Transmission of SCHC-compressed packets over IEEE 802.15.4 networks

draft-gomez-6lo-schc-15dot4-02

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Introduction (I/III)

- 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/III)

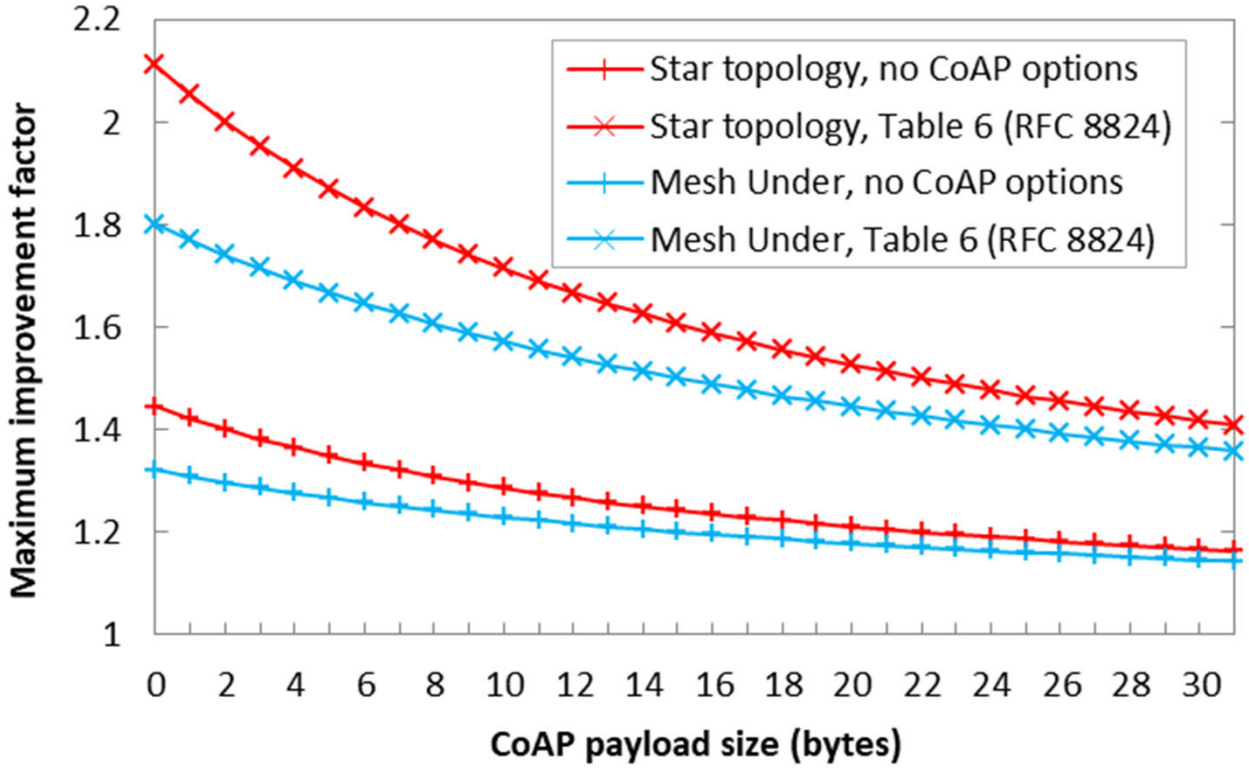
- Compressed IPv6/UDP/CoAP header size
  - 6Lo(WPAN) compression:
    - No CoAP header options: 11 bytes
    - CoAP header options (Table 6, RFC 8824): 23 bytes
  - SCHC compression: e.g. 2 bytes

Assumptions:
- Best case
- Global addresses

- Theoretical battery lifetime improvement over IEEE 802.15.4 by a factor up to >2
  - Including a 1-byte SCHC Dispatch
  - Actual improvement will be lower, depending on various parameters and features: device hardware, MAC settings, application settings, payload size, network topology, etc.

Introduction (III/III)

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



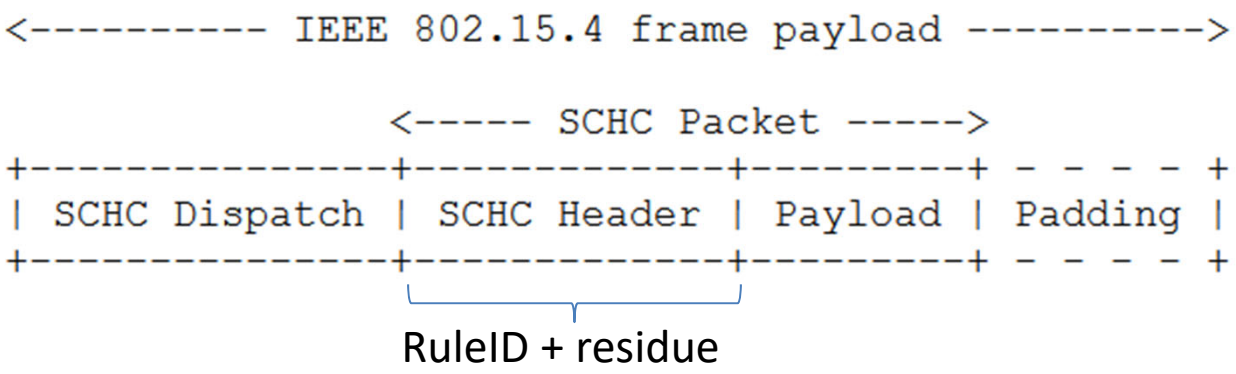
NOTE: actual improvement will be lower

Status

- Related document: draft-gomez-6lo-schc-dispatch
  - Proposal of a dispatch to signal SCHC HC
  - Presented at IETF 110
- draft-gomez-6lo-schc-15dot4
  - Greater scope
    - Transmission of SCHC-compressed packets over IEEE 802.15.4 networks
  - -00 presented in IETF 111
  - -01 presented in IETF 112
- Revision -02
  - Aims to incorporate the feedback from IETF 112 and LPWAN WG interims

4. Frame format

- Frame format (i.e. L2 frame payload)
  - Encapsulated SCHC compressed packet:

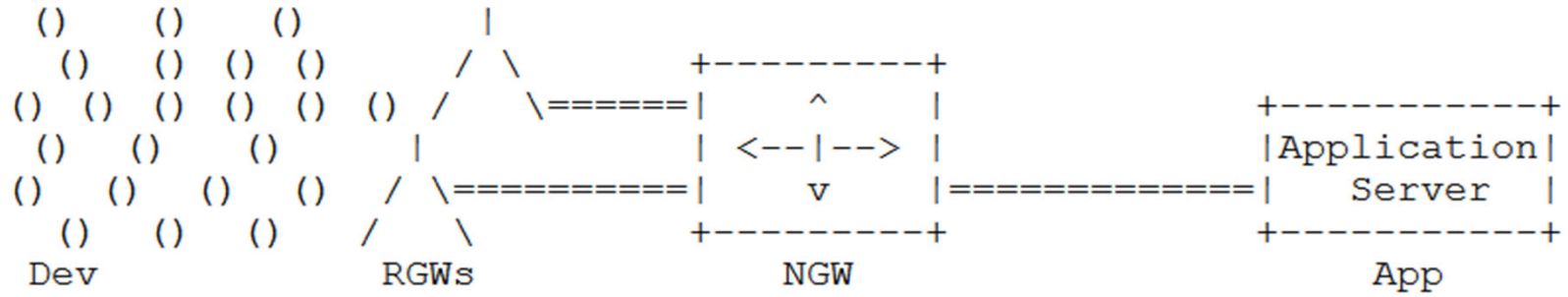


  - RuleID size:
    - In -01: 8 bits (MUST)
    - In -02: 1-16 bits (RECOMMENDED)
      - Allow an appropriate RuleID size to be used in each deployment
      - Avoid a hard limit on network size and number of endpoint pairs that can benefit from SCHC HC

5.1. IPv6/UDP header compression

- As per Section 10 of RFC 8724
- Problem: IPv6 addresses and UDP ports
  - Dev and App terms (RFC 8724) allow a single Rule to be usable in both directions

LPWAN architecture (RFC 8724):



  - In -02: some 802.15.4 scenarios can use this optimization “as is” (e.g., star topology networks)

5.1. IPv6/UDP header compression

- Problem: IPv6 addresses and UDP ports
  - In -02: in some 802.15.4 scenarios (e.g. two peers within a mesh topology), additional functionality (TBD) needed to use Dev and App
    - Each endpoint needs to know whether it is Dev or App when talking to another device
    - Uplink and Downlink have a meaning specific to each pair of endpoints
  - In -02, removed the tentative solution in -01:
    - Using “source” and “destination” in the Rules
    - “Transmit” and “Receive” terms (intended as replacements of Uplink and Downlink)

5.1.1. Compression of IPv6 addresses

- In RFC 8724, AppIID CDA cannot be used on LPWAN technologies that only carry the Dev identifier
- In -02: in 802.15.4, data frames carry both a source and a destination field, therefore AppIID CDA can be used
  - If the IID can be reconstructed based on information available at the L2 header

8. Security considerations

- No header compression functionality beyond the one in RFC 8724
  - Security considerations of Sec. 12.1 (RFC 8724) apply
  - Also, secur. considerations of Sec. 9 (RFC 8824) apply

- 802.15.4 networks support link-layer encryption and authentication
  - As in RFC 8824: cryptographic integrity-protection mechanism REQUIRED to protect SCHC headers

Next steps

- Who is Dev or App, and writing the Rules accordingly
- Do all nodes need to store all the Rules used in the 802.15.4 network?
  - If not, can RuleIDs be reused across disjoint pairs of endpoints?
- Scope of SCHC header compression of IPv6/UDP in peer-to-peer 802.15.4 topologies:
  - One hop between source and destination
  - Several hops between source and destination
    - Mesh under
    - Route over: challenging…

WG adoption?

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