Associated Channel over IPv6

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Motivation

IPv6 provides **connectivity** in many use cases, including Cloud-Network convergence, DCI, DCN, mobile backhaul, metro/core networks etc.

- IP services requires **high quality of SLA guarantee**
- SR over IPv6 provides optimized route for service via routing programming
- Concept of ACH is proposed, identify the service’s path, and provide *control and management capabilities*, e.g. OAM, protection switchover, etc., to fulfill the SLA requirement
ACH Architecture

- A control channel
- An associated channel to an IP forwarding path
- Carries messages of control and management protocols
- To provide control and management functions
ACH TLV

<table>
<thead>
<tr>
<th>Type (ACH)</th>
<th>Length</th>
<th>Channel-Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associated Channel ID</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed Message (per application)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>zero or more TLVs (optional)</td>
<td></td>
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</tbody>
</table>

• A TLV format
• Type: specify the control channel for one specific IP path
• Length: length of value field
• Channel-Type: one specific type of control/management protocol
• Associated Channel ID:
  • path ID of the associated channel
  • map with the path ID of data forwarding path, with which the associated channel is associated
• Carried Message: messages of the specific control/management protocol
• ACH TLV can be encapsulated in IPv6 extension headers (DoH/HbH/SRH) or payload
• Two types of applications: E2E and HbH
Applicability

case 1: unified OAM

Ping | BFD | TWAMP
---|---|---
L2 | IP | ICMP | L2 | IP | UDP | BFD | L2 | IP | UDP | TWAMP

Problem:
- Different protocols fulfill different OAM functions
- Repeated functions, e.g. CV
- Independent session identifiers, e.g. discriminator, 5 tuple
- Deep encapsulation, not friendly to control plane
- Intermediate node is not sensed in E2E session

Solution:
- ACH carries different OAM messages in a uniform way
- Reduce the number of OAM protocols and sessions
- Unified session identifier

IPv6 header
IPv6 E2E
ACH TLV: DM
ACH ID = 1
 Timestamps

① R1 generates E2E performance management probe

IPv6 header
IPv6 E2E
ACH TLV: DM
ACH ID = 1
 Timestamps

② R4 receives ACH to measure the packet delay
Applicability

case 2: signal degrade trigger protection

① R1 generates HbH fault management probe

IPv6 header
IPv6 HbH
ACH TLV: FM
ACH ID = 1
Error indication flag: 0
IPv6 HbH

② R3 sets flag to positive to indicate link signal degrade

IPv6 header
IPv6 HbH
ACH TLV: FM
ACH ID = 1
Error indication flag: 1
IPv6 HbH

③ R4 receives signal degrade indication, generates E2E protection switch request to R1

IPv6 header
IPv6 E2E
ACH TLV: Protection
ACH ID = 2
Protection switch request (ACH ID=1, switch to backup)
IPv6 E2E

④ R1 receives protection switch request, and trigger switchover

IPv6 header
IPv6 E2E
ACH TLV: Protection
ACH ID = 2
Protection switch request (ACH ID=1, switch to backup)
IPv6 E2E
Next Step

1. Refine ACH over IPv6
2. Specifically define ACH over SRv6
3. Specify the applications in different drafts
   • OAM over ACH
   • Linear protection over ACH
   • Others

As always, comments and suggestions are greatly welcome!
Seek for collaborations!