Transmission of SCHC-compressed packets over IEEE 802.15.4 networks

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

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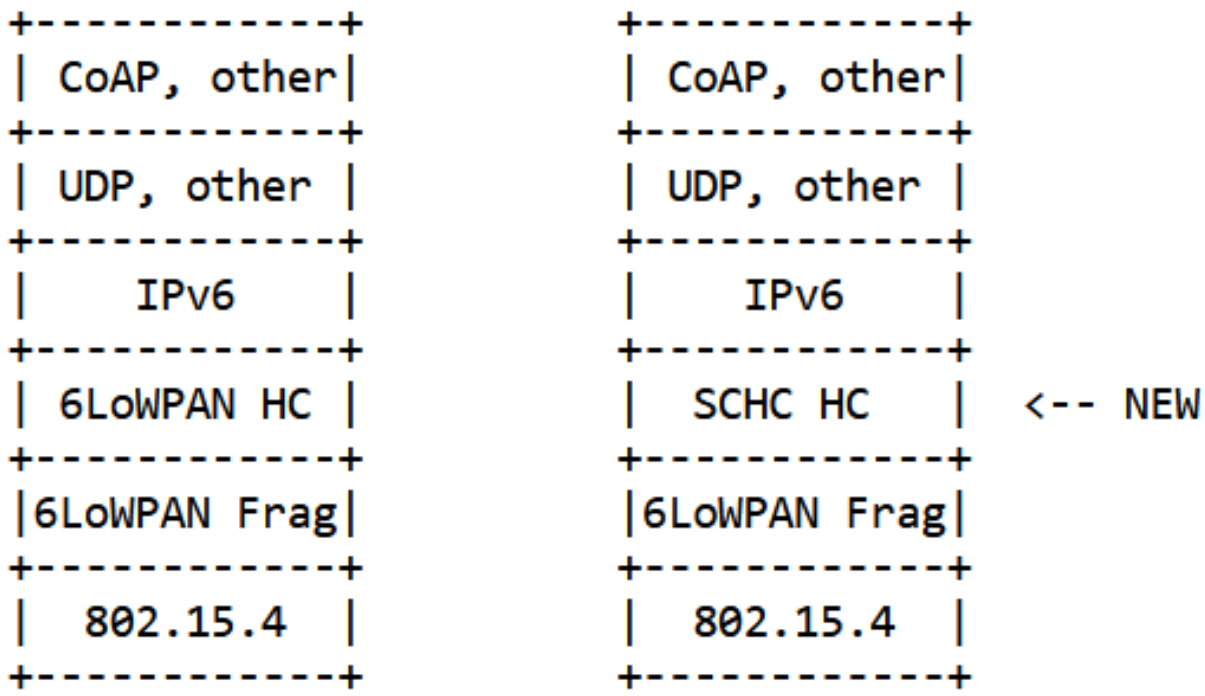
Main goal



Traditional

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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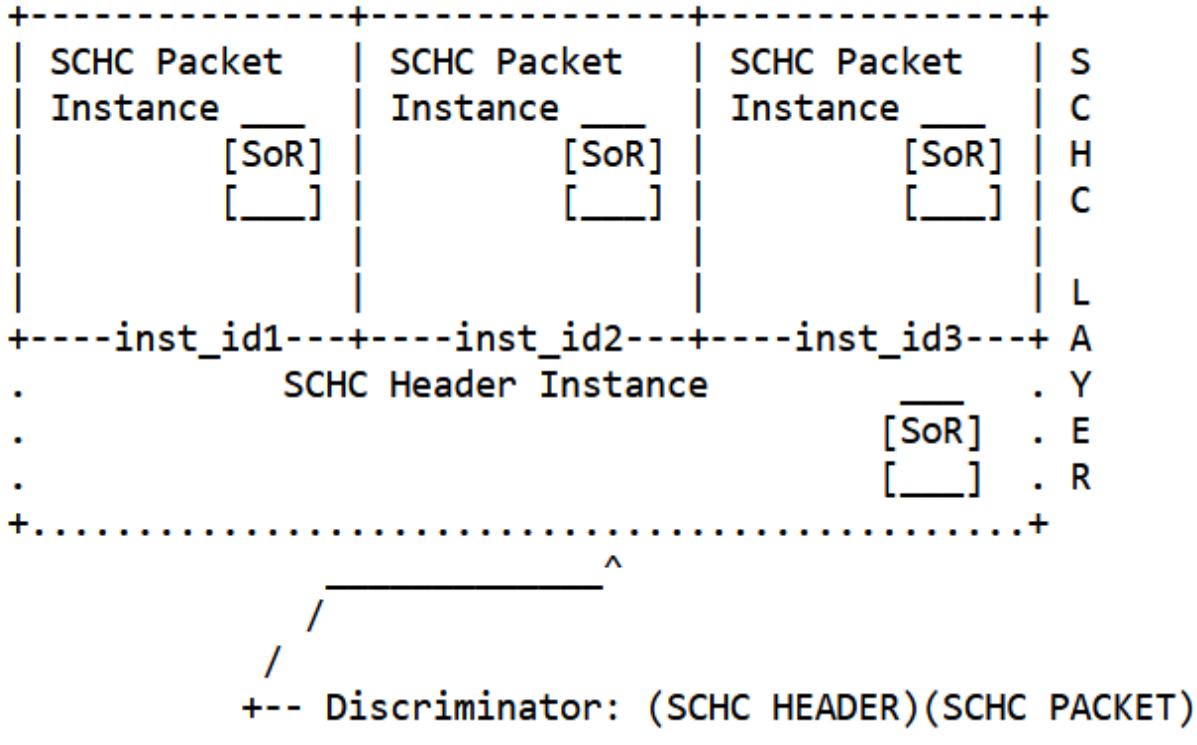
Background

- 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
  - SCHC Stratum:
    - "*Layer*" at which SCHC operates

From draft-ietf-schc-architecture-02:



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)

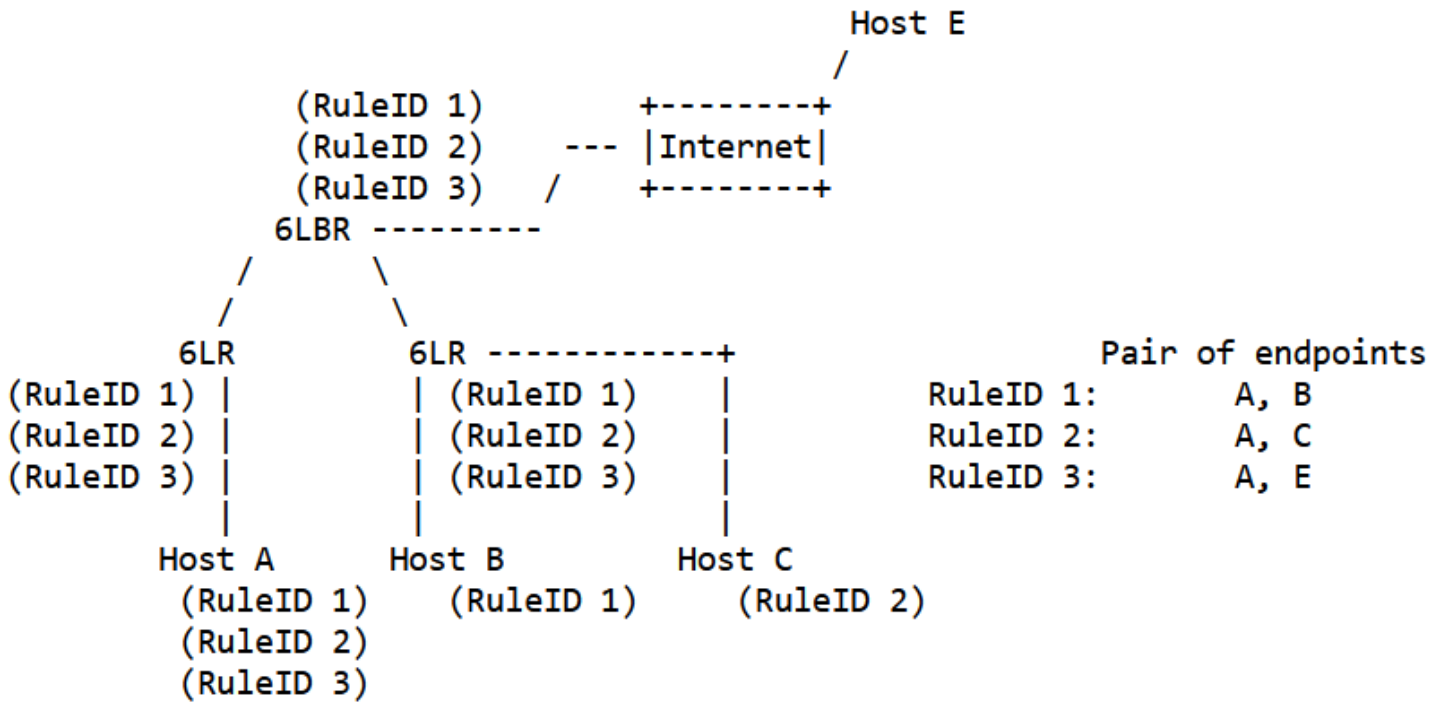
- Multiple-instance networks
  - Some network nodes have:
    - More than one SCHC Packet Instance for C/D
    - One SoR for each SCHC Packet Instance
  - SCHC Header cannot (generally) be fully compressed
    - More than 0 bits sent over the air
  - All network nodes have:
    - A single SCHC Header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

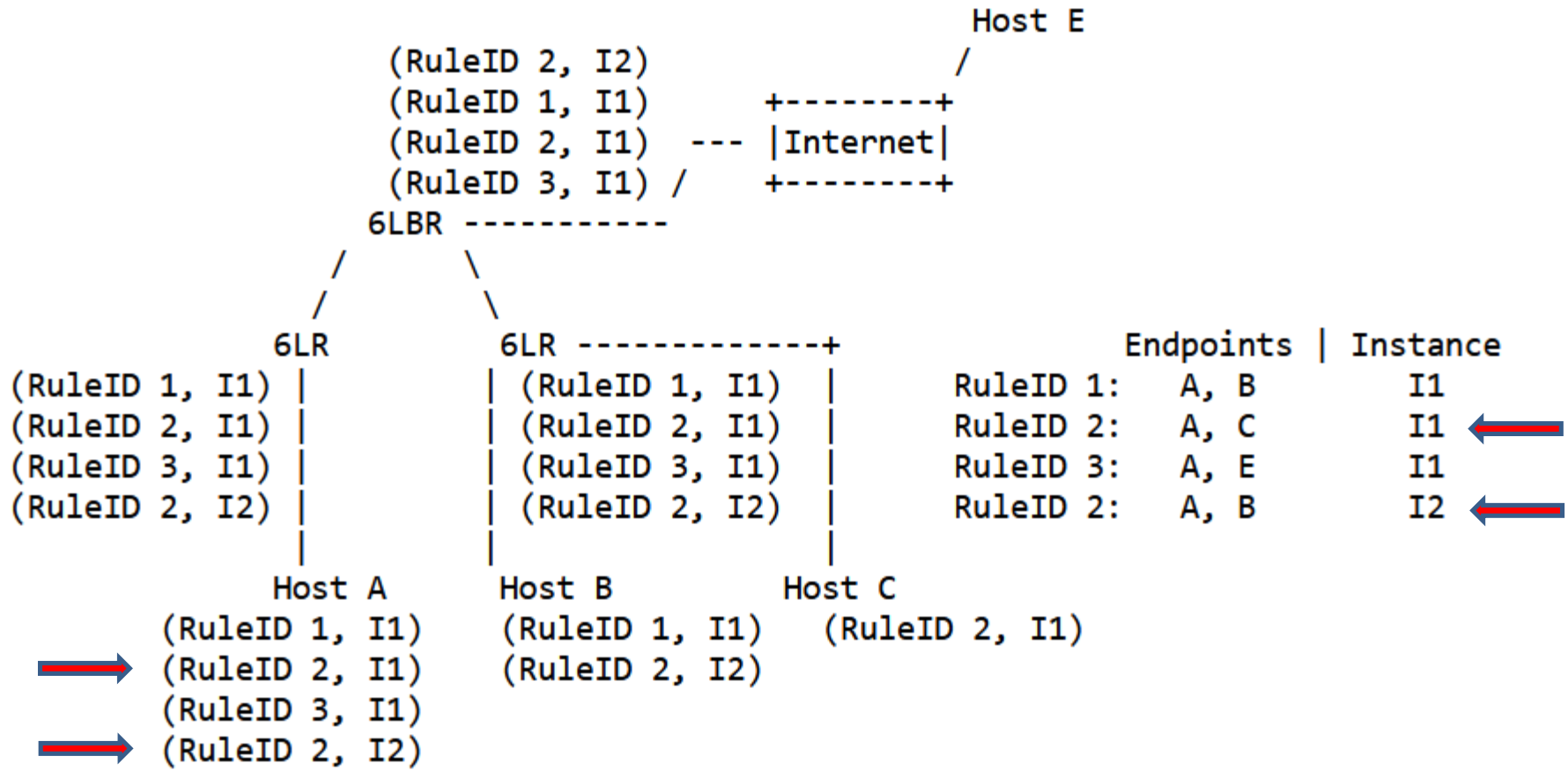
SCHC Header compressed to 0 bits

  - 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)

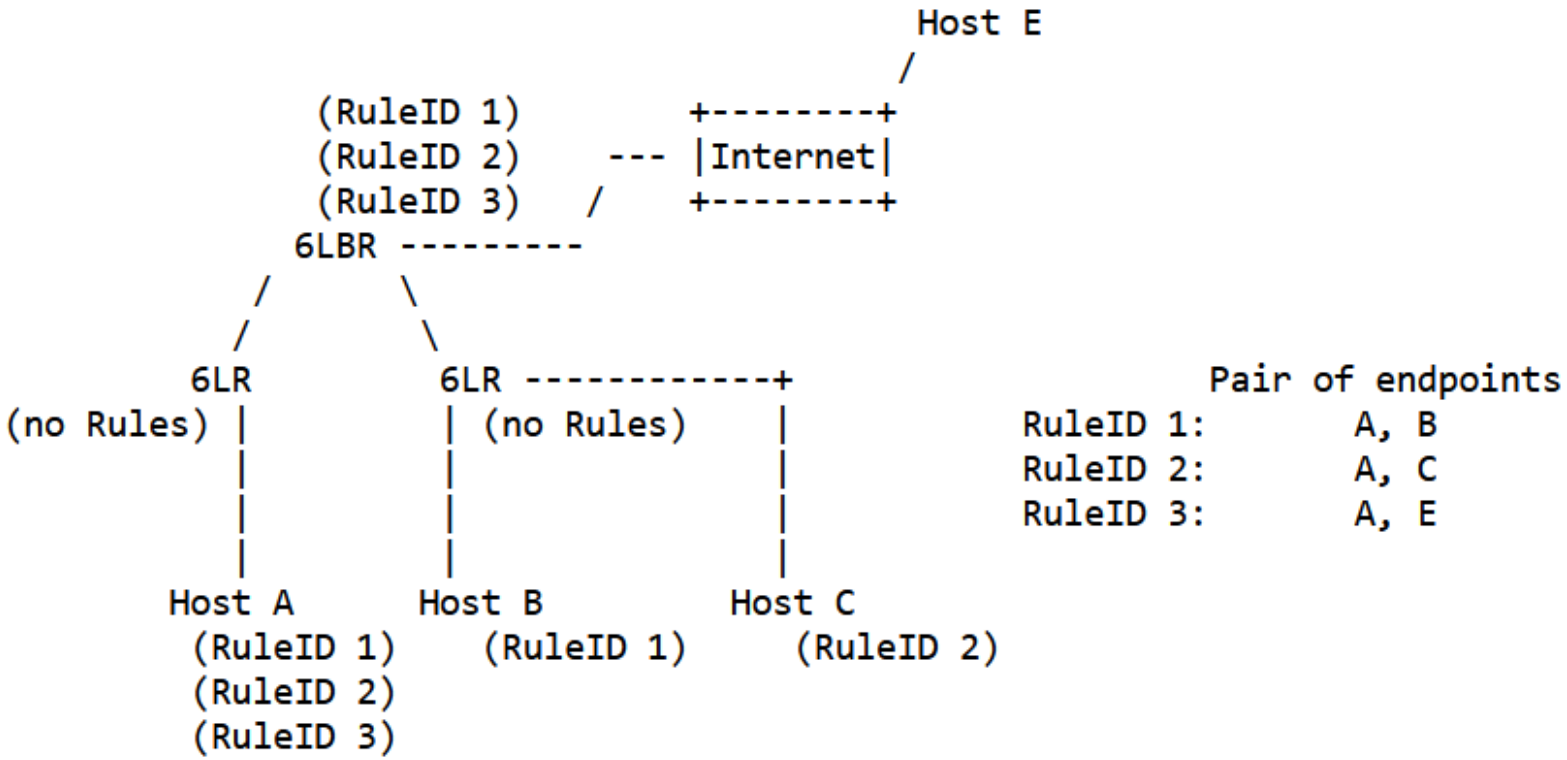
- SRO:
  - Multiple-instance networks:
    - A not fully compressed SCHC Header MUST be used



3.5. Multihop communication (III/VIII)

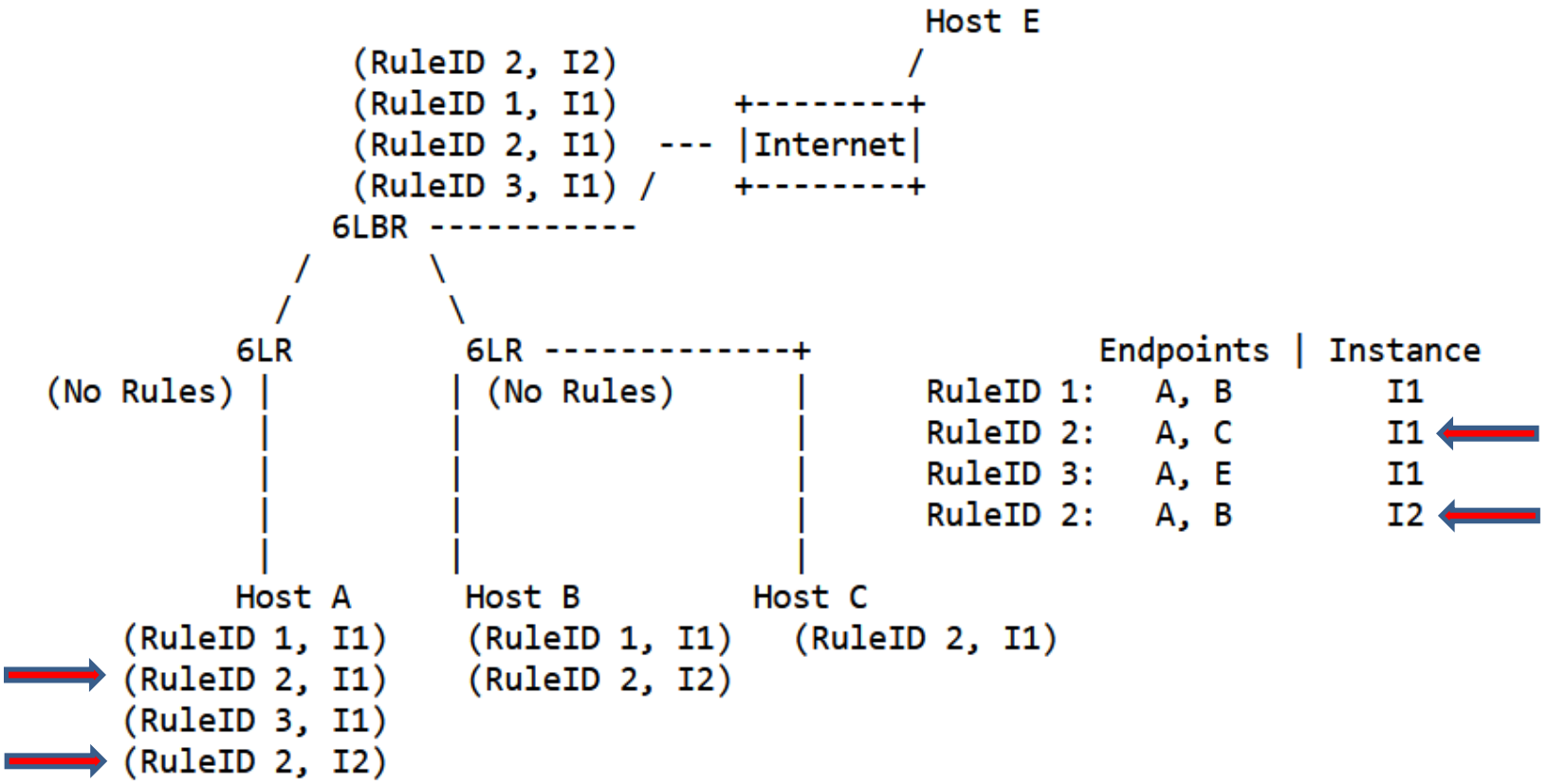
- TRO:
  - Single-instance networks:
    - A Rule and its RuleID MUST be unique network-wide
    - The means to ensure so are out of scope

SCHC Header compressed to 0 bits



3.5. Multihop communication (IV/VIII)

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

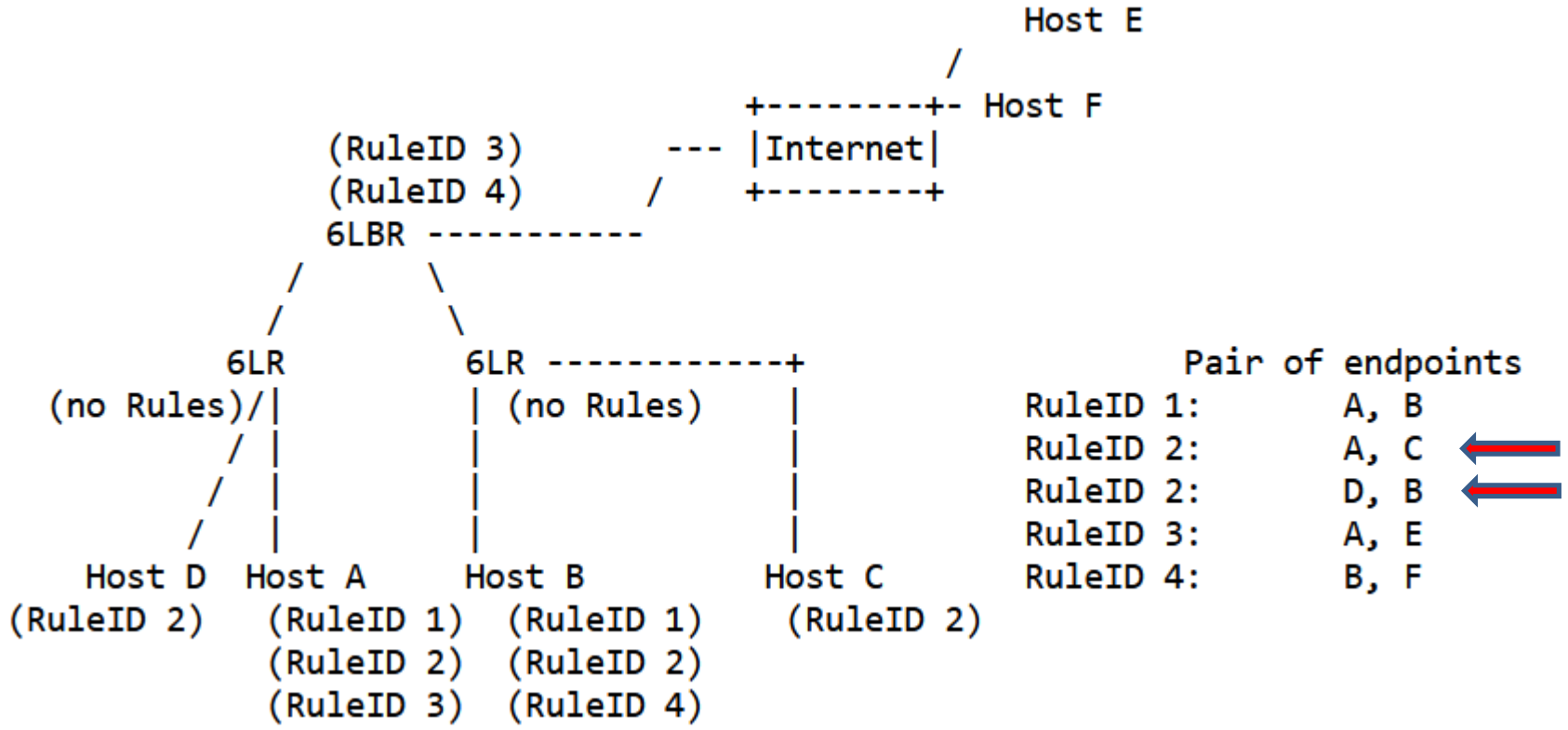


3.5. Multihop communication (V/VIII)

- PRO:

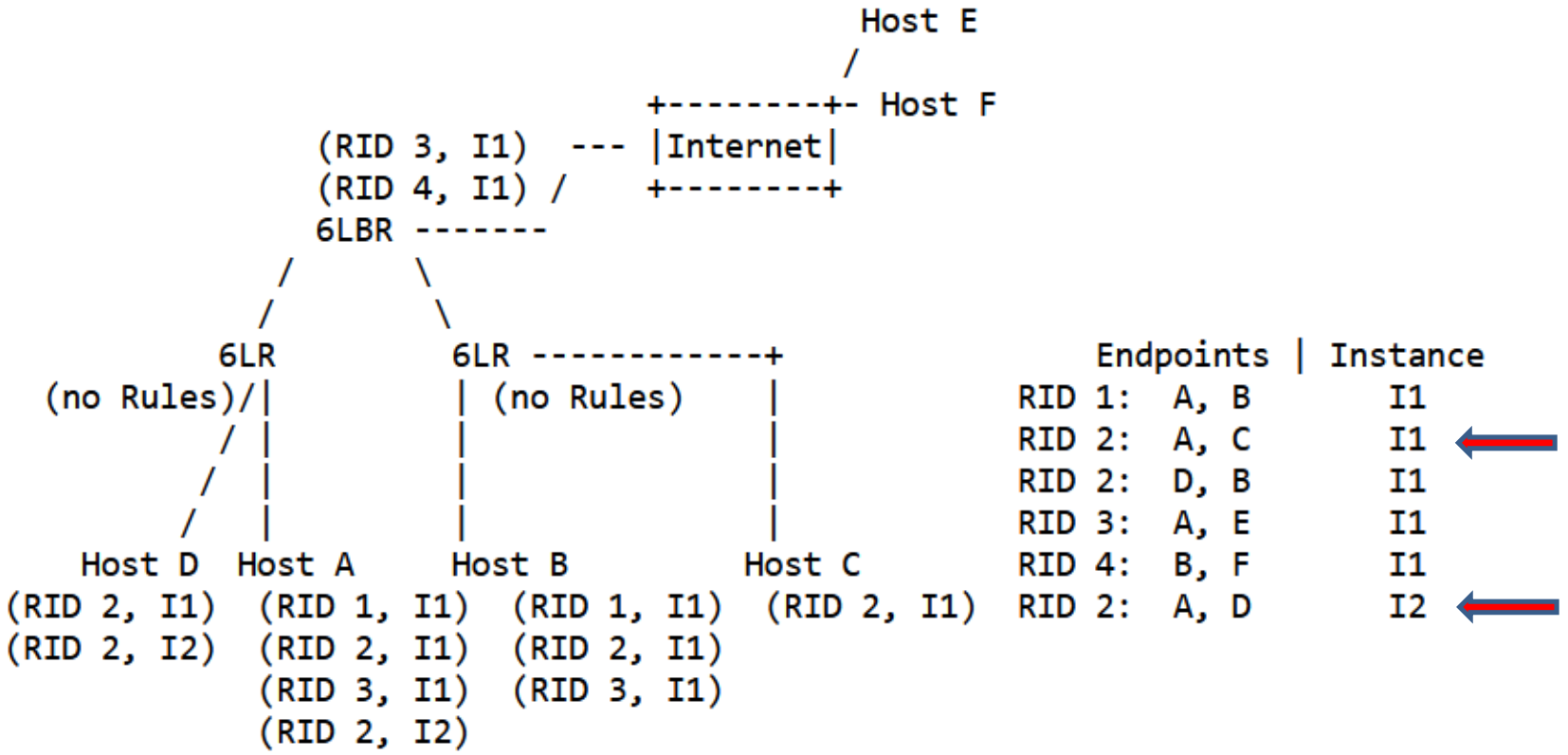
SCHC Header compressed to 0 bits

  - 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

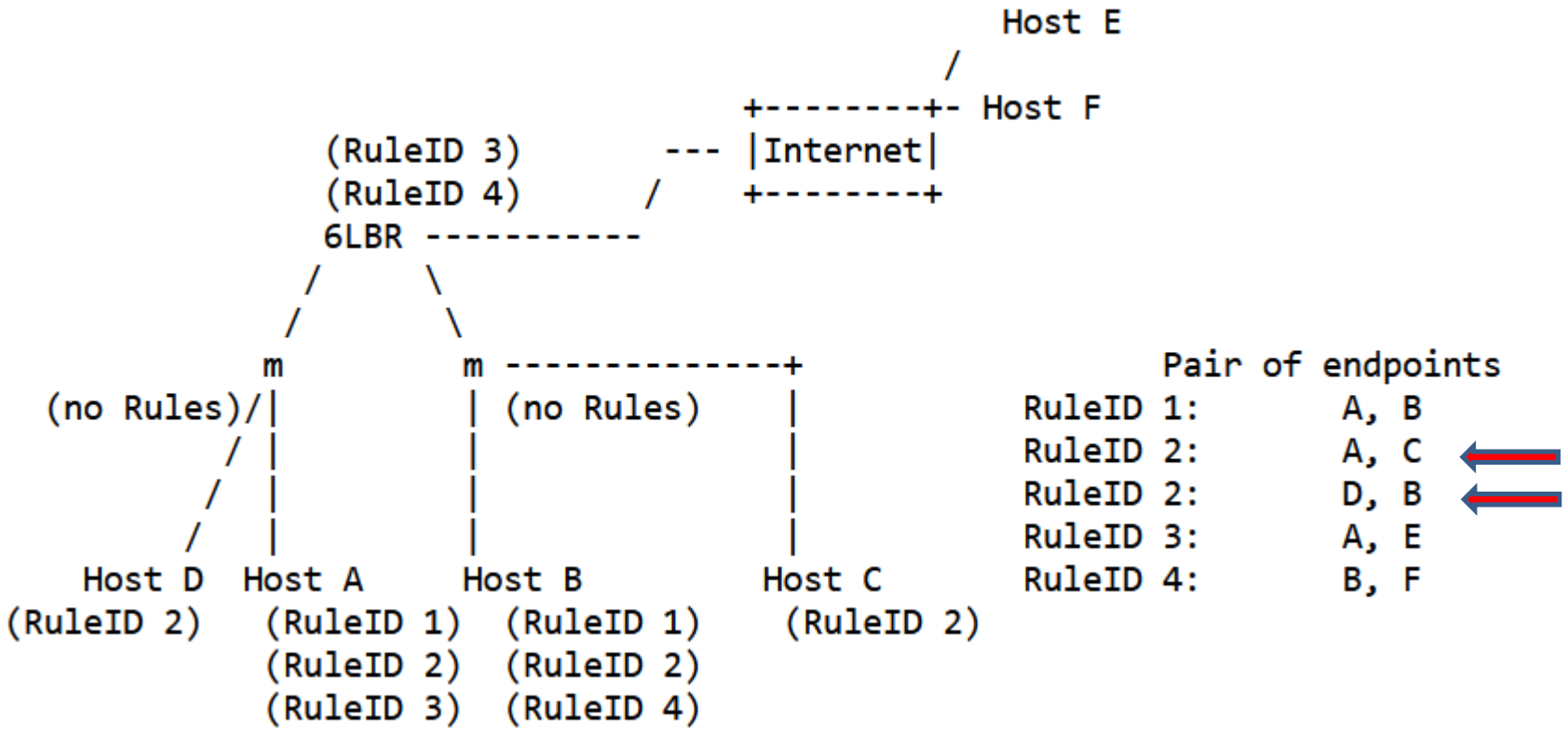


3.5. Multihop communication (VII/VIII)

- Mesh-Under:

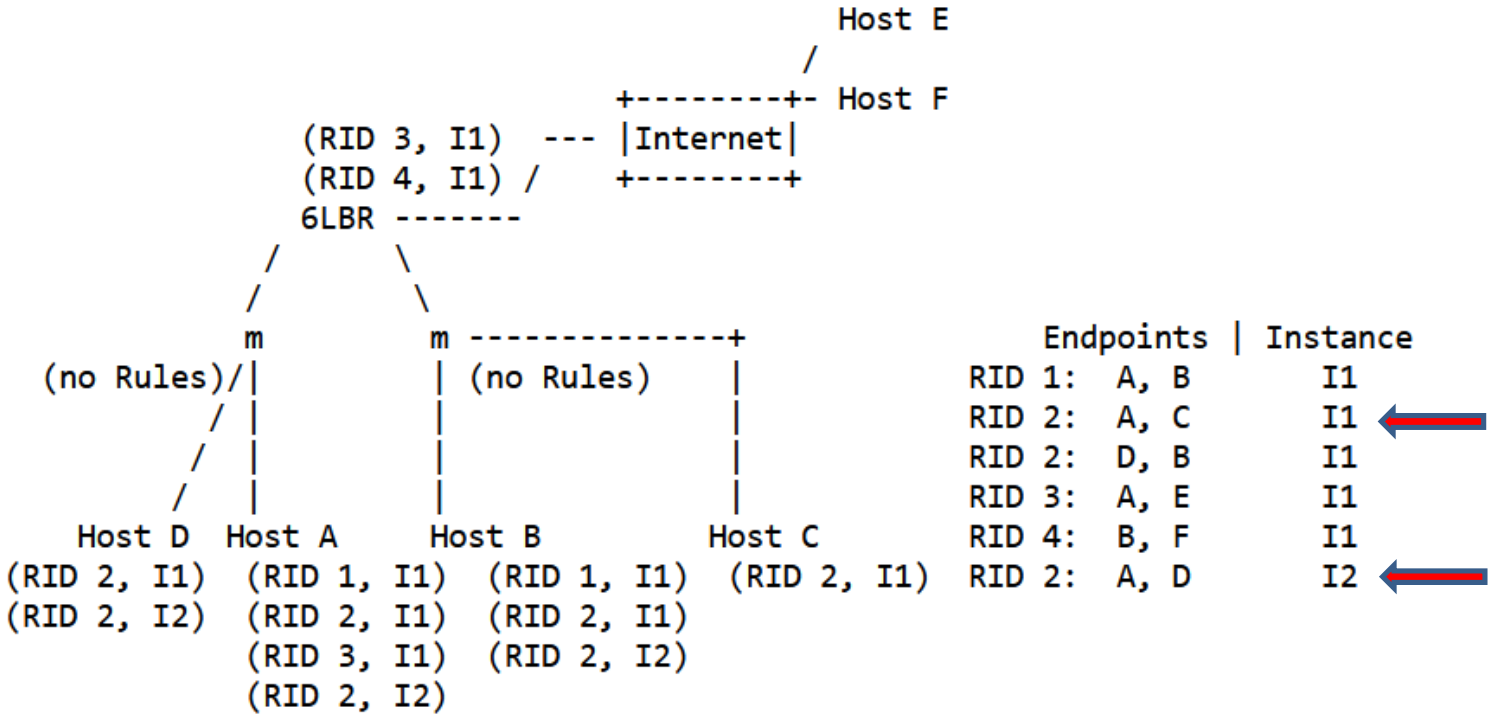
SCHC Header compressed to 0 bits

  - Single-instance networks:
    - A RuleID MAY be used to identify different Rules used by different pairs of endpoints



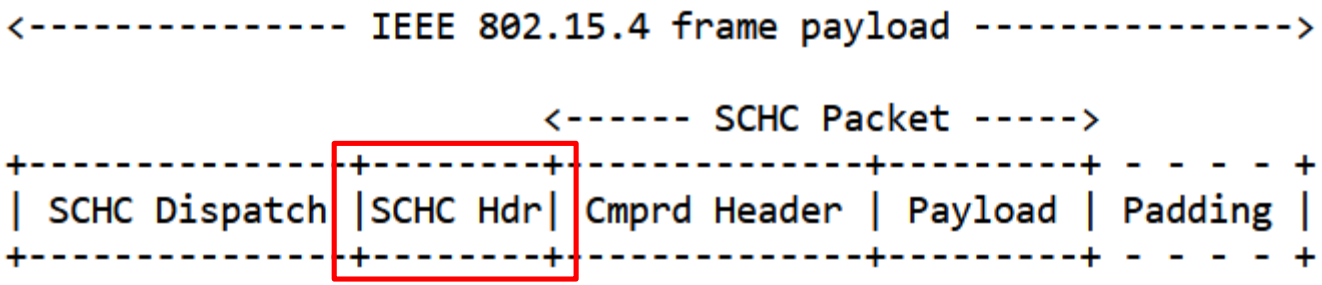
3.5. Multihop communication (VIII/VIII)

- 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

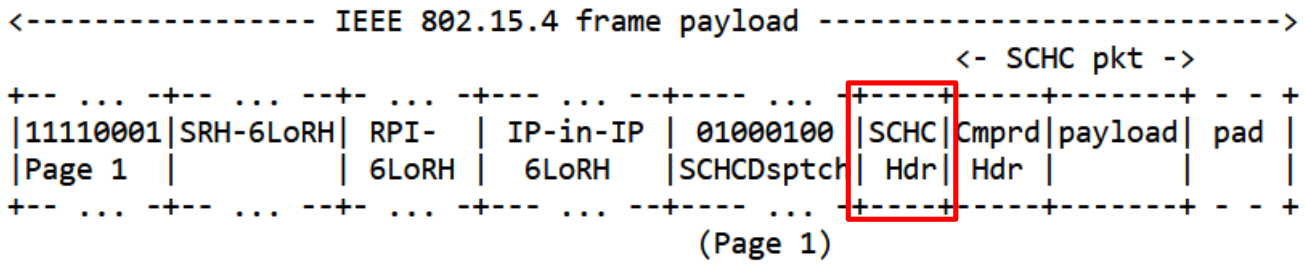
- Frame format:



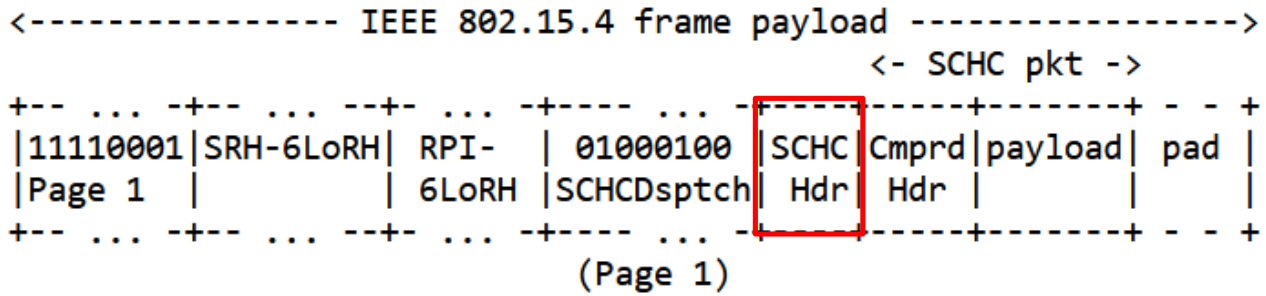
  - SCHC Header
    - Determines the SCHC Packet Instance to be used to decompress the next field
    - In compressed form: a RuleID and a compression residue
    - Single-instance networks: fully compressed (0 bits)
    - Multiple-instance networks: (generally) not fully compressed
      - » RuleID size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

4.2. TRO frame formats

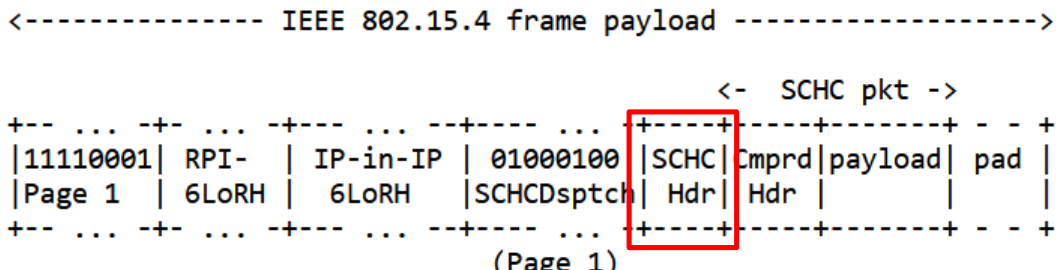
- Downward, source not a root:



- Downward, source is a root:

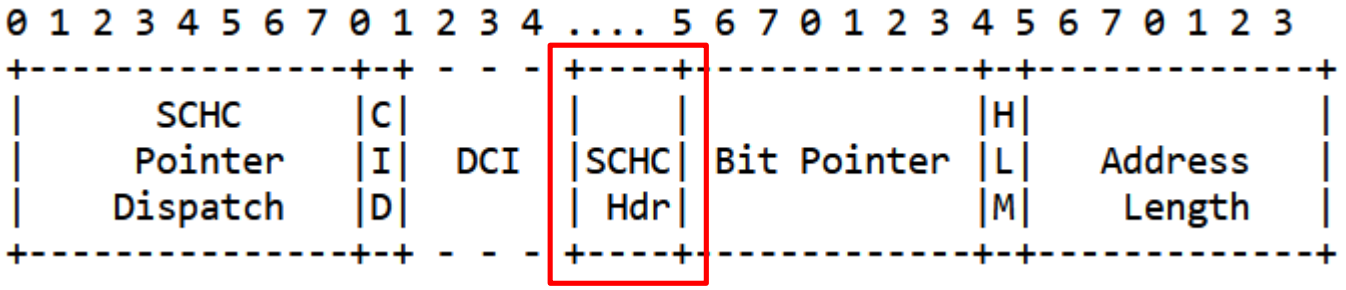


- Upward:

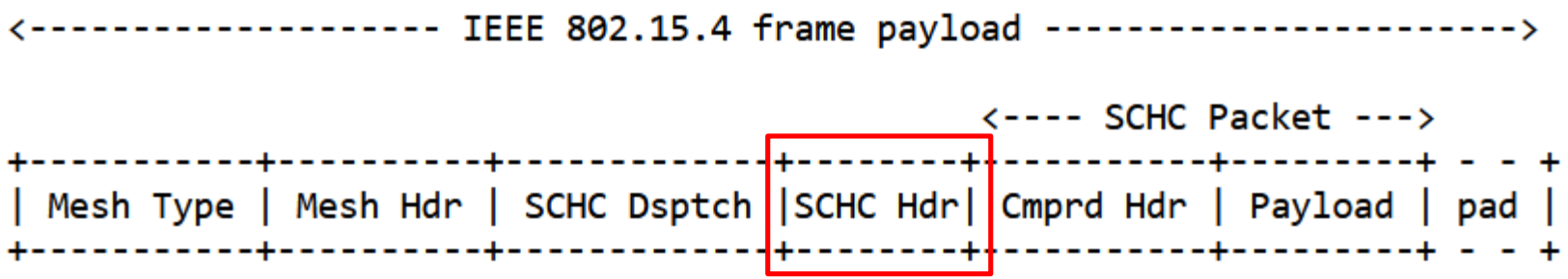


4.3. PRO and Mesh-Under frame formats

- PRO Header



- Mesh-Under
  - No fragmentation, not broadcast:



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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