

Transmission of SCHC-compressed packets over IEEE 802.15.4 networks

`draft-ietf-6lo-schc-15dot4-06`

Carles Gomez

Universitat Politècnica de Catalunya (UPC)

carles.gomez@upc.edu

Ana Minaburo

Consultant

anaminaburo@gmail.com

Main goal

```
+-----+
| CoAP, other |
+-----+
| UDP, other  |
+-----+
|   IPv6     |
+-----+
| 6LoWPAN HC |
+-----+
|6LoWPAN Frag|
+-----+
|  802.15.4  |
+-----+
```

Traditional

```
+-----+
| CoAP, other |
+-----+
| UDP, other  |
+-----+
|   IPv6     |
+-----+
|  SCHC HC   |
+-----+
|6LoWPAN Frag|
+-----+
|  802.15.4  |
+-----+
```

<-- NEW

SCHC-based

SCHC (RFC 8724) exploits a priori knowledge of header field values

Status

- WG adoption
 - draft-ietf-6lo-schc-15dot4-00
 - Same content as draft-gomez-6lo-schc-15dot4-05
 - In January 2023
- Version -06
 - Main updates: aligning with draft-ietf-schc-architecture-02
 - Presented/Discussed in two SCHC WG interims
 - Miscellaneous minor updates throughout the document

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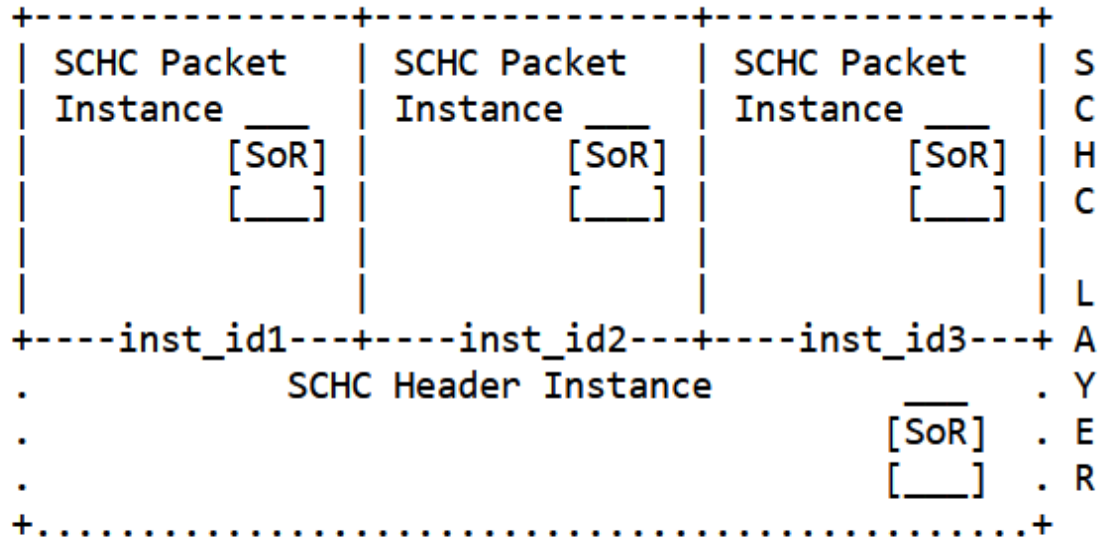
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Background

- draft-ietf-schc-architecture-02:
 - SCHC Header: indicates SCHC Packet Instance to be used to decompress the SCHC Packet

- Discriminator:
 - Indicates the SCHC Header Instance to decompress a SCHC Header

From draft-ietf-schc-architecture-02:



- SCHC Stratum:
 - “Layer” at which SCHC operates

^
 / /
 +-- Discriminator: (SCHC HEADER)(SCHC PACKET)

3.2. SCHC architecture concepts (I/III)

- SCHC Stratum
 - When SCHC is used to compress IPv6 packets over IEEE 802.15.4 networks, the SCHC Stratum is located on top of layer 2 and below layer 3
 - The compressed data of the SCHC Stratum may also comprise upper layer packet headers.
 - For example, SCHC may be used to compress IP headers, IP/UDP headers or IP/UDP/CoAP headers (all at once)
- Discriminator
 - 6LoWPAN Dispatch Type set to:
 - SCHC Dispatch
 - SCHC Pointer Dispatch

3.2. SCHC architecture concepts (II/III)

- Single-instance networks
 - All network nodes have:
 - A single SCHC Packet Instance for C/D
 - A single SoR for SCHC Packet C/D
 - SCHC Header is fully compressed
 - 0 bits sent over the air
 - All network nodes have:
 - A single SCHC Header Instance
 - A single SoR for SCHC Header C/D
 - » Comprises a single, implicit Rule for SCHC Header C/D

3.2. SCHC architecture concepts (III/III)

- Multiple-instance networks
 - Some network nodes have:
 - More than one SCHC Packet Instance for C/D
 - One SoR for each SCHC Packet Instance
 - SCHC Header cannot (generally) be fully compressed
 - More than 0 bits sent over the air
 - All network nodes have:
 - A single SCHC Header Instance
 - A single SoR for SCHC Header C/D
 - » May comprise several Rules for SCHC Header C/D

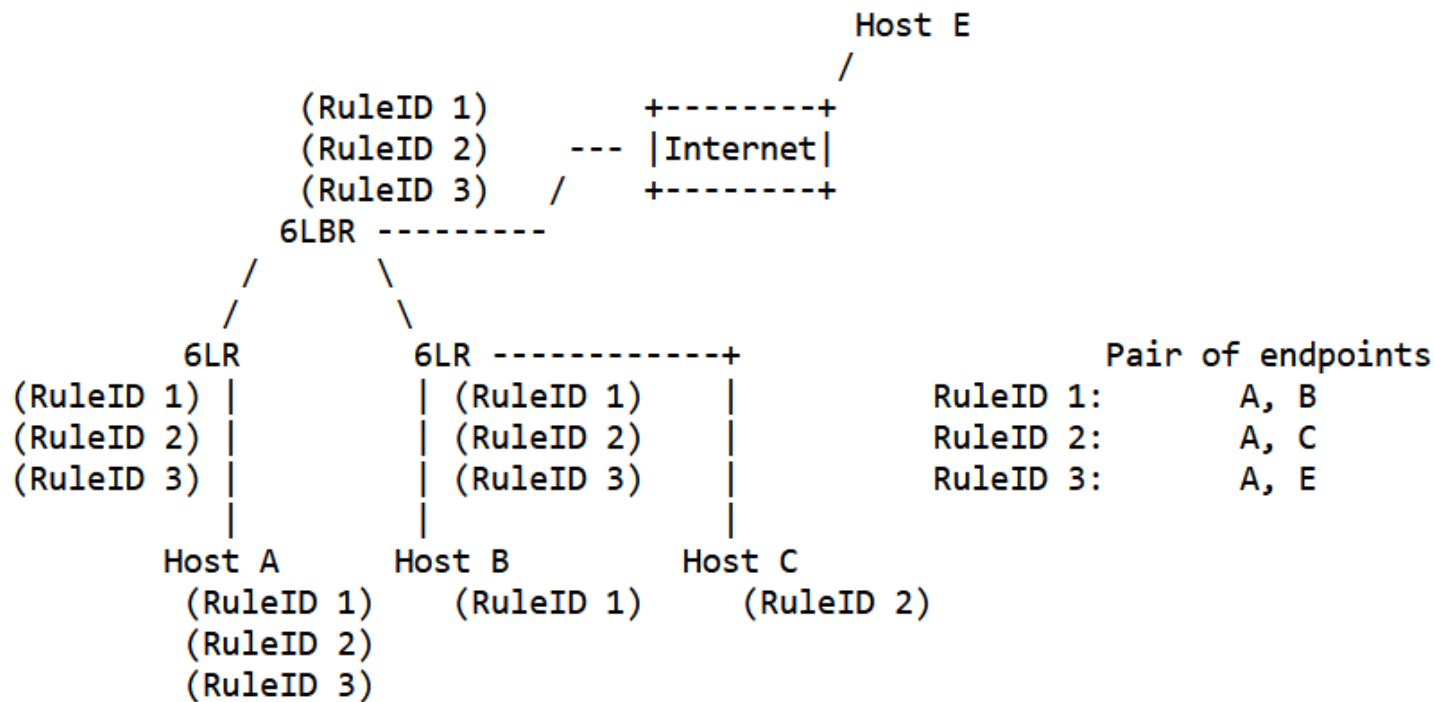
3.5. Multihop communication (I/VIII)

- SRO:

SCHC Header compressed to 0 bits

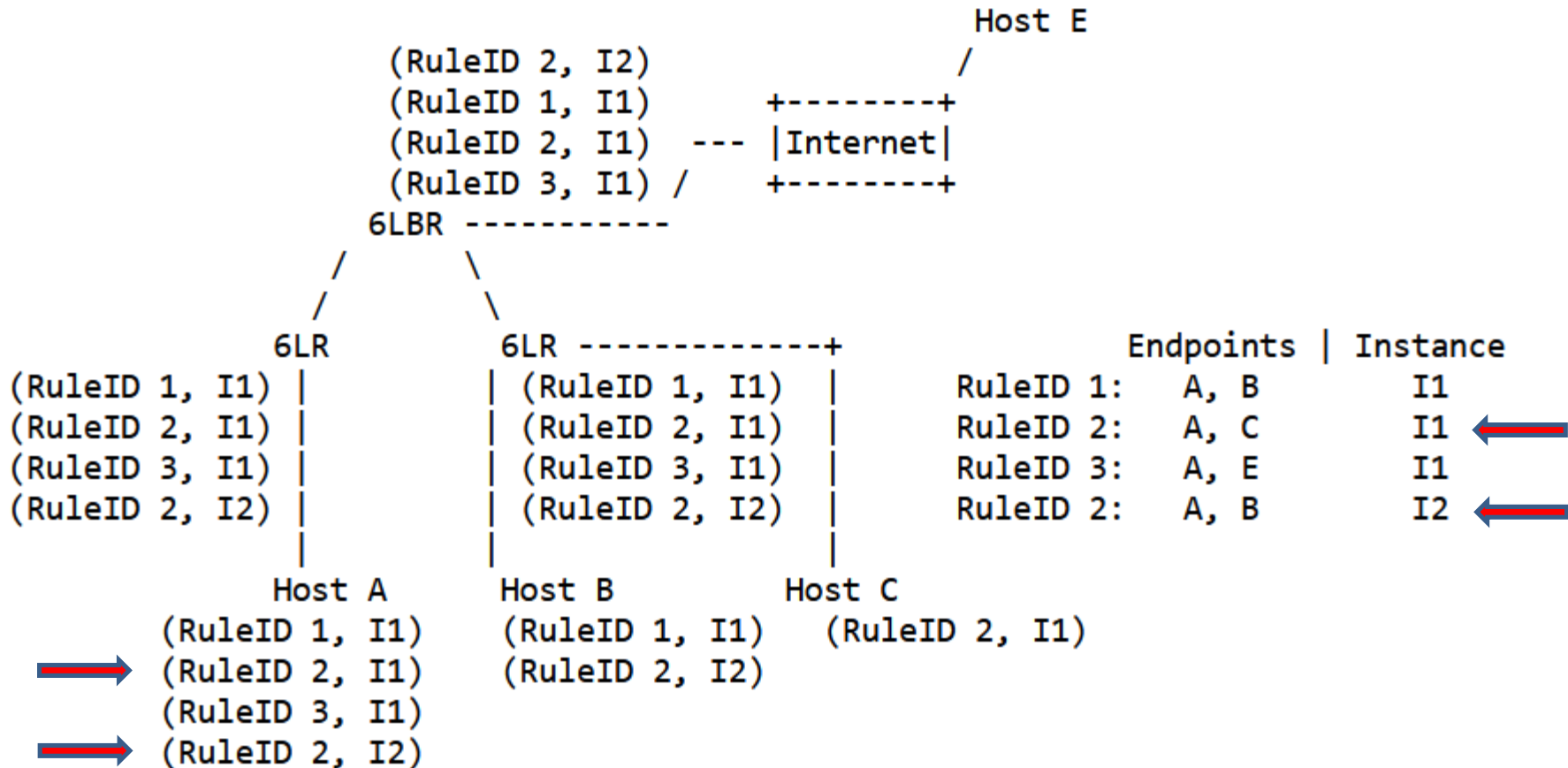
- Single-instance networks:

- A Rule and its RuleID MUST be unique network-wide
- The means to ensure so are out of scope
- To simplify the management of RuleIDs, in SRO, all nodes in the network MAY share the same SoR



3.5. Multihop communication (II/VIII)

- SRO:
 - Multiple-instance networks:
 - A not fully compressed SCHC Header MUST be used



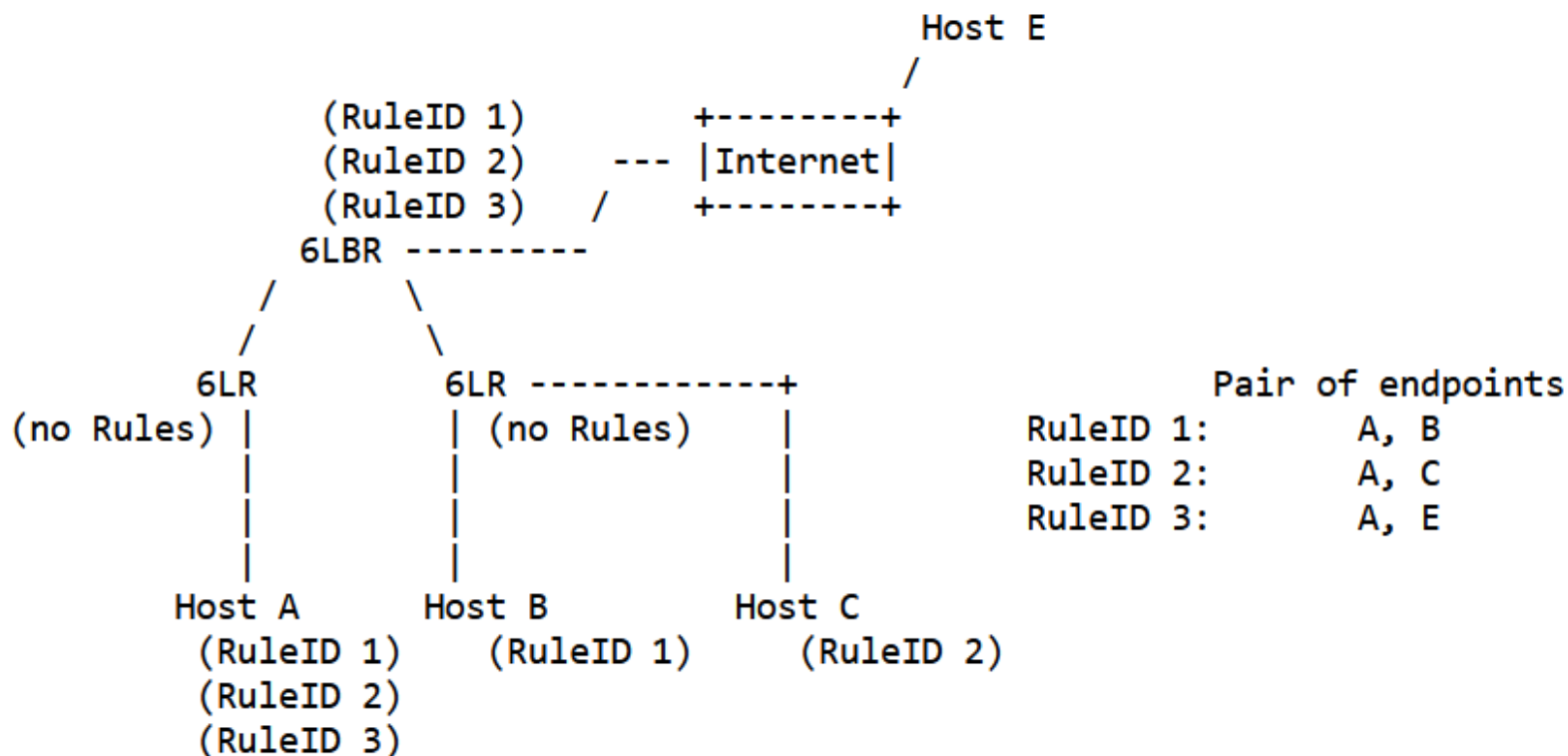
3.5. Multihop communication (III/VIII)

- TRO:

SCHC Header compressed to 0 bits

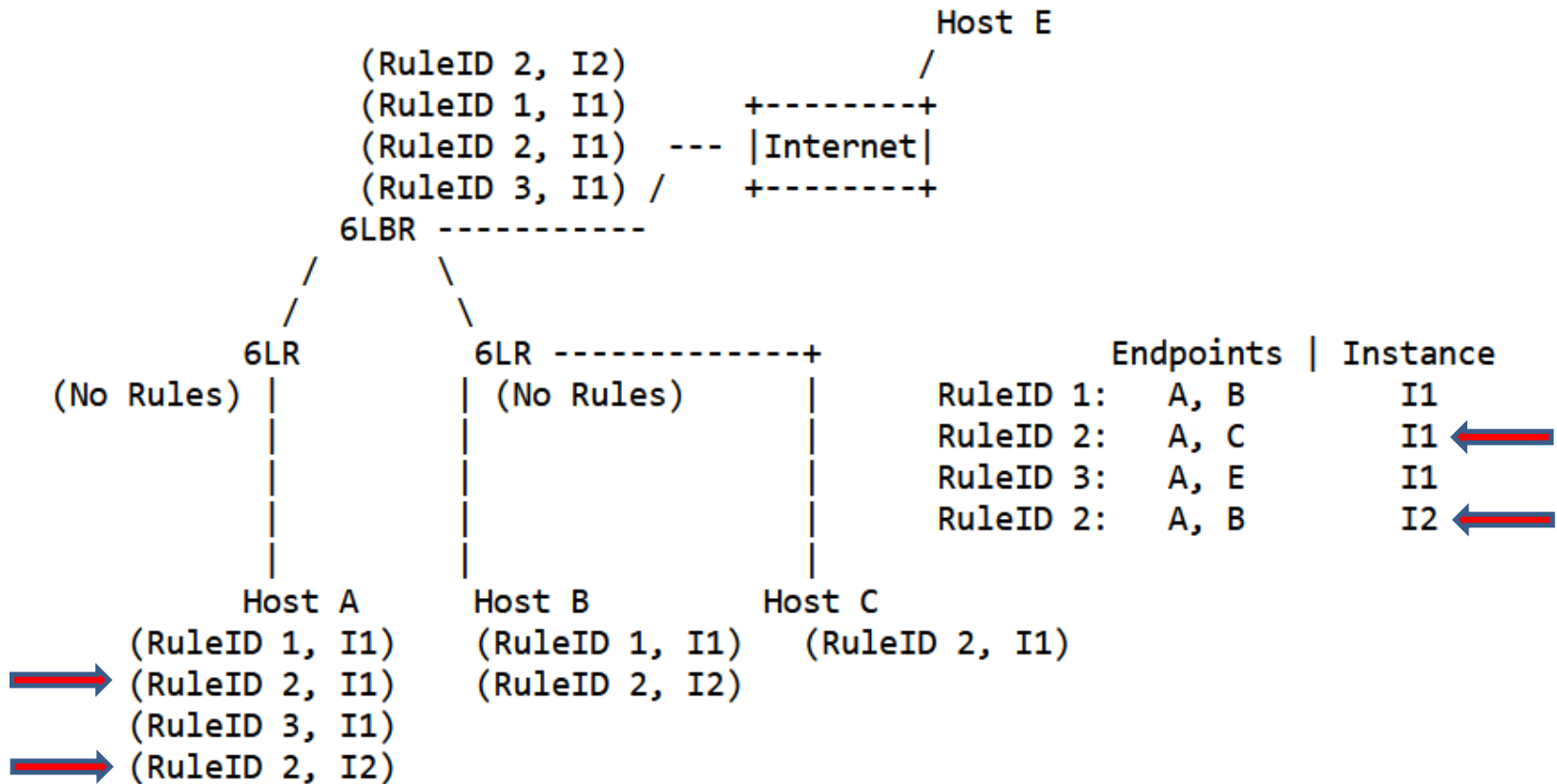
- Single-instance networks:

- A Rule and its RuleID MUST be unique network-wide
- The means to ensure so are out of scope



3.5. Multihop communication (IV/VIII)

- TRO:
 - Multiple-instance networks:
 - A not fully compressed SCHC Header MUST be used



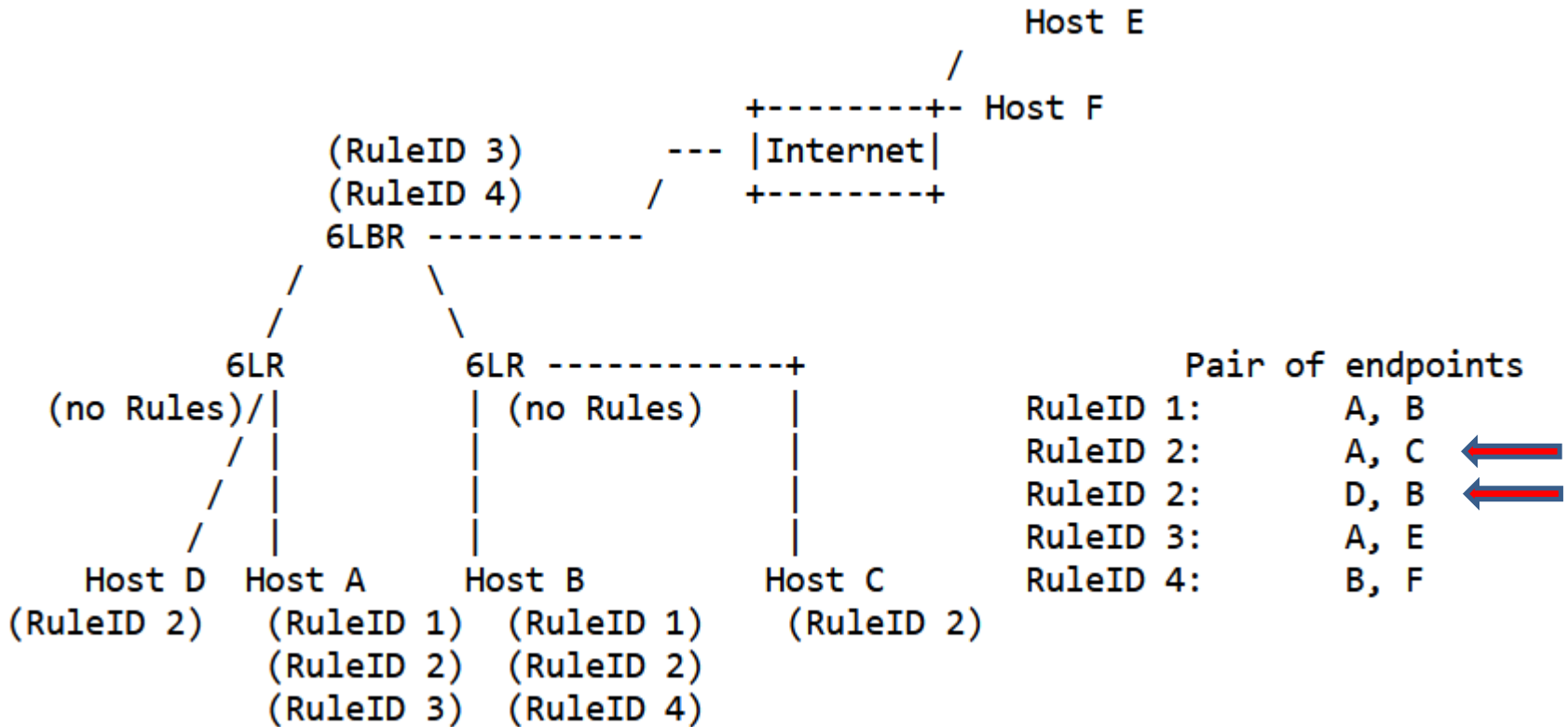
3.5. Multihop communication (V/VIII)

- PRO:

SCHC Header compressed to 0 bits

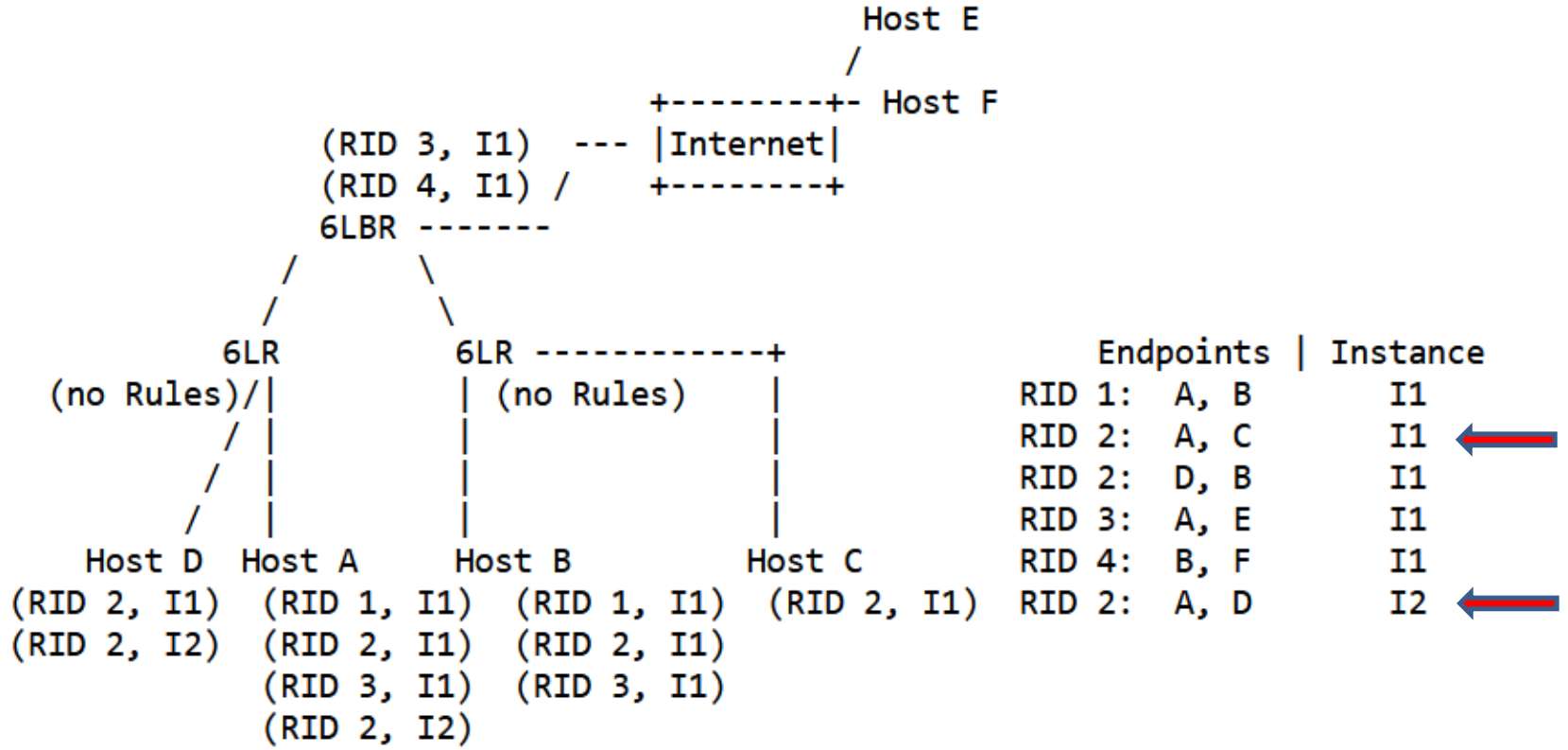
- Single-instance networks:

- A RuleID MAY be used to identify different Rules used by different pairs of endpoints



3.5. Multihop communication (VI/VIII)

- PRO:
 - Multiple-instance networks:
 - A not fully compressed SCHC Header MUST be used



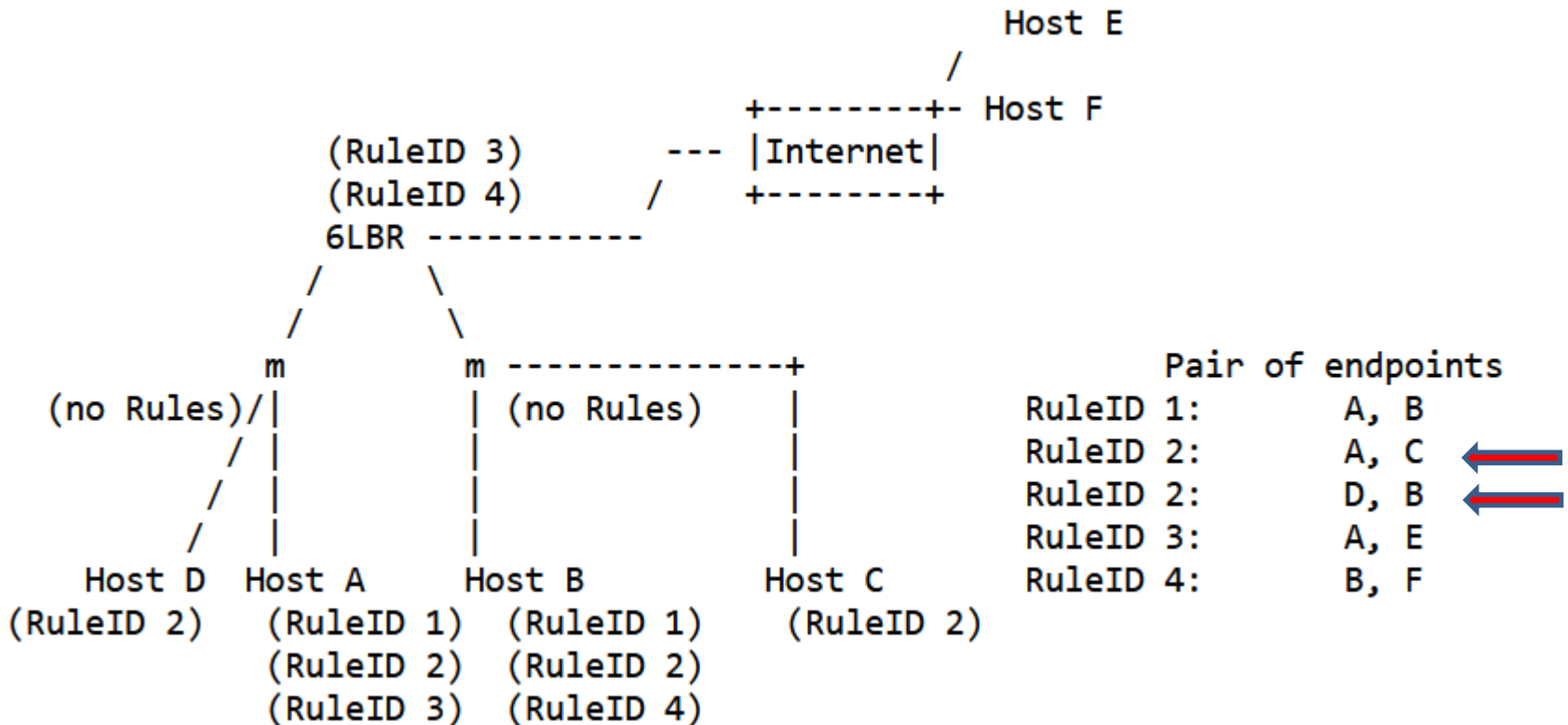
3.5. Multihop communication (VII/VIII)

- Mesh-Under:

SCHC Header compressed to 0 bits

- Single-instance networks:

- A RuleID MAY be used to identify different Rules used by different pairs of endpoints

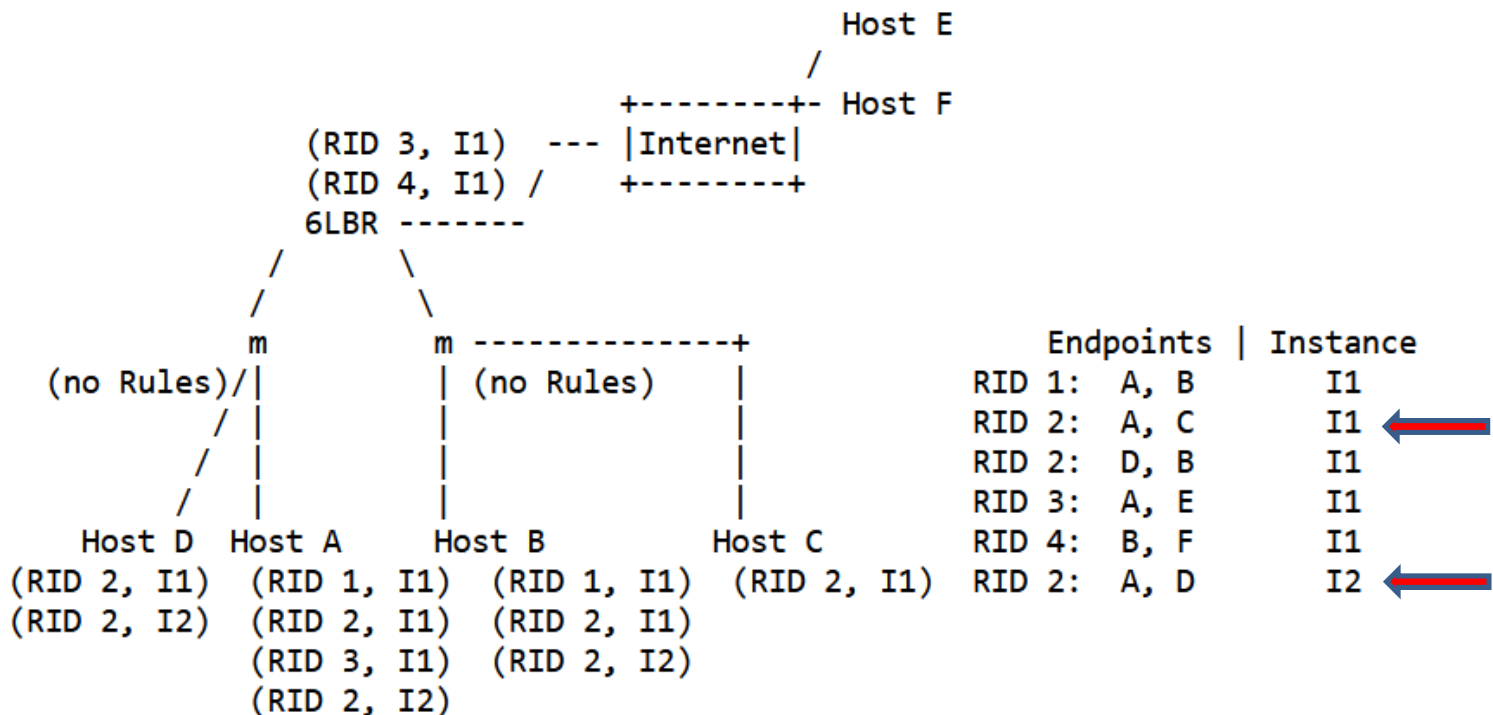


3.5. Multihop communication (VIII/VIII)

- Mesh-Under:

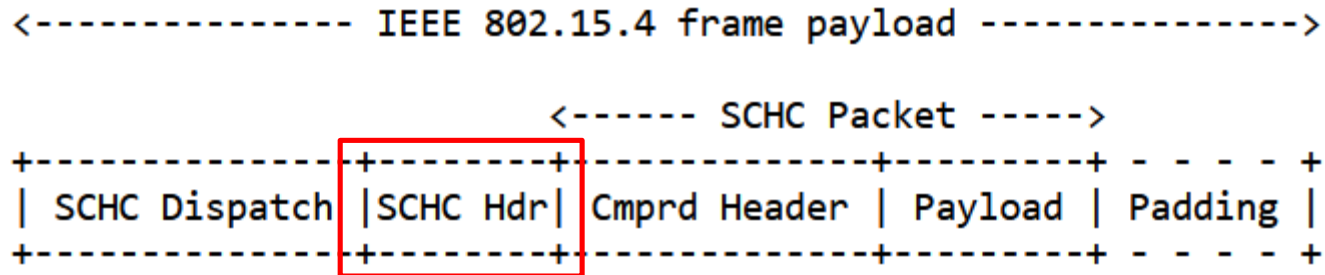
- Multiple-instance networks:

- A fully compressed SCHC Header MAY be used
 - » Only if it is possible to determine the SCHC Packet Instance needed to decompress a SCHC-compressed packet based on the packet source identifier (Mesh-Under header [RFC 4944])



4.1. Single-hop or SRO frame format

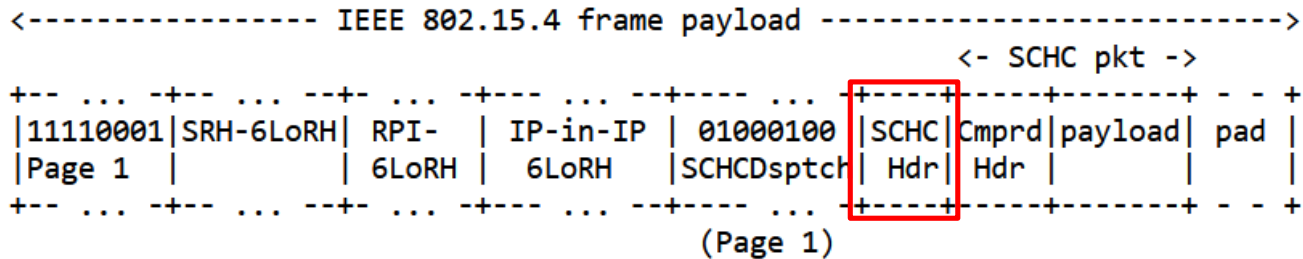
- Frame format:



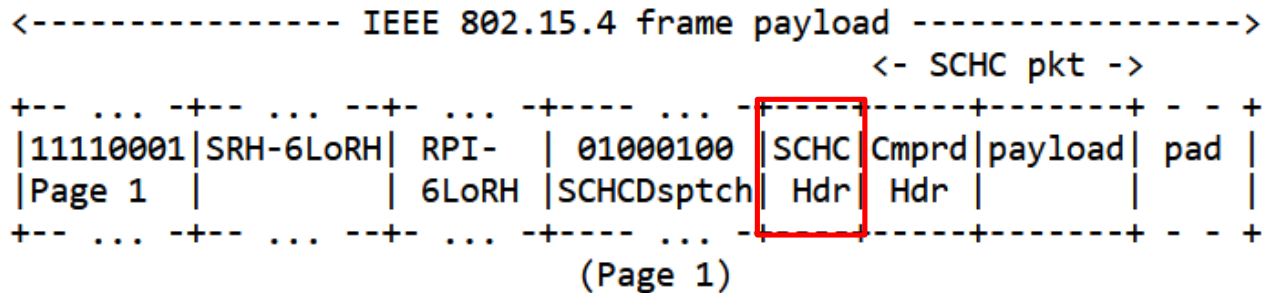
- SCHC Header
 - Determines the SCHC Packet Instance to be used to decompress the next field
 - In compressed form: a RuleID and a compression residue
 - Single-instance networks: fully compressed (0 bits)
 - Multiple-instance networks: (generally) not fully compressed
 - » RuleID size RECOMMENDED between 1 and 8 bits

4.2. TRO frame formats

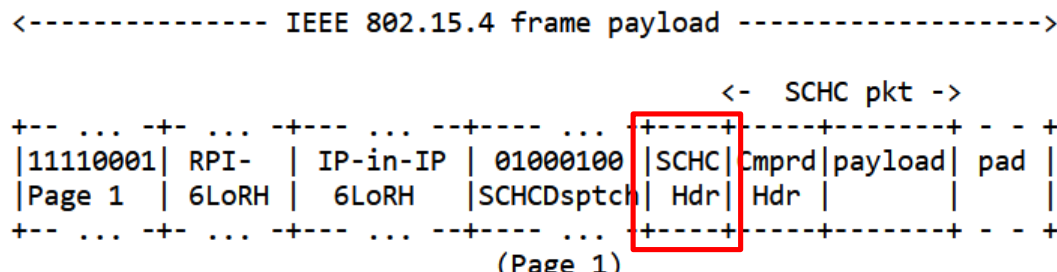
- Downward, source not a root:



- Downward, source is a root:

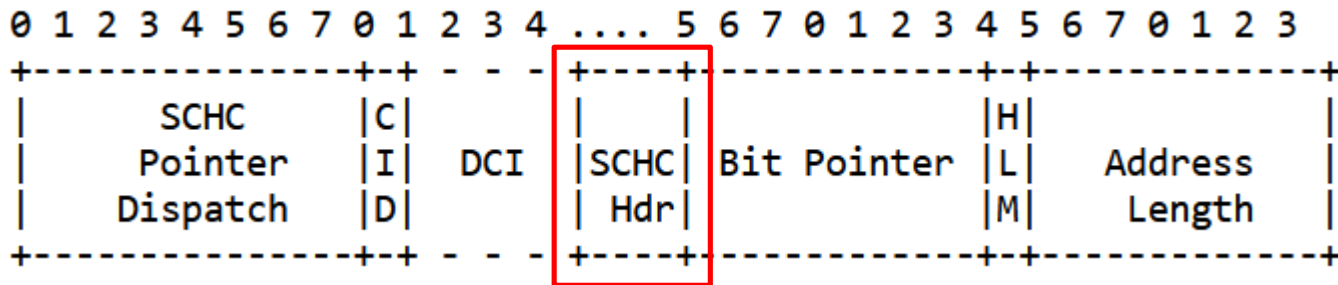


- Upward:



4.3. PRO and Mesh-Under frame formats

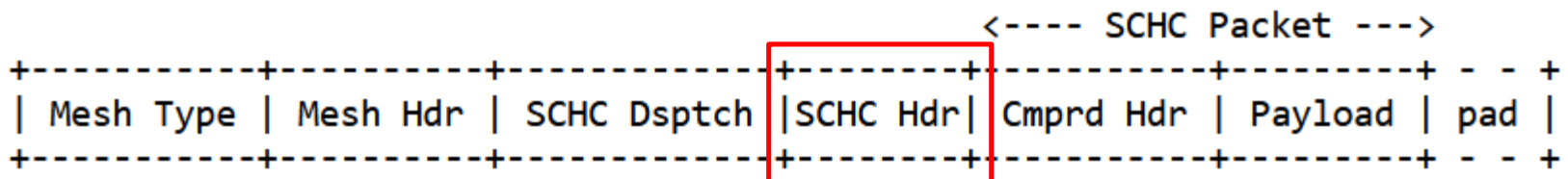
- PRO Header



- Mesh-Under

- No fragmentation, not broadcast:

<----- IEEE 802.15.4 frame payload ----->



Other updates (I/II)

- 7. Neighbor Discovery
 - Compression of ICMPv6 headers is being specified in the SCHC WG (draft-barthel-schc-oam-schc)
- 9. IANA considerations
 - 6LoWPAN Dispatch Type Field request

Bit Pattern	Page	Header Type	Reference
01000100	0	SCHC	[RFCthis]
01000100	1	SCHC	[RFCthis]
01000101	0	SCHC Pointer	[RFCthis]

Other updates (II/II)

- 10. Security considerations
 - Pointer in PRO creates new attack opportunities
 - A malicious node might modify the related fields
 - Use of link-layer security can mitigate the threat
- Appendix B.3
 - Analysis of PRO up to date (corresponds to the current version of the PRO header)

Comments/Questions?

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