Performance Measurement in Segment Routing Networks with MPLS Data Plane

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Agenda

• Requirements and Scope
• In-band Probes for SR Links and P2P and P2MP SR Policies
• DM and LM Packets for SR Links and SR Policies
• Probe Responses
• Path Segment ID for PM
• SR Link Extended TE Metrics Advertisements
• Next Steps
Requirements and Scope

Requirements:
- Delay and Loss Performance Measurement (PM) for SR links and end-to-end P2P and P2MP SR Policies
- Delay and Loss extended TE link metrics advertisement in the network

Scope:
- Segment Routing (SR) with MPLS data plane
- **In-band PM probe messages**
- Use RFC 6374 (defined for MPLS-TP) based mechanisms
- Use RFC 7876 (UDP return path) for probe response messages
- Informational
PM Probes for SR Links

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

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|         |     |         |     |         |     |         |     |         |     |         |     |         |     |         |     |         |     |         |     |         |     |         |     |         |     |         |     |         |     |         |     |         |     |         |     |         |     |         |     |         |     |         |     |         |     |         |     |         |     |         |     |         |     |         |     |         |
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| 0 0 0 1 | | Version | | Reserved | | GAL Channel Type | |
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Figure 3: Probe Packet Header for an SR-MPLS Link
PM Probes for P2P and P2MP SR Policies

- For end-to-end measurement of P2P and P2MP SR Policies, the PM probe query messages for delay and loss measurements are sent **in-band** using MPLS GAL/GAch header as defined in [RFC6374] and SR-MPLS label stack.

Figure 2: Probe Packet Header for an SR-MPLS Policy
DM Probes for SR Links and SR Policies

DM probes use the message format defined in [RFC6374] as payload.

GAL : 13
G Ach : 0x000C

Figure 4: Delay Measurement Message Format
LM Probes for SR Links and SR Policies

LM probes use the message format defined in [RFC6374] as payload.

GAL : 13
GACH : 0x000A (Direct mode)
  0x000B (Inferred mode)

Figure 5: Loss Measurement Message Format
Probe Responses

• One-way Measurement Response (out-of-band)
  - Sent to the querier node using the information from the UDP Return Object (URO) TLV [RFC7876].
  - URO TLV is sent by the querier node in the probe query messages and contains the UDP destination port and IP address.

• Two-way Measurement Response (in-band)
  - Sent to the querier node using a message similar to the in-band probe query message as SR-MPLS packet.
Path Segment ID

• Path Segment IDs [draft-cheng-spring-mpls-path-segment] are useful for Performance Measurement:
  – Loss Measurement
  – Bidirectional SR Policy
SR Link Extended TE Metrics Advertisement

- PM procedure is used to 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] [draft-ietf-lsr-isis-rfc7810bis]
  - BGP-LS [draft-ietf-idr-te-pm-bgp]
Next Steps

• Welcome your comments and suggestions
• Multiple implementations already exist
• Request for WG adoption
Thank you.