Problem Statement with Aggregate Header Limit

draft-liu-spring-aggregate-header-limit-problem

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Background

**Aggregate Header Limit (AHL)**
- [RFC8883] the total header size that a router is able to process due to it’s processing limit
- related with the device’s buffer size ( for devices designed with parsing buffer )
- packet may be dropped or sent to slow path if the limit is exceeded

**Total packet header chain size is increasing greatly in IPv6/SRv6**
- IOAM: IOAM data fields in HBH/DOH
- Alternate-Marking: AltMark Option in HBH/DOH
- network slicing: NRP Option in HBH
- SR service programming: Metadata in SRH TLV
- BSID: a new SID list to the original packet
- other potential extension requirements, e.g, detnet

SID List
SRH TLV
HBH TLV
DOH TLV
SR Nodes

SR source nodes
- encapsulate the packet with SRH and other possible extension headers
- normally don’t process the EHs

Transit Nodes
- forward packets destined to a remote segment
- don’t process SRH and DoH, MAY process HbH

Intermediate SR nodes
- process a local segment in the DA
- process SRH(and possible SRH TLV), DoH ahead of SRH; MAY process HbH

IPv6 header
HbH
DoH
SRH
{segment list[0]...segment[n];
SRH TLV}

For an intermediate which is expected to process the SRH TLV, it should read all of these into its buffer.
Potential Problems

- **Combination** of different functions would make total header size even bigger.

- The operator's network usually consists of different versions of devices from multiple vendors, which often have different processing limits and different behaviors after limit exceeding, difficult to manage.

- **Path calculation** without the awareness of AHLs of the nodes and the prediction on which features would be enabled, may result in a path with nodes with lower AHLs than required.

- **Packet encapsulation** triggered by function enablement, on the headend/intermediate node, packets may be encapsulated with larger header size than the downstream nodes able to process.

  Aggregate Header Limits of the nodes/path need to be aware.
Usecases with AHL

Centralized Controller

- **Input**
  - an SR path is required from S to D
  - the AHLs of the nodes in the network
  - per-hop IOAM and network slicing (using NRP-ID in HBH) would be enabled on this path

- **Output**
  - an segment list between S to D, leaving out the space for HBH header with options for IOAM and NRP-ID

Headend/intermediate nodes

- **Input**
  - function enablement on certain SR path requires increasing the size of packet header that needs to be processed
  - the AHLs of the downstream endpoint nodes are not sufficient

- **Output**
  - not to enable the function on the path and log an error
How to obtain AHL

Existing mechanism

➢ [RFC8883]: an ICMPv6 Destination Unreachable error with code for "Headers too long", when a node discards a packet due to aggregate header limit exceeding

➢ May not work well when
  - there’re a large amount of paths: the burden of sending and receiving ICMP messages increases
  - the paths are dynamic: the segment lists may change over time, more difficult to get the AHL in advance

Possible options

➢ IGP signaling
  - AHLs of all the nodes in the domain can be obtained easily, regardless of the amount or type of the paths

➢ For the controller
  - via BGP-LS or other south-north mechanisms
Welcome feedback and comments!
Thank You !