**IEEE P802.15 Wireless Personal Area Networks**

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| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) |
| Title | **<IETF 6tisch IE Information>** |
| Date Submitted | [13 November 2015] |
| Source | [Pat Kinney][<Kinney Consulting>][address] | Voice: [ ]Fax: [ ]E-mail: [ ] |
| Re: | Response to a request for information from IETF 6tisch |
| Abstract | [Information on request procedure for SDOs to obtain IE IDs and recommendation on IE sub-typing  |
| Purpose | [This document has been approved by the IEEE 802.15 6T interest group for release to IETF 6tisch] |
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**Introduction**

This document is in response to requests from IETF 6tisch for an assignment of a new IEEE Std. 802.15.4 Payload IE ID for use by IETF 6top and guidance on sub-typing the ID to prevent the need for additional requests in the future.

This document consists of four sections:

# IETF 6tisch Request Statements (email, draft)

# Procedure for requesting IDs from IEEE 802.15 WPANTM

# Excerpts of IEEE Std. 802.15.4-2015 pertaining to the use of IEs

# [Recommended practice of formatting Payload IE sub-types](#_Recommended_practice_of)


# IETF 6tisch Request Statements (email, draft)

|  |
| --- |
| The following email and IETF draft excerpt form the basis of the request to the 6T interest group (IG6T)Email**From: Thomas Watteyne** watteyne@eecs.berkeley.edu**Subject:** IETF IE request**Date:** 23October, 2015 at 9:01 **To:** Pat Kinney pat.kinney@kinneyconsultingllc.com**Cc:** Pascal Thubert pthubert@cisco.com |
| Pat,I want to bring to your attention the following: * https://tools.ietf.org/html/draft-wang-6tisch-6top-sublayer-03#appendix-A
* https://tools.ietf.org/html/draft-wang-6tisch-6top-sublayer-03#appendix-B

Once we agree in principle this is doable, we can issue an official request and work on a mechanism to manage that IE space through IANA. Thomas\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  |

## IETF Draft

[https://tools.ietf.org/html/draft-wang-6tisch-6top-sublayer-03](https://tools.ietf.org/html/draft-wang-6tisch-6top-sublayer-03#appendix-A):

Appendix A. [TEMPORARY] IETF IE

This section contains a proposal for the specification of an IETF IE. If this proposal is supported by the 6TiSCH WG, the authors of this draft recommend for the specification of the IETF IE to be its own draft, possibly developed in the 6TiSCH WG. The reason for having it a separated document is that the scope of the IETF IE is wider that the 6P protocol defined in this document.

The IETF IE is a IEEE 802.15.4 Payload Information Element with the Group ID set to IANA\_6TOP\_IE\_GROUP\_ID. The value of IANA\_6TOP\_IE\_GROUP\_ID is defined by the IEEE, communicated to the IETF, and noted by IANA. The format of the IETF IE is exactly the same as the format of an MLME Information Element, as specified in [IEEE802154e], Section 5.2.4.5. The difference is that the space of Sub-IDs is managed by the IETF/IANA.

Appendix B. [TEMPORARY] IEEE Liaison Considerations

 If the specification described in this document is supported by the 6TiSCH WG, the authors of this document ask the 6TiSCH WG chairs to liaise with the IEEE to request a Payload Information Element Group ID to be assigned to the IETF (Group ID IANA\_6TOP\_IE\_GROUP\_ID described in [Appendix A](#Appendix_A)).


# Procedure for requesting IDs from IEEE 802.15 WPANTM

# Assigned Numbers Authority (ANA)[http://www.ieee802.org/15/ANA.html]

The following text is excerpted from the IEEE 802.15 ANA policy.

## ANA Request Procedure for other standards development organizations (SDOs)

A limited number of numbers may be assigned to allow SDOs to extend the use of IEEE 802.15. Currently, this is only allowed for IEEE Std. 802.15.4, but it may be applied to other IEEE 802.15 standards in the future at the discretion of the WG Chair.

Only the following categories of IDs may be assigned for IEEE Std. 802.15.4:

1. Frame Extension ID
2. Header Information Element (IE) Element ID
3. Payload IE Group ID

Only one number shall be assigned to an SDO from an ID category. The SDO is responsible to create a method for sub-typing that would prevent the need for an additional ID.

To request an ID, the SDO shall send an official request to the IEEE 802.15 WG Chair that includes, at a minimum, the following information:

1. The name of the SDO and its accreditation
2. The reason for the request
3. The ID categories that are requested
4. A description of the protocol format that shows that there is sufficient subtype capability withstand enhancement by the originator without the need for the assignment of a further ID in the future.
5. A statement that the SDO understands that only one ID number will be issued to the SDO in an ID category and that the SDO is responsible to create a method for sub-typing the ID to prevent the need for additional requests in the future.

If the request from the SDO contains the required information, the IEEE 802.15 WG Chair shall appoint a committee of experts to review the request. The WG ANA lead shall be the Chair of the committee and the WG 802.15 Chair is an ex-officio member. The committee should decide on the request within three months of the request. This is to allow the consideration of the request at an interim or plenary session.

The committee shall refuse the request if:

1. The SDO is not an accredited SDO
2. The SDO has already been assigned a number in a requested ID category.
3. The SDO has not adequately described a subtyping method to prevent the need for the SDO request a further ID in the future.
4. There is a technical reason why a number cannot be allocated.

If the committee approves the request, the WG ANA lead will assign a number for the requested ID categories and update the ANA database document. The assignment of the number should also be submitted for inclusion in the next revision of the standard.


# Excerpts of IEEE 802.15.4-2015 pertaining to the use of IEs

**7.4.3 Payload IEs**

The general format of the Payload IE is shown in Figure 7-46.

|  |  |  |  |
| --- | --- | --- | --- |
| **Bits: 0-10** | **11-14** | **15** | **Octets: 0-2047** |
| Length | Group ID | Type = 1 | Content |

**Figure 7-46—Format of Payload IEs**

The Length field specifies the number of octets in the Content field.

The Group ID values are defined in Table 7-15 for each of the Payload IEs. In the table, an X in the columns for frame indicates that the IE may be used in that frame. If there is not an X in the column, then the IE shall not be used in that frame. In the table, UL refers to the layers above the MAC.

**Table 7-15—Payload IE Group ID**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Group ID value**  | **Name**  | **Enhanced Beacon** | **Enhanced ACK** | **Data** | **Multipurpose** | **MAC Command** | **Format Subclause** | **Use Description** | **Used by** | **Created by** |
| 0x0  | Encapsulated Service Data Unit (ESDU) IE  | X |  | X | X | X | 7.4.3.1 | 7.4.3.1 | UL | UL |
| 0x1  | MLME IE  | X | X | X | X | X | 7.4.3.2 | 7.4.3.2 | MAC | MAC |
| 0x2  | Vendor Specific IE  | X | X | X | X | X | 7.4.4.30 | — | UL | UL |
| 0x3 | Multiplexed (MP) IE | Assigned to IEEE 802.15.9 (KMP) |
| 0x4 | Omnibus Payload Group IE | Assigned to WiSUN |
| 0x5–0xe  | IEEE 802.15 ANA assigned  |
| 0xf  | Payload Termination IE  | X | X | X | X | X | 7.4.3.3 | 7.4.1 | MAC | MAC |

**7.4.3.3 Payload Termination IE**

The Payload Termination IE shall have a zero length Content field.


# Recommended practice of formatting Payload IE sub-types

In a response to the request for a recommendation from IEEE 802.15 Interest Group (IG) 6T for a mechanism to manage that IE space via sub-types, the IEEE 802.15 IG 6T has arrived at a consensus on the following mechanism.

As per IEEE Std. 802.15.4, a Payload IE has a format as shown in Figure 7-46.

The length field is an 11-bit value (allowing a length of up to 2047 octets).

The Payload IE Group ID (an assignment from IEEE 802.15 ANA) is a 4-bit value.

The type field shall be set to 0b1.

The current 802.15.4-2015 standard allows multiple nested IEs within the MLME Payload IE. However this method trades off the number of sub-types that can be allocated with their maximum length due to the 16 bits allocated for both sub-type ID, type, and length.

Accordingly, the IEEE 802.15 IG 6T recommends that the IETF use an alternate scheme that restricts the Payload IE to only one sub-type ID and content, i.e. no nesting. The advantages of this recommended scheme is that it eliminates one octet from the total Payload IE, it allows a full 256 sub-type IDs, and each sub-type length can be up to 2046 octets.

This recommended scheme uses the length field in the Payload IE to represent the sub-type content length, less one octet to account for the sub-type ID length. There is no need for long or short types since the length is described in the Payload IE length field.

In comparison to the IEEE Std. 802.15.4-2015 nested IE, the recommended scheme eliminates the length and type fields used in nested IEs, and removes the restriction of only 144 sub-types consisting of 128 short sub-type IDs for 256 octet length and 16 long sub-type IDs for 2048 octets.

In summary, for this recommended scheme the content field of the Payload IE shall consist of only one sub-type ID field and one sub-type content field that are formatted as shown in the following Sub-type field format figure.

|  |  |
| --- | --- |
| **Octets: 1** | **Variable = Content length of Payload IE -1** |
| Sub-type ID  | Sub-type Content |

**Sub-type Fields Format**

The following figure shows the Payload IE along with the sub-type fields as the Payload IE content, for a frame that has no payload:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Bits: 0-10** | **11-14** | **15** | **16-23** | **Octets: 0-2046** |
| Payload IE Content Length | Group ID | Type (0b1) | Sub-type ID  | Sub-type Content |
| Payload IE | Payload IE Content |

**Example of single Payload IE (part of MAC payload) without a frame payload**

When a frame has a data payload, the Payload IE and Payload IE content needs to be terminated with a Payload Termination IE as shown in the following figure:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Bits: 0-10** | **11-14** | **15** | **16-23** | **Octets: 0-2046** | **Bits: 0-10** | **11-14** | **15** |
| Payload IE Content Length | Group ID | Type (0b1) | Sub-type ID  | Sub-type Content | Length (0x00) | Group ID (0xf) | Type (0b1) |
| Payload IE | Payload IE Content | Payload Termination IE |

**Example of single Payload IE (part of MAC payload) followed by a frame payload**

Multiple Payload IEs can be concatenated in a frame as shown in the following figure:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Payload IE | Payload IE Content | Payload IE | Payload IE Content | … |

**Example overview of multiple concatenated payload IEs**

Finally, the IEEE 802.15 6T believes that the name “The IETF IE is a IEEE802.15.4 IANA\_6TOP\_IE\_GROUP\_ID” is inappropriate since the Payload Group IE will be assigned to the whole IETF. The naming should be sufficiently general to allow other IETF work groups to use this IE.