SCHC Header Compression in 6Lo Environments

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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)
- IEEE 802.15.4 (or other techs)
- 6LoWPAN Frag
- 6LoWPAN HC
- IPv6
- UDP, other
- CoAP, other

Proposed alternative 6Lo(WPAN)
- IEEE 802.15.4 (or other techs)
- 6LoWPAN Frag
- SCHC HC
- IPv6
- UDP, other
- CoAP, other
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:
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.
Comparison (I/III)

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

![Comparison Diagram](image)
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

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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