

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

*draft-gandhi-mpls-rfc6374-sr-03*

*Rakesh Gandhi - Cisco Systems ([rgandhi@cisco.com](mailto:rgandhi@cisco.com)) - Presenter*

*Clarence Filsfils - Cisco Systems ([cfilsfil@cisco.com](mailto:cfilsfil@cisco.com))*

*Daniel Voyer - Bell Canada ([daniel.voyer@bell.ca](mailto:daniel.voyer@bell.ca))*

*Stefano Salsano - Universita di Roma "Tor Vergata" ([stefano.salsano@uniroma2.it](mailto:stefano.salsano@uniroma2.it))*

*Mach Chen - Huawei ([mach.chen@huawei.com](mailto:mach.chen@huawei.com))*

# 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)
  - SR Links and end-to-end P2P/ P2MP SR Paths
- Delay and Loss extended TE link metrics advertisement in the network
- One-way, two-way and loopback measurement modes

## Scope:

- Segment Routing (SR) with MPLS data plane
- 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

# Updates Since IETF-106 (Version 00)

## Updates:

- ✓ Updated procedure for Two-way measurement mode
- ✓ Identify the Return Path TLV and Block Number TLV as mandatory TLVs
- ✓ Added Destination Address TLV handling
- ✓ Addressed various review comments
- ✓ Various editorial changes

## Open Items:

- None

# Measurement Modes for SR 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 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 SR Path
  2. Type (value 2): SR-MPLS Binding SID [draft-ietf-pce-binding-label-sid] of the Reverse SR Policy
- **TLV is mandatory when used and if responder does not support, it MUST return Error 0x17: Unsupported Mandatory TLV Object**

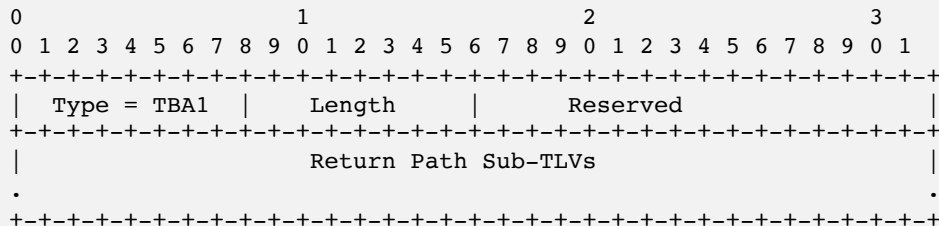


Figure: Return Path TLV

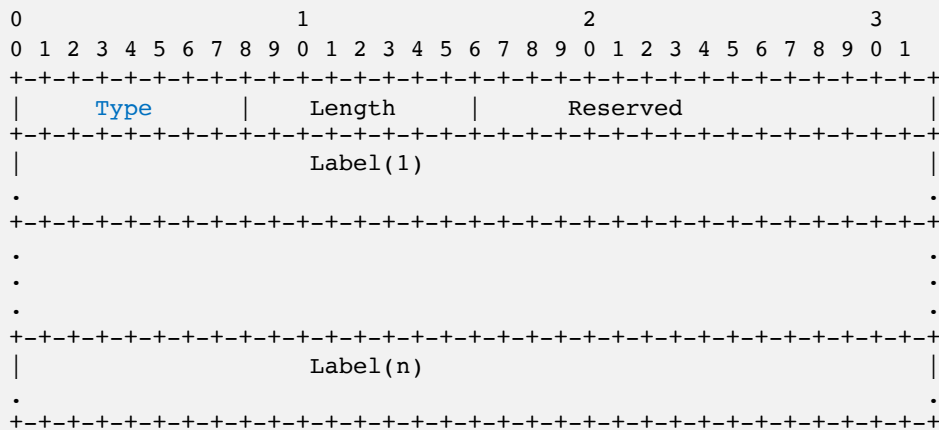


Figure: Segment List Sub-TLV in Return Path TLV

# Block Number TLV for Loss Measurement

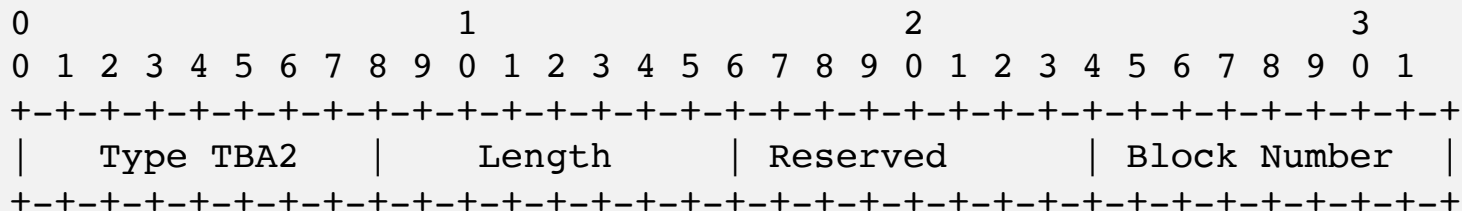


Figure: Block Number TLV

- 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 used and if responder does not support, it MUST return**
  - **Error 0x17: Unsupported Mandatory TLV Object**



# 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.

# Next Steps

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

# Thank you

# PM Probes for SR Links

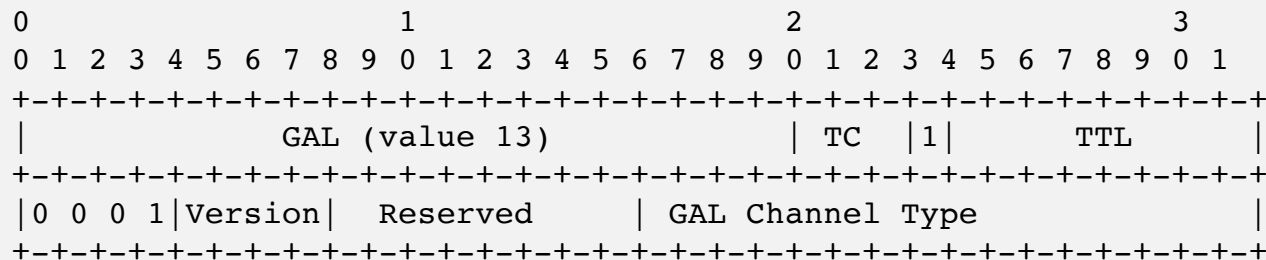


Figure: Probe Message Header for an SR-MPLS Link

- For SR 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 Link Extended TE Metrics Advertisement

- Measure delay and loss performance of SR Links.
- Compute SR Link Delay metrics (minimum-delay, maximum-delay, average-delay, delay-variance) and SR Link Packet Loss metric.
- SR 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]

# PM Probes for SR 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: Probe Message Header for an End-to-end SR-MPLS Policy

- For end-to-end measurement of SR Policy, the PM 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 Policy.

# PM Probes for P2MP SR Policy

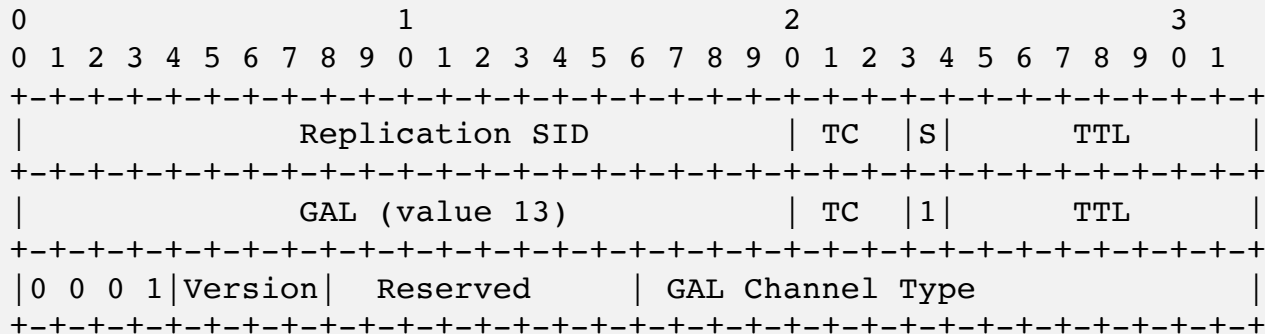


Figure: P2MP SR-MPLS Policy

- The Querier root node sends probe query messages using the Replication Segment for the P2MP SR 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 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