Performance Measurement Using TWAMP Light for Segment Routing Networks

draft-gandhi-spring-twamp-srpm-04

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Agenda

- Requirements and Scope
- History of the Draft
- Updates Since IETF-104
- Summary
- 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 messages – TWAMP Light
- STAMP [draft-ietf-ippm-stamp] defined probe messages applicable
- **User-configured** IP/UDP path for probe messages

History of the Draft

- Feb 2019
  - Draft was first published
  - Uses the similar mechanism defined in draft-gandhi-spring-udp-pm for RFC 6374 (that was published Mar 2018)
- Mar 2019
  - Presented revision-00 at IETF 104 Prague in SPRING WG
- July 2019
  - Presented revision-01 at IETF 105 Montreal in IPPM WG

Updates Since IETF-104 (Revision-00)

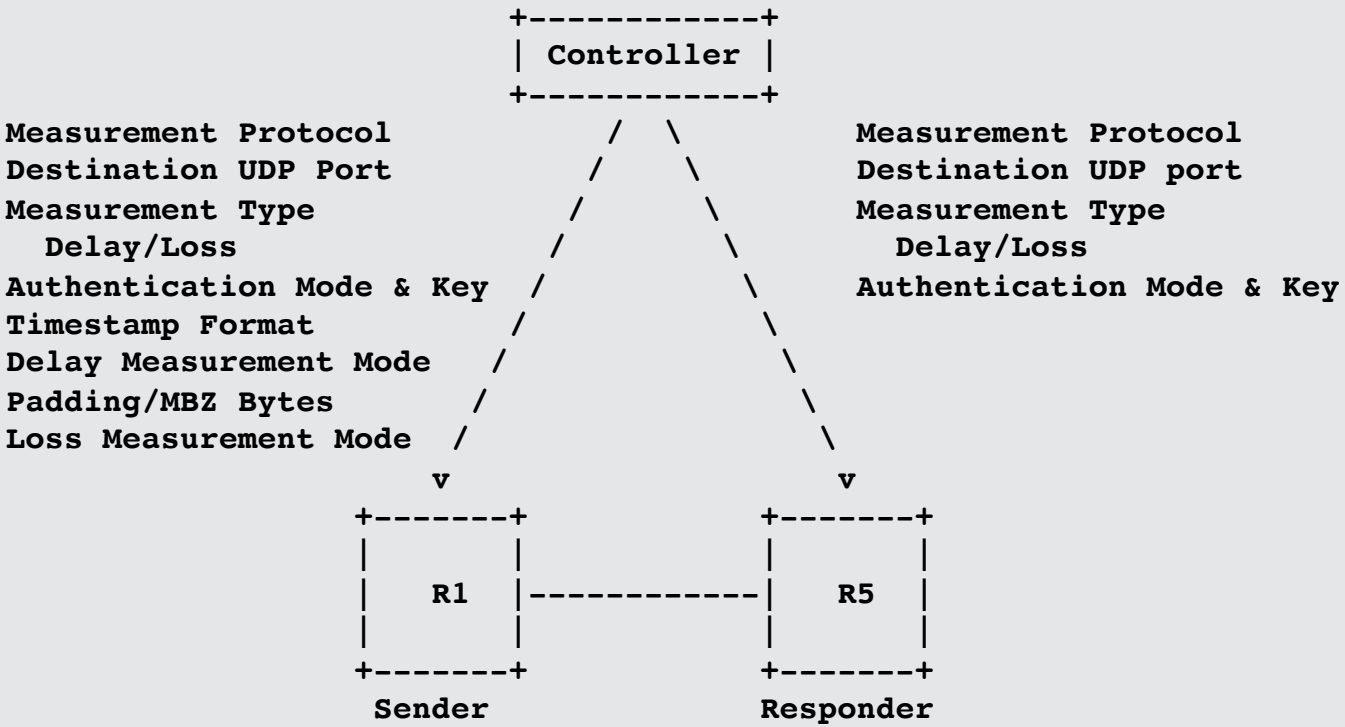
Updates:

- ✓ Welcome Mach Chen and Bart Janssens as co-authors
- ✓ Added provisioning model
- ✓ Added STAMP [draft-ietf-ippm-stamp] message formats
- ✓ Added Loopback measurement mode
- ✓ Defined Return Path TLV for two-way measurement
- ✓ Additional message processing rules (TTL value, Router Alert option, UDP checksum validation)
- ✓ Elaborated on procedure for P2MP SR Policy
- ✓ Aligned message format for direct-mode loss measurement with delay measurement
  - Added flags for counter formats and loss measurement mode
- ✓ Various editorial changes

Open Items:

- None

Provisioning Model



Measurement Modes for SR Policy

- One-way Measurement Mode
  - Reply sent “out of band” IP/UDP path
- Two-way Measurement Mode
  - Reply sent using Return Path TLV from the probe query message
- Loopback Measurement Mode
  - Probe message carries the return path in the header of the packet

Return Path TLV for Two-way Measurement

1. Type (value 1): Respond back on Incoming Interface (Layer-3 and Layer-2) (Segment List is Empty)
2. Type (value 2): SR-MPLS Segment List (Label Stack) of the Reverse SR Path
3. Type (value 3): SR-MPLS Binding SID [draft-ietf-pce-binding-label-sid] of the Reverse SR Policy
4. Type (value 4): SRv6 Segment List of the Reverse SR Path
5. Type (value 5): SRv6 Binding SID [draft-ietf-pce-binding-label-sid] of the Reverse SR Policy

Case 1: Reply on the same bundle member as probe query
Case 2: Reply on the congruent return SR path of a bidirectional SR Policy

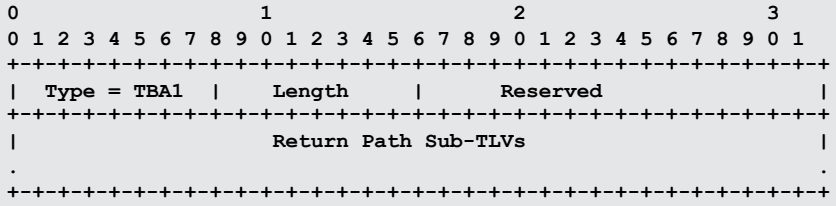


Figure 8A: Return Path TLV

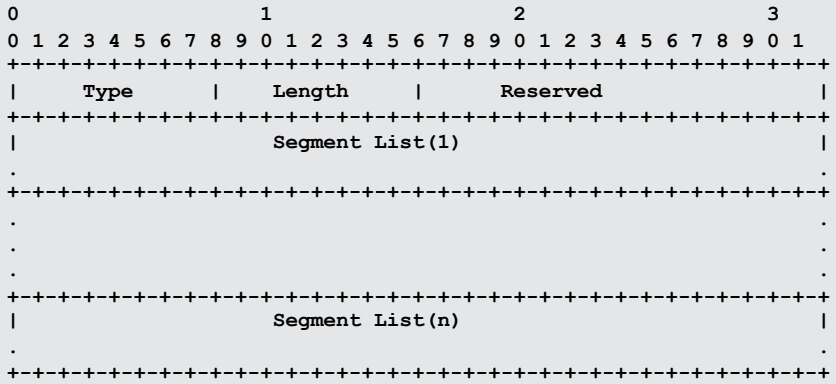
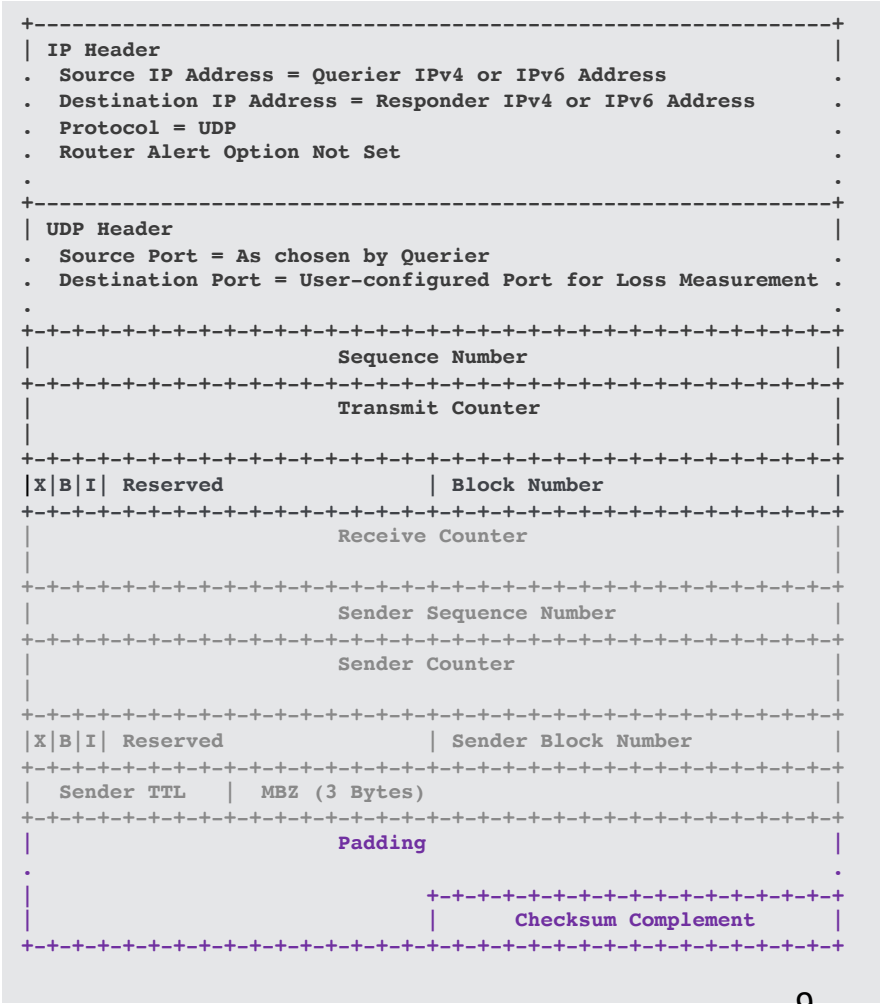


Figure 8B: Segment List Sub-TLV in Return Path TLV

LM Message Format for TWAMP and STAMP

- Independent Loss Measurement (LM) message defined with **fixed offsets** for transmit and receive traffic counters
  - Hardware efficient counter-stamping
- LM message format 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
- Corresponding LM messages also defined for STAMP [draft-ietf-ippm-stamp]



Next Steps

- Welcome your comments and suggestions
- Has been implemented
- Has been deployed
- Ready for WG adoption (SPRING WG)
- Keep IPPM WG in the loop about the milestones

Thank you

Backup

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.

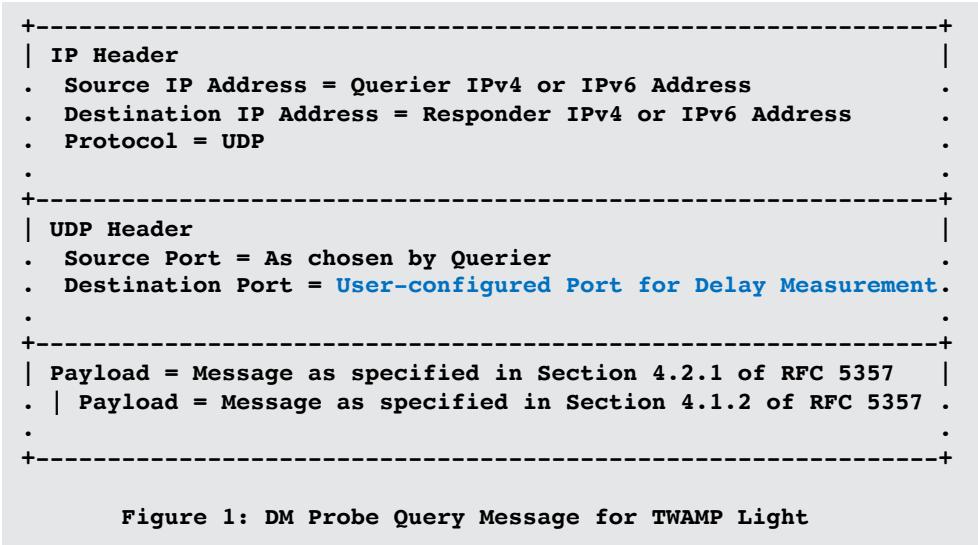


Figure 1: DM Probe Query Message for TWAMP Light

Probe Response Message

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

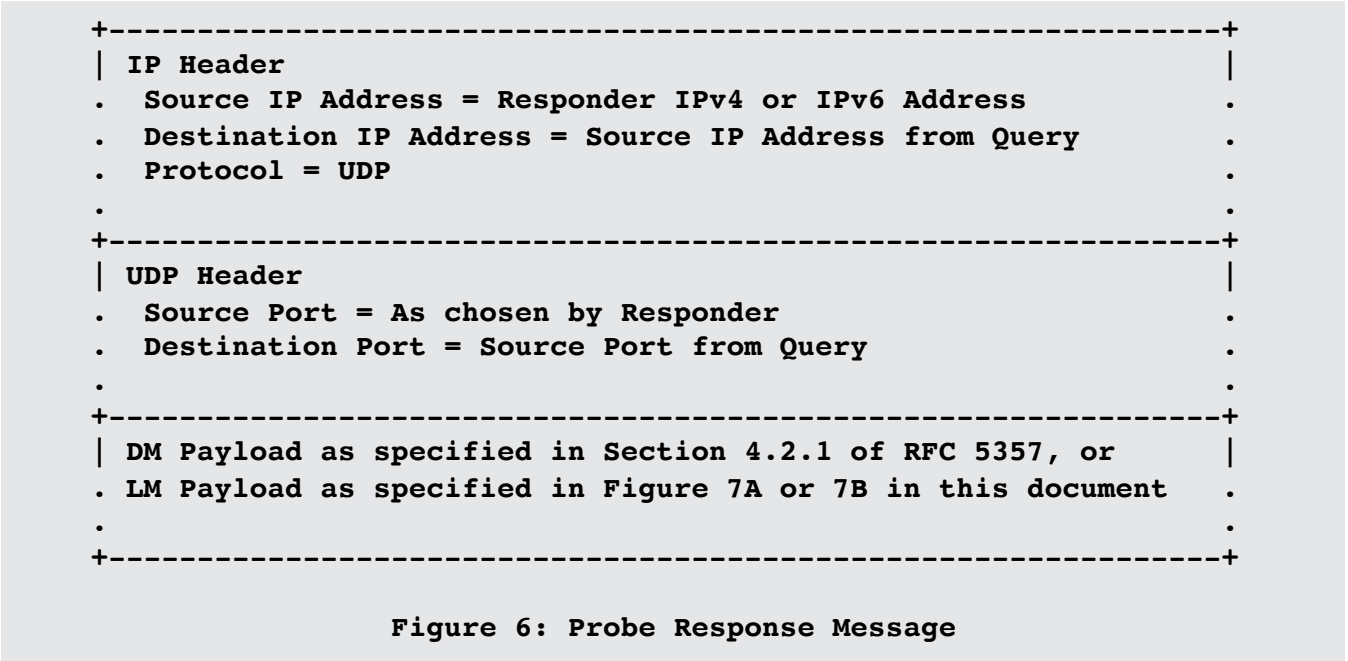


Figure 6: Probe Response Message

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.

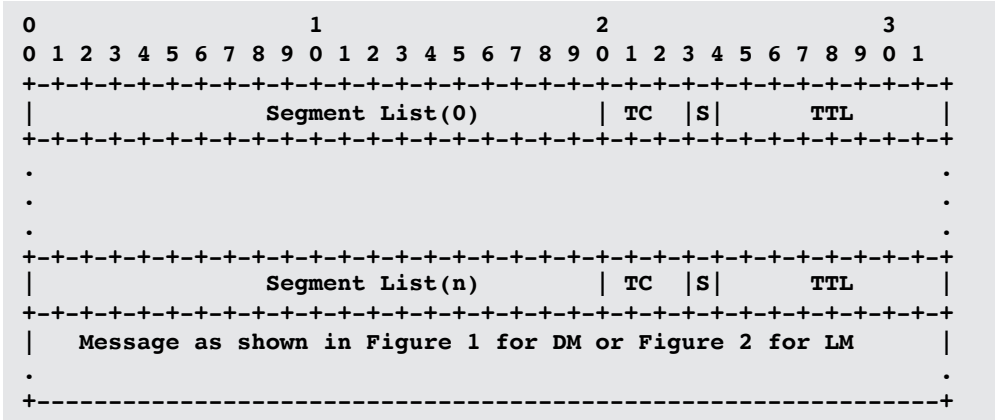


Figure 3: Probe Query Message for SR-MPLS Policy

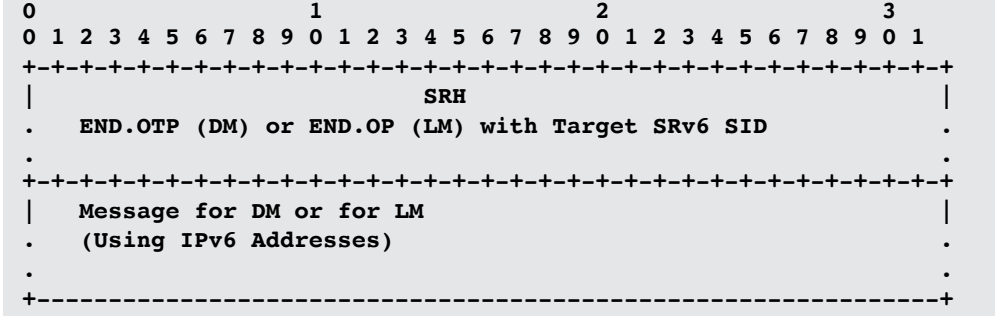


Figure 4: Probe Query Message for SRv6 Policy

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 header (e.g. 127/8 for IPv4 and FFFF:7F00/104 for IPv6)
    - Flow label in IPv6 header

STAMP DM Message with LM TLV (Destination UDP **Port3** for DM+LM)

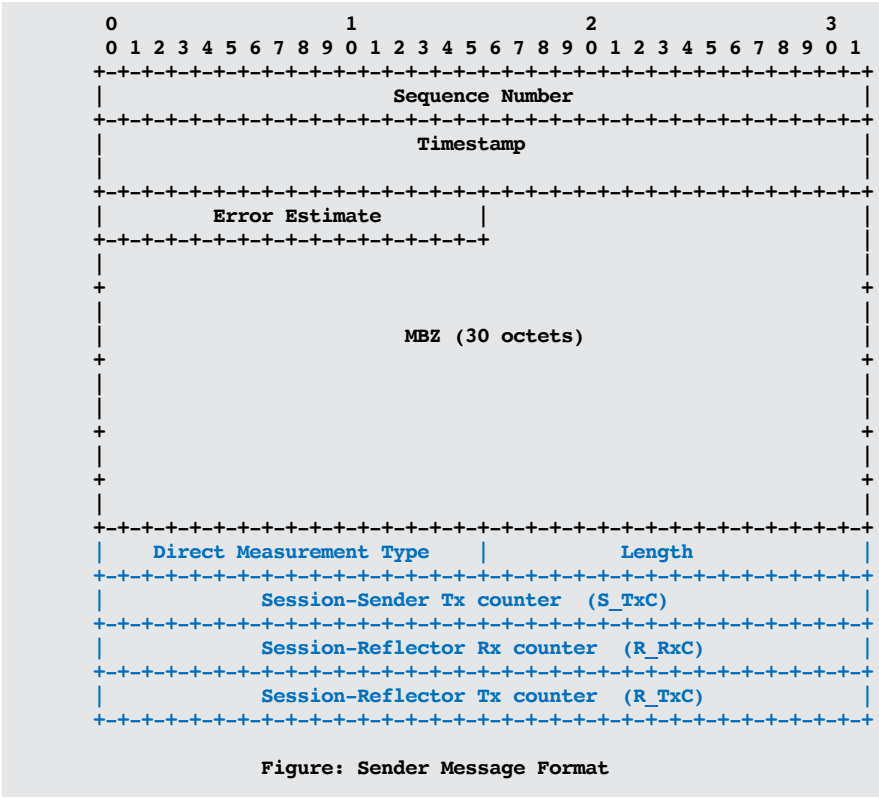


Figure: Sender Message Format

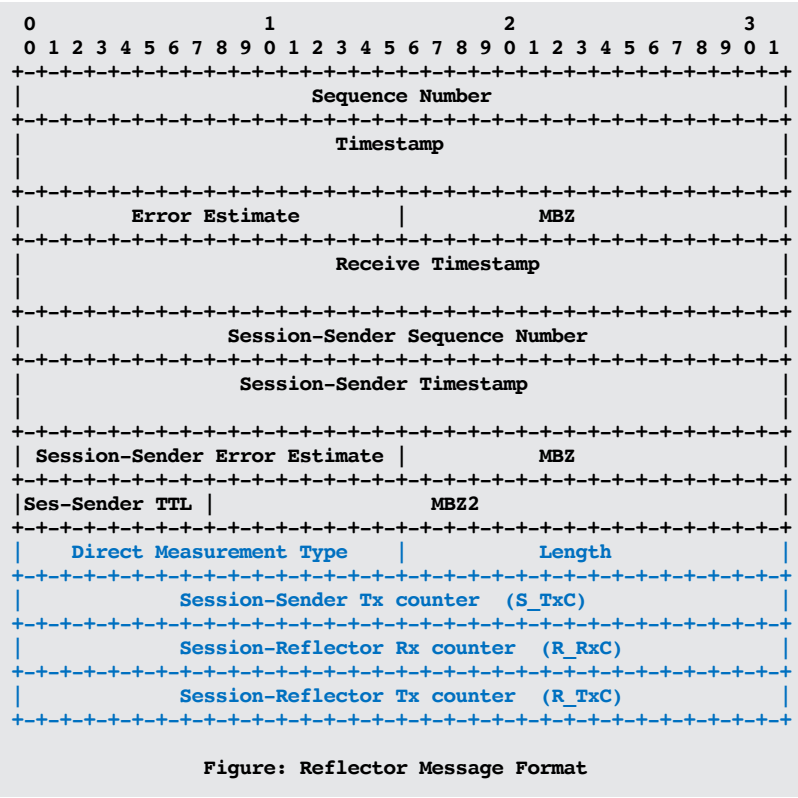


Figure: Reflector Message Format

Thank you