Performance Measurement Using Simple TWAMP for Segment Routing Networks

draft-gandhi-spring-stamp-srpm-02

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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:

- STAMP [RFC 8762]
- STAMP TLVs [draft-ietf-ippm-stamp-option-tlv]

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
- May 2019
  - Added STAMP TLV for Return Path
- 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-stamp-srpm-01* at IETF 108 in SPRING and IPPM WG

STAMP 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 reverse direction.

0x2: No Response Requested.

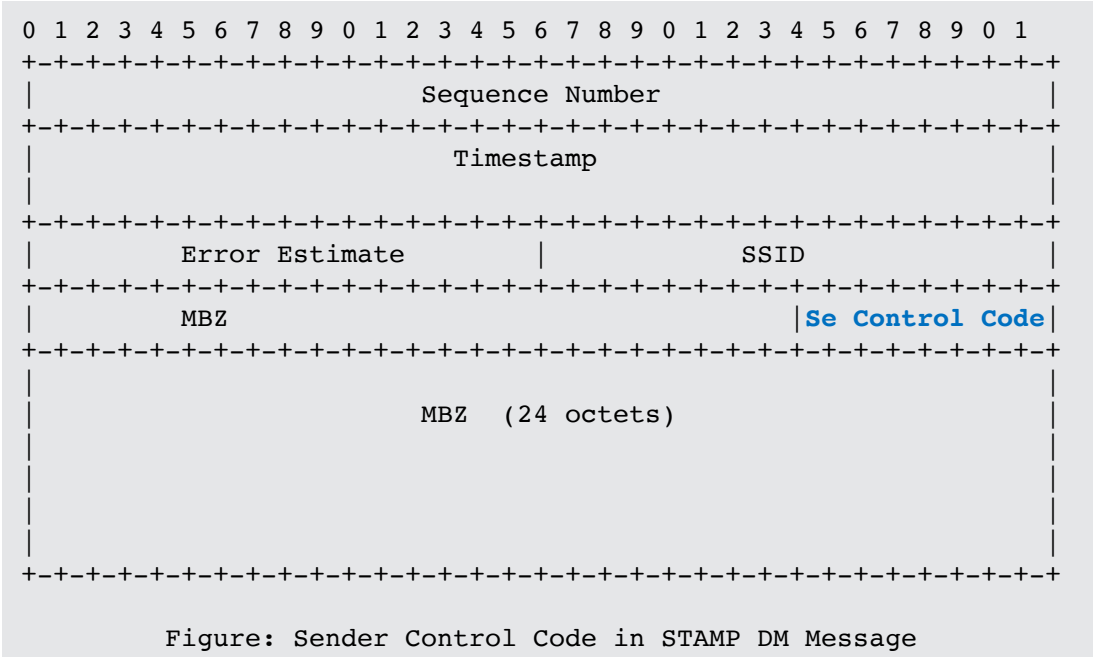


Figure: Sender Control Code in STAMP DM Message

- 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 by default
- Two-way Measurement Mode
  - Reply sent “in-band” on reverse SR path
    - Based on Control Code from the probe query message
  - **Use Return Path TLV for STAMP from the probe query message**

Destination Address in STAMP Node Address TLV

Destination Node Address (value TBA1):

- Indicates the address of the intended recipient node of the query message.
- The reflector node **MUST NOT** send response if it is not the intended destination node of the query.
- Useful when query is sent with 127/8 destination address.

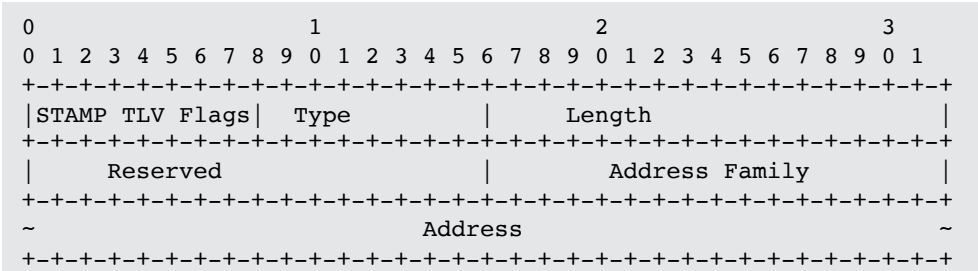


Figure: Node Address TLV Format

Return Address in STAMP Return Path TLV

Return Path (value TBA2):

Sub-TLVs Types:

- Type (value 1): Return Address. Target node address of the response; different than the Source Address in the query
- Type (value 2): SR-MPLS Label Stack of the Reverse SR Path
- Type (value 3): SR-MPLS Binding SID [draft-ietf-pce-binding-label-sid] of the Reverse SR Policy
- Type (value 4): SRv6 Segment List of the Reverse SR Path
- Type (value 5): SRv6 Binding SID [draft-ietf-pce-binding-label-sid] of the Reverse SR Policy

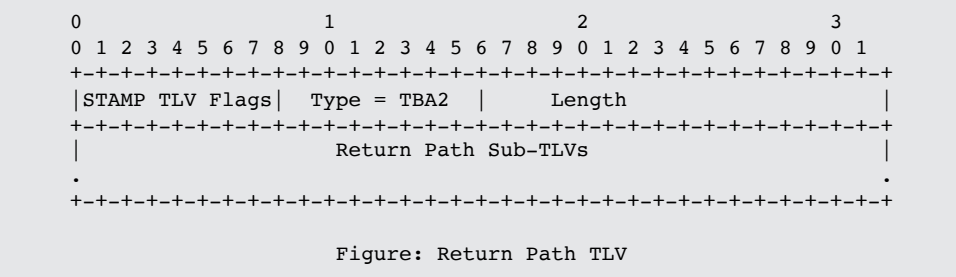


Figure: Return Path TLV

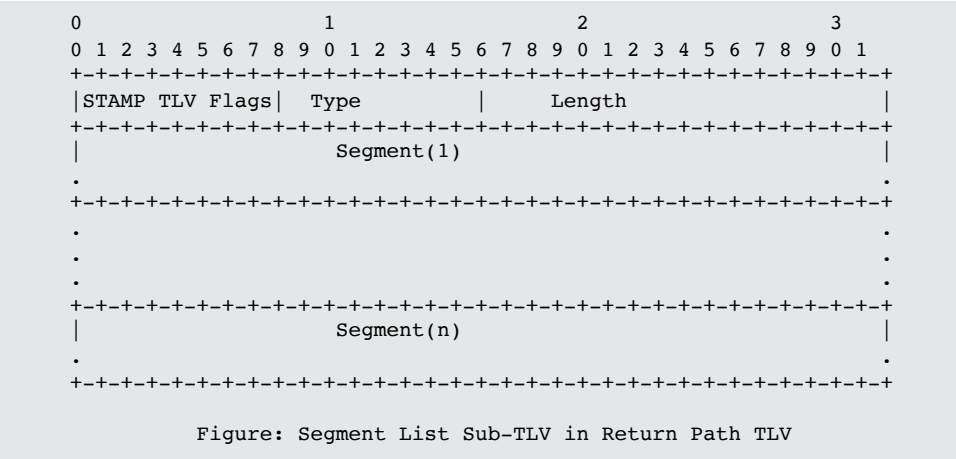


Figure: Segment List Sub-TLV in Return Path TLV

Stand-alone LM Message Format for STAMP

- 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 STAMP (which is for DM) procedure as different destination UDP is used for LM

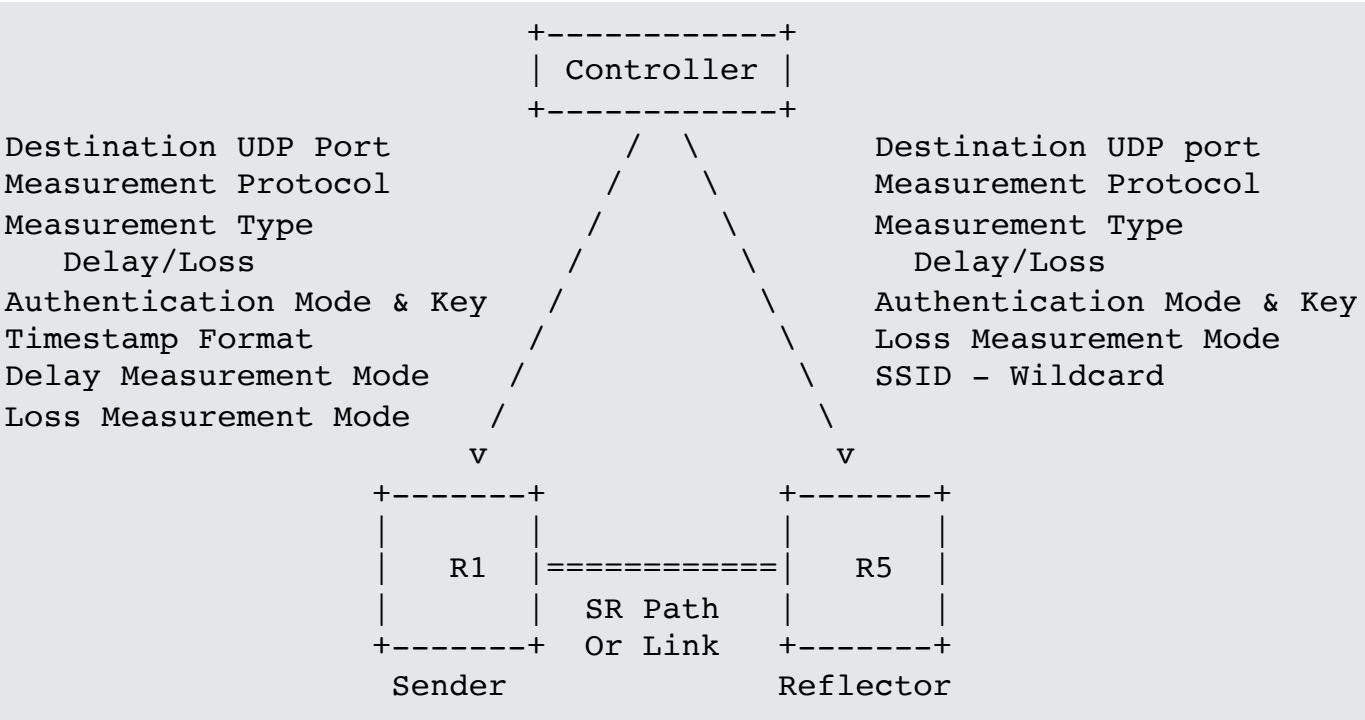
Next Steps

- 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

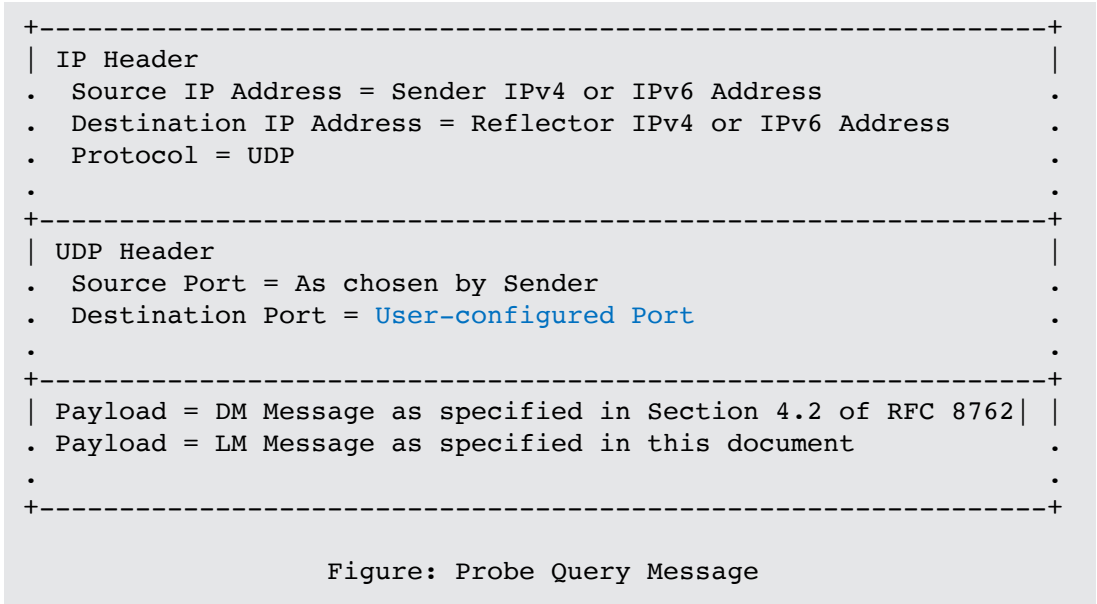


Figure: Probe Query Message

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

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

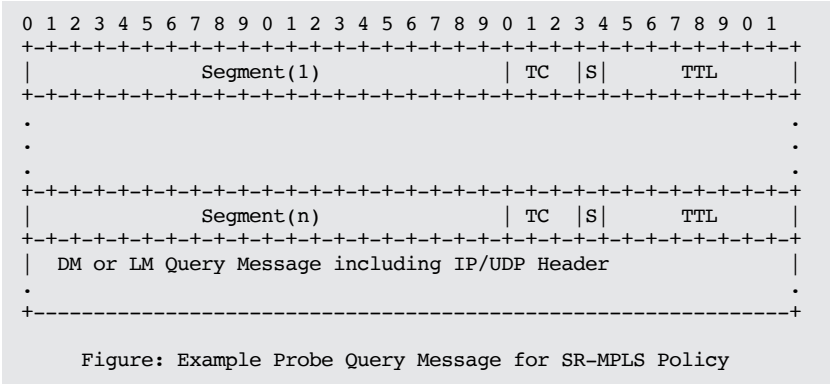


Figure: Example Probe Query Message for SR-MPLS Policy

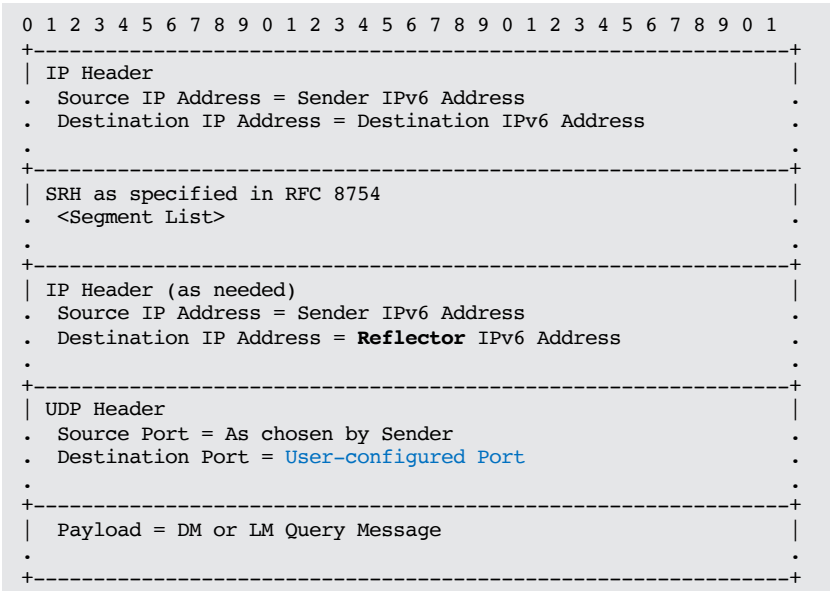


Figure: Example Probe Query Message for SRv6 Policy

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
- **Use Segment List from Return Path TLV if present in probe query message.**

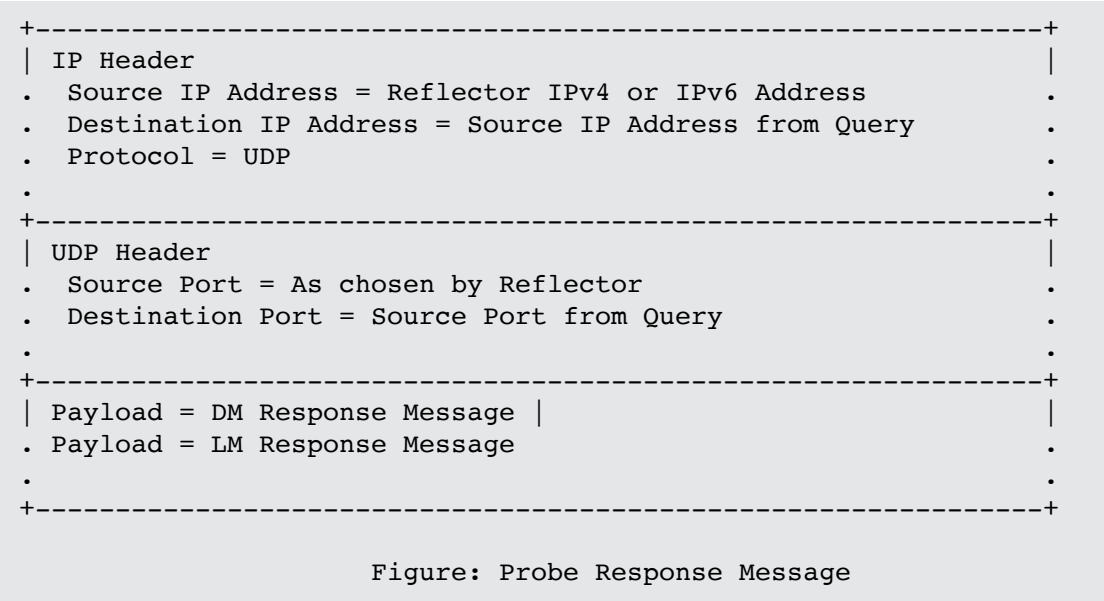


Figure: Probe Response Message

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

Backup

STAMP DM Message with Direct Measurement TLV (Combined DM+LM Probe Message)

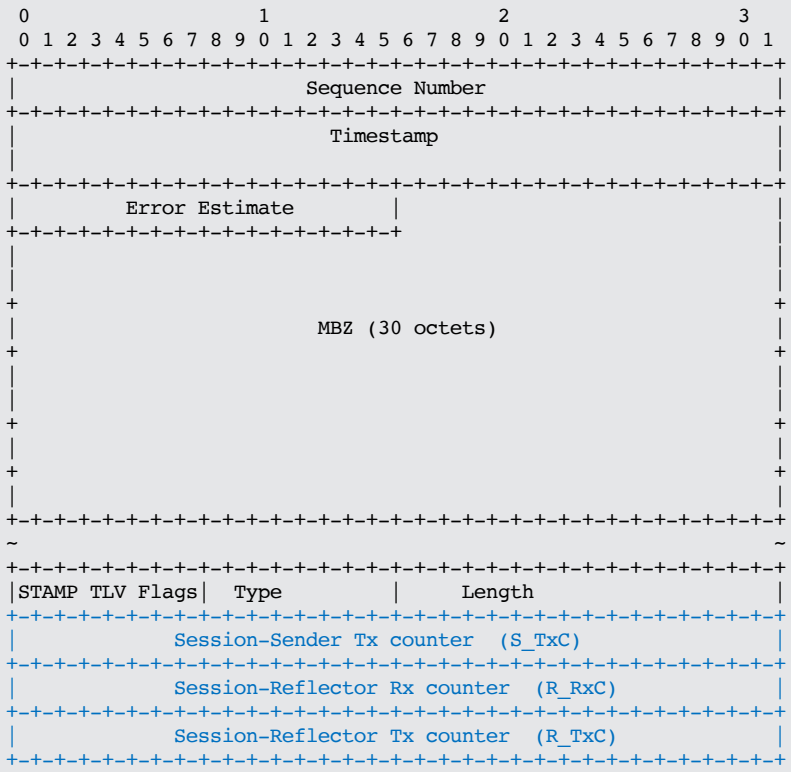


Figure: Sender Message Format

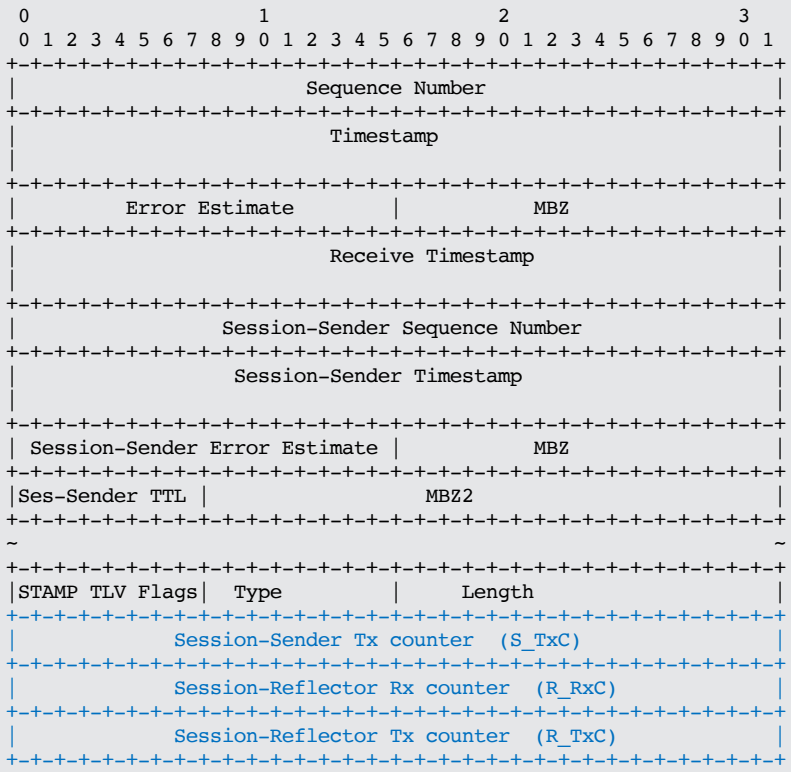


Figure: Reflector Message Format

Thank you