

Performance Measurement Using RFC 6374 with UDP Path for Segment Routing Networks

draft-gandhi-spring-rfc6374-srpm-udp-04

Rakesh Gandhi - Cisco Systems (rgandhi@cisco.com) - Presenter

Clarence Filsfils - Cisco Systems (cfilsfil@cisco.com)

Daniel Voyer - Bell Canada (daniel.voyer@bell.ca)

Stefano Salsano - Universita di Roma "Tor Vergata" (stefano.salsano@uniroma2.it)

Mach Chen - Huawei (mach.chen@huawei.com)

Agenda

- Requirements and Scope
- History of the Draft
- Updates Since IETF-104
- Summary
- Next Steps

Requirements and Scope

Requirements:

- Delay and Loss Performance Measurement (PM)
 - ✓ Links and End-to-end P2P/ P2MP SR Paths
 - ✓ Applicable to SR-MPLS/SRv6 data planes
- No need to negotiate UDP port to bootstrap PM session - spirit of SR
 - ✓ Stateless on egress node - spirit of SR
- Handle ECMP for SR Paths

Scope:

- Use RFC 6374 defined probe message formats
- Use RFC 7876 (IP/UDP OOB return path) defined probe response messages
- **User defined** IP/UDP path for PM probe messages

History of the Draft

- Mar 2018
 - Draft was published *draft-gandhi-spring-udp-pm-00*
- July 2018
 - Presented *draft-gandhi-spring-udp-pm-01* at IETF 102 Montreal in SPRING WG
- Nov 2018
 - Presented *draft-gandhi-spring-udp-pm-02* at IETF 103 Bangkok in SPRING and IPPM WGs
- Feb 14, 2019
 - Draft was renamed to *draft-gandhi-spring-rfc6374-srpm-udp-00*
- Mar 2019
 - Presented *draft-gandhi-spring-rfc6374-srpm-udp-00* at IETF 104 Prague in SPRING WG

Updates Since IETF-104 (Revision-00)

Updates:

- ✓ Add loopback measurement mode
- ✓ Reference for probe message processing rules
 - ✓ TTL value, UDP Checksum and Router Alert
- ✓ Reference for example provisioning model
- ✓ Align with draft-gandhi-mpls-rfc6374-sr
 - ✓ Return Path TLVs for SR
- ✓ Various editorial changes to address review comments

Open Items:

- None

Next Steps

- Welcome your comments and suggestions
- Like to request for WG adoption

Thank you

Backup

Probe Query Messages

- IP/UDP path is defined for PM probe query messages for delay and loss measurements for SR links and end-to-end P2P and P2MP SR Paths.
- Payload contains [RFC6374] defined message for DM or LM.
- User-configured UDP port TBA1 is used for identifying DM probe packets.
- User-configured UDP port TBD2 is used for identifying LM probe packets.
- User-configured UDP port TBD3 is used for identifying Combined LM+DM probe packets.

```
+-----+
| IP Header                                     |
. Source IP Address = Querier IPv4 or IPv6 Address .
. Destination IP Address = Responder IPv4 or IPv6 Address .
. Protocol = UDP .
. .
+-----+
| UDP Header                                   |
. Source Port = As chosen by Querier .
. Destination Port = User-configured Port .
. .
+-----+
| Payload = Message as specified in RFC 6374 for DM and LM |
. .
+-----+
```

Probe Query for SR-MPLS and SRv6 Policy

For **end-to-end** performance delay/loss measurement of SR Policy, the probe query messages are sent on the SR Policy path with:

1. MPLS label stack for SR-MPLS Policy
2. SRv6 SRH [RFC 8754] with SID list for SRv6 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
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
|                                     | TC | S |           TTL          |
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
.
.
.
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
|                                     | TC | S |           TTL          |
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
| Message for DM or LM Query with IP/UDP Header                      |
.
+-----+

```

Figure: Example Probe Query Message 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
+-----+
| IP Header |
| . Source IP Address = Querier IPv6 Address |
| . Destination IP Address = Destination IPv6 Address |
| . |
+-----+
| SRH |
| . <SID List> |
| . |
+-----+
| IP Header |
| . Source IP Address = Querier IPv6 Address |
| . Destination IP Address = Responder IPv6 Address |
| . |
+-----+
| UDP Header |
| . Source Port = As chosen by Querier |
| . Destination Port = User-configured Port |
| . |
+-----+
| Message for DM or LM Query |
| . |
+-----+
```

Probe Response Messages

- Probe response messages can be sent in-band (two-way measurement) or out-of-band (one-way measurement) for SR links and SR Policies.
- Use the information from the UDP Return Object (URO) TLV [RFC7876] from the received Probe query message payload, otherwise use the IP/UDP information (Source IP Address and Source UDP port) from the received Probe query message header.

```
+-----+
| IP Header |
. Source IP Address = Responder IPv4 or IPv6 Address
. Destination IP Address = Source IP Address from Query
. Protocol = UDP
.
+-----+
| UDP Header |
. Source Port = As chosen by Responder
. Destination Port = Source Port from Query
.
+-----+
| Message as specified in Section 3.2 of RFC 6374 for DM, or
| Message as specified in Section 3.1 of RFC 6374 for LM, or
. Message as specified in Section 3.3 of RFC 6374 for LM/DM
.
+-----+
```

Figure: Probe Response Message

```
+-----+
| IP Header |
. Source IP Address = Responder IPv4 or IPv6 Address
. Destination IP Address = URO.Address
. Protocol = UDP
.
+-----+
| UDP Header |
. Source Port = As chosen by Responder
. Destination Port = URO.UDP-Destination-Port
.
+-----+
| Message as specified in Section 3.2 of RFC 6374 for DM, or
| Message as specified in Section 3.1 of RFC 6374 for LM, or
. Message as specified in Section 3.3 of RFC 6374 for LM/DM
.
+-----+
```

Figure: Probe Response Message Using URO from Probe Query

Return Path TLV for Two-way Measurement

Sub-TLV Types:

- Type (value TBA1): SRv6 Segment List of the Reverse SR Path
- Type (value TBA2): SRv6 Binding SID [draft-ietf-pce-binding-label-sid] of the Reverse SR Policy
- **TLV is mandatory when carried in a probe query and if responder does not support, it MUST return Error 0x17: Unsupported Mandatory TLV Object**

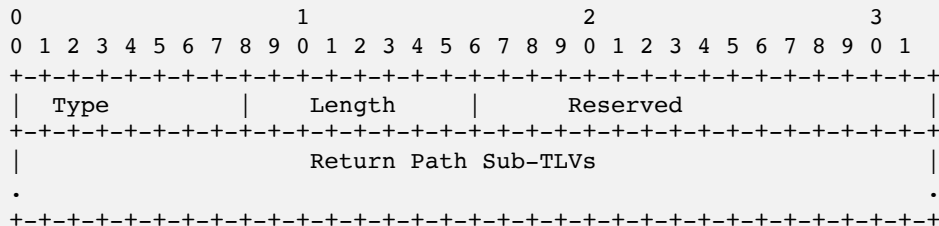


Figure: Return Path TLV

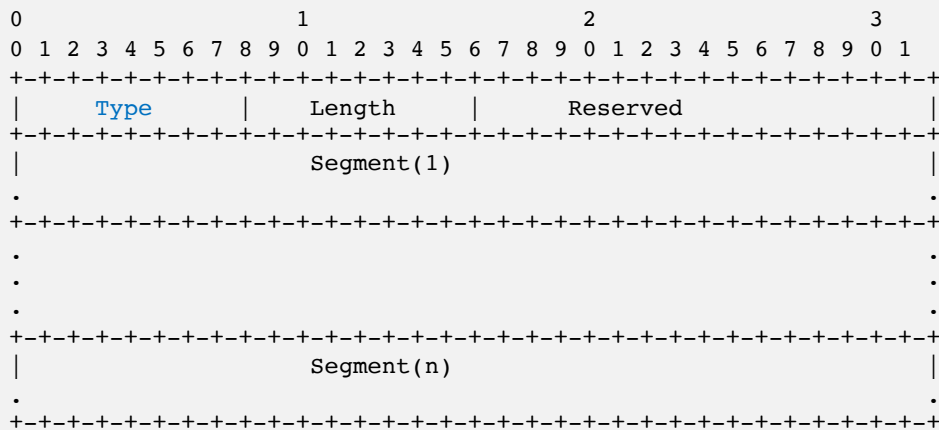


Figure: Segment List Sub-TLV in Return Path TLV

Authenticated Mode

- Define Sequence Number TLV for Probe Query and Response messages.
- Useful when some probe query messages are lost, or they arrive out of order.
- Used for authentication of probe messages.

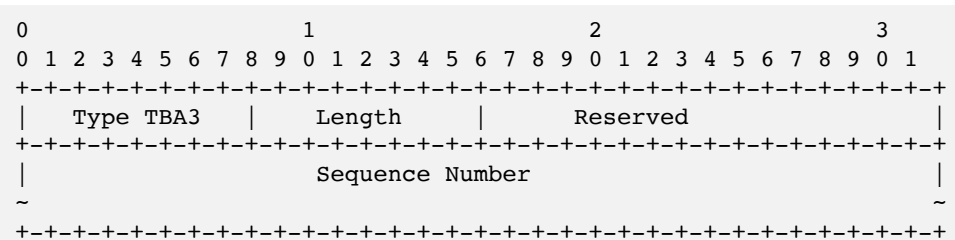


Figure: Sequence Number TLV - Unauthenticated Mode

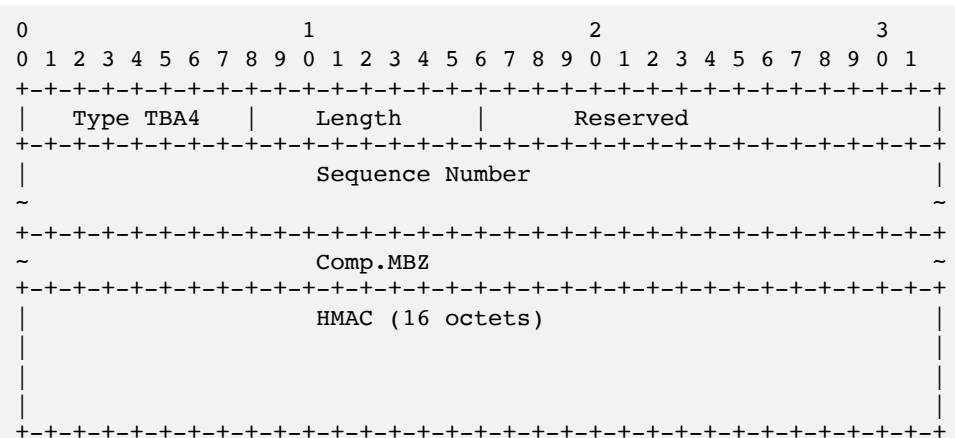


Figure: Sequence Number TLV - Authenticated Mode

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 PM probe messages. Examples are:
 - For IPv4
 - Sweeping destination address in IPv4 header (e.g. 127/8)
 - For IPv6
 - Sweeping flow label in IPv6 header

Thank you