

# Performance Measurement Using TWAMP Light for Segment Routing Networks

*draft-gandhi-spring-twamp-srpm-11*

*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
- History of the Draft
- Summary of Procedures
- Next Steps

# Requirements and Scope

## Requirements:

- Delay and Loss Performance Measurement (PM)
  - ✓ 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
- No need to signal to PM parameters - spirit of SR
  - ✓ Stateless on egress node - spirit of SR
  - ✓ State is in the probe message
- Handle ECMP for SR Paths
- Support stand-alone direct-mode loss measurement

## Scope:

- RFC 5357 (TWAMP Light) defined probe messages
- User-configured IP/UDP path for probe messages

# History of the Draft

- Feb 2019
  - Draft was published - *draft-gandhi-spring-twamp-srpm-00*
- Mar 2019
  - Presented *draft-gandhi-spring-twamp-srpm-00* at IETF 104 Prague in SPRING WG
- July 2019
  - Presented *draft-gandhi-spring-twamp-srpm-01* at IETF 105 Montreal in IPPM WG
    - Slide 9 Titled - Applicability of STAMP
- Nov 2019
  - SPRING Chairs announced in the meeting the agreement with IPPM chairs to progress the draft in SPRING WG
  - Presented *draft-gandhi-spring-twamp-srpm-04* at IETF 106 Singapore in SPRING WG
- Mar 2020
  - Moved STAMP support to *draft-gandhi-spring-**stamp**-srpm-00*
  - Keep TWAMP Light support as informational in *draft-gandhi-spring-**twamp**-srpm-08*
- Jul 2020
  - Presented *draft-gandhi-spring-twamp-srpm-09* at IETF 109 in IPPM WG
- October 2020
  - Split draft into *draft-gandhi-**spring**-twamp-srpm-11* and *draft-gandhi-**ippm**-twamp-srpm-00*

# TWAMP Light - Summary of PM Drafts

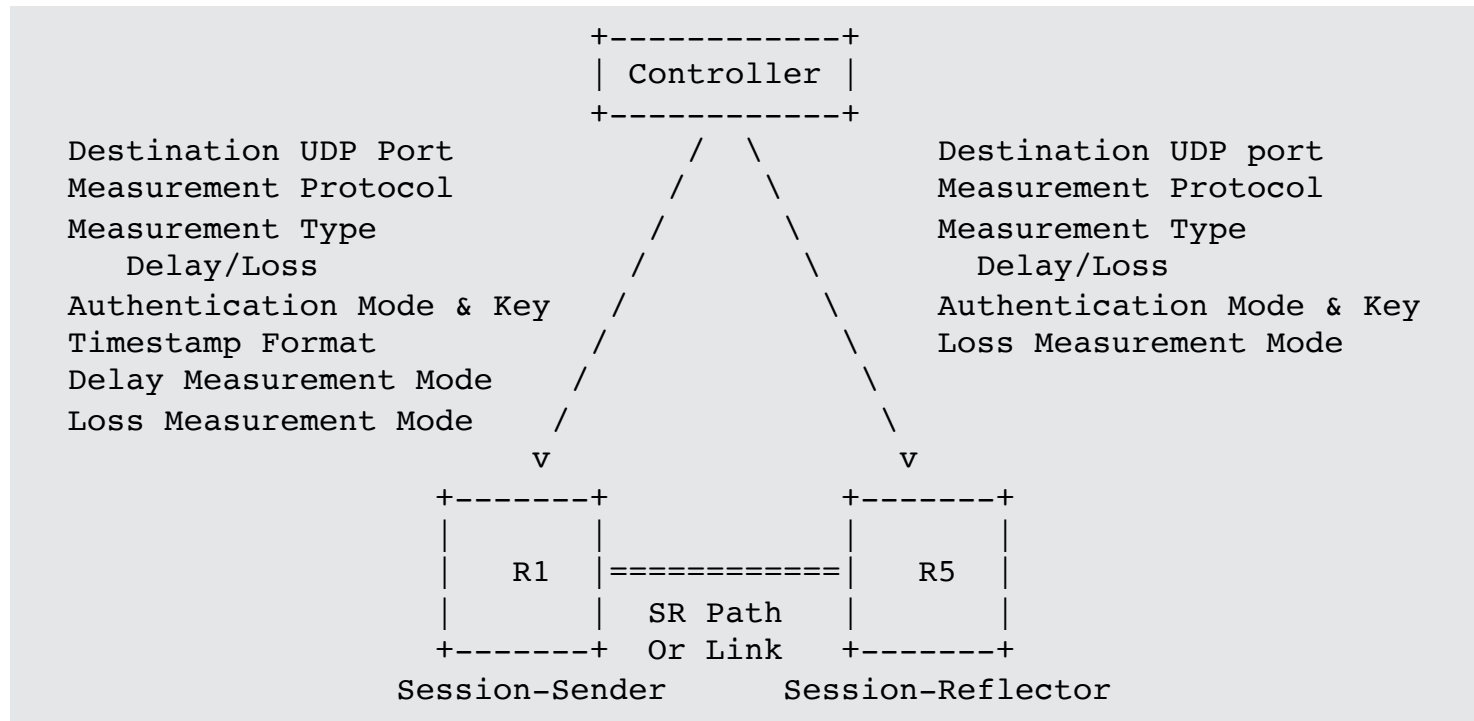
## **draft-gandhi-spring-twamp-srpm**

- Defines procedures for delay, synthetic loss and direct-mode loss measurements
  - For Links and end-to-end SR Paths for SR-MPLS and SRv6 data planes

## **draft-gandhi-ippm-twamp-srpm**

- Defines extensions for TWAMP Light for Segment Routing
  - Defines Session-Sender Control Code field for in-band response request
  - Defines stand-alone direct-mode loss measurement query and response messages

# Example Provisioning Model



# Probe Query for Links

- User-configured destination UDP **port1** is used for DM probe messages and **port2** is used for direct-mode LM probe messages (unauthenticated mode)
- Applicable to physical, virtual, LAG, LAG member, numbered/unnumbered links – probe messages pre-routed over the 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 = DM Message as specified in Section 4.2.1 of RFC 5357 |
. Payload = DM Message as specified in Section 4.1.2 of RFC 5357.
. Payload = LM Message as specified in this document .
. .
+-----+
```

Figure: Probe Query Message

# Probe Query for SR-MPLS and SRv6 Policy

For performance delay/loss measurement of **end-to-end** SR Policy, the probe query message 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

Same user-configured destination UDP **port1** is used for DM probe messages and **port2** is used for direct-mode LM probe messages (unauthenticated mode) – same as Links.

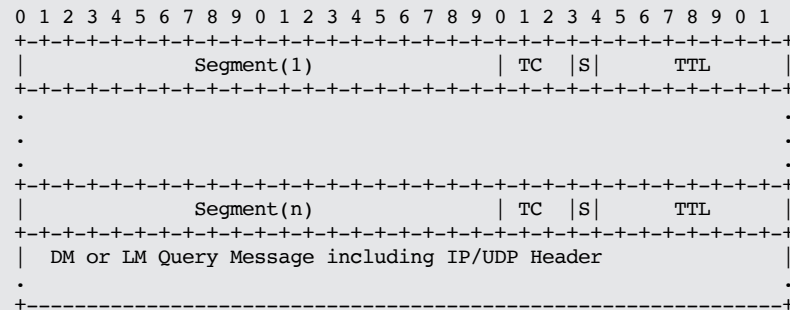


Figure: Example Probe Query Message for SR-MPLS Policy

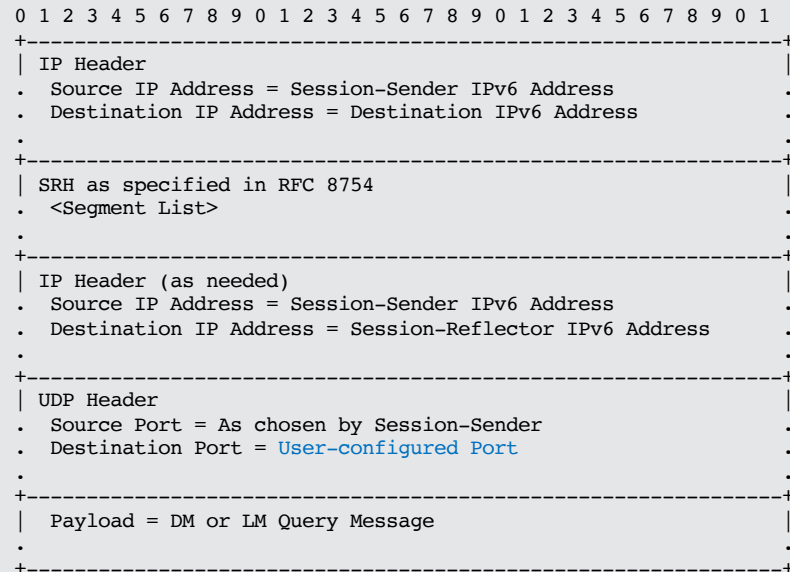


Figure: Example Probe Query Message for SRv6 Policy



# Probe Response Message

- The probe response message is sent using the IP/UDP information from the probe query message.
- Based on Control Code from the probe query message

```
+-----+
| IP Header |
| . Source IP Address = Session-Reflector IPv4 or IPv6 Address . |
| . Destination IP Address = Source IP Address from Query . |
| . Protocol = UDP . |
| . |
+-----+
| UDP Header |
| . Source Port = As chosen by Session-Reflector . |
| . Destination Port = Source Port from Query . |
| . |
+-----+
| Payload = DM Message specified in Section 4.2.1 of RFC 5357 or |
| . Payload = LM Message specified in this document . |
| . |
+-----+
```

Figure: Probe Response Message

# 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 probe queries that can take advantage of the hashing function in forwarding plane.
- Existing forwarding mechanisms are applicable to probe messages. Examples are:
  - For IPv4
    - Sweeping destination address in IPv4 header (e.g. 127/8)
  - For IPv6
    - Sweeping flow label in IPv6 header

# Performance Measurement Modes

- One-way Measurement Mode
  - Reply sent “out of band” on IP/UDP path - default
- Two-way Measurement Mode
  - Reply sent “in-band” on reverse SR path
    - Based on Control Code from the probe query message
- Loopback Measurement Mode
  - Probe message carries the return path in the header of the packet

# Example PM Metrics

- PM probe packets can be used to compute following delay metrics:
  - Minimum delay
  - Maximum delay
  - Average delay
  - Delay variance
- PM probe packet loss can be used to compute following loss metrics:
  - Synthetic packet loss (aka indirect-mode packet loss measurement)
  - Connection loss (aka liveness heart-beat failure)

# Next Steps

- Welcome your comments and suggestions
- Request SPRING WG adoption

# Thank you