Performance Measurement Using UDP Path for Segment Routing Networks

draft-gandhi-spring-rfc6374-srpm-udp-03

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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
- ✓ Elaborate on message processing rules (e.g. TTL value, UDP Checksum and Router Alert)
- ✓ Add example provisioning model
- ✓ Add details for P2MP SR Policy
- ✓ Move SR-MPLS Return Path TLV and Block Number TLV to SR-MPLS draft
    - ✓ They are not related to UDP path extensions
- ✓ 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 IANA-TBD2 is used for identifying LM probe packets.

```
+-------------------------------------------------------------------+
| IP Header                                                         |
.   Source IP Address = Sender IPv4 or IPv6 Address                 .
.   Destination IP Address = Responder IPv4 or IPv6 Address         .
.   Protocol = UDP                                                  .
.                                                                   .
+-------------------------------------------------------------------+
| UDP Header                                                        |
.   Source Port = As chosen by Sender                               .
.   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 Policies
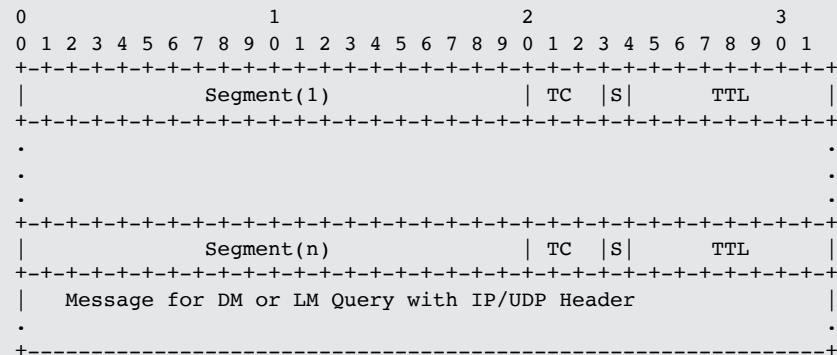2. SRv6 SRH [RFC 8754] with SID list for SRv6 Policies

```
 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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                 Segment(1)                 |  TC  |S|   TTL    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
.                                                               .
.                                                               .
.                                                               .
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                 Segment(n)                 |  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
 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 = Sender IPv6 Address                     .
.   Destination IP Address = Reflector IPv6 Address             .
.   Next Header = 43 (Routing Header)                           .
.                                                               .
+---------------------------------------------------------------+
| SRH                                                           |
.   <SID List>                                                  .
.   Next Header = 17 (UDP)                                      .
.                                                               .
+---------------------------------------------------------------+
| UDP Header                                                    |
.   Source Port = As chosen by Sender                           .
.   Destination Port = User-configured Port                     .
.                                                               .
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|    Message for DM or LM Query                                 |
.                                                               .
+---------------------------------------------------------------+

       Figure: Example Probe Query Message for SRv6 Policy
```
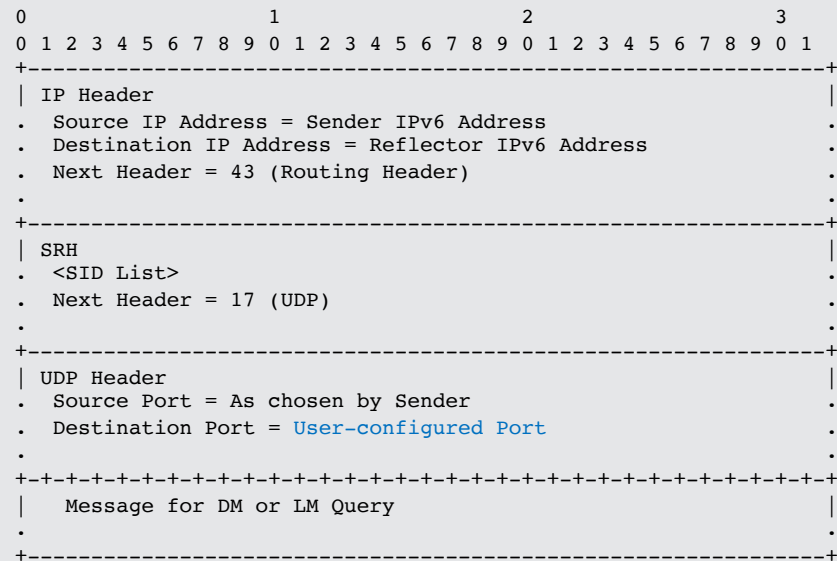
10

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    .
.                                                           .
+-----------------------------------------------------------+
```
```
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         .
.                                                                .
+----------------------------------------------------------------+
```
```
Figure: Probe Response Message Using URO from Probe Query
```

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.

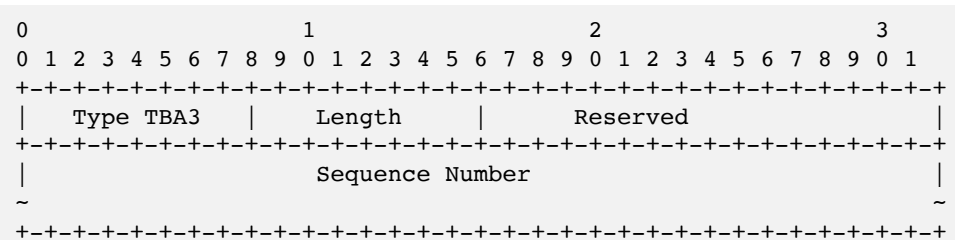- Used for authentication of probe messages.

```
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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   Type TBA3   |     Length    |            Reserved           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                       Sequence Number                         |
~                                                               ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

      Figure: Sequence Number TLV – Unauthenticated Mode
```

```
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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   Type TBA4   |     Length    |            Reserved           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                       Sequence Number                         |
~                                                               ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
~                          Comp.MBZ                             ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                      HMAC (16 octets)                         |
|                                                               |
|                                                               |
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

       Figure: Sequence Number TLV – Authenticated Mode
```
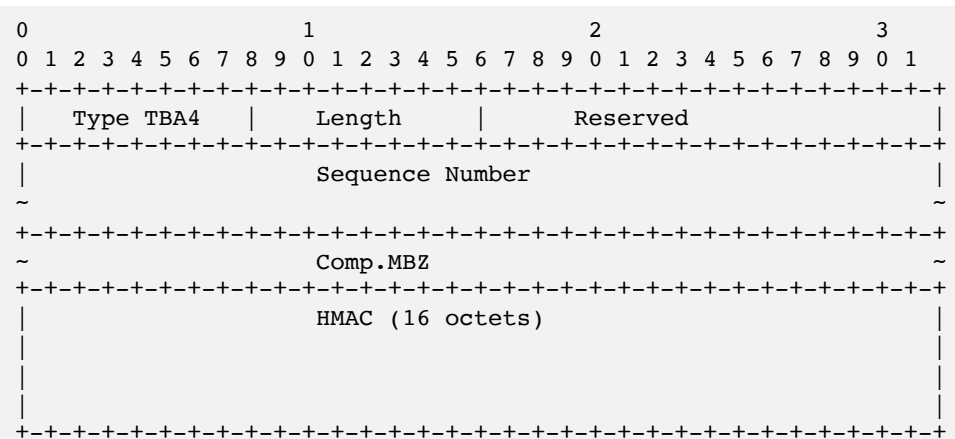
ECMP Support for SR Path

- SR Path can have ECMP between the ingress and transit nodes, between transit nodes and between transit and egress nodes.
- Sending PM 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
    - Destination addresses in IPv4 header (e.g. 127/8)
  - For IPv6
    - Flow label in IPv6 header

Thank you