draft-gomez-lpwan-fragmentation-header-03

Carles Gomez, Josep Paradells
Universitat Politècnica de Catalunya / Fundació i2cat

Jon Crowcroft
University of Cambridge
Updated content (I/III)

• Fragmentation header
  – From 3-byte to 2-byte format

• First fragment

• Subsequent fragments
Updated content (II/III)

• Format now not bound to 6LoWPAN dispatch
  – To be aligned with LPWAN work on header compression

• Name
  – Old: Optimized 6LoWPAN Fragmentation Header for LPWAN (6LoFHL)
  – New: LPWAN Fragmentation Header (LFH)
Updated content (III/III)

- Adaptation layer fragmentation header overhead (bytes)

<table>
<thead>
<tr>
<th>IPv6 datagram size (bytes)</th>
<th>11</th>
<th>40</th>
<th>100</th>
<th>1280</th>
</tr>
</thead>
<tbody>
<tr>
<td>L2 payload (bytes)</td>
<td>4944</td>
<td>LFH</td>
<td>4944</td>
<td>LFH</td>
</tr>
<tr>
<td>10</td>
<td>----</td>
<td>4</td>
<td>----</td>
<td>10</td>
</tr>
<tr>
<td>15</td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>8</td>
</tr>
<tr>
<td>20</td>
<td>0</td>
<td>0</td>
<td>19</td>
<td>6</td>
</tr>
<tr>
<td>25</td>
<td>0</td>
<td>0</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>30</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>4</td>
</tr>
</tbody>
</table>
Discussion: 1-byte format?
Option A

- **Possible format**
  - 1 bit: fragmentation header or not
  - 7 bits: fragment number
  - No tag, no ‘more fragments’ bit

- **Is this feasible at all?**
  - LoRaWAN: yes (enough to number all fragments for a 1280-byte packet)
  - Sigfox: yes (uplink), no (downlink)
Option A: issues

- Incomplete packets
  - E.g. received sequence of fragments 1, 2, 1, 2, 3, 4
    - If two packets carried by 4 fragments each had been sent, the first one is incomplete

- Additional delay
  - Receiver does not know when all fragments of a packet have been received
    - Must wait for a time that, given message rate constraints, may be significant

- Apparently correct reassembly
  - E.g. received sequence of fragments 1, 2, 3, being in reality 1-A, 2-B, 3-B
Option B

• Possible format
  – 1 bit: fragmentation header (or not)
  – 1 bit: more fragments (or not)
  – 6 bits: fragment number
  – No tag

• Is this feasible at all?
  – LoRaWAN: yes (enough to number all fragments for a 1280-byte packet)
  – Sigfox: no
Option B: issues

- No incomplete packets issue
  - The ‘more fragments’ bit allows to identify incomplete packets
- No additional delay
  - Receiver knows whether all fragments of a packet have been received
- Apparently correct reassembly
  - E.g. received sequence of fragments 1, 2, 3, being in reality 1-A, 2-B, 3-B
Summary

- **LoRaWAN**
  - Can use option B
  - 1-byte, but ‘apparently correct reassembly’ issue

- **Sigfox**
  - Can use option A for the uplink (only)
  - 1-byte, but ‘incomplete packets’, ‘apparently correct reassembly’, and ‘additional delay’ issues