SCHC Header Compression in 6Lo Environments

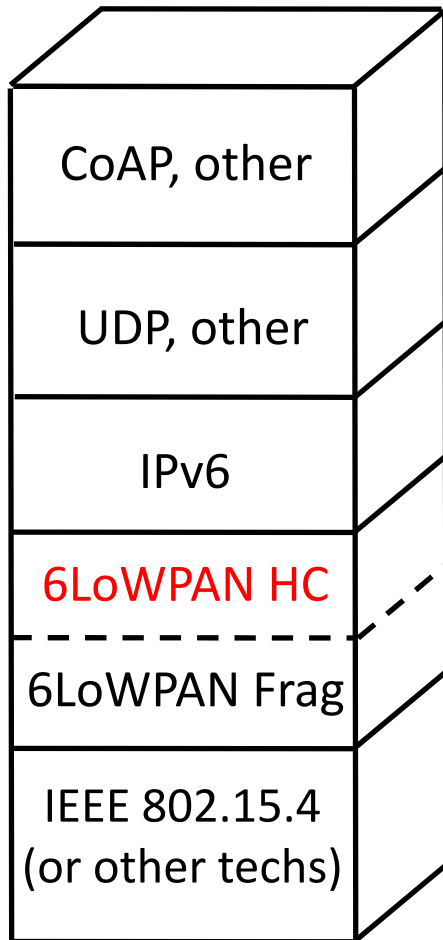Ana Minaburo, Laurent Toutain, Carles Gomez

Introduction (I/II)

- ## RFC 6282: the basis for header compression in 6Lo(WPAN)
  - Designed for IEEE 802.15.4 as the target technology
  - Adapted/Reused for *relatively* similar IoT technologies
  - Compressed IPv6/UDP header size of 7 bytes
    - Best case, with global addresses

- ## RFC 8724 (aka "SCHC"), a product of the LPWAN WG
  - Adaptation layer functionality:
    - **Header compression**
    - Fragmentation
  - Designed for even more constrained (LPWAN) technologies

- ## SCHC header compression
  - Compressed IPv6/UDP header size of e.g. 1 byte
    - Best case, with global addresses
  - Static Context: exploit a priori knowledge of header field values

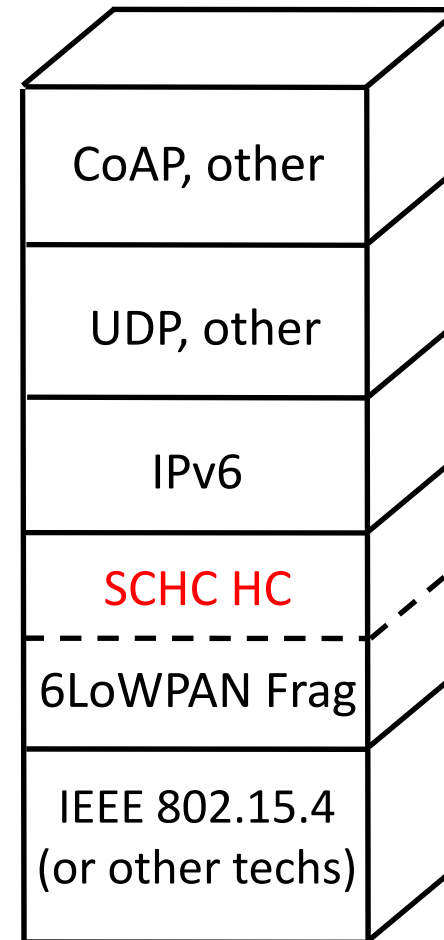# Introduction (II/II)

- There exists no 6Lo(WPAN) header compression for CoAP

  - Compressed IPv6/UDP/CoAP header size of 11 bytes

    - Best case, with global addresses
    - No CoAP header options

- There exists SCHC header compression for CoAP

  - Compressed IPv6/UDP/CoAP header size of e.g. 2 bytes

    - Best case, with global addresses
    - No CoAP header options

  > Note: the improvement can be greater (i.e., greater CoAP uncompressed header size) depending on how CoAP is used
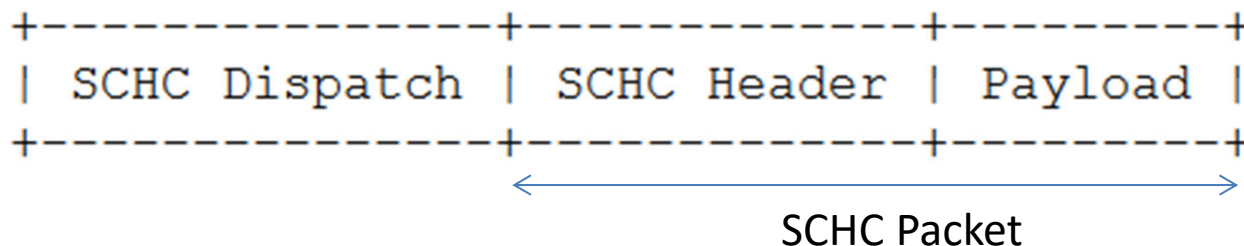
Introduction

Current
6Lo(WPAN)

CoAP, other

UDP, other

IPv6

6LoWPAN HC

6LoWPAN Frag

IEEE 802.15.4
(or other techs)

Proposed alternative
6Lo(WPAN)

CoAP, other

UDP, other

IPv6

SCHC HC

6LoWPAN Frag

IEEE 802.15.4
(or other techs)

SCHC HC for 6Lo(WPAN) ?

- Some 6Lo(WPAN) environments may benefit from SCHC header compression
  - Background:
    - draft-toutain-6lo-6lo-and-schc-00
    - draft-gomez-6lo-schc-dispatch-01
    - Positive feedback from the 6Lo WG (IETF 106, IETF 108)
  - If yes, need to signal when SCHC HC is used
- Frame format (i.e. L2 frame payload)
  - Encapsulated SCHC compressed packet:

```
+----------------+----------------+----------+
| SCHC Dispatch  | SCHC Header  | Payload |
+----------------+----------------+----------+
                  <------------------------------------>
                            SCHC Packet
```

6LoWPAN Dispatch Type for SCHC

- Proposal in draft-gomez-6lo-schc-dispatch-01:
  - SCHC Dispatch pattern is the Paging Dispatch (1111ZZZZ)
    - RFC 8025 concept of "page", ZZZZ to be determined
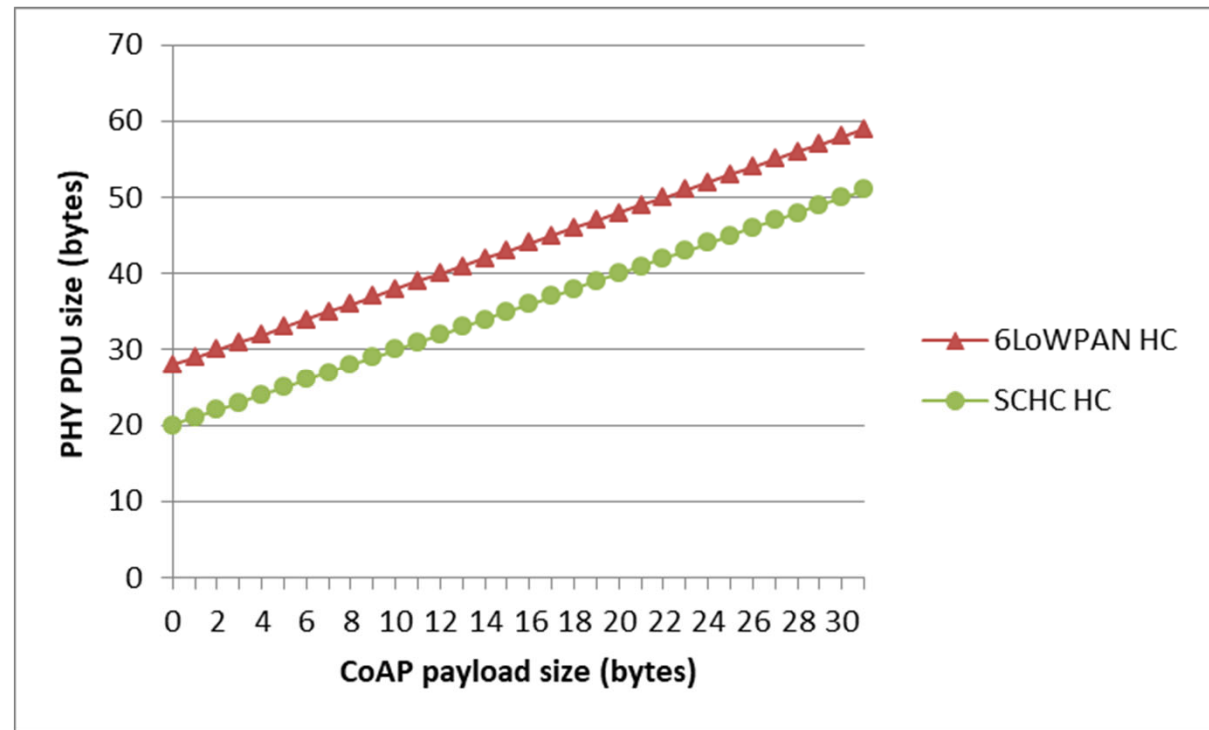   - A whole page for SCHC, to keep low overhead

- Potential performance improvement:
  - Compressed IPv6/UDP (RFC 6282) + CoAP header: 11 bytes
  - SCHC Dispatch + SCHC compressed header: 3 bytes
    - SCHC compressed header of 2 bytes
  - Battery lifetime increase by up to 40% over IEEE 802.15.4
    - Up to 44% in star topology
    - NOTE: actual improvement will be lower, depending on various parameters: payload size, MAC layer settings, device hardware features and operation, application settings, etc.
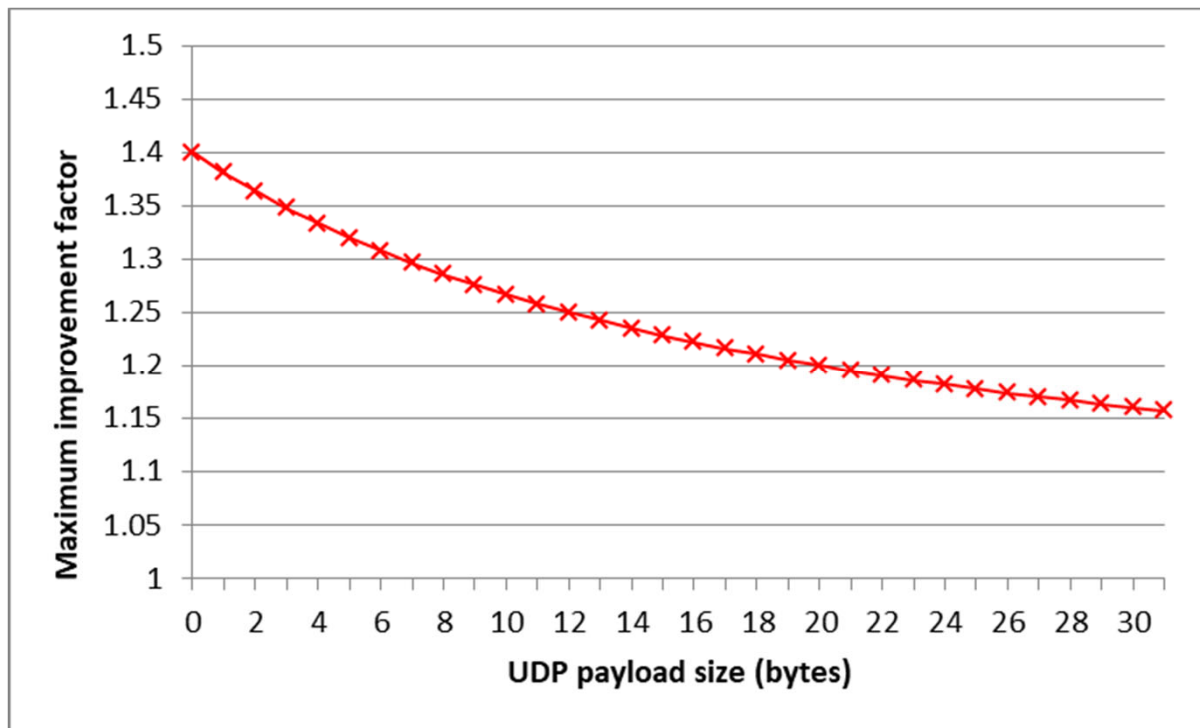
No CoAP header options

Comparison (I/III)

- IEEE 802.15.4 PHY PDU size vs UDP payload size
  - Short MAC layer addresses, intra-PAN

Comparison (II/III)

- Maximum lifetime improvement factor
  - E.g. a battery-operated sensor that periodically sends a message over IEEE 802.15.4
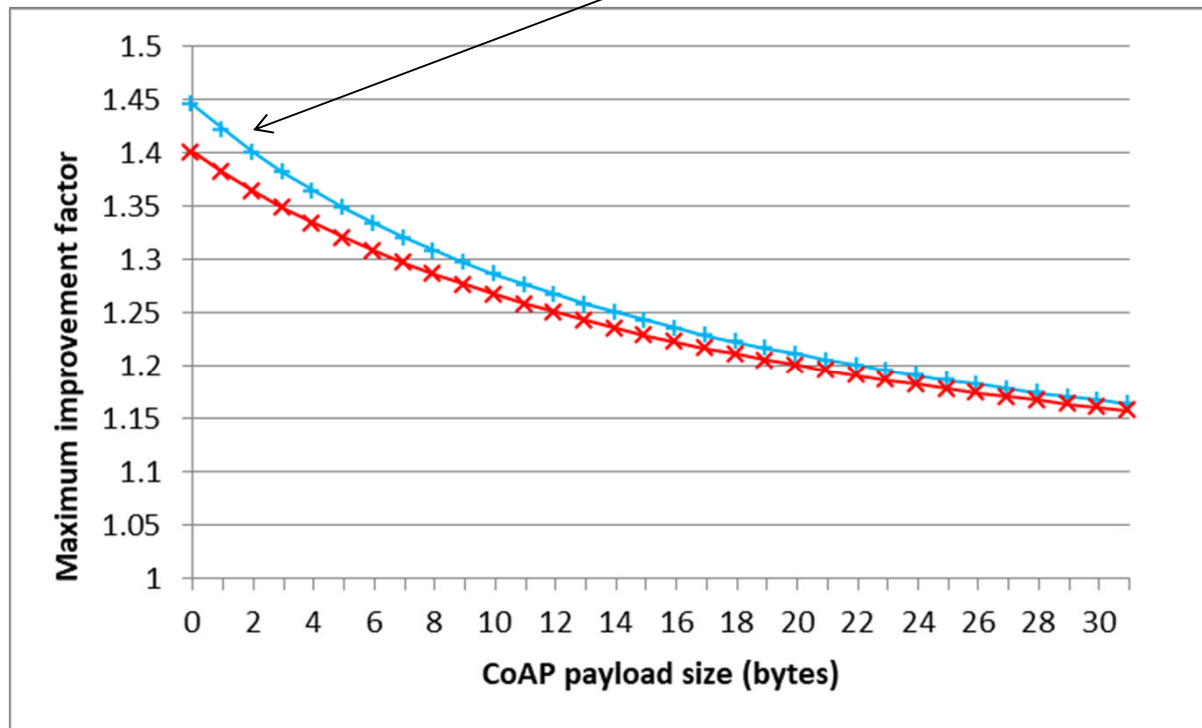 - Short MAC layer addresses, intra-PAN

NOTE: actual improvement will be lower

Comparison (III/III)

- Maximum lifetime improvement factor
  - E.g. a battery-operated sensor that periodically sends a message over IEEE 802.15.4

Star topology

NOTE: actual improvement will be lower

Components needed?

- 6LoWPAN Dispatch Type for SCHC
  - Not specific to any particular underlying L2 technology

- Handling padding
  - A SCHC compressed header might have a size not being a multiple of an L2 word
  - Might be specified in generic terms (not for a specific tech.)?

- SCHC context provisioning?
  - Preprovisioning, out-of-band, dynamic approach, etc.?
  - Consider solutions from the LPWAN WG

SCHC HC for upper layers

- Compatible with keeping 6Lo(WPAN) HC (RFC 6282, RFC 8138)

- E.g. defining a SCHC LOWPAN_NHC format
    - To signal that the next header is SCHC-compressed
    - Could be useful for UDP, UDP/CoAP, etc.

- Reminder: two LOWPAN_NHC formats defined in RFC 6282
    - IPv6 Extension header compression
    - UDP header compression

Thanks!
Thoughts? Questions? Comments?

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