

Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)

Submission Title: [802.15.4 Profile for IETF SCHC]

Date Submitted: [14 March 2019]

Source: [Charlie Perkins] Company [Futurewei]

Address [2330 Central Expressway, Santa Clara Ca, USA]

Voice:[+1.408-330-4586]

E-Mail:[charlie.perkins@huawei.com]

Re: [SC IETF topic for SCHC header compression]

Abstract: [Discussion about ways to use SCHC with 802.15.4]

Purpose: [Develop document text for IETF [lpwan] submission]

Notice: This document has been prepared to assist the IEEE P802.15. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.

Release: The contributor acknowledges and accepts that this contribution becomes the property of IEEE and may be made publicly available by P802.15.

Activities in some relevant groups

- 802.15.4w sent out for Letter Ballot
- 802.15.4x approved by IEEE-SA
- 802.15.10a approved by IEEE-SA
- Coexistence concerns between 802.11ah and 802.15.4g
- Progress in 802.15.12 – API definitions
 - Next: internal module structure / interfaces

SCHC – Static Context Header Compression

- Static Context:
 - Topology
 - Application (i.e., kind of traffic)
 - Packets always delivered in order
- Fragmentation modes
 - Never Ack
 - Always Ack
 - Ack on Error

Minimal SCHC Fragment Header sizes

- RuleID: two or three bits minimum
- Dtag: can be zero
- W: at least one bit if windows are used
- FCN: probably at least two bits

Let's say one byte.

Plus, MIC

Comparing Fragmentation

- For SCHC, fragmentation overhead is:
 - ~1 byte / fragment
 - plus SCHC MIC
 - ❖ Request SC IETF to recommend Profile setting MIC=0, since 802.15.4 *will* check
 - plus 802.15.4 header per fragment (5-7 bytes)
 - ❖ How much can we compress MHR?

Goal 1: Optional SCHC MIC

- No need to have FCS and MIC on every reassembled frame, may well be identical
- SC IETF agreed it would be proper to request MIC = 0

Frame Composition

2	1	2	2	0	2	1	4	1	0	Variable	Max Frame Size-?all other fields			4	2
Octets: 2	0/1	0/2	0/2/8	0/2	0/2/8	1	0/4	0/1/5/9	Variable	Variable	Variable			0/4/8/16	2/4
Frame Control	Sequence Number	Dest PAN ID	Dest Addr	Source PAN ID	Source Addr	Security Control	Frame Counter	Key Identifier	Header IEs	Payload IEs	Data Payload			MIC	FCS
MHR									MAC Payload					MFR	

802.15.4 Fragmentation overhead

- 802.15.4 only defines for LECIM
- FCSD IE required prior to fragments (4)
- Fragment acknowledge – Table 23-4
- Fragment header (2)
- FICS on every fragment – (2) or (4)

Minimal 802.15.4 frame format

- General frame format defined in 7.2
- 3 bits for Frame type
- 0 bits for PAN IDs, Source/Dst Address
- 0 bits for IEs
- 2/4 bytes for FCS

Frame type values

Frame type value	Description
$b_2 b_1 b_0$	
'000	Beacon
'001	Data
'010	Acknowledgment
'011	MAC command
'100	Reserved
'101	Multipurpose
'110	Fragment or Frak
'111	Extended
The Fragment and Frak formats are defined in 23.3.3 and 23.3.6.2, respectively.	

Possibility for a new Frame Type

- Frame type 0b'100' is "Reserved"
- Frame type 0b'111' is "Extended"
- Frame type 0b'110' is "Interesting"

If a new frame type is possible, the next bits could be the SCHC header

➤ RuleID, DTAG, W, ...

Questions

- How to minimize 802.15.4 MAC header overhead?
- Should the document be only for 15.4w?
- Should we consider specifying an extended frame type?
- Does SCHC require security? How shall we compare 802.15.4 security versus SCHC security?

Observations

- 802.15.4 MIC is cryptographically secure and typically is done on-chip
- SCHC MIC is a CRC checksum and not secure. Should call it FCS, not MIC