**IEEE P802.15**

**Wireless Personal Area Networks**

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| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) |
| Title | **Proposed Resolution for MMS – Status Code** |
| Date Submitted | May 2024 |
| Sources | Rojan Chitrakar, Lei Huang (Huawei)rojan.chitrakar@huawei.com; Li-Hsiang Sun (MediaTek) |  |
| Re: |   |
| Abstract |  |
| Purpose | To propose resolution for MMS – Status Code related comments for “P802.15.4ab™/D (pre-ballot) C Draft Standard for Low-Rate Wireless Networks” .  |
| Notice | This document does not represent the agreed views of the IEEE 802.15 Working Group or IEEE 802.15.4ab Task Group. It represents only the views of the participants listed in the “Sources” field above.It is offered as a basis for discussion and is not binding on the contributing individuals. The material in this document is subject to change in form and content after further study. The contributors reserve the right to add, amend or withdraw material contained herein. |

Rev 0: Initial version.

Rev 1: Changed the status values

Rev 2:

1. Fixed the errors in the text relating to incorrect reference of Status Code values. Changes in green.

2. Resolution added for CID 689b: Status code SUCCESS added to allow SOR frame to carry partial list of parameters.

3. Resolution added for CID 19: Added the Starting Block Index field in SOR frame to allow initiator to add a responder to a block with a non-zero block index. Changes in grey.

***Comment Indices in 15-24-0010-00-04ab-consolidated-comments-draft-c:***

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| **Name** | **Index#** | **Pg** | **Sub-Clause** | **Ln** | **Comment** | **Proposed Change** | **Disposition** |
| Li-Hsiang Sun | 34 | 71 | 10.38.10.4 | 15 | It is not clear whether SMC TLV are related to: 1) the receiving capability to understand msg ID and ctrl from the peer, or 2) in additionally to receving capability it also indicates that the sender of this field requires the peer to understand msg id and ctrl indicated in SMC TLV from the sender | when SMC TLV in ADV\_POLL, it is case 2), when SMC TLV in ADV\_RESP, it is case 1) | Revised |
| Rojan Chitrakar | 641 | 75 | 10.38.10.6 | 2 | It is beneficial to include a Status field in the Start of Ranging Compact frame to indicate whether or not the initiator can fulfill the ranging parameters requested by the responder(s) (in the Advertising Response Compact frame).  | Include a Status field in the Start of Ranging Compact frame to indicate whether or not the initiator can fulfill the ranging parameters requested by the responder(s). When the Status is not SUCCESS, the rest of the fields in the Start of Ranging Compact frame can be omitted and the initiator will not proceed to the ranging phase. | Revised |
| Rojan Chitrakar | 652 | 92 | 10.38.10.18 | 21 | It is beneficial to include a Status field in the Public Start of Ranging Compact frame to indicate whether or not the initiator can fulfill the ranging parameters requested by the responder(s) (in the Advertising Response Compact frame).  | Include a Status field in the Public Start of Ranging Compact frame to indicate whether or not the initiator can fulfill the ranging parameters requested by the responder(s). When the Status is not SUCCESS, the rest of the fields in the Start of Ranging Compact frame can be omitted and the initiator will not proceed to the ranging phase. | Revised |
| Carl Murray | 689b | 48 | 10.38.3.4 | 13 | [...]Currently all values are sent in the SOR. If there are prenegotiated default values should the SOR not have a configuration (i.e. message control) to only send the changes? | [,,,]Also add a SOR that does not have to transmit everything. | Revised: Agree that it is beneficial to have the option to not include default values in SOR. SOR (with message control 0x10) is adapted for this usage. |
| Li-Hsiang Sun | 19 | 60 | 10.38.9.1 | 12 | If different responders join at different block, how do they hop to the same NB channel in a ranging round? | Include block index in SOR message for late joining responders to sync with earlier responders | Revised: Add Starting Block Index field to SOR message for one-to-many ranging session. Also add a note in 10.38.3.2.3 to indicate that an initiator can continue advertise using the same IRK and assign the responders to a different round index if NbChannelAllowlist of these responders differs from the existing O2M session |

**Disposition: Revised**

**Disposition Detail:**

**Proposed text changes on P802.15.4ab™/D (pre-ballot) C:**

**10.38.10.6 Start of Ranging Compact frame (#641)**

***Change the subfield as follows (Track changes ON)***

…

The Message Control field value shall be one of 0x00 or 0x10. This value determines the formatting of the Message Content field.

When the Message Control field value is 0x00 the Message Content field shall be formatted as shown in Figure 60.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Octets: 4** | **1** | **6** | **1** | **7** | **3** | **2** |
| Time Offset | NB Channel Seed | NB Channel Map | Management PHY Configuration | Management MAC Configuration | Ranging PHY Configuration | Ranging MAC Configuration |

**Figure 60—Format of the Message Content field in the Start of Ranging Compact frame**  **when the Message Control field value is 0x00**

…

The Ranging MAC Configuration field shall be set as per 10.38.10.3.9.

The Start of Ranging Compact frame with Message Control field value equal 0x10 is sent by the initiator to indicate the status of the initialization and setup phase. When the Message Control field value is 0x10 the Message Content field shall be formatted as shown in Figure 60A.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Octets: 1** | **0/4** | **0/1** | **0/1** | **0/6** | **0/1** | **0/7** | **0/3** | **0/2** | **0/2** |
| Status | Time Offset | NB Channel Seed | Presence Bitmap | NB Channel Map | Management PHY Configuration | Management MAC Configuration | Ranging PHY Configuration | Ranging MAC Configuration | Starting Block Index |

**Figure 60A—Format of the Message Content field in the Start of Ranging Compact frame** **when the Message Control field value is 0x10**

The Status field is described in 10.38.10.3.20. The value of the status field is set as SUCCESS if the initiator intends to proceed to the control phase but not all configuration values are transmitted over the air explicitly. Otherwise, if the initiator does not intend to proceed to the control phase, the value of the status field is set as one of the non-reserved values.

The Time Offset field is present when the value of status field is set as SUCCESS and is not present otherwise. The Time Offset field if present shall be set as per 10.38.10.3.12.

The NB Channel Seed field is present when the value of status field is set as SUCCESS and is not present otherwise. The NB Channel Seed field if present shall be set as per 10.38.10.3.14.

The presence bitmap field is present when the value of status field is set as SUCCESS or REJECT\_WITH SUGGESTED\_CONFIG\_CHANGE, otherwise the field is not present. The Presence Bitmap if present is set as specified in 10.38.10.3.xx (The Presence Bitmap field) with the fields other than NB Channel Map, Management PHY Configuration Present field, Management MAC Configuration Present field, Ranging PHY Configuration Present field, Ranging MAC Configuration Present field and Starting Block Index Present field set to 0. The encoding and meaning of the Presence Bitmap field and subsequent fields in the frame content is identical to that of the field of the same name in the Advertising Response Compact frame with Message Control field value equal to 0x10.

The Starting Block Index field if present indicates the index of the first ranging block for a ranging session.

**10.38.10.3 Common message fields**

***Add the following new sub-clause at the end of 10.38.10.3 Common message fields***

**10.38.10.3.20 Status fields**

The Status field indicates the status of the initialization and setup phase and the valid values are listed in Table XXX.

Table XXX – Status field values

|  |  |  |
| --- | --- | --- |
| **Value** | **Name** | **Meaning** |
| 0 | SUCCESS | Request is accepted |
| 1 | REQUESTED\_PARAMETERS\_NOT\_ACCEPTED  | Request is denied as one or more requested parameters cannot be accepted by the Initiator. |
| 2 | REQUIRED\_CAPABILITY\_NOT SUPPORTED\_BY RESPONDER | One or more required capability is not supported by the responder. For example, a (Compact frame ID, Message Control ID) tuple intended to be used by the initiator is not supported by the responder |
| 3 | REJECT\_WITH SUGGESTED\_CONFIG\_CHANGE | Initiator indicates rejection with the suggested difference from the configuration parameters in Advertising Response Compact frame  |
| 4 | FAILURE | Request is denied due to other reasons |
| 5 - 255 |  | Reserved |

10.38.10.5 Advertising Response Compact frame

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

***Add a paragraph after the paragraph starting with “The Ranging MAC Configuration Present field when one indicates that…”***

The Starting Block Index Present field is set to 0 when the Extended Presence Bitmap field is included in an Advertising Response Compact frame.

**10.38.10.18 Public Start of Ranging Compact frame (#652)**

***Change the subfield as follows (Track changes ON)***

…

The Message Control field value shall be one of 0x00 or 0x10. This value determines the formatting of the Message Content field.

When the Message Control field value is 0x00 the Message Content field shall be formatted the same as for the Start of Ranging Compact frame Message Content field when the Message Control field value is 0x00 shown in Figure 60, with the same function and meaning for each of the fields.

When the Message Control field value is 0x10 the Message Content field shall be formatted the same as for the Start of Ranging Compact frame Message Content field frame when the Message Control field value is 0x10, as shown in Figure 60A, with the same function and meaning for each of the fields.

**10.38.3.2 Session initialization**

…

After transmitting the Advertising Poll Compact frame on the initialization channel, the initiator shall listen for an incoming Advertising Response Compact frame in the subsequent initialization slot. Once a responder has received an Advertising Poll Compact frame, it may transmit the Advertising Response Compact frame in the subsequent initialization slot. When the responder has transmitted the Advertising Response Compact frame, it shall listen for a Start of Ranging Compact frame in the subsequent slot. Once the initiator has received an Advertising Response Compact frame, it may transmit a Start of Ranging Compact frame in the subsequent slot.

If the initiator intends to proceed to the control phase, the Message Control field of the Start of Ranging Compact frame shall be set as 0x00 or 0x10 (with value of the status field set as SUCCESS). If a responder receives a Start of Ranging Compact frame with the Message Control field equal to 0x10 and the value of the status field is set as SUCCESS and if any of the NB Channel Map, Management PHY Configuration field, Management MAC Configuration field, Ranging PHY Configuration field and Ranging MAC Configuration field is not present, the value of the field of the same name from the Advertising Response Compact frame shall be used for starting the ranging session, or if no value was given in the Advertising Response Compact frame, if applicable the value communicated via OOB methods, or otherwise the default value of the field shall be used for the ranging session.

Otherwise, if the initiator does not intend to proceed to the control phase, the Message Control field of the Start of Ranging Compact frame shall be set as 0x10 and the value of the Status field is set as one of the non-reserved entries in Table XXX (Status field values) other than SUCCESS. If a responder receives a Start of Ranging Compact frame with the Message Control field equal to 0x10 and the value of the Status field is set as one of the non-reserved entries in Table XXX (Status field values) other than SUCCESS, the responder’s action is as follows:

* If the value of the Status field is set as REQUESTED\_PARAMETERS\_NOT\_ACCEPTED, it may reattempt the session initialization with a different set of parameters by listening for another Advertising Poll Compact frame.
* If the value of the Status field is set as REQUIRED\_CAPABILITY\_NOT SUPPORTED\_BY RESPONDER, it should not reattempt the session initialization.
* If the Status field is set as REJECT\_WITH SUGGESTED\_CONFIG\_CHANGE , it may reattempt the session initialization with the initiator suggested configuration. If the suggested configuration is not supported by the responder, the responder should not reattempt the session initialization.
* If the value of the Status field is set as FAILURE, the responder may reattempt the session initialization at a later time.

After transmitting the Start of Ranging Compact frame with the Message Control field equal to 0x00 , the initiator shall enter the control phase. After the initiator has confirmed receipt of the RESP Compact frame from the responder during control phase, and unless initialization of further devices is required, the initiator shall discontinue ranging initialization and cease transmission of Advertising Poll Compact frames.

A successful initialization process when coordination is not active is illustrated in Figure 23.



If the coordination is active, the initiator determines the configuration for the ranging session based on knowledge of UWB channel usage learned from acquisition packets (APs) received from other initiators as described in 10.38.3.6. For coordination of channel use, the initiator may scan the channel specified by the macMmsNbInitChannel attribute and the channel specified by the macMmsUwbChannel attribute before transmitting the Start of Ranging Compact frame. To perform scanning for coordination and defer the transmission of the Start of Ranging Compact frame, the initiator sends an Advertising Confirmation Compact frame with the time offset between the first symbol of the Advertising Confirmation Compact frame and the first symbol of the Start of Ranging Compact frame.

If the initiator intends to proceed to the control phase, the Message Control field of the Start of Ranging Compact frame shall be set as 0x00 or 0x10 (with value of the status field set as SUCCESS). If a responder receives a Start of Ranging Compact frame with the Message Control field equal to 0x10 and the value of the status field is set as SUCCESS and if any of the NB Channel Map, Management PHY Configuration field, Management MAC Configuration field, Ranging PHY Configuration field and Ranging MAC Configuration field is not present, the value of the field of the same name from the Advertising Response Compact frame shall be used for starting the ranging session, or if no value was given in the Advertising Response Compact frame, if applicable the value communicated via OOB methods, or otherwise the default value of the field shall be used for the ranging session.

Otherwise, if the initiator does not intend to proceed to the control phase, the Message Control field of the Start of Ranging Compact frame shall be set as 0x10 and the value of the Status field is set as one of the non-reserved entries in Table XXX (Status field values) other than SUCCESS. If a responder receives a Start of Ranging Compact frame with the Message Control field equal to 0x10 and the value of the Status field is set as one of the non-reserved entries in Table XXX (Status field values) other than SUCCESS, the responder’s action is as follows:

* If the value of the Status field is set as REQUESTED\_PARAMETERS\_NOT\_ACCEPTED,it may reattempt the session initialization by listening for another Advertising Poll Compact frame.
* If the value of the Status field is set as REQUIRED\_CAPABILITY\_NOT SUPPORTED\_BY RESPONDER , it should not reattempt the session initialization.
* If the value of the Status field is set as REJECT\_WITH SUGGESTED\_CONFIG\_CHANGE , it may reattempt the session initialization with the initiator suggested configuration. If the suggested configuration is not supported by the responder, the responder should not reattempt the session initialization.
* If the value of the Status field is set as FAILURE, the responder may reattempt the session initialization at a later time.

A successful initialization process when coordination is active is illustrated in Figure 24.



***Add a NOTE in 10.38.3.2.3 Contention based initialization setup handshake, after the paragraph starting with “If two or more responders are selected and the initiator intends to perform one-to-many ranging with the selected responders…”***

NOTE—After a one-to-many session starts, the initiator can use the same IRK to transmit Advertising Poll compact frames to advertise another one-to-many session, which occupies a different round index than that of the ongoing one-to-many session using the same initiator IRK.

***Modify the 5th paragraph of 10.38.3.4***

**10.38.3.4 Initialization setup handshake**

**…**

In addition to the common ranging configuration fields, the initiator shall provide synchronization information in the Start of Ranging Compact frame.. The initiator may set the value of the field Time\_Offset to the time difference between the start of the Start of Ranging Compact frame and the start of the ranging block with index indicated by the Starting Block Index field in the Start of Ranging Compact frame. If the Starting Block Index field is not present in the Start of Ranging Compact frame, the value of the field Time\_Offset indicates the time difference between the start of the Start of Ranging Compact frame and the start of the ranging block index 0. To enable synchronized switching of NB channels the initiator shall set the value of NB\_Channel\_Seed. The responder shall apply the provided value to calculate the NB channel index used during the first and all following ranging blocks as defined in 10.38.8.4.