is set to 1

```
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
|                                     | TC | S |          TTL          |
+-+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
.
.
.
+-+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
| Test Packet including IP/UDP Header from Figure 1                |
.
+-----+

```

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

STAMP Session-Reflector Test Packet

- The STAMP reply test packet is sent using the IP/UDP information from the received test packet.
- [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.](#)

```
+-----+
| IP Header                                     |
| . Source IP Address = Session-Reflector IPv4 or IPv6 Address . |
| . Destination IP Address =                      . |
| .           Source IP Address from Received Test Packet . |
| . Protocol = UDP                               . |
| .                                              . |
+-----+
| UDP Header                                   |
| . Source Port = As chosen by Session-Reflector . |
| . Destination Port = Source Port from Received Test Packet . |
| .                                              . |
+-----+
| Payload = Test Packet specified in Section 4.3 of RFC 8762 |
| .                                                          . |
+-----+
```

Figure 5: STAMP 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 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

Performance Measurement Modes

- One-way Delay Measurement Mode
 - Existing (default) behavior
- Two-way Delay Measurement Mode
 - STAMP test packet reply sent “in-band” on reverse path
 - 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.
- Loopback Measurement Mode
 - STAMP Session-Sender test packet carries the return path in the packet header

Example PM Metrics

- Compute following example delay metrics:
 - Minimum delay
 - Maximum delay
 - Average delay
 - Delay variance
- Compute following example loss metrics:
 - Test packet loss (aka synthetic packet loss)
 - Data packet loss (aka direct measurement)
 - Connectivity loss (aka session state up or down)

Next Steps

- Welcome your comments and suggestions
- Requesting WG adoption

Thank you