

# Performance Measurement Using Simple TWAMP for Segment Routing Networks

*draft-gandhi-spring-stamp-srpm-05*

*Rakesh Gandhi - Cisco Systems ([rgandhi@cisco.com](mailto:rgandhi@cisco.com)) - Presenter*

*Clarence Filsfils - Cisco Systems ([cfilsfil@cisco.com](mailto:cfilsfil@cisco.com))*

*Daniel Voyer - Bell Canada ([daniel.voyer@bell.ca](mailto:daniel.voyer@bell.ca))*

*Mach(Guoyi) Chen - Huawei ([mach.chen@huawei.com](mailto:mach.chen@huawei.com))*

*Bart Janssens - Colt ([Bart.Janssens@colt.net](mailto:Bart.Janssens@colt.net))*

# Agenda

- Requirements and Scope
- Summary of Procedure
- Next Steps

# Requirements and Scope

## Requirements:

- 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

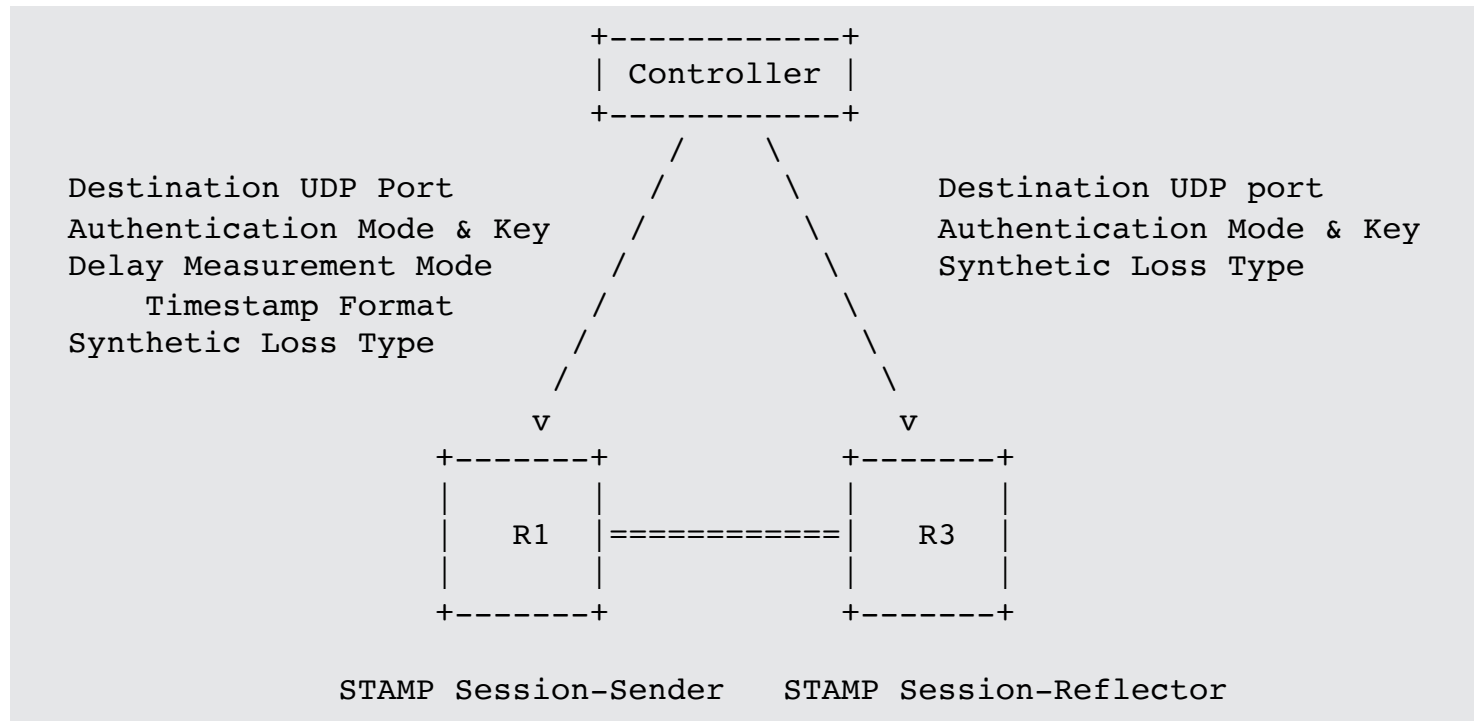
## Goals:

- Avoid per session provisioning on STAMP Session-Reflector
- Avoid control-channel signaling for sessions
- Very high scale for number of sessions and faster detection interval
  - Support hardware implementation

## Scope:

- STAMP [RFC 8762]
- STAMP Extensions [RFC8972]
- draft-gandhi-ippm-stamp-srpm

# Example Provisioning 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 **port1** is used for STAMP test packets (also port 862)
- TTL is set 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 in SRv6 network programming
- User-configured destination UDP **port1** is used for STAMP test packets (also port 862)
- TTL is set 255
- Color only SR-MPLS Policy:
  - Destination Address in 127/8 address
  - TTL is set 1.

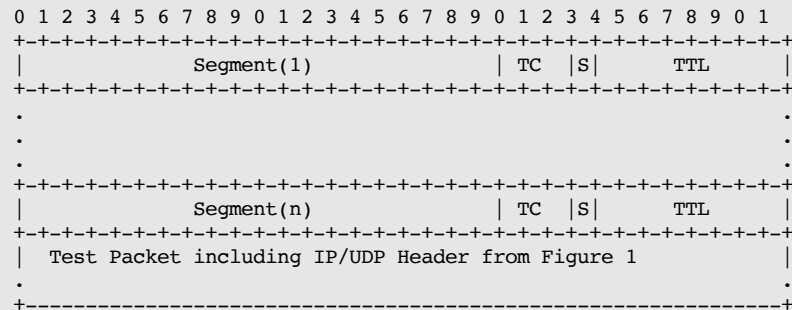


Figure 2: Example Session-Sender test packet for SR-MPLS Policy

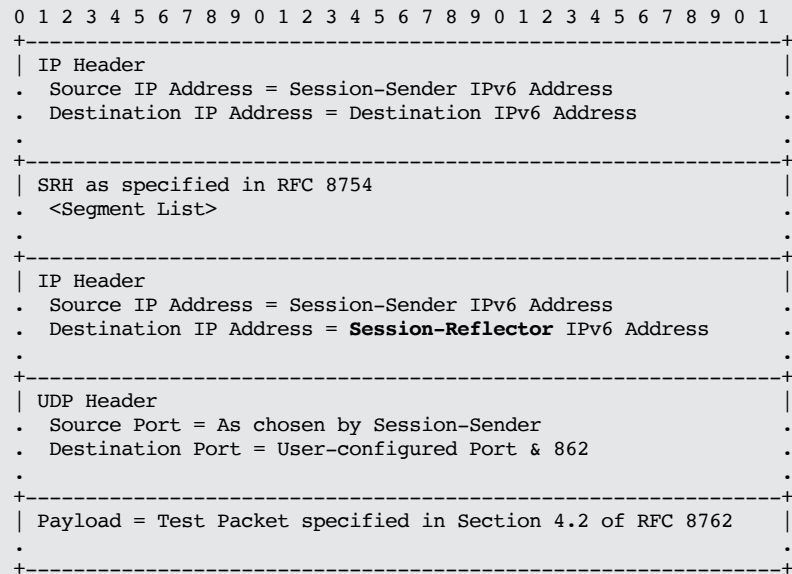


Figure 3: Example Session-Sender test packet for SRv6 Policy

# 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 set from 127/8 range
- TTL is set 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
+-+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
|                                     Tree-SID                        | 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 from the received test packet if set.
- SR path - Use Segment List from Return Path TLV if present in the 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 |
| . |
+-----+
```

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 from the received test packet
    - SR path - Use Return Path TLV from the received test packet
- Loopback Measurement Mode
  - STAMP Session-Sender 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)
  - Connectivity loss (aka liveness heart-beat failure detection)

# Next Steps

- Welcome your comments and suggestions
- Requesting WG adoption

# Thank you