**IEEE P802.15**

**Wireless Personal Area Networks**

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| Re: | IEEE P802.15.4ab Comment Resolutions |
| Abstract | Comment Resolutions for selected comments on the LB207 / P802.15.4ab D01. |
| Purpose | This document provides text changes intended to be part of the final IEEE Std 802.15.4ab (amendment to IEEE Std 802.15.4), as part of resolving selected comments from the consolidated spreadsheet (doc 15-24-0371) that have been assigned to the author to resolve. |
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| **Comments addressed here:** |

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# Comment index number(s): 304

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Index** | **page** | **clause** | **line** | **Comment** | **Proposed Change** |
| 304(Tero) | 23 | 8.3.4 | 16 | There is no point of using MCPS-DATA.request primitive to send compact frames, as almost none of the parameters given to the MCPS-DATA.request are valid when sending compact frames.  | Create new MCPS-COMPACT.request primitive and add it to the 10.38.x MAC Services section. |

**Discussion:**

It is true that there are several parameters for data frames that are not relevant to compact frames, however for a simple Data frame (or the even simpler Multipurpose frame) there are lots of parameters that are not relevant (i.e., various parameters are relevant only to specific cases).

The benefit of conveying Compact frames using MCPS-DATA is that it gives a single mechanism for next higher layer to send packets, which irrespective of the frame type are essentially performing the same function for the protocols, and, there are quite a few parameters that are common…

Several Compact frames include the capability to include passthrough payload which is akin to the use of the Msdu field, (so it might be reused).

Both UWB PHY and O-QPSK PHY can be used to send and receive Compact frames, so MCPS-DATA parameters related to PHY control and event reporting are applicable. That is, all the parameters relating to controlling the transmission time, and reporting the receive time, clock offset, etc., are relevant for reception of compact frames. And, the parameters to select the modulation data rate and the preamble length for UWB transmissions are also valid for UWB transmission of Compact frames. Reuse of MCPS-DATA.indication saves making duplication of the definition of these. Even though the security is different some of the control parameters are relevant, key ID, security level, etc..

The addressing is different, i.e., Compact frame’s use Prand and hash fields for this, but this difference is easy to incorporate into the MCPS-DATA as another value in the SrcAddrMode and DstAddrMode enumeration lists, to select this Compact frame addressing.

A number of CID resolutions are overlapping with this, so (for now at least) it is preferable to continue using MCPS-DATA primitives. (After the use case and parameters have stabilised, we can consider this again).

**Proposed Resolution**: Reject.

**Proposed Disposition:** There is substantial commonality of parameters and more to be identified.

# Comment index number(s): 102

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Index** | **page** | **clause** | **line** | **Comment** | **Proposed Change** |
| 102(Rojan) | 23 | 8.3.4 | 17 | SrcAddr is not present in the data.request primitive | Delete SrcAddr here and clarify how the source address is set in the compact frame. |

**Discussion:**

Yes, indeed, there is no SrcAddr parameter in the MCPS-DATA.request primitive.

For Data frames (and Multipurpose frames) with a source address, this is not provided in the primitive but comes either from the *macExtendedAddress* or the short address (and PANID) assigned by the PAN coordinator.

For compact frames, the resolution to CID # 1033 in 15-24-0687-04 is saying that the SrcAddr is the IRK of the transmitting device and DstAddr is the IRK of the transmitting device and the receiving device (i.e. the destination). Then one of these IRKs is used to generate the RPA Hash field in the transmitted message, which depends on the Compact Frame ID field.

But this is not right since thefe is no SrcAddr parameter in the MCPS-DATA.request primitive.

To fix this we can add a SourceIrk parameter within the CompactFrameDescriptor.

**Proposed Resolution**: Revised.

**Proposed Disposition:** Apply the changes that follow:

Insert the following new row into Table 2 “Elements of the CompactFrameDescriptor”:

**Table 2—Elements of the CompactFrameDescriptor**

| **Name** | **Type** | **Valid range** | **Description** |
| --- | --- | --- | --- |
| SourceIrk | Set of octets | 128-bit identity | This parameter provides an IRK to use to generate the RPA Hash field for those Compact frames for which a source RPA hash value is appropriate. |

In clause 8.2.4 on page 23, line 17 change “SrcAddr” to “SourceIrk”

# Comment index number(s): 308

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Index** | **page** | **clause** | **line** | **Comment** | **Proposed Change** |
| 308(Tero) | 23 | 8.3.4 | 25 | The actual description of the interleaved transmission should be in somewhere else, and it should have figure explaining different cases (MmsRangingRxOnTime > RangingTxTime vs RangingTxTime > MmsRangingRxOnTime etc).  | Move this paragraph to 10.x and just add reference to it. Include figures explaining the interleaved transmission (or if this is already described somewhere move text there, and just add reference). |

**Discussion:**

This paragraph is a description of the primitive parameters and their use, to support the interleaved TX and RX of the MMS UWB ranging exchange, and this is the best place for it.

However, it could be made clearer by adding the word “parameter” in a few places, and there is also some informative text that can be removed to make the paragraph more succent and focused on the parameters.

**Proposed Resolution**: REVISED.

**Proposed Disposition:** Change the paragraph (with insertions and ~~deletions~~) as shown below:

For the purposes of the interleaved transmission and reception of MMS UWB ranging fragments, the RangingTxTime parameter specifies the transmission time of the first transmitted fragment, the MmsRangingRxOnTime parameter specifies the reception time for the first receive fragment, and the MmsRxClockTrackInterval and MmsRxClockTrackOffset parameters specify the clock offset. ~~Generally, it is expected that the RangingTxTime parameter value will be set based upon the transmission time of an MMS Ranging Control Phase packet, (e.g., for an initiator this might be a One-to-one Poll Compact frame), and that the MmsRangingRxOnTime and MmsRxClockTrackInterval, and MmsRxClockTrackOffset parameter values will be set based upon the reception of an MMS Ranging Control Phase packet, (e.g., for an initiator this might be a One-to-one Response Compact frame).~~ The selection of whether fragment transmission or reception is done first~~, (i.e., for initiator or responder),~~ is ~~defined~~ determined by which of ~~the times specified by~~ the RangingTxTime ~~and~~ or MmsRangingRxOnTime parameter values is the earlier. ~~For the interleaved fragments, these times are nominally separated by 600 RSTU.~~ When the MmsReceive parameter is FALSE, interleaved MMS UWB fragment reception is not enabled and the MmsRangingRxOnTime, MmsRxClockTrackInterval, and MmsRxClockTrackOffset parameters are ignored.

# Comment index number(s): 306

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Index** | **page** | **clause** | **line** | **Comment** | **Proposed Change** |
| 306(Tero) | 23 | 8.3.4 | 26 | The RangingTxTime can be either in RCTUs or RSTUs. Does the TxTimeSpecified also affect the MmsRanginRxOnTime units?  | Specify the MmsRangingRxOnTime in relation to the different values of the TxTimeSpecified enumeration which affects units of the RangingTxTime. |

**Discussion:**

For MMS Ranging we need high precision in specifying the times for transmission and reception of the UWB packet, and MmsRangingRxOnTime is already specified to be in “the units defined in 10.29.1.4” which are the ranging counter time unit.

To ensure that RangingTxTime is also in these units, in response to CID 18, document number 15‑24‑0590‑00 has inserted the following at the end of 8.3.2.2:

“*For NBA MMS UWB the TxTimeSpecified parameter shall be RCTU\_TIME.*”

That change means that RangingTxTime has to be in ranging counter time unit, which addresses the point that the commenter is making here (in CID 306).

**Proposed Resolution**: Revised.

**Proposed Disposition:** The change specified in DCN 15‑24‑0590‑00 for CID #18 also resolves this CID #306, and no additional changes are necessary.

# Comment index number(s): 305

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Index** | **page** | **clause** | **line** | **Comment** | **Proposed Change** |
| 305(Tero) | 23 | 8.3.4 | 27 | This does not specify the time reference for the MmsRangingRxOnTime related to the other timing. Is it same as RangingTxTime (i.e., reference to the running ranging counter units as defined in 10.29.1.4) or something else.  | Define the reference time for the MmsRangingRxOnTime. |

**Discussion:**

The answer to the question asked is that the time reference for MmsRangingRxOnTime is indeed the running ranging counter (as is the case for RangingTxTime for MMS UWB).

To clarify this a statement to that effect is needed here.

**Proposed Resolution**: Revised.

**Proposed Disposition:**

***After the first sentence in the last paragraph on p.23, (page 23 / line 28) insert the following:***

The time specified by the MmsRangingRxOnTime parameter is with reference to the running ranging counter.

# Comment index number(s): 307 & 1432

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Index** | **page** | **clause** | **line** | **Comment** | **Proposed Change** |
| 307(Tero) | 23 | 8.3.4 | 28 | The text says that MmsRxClockTrackInterval and MmsRxClockTrackOffset specify the clock offset, but it does not exactly specify how they specify it.  | Add description how MmsRxClockTrackInterval and MmsRxClockTrackOffset affect the timing of the MmsRanginRxOnTime.  |
| 1432(Lei Huang) | 23 | 8.3.4 | 28 | It is unclear how MmsRxClockTrackInterval together with MmsRxClockTrackOffset can be used to specify the clock offset for the fragment receptions. | It should be clarified in the draft standard how MmsRxClockTrackInterval together with MmsRxClockTrackOffset can be used to specify the clock offset for the fragment receptions. |

**Discussion:**

These parameters together specify the clock offset as a unitless ratio given by the offset divided by the interval. This assists the receiver to correctly receive the MMS UWB packet fragments.

The description of these parameters in Table 8-27 should have made that clear, however in D01 this was not the case, i.e., a necessary piece of their description was missing from D01.

This missing description was added into Table 8-27 by the changes captured 15-24-0509-00 to resolve comment index numbers 300, 301, 1029, 1030, 17, and 139, which add the text shown below (screenshot from 0509r0):



Those changes provide the missing description, and no further changes are necessary here to address comment #’s 307 & 1432. The proposed resolution is then as follows:

**Proposed Resolution**: Revised.

**Proposed Disposition:** The changes specified in DCN 15‑24‑0590‑00 for CID #’s 300, 301, 1029, 1030, 17, and 139 also resolve CID #’s 307 & 1432, and no additional changes are necessary.

# Comment index number(s): 312

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Index** | **page** | **clause** | **line** | **Comment** | **Proposed Change** |
| 312(Tero) | 24 | 8.3.4 | 6 | What is this text "nominally separated by 600 RSTU" trying to say?  | If there is requirement that RangingRxTime and MmsRangingRxOnTime are separated by certain time, add text specifying that relation, if there is not what is the point of giving some nominal value? |

**Discussion:**

This (quoted) phrase is referring to the spacing between the interleaved TX and RX fragments as shown in Figure 36. While this is the nominal spacing, in practice the separation is dependent on the TX and RX times of the poll and response compact frames.

We could explain this with a reference to Figure 36, however this sentence mentioning “nominal separation” has been deleted by the resolution to comment # 308 (earlier in this doc) so there is no longer any need to add an explanation.

The commenter also asks is there a requirement for a certain separation between RangingRxTime and MmsRangingRxOnTime, and the answer is yes. They need to be separated sufficiently that the individual fragment transmissions and receptions are not overlapping, but not so far apart that they extend beyond a millisecond to overlap with subsequent milliseconds.

Also examining the maximum length of RSF, there are cases, (e.g., time efficient one-to-many ranging), where selecting large MSR with large symbol (e.g., the higher *MMRS Config Set #*’s of Table 21 can result an unavoidable overlap at the nominal separation, i.e., a smaller MSR value is needed to avoid the overlap.

A good way to handle these error cases is for the MCPS-DATA.request to fail in those cases where the fragments are insufficiently separated. That is for the MCPS-DATA.confirm to be issued with a Status parameter value to indicate the failure/error condition.

**Proposed Resolution**: Revised.

**Proposed Disposition:** Change the draft as follows:

***In clause 8.3.4, between lines 8 and 9 on D01 p24 insert the following new paragraph:***

For MMS UWB packet transmission, if the RangingTxTime and MmsRangingRxOnTime parameter values result in there being an overlap of the TX and RX fragments or insufficient time for the turnarounds between TX and RX, then the MAC sublayer shall abandon the attempted MMS UWB packet transmission (and interleaved reception) and shall issue the MCPS-DATA.confirm primitive with a Status of MMS\_OVERLAP\_ERROR.

***And, …***

***In clause 8.3.5, D01 p24, before line 16 insert the following editorial instructions and content:***

***Change the row(s) of Table 8-31 shown below: (only changed & inserted rows are shown):***

**Table 8-31—MCPS-DATA.confirm parameters**

| **Name** | **Type** | **Valid range** | **Description** |
| --- | --- | --- | --- |
| Status | Enumeration  | SUCCESS,INVALID\_ADDRESS,INVALID\_GTS,UNSUPPORTED FEATURE,UNSUPPORTED\_PRF,UNSUPPORTED\_RANGING,UNSUPPORTED\_PSR,UNSUPPORTED\_DATARATE,UNSUPPORTED\_LEIP,ACK\_RCVD\_NODSN\_NOSA,TX\_TIME\_ERROR,MMS\_OVERLAP\_ERROR,also see 8.2.2 | The status of the last requested transmission. |

# Comment index number(s): 314

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Index** | **page** | **clause** | **line** | **Comment** | **Proposed Change** |
| 314(Tero) | 24 | 8.3.5 | 17 | Ranging counters are enabled in the transmission if the DataRequestRangingDescriptor has Ranging set to true. If Ranging is not true, then ranging counters are disabled, thus there is no counter to report.  | Most likely there needs to be separate setting in the DataRequestRangingDescriptior to enable ranging counters even when ranging is not used, and when those frames are transmitted the next higher layer needs to set that setting on. Technical\nThe current text does not work as the ranging counters are not enabled unless the Ranging is set true. Instead of adding this text to MCPS-DATA.confirm add new element to the DataRequestRangingDescriptor where you enable ranging counters even when you are not doing ranging, and add text to those compact frames saying that they need to set that element to true. |

**Discussion:**

These comments relate to the following text added to report the TX time of poll and response packets, to use as reference times relative to which we schedule the transmission of the MMS UWB packet.



The comment is saying that we need to enable the ranging counter clocks to allow this reporting.

The “Ranging” parameter in the DataRequestRangingDescriptor does this.

The commenter suggests we need a separate parameter in the DataRequestRangingDescriptor to enable ranging counters even when ranging is not used, and when those frames are transmitted the next higher layer needs to set that setting on.

We do want the ranging counter clocks to allow this reporting, however we probably don’t need a new parameter for this because arguably the NB packet and subsequent MMS UWB packet are part of the ranging exchange. So, the “Ranging” parameter can do this.

**Proposed Resolution**: Revised.

**Proposed Disposition:** Make the following changes to the draft.

***Replace the paragraph p24 lines 17 to 19 with the following:***

For the NBA MMS UWB ranging exchange, setting the DataRequestRangingDescriptor’s Ranging parameter to TRUE when sending an NBA ranging control packet (poll or response) enables the ranging counter so that in the MCPS-DATA.confirm the transmission time of the packet is reported in the TxRangingCounter parameter of the RangingReportDescriptor. This is then the reference time relative to which the subsequent MMS UWB packet transmission is scheduled.

# Comment index number(s): 315

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Index** | **page** | **clause** | **line** | **Comment** | **Proposed Change** |
| 315(Tero) | 25 | 8.3.6 | 22 | Unless there is ranging enabled for the received packet the ranging counters are not running, thus there is no counters to report. If those frames are ranging frames then the counters are automatically already filled in.  | Why are those few frames special cases? Why they can't use the default ranging frame processing. Remove this text and just make those frames to be processed just like other ranging frames. |

**Discussion:**

These comments relate to the following text:



This is intended to specify that the MCPS-DATA.indication will report the receive time and clock offset information when receiving an NBA ranging control packet (poll or response), but what the commenter is saying is that we should have turned on the ranging functionality to have running counters with which to do this, which is correct.

To cover this case in a more general way it is proposed to state that the RangingControl parameter of the MLME-RX-ENABLE.request is used to enable this.

**Proposed Resolution**: Revised.

**Proposed Disposition:** Make the following changes to the draft.

***Replace the paragraph p25 lines 22 to 25 with the following:***

For the NBA MMS UWB ranging exchange, setting the RangingControl parameter to RANGING\_ON when invoking the MLME-RX-ENABLE.request prior to receiving an NBA ranging control packet (e.g., a poll Compact frame) enables the ranging function (if not already enabled) so that the MCPS-DATA.indication will include valid RxRangingCounter, RangingTrackingInterval, and RangingOffset parameters in the RangingReportDescriptor to convey the arrival time and clock offset information for the received packet, thus giving a reference time relative to which the subsequent MMS UWB packet reception can be scheduled, and the clock offset information to assist in that reception.

*<END>*