UDP Path for In-band Performance Measurement for Segment Routing Networks

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102nd IETF @ Montreal
Agenda

• Requirements and Scope
• Probe Query Message
• Probe Response Message
• Return Path Segment List
• ECMP Support
• Next Steps
Requirements and Scope

Requirements:
- Delay and Loss Performance Measurement (PM) for SR links and end-to-end SR Policies
- Agnostic to data plane (SR-MPLS/SRv6/IP)
- No need to bootstrap PM session (e.g., to negotiate UDP port) - spirit of SR
- Stateless on egress node - spirit of SR
- One-way and two-way measurements
- Handle ECMP for SR Policies

Scope:
- Use RFC 6374 defined **probe message formats**
- Use RFC 7876 (IP/UDP return path) defined probe response messages
- Define IP/UDP path for PM probe query messages
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 SR Policies.
- For **end-to-end** performance measurement, the probe query messages are sent in-band with MPLS label stack for SR-MPLS Policies and SRv6 SRH with SID list for SRv6 Policies.
- Payload contains [RFC6374] defined message for DM or LM.
- UDP port IANA-TBA1 is used for identifying DM probe packets.
- UDP port IANA-TBD2 is used for identifying LM probe packets.

<table>
<thead>
<tr>
<th>IP Header</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source IP Address = Querier IPv4 or IPv6 Address</td>
</tr>
<tr>
<td>Destination IP Address = Responder IPv4 or IPv6 Address</td>
</tr>
<tr>
<td>Protocol = UDP</td>
</tr>
<tr>
<td>IP TTL = 1</td>
</tr>
<tr>
<td>Router Alert Option Not Set</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UDP Header</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source Port = As chosen by Querier</td>
</tr>
<tr>
<td>Destination Port = TBA1 by IANA for DM, TBA2 for LM</td>
</tr>
</tbody>
</table>

| Payload = Message as specified in RFC 6374 for DM and LM |
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.

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<tbody>
<tr>
<td>Source IP Address = Responder IPv4 or IPv6 Address</td>
</tr>
<tr>
<td>Destination IP Address = Source IP Address from Query</td>
</tr>
<tr>
<td>Protocol = UDP</td>
</tr>
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<td>Router Alert Option Not Set</td>
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<tbody>
<tr>
<td>Source Port = As chosen by Responder</td>
</tr>
<tr>
<td>Destination Port = Source Port from Query</td>
</tr>
</tbody>
</table>

| Message as specified in RFC 6374 Section 3.2 for DM, or |
| Message as specified in RFC 6374 Section 3.1 for LM |
Return Path Segment List

- For two-way end-to-end performance measurement of SR Policies, the responder node needs to send the probe response messages in-band on a specific reverse SR path.
- Querier node can request the responder node to send the probe response messages back on a given reverse path (e.g. co-routed path) by adding a Return Path Segment List (RPSL) TLV in the probe query messages.
- This does not require any SR Policy state on the egress node.

- TBA3: SR-MPLS RPSL
- TBA4: SRv6 RPSL
- TBA5: SR-MPLS BSID
- TBA6: SRv6 BSID

<table>
<thead>
<tr>
<th>RPSL Type</th>
<th>Length</th>
<th>Reserved</th>
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<tbody>
<tr>
<td></td>
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</table>

Segment List[0]

Segment List[n]
ECMP Support

- SR Policy 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:
  - For IPv4 and SR-MPLS
    - Different Destination Addresses in the range of 127/8 or different Source Addresses or different Source UDP ports in IP/UDP header.
  - For SR-MPLS
    - Entropy label.
  - For IPv6
    - 3-tuple of Flow Label, Source Address and Destination Address fields in the IPv6 header.
  - For SRv6
    - Flow Label in SRH.

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Next Steps

• Welcome your comments and suggestions
• Implementations of building blocks already exist (e.g. RFC6374, IP/UDP paths for probes)
• Request for WG adoption
Thank you.