**IEEE P802.15**

**Wireless Specialty Networks**

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| Title | **Proposed resolution draft for Group BAN frame - LB212** | |
| Date Submitted | 6 May, 2025 | |
| Source | Seong-Soon Joo (Nano HiTech) | E-mail: [ssjoo@etri.sci.kr] |
| Re: | Contribution to IEEE 802.15.6ma | |
| Abstract | This document provides a proposed text draft to update the frame format for resolving LB212 comments. | |
| Purpose | Support development of technical content for the draft | |
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Draft Standard for Wireless Body Area Network

1. 1. Management frames
      1. Format of management frames

The format of a management frame is defined in Figure 11.



1. —Management frame format
   * 1. Beacon Frame Body format
        1. Introduction

The frame body of a Beacon frame contains the information shown in Table 20.

1. — Beacon Frame Body encoding

|  |  |  |
| --- | --- | --- |
| **Octet** | **Field name** | **Description** |
| 0−7 | Timestamp | This field represents the timing synchronization function (TSF) timer of the conveyed MAC frame. |
| 8-9 | BAN ID | 5.5.2.2 |
| 10 | Capability information | 5.5.2.3 |
| 11-13 | Beacon Interval | This field specifies the transmission interval of the beacon by the number of beacon time unit |
| 14 | Superframe Duration | This field specifies the length of active superframe duration by the number of beacon time unit. |
| 15 | CFP Length | This field specifies the length of the contention-free period by the number of time slots. |
| 16 | CFP Descriptor Count | This field specifies the number of nodes that are allowed to access CFP. |
| var | CFP Descriptor List | This field specifies the list of CFP descriptor information as defined in Table 71, which specifies the location and length of CFP slots assigned for a node to be allowed to access CFP. The size of CFP Descriptor List is specified by CFP Descriptor Count. A node may request to configure CFP slots such as consecutive allocation or distributed allocation. |

1. — Format of the CFP descriptor information

|  |  |  |  |
| --- | --- | --- | --- |
| **Octet** | **Bits** | **Field name** | **Description** |
| 0−5 |  | Node Address | This field represents the address of a node to access CFP. |
| 6 | 0-1 | GTS type | This field specifies the configuration of GTS distribution.  0 : aperiodic GTS  1 : periodic uniform GTS  2: periodic configured GTS  3: reserved |
| 6 | 2-7 | Slot Parts Count | This field specifies the number of distributed slot parts in a CFP. |
| var |  | Slot Parts Descriptor List | This field specifies the list of GTS slot parts information as defined in Table 72, which specifies the start superframe and slot number, GTS transmission direction, and the number of consecutive slots allocated to a GTS. The size of Slot Parts Descriptor List is specified by Slot Parts Count. |

1. — Format of the slot parts descriptor information

|  |  |  |  |
| --- | --- | --- | --- |
| **Octet** | **Bits** | **Field name** | **Description** |
| 0 | 0-7 | Superframe Number | This field represents the starting superframe of a slot parts in a CFP. |
| 1-2 | 0-15 | Start Slot Number | This field represents the starting slot number of a slot parts in a CFP. |
| 3 | 0-2 | Direction | This field represents the direction of transmission for CFP slots.  0 : a slot for downward transmission from the coordinator  1 : a slot upward transmission from the node |
| 3 | 3-7 | Slot Count | This field specifies the length of consecutive slots for a distributed slot part. |

* + - 1. The BAN ID subfield

The BAN ID consists of the first 16 octets of output of the security hash SHA-224 with input the first timestamp concatenated with the coordinator’s MAC address.

* + - 1. Capability Information subfield

1. — Capability Information subfield encoding

|  |  |  |
| --- | --- | --- |
| **Bits** | **Capability Information** | **Description** |
| b136 | Group Coordinator | The device is a group coordinator. |
| b137 | QoS | The device has QoS capabilities |
| b138 | HARQ | The device has HARQ capability |
| b139 | Spectrum\* Measurements | Spectrum measurements enable. |
| b140 | Link\* Measurements | Link measurements enable. |
| b141 | Traffic Indication Map\*\* | A Traffic Indication Map is present. |
| b142−b143 | Reserved |  |

\* Spectrum Measurements and Link Measurements measure channel qualities and radio performance. It enables a BAN or Group BAN to learn the wireless environment and use wireless resources such as spectrum, power, and bandwidth more effectively.

\*\* The TIM identifies the devices for which traffic is pending and buffered in the coordinator.

* + 1. Disassociation frame body format

The Disassociation frame body contains the information shown in Table 24.

1. —Disassociation Frame body

|  |  |
| --- | --- |
| **Octet** | **Description** |
| 1 | Reason Code |

The Reason Code indicates the reason for the generation of an unsolicited Dissociation frame.

1. —Reason code encoding

|  |  |
| --- | --- |
| **Value** | **Description** |
| 0 | Reserved. |
| 1 | Unspecified reason. |
| 2 | Invalid authentication: Previous authentication is no longer valid. |
| 3 | Leaving network: Sending device is leaving (or has left) the BAN |
| 4 | Leaving group: Sending coordinator is leaving (or has left) the Group BAN |
| 5 | Inactivity: Disassociated due to inactivity |
| 6 | BAN at capacity: Disassociated because the coordinator is unable to handle more devices |
| 7 | Group at capacity: Disassociated because the group coordinator is unable to handle more BANs. |
| 8 | Not authenticated: Device requesting (re)association is not authenticated with responding coordinator |
| 9 | Not enough bandwidth: Disassociated because the coordinator lacks sufficient bandwidth for this QoS. |
| 10 | Missing ACKs: Disassociated because an excessive number of frames need to be acknowledged but are not acknowledged due to coordinator activity and/or poor channel conditions. |
| 11 | Exceeded GTX: Disassociated because the group member is transmitting outside the limits of its Group allocation period. |
| 12 | Timeout: Requested from device due to timeout |
| 13-256 | Reserved |

NOTE⎯ The Deauthentication frame has the same frame format.

* + 1. Association Request body frame format

The Association frame body contains the information shown in Table 26.

1. — Association Request body frame encoding

|  |  |  |
| --- | --- | --- |
| **Octet** | **Field name** | **Description** |
| 0−1 | Capability Information | Capability information of device requesting association (5.5.2.3) |
| 2 | BAN ID | Requesting association to BAN identified with BAN ID |
| 3 | Supported rates | Supported rates of the device requesting association Annex E) |
| 4 | Supported FEC | Supported FEC mechanisms of device requesting association |
| 5 | QoS capability I (coordinator) | The subfield is present (Table 27) if QoSOption1Implemented in MIB is true. Otherwise, absent. |
| 6 | QoS capability II (non-coordinator) | The subfield is present (Table 28) if QoSOption2IImplemented in MIB is true. Otherwise, absent. |
| 7-8 | Supported Channels | List of supported channels of device requesting association. |
| 9-11 | Cipher Suite Capability |  |
| 12-13 | Public Key |  |
| 14-18 | Key Session |  |
| 19 | CFP Management | This set of subfields specifies the requested GTS configuration as defined in Table 82. |

1. — QoS Capability I field

|  |  |  |  |
| --- | --- | --- | --- |
| **Octet** | **Bits** | **Field name** | **Description** |
| 0 | b0-b3 | Update count | Incremented by one every time there is a change in QoS during a session. |
| b4 | Queue request |  |
| b5 | GTX request |  |
| b6-b7 | Reserved |  |

1. — QoS Capability II field

|  |  |  |  |
| --- | --- | --- | --- |
| **Octet** | **Bits** | **Field name** | **Description** |
| 0 | b0 | AC\_VO Flag | It shall be set to one in [Re]Association Request frames to indicate the type of traffic AC\_VO generated by a node or bridge. Otherwise, it is set to zero. |
| b1 | AC\_VI Flag | It shall be set to one in [Re]Association Request frames to indicate the type of traffic AC\_VI generated by a node or bridge. Otherwise, it is set to zero. |
| b2 | AC\_BK Flag | It shall be set to one in [Re]Association Request frames to indicate the type of traffic AC\_BK generated by a node or bridge. Otherwise, it is set to zero. |
| b3 | AC\_BE Flag | It shall be set to one in [Re]Association Request frames to indicate the type of traffic AC\_BE generated by a node or bridge. Otherwise, it is set to zero. |
| b4-b5 | Max Buffer | It indicates the maximum number of buffered MSDUs the node is prepared to receive during any session triggered by the node |
| b6 | More ACK | The node can process ACK frames with the More Data bit in the Frame Control field equal to 1 and remains in the awake state. Otherwise, it is set to zero. |
| b7 | Reserved |  |

The type of traffic (AC\_VO, AC\_VI, AC\_BK, AC\_BE) is used by a coordinator to associate such AC with the node. Also, it indicates the type of traffic (AC\_VO, AC\_VI, AC\_BK, AC\_BE) is trigger-enabled AC and delivery-enabled AC.

NOTE⎯ Delivery-enabled AC enables the coordinator to deliver data from such AC to a node or bridge triggered or requested by the node or bridge.

NOTE⎯ Trigger-enabled AC enables a Data frame from a node or bridge to trigger a session with such AC if one is not in progress.

1. —Max Buffer subfield

|  |  |
| --- | --- |
| **b4−b5** | **Description** |
| 00 | The node is prepared to receive all buffered MSDUs. |
| 01 | The node is prepared to receive a maximum of two MSDUs per session |
| 10 | The node is prepared to receive a maximum of four MSDUs per session. |
| 11 | The node is prepared to receive a maximum of six MSDUs per session. |

1. — Supported Channels field

|  |  |  |  |
| --- | --- | --- | --- |
| **Octet** | **Bits** | **Field name** | **Description** |
| 0 | b0−b1 | Channelization Plan | Frequency band channelization (Table 31) |
| b2−b7 | Supported channel number | The supported channel number from the channelization plan is indicated as *i*−2 if bit bi shall be set to one for *i*=2,3,..,15. Otherwise, it is set to zero.  Example if bit b2=1, then the channel number 0 (2−2) is supported from Channelization Plan of Table 31. |
| 1 | b8−b15 |

1. —Channelization Plan subfield

|  |  |
| --- | --- |
| **b0−b1** | **Description** |
| 00 | Frequency band channelization 1 (Annex F) |
| 01 | Frequency band channelization 2 (Annex F) |
| 10 | Reserved. |
| 11 | Reserved. |

1. —CFP Management

|  |  |  |  |
| --- | --- | --- | --- |
| **Octet** | **Bits** | **Field name** | **Description** |
| 0 | 0-1 | GTS Management Type | This field specifies the management type of CFP slots distribution.  0 : GTS request  1 : GTS response  2: reserved  3: reserved |
| 0 | 2-7 | GTS Identifier | This field specifies the identifier of GTS request and response. |
| 1 | 0-1 | GTS type | This field specifies the configuration of GTS distribution.  0 : aperiodic GTS  1 : periodic uniform GTS  2: periodic configured GTS  3: reserved |
| 1 | 2-7 | Slot Parts Count | This field specifies the number of distributed slot parts in a CFP. |
| var |  | Request Slot Parts List | This field specifies the list of requesting GTS slot parts information as defined in Table 83, which specifies the time interval of a periodic GTS, GTS transmission direction, and the number of consecutive slots allocated to a GTS. The size of Slot Parts Request List is specified by Slot Parts Count. |

1. — Format of the request slot parts

|  |  |  |  |
| --- | --- | --- | --- |
| **Octet** | **Bits** | **Field name** | **Description** |
| 0-1 |  | Interval | This field represents the inter-arrival time of a periodic GTS in BTU. For GTS type 0 this field is a duration of reserving the time slots in BTU. |
| 2 | 0-2 | Direction | This field represents the direction of transmission for CFP slots. This field is set to 0 for a slot downward transmission from the coordinator, and set to 1 for a slot upward transmission from the node. |
| 2 | 3-7 | Slot Count | The length of consecutive slots for a distributed slot part. |

* + 1. Association Response frame format
       1. Introduction

The Association frame body contains the information shown in Table 34.

1. — Association Response body frame encoding

|  |  |  |
| --- | --- | --- |
| **Octet** | **Field name** | **Description** |
| 0−1 | Capability Information | Capability information of device requesting association (5.5.2.3) |
| 2 | Device ID | Assigned ID to the device. |
| 3 | Supported rates | Supported rates by the coordinator (MIB) |
| 4 | Supported FEC | Supported FEC mechanisms by the coordinator (MIB) |
| 5 | FEC Configuration | Assigned FEC configuration (Table 35) |
| 6 | QoS Map | The subfield is present (Table 36) if QoSMapActiveted in MIB is true. Otherwise, absent. |
| 7 | QoS capability II (non-coordinator) | The subfield is present (Table 28) if QoSOption2IImplemented in MIB is true. Otherwise, absent. |
| 8 | Supported Channels | List of supported channels of device requesting association (Annex F) |
| 9-11 | Cipher Suite Configuration |  |
| 12-15 | Public Key |  |
| 16-18 | Key Session |  |
| var | CFP Management | This set of subfield specifies the assigned CFP slots configuration as defined in Table 82. |

* + - 1. FEC Configuration subfield

1. —FEC Configuration subfield encoding

|  |  |  |  |
| --- | --- | --- | --- |
| **Octet** | **Coexistence Class** | **FEC Configuration** | **Eight possible FEC configurations from 8 possible User Priorities** |
| 0−1 | 0 | 0−7 | Table 119 |
| 1 | 8−15 | Table 120 |
| 2 | 16−23 | Table 121 |
| 3 | 24−31 | Table 122 |
| 4 | 32−39 | Table 123 |
| 5 | 40−47 | Table 124 |
| 6 | 48−55 | Table 125 |
| 7 | 56−63 | Table 126 |

* + - 1. QoS map subfield

The QoS Map field is transmitted from a coordinator to a node in a (Re)Association Response frame to provide the mapping of higher layer QoS constructs to User Priorities (UPs) to be used for transmission of Data frames. The QoS Map field maps the higher layer priority from the DSCP field used with the Internet Protocol onto User Priority as defined by this standard. The QoS Map field is shown in Table 36.

The DSCP List field contains zero or more DSCP subfields (Table 36) with a maximum value of 10.

1. —QoS Map field

|  |  |  |
| --- | --- | --- |
| **Number of Octets** | **Subfield** | **Description** |
| 1 | N | List length |
| 2 | DSCP\_1 | Table 37 |
|  | … |
| 2 | DSCP\_N |
| 2 | UP0\_2\_DSCP |  |
| 2 | UP\_1\_DSCP |  |
| 2 | UP\_2\_DSCP |  |
| 2 | UP\_3\_DSCP |  |
| 2 | UP\_4\_DSCP |  |
| 2 | UP\_5\_DSCP |  |
| 2 | UP\_6\_DSCP |  |
| 2 | UP\_7\_DSCP |  |

1. —DSCP\_n subfield

|  |  |  |
| --- | --- | --- |
| **Number of Octets** | **Subfield** | **Description** |
| 1 | DSCP Value | The DSCP value is in the range zero to 63, or 255 |
| 1 | UP | The UP value is in the range zero to 7 |

When a node begins transmission of a Data frame containing the Internet Protocol, it matches the DSCP field in the IP header to the corresponding DSCP value contained in this field.

The node attempts to match the DSCP value to a DSCP\_n subfield. If successful, it uses the corresponding UP value (Table 33). If unsuccessful, the node attempts to match the DSCP value of the UPm\_2\_DSCP subfield and uses the m as the UP if successful; otherwise, it uses a UP of zero.

The DSCP value is between zero and 63 or 255.

* + 1. Group Beacon frame body format
       1. Introduction

The Group Beacon frame body contains the information shown in Table 38.

1. — Group Beacon frame body format

|  |  |  |
| --- | --- | --- |
| **Octet** | **Field name** | **Description** |
| 0−7 | Timestamp | This field represents the timing synchronization function (TSF) timer of the conveyed MAC frame. |
| 8 | Group ID | Assigned ID to the Group BAN. |
| 9 | Supported rates | Supported rates by the coordinator (MIB) |
| 10 | Supported FEC | Supported FEC mechanisms by the coordinator (MIB) |
| 11-12 | FEC Configuration | Assigned FEC configuration (Table 35) |
| 13-14 | Supported Channels | List of supported channels of device requesting association (Annex F) |
| 15-17 | Group Beacon Interval | The length of group beacon interval in the number of BTU. |
| var | Group BAN Descriptor | This set of subfields specifies the Group BAN configuration as defined in Table 39. |

* + - 1. Group BAN descriptor subfield

1. — Group BAN descriptor

|  |  |  |
| --- | --- | --- |
| **Octet** | **Field name** | **Description** |
| 0 | Group BAN Count | The number of BANs joined in the group BAN. |
| var | BAN Descriptor List | This set of subfield specifies the list of BAN joined in the group BAN in order of allocation, as defined in 0. |

1. BAN descriptor

|  |  |  |
| --- | --- | --- |
| **Octet** | **Field name** | **Description** |
| 0-1 | BAN ID | Assigned ID to the BAN. |
| 2-7 | BAN Coordinator address | The address of the BAN coordinator. |
| 8 | Superframe Duration | This field specifies the active superframe duration of the BAN in BTU. |

* + 1. Group allocation map frame body format
       1. Introduction

The Group allocation map frame body contains the information shown in Table 41.

1. — Group allocation map frame body format

|  |  |  |
| --- | --- | --- |
| **Octet** | **Field name** | **Description** |
| 0−7 | Timestamp | This field represents the timing synchronization function (TSF) timer of the conveyed MAC frame. |
| 8 | Group ID | Assigned ID to the Group BAN. |
| 9-11 | Group Beacon Interval | The length of group beacon interval in the number of BTU. |
| var | Group Allocation Descriptor | This set of subfields specifies the Group allocation map as defined in Table 42. |

* + - 1. Group BAN descriptor subfield

1. — Group Allocation descriptor

|  |  |  |
| --- | --- | --- |
| **Octet** | **Field name** | **Description** |
| 0 | Group BAN Count | The number of BANs joined in the group BAN. |
| var | Allocation Descriptor List | This set of subfields specifies the list of active superframe allocation of the BANs joined in the group BAN, as defined in Table 43. |

1. —BAN Allocation descriptor

|  |  |  |
| --- | --- | --- |
| **Octet** | **Field name** | **Description** |
| 0-1 | BAN ID | Assigned ID to the BAN. |
| 2-7 | BAN Coordinator address | The address of the BAN coordinator. |
| 8 | Superframe Duration | This field specifies the active superframe duration of the BAN in BTU |
| 9-11 | Start slot | The slot number of the starting active superframe duration of the BAN |

* + 1. Group association frame body format

The Group association frame body contains the information shown in Table 44.

1. — Group association frame body format

|  |  |  |
| --- | --- | --- |
| **Octet** | **Field name** | **Description** |
| 0-1 | BAN ID | Assigned ID to the BAN. |
| 2-7 | BAN Coordinator address | The address of the BAN coordinator. |
| 8-10 | Beacon Interval | The length of BAN beacon interval in the number of BTU. |
| 11 | Superframe Duration | This field specifies the active superframe duration of the BAN in BTU |
| 12 | Supported rates | Supported rates by the coordinator (MIB) |
| 13 | Supported FEC | Supported FEC mechanisms by the coordinator (MIB) |
| 14 | QoS capability I (coordinator) | The subfield is present (Table 27) if QoSOption1Implemented in MIB is true. Otherwise, absent. |

* + 1. Group disassociation frame body format

The Group disassociation frame body contains the information shown in Table 45.

1. — Group disassociation frame body format

|  |  |  |
| --- | --- | --- |
| **Octet** | **Field name** | **Description** |
| 0-1 | BAN ID | Assigned ID to the BAN. |
| 3 | Reason code | As defined in Table 26. |