

Performance Measurement Using TWAMP for Segment Routing Networks

draft-gandhi-spring-twamp-srpm-01

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Agenda

- Requirements and Scope
- Probe Query and Response Messages
- ECMP Support for SR Policy
- Next Steps

Requirements and Scope

Requirements:

- Delay and Loss Performance Measurement (PM) for SR links and end-to-end P2P/ P2MP SR Policies
 - ✓ Applicable to SR-MPLS/SRv6 data planes
- No need to bootstrap PM session (e.g., to negotiate UDP port) - spirit of SR
 - ✓ Stateless on egress node - spirit of SR
- Handle ECMP for SR Policies
- Support direct-mode loss measurement

Scope:

- Use RFC 5357 (TWAMP) defined probe message formats
- **User-configured** IP/UDP path for probe messages (TWAMP-Light)
- Authenticated and unauthenticated modes

Probe Query Message

- User defined IP/UDP path for PM probe messages for delay and loss measurements for SR links and end-to-end P2P/ P2MP SR Policies.
- Payload contains RFC 5357 (TWAMP) defined probe message for Delay Measurement (DM).
- User-configured destination UDP **port1** is used for identifying DM probe packets in unauthenticated mode.

```
+-----+
| IP Header |
. Source IP Address = Querier IPv4 or IPv6 Address .
. Destination IP Address = Responder IPv4 or IPv6 Address .
. Protocol = UDP .
. Router Alert Option Not Set .
.
+-----+
| UDP Header |
. Source Port = As chosen by Querier .
. Destination Port = User-configured Port for Delay Measurement. .
.
+-----+
| Payload = Message as specified in Section 4.2.1 of RFC 5357 |
| | Payload = Message as specified in Section 4.1.2 of RFC 4656 |
.
+-----+
```

Figure 1: DM Probe Query Message for TWAMP

LM Message Format for TWAMP

- Loss Measurement (LM) message defined with **fixed offsets** for transmit and receive traffic counters.
 - Hardware efficient counter-stamping
 - Aligned with DM message format
- LM Message format is also defined for authenticated mode.
- User-configured destination UDP **port2** is used for identifying LM probe packets in unauthenticated mode.



Figure 2A: LM Probe Query Message for TWAMP

Probes for SR-MPLS or SRv6 Policy

For **end-to-end** performance delay/loss measurement of SR Policy, the probe query messages are sent on the SR Policy path with:

1. MPLS label stack for SR-MPLS Policies,
Or,
2. SRv6 SRH [draft-ietf-6man-segment-routing-header] with SID list and END.OTP (for DM) or END.OP (for LM) for target SID for SRv6 Policies.

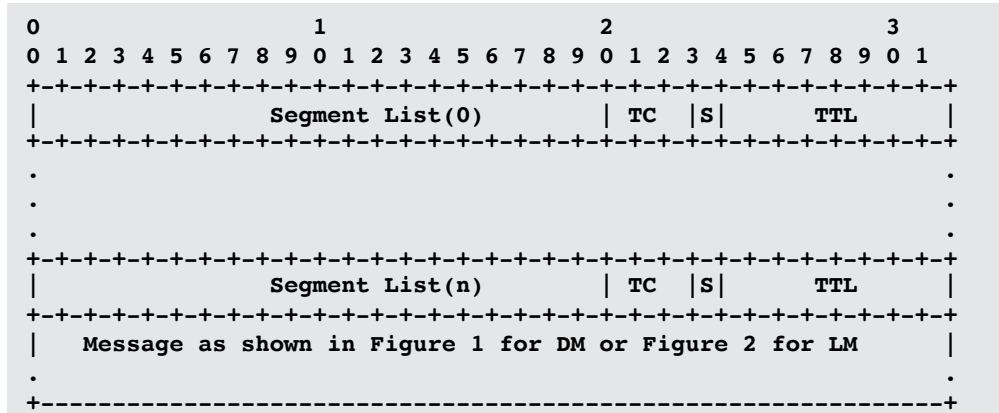


Figure 3: Probe Query Message for SR-MPLS Policy

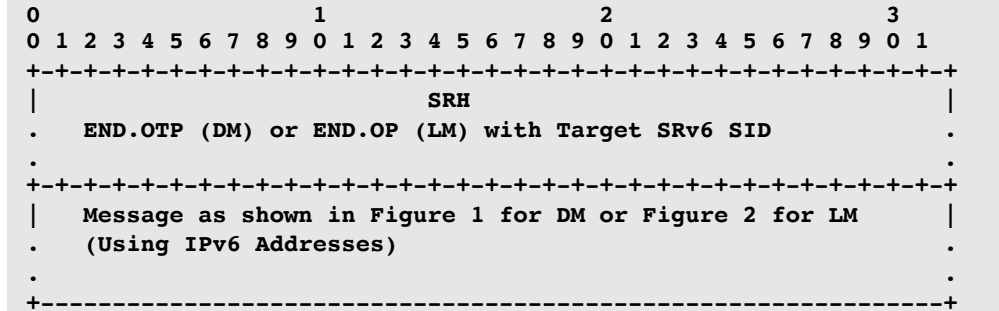


Figure 4: Probe Query Message for SRv6 Policy

Probe Response Message

- One-way, two-way and loopback measurement modes for delay.
- For one-way mode, the probe response is sent out of band.
- For two-way mode, Return Path TLV is used.
- For loopback mode, the probe query message contains both forward and reverse path in the header.

```
+-----+
| IP Header |
. Source IP Address = Responder IPv4 or IPv6 Address .
. Destination IP Address = Source IP Address from Query .
. Protocol = UDP .
. Router Alert Option Not Set .
. .
+-----+
| UDP Header |
. Source Port = As chosen by Responder .
. Destination Port = Source Port from Query .
. .
+-----+
| Payload for DM or LM |
. .
+-----+
```

ECMP Support for SR Policy

- SR Policy 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:
 - For IPv4 and IPv6
 - Destination addresses in IP/UDP header (e.g. 127/8 for IPv4 and FFFF:7F00/104 for IPv6)
 - For SR-MPLS
 - Entropy label
 - For SRv6
 - Flow label in SRH

Applicability of STAMP

- Probe message formats defined in *draft-ietf-ippm-stamp* are applicable
 - Different padding size configuration option (27 (29), 30, etc.)
- TLVs defined in *draft-mirsky-ippm-stamp-option-tlv* are applicable
 - Define Return Path TLV for STAMP

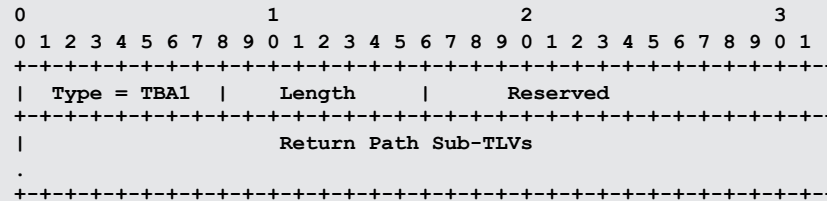


Figure 8A: Return Path TLV

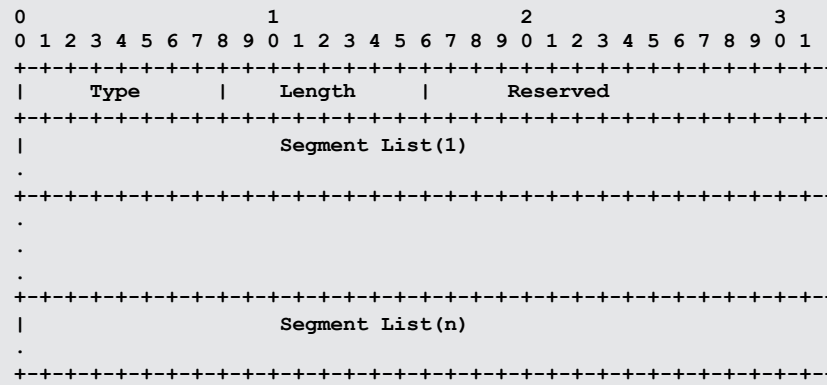


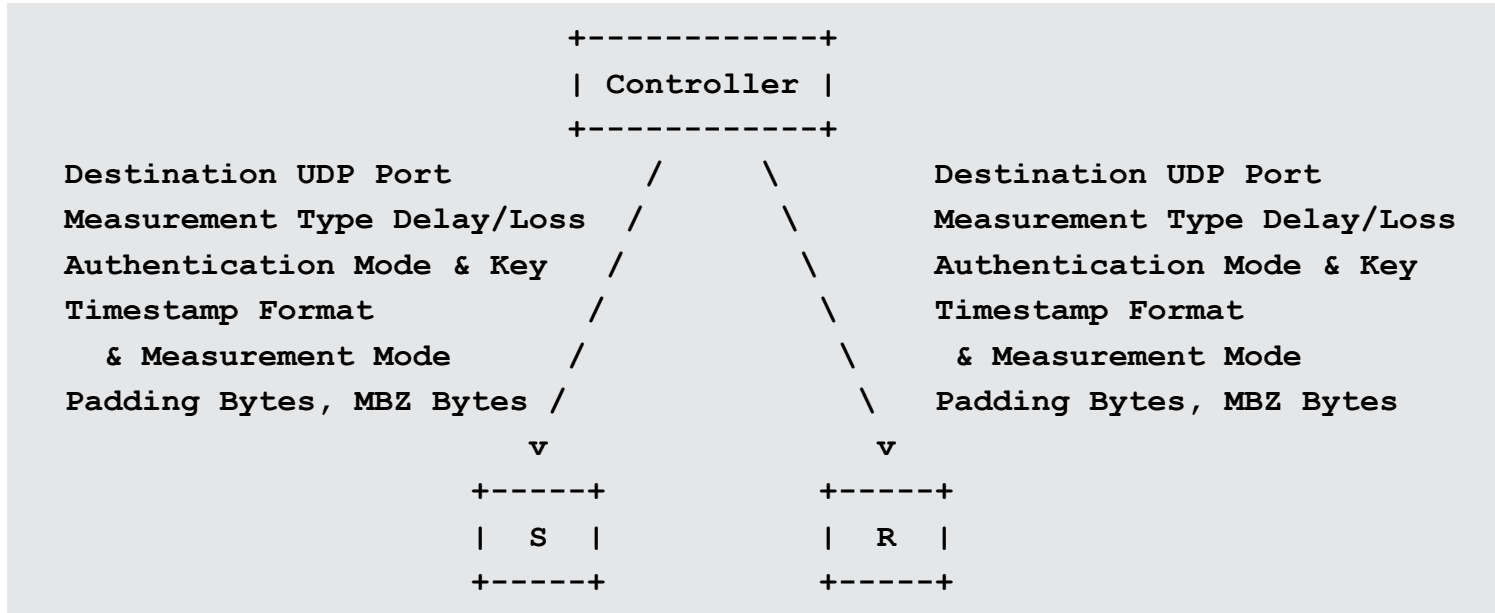
Figure 8B: Segment List Sub-TLV in Return Path TLV

Next Steps

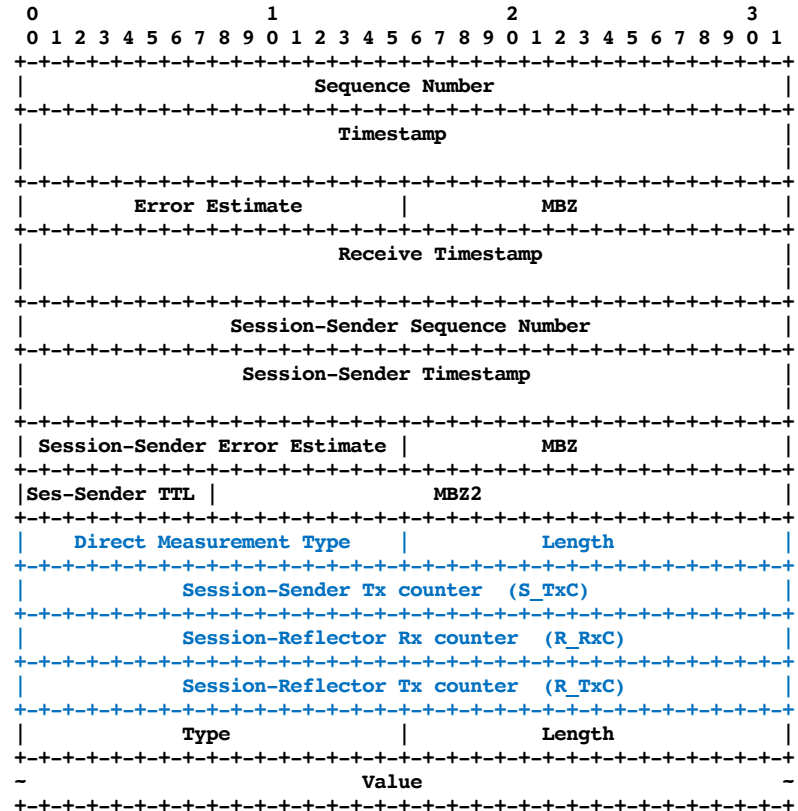
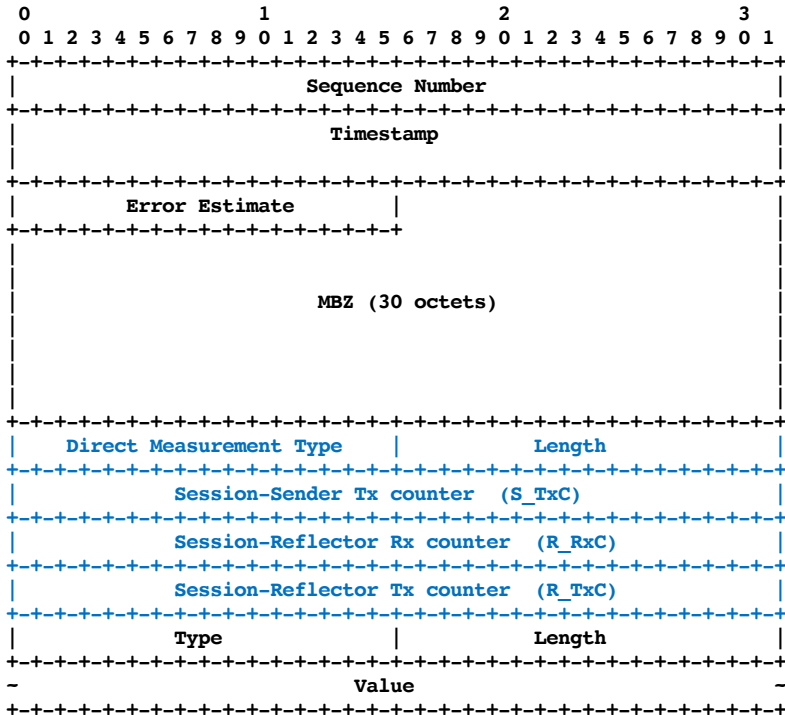
- Welcome your comments and suggestions
- Implementations exist
- Like to request for SPRING WG adoption

Thank you

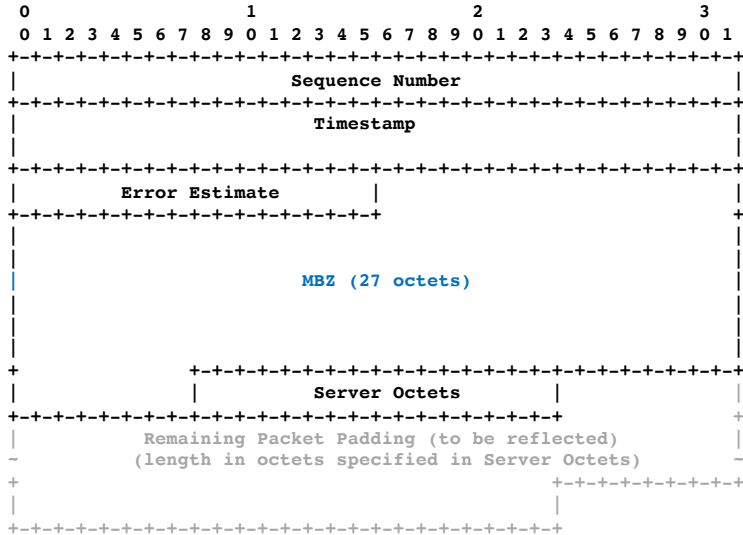
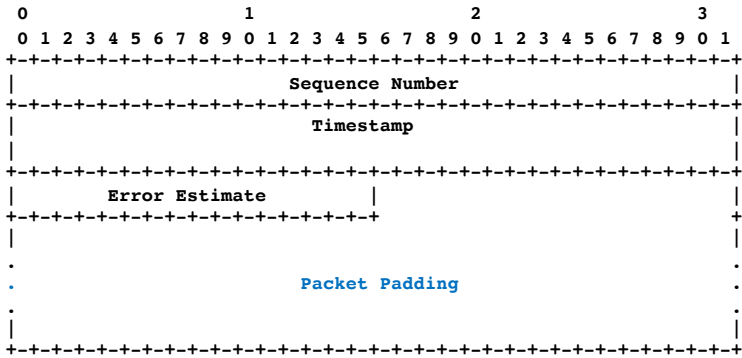
Provisioning Model



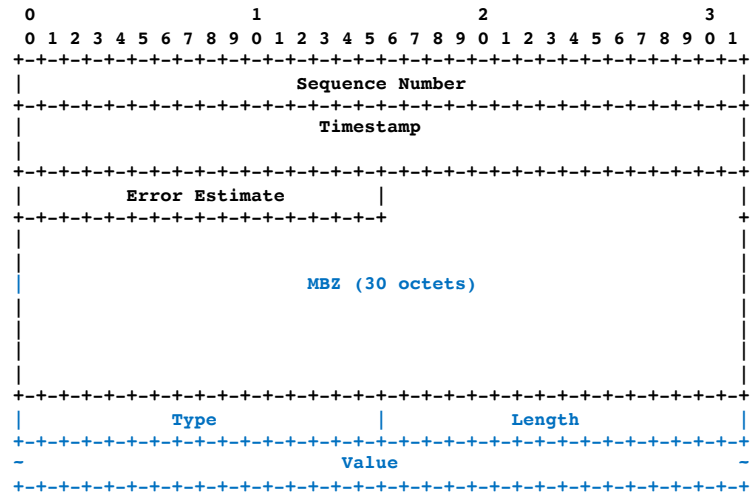
STAMP DM Message + LM TLV Probe Sender/Reflector Packets (Fixed Offsets for Counters) (Destination UDP Port3 for DM+LM)



TWAMP, STAMP, STAMP-TLV Probe Sender Packet Formats (Different Padding size)

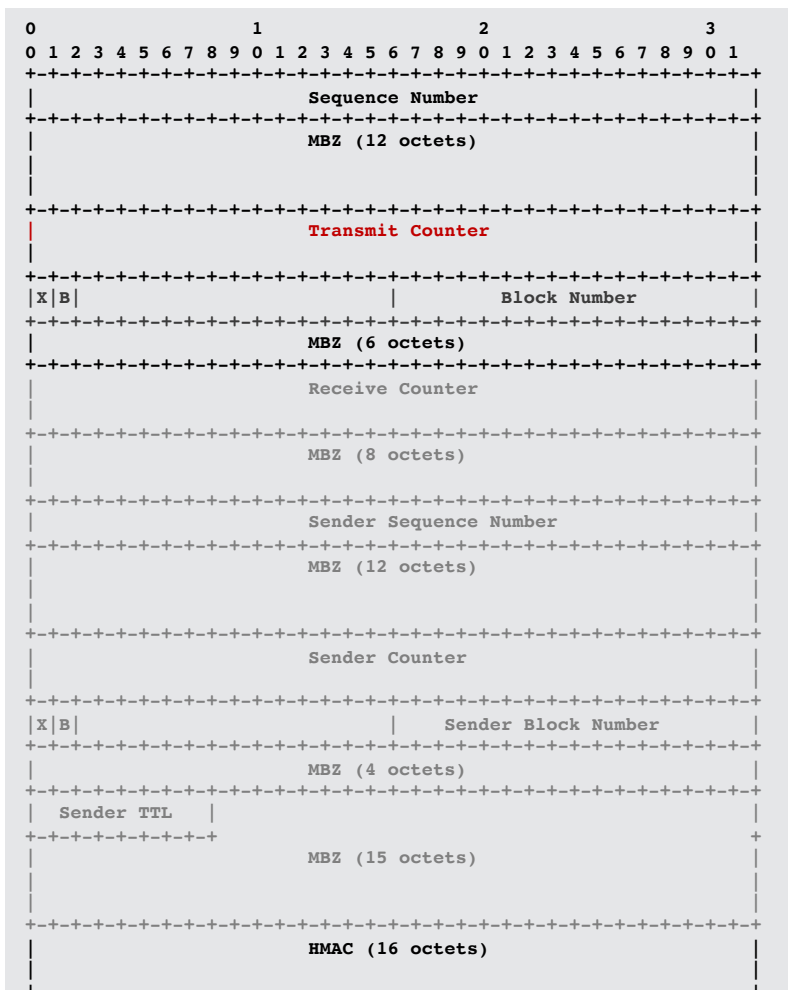


STAMP



STAMP with TLV

Loss Measurement Probe Packet - Authenticated Mode



LM Packet –
RFC 5357-based