

# Performance Measurement Using TWAMP Light for Segment Routing Networks

*draft-gandhi-spring-twamp-srpm-09*

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# Agenda

- Requirements and Scope
- History of the Draft
- Updates Since IETF-106
- Summary
- 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 (bundles) and LAG member links
  - ✓ Applicable to SR-MPLS/SRv6 data planes
- No need to negotiate UDP port to bootstrap PM session - spirit of SR
  - ✓ Stateless on egress node - spirit of SR
- 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*

# Updates Since IETF-106 (Version-04)

## Updates:

1. Defined Control Code for “In-band Response Requested” for TWAMP Light
  - ✓ Updated Two-way mode procedure using the Control Code
2. Moved STAMP support to a new draft - *draft-gandhi-spring-stamp-srpm*
3. Informational draft - as TWAMP Light is informational, see Appendix I in RFC 5357 and Appendix A in RFC 8545
4. Various editorial changes

## Open Items:

- None

# TWAMP Light Control Code Field

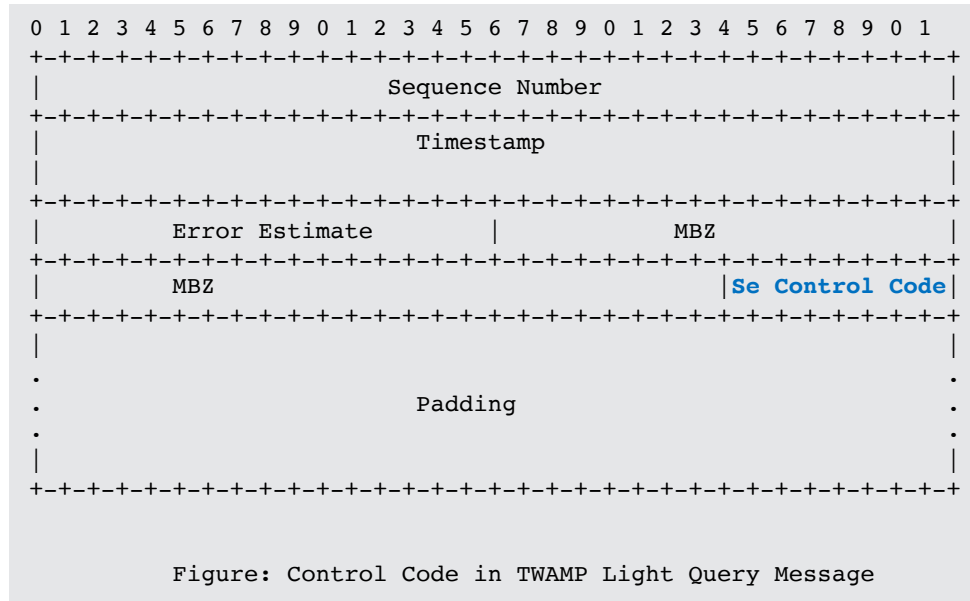
## In a Query: **Sender Control Code**

0x0: Out-of-band Response Requested.  
This is also the default behavior.

0x1: In-band Response Requested.  
Indicates that this query has been sent over a bidirectional path and the probe response is required over the same path in the reverse direction.

0x2: No Response Requested.

**Also applicable to non-SR paths.**



# 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

# Next Steps

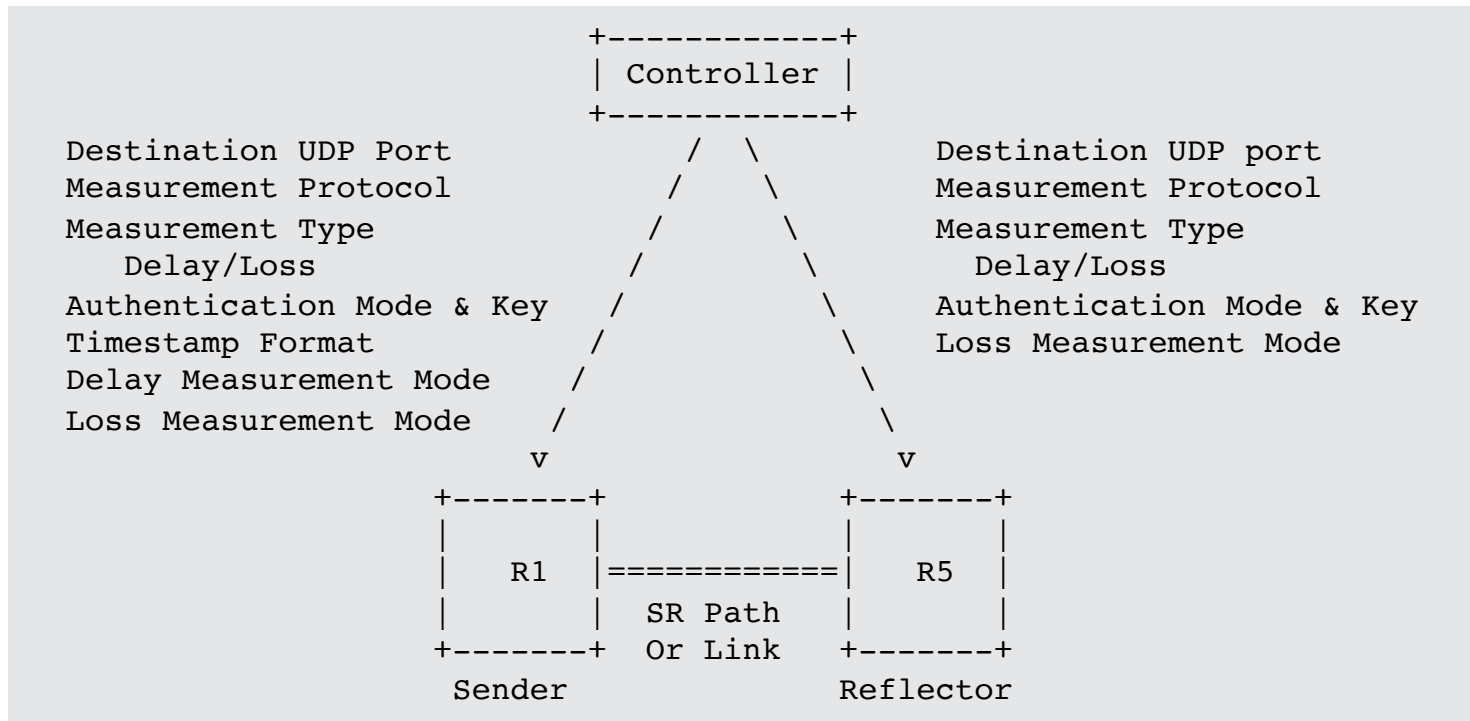
- Welcome your comments and suggestions
- Implementation exists
- In WG adoption (SPRING WG) queue
- Keep IPPM WG in the loop about the milestones



# Thank you

# Backup

# Example Provisioning Model



# Probe Query for Links

- User-configured destination UDP **port1** is used for DM probe messages and **port2** is used for LM probe messages, both in unauthenticated mode.
- Applicable to physical, virtual, LAG and LAG member links

```
+-----+
| IP Header                                     |
. Source IP Address = Sender IPv4 or IPv6 Address .
. Destination IP Address = Reflector IPv4 or IPv6 Address .
. Protocol = UDP .
. .
+-----+
| UDP Header                                   |
. Source Port = As chosen by 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

```

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 |
+-----+-----+-----+-----+-----+-----+-----+-----+
.
.
.
+-----+-----+-----+-----+-----+-----+-----+-----+
|                                     | TC | S |           TTL |
+-----+-----+-----+-----+-----+-----+-----+-----+
| DM or LM Query Message including IP/UDP Header |
.
+-----+-----+-----+-----+-----+-----+-----+-----+

```

Figure: Example Probe Query Message for SR-MPLS Policy

```

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
+-----+-----+-----+-----+-----+-----+-----+-----+
| IP Header |
. Source IP Address = Sender IPv6 Address
. Destination IP Address = Destination IPv6 Address
.
+-----+-----+-----+-----+-----+-----+-----+-----+
| SRH as specified in RFC 8754 |
. <Segment List>
.
+-----+-----+-----+-----+-----+-----+-----+-----+
| IP Header |
. Source IP Address = Sender IPv6 Address
. Destination IP Address = Reflector IPv6 Address
.
+-----+-----+-----+-----+-----+-----+-----+-----+
| UDP Header |
. Source Port = As chosen by Sender
. Destination Port = User-configured Port
.
+-----+-----+-----+-----+-----+-----+-----+-----+
| Payload = DM or LM Query Message |
.
+-----+-----+-----+-----+-----+-----+-----+-----+

```

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

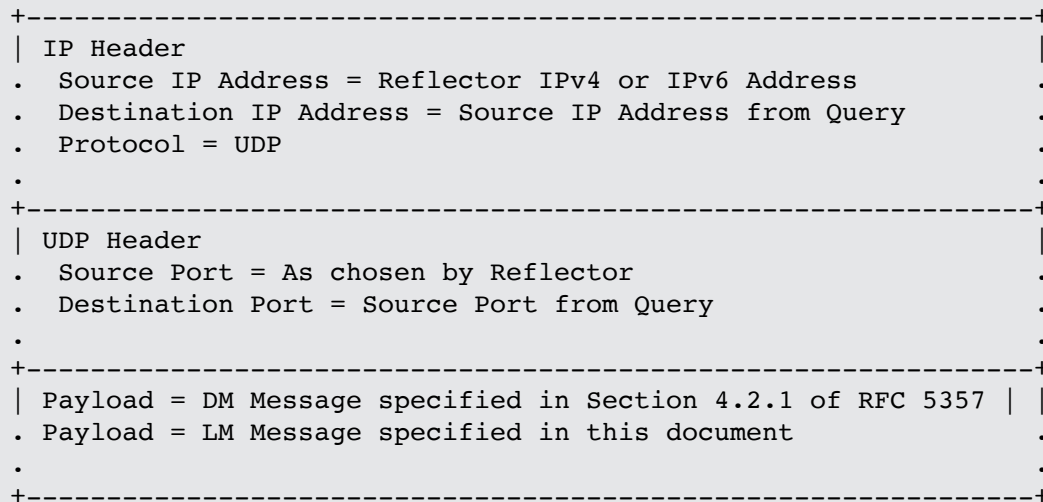
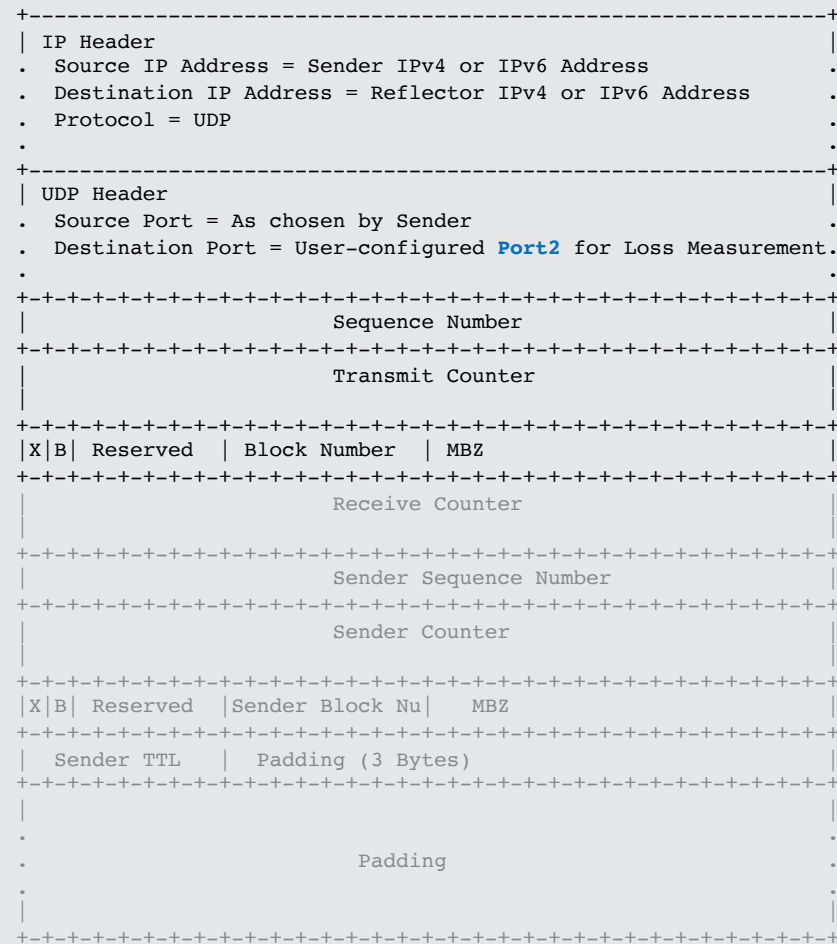


Figure: Probe Response Message

# Stand-alone LM Message Format for TWAMP Light

- Loss Measurement (LM) message defined
  - Hardware efficient counter-stamping
    - Well-known locations for transmit and receive traffic counters
  - Stand-alone LM message, not tied to DM
- LM message format is also defined for authenticated mode
- User-configured destination UDP **Port2** is used for identifying LM probe packets
- Does not modify existing TWAMP Light (which is for DM) procedure as different destination UDP is used for LM



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



# Thank you