Transmission of SCHC-compressed packets over IEEE 802.15.4 networks

draft-gomez-6lo-schc-15dot4-03

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Introduction

• Compressed IPv6/UDP/CoAP header size

<table>
<thead>
<tr>
<th></th>
<th>IPv6/UDP (bytes)</th>
<th>CoAP (bytes)</th>
<th>TOTAL (bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No compression</td>
<td>48</td>
<td>16</td>
<td>52, 64</td>
</tr>
<tr>
<td>6Lo(WPAN) - RFC 6282</td>
<td>7</td>
<td>16</td>
<td>11, 23</td>
</tr>
<tr>
<td>SCHC - RFC 8724, 8824</td>
<td>e.g. 1</td>
<td>e.g. 1</td>
<td>e.g. 2</td>
</tr>
</tbody>
</table>

– SCHC: static context, a priori knowledge of header field values

• Theoretical battery lifetime improvement over IEEE 802.15.4 by a factor up to >2
  • Actual improvement will be lower, depending on device HW, MAC settings, appl. settings, payload size, net. topology, etc.

Assumptions:
- Best case
- Global addresses
- CoAP
  - No header options
  - Table 6, RFC 8824
Status

• Previous discussion Related document: draft-gomez-6lo-schc-dispatch
  • Proposal of a dispatch to signal SCHC HC
  • Presented in 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
  • -02 presented in IETF 113

• Revision -03
  • Aims to incorporate the feedback from IETF 113 and discussion on the mailing lists (6lo and lpwan)
5.1. IPv6/UDP header compression

- 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):

- 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 some 802.15.4 scenarios (e.g. two peers within a mesh topology), additional functionality needed to use Dev and App
  - Consensus so far: keep using Dev and App terms
- In -03:
  - Dev or App role, and Rules to be used, need to be known by a SCHC C/D entity before communication
    - Rules need to be written beforehand anyway
    - draft-ietf-lpwan-architecture, now referenced
6. Multihop communication

• Route-Over
  – Straightforward approach (MAY), all nodes MUST store all the Rules in use in the network
    • Suitable for/when: small networks, static context, no significant memory issues
  – If RPL is used, RPL non-storing mode and RFC 8138 MAY be exploited
    • An endpoint MUST store the Rules for the communications it is involved in

• Mesh-Under
  – An endpoint MUST store the Rules for the communications it is involved in
    • A RuleID MAY be reused across disjoint pairs of endpoints
7. Fragmentation and reassembly

• In a Route-Over multihop network
  – Virtual Reassembly Buffer (VRB), RFC 8930, SHOULD be used
    • Unless caveats (section 6 of RFC 8930) are unacceptable
      – Non-zero packet drop probability
      – No fragment recovery (addressed in RFC 8931)
      – No per-fragment routing
Comments/Questions?

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Annex

• Question: LoWPAN_NHC for SCHC?
  • RFC 6282 to compress the IPv6 header
  • SCHC to compress CoAP (/UDP?) header

• If yes, separate document?
  • Motivation is somewhat different...
Annex

• RFC 6282: the basis for header compression in 6LoWPAN
  • 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
Annex

• 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