**IEEE P802.15**

**Wireless Personal Area Networks**

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| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) | |
| Title | **Resolutions for comment rows 458, 461, 462, 465** | |
| Date Submitted | August 2017 | |
| Source | Billy Verso (Decawave), | billy.verso (at) decawave.com |
| Re: | Comment resolutions of 802.15.8 -- SB1 | |
| Abstract | This gives a proposed resolution to the indicated comment from the first sponsor ballot of the 802.15.8 draft standard. | |
| Purpose | The purpose of this document is to resolve the comment | |
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| **Comment row: 458** (Comment ID: 22806100023) | |
| Location detail: | **Clause 6.12.4, Page 97, line 16** |
| Comment: | Aligned to the superframe is due to the preamble in the SHR of the PPDU; the MAC frame can be anything. |
| Suggested change: | Rephrase to include the preamble in the SHR. |

**Discussion:**

This paragraph says:

* The new PD turns on its receiver to listen for Sync frames and aligns to the superframe if any are received. The PD notes any discovery information provided by the received Sync frames along with the other information about CFP and CAP usage, and peering being accepted.

I suppose that this paragraph is leaving the method somewhat unexplained, I had thought these steps to be straightforward and relatively obvious but perhaps it is worth stating them for clarity sake….

**Resolution:**

Comment sheet “Disposition Detail” shall say:

“ACCEPT IN PRINCIPLE. The text will be modified as described in 15-17-0462”.

***Make the following changes to resolve this comment:***

***With respect to the draft “P802.15.8-D4.0.MEC.pdf”, modify clause 6.12.4, page 97, line 16, as shown in the following tracked change:***

In summary, the process consists of:

* The new PD turns on its receiver to listen for Sync frames and aligns to the superframe, (as described in 6.12.4.1.1), if any are received. The PD observes any discovery information provided by the received Sync frames along with the other information about CFP and CAP usage, and peering being accepted.

***In addition, insert new sub-clause 6.12.4.1.1 at the end of 6.12.4.1 before 6.12.4.2 begins:***

6.12.4.1.1 Alignment to superframe start

The alignment of the superframe boundary may be calculated as follows:

Using the arrival time-stamp (*TA*) of the physical layer frame, which is the RMARKER arrival time, and knowing the SHR length (*LSHR*) in symbols, the start time of the physical frame (*TSTART*) may be calculated as:

*TSTART* = *TA* – *LSHR* ˟ *Tpsym*   
  
where *Tpsym* is the preamble symbol duration.

The Sync Delay Code field of the Sync frame indicates the transmission delay applied with respect to the slot start time (*TSS*), which may thus be calculated as:

*TSS* = *TSTART* – [Sync Delay Code] ˟ 2.25 ˟ *Tpsym*  
  
The selected transmission slot is indicated by the Sync Position field of the Sync frame, so the superframe start time can be calculated as:

Superframe start time = *TSS* – [Sync Position] ˟ *TSLOT*   
  
where *TSLOT* is the slot duration, i.e. *aUwbSyncPeriodDuration* ˟ ⅛.

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| **Comment row: 461** (Comment ID: 22806300023) | |
| Location detail: | **Clause 6.12.4.1, Page 97, line 34** |
| Comment: | According to the statement "If a Sync frame is received, the PD shall align itself to the superframe boundary", if such PD receives subsequent Sync frames with other superframe boundaries, the PD will change its alignment. There is not mechanism for distributed synchronization such that PDs align to a common superframe boundary. |
| Suggested change: | Either consider to use the distributed synchronization for the OFDM PHYs, the rest can be done with the UWB PHY; or rephrase the text to indicate that the superframe boundary alignment or synchronization is done in a PD-to-PD basis. |

**Discussion:**

Each participating UWB PD sends its sync frame in a random slot, sometimes before and sometimes after any particular peer in its neighborhood.

Across the 8 slots of the synch period each sender will be aligning to its most recent received sync both before sending its own sync frame and after sending it.

The result of the procedure as described in the text is that PDs in communication range will all align to a common superframe.

Across the 100 ms superframe, with the maximum 20 PPM clock tolerance, the error will be less than 100e3\* 20e-6 seconds, which is 2 µs, and between any two 500 µs sync slots the maximum drift should be < 10 ns.

While 2 µs is around two symbol times, that is still more than sufficient precision for the purposes of cooperating on the use and alignment of CFP slots.

**Resolution:**

Comment sheet “Disposition Detail” shall say:

“REJECT. The cooperative synchronization mechanism for UWB achieves sufficient synchronization to allow PD to cooperate and coordinate their operation with respect to the superframe and use of the CFP”.

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| **Comment row: 462** (Comment ID: 22806400023) | |
| Location detail: | **Clause 6.12.4.3, Page 98, line 18** |
| Comment: | As described in the previous comment, PDs with UWB PHY do not synchronize to a common superframe. |
| Suggested change: | Please consider revising this clause. |

**Discussion:**

This is a very similar comment to previous one, (comment row 461 / comment ID 22806300023), for which the resolution has been “Reject”.

**Resolution:**

Comment sheet “Disposition Detail” shall say:

“REJECT. See comment row 461 / comment ID 22806300023.”

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| **Comment row: 465** (Comment ID: 22806500023) | |
| Location detail: | **Clause 6.12.4.4, Page 99, line 26** |
| Comment: | Even if the decision and control of moving to another channel is done in higher layers, still the MAC and PHY shall specified how to do it. |
| Suggested change: | Please specify the procedure, primitives and command notification. |

**Discussion:**

This paragraph says:

* The decision and control of moving the closed group to operate on another complex channel, and the complex channel selection, is a function of the next higher layers to agree and inform all members of the closed group to move to the new complex channel at an agreed time. The mechanisms for doing this are out of scope of this standard.

The text does not provide the mechanism for agreement on the channel move. The intention was that this would be coordinated by data messages between the upper layers, but I suppose an IE should be provided to allow this to be done in a more standardized way. (A new one is specified below as part of the resolution)

The text already says that *phyCurrentChannel* and *phyUWBPreambleCode* attributes are used locally to select the complex channel (which is via MDLE-SET primitive). Once the IE is provided, there is no need for additional primitives since MLDE-DATA.request and MLDE-DATA.indication primitives already have parameters to convey IEs.

**Resolution:**

Comment sheet “Disposition Detail” shall say:

“ACCEPT IN PRINCIPLE. The text will be modified as described in 15-17-0462”.

***Make the following changes to resolve this comment:***

***With respect to the draft “P802.15.8-D4.0.MEC.pdf”, modify clause 6.12.4.4, p99 paragraph beginning on line 26 as shown in the following tracked change:***

The decision and control of moving the closed group to operate on another complex channel, and the complex channel selection, is a function of the next higher layers to agree and inform all members of the closed group to move to the new complex channel at an agreed time. The New Operating Channel IE is used to achieve this. The next higher layer may include the IE in a multicast message to the group, or in individual acknowledged messages to each group member.

***Move the previous single sentence paragraph from line 24 beginning on line 24 with “The selection of a new complex channel is achieved…” to come after this modified paragraph.***

***Then, modify Table 19 “Class 1 Payload IEs” as shown to insert new IE:***

**Table 19—Class 1 Payload IEs**

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| --- | --- | --- | --- |
| **Class 1  Payload IE ID** | **IE Description** | **Acronym** | **Sub-clause** |
| 0 | Interaction Period Specification IE | IPS IE | 6.10.4.4.2 |
| 1 | New Operating Channel IE | NOC IE | 6.10.4.4.3 |
| 2 to 511 | Reserved | ⎯ | ⎯ |

***And, insert following clause defining the new IE:***

6.10.4.4.3 New Operating Channel IE

The New Operating Channel IE (NOC IE) is used to indicate a new operating channel selection. The content field of the ITA IE shall be formatted as shown in Figure 1.

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| **Octets: 2** | **1** | **1** |
| Channel | Preamble Code | Change Time |

**Figure 1—New Operating Channel IE Content field format**

The NOC IE’s Channel field shall specify a channel number as per 8.1.1.6 and the Preamble Code field shall specify a preamble code as per Table 135 for the BPM-BPSK modulation mode and Table 139 for the OOK modulation mode. The Change Time field shall indicate, in units of superframes, when the change is to be made, where a value of zero means immediately, and a value one means from the start of the next superframe, etc.

**<END>**