

# LPWAN WG

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## Reminder:

Minutes are taken \*

This meeting is recorded \*\*

Presence is logged \*\*\*

- \* Scribe; please contribute online to the minutes at: <http://etherpad.tools.ietf.org:9000/p/lpwan>
- \*\* Recordings and Minutes are public and may be subject to discovery in the event of litigation.
- \*\*\* From the Webex login

# Agenda bashing

16:00> Opening, agenda bashing (Chairs) [2min]

- Note-Well, Blue Sheets, Scribes, Agenda Bashing
- Milestones

16:02> Status of Drafts (Chairs) [5min]

16:07> LPWAN Overview Presentation and Discussion (Stephen Farrel) [10min]

- <https://datatracker.ietf.org/doc/draft-ietf-lpwan-overview/>

16:17> Static Context Header Compression for IPv6 and UDP (Ana, Laurent) [15min]

- <https://datatracker.ietf.org/doc/draft-ietf-lpwan-ipv6-static-context-hc/>

13:32> Static Context Header Compression Fragmentation Header (Carles Gomez) [20min]

- <https://datatracker.ietf.org/doc/draft-ietf-lpwan-ipv6-static-context-hc/>

13:52> LPWAN Static Context Header Compression (SCHC) for CoAP (Laurent) [5min]

- <https://datatracker.ietf.org/doc/draft-ietf-lpwan-coap-static-context-hc/>

# Status

WG formed October 14<sup>th</sup>

- Charter item #1 (Informational document)
  - Baseline technology description
- Charter item #2 (Standards track document)
  - Enable the compression and fragmentation of a CoAP/UDP/IPv6 packet over LPWA networks

# Charter - Milestones

## Milestones

**Date**    ⇄    **Milestone**

Jul 2017    Submit CoAP compression mechanism to the IESG for publication as a Proposed Standard

May 2017    Submit IP/UDP compression and fragmentation mechanism to the IESG for publication as a Proposed Standard

Apr 2017    Submit LPWAN specification to the IESG for publication as an Informational Document

**Done**    Adopt CoAP compression mechanism as a WG item

**Done**    Adopt IP/UDP compression and fragmentation mechanism as a WG item

**Done**    Adopt LPWAN specifications as WG item

# IETF 98 Action items

- Announce decision of SCHC IP/UDP/CoAP document structure.
- Follow-up on the WI-SUN contribution for the LPWAN overview document.
- Identify reviewers for the IP/UDP draft.
- Follow-up on the reviewers who volunteered to review the SCHC CoAP draft.
  - Diego Dujovne, Juan-Carlos Zuniga, Michel Veillette Carsten Borman

# LPWAN Overview

Editor: Stephen Farrell  
(many contributors)

# Wi-Sun Contribution?

- Expected, no received
- « I think the only action wrt the overview is that since we have no new contributed text with references on Wi-Sun (as was promised in Chicago) we ought decide to excise that section or to take some other action that would allow us to finish. »

# LPWAN IPv6/UDP SCHC

Authors:

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Carles Gomez <carlesgo@entel.upc.edu>

# Changes in IPv6 HC

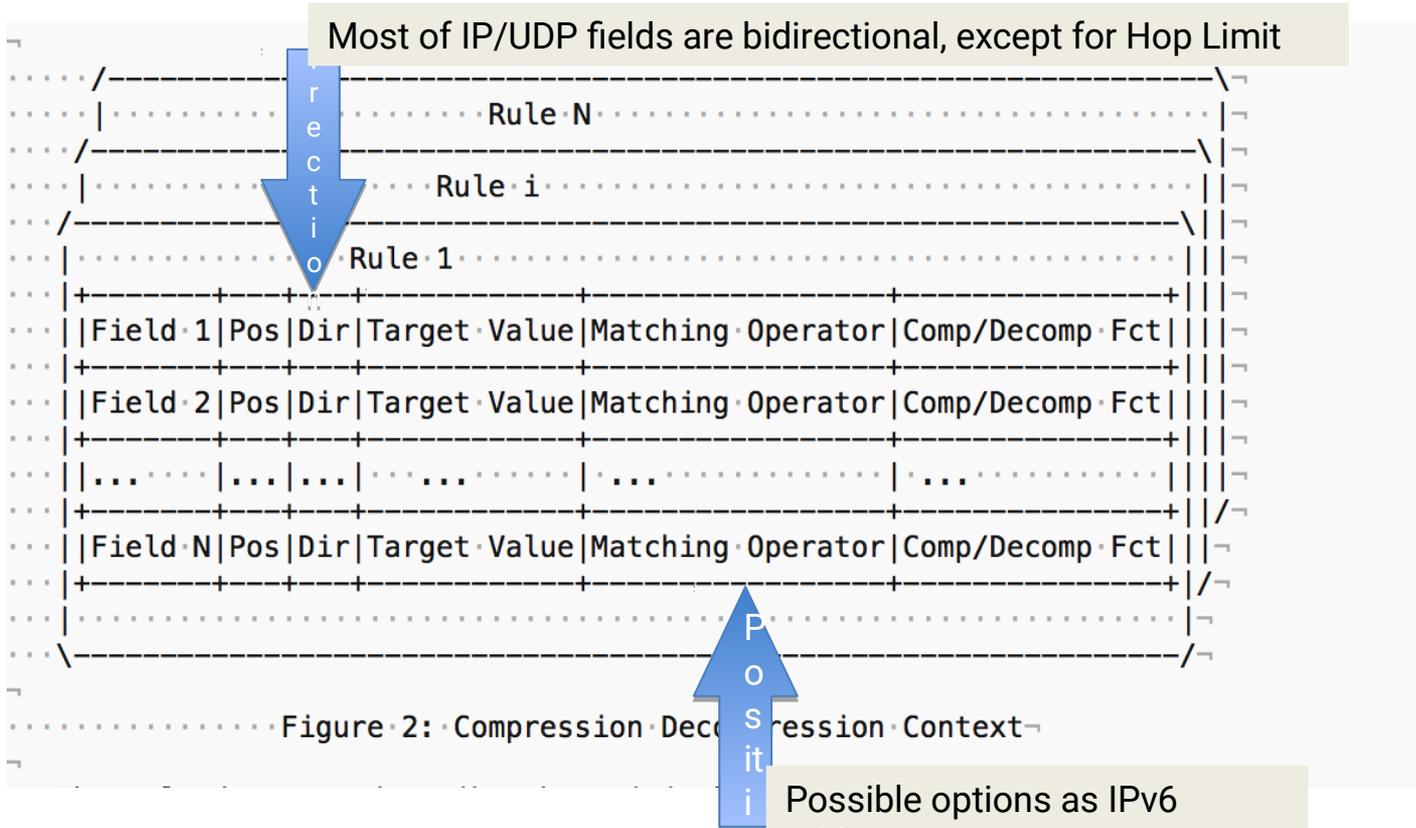
# Status

- Proposed updates to draft-ietf-lpwan-ipv6-static-context-hc
  - Intended as basis of new content for -03
- Input from the list and from hallway meetings
  - Thanks!
- New text already on github
  - <https://github.com/lp-wan/ip-compression>

# Major changes

- Move all CoAP SCHC specific behavior in IPv6
  - Directions
    - used for HL
  - Position
    - mapping-sent
- Simplify LSB
  - No arguments
  - Compressed field length – MSB specified size
  - Useful for variable length fields
- Define the size of mapping-sent
  - The minimum number of bit to send the index

# Rules



# Compression Decompression Functions

- Add *mapping-sent* (from CoAP draft)
  - Index is sent corresponding to the FV
    - { 0: 2001:db8:1:1,  
1: 2001:db8:2:3  
2: 2001:db8:3:7}
- Rename *compute-length* and *compute-checksum*
  - More generic (IPv6, UDP, ...)

# Fragmentation

# Reliability options: definition

- Clarifying the available reliability options
- Reluctance about “NACK” term
- Reliability options
  - No ACK
  - Packet mode – ACK “Always”
  - Packet mode – ACK on error
  - Window mode – ACK “Always”
  - Window mode – ACK on error
- New terms used throughout current working (github) version
  - Instead of the former UnR, RpP, RpW

# Reliability options: discussion

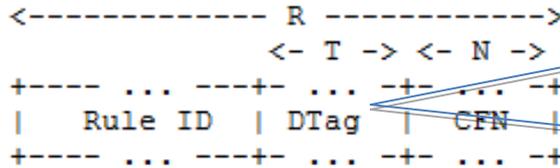
- Discussion on pros/cons of each reliability option
  - Text plus summary table
  - ‘No ACK’ not in the table: not actually tied to Packet or Window

	Packet mode	Window mode
ACK on error	+ Low ACK overhead - Long loss burst - No flow control	(Use case unknown)
ACK "always"	+ Moderate ACK overh. - Long loss burst - No flow control	+ Flow control + Long loss burst - Higher ACK overh.

Figure ZZZ: Summary of fragment delivery options that provide receiver feedback, and their main advantages (+) and disadvantages (-)

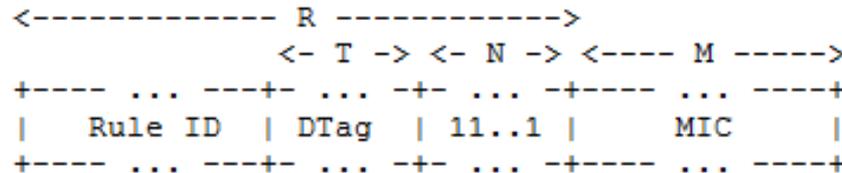
# Fragmentation header formats

- Not the last fragment:



- Datagram Tag
- Allows interleaving fragments from different IPv6 datagrams
- Sequentially increasing
- Starts from 0, wraps from  $2^T-1$  to 0
- $T \geq 0$

- Last fragment:

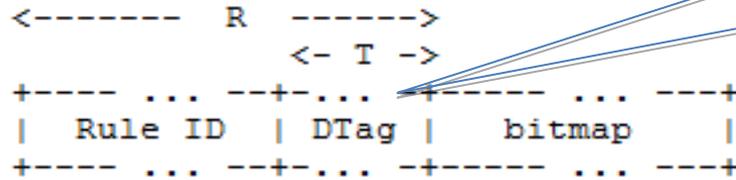


R, T, N, M to be decided by underlying L2 technology

Rule ID to signal "a fragment": allows interleaving non-fragmented and fragmented IPv6 datagrams

# ACK format

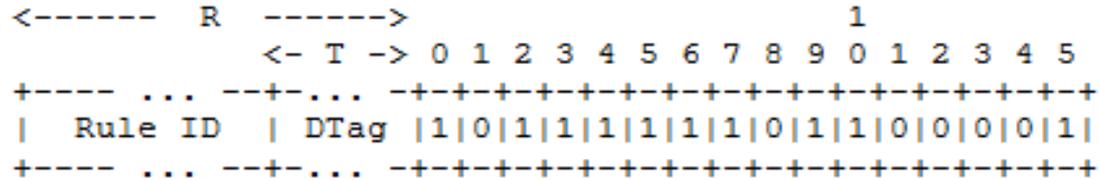
- General format



- Same value as DTag in the fragments for which this ACK is provided

- Example

- 11 fragments, 2nd and 9th lost



# ACK on error timer

- Upon reception of the first fragment from an IPv6 datagram, the receiver starts a timer
- The timer is reset every time a new fragment (same IPv6 packet) is received
  - Assumption: not many long bursts of losses, so the initial timer value may be kept relatively small (e.g. a few expected RTTs)
  - Difficult to estimate the time needed for a whole packet or window (may be large)
- Upon timer expiration
  - Packet mode: if last fragment not received, ACK transmitted
  - Window mode: if last frag of window not received, ACK transm.

# ACK “Always” timer

- Sender starts a timer upon sending last fragment
  - Of the packet (Packet mode)
  - Of the current window (Window mode)
- Upon timer expiration, if no ACK received
  - Sender retransmits last fragment and restarts the timer

# Fragment renumbering

- Minimize ambiguity about resent frags in Packet

mode

```

Sender                Receiver
|-----CFN=6----->|
|-----CFN=5----->|
|-----CFN=4---X--->|
|-----CFN=3----->|
|-----CFN=2---X--->|
|-----CFN=1----->|
|-----CFN=0----->|
|-----CFN=6----->|
|-----CFN=5----->|
|-----CFN=4---X--->|
|-----CFN=7----->|MIC checked =>
|<-----ACK-----|bitmap:1101011110100001
|-----CFN=4----->|
|-----CFN=2----->|
|-----CFN=4----->|MIC checked =>
|<-----ACK-----|no bitmap
(End)
  
```

In -02

```

Sender                Receiver
|-----CFN=6----->|
|-----CFN=5----->|
|-----CFN=4---X--->|
|-----CFN=3----->|
|-----CFN=2---X--->|
|-----CFN=1----->|
|-----CFN=0----->|
|-----CFN=6----->|
|-----CFN=5----->|
|-----CFN=4---X--->|
|-----CFN=7----->|MIC checked
|<-----ACK-----|bitmap:1101011110100001
|-----CFN=6----->|
|-----CFN=5----->|
|-----CFN=4----->|MIC checked =>
|<-----ACK-----|no bitmap
(End)
  
```

Fragment renumbering

- As for a new sequence of fragments  
 - But last resent frag does not carry

CFN=11..1

# Aborting a fragmented transmission

- Support both sender and receiver aborting fragm'ed tx
- If fragment sender aborts
  - It sends a format equivalent to a fragmentation header (without MIC) with Rule ID set to TBD\_ABORT\_TX, and CFN=11..1
- If fragment receiver aborts
  - It sends a Rule ID set to TBD\_ABORT\_RX
- Resources are released
- Question
  - Aborting one specific IPv6 datagram vs aborting all on-going interleaved fragmented IPv6 datagram transmissions?

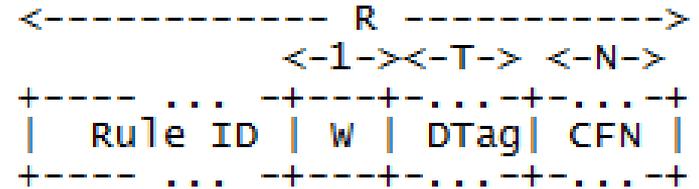
# Editorial improvements

- In different sections (e.g. also in the Introduction section)
- No reordering assumption now introduced
  - In the Introduction section
  - In the introductory part of the Fragmentation section

# Pending

- Window bit for Window mode

- What about this?



- L2 MTU variation

- Problem: L2 MTU becomes smaller and fragments need to be resent
  - Option 1: abort the IPv6 datagram transmission?
  - Option 2: trying to handle this (complex, increases overhead)

- Quick downlink fragment delivery

- In some technologies, DL transmission only possible after UL transmission
  - Uplink feedback after each fragment as an option?

- A section to describe the tools before we use them

- CFN, ACK, bitmap, datagram tag...

# LPWAN CoAP SCHC

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# CoAP

- No more normative
- Description of CoAP fields compression
  - Work in progress...
- Read it !
- Questions on
  - Block / fragmentation
- Analysis of common exchanges
  - CoMi, LWM2M, IoTivity ?
  - URI-path/Query not flexible: is it a problem?
- Definition of timers:
  - Impact in MID and Token size.

**AOB ?**