**IEEE P802.15**

**Wireless Personal Area Networks**

|  |  |
| --- | --- |
| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) |
| Title | **Information Element SB comment support** |
| Date Submitted | 17 August 2011 |
| Source | Jonathan Simon, B. Rolfe, W. San FilippoDust Networks, BCA, Silver Spring NetworksHayward, CA | Voice: 1 510 400 2936 Fax: E-mail: jsimon@dustnetworks.com |
| Re: | Editorial instructions in support of proposed resolutions to sponsor ballot comments (J. Simon) |
| Abstract | Editor instructions |
| Purpose | Provide instructions to the editor to correct problems identified with the Information Elements description in the sponsor ballot draft D6 review. |
| Notice | This document has been prepared to assist the IEEE P802.15. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein. |
| Release | The contributor acknowledges and accepts that this contribution becomes the property of IEEE and may be made publicly available by P802.15. |

***Editor’s instructions – Modify third paragraph of 5.2.1.10 and figure 43a as follows:***

**5.2.1.10 IE List field**

Payload IEs, if present, follow the MHR and are considered part of the MAC payload, i.e. they may be encrypted. ~~A list of payload IEs may require termination.~~ See 5.2.4.~~5~~6 for details on termination.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Octets: variable |  | Variable | 0/2 | Octets: variable |  | Variable |
| 1st Header IE  | … | nth Header IE | Header IE List Termination IE | 1st Payload IE  | … | nth Payload IE |

Figure 43a—Format of IE List field

***Replace sections 5.2.4 – 5.2.4.2 with the following***

* + 1. **Information Elements**
			1. **General**

IEs provide a flexible, extensible, and easily implementable method of encapsulating information. The general form of an IE consists of an ID (or tag) field, a length field, and a content field (or value). Multiple IEs may be concatenated, and elements with unknown ID values in a list of IEs can be skipped since their length is known. IEs provide a flexible container for information that allows for adding new features and updating existing features in a backwards-compatible way.

IEs may be either part of the MHR or MAC payload. Header IEs are used by the MAC to process the frame immediately, i.e. they cover security, addressing, etc. and are part of the MHR. Payload IEs are destined for another layer or SAP and are part of the MAC payload (but like command IDs they may not be encrypted). If IEs are contained in a frame, they always occur before other unstructured MAC payload elements.

Each IE starts with an IE descriptor. Format of the descriptor is different for Header and Payload IEs.

* + - 1. Header Information Elements

The Header IE descriptor consists of a 7-bit length field, an 8-bit Element ID that uniquely identifies the IE, and a 1-bit type, always set to zero. It is followed by the IE content. The form of the Header IE is shown in Figure 55o. The Element ID space is broken into managed and unmanaged spaces as shown in table 4a. The allocation of Managed Element IDs shall be according to Table 4f for Header IEs.

|  |  |  |  |
| --- | --- | --- | --- |
| Bit: 0-6 | 7–14 | 15 | Octets: 0 … 127 |
| Length | Element ID | Type = 0 | IE Content |

Figure 55.o—Format of MAC information elements

Table 4a—Header Element ID namespace

|  |  |
| --- | --- |
| ID range | Function |
| 0x00-0x19 | Unmanaged IDs (see 5.2.4.5) |
| 0x20-0xff | Managed IDs (see 5.2.4.3) |

Table 4f—Element IDs, Header IEs

|  |  |  |  |
| --- | --- | --- | --- |
| Element ID  | Content Length | Name | Description |
| 0x00 –0x19 | — | — | Unmanaged (i.e. implementation specific) IEs. |
| 0x1a | 4 | LE CSL | (See 5.2.4.4.2) |
| 0x1b | 4 | LE RIT | (See 5.2.4.4.3) |
| 0x1c | variable | DSME PAN Descriptor | (See 5.2.4.4.4) |
| 0x1d | 2 | RZ Time | (See 5.2.4.4.5) |
| 0x1e | 2 | ACK/NACK TimeCorrection | (See 5.2.4.4.6) |
| 0x1f | 4 | Group ACK (GACK) | (See 5.2.4.4.7) |
| 0x20 | variable | LowLatencyNetworkInfo | Information for association specific to low latencynetworks from the next higher layer. |
| 0x21-0x7d | — | Reserved | — |
| 0x7e | 0 | List Termination 1 | Signals the end of the Header IEs when followed by payload IEs. See (5.2.4.6) |
| 0x7f | 0 | List Termination 2 | Signals the end of the Header IEs when followed by unformatted payload. See (5.2.4.6) |
| 0x80-0xff | — | Reserved | — |

***Insert before existing section 5.2.4.3***

* + - 1. Payload Information Elements

The Payload IE descriptor consists of an 11-bit length field, a 4-bit Group ID, and a 1-bit type, always set to one. It is followed by the IE content which may contain additional IE formatting. The form of the Payload IE is shown in Figure .

|  |  |  |  |
| --- | --- | --- | --- |
| Bit: 0-10 | 11-14 | 15 |  Octets: 0 … 2047 |
| Length | Group ID | Type = 1 | IE Content |

Figure 55p— Payload IE general form

The Group ID space is broken into managed and unmanaged spaces as shown in Table 4b.

Table 4a— Payload IE Group ID namespace

|  |  |
| --- | --- |
| Group ID Value | Description |
| 0x0 | Higher layer payload (SDU passed up/down. Content transparent to the MAC) |
| 0x1 | MLME (Nested) |
| 0x2-0x9 | Un-managed  |
| 0xa-0xf | Reserved |

* + - * 1. SDU Information Elements

A SDU IE encapsulates upper layer payload (SDU), the content is transparent to the MAC, and it shall have the form shown in Figure 55q. Upper layer content is sent as received – no byte ordering changes are to be made.

|  |  |  |  |
| --- | --- | --- | --- |
| Bit: 0-10 | 11-14 | 15 |  Octets: 0 … 2047 |
| Length | Group ID = 0 | Type = 1 | IE Content |

Figure 55q— SDU IE

* + - * 1. MLME Information Elements

The MLME IE transports MAC management information. The MLME uses a nested form as shown in Figure 55r (Nested IE).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Bit: 0-10 | 11-14 | 15 | Octets:2 | Variable | … |
| Length = 0-2047 | Group ID = 9 | Type = 1 | Length | Sub-ID | Type | Sub-IE Content |  |
| Outer IE Descriptor | Sub-IE descriptor |  | Additional Sub-IEs |

**Figure 55r—MLME IE**

Each IE nested in an MLME IE shall consist of a nested Sub-IE descriptor (consisting of a length field, a Sub-ID, and a 1-bit type) followed by the IE content. Short and long forms of the nested IE are shown in Figure 55s and Figure 55t. The Sub-ID space for nested MLME IEs broken into managed and unmanaged spaces as shown in Table 4c (short form) and Table 4d (long form).

|  |  |  |  |
| --- | --- | --- | --- |
| Bit: 0-7 | 8-14 | 15 |  Octets: 0 … 255 |
| Length | Sub-ID | Type = 0 (short) | IE Content |

**Figure 55s—Short form of the nested MLME IE**

|  |  |  |  |
| --- | --- | --- | --- |
| Bit: 0-10 | 11-14 | 15 |  Octets: 0 … 2047 |
| Length | Sub-ID | Type = 1 (long) | IE Content |

**Figure 55t—Long form of the nested MLME IE**

Table 4c— Sub-ID allocation for short form

|  |  |  |  |
| --- | --- | --- | --- |
| Sub-ID Value  | Content Length | Name | Description |
| 0x00-0x19 | — | Reserved | — |
| 0x1a | 6 | TSCH Synchronization | Information to synchronize to a TSCH network. ASN of TSCH device and its join prority (see 5.2.4.4.8) |
| 0x1b | variable | TSCH Slotframe and Link | Slotframe and link information for joining a TSCH device (see 5.2.4.4.9) |
| 0x1c | variable | TSCH Timeslot | Timeslot template being used by the TSCH device (see 5.2.4.4.10) |
| 0x1d | 5 | Hopping Timing | Timing information used to synchronize to an unslotted hopper (see 5.2.4.4.12) |
| 0x1e | variable | EB Filter | Response filter for EBR (see 5.2.4.4.8) |
| 0x1f | 5 | MAC Metrics 1 | MAC Metrics counters 0x91 through 0x99 (see 5.2.4.4.14) |
| 0x20 | 40 | MAC Metrics 2 | All MAC Metrics counters in Figure 55nn (see 5.2.4.4.14) |
| 0x21-0x3f | — | Reserved | — |
| 0x40-0x7f | — | Unmanaged. | — |

Table 4d— Sub-ID allocation for long form

|  |  |  |  |
| --- | --- | --- | --- |
| Sub-ID Value | Content Length | Name | Description |
| 0x0 – 0x8 | — | Un-managed. | — |
| 0x9 | variable | Channel Hopping Sequence | The Hopping Sequence being used by the device (see 5.2.4.4.11) |
| 0xa-0xf | — | Reserved | — |

***Increase section 5.2.4.3 to 5.2.4.4 and modify as follows:***

**5.2.4.4 Defined IEs**

**5.2.4.4.1 General**

The following IEs are used by the optional functional organization modes indicated in Table 52a. When sending, an appropriate header descriptor must be used. All multi-byte fields within IE’s are sent LSB first, except where otherwise indicated.

***Increase section 5.2.4.4 to 5.2.4.5 and modify as follows:***

**5.2.4.5 Unmanaged ID space**

Unmanaged ID spaces are left to the implementer to manage. The format of unmanaged IE’s is beyond the scope of this document. Since multiple implementers may re-use the same IDs, use of a mechanism to ensure correct identification of a specific implementer’s IE is encouraged.

***Increase section 5.2.4.5 to 5.2.4.6 and modify as follows:***

**5.2.4.6 IE List Termination**

The IE list is terminated with a list termination IE (ID = 0x7e or 0x7f) that has a content length of zero. Explicit termination is required after a Header IE if there is one or more encrypted Payload IEs (0x7e), or MAC payload (0x7f), ~~or both~~ following the Header IE list~~s~~. Otherwise the terminator may be omitted. Payload IEs and unformatted payload may not be combined.