LPWAN WG

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Interim, September 12th, 2017

Webex

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Minutes are taken *
This meeting is recorded **
Presence is logged ***

* Scribe; please contribute online to the minutes at: https://etherpad.tools.ietf.org/p/lpwan
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*** From the Webex login

Agenda bashing

17:00	Opening, agenda bashing (Chairs) • Note-Well, Scribes, Agenda Bashing, Approval minutes from last meeting • Review todo • Status of drafts (WGLC / forthcoming WGLC)	10mn
17:10	LPWAN Overview - WGLC status and updates	5mn
17:15	Milestone updates and new items (Chairs)	5mn
17:20	SCHC - Adding a length field for rules (Arun)	10mn
17:30	SCHC – LPWAN Fragmentation (Carles)	10mn
17:40	SCHC - Fragmentation optimization + FSM (Laurent)	20mn
17:xx	AOB	QS

Last meeting Action items

- ~~Start WGLC Process for LPWAN overview~~
- ~~CG: Default fragmentation mode (Window mode)~~
- DB, DD: Review SCHC IP/UDP fragmentation

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

Charter – Milestone updates

Milestones

	Milestone
Jan 2018	Submit CoAP compression mechanism to the IESG for publication as a Proposed Standard
Nov 2017	Submit IP/UDP compression and fragmentation mechanism to the IESG for publication as a Proposed Standard
	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

WG Rechartering

- ICMP Compression (draft from Diego)
- SCHC over specific LPWAN technologies
  - Profile Technologies.
  - Develop the different document for each technology in order to define the different parameters.
- Security, all the security solution for the LPWAN
- Rules-ID's management – Use to identify some specific cases:
  - Fragmentation
  - Format Values
  - Rule-IDs dedicated for some specific cases as CBOR structure representation, fragmentation, etc
  - The way to use the Rule-Id and their configuration
- YANG data modeling for SCHC

(Ana Minaburo's slide presented at IETF99)

IETF 100

- 2Hours? More?
- ~70 people?
- Exclusions?

LPWAN Overview

Editor: Stephen Farrell
(many contributors)

WGLC status and updates

Some minor WGLC comments

But nothing that ought delay IETF LC

Stephen is ready for pushing out a new rev at the end of IETF LC with whatever's sent to the list(s) since the current rev went out.

Then shoot in the pub-req and let's move it along.

SCHC

Authors:
Ana Minaburo <ana@ackl.io>
Laurent Toutain <laurent.toutain@imt-atlantique.fr>
Carles Gomez <carlesgo@entel.upc.edu>

SCHC Compression

- Dominique Barthel input request
- Carles modification on fragmentation part
- Document reordering text:

Representing Length field in the Rule draft-ietf-lpwan-ipv6-static-context-hc-05

Authors:
Arunprabhu Kandasamy <arun@ackl.io>

Why we need it?

"The receiver must be able to find the size of each compressed field which can be given by the rule or may be sent with the compressed header" [Section:6, pg: 11]

- Compressor/Decompressor shall use the length from rule for CDA's

- makes life easier for interop
  - we spent considerable amount of time in rewriting the rules during interop @ Prague

How can it be done?

- A new column "length" in the context table.
- represent the length in bits for each fileds.
- use '0' to represent variable length fields.

LPWAN SCHC Fragmentation

Authors:
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Carles Gomez <carlesgo@entel.upc.edu>

Outline

- Status
- Outstanding issues/details reported on the list
  - 1. Window mode – ACK "always"
    - Retries in the last window
  - 2. Window mode – ACK "always"
    - MAX_FRAG_RETRIES and MAX_ACK_REQUESTS
  - 3. Window mode – ACK on error
    - MAX_FRAG_RETRIES

Status

- Last version published is -05
- Updated working version already available on GitHub:
  - https://github.com/lp-wan/ip-compression

Item 1 (I/III)

- Window mode – ACK "always"
  - Retries in the last window
  - Problem: not clear for a receiver when to check the MIC and send an ACK after fragment retries in the last window
    - E.g. the last retransmitted fragment might not be FCN=2^N-1

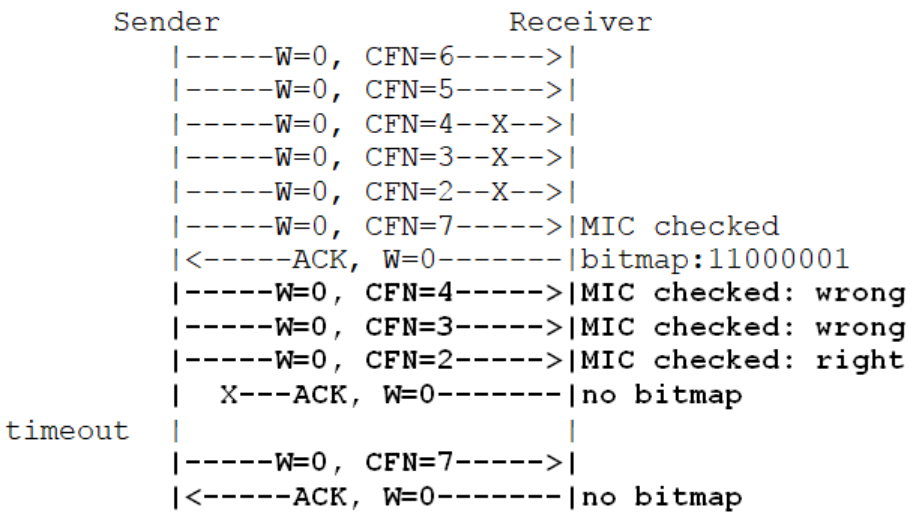
Item 1 (II/III)

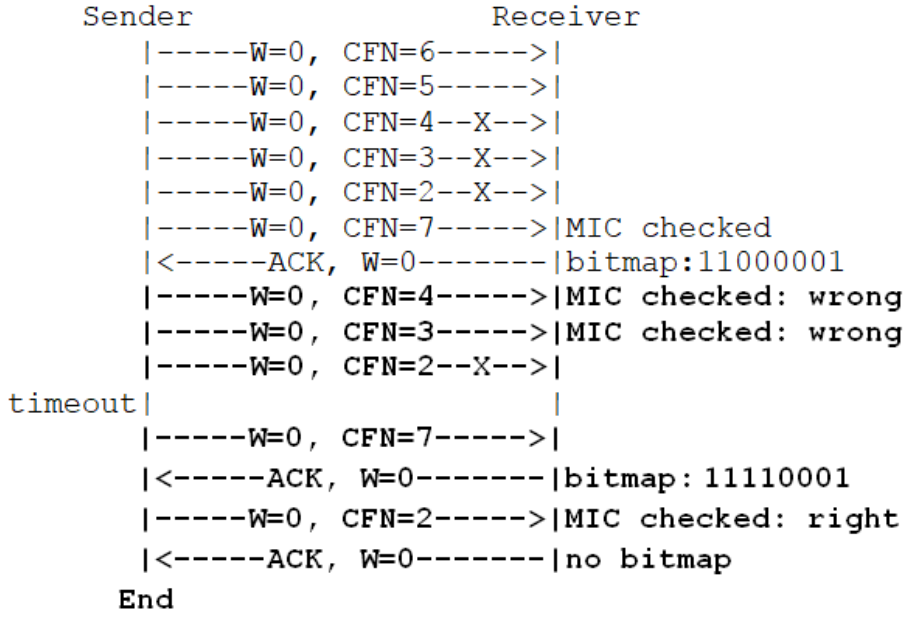
- Solution (based on Laurent's email)
  - After frag FCN=2^N-1 received, check MIC after each retransmitted frag received
  - If reassembly OK, frag receiver sends the ACK

```
Sender                    Receiver
   |-----W=0, CFN=6----->|
   |-----W=0, CFN=5----->|
   |-----W=0, CFN=4--X-->|
   |-----W=0, CFN=3--X-->|
   |-----W=0, CFN=2--X-->|
   |-----W=0, CFN=7----->|MIC checked
   |<-----ACK, W=0-------|bitmap:11000001
   |-----W=0, CFN=4----->|MIC checked: wrong
   |-----W=0, CFN=3----->|MIC checked: wrong
   |-----W=0, CFN=2----->|MIC checked: right
   |<-----ACK, W=0-------|no bitmap
```

Item 1 (III/III)

- If no ACK arrives, ACK "always" timer expires
- Frag FCN=2^N-1 is resent





Item 2

- Window mode – ACK "always"
  - MAX_FRAG_RETRIES
    - Maximum number of retries for a specific fragment reported in an ACK to be lost
  - MAX_ACK_REQUESTS
    - Maximum number of requests for a specific ACK
    - Might be e.g. a greater value than MAX_FRAG_RETRIES (e.g. for very large windows)
- Proposal: simplify into a single parameter
  - Actually, only MAX_ACK_REQUESTS applies

Item 3

- MAX_FRAG_RETRIES
  - Currently only defined for ACK "always"
  - ACK on error:
    - Currently, the receiver sends an ACK and expects frag retries
    - Might also be a way to deplete the battery of an end-device?
  - Some options:
    - a) Define MAX_FRAG_RETRIES also in ACK on error?
      - If yes, allow up to "infinite" retries and defer to SCHC over foo documents?
    - b) Handle this only at an implementation level?

No feedback from the list so far …

Thanks!

Comments?

Authors:
Ana Minaburo <ana@ackl.io>
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Carles Gomez <carlesgo@entel.upc.edu>

SCHC

Fragmentation optimization

Authors:
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Carles Gomez <carlesgo@entel.upc.edu>

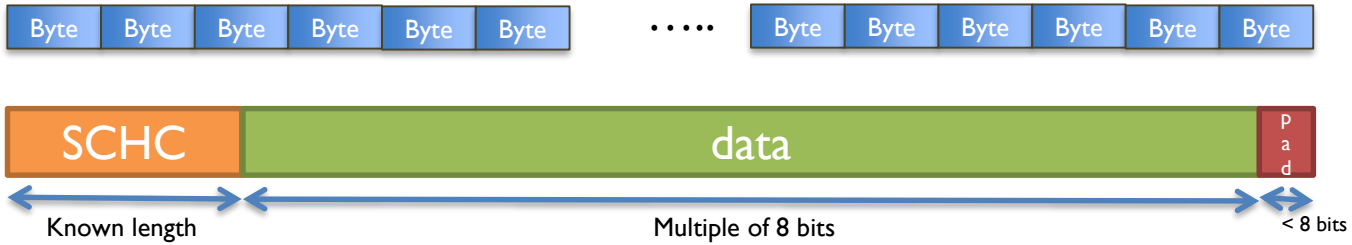
Fragmentation optimization

Notation:

- All-0 frag: all the bits of FCN are set to 0
- All-1 frag: all the bits of FCN are set to 1
- All-x frag: either All-0 or All-1 frag

Padding issue

- LPWAN is aligned on bytes
- SCHC ruleid/Dtag/W/LCN may break this alignment.



Data frame

Sigfox downlink (padding > 8 bits): must be solve in SCHC d

Bitmap frame

Problem with Abort message

The entity (either the fragment sender or the fragment receiver) that triggers abortion transmits to the other endpoint a format that only comprises a **Rule ID (of size R bits)**, which signals abortion of all on-going fragmented IPv6 packet transmissions.

SCHC: RRDD WNNN

Abort: RR**PP PPPP**

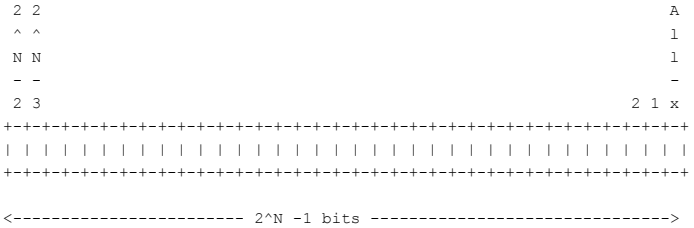
- Possible Confusion
- Proposal: use empty All-1 frag
  - Regular All-1 frag carries the MIC
  - Length < MIC length => Abort
  - Do not abort all the Dtag transmissions
  - Work only in sender to receiver direction
    - Is it enough, can receiver trigger an Abort ?

All-x frag optimization

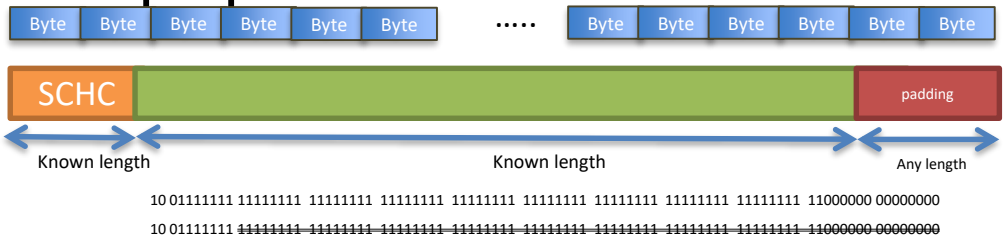
- All-x frag are used to request ack from receiver
  - In normal fragmentation process All-x should contain:
    - 1 byte for All-0 frag
    - MIC-size + 1 byte for All-1 frag
  - Sending empty ack for bitmap transmission:
    - All-0 frag (SCHC+pad [no data]) or
    - All-1 frag (SCHC+MIC+pad [no data])
      - Empty All-1 frag (SCHC+pad) is abort message.

Ack Optimization

- Bitmap structure:



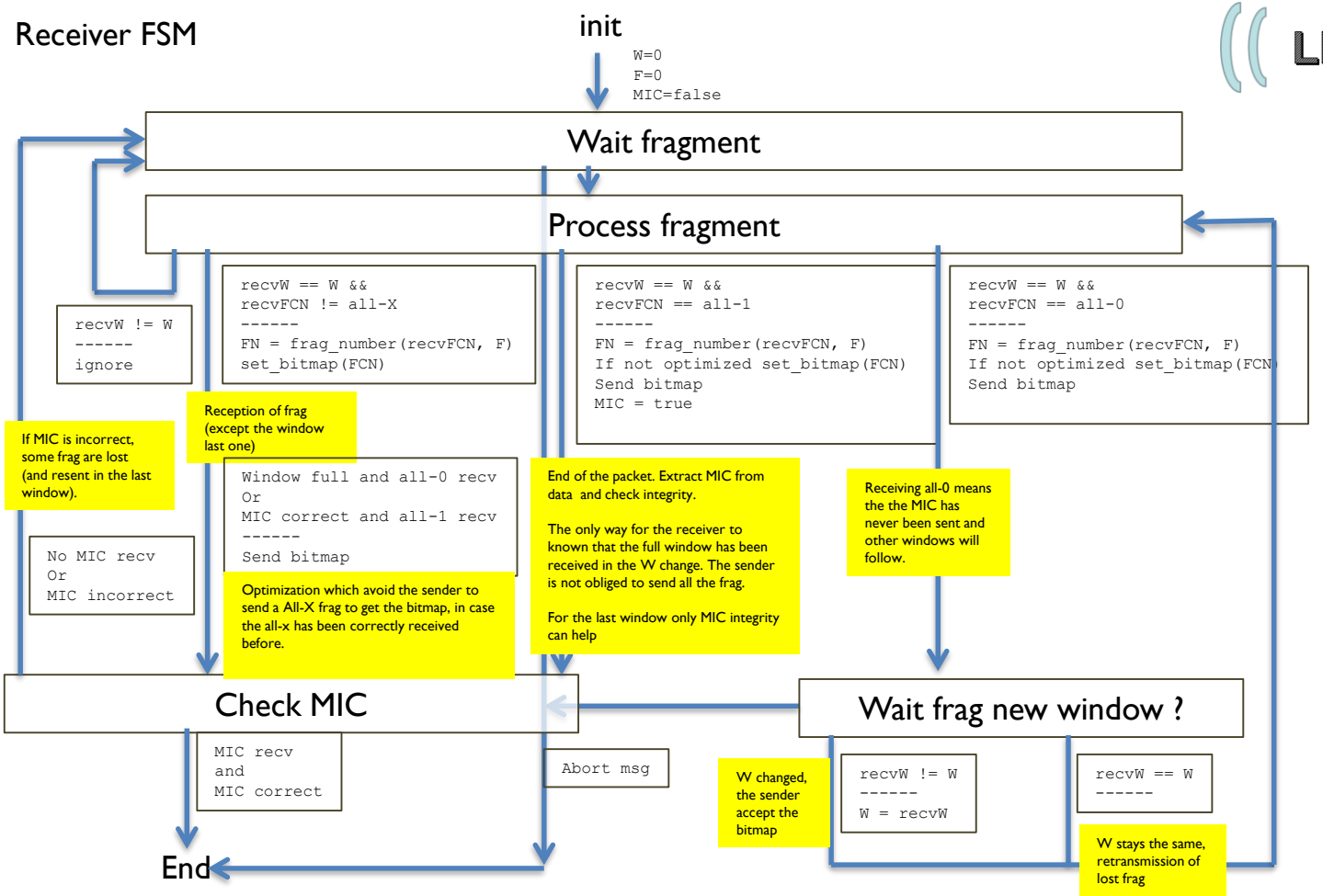
- Bitmap optimization:



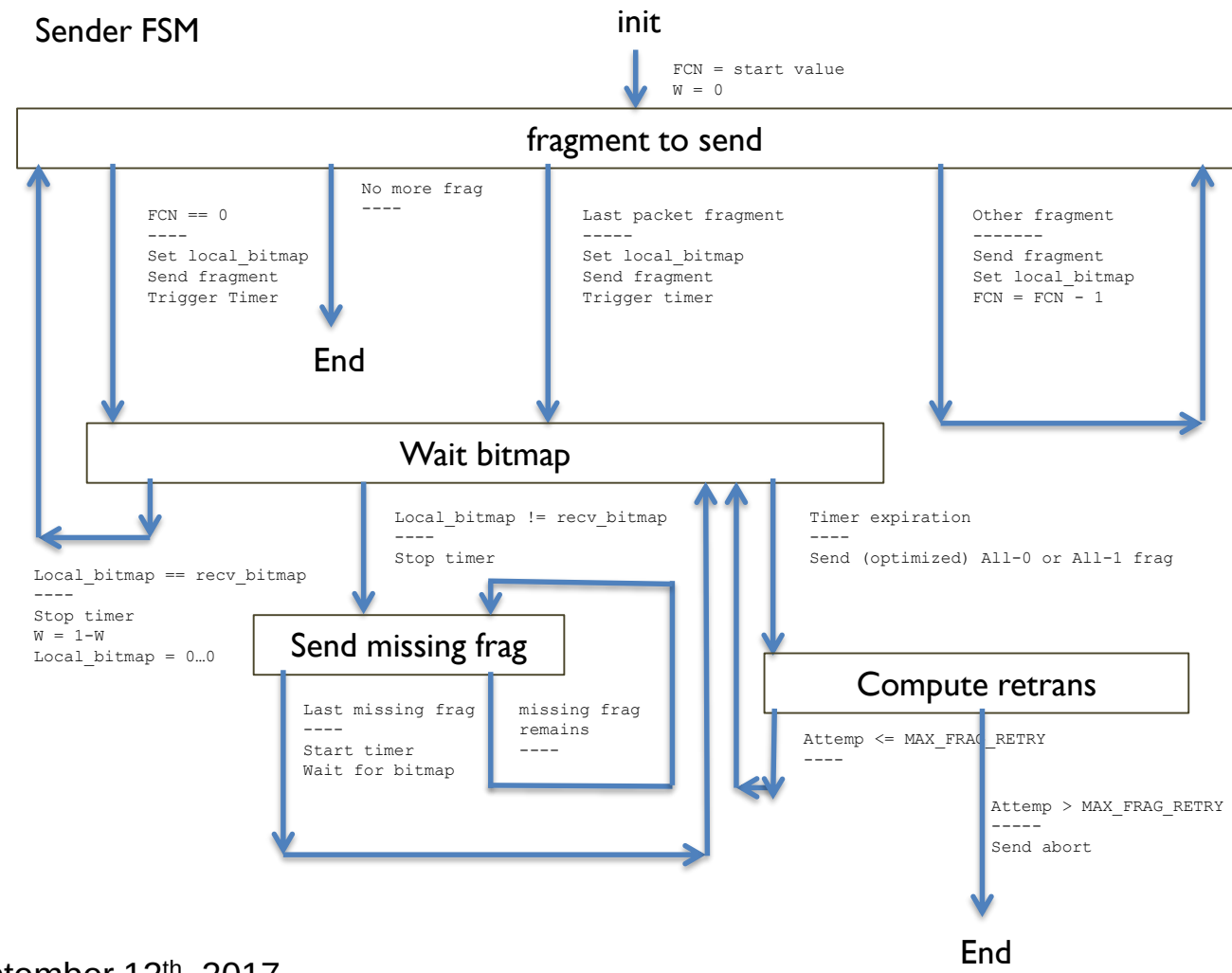
Does not work if error are on left bitmap part, but full received window can be compressed

Impose always 1 Byte of bitmap : 0 Byte of bitmap => abort ?

Receiver FSM



Sender FSM


init
FCN = start value
W = 0
fragment to send
FCN == 0

Set local_bitmap
Send fragment
Trigger Timer
No more frag

End
Last packet fragment

Set local_bitmap
Send fragment
Trigger timer
Other fragment

Send fragment
Set local_bitmap
FCN = FCN - 1
Wait bitmap
Local_bitmap == recv_bitmap

Stop timer
W = 1-W
Local_bitmap = 0…0
Local_bitmap != recv_bitmap

Stop timer
Timer expiration

Send (optimized) All-0 or All-1 frag
Send missing frag
Last missing frag

Start timer
Wait for bitmap
missing frag
remains

Compute retrans
Attemp <= MAX_FRAG_RETRY

Attemp > MAX_FRAG_RETRY

Send abort
End

AOB ?