

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

draft-gandhi-mpls-rfc6374-sr-04

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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 and 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

Scope:

- Segment Routing with MPLS data plane (SR-MPLS)
- 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

Updates Since IETF-107 (Version 02)

Updates:

- ✓ Addressed MPLS-RT expert review comments
- ✓ Various editorial changes

Open Items:

- None

Next Steps

- Welcome your comments and suggestions
- Implementation exists
- Requested adoption in MPLS WG

Thank you

Probes for SR-MPLS Links

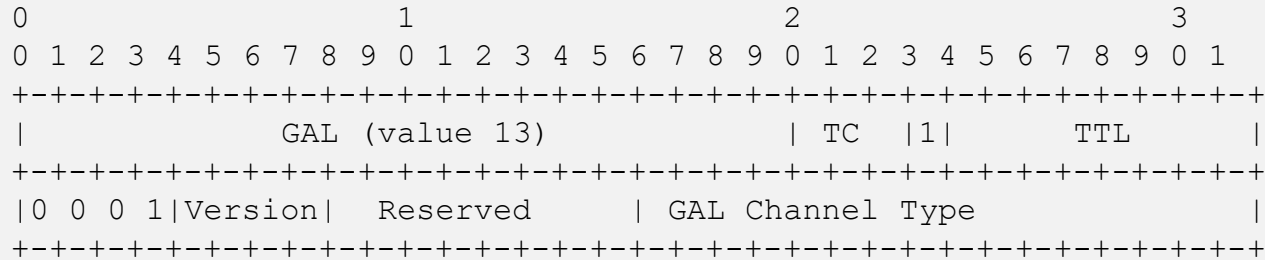


Figure: Probe Message Header for an SR-MPLS Link

- 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/Drafts:
 - OSPF [RFC7471]
 - ISIS [RFC7810] [RFC8570]
 - BGP-LS [RFC8571]

Probes 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
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     Label (1)                 | TC  |S|          TTL          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
.
.
.
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     Label (n)                 | TC  |S|          TTL          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     PSID                      | TC  |S|          TTL          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     GAL (value 13)           | TC  |1|          TTL          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|0 0 0 1|Version|  Reserved      | GAL Channel Type          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

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 when carried in a probe query message and if responder does not support, it MUST return Error 0x17: Unsupported Mandatory TLV Object**

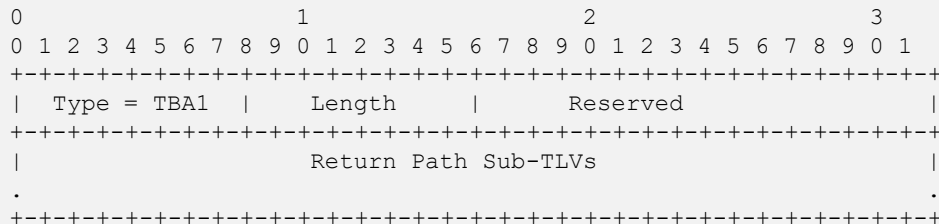


Figure: Return Path TLV

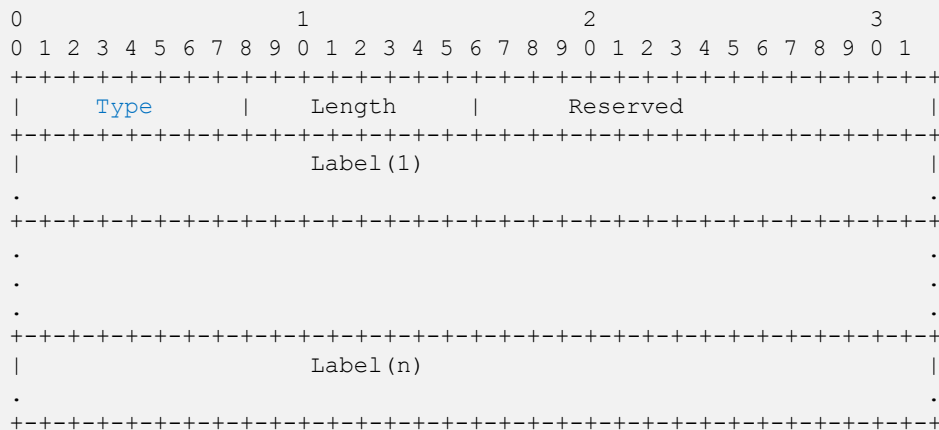


Figure: Segment List Sub-TLV in Return Path TLV

Destination Address TLV (Type 129) Handling

- To ensure that the probe query message is processed by the intended responder node, Destination Address TLV [RFC6374] can 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

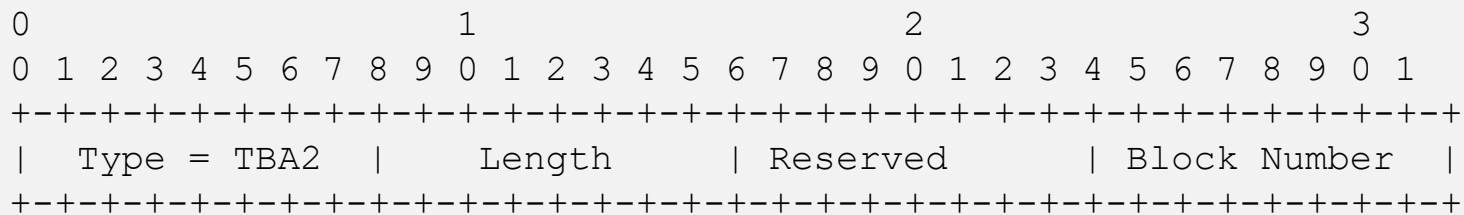


Figure: Block Number TLV

- 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
- **TLV is mandatory when carried in a probe query message and if responder does not support, it MUST return**
 - **Error 0x17: Unsupported Mandatory TLV Object**

Probe Query for P2MP SR-MPLS Policy

```

0                               1                               2                               3
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
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     Tree-SID                             | TC | S |          TTL          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     GAL (value 13)                       | TC | 1 |          TTL          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| 0 0 0 1 | Version |   Reserved   | GAL Channel Type                    |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

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

- One-way and loopback modes for delay and loss measurement for P2MP SR-MPLS Policy.
- 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

WG Co-ordination Plan

- IANA code-points to be allocated by MPLS WG
- Draft to progress in MPLS WG
- From Bruno:
 - Please keep SPRING in the loop for the SPRING specific content

Thank you