SRv6 for Mobile User-Plane

draft-matsushima-spring-dmm-srv6-mobile-uplane

IETF99

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A Current Mobile Network Example

- Well fragmented to RAN, EPC and SGi.
- Per-session tunnel creation and handling.
- Non-optimum data-path.
What if SRv6 Becomes An Alternative of GTP-U Tunnel?

- Well fragmented to RAN, EPC and SGi.
- Per-session tunnel creation and handling.
- Non-optimal data-path.
- IPv6 integrates networks of the mobile and others.
- A SID represents data-plane role and function.

IPv6 integrates networks of the mobile and others.
SRv6 in A Nutshell

**SRH (Segment Routing Header)**

Segment Identifier (SID)
SRv6 in A Nutshell (Cont’d)

IPv6 Header
- SA=S::
- DA=D::
- NH=TCP
- Payload

SRH
- SA=S::
- DA=B::
- NH=SRH(43)
- SL=2
- SID[0]=D::
- SID[1]=C::
- SID[2]=B::
- Payload

SRH
- SA=S::
- DA=C::
- NH=SRH(43)
- SL=1
- SID[0]=D::
- SID[1]=C::
- SID[2]=B::
- Payload

IPv6 Header
- SA=S::
- DA=D::
- NH=TCP
- Payload
## SRv6 in A Nutshell (Cont’d)

<table>
<thead>
<tr>
<th>SRv6 Function* Name</th>
<th>Forwarding</th>
</tr>
</thead>
<tbody>
<tr>
<td>END</td>
<td>Lookup SRH</td>
</tr>
<tr>
<td>END.X</td>
<td>L3 cross-connect to next-hop</td>
</tr>
<tr>
<td>END.T</td>
<td>L3 lookup IPv6 table</td>
</tr>
<tr>
<td>END.DT6</td>
<td>Decap outer IPv6 hdr and lookup IPv6 table</td>
</tr>
<tr>
<td>END.DT4</td>
<td>Decap outer IPv6 hdr and lookup IPv4 table</td>
</tr>
<tr>
<td>END.DX6</td>
<td>Decap outer IPv6 hdr and IPv6 cross-connect</td>
</tr>
<tr>
<td>END.DX4</td>
<td>Decap outer IPv6 hdr and IPv4 cross-connect</td>
</tr>
<tr>
<td>END.B6</td>
<td>Bound to an SRv6 policy(SID list)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SRv6 Function* Name</th>
<th>Forwarding</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>Pure IPv6 transit</td>
</tr>
<tr>
<td>T.Insert</td>
<td>Insert an SRv6 policy (SID list)</td>
</tr>
<tr>
<td>T.Encaps</td>
<td>Encap SRv6 policy (SID list) by outer IPv6 hdr</td>
</tr>
</tbody>
</table>

* SRv6 Network Programming
## SID Functions* for Mobile Data-Plane Roles

<table>
<thead>
<tr>
<th></th>
<th>Uplink</th>
<th>Downlink</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Access Node</strong></td>
<td>T.Insert, or T.Encaps</td>
<td>END.X/END.DX{6</td>
</tr>
<tr>
<td><strong>L2 Anchor Node</strong></td>
<td>END, or END.B6</td>
<td>END, or END.B6</td>
</tr>
<tr>
<td><strong>L3 Anchor Node</strong></td>
<td>END.T/END.DT{6</td>
<td>4}</td>
</tr>
</tbody>
</table>

* SRv6 Network Programming

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**SID Functions**

Internet, Service network

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**Uplink**

Access Node (eNode-B)  
L2 Anchor Node (Serving Gateway)  
L3 Anchor Node (Packet Data Network Gateway)

**Downlink**

SRv6 SIDs

SRv6 Network
Stateless Interworking Segment

User pkt | Tun-ID | DA | SA
---|---|---|---

IPv4 header | Tunnel header

IPv6 header | SRH header

Locator | DA(v4) | SA(v4) | Tun-ID
---|---|---|---
128-a-b-c | a | b | c

Existing IPv4 Network

SRv6 Enabled IPv6 Network
E2E Mobile Orchestration with SRv6

- Data-plane nodes are NOT dedicated to specific roles. -> SID represents each data-plane role.
- Orchestrator puts SIDs to the nodes with its functions - It requires some data models to instantiate the data-plane.
Data Model for Mobile Orchestration with SRv6

Abstracted Tenants/Slices NW on Orchestrators

ietf-dmm-fpc.yang
SRv6 for Network Slicing

- A set of SIDs represents Network Slice.  
  -> Sharing same prefix among SIDs in a slice would work.
- Then user packets could also indicate Slices by SID.  
  -> Applications in a MN could be able to use SID to do that.
Summary

• SRv6 is expected to make mobile network to be:
  • Simple to operate in E2E basis.
  • Flexible where to deploy various functions.

• SID Functions for mobile data-plane can be considered:
  • Access-node, L2 Anchor-node and L3 Anchor-node.

• To orchestrate mobile user-plane network, SRv6 needs to be integrated into:
  • Data model for mobile data-plane.
  • 5G related standards.

• Network Slicing could take advantage of SRv6.
Nest Step

• Studies for supporting more user-plane functions with SRv6.
  • QoS
  • Accounting
  • etc.,

• Update the I-D with:
  • Outcomes from the studies
  • Figure out the sets of SRv6 functions for mobile user-plane which could be standardized.

• Collaborations.
  • DMM WG items
  • Other WG in the IETF (Spring, if any)
  • Both operators and vendors those who are interested in SRv6 are welcome.
References

• IPv6 Segment Routing Header (SRH)
  • draft-ietf-6man-segment-routing-header

• SRv6 Network Programming
  • draft-filsfils-spring-srv6-network-programming

• ietf-dmm-fpc.yang
  • A SDO neutral mobile data-plane model as a part of the FPC work in IETF DMM working group.
  • draft-ietf-dmm-fpc-cpdp