Packet Delivery Deadline Time in 6LoWPAN Routing Header

draft-lijo-6lo-expiration-time-04

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Motivation and Background

• Delay sensitive industrial M2M IoT applications
• Packet expiration assists in meeting delay constraints in deterministic network
• Positive response from the 6TiSCH ML
• Interest from in-band-oam draft authors to include packet expiration time in IPv6 Header
• Applicability: 6lo, 6tisch, roll, and detnet
Overview

- Deadline-6LoRHE type for 6LoWPAN dispatch page 1
  - Carries Packet Delivery Deadline Time
  - Optional Packet Origination Time
- Enables delay-aware forwarding and scheduling decisions
- Operates on time-synchronized constrained networks
- Handles different time zones over heterogeneous networks
# Deadline – 6LoRHE Format

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>Length</td>
</tr>
<tr>
<td>2</td>
<td>O</td>
<td>D</td>
<td>DTL</td>
</tr>
<tr>
<td>3</td>
<td>OTL</td>
<td>TU</td>
<td>EXP</td>
</tr>
</tbody>
</table>

**6LoRH Type = TBD**

**DT (Variable length)**

**DTL**

- [bbb]+1 = Length of DT field
- 000: Length of DTL is “1 octet”
- 111: Length of DTL is “8 octets”

**OTL**

- [bbb]+1 = Length of OT field
- 000: Length of OTL is “1 octet”
- 111: Length of OTL is “8 octets”

<table>
<thead>
<tr>
<th>Flag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>O flag</td>
<td>Origination Time flag</td>
</tr>
<tr>
<td></td>
<td>1: Origination Time is present</td>
</tr>
<tr>
<td></td>
<td>0 : Origination Time is absent</td>
</tr>
<tr>
<td>D flag</td>
<td>Drop flag</td>
</tr>
<tr>
<td></td>
<td>1 : SHOULD drop the packet if the deadline</td>
</tr>
<tr>
<td></td>
<td>time is elapsed</td>
</tr>
<tr>
<td></td>
<td>0 : MAY ignore and forward</td>
</tr>
</tbody>
</table>

**TU**

- Indicates the time units for DT and OT
- 00 : Time in microseconds
- 01 : Time in seconds
- **10 : Network ASN**
- 11 : Reserved

**EXP**

- Multiplication factor (exponent of base 10)

**RSV**

- Reserved

**DT**

- Deadline Time value (8..64-bit)

**OT**

- Origination Time value (Optional) (8..64-bit)
Draft Implementation

• Implemented the draft in OpenWSN platform for a 6tisch network

• The code has been merged with OpenWSN and is available for download!!
  ▪ https://github.com/openwsn-berkeley/openwsn-fw
  ▪ https://github.com/openwsn-berkeley/openwsn-sw

  ▪ Thanks OpenWSN team for your support !!!!

• Recently implemented a basic EDF scheduling policy to demonstrate the draft’s applicability
Way Forward

• A scheduling function based on this draft to enable realization of applications with deadlines

Comments and Questions

Thanks !!!