**IEEE P802.15**

**Wireless Personal Area Networks**

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| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) |
| Title | Comment Resolution – D2 – Ayman’s Assignemnt |
| Date Submitted | [September 2019] |
| Source | Ayman Naguib (Apple) |  |
| Re: | Re: |  |
| Abstract | Text for possible inclusion in IEEE 802.15.4z MAC |
| Purpose | Provision of the text to facilitate its incorporation into the draft text of the IEEE 802.15.4z standard currently under development in the 802.15 TG4z. |
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| Release |  |
| Patent Policy | The contributor is familiar with the IEEE-SA Patent Policy and Procedures:<http://standards.ieee.org/guides/bylaws/sect6-7.html#6> and<http://standards.ieee.org/guides/opman/sect6.html#6.3>.Further information is located at <http://standards.ieee.org/board/pat/pat-material.html> and<http://standards.ieee.org/board/pat>. |

* CID-0043: rejected. A FoM for AoA is implementation specific and it does not make any sense to specify reporting FoM for AoA without specifying the implementation.
* CID-0063: Revised

Add a header IE definition to section 7.4.2.1 that allows signaling of information about custom messages sent in the payload. Specifically, define a header IE that specifies the ID of the custom message and its length in octet. Specifically:

Resolution: Define Custom Message IE with Element ID 0x01 in section 7.4.2.x as follows:

Add the following raw to table 7-1

0x01 | Custom Message ID | x | x | x | x | x | 7.4.2.x | 7.4.2.x | UL | UL

Add the following subclause 7.4.2.x

7.4.2.x Custom Message ID

The Custom Message ID is used signal basic information about custom messages carried in the payload. The Vendor Specific Header IE Content field shall be formatted as illustrated in Figure 7-XX.

|  |  |
| --- | --- |
| Octets: 1 | Octets: 2 |
| Message ID | Message Length |

* CID-0268: Resolution: replace lines 14-20 on page 35 with the following text

The ranging block structure can be repeatedly transmitted in every RCM by the controller. If the ranging block structure needs to be changed or updated (i.e., to a new ranging block duration, ranging round duration, and/or ranging slot duration), the controller may send a Ranging Block Update IE (RBU IE), as described in 7.4.4.37, to signal the new configuration. In addition to the new block structure configuration, the RBU IE also includes a count down field indicating the number of remaining ranging blocks with the current configuration before switching to the new configuration. The RBU IE can be sent either in the RCM or in the final data frame of a ranging message sequence. Each time the RBU IE is sent, the controller will decrement the count down field by one until it reaches zero. This signals that the next block will be using the new configuration and that the RCM ARC IE in the next block will include the new configuration. Alternatively, the ranging block structure update signaled to the participating ERDEVs via the next higher layer.

* CID-0273, CID-0275: Accepted.

Line 3 page 28: Replace two instances of “slot index” with “ranging slot index”

Replace lines 21-29 on page 35 with: “For a given block configuration, each ranging block will be assigned a rang block index relative to the first block in that configuration (block number 0). Each ranging round in any ranging block will have an ranging round index relative to the first ranging round in the current ranging block. For example, if the ranging block has M ranging rounds, the first ranging round in the block will have ranging round index 0 and the last ranging round in the block will have ranging round index M -1. Similarly, each ranging slot in a ranging round will have a ranging slot index relative to the first ranging slot in the ranging round. For example, in a ranging round with K ranging slots, the first ranging slot in the round will have ranging slot index 0 and the last ranging slot in the round will have ranging slot index K-1. A new ranging message exchange will start by transmitting the first RCM in Ranging Slot 0 of Ranging Round 0 in Ranging Block 0.”

Figure 52 page 70: Replace “Relative Block Index” in Figure 25 with “Relative Ranging Block Index”

Line 5 page 70: Replace “Relative Block Index” in Figure 25 with “Relative Ranging Block Index”

Line 5 page 71: Replace two instances of “slot index” with “ranging slot index”

Line 8 page 71: replace “slot indexing” with “ranging slot indexing”

Line 14 page 73: replace “Slot Index” with “Ranging Slot Index”

Figure 58 page 73: replace “Slot Index” with “Ranging Slot Index”

Line 25 page 73: replace “Slot Index” with “Ranging Slot Index” and “slot index” with “ranging slot index”

* CID-0280: Rejected, reason for rejection: This is not correct. Transmission offset is constraint to less than a slo duration while this is not case for RTW. Coming up with a text that will combine both will actuall be a lot more complicated than you are assuming.
* CID-0281: Replace the text on lines 1-5 on page 36 with the following text

“Additionally, participating ERDEVs may continue to use the same ranging round in the next ranging block (i.e., if they are using ranging round with m in ranging block *n*, they will also use ranging round *m* in ranging block *n*+1). Alternatively, the controller may also decide to “hop” to a different ranging round in the next ranging block (i.e., if participating ERDEVs are using ranging round *m* in ranging block *n*, they will use ranging round *k* in ranging block *n*+1 where *k* ≠ *m*). Figure 28 shows an illustration for the”

* CID-0287:

Line 18 page 36 - replace sentence starting with “By default ….the next ranging block” with the following sentence: “The controller next higher layer is responsible for selecting the hopping mode and transmission offset to be used in the ranging round of the next ranging block”

* CID-0277, CID-0278, CID-0279, CID-0288, CID-0289, CID-0291, CID-0475,CID-0476,CID-480, CID-481, CID-482, CID-0485, CID-486, CID-487, CID-489

Insert the following text before line 30 on page 35

“The Ranging Round IE RR IE may be used the signal the ranging round information regarding:

1. the current ranging round (i.e. ranging round in the current ranging block *i*). In this case, the RR IE will be included in the RCM of ranging block *i*. The transmission of the RR IE the RCM of the current ranging round will aid ERDEV to synchronize to the block structure.
2. the next ranging round (i.e ranging round in the next ranging block *i*+1). In this use case, if the last scheduled message in the current ranging round (of ranging block *i*) is a message sent by the controller to the controlees, the RR IE will be sent in this final message to signal ranging round information for ranging block *i*+1. If the last scheduled message in the current ranging round (of ranging block *i*) is not from the controller but from a controlee, then the controller will send the RR IE in the RCM of the next ranging block (ranging block *i*+1) to signal the ranging round information in ranging block *i*+2. In this case, the RCM of ranging block *i*+1 will have two instances of RR IE. The first one is applicable to ranging round in ranging block *i*+1 and the second one is applicable to ranging block *i*+2.”

Replace lines 30-34 on page 35 (subclause 6.9.7.3.2) with the following text:

“In the first ranging round of a ranging message exchange , the RCM packet is transmitted at the beginning of the ranging slot. This RCM will include a Ranging Round IE (RR IE) as defined in 7.4.4.36 to signal information regarding the ranging round in the current ranging block. In subsequent ranging rounds, the controller may decide to start the transmission within each slot at a different transmission offset. This will be signaled by the controller in the Transmission Offset field of a second instance of the RR IE as defined in 7.4.4.36. This offset shall be less than the Ranging Slot Duration minus the UWB packet duration. Figure 27 shows an example of ranging rounds with different Transmission Offsets.”

Page 36 line 28 - Remove “in this case”. The content of the RR IE is the same for both instances of the RR IE. Th difference is in the order of the RR IE instances as explained by the modified text above.

Page 36 line 30-34 replace the sentence starting with “ A Controlee that ….” With the following sentence: “After receiving the RR IE in the final message of a ranging message sequence or as a second RR IE instance in an RCM, the Controlee next higher layer is responsible for using the indicated ranging round and transmission offset in subsequent ranging block.”

Replace lines 19-20 on page 69 (subclause 7.4.4.36) with the following text:

“The RR IE may be used to signal ranging round information for the current ranging round or ranging round information for the next ranging round according to the description in subclause 6.9.7.3.2. The content fields of the RR IE shall be formatted as shown in Figure 51.

Insert the following text before line 23 on page 69

“The Ranging Round IE RR IE may be used the signal the ranging round information regarding:

1. the current ranging round (i.e. ranging round in the current ranging block *i*). In this case, the RR IE will be included in the RCM of ranging block *i*. The transmission of the RR IE the RCM of the current ranging round will aid ERDEV to synchronize to the block structure.
2. the next ranging round (i.e ranging round in the next ranging block *i*+1). In this use case, if the last scheduled message in the current ranging round (of ranging block *i*) is a message sent by the controller to the controlees, the RR IE will be sent in this final message to signal ranging round information for ranging block *i*+1. If the last scheduled message in the current ranging round (of ranging block *i*) is not from the controller but from a controlee, then the controller will send the RR IE in the RCM of the next ranging block (ranging block *i*+1) to signal the ranging round information in ranging block *i*+2. In this case, the RCM of ranging block *i*+1 will have two instances of RR IE. The first one is applicable to ranging round in ranging block *i*+1 and the second one is applicable to ranging block *i*+2.”

Remove lines 29-32 on page 69

* CID-0297: Line 38 page 36 – replace “resynchronize itself” with “resynchronize to the block structure”
* CID-0300, CID-0301: Line 41-43 page 36 – replace text starting from “allow the participating …” with “allow the participating ERDEVs to maintain the synchronization with ranging block structure while being idle with their receiver turned off between transmit and receive slots to save energy”
* CID-0302: reason for rejecting this comment “The transmission offset does not preclude one from completing the ranging rounds as soon as possible with back to back transmission of poll response frames if the transceiver can support it. In this case, you will always transmit with offset 0. The scheme is actually targeted for cases where the UWB transceiver must have a turn around time between transmit/receive or two consecutive transmit and receive operation”
* CID-0303: line 5 page 38 – add “example” before “ranging exchange”
* CID-0307: line 11 page 38 – replace “RRMC(0)” with “RRMC”
* CID-0310: line 13 page 38 – Replace “RequestRrti” with “RequestRrtiTx”
* CID-0314: line 4 page 39 – delete “node”
* CID-0315: line 6 page 39 – replace “a sequential order” with “sequence”
* CID-0317: line 8 page 39 – replace “Responder-1” with “Responder-N”
* CID-0320: line 19 page 39 – replace “consisting of” with “with”
* CID-0321: line 3 page 40 – replace “Once the responder receives the ranging initiation message, it will initiate the second round-trip time measurement by sending a ranging response message, containing..” with “Each responder receiving the ranging initiation message, will respond in sequence with a ranging response message that serves to end the first round trip measurement and initiate the second round-trip time measurement. Each such response message contains”
* CID-0334: line 9 page 43 – replace "while multiple initiators" with "while in this many-to-many case multiple initiators"
* CID-0339: line 13 page 44 – replace "the initiator next higher layer has sufficient information" with "each initiator next higher layer has sufficient information"
* CID-0477: add the following text to 7.4.4.2 “ devices participating in the ranging exchange have either a) pre-negotiated a hoping sequence that is known to all devices, or (b) have exchanged all the information necessary such that each devices can generate the hopping sequence”

Note that text in 6.9.7.3.2 already states that.

* CID-0491:

Replace text on lines 2,3 page 70 with the following text:

“The RBU IE is sent by the controller to the controlees to signal an update the ranging block structure. If the final message in the ranging messages sequence is sent by the controller, then the RBU IE will be sent in that message. However, if the final message in the ranging messages sequence is sent by a controllee, then the RBU IE will be sent by the controller in the following RCM. The content field of the RBU IE shall be formatted as shown in Figure 52. “

* CID-0492: Very cool idea to use RBU IE to terminate a ranging message exchange.

Add the following text at the end of line 8 on page 70.

“The RBU IE can be used to signal the termination of the ranging message exchange. This is achieved y setting the Updated Ranging Block Duration in the RBU IE to 0”

* CID-0719: Add the following text to subclause 6.7.2

“In the case of an HRP-ERDEV configured to use SP3 format packets (where the packet does not include a MHR, MFR, PHR, or data payload) the reception of a packet shall be treated differently from a normal data packet. For an unintended recipient expecting a normal data packet, the lack of PHR in the received packet shall cause the MAC sublayer to discard the received the frame. For a receiver expecting an SP3 packet, the MAC sublayer shall accept the received the frame if and only if the STS sequence in the received frame matches the expected STS sequence. The criteria for declaring a match is left up to the implementor”

* CID-0424: Comment accepted to remove all mention of the MAC in the Used by column with the understanding that this column will be revised the recirculation.
* CID-0504: Add the following text at the end of line 9 page 23

“Note that in the case of contention-based ranging, collision between responding devices is possible and it is assumed that the upper layer of the initiating node shall implement a filtering mechanism to discard to filter out inaccurate/wrong ranging results.”