Extension header attribution option

draft-herbert-6man-eh-attrib-01

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Motivation

• Annotate packets as they transit limited domain for reasons like QoS, IOAM, source routing
• Basic operation
  – Ingress: insert EH or options into a packet
  – Egress: remove inserted extension or options
• Examples
  – Hop-by-hop options (IOAM, network tokens)
  – Routing headers (SR)
  – Destination options before routing header
Problems with EH insertion

- A lot of discussion in 6man!
- Breaks fundamental attribution model of IP
- No way to know which headers were inserted
- Break PMTU discovery
- Break ICMP (host get ICMP errors for problems it didn’t create)
- No feedback to culprit when a node insert headers than cause packet drops downstream
- Breaks AH if applied to inserted headers
Why not IPIP encapsulation?

• Appropriate destination address may be unknown to encapsulating device
• Consistent routing (ECMP) may be required for annotated and unannotated packets
• Less overhead than encapsulation (worse case is 40 bytes overhead of IPv6 header)
EH attribution option

- Destination or Hop-by-Hop option
- Unambiguously identifies extension headers and options that are inserted in a packet
- Attribute inserted data to responsible node

```
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
+---------------------------+---------------------------+---------------------------+
| E | Num_opts |                                               |
|   |          |                                               |
+---------------------------+                                               |
|                            Identification                              |
|                            |                                               |
+---------------------------+---------------------------+---------------------------+
```
Insertion operation

• Inserting options
  – No DO or HBH EH: insert EH, options are attrib option followed by inserted options
  – Else, make options to be attrib options, inserted options, existing options

• Inserting extension headers (not DO or HBH)
  – Immediately preceded by DestOpt EH
  – DO options are attrib option(EH inserted bit), inserted options, existing options
Removal operation

• Pop extension headers and options in reverse order of insertion
• Modify AH implementations to logically remove inserted data before computation
Stacking

+++++++
| IPv6 header |
+++++++
| Hop-by-Hop EH |
+++++++
| Attribution Opt |
+++++++
| Inserted options |
+++++++
| DestOpt EH |
+++++++
| Attribution Opt |----------- #2 attribution option
+++++++
| Inserted options |
+++++++
| Attribution Opt |----- #1 attribution option
+++++++
| Original options |
+++++++
| Inserted EH |<---------------------
+++++++
| Inserted EH |<---------
+++++++
| Original EHs |
Next Steps

• Additional comments/feedback
• Request WG adoption