

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, 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

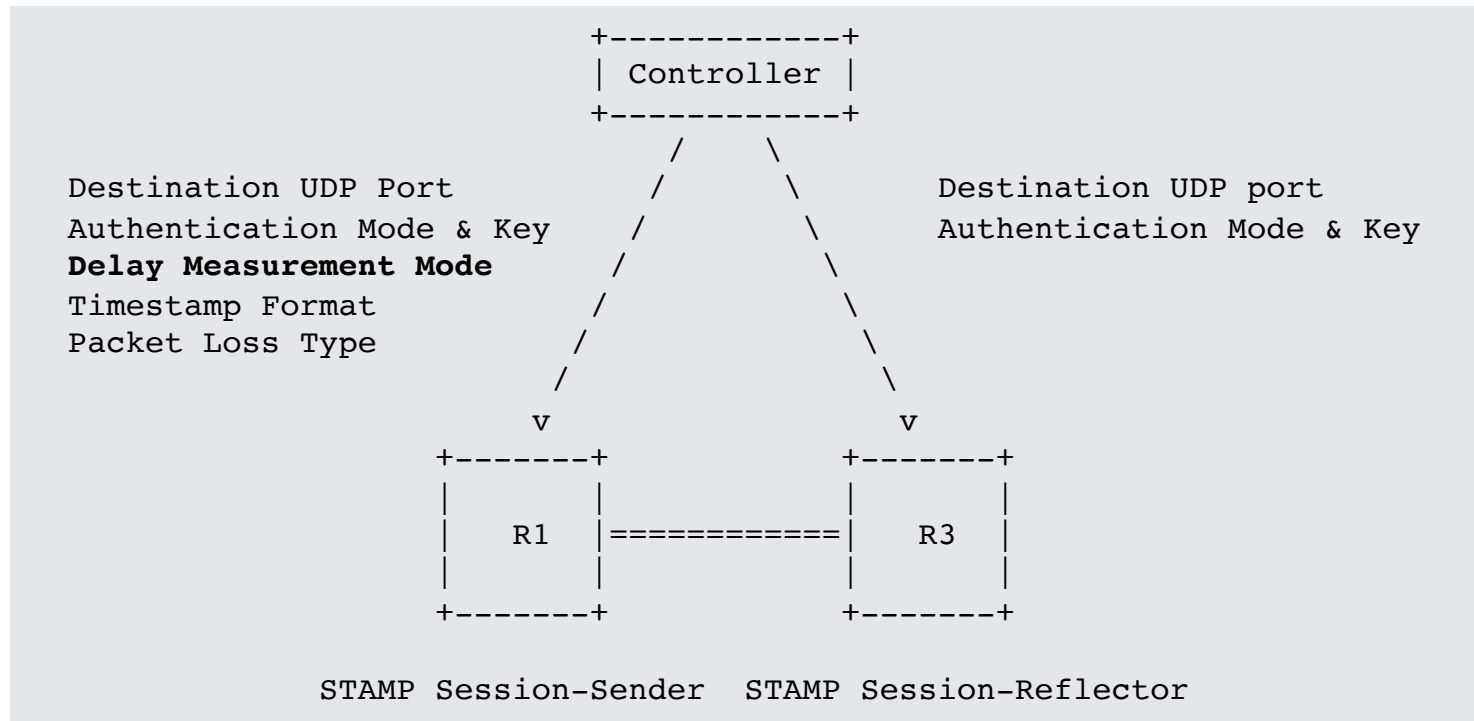
Updates:

- ✓ STAMP Extensions for SR was moved to [draft-gandhi-ippm-stamp-srpm](#)
- ✓ Replaced TWAMP Light draft with STAMP draft
- ✓ Draft status - Informational
- ✓ Updated terminology to align with STAMP
- ✓ Added (test) packet loss section
- ✓ Removed STAMP 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



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)
- IPv4 TTL /IPv6 Hop-limit 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)
- 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

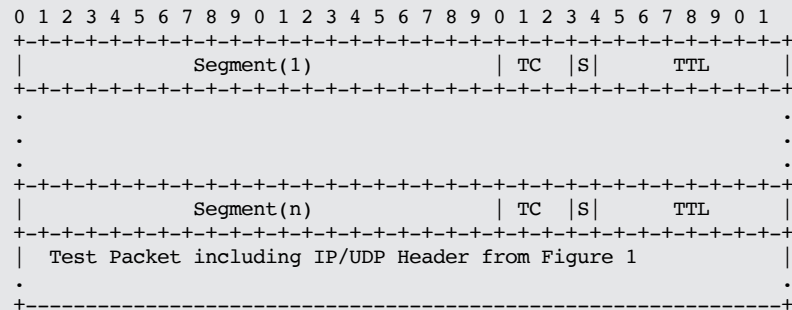


Figure 2: Example Session-Sender test packet for SR-MPLS Policy

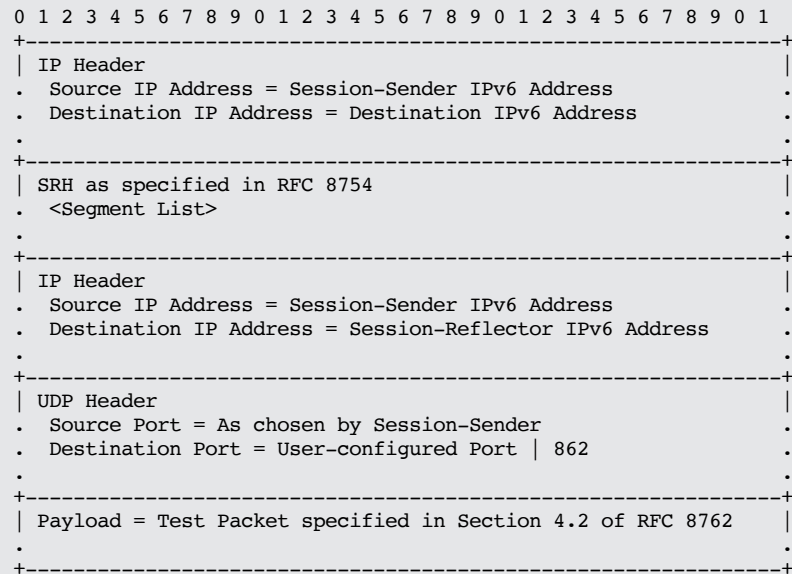


Figure 3: Example Session-Sender test packet for SRv6 Policy

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

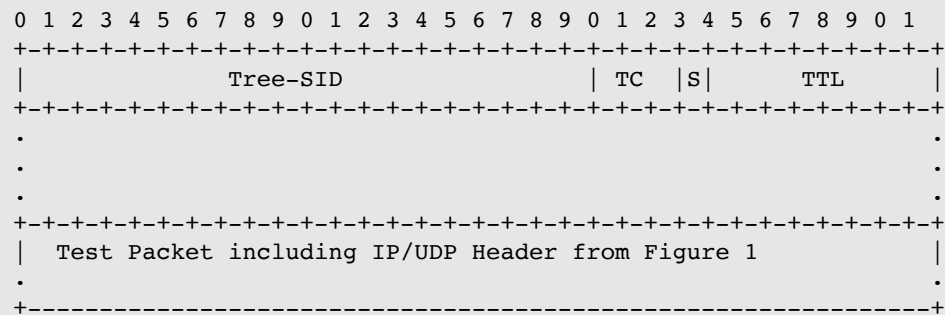


Figure 4: Example Session-Sender test packet for SR-MPLS Policy

STAMP Session-Reflector Test Packet

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

```
+-----+
| 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

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
 - 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