

Performance Measurement Using TWAMP Light for Segment Routing Networks

draft-gandhi-spring-twamp-srpm-10

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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 (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 108 in IPPM WG

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

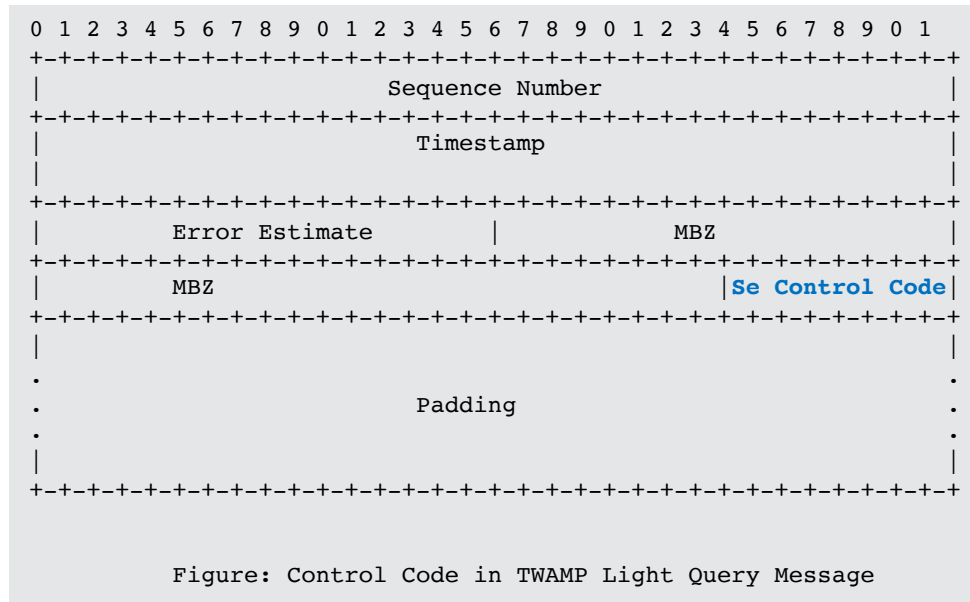
TWAMP Light Control Code Field

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.



- With this, the reflector node does not require any additional SR state for PM (recall that in SR networks, the state is in the probe packet and signaling of the parameters is avoided).
- 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

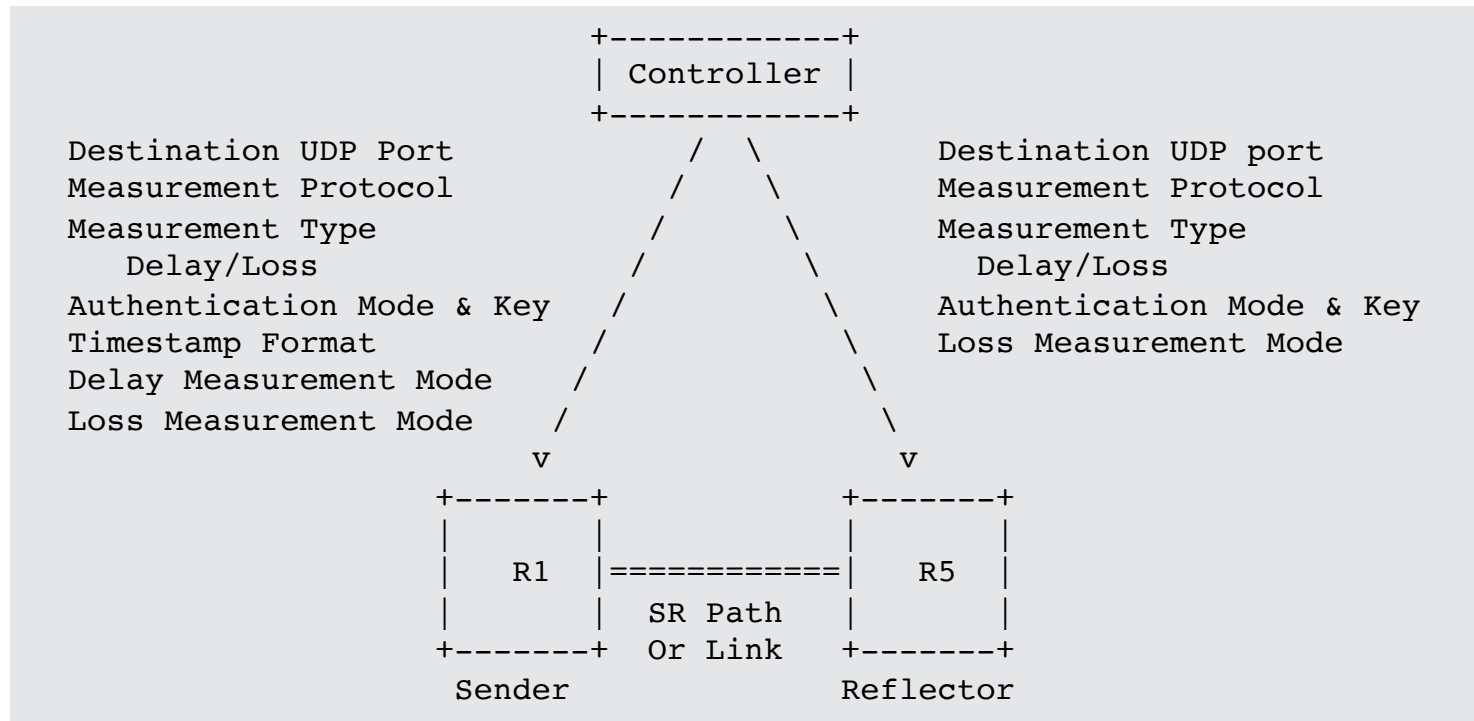
Next Steps

- Welcome your comments and suggestions
- Implementation exists
- Request SPRING WG adoption
- 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 (unauthenticated mode).
- Applicable to physical, virtual, LAG, LAG member, numbered/unnumbered links – probe messages pre-routed over the 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

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

```

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 (as needed) |
. 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

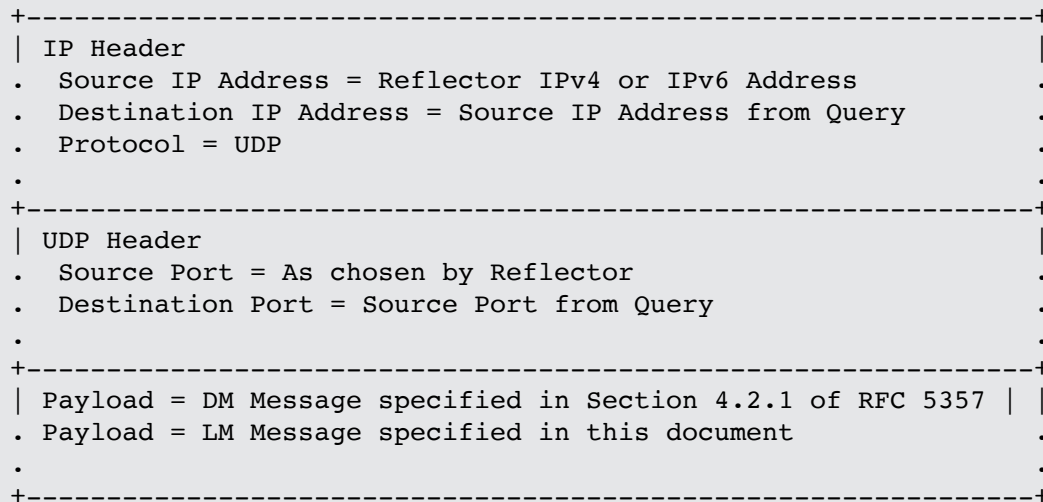
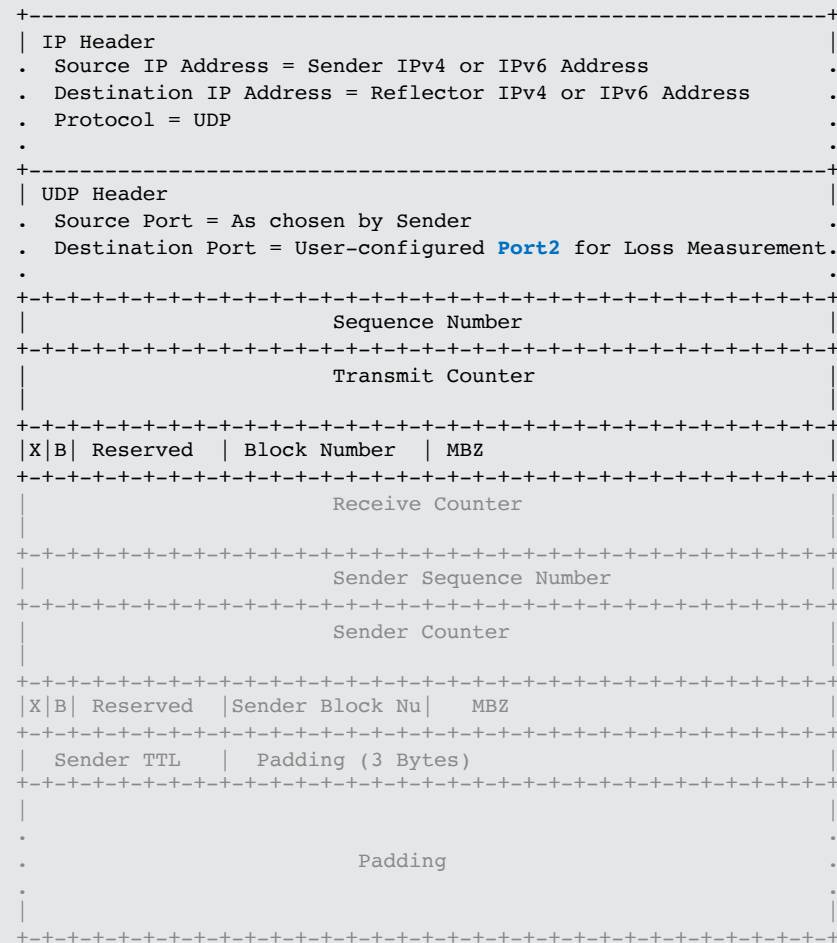


Figure: Probe Response Message

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 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

Thank you