



I E T F[®]

IPv6 Hop-by-Hop Options Processing Procedures

<draft-ietf-6man-hbh-processing-04>

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Overview



- Changes from -01 to -04 drafts
- Open Issues
- Data about HBH on Internet Paths
- Next Steps

Changes -01 to -04 draft



Editorial:

- More on the separation between hardware and software processing described in [RFC6398], does not apply to all router architectures.
- Cited 2015 survey [RFC7872] and [I-D.ietf-v6ops-hbh]
- Security considerations updated following list comments.
- Various other improvements by editors and others.



Changes -01 to -04 draft

Normative:

- Rev 04 now cites and updates section 2.2 of [RFC7045]
- SHOULD: ... Hop-by-Hop options SHOULD keep the time to process low.
- SHOULD: ... New options SHOULD be defined with the Action type set to 00
- SHOULD: ... New Hop-by-Hop options SHOULD be designed to be the first option in a Hop-by-Hop options header.
- SHOULD NOT: ... The size of an option SHOULD NOT extend beyond what can be reasonably expected to be executed at full forwarding rate
- Changed in Section 5.2 for router to skip over options if it can't process at full forwarding rate.
- MUST: ... the router MUST the router MUST be configured ... to use ... the Router Alert option

Issue Tracker



Captured Issues raised in Adoption Call

<https://github.com/ietf-6man/hbh-processing/issues>

Currently 2 open issues

- #2 High end routers might not support HBH options
- #5 Use of fast path / slow path

We think both are addressed in rev 04.

Relationship with <draft-ietf-6man-eh-limits-01>



- Differences
 - EH Limits gives more guidance on *how to handle more options than a node can process*
 - Both drafts recommend making “00” bits in Option type *the default*
 - Both drafts say that *variable length options are difficult to process; EH Limits draft is more specific*
 - Differences on terminology (Fast/Slow Path, Full Forwarding rates).
 - Suggest adding text about out-of-order processing.

Recommendations



- HBH Processing draft should define *the HBH processing*
 - EH Limits draft should reference it (and cite text)
- Some items should be brought into HBH Processing draft
 - Discuss out of order packets
- EH Limits drafts should continue to define *total EH limits*

Other Proposed Changes



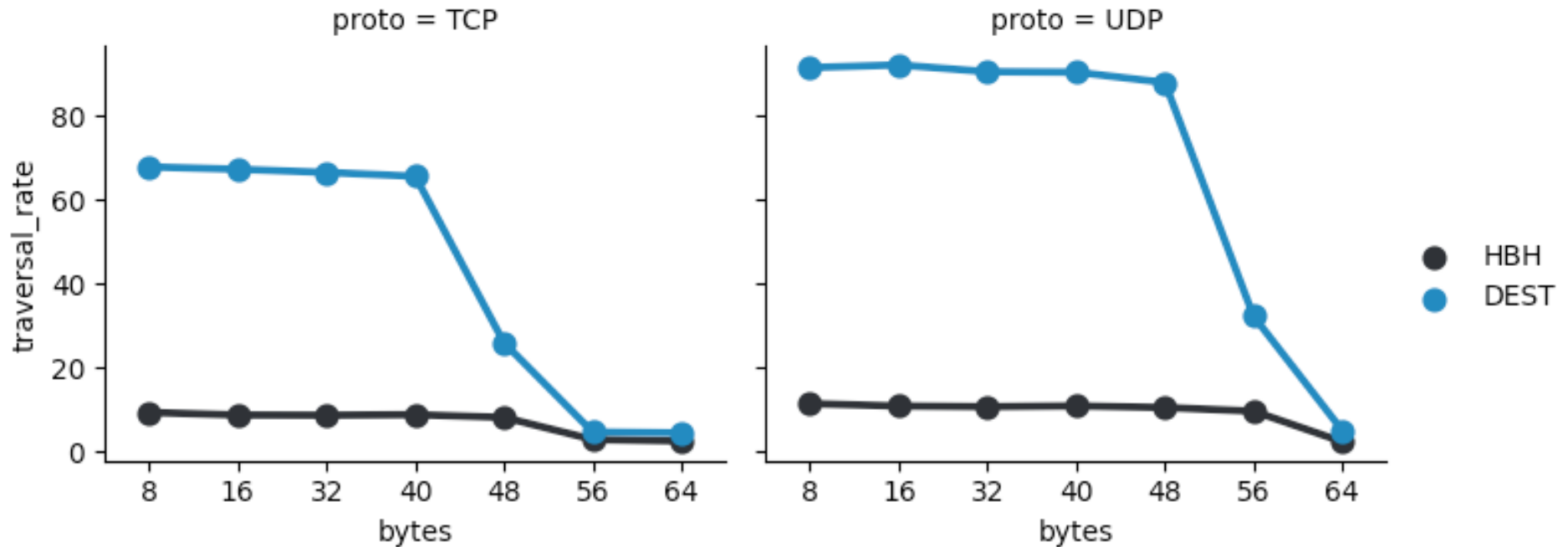
- HBH Processing draft focus on processing HBH Options
 - Normative text on Router node processing
 - Based on recent discussion, this needs some expansion, specifically:
 - Nodes **SHOULD** process the HBH Option header, if they do not, nodes **MUST** forward packet normally
 - When processing the HBH Option header, nodes **MUST** process the first HBH Option, nodes **MAY** process more

Now for some data...



- What can we learn about current Internet paths?
- *Data from an IEPG talk at IETF-115 by Ana Custura*

Traversal for TCP vs UDP



- Packets carrying TCP have the biggest drop in traversal at 48B:
 - $48 + 20 = 68\text{B}$ (108B total)
- UDP has the biggest drop at 56B: $56 + 8 = 64\text{B}$ (104B total)
- A 40 B EH more often traverses (max IPv4 options was 40 B)

Per-AS Traversal (UK path)



DEST OPT EH

The **local AS** is responsible for most of the drops:

- 5% for UDP
- 25% for TCP

	1st AS	AS1>AS2	∞
Dest UDP 8B	95.3%	93%	91.5%
Dest TCP 8B	74.7%	70%	68.5%

HBH EH

The **local AS** is responsible for most of the drops:

- 68% for UDP
- 74% for TCP

	1st AS	AS1>AS2	2nd AS	AS2>AS3	∞
HBH UDP 8B	31.4%	20.1%	15%	12.2%	11.4%
HBH TCP 8B	26.9%	16.3%	13.9%	9.7%	8.6%

Drops are considered to be within the AS if the next hop on a control measurement is also in that AS. If the next hop would otherwise be in a different AS, then the drop is attributed to the AS boundary.

We learned



- Some paths do support HBH Options.
- However, many currently drop packets with a HBH EH
- Limiting the size of the EH improved traversal.
- draft-ietf-6man-hbh-processing would seem to help.

- See IEPG talk at IETF-115 for more details

Next Steps



- Align this draft with EH Limit draft
- WGLC or Receive more comments/issues ?



QUESTIONS / COMMENTS?

<https://github.com/ietf-6man/hbh-processing/issues>