Performance Measurement Using RFC 6374 for Segment Routing Networks with MPLS Data Plane

draft-ietf-mpls-rfc6374-sr-00

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Agenda

- Requirements and Scope
- History of the Draft
- Updates Since IETF-107
- Summary
- Next Steps

Requirements and Scope

Requirements:

- Delay and Loss Performance Measurement (PM)
  - SR-MPLS Links (Physical, Virtual, LAG, LAG members)
  - End-to-end P2P/ P2MP SR-MPLS Paths
- Delay and Loss extended TE link metrics advertisement in the network
- One-way, two-way and loopback measurement modes
- Segment Routing with MPLS data plane (SR-MPLS)
  - Stateless on responder node, state is in the probe message - spirit of SR

Scope:

- RFC 6374 for probe query and response messages
- RFC 7876 (UDP return path) for probe response messages

History of the Draft

- Feb 14, 2018
  - Draft was published *draft-gandhi-spring-sr-mpls-pm-00*
- July 2018
  - Draft *draft-gandhi-spring-sr-mpls-pm-02* was introduced at IETF 102 Montreal in SPRING WG
- Nov 2018
  - Presented *draft-gandhi-spring-sr-mpls-pm-03* at IETF 103 Bangkok in SPRING and IPPM WGs
- Feb 14, 2019
  - Draft was renamed to *draft-gandhi-spring-rfc6374-srpm-mpls-00*
- Mar 2019
  - Presented *draft-gandhi-spring-rfc6374-srpm-mpls-00* at IETF 104 Prague in SPRING WG
- Oct 2019
  - Chairs agreed to progress the work in MPLS WG
  - Draft renamed to *draft-gandhi-mpls-rfc6374-sr-00*
- Nov 2019
  - Presented *draft-gandhi-mpls-rfc6374-sr-00* at IETF 106 Singapore in MPLS WG
- Apr 2020
  - Presented *draft-gandhi-mpls-rfc6374-sr-02* at IETF 107 in MPLS WG Interim
- Jul 2020
  - Adopted as a WG document

Updates Since IETF-107 (Version 02)

Updates:

- ✓ Addressed MPLS-RT expert review comments
  - ✓ Included combined DM+LM message format
  - ✓ Additional details for P2MP SR-MPLS paths
  - ✓ Added Backwards Compatibility
  - ✓ Updated IANA Section - Registry for Return Path Sub-TLVs
  - ✓ Various editorial changes

Open Items:

- None

Next Steps

- Welcome your comments and suggestions

Thank you

Probes for SR-MPLS Links

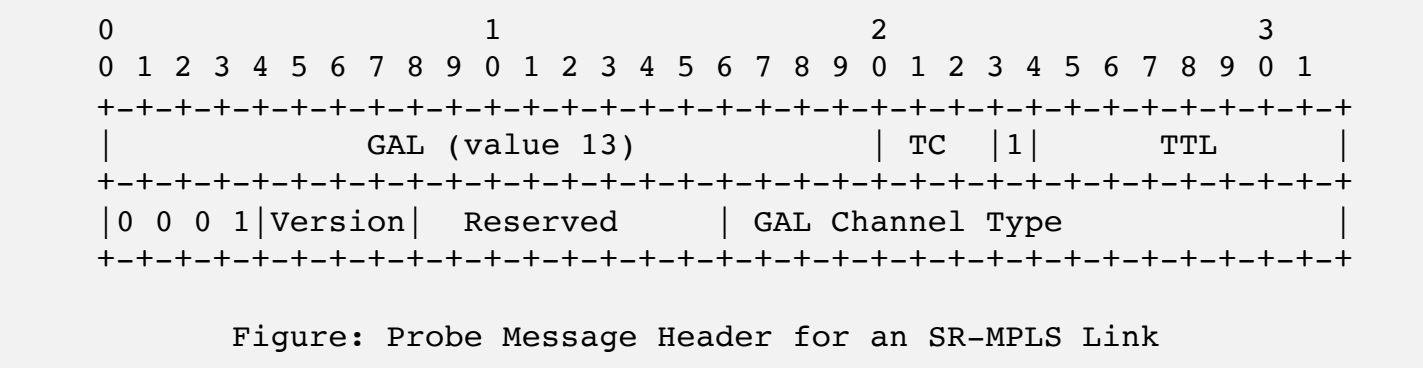

Figure: Probe Message Header for an SR-MPLS Link

- For SR-MPLS links, the PM probe query messages for link delay and packet loss measurements are sent using MPLS GAL/GAch header as defined in [RFC6374].

SR-MPLS Link Extended TE Metrics Advertisement

- Measure delay and loss performance of SR-MPLS Links.
- Compute SR-MPLS Link Delay metrics (minimum-delay, maximum-delay, average-delay, delay-variance) and SR Link Packet Loss metric.
- SR-MPLS Link extended TE metrics advertised in the network using the TLVs defined in the following RFCs:
  - OSPF [RFC7471]
  - ISIS [RFC7810] [RFC8570]
  - BGP-LS [RFC8571]

Probes for SR-MPLS Policy

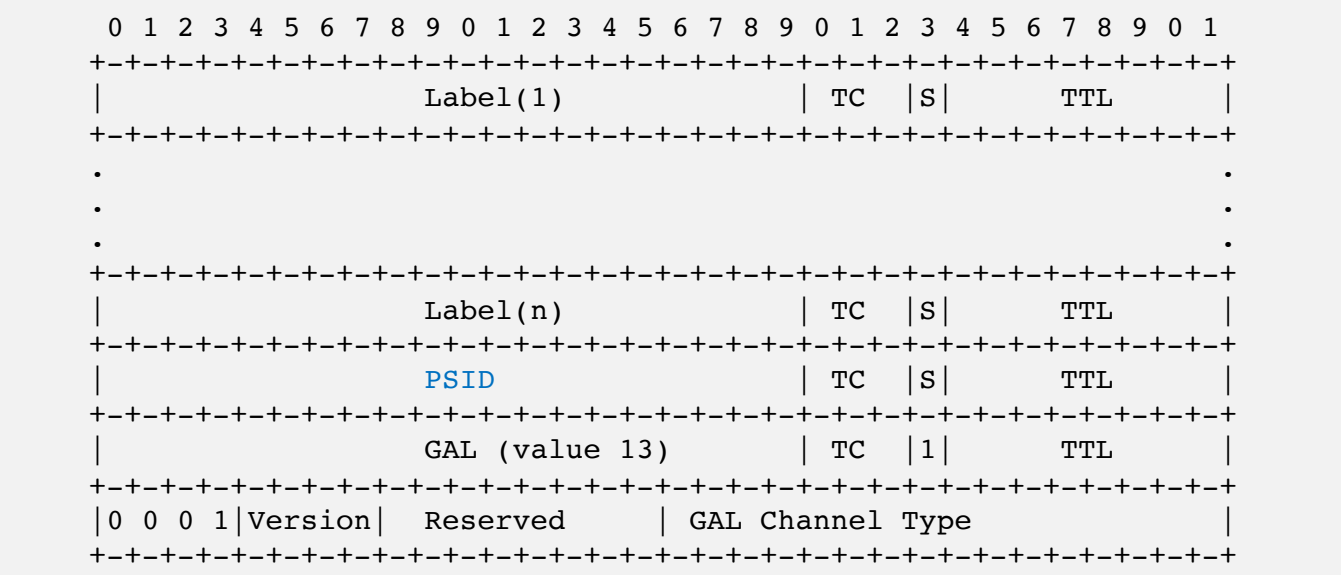

Figure: Example Probe Message Header for an End-to-end SR-MPLS Policy

- For end-to-end measurement of SR-MPLS Policy, the probe query messages for delay and loss measurements are sent on the congruent path with data traffic using MPLS GAL/GAch header as defined in [RFC6374] and SR-MPLS label stack of the SR-MPLS Policy.

Measurement Modes for SR-MPLS Policy

- One-way Measurement Mode
  - Reply sent out of band IP/UDP path using RFC 7876 mechanisms
- Two-way Measurement Mode
  - Reply sent in-band using the RFC 6374 mechanisms (using Control code)
  - Return Path TLV can be used from the probe query message for SR-MPLS Paths
- Loopback Measurement Mode
  - Probe message carries the return path label stack in the header of the message

Return Path TLV for Two-way Measurement

Sub-TLV Types:

1. Type (value 1): SR-MPLS Segment List (Label Stack) of the Reverse Path
2. Type (value 2): SR-MPLS Binding SID [draft-ietf-pce-binding-label-sid] of the Reverse SR-MPLS Policy

- TLV is mandatory type.
- If responder does not support, it MUST return Error 0x17: Unsupported Mandatory TLV Object

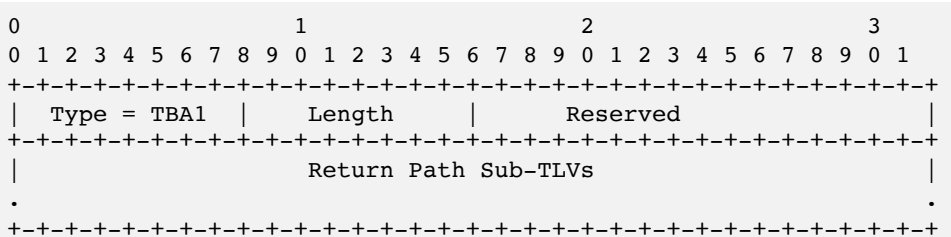

Figure: Return Path TLV

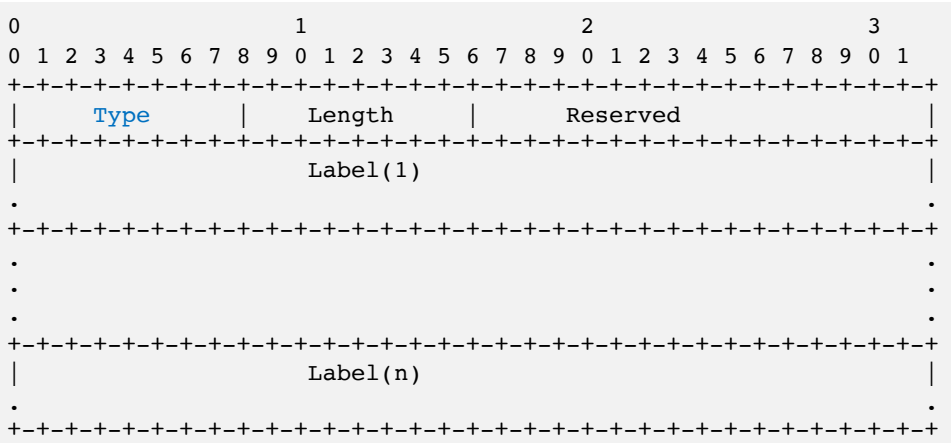

Figure: Segment List Sub-TLV in Return Path TLV

Destination Address TLV (Type 129) Handling

- To ensure that the probe query message is processed by the intended responder node, Destination Address TLV [RFC6374] MAY be sent in the probe query message.
- The responder node only replies with Success in Control Code if it is the intended destination for the probe query.
  - Otherwise, it MUST return 0x15: Error - Invalid Destination Node Identifier.

Block Number TLV for Loss Measurement

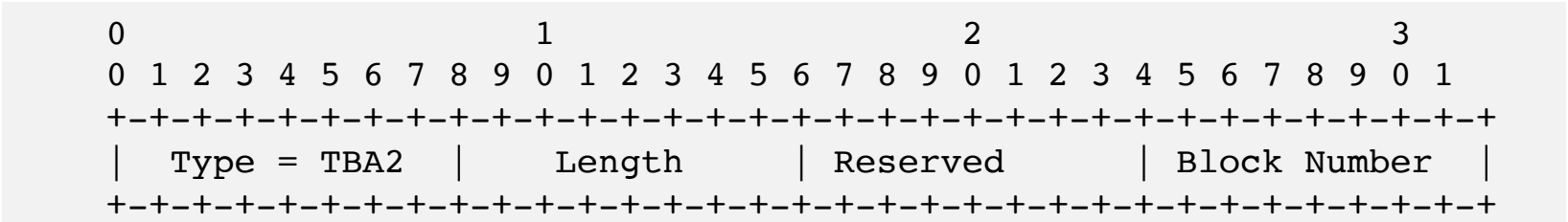

Figure: Block Number TLV

- Carry the Block Number (8-bit) of the traffic counters in the probe query and response messages for loss measurement
- **Correlate** PM data (e.g. counters) from both endpoints
- **Aggregate** PM data collected in data plane, e.g. compute measurement metrics for each block
- TLV is mandatory type
- If responder does not support, it MUST return
  - Error 0x17: Unsupported Mandatory TLV Object

Probe Query for P2MP SR-MPLS Policy

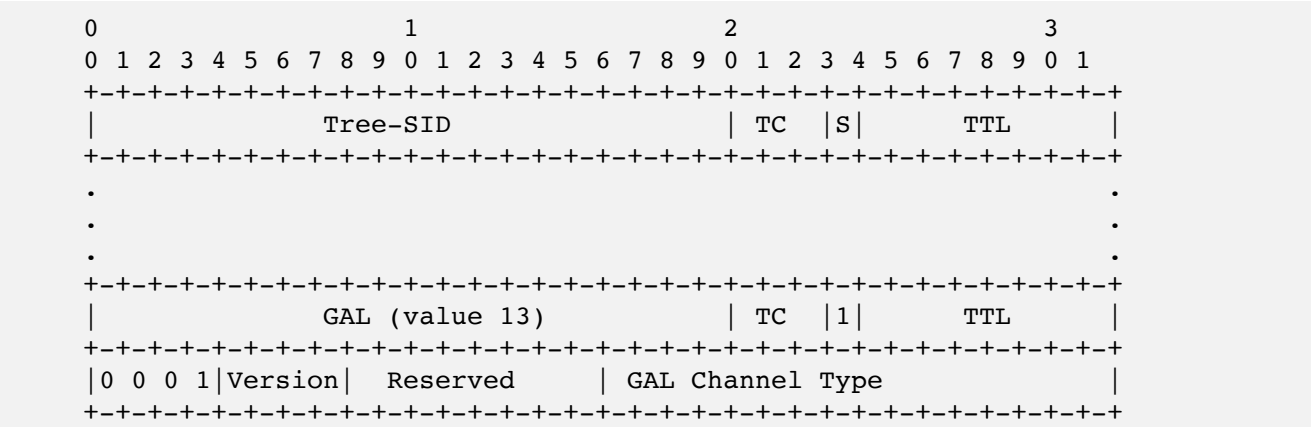

Figure: Example Probe Query with Replication Segment for P2MP SR-MPLS Policy

- One-way mode for delay and loss measurement for P2MP SR-MPLS Policy as follows:
  - The querier root node sends probe query messages using the Tree-SID for the P2MP SR-MPLS Policy
  - Each responder leaf node adds the "Source Address" TLV (Type 130) [RFC6374] with its IP address in the probe response messages
    - This TLV allows the querier root node to identify the responder leaf nodes of the P2MP SR-MPLS Policy

Thank you