**IEEE P802.15**

**Wireless Personal Area Networks**

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| Project | IEEE P802.15 Wireless Specialty Networks (WSNs) | |
| Title | **Frame format changes** | |
| Date Submitted | 16 May 2022 | |
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| Re: |  | |
| Abstract | This document contains proposed resolutions for CIDs on D6.0 | |
| Purpose | Aid comment resolution | |
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**Legend:**

* Arial size 13 indicates subsections for individual comments
* Red underlined text needs to be adapted during the comment implementation (e.g., because it is a reference).
* Bold italic text is an instruction to the editor to implement the text

R2-8R2-36 R2-37 R2-46

*Summary: This proposal updates the general frame format to include addresses for bridging in the payload / MSDU. Also, we remove subtypes and indicate the payload type / format in a new MPDU header field. Moreover, add a table listing all elements and in which frame type they shall be transported.*

Update 5.6.4

***On P30L11f., replace***

For each type, further subtypes exist that define the contents of the MPDU’s payload.

***with***

Information exchanged between two peer MAC entities is encoded in elements. MAC protocol procedures define the exchange of such elements. Elements are carried in the payload of MPDUs. Depending on which protocol procedure they serve, elements have the type data, management or control. MPDUs carry elements of their respective type.

Update 6

***Remove subsection 6.6.***

**Remove all mentions of A-MSDU.**

* **Remove 6th bullet in 6.1**
* **Update reference to 6.6 in P33L10 to new “Data Frame Transmissions” clause.**
* **Remove P33L26-27, 29-30 (second sentence in paragraph)**
* **Remove 7.6.10**
* **Remove Table D.7**
* **Remove “A-MSDU” Acronym on P19L3**
* **Remove “or A-MSDU" in P45L28, P50L9**

***Add a new Subsection 6.X Data Frame Transmissions with the following text:***

**6.X.1 Overview**

MSDUs received through the MD-SAP.request for transmission, as specified in 8.2.2, shall be encapsulated into one of the elements specified in [REF to table in 7.3] and transmitted in a data frame.

When receiving a data frame, devices shall pass the contained MSDU(s) to the higher layer through the MD-SAP.indication primitive, specified in 8.2.3.

**6.X.2 Single MSDU transmission**

When transferring a single MSDU to a peer device in the OWPAN, that MSDU shall be encapsulated in a *Single MSDU* element*. Single MSDU* elements shall the destination and source addresses of the MSDU, as received through the MD-SAP.request, in the *Destination Address* and *Source Address* fields, respectively.

**6.X.3 Multiple MSDU aggregation**

A device may aggregate multiple MSDUs in a single MPDU. The number of MSDUs that are aggregated within a single MPDU is implementation specific and may vary on a per MPDU basis.

On reception of multiple MSDUs within a single MPDU, the contained MSDUs shall be passed to the higher layer in order of appearance in the encapsulating element.

A *Single Address Aggregated MSDU* element may be used to aggregate several MSDUs, i.e., transfer several MSDUsin one MPDU. All MSDUs in a *Single Address Aggregated MSDU* element contained in a data frame shall have the same source and destination addresses, as received through the MD-SAP.request. The *Destination Address* and *Source Address* fields of the *Single Address Aggregated MSDU* element shall be set to the respective addresses as received through the MD-SAP.request.

For each MSDU, the source and destination address in the MD-SAP.indication shall be equal to the *Destination Address* and *Source Address* fields of the *Single Address Aggregated MSDU* element.

A *Multiple Address Aggregated MSDU* element may be used to aggregate several MSDUs, i.e., transfer several MSDUsin one MPDU when transferring more than one MSDU with different source or destination addresses to the same peer device in the OWPAN. The *Destination Address* and *Source Address* fields for each MSDU shall be set to the respective source and destination addresses as received through the MD-SAP.request.

For each MSDU, the source and destination address in the MD-SAP.indication shall be equal to the *Destination Address* and *Source Address* fields that correspond the respective MSDU in the *Multiple Address Aggregated MSDU* element.

Update 6.2.2

***Insert at suitable location:***

MSDUs that have a Destination Address that has the multicast bit set in the MD-SAP.request shall be treated as if the destination address was the broadcast address.

Update 7.2

***On P56L23, replace***

a Type and Subtype of frame

***With***

the *Type* of the respective frame

***On P57L3, replace the paragraph with***

The payload of each data-, management-, or control frame consists of one or more elements. Depending on the frame type, different elements are contained in the payload. Data frames include one or multiple MSDUs received via the MD-SAP for transmission, encapsulated into the corresponding elements. For management frames, the payload includes elements that convey management information. The payload of control frames includes elements that carry control information.

The element(s) contained in the payload are indicated in the *Payload Control* field of the MPDU. For that purpose, the field contains the element id of the top-level payload element.

***Update Figure 23: Add 2-Octet field “Payload Type”, bringing size of the always-present part of the header to 16 bytes (128 Bits).***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2 Octets | 6 Octets | 6 Octets | 2 Octets | 0/6 Octets | 0/2 Octets | 0/2 Octets | Variable | 4 Octets |
| Frame  Control | Receiver  Address | Transmitter  Address | Payload  Type | Relay  Control | Sequence  Control | Fragmentation  Control | Payload | FCS |
| **MAC header** | | | | | | |

***In Figure 23, remove “Auxiliary Address” field.***

***In Figure 24, remove “Subtype” field.***

***On P57L24, remove paragraph for “Subtype”.***

***Remove P58L12-13 (Description of Auxiliary Address in Address fields).***

***Remove Table 1 and all mentions of the “direction” bits.***

* ***Bit 8-9 in Figure 24***
* ***P57L26f.***
* ***Table 1***
* ***P58L3.***

***Insert the following as the new content of 7.2.7 “Payload”:***

The payload contains the element that is indicated in the *Payload Type* field. The payload shall only contain elements that are allowed for the frame type, as indicated in Table X. This shall also apply when the payload contains multiple elements, e.g., included in a *Multiple Element Container* element.

The payload of management frames shall include either a *Management Procedure Container* element or a *Multiple Element Container* element that contains only *Management Procedure Container* elements. *Management Procedure Container* elements shall only include elements that belong to the same transmission as part of a management procedure.

The Invocation ID of the *Management Procedure Container* element shall contain a monotonically increasing index that identifies the invocation of the corresponding procedure. The index shall wrap to zero after reaching the highest representable value.

***Delete 7.3, 7.4, and 7.5.***

Update 7.6

***Rename “Variable Element Container element” to “Multiple Element Container element” in the whole document.***

***Remove the termination in the Multiple Element Container element in the whole document. (In field description, table, in description of the Type field).***

***In 7.6.1, after P61L24 replace the last line in the paragraph with the following and possibly change the ID order:***

[REF to Table X] lists the elements defined within this standard and the frame type(s) and procedure(s) they are used in, as well as their ID.

***Add new Table X:***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Element** | **Element ID** | **Element**  **reference** | **Allowed frame type** | **Procedure(s) using the element** |
| *Single MSDU* element |  | 7.6X | data | - Data transmission (6.X) |
| *Multiple Address Aggregated MSDU* element |  | 7.6X | data | - Data transmission (6.X) |
| *Single Address Aggregated MSDU* element |  | 7.6X | data | - Data transmission (6.X) |
| *Association Request* element |  | 7.6.2 | management | - Association (6.4.6) |
| *Association Response* element |  | 7.6.3 | management | - Association (6.4.6) |
| *Capability List* element |  | 7.6.6 | management | - Association (6.4.6) |
| *Supported MCS* element |  | 7.6.18 | management | - Association (6.4.6) |
| *Explicit MIMO Feedback* element |  | 7.6.9 | control  management | - Association (6.4.6)  - Distributed MIMO transmission (6.9) |
| *PM-PHY MCS* element |  | 7.6.19 | management | - Association (6.4.6)  - Adaptive transmission (6.8) |
| *HB-PHY MCS* element |  | 7.6.20 | management | - Association (6.4.6)  - Adaptive transmission (6.8) |
| *MCS Request* element |  | 7.6.14 | control | - Adaptive transmission (6.8) |
| *BAT Request* element |  | 7.6.15 | control | - Adaptive transmission (6.8) |
| *Disassociation Notification* element |  | 7.6.4 | management | - Disassociation (6.4.7) |
| *Announcement* element |  | 7.6.X | management | - OWPAN management (6.4) |
| *Sync* element |  | 7.6.X | control | - Beacon-Enabled Channel Access (6.3) |
| *GTS Descriptor List* element |  | 7.6.7 | control | - Beacon-Enabled Channel Access (6.3.6) |
| *GTS Descriptor* element |  | 7.6.8 | control | - Beacon-Enabled Channel Access (6.3.6) |
| *ACK* element |  | 7.6.11 | control | - Acknowledgement (6.7) |
| *Block ACK Request* element |  | 7.6.12 | control | - Acknowledgement (6.7) |
| *Block ACK* element |  | 7.6.13 | control | - Acknowledgement (6.7) |
| *GTS Request* element |  | 7.6.16 | control | - GTS allocation and signaling (6.3.6) |
| *RTS Descriptor* element |  | 7.6X | control | - RTS allocation and signaling (6.3X) |
| *Alien Signal* element |  | 7.6.17 | management | - Interference detection (6.4.8) |
| *Attribute Change Request* element |  | 7.6.21 | management | - OWPAN maintenance (6.4.4) |
| *Attribute Change Response* element |  | 7.6.22 | management | - OWPAN maintenance (6.4.4) |
| *Vendor Specific* element |  | 7.6.24 | control  management | - OWPAN maintenance (6.4.4) |
| *Management Procedure Container* element |  | 7.6X | management | - OWPAN maintenance (6.4.4) |
| *Reachable Address* element |  | 7.6.25 | control | - Relaying (6.10) |
| *Relay Device Configuration Request* element |  | 7.6.26 | management | - Relaying (6.10) |
| *Relay Device Configuration Response* element |  | 7.6.27 | management | - Relaying (6.10) |
| *Relayed Device Configuration Request* element |  | 7.6.28 | management | - Relaying (6.10) |
| *Relayed Device Configuration Response* element |  | 7.6.29 | management | - Relaying (6.10) |

***Insert the following new subclause under 7.6:***

**7.X Single MSDU Element**

The *Single MSDU* element, depicted in Figure Y1, is used to transfer a single MSDU received through the MD-SAP to another device in the OWPAN.

|  |  |  |
| --- | --- | --- |
| **6 Octets** | **6 Octets** | **Variable** |
| Destination MAC Address | Source MAC Address | MSDU |

Figure Y1: Single MSDU element

**Destination MAC Address**: The *DestinationAddress* as indicated in the MD-DATA.request primitive invocation.

**Source MAC Address:** The *SourceAddress* as indicated in the MD-DATA.request primitive invocation.

**MSDU:** The MSDU as provided through the MD-DATA.request primitive.

***Insert the following new subclause under 7.6:***

**7.X Multiple Device Element Container element**

The *Multiple Device Element* Container element contains multiple elements that are destined to different devices.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2 Octets | 2 Octets | 2 Octets | variable | (N-1) \* (6 + variable) Octets | | | | |
| Type 1 | Length 1 | AID 1 | Element 1 | ... | Type N | Length N | AID N | Element N |

Figure Y4: Multiple Device Element Container element

**Type 1 … N**: The type of the subsequent element. This field is two octets wide. The value shall be a valid ID as listed in [REF to Table X].

**Length 1 … N**: This field contains the length of the subsequent element in octets and is two octets wide.

**Element 1 … N**: The contained element indicated by the Type field as defined in the respective Clause.

**AID 1...N:** The association identifier of the device the corresponding element is destined for, or the broadcast AID (0xffff) if the element is destined for all receivers of the *Multiple Device Element Container* element.

**7.X Multiple Address Aggregated MSDU element**

The *Multiple Address Aggregated* *MSDU* element, depicted in Figure Y2, is used to transfer multiple MSDUs that have different Source and Destination MAC Addresses to devices in the OWPAN.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 6 Octets | 6 Octets | variable | (N-1) \* (14 + variable) Octets | | | | |
| Length 1 | Destination Address 1 | Source Address 1 | MSDU 1 | … | Length N | Destination Address N | Source  Address N | MSDU N |

Figure Y2: Combined MSDU element

**Length 1...N**: Number of octets of the subsequent MSDU. This field is two octets wide.

**Destination Address 1...N**: The *DestinationAddress* of the subsequent MSDUas indicated in the MD-DATA.request primitive invocation.

**Source Address 1...N:** The *SourceAddress* of the subsequent MSDUas indicated in the MD-DATA.request primitive invocation.

**MSDU 1...N:** MSDUs as provided through the MD-DATA.request primitive.

**7.X Single Address Aggregated MSDU element**

The *Single Address* *Aggregated MSDU* element, depicted in Figure Y3, is used to transfer multiple MSDUs that share Source and Destination MAC Addresses received through the MD-SAP between devices in the OWPAN.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **2 Octets** | **6 Octets** | **6 Octets** | **variable** | **variable** | | | | |
| Length 1 | Destination Address | Source Address | MSDU 1 | **…** | Length N | Destination Address  N | Source Address  N | MSDU N |

Figure Y3: Combined MSDU element

**Length 1...N**: Number of octets of the subsequent MSDU. This field is two octets wide.

**Destination Address**: The *DestinationAddress* of all MSDUsas indicated in the MD-DATA.request primitive invocation.

**Source Address:** The *SourceAddress* of all MSDUsas indicated in the MD-DATA.request primitive invocation.

**MSDU 1...N:** MSDUs as provided through the MD-DATA.request primitive.

***Remove subclause 7.6.10 “MSDU Aggregation element”.***

***On P75L8, change “The value shall be a valid ID as listed in Table 14” to***

The value shall be a valid ID as listed in table X.

***Remove Table 14 and change all references to table X instead.***

***7.X* Management Procedure Containerelement**

The *Management Procedure Container* element, depicted in figure Y4, encapsulates one or multiple other elements that comprise an invocation of a management procedure as assigned in table X.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 Octet | 1 Octet | 2 Octets | 2 Octets | variable | (N-1) \* (4 + variable) Octets | | | |
| reserved | Invocation ID | Type 1 | Length 1 | Element 1 | … | Type N | Length N | Element N |

**Figure Y4 Management Procedure Container element**

**Invocation ID:** Index of the invocation of the management procedure the contained elements are associated with.

**Type 1...N**: The type of the subsequent element. This field is two octets wide. The value shall be a valid ID as listed in table X.

**Length 1...N**: This field contains the length of the subsequent element in octets and is two octets wide.

**MSDU 1...N:** The contained element indicated by the Type field as defined in [REF to table X].

Update 8.2

***In table 18 and 19, update the “Description” column of the row that starts with “Msdu” to the following text:***

The MSDU in EtherType format, i.e., starting with the Length/Type field and ending with the MAC Client Data field as defined in [REF to IEEE802.3].