IEEE P802.11
Wireless LANs

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| CC08 – Normative Text for CIDs allocated to Lin Cai |
| Date: 2013-07-02 |
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Abstract

This submission proposes resolutions to the assigned CC8 comments, #1112, 1145, 1144, 1141, 1118, 1117, 1116, 1115, 1044, 1113, 1148, 1078, 1077, 1076, 1075, 1073, 1072, 1071, 1114, 1329, 1444, 1443, 1441, 1440, 1439, 1364, 1333, 1146, 1330, 1147, 1278, 1277, 1244, 1221, 1219, 1196, 1149, 1445, and 1331, as indicated in document 13/0495r11.

# Introduction

In TGai CC8 comment database, 13/0495r11 Comments [Ref-2], #1112, 1145, 1144, 1141, 1118, 1117, 1116, 1115, 1044, 1113, 1148, 1078, 1077, 1076, 1075, 1073, 1072, 1071, 1114, 1329, 1444, 1443, 1441, 1440, 1439, 1364, 1333, 1146, 1330, 1147, 1278, 1277, 1244, 1221, 1219, 1196, 1149, 1445, and 1331 are assigned to the contributor of this contribution. This contribution proposes resolutions to the above assigned CC8 comments.

# Conventions

In this contribution, the proposed 802.11ai Specification Document text will be presented as changes to the current TGai draft specification, 11ai/D0.5 [Ref-1]. The following format conventions are used:

1. The new added and modified text is marked as underline text;
2. The deleted text is marked as ~~strikethrough text~~;
3. The unchanged baseline standard text stays in black text in the context of proposed TGai specification text;
4. The editorial instruction is marked as *italic text highlighted by Yellow*; and
5. Any other text, e.g., discussions, proposed motions, etc., is in black text, but not in the context of proposed TGai specification text.

# Proposed Changes to 802.11ai/D0.5 Specification Text

# 3.1 Definitions

*Instructions to Editor: replace the definition of ILSC with the following text:*

**fast initial link setup category (FILSC)[1278]:** A label used by associating station (STA) to associate with an access point (AP) with high prioritiy.

**8.4.2.187** Differentiated Initial Link Setup element

*Instructions to Editor: Modify the Clause 8.4.2.187 with the following text:*

The Differentiated Initial Link Setup element includes the conditions for a STA to determine the fast initial link setup category (FILSC) value for the duration specified in the element[1278]. The Differentiated Initial Link Setup element is optionally present in the Beacon, and Probe Pesponse frames. The Differentiated Initial Link Setup element is defined in **Figure 8-183al**.

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| --- | --- | --- | --- |
|  **Element ID** | **Length** | **ILS Time**  |  |

 **Octets: 1 1 1 Variable**

 **Length[1219]**

**Figure 8-183al Differentiated Initial Link Setup element format**

The Element ID field is equal to the Differentiated Initial Link Setup element value in Table 8-54.

The Length field is 1 octet long. It specifies the length of Differentiated Initial Link Setup element in octets.

The ILS Time field is an unsigned integer that specifies the time, expressed in units of 10 ms beginning with the transmission of the frame with Differentiated Initial Link Setup element and ending after the ILS Time elapses, during which only the STAs with the FILSC value equal to 1 are allowed to attempt initial link setup to the AP[1141, 1221]; all categories of STAs can attempt initial link setup with the AP after this time expires.

The ILSC Information field is of variable length, it indicates the conditions to determine the value of the initial link setup category (ILSC) for the time as indicated in the ILS Time field.

The ILSC Information field contains one ILSC Type bitmap subfield and at least one of the four optional subfields including ILS User Priority, MAC Address Filter, ILS Synchronization, and Vendor Specific Category, as specified in Figure 8-183am.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ILSC Type**  | **ILS User Priority**  | **MAC Address Filter** | **ILS Synchronization** | **Vendor Specific Category** |

**Octets:**  1 0 or 1 0 or 1 0 or 1 0 or variable length

**Figure 8-183am — ILSC Information field format**

The ILSC Type subfield is 1 octet in length and it is used to indicate the presence of the optional subfields in the ILSC Information field, as defined in Figure 8-183al. A bit value of 1 in the subfields of ILS User Priority[1364], MAC Address Filter, ILS Synchronization, and Vendor Specific Category subfields indicates that the corresponding ILSC subfield is present. At least one of the bits in ILSC Type subfield is set to 1 when Differentiated Initial Link Setup element is present[1439].

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**Figure 8-183al ILSC Type subfield format[1440]**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ILS User Priority | MAC Address Filter | ILS Synchronization  | Vendor Specific Category | Reserved |

Bit: 1 1 1 1 1

The ILS User Priority subfield is defined in Figure 8-183am,. A value of 1 in the ILS User Priority bit 0 indicates high priority initial link setup for the stations that have data frames in the buffer with UP values between 4 and 7. A value of 1 in the ILS User Priority bit 1 indicates high priority initial link setup for the stations that have data frames in the buffer with UP values between 0 and 3. A value of 1 in the ILS UP bit 3 indicates high priority initial link setup for those stations that have no data traffic[1112, 1114, 1115, 1147]. Similarly, the bit value of 0 in the ILS User Priority bit 0-2 indicate low priority link setup for the stations that have data frame with UP values between 4 and 7, the stations that have data frames with UP values between 0 and 3, and the stations has no data traffic.

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| --- | --- | --- | --- |
| ILS User Priority bit 0 | ILS User Priority bit 1 | ILS User Priority bit 2 | Reserved |

Bit: 1 1 1 5

**Figure 8-183am ILS User Priority subfield format[1441]**

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

The MAC Address Filter subfield is 1 octet in length as illustrated in figure 8-183ao. The Bit Pattern Length subfield is 3 bits in length, and the Bit Pattern subfield is 5 bits in length...

B0 B2 B3 B7

|  |  |
| --- | --- |
| Bit Pattern Length | Bit Pattern |

Bits: 3 5

**Figure 8-183ao MAC Address Filter subfield**

The usage of the Bit Pattern Length subfield and Bit Pattern subfield is defined in Table 8-183ao. The Bit Pattern Length subfield specifies the number of bits and the position of the bits in the Bit Pattern subfield that are used for MAC address filtering. The values of the bits specify the MAC addresses of the STAs that are allowed to attempt initial link setup [1149].

Table 8-183a0 MAC Address Filter subfield

|  |  |
| --- | --- |
| Bit Pattern Length valueb2 b1 b0 | Bit Pattern  |
| Bit 3 | Bit4 | Bit 5 | Bit 6 | Bit 7 |
| 001 | 0 | 0 | 0 | 0 | Used for MAC address filtering |
| 010 | 0 | 0 | 0 | Used for MAC address filtering |
| 011 | 0 | 0 | Used for MAC address filtering |
| 100 | 0 | Used for MAC address filtering |
| 101 | Used for MAC address filtering |
| 000 | Reserved |
| 110-111 | Reserved |

|  |  |  |
| --- | --- | --- |
|  | Synchronization Detected | Reserved |
| Bits: | 1 | 7 |

**Figure 8-183ap** ILS Synchronization subfield

The value 1 of the Synchronization Detected subfield of ILS Synchronization subfield indicates that the AP has detected peak of transmitted Initial Link Setup frames after the AP has transmitted Beacon orProbe Response frame. Value 0 indicates that the peak is not detected.

The Vendor Specific Category subfield is defined in Figure 8-183an, which includes 1 byte length subfield, variable length OI subfield and Vendor Specific Category subfield.

|  |  |  |
| --- | --- | --- |
| **Length** | **OI** | **Vendor Specific Category**  |

**Octets: 1 variable length vairable length**

**Figure 8-183an Vendor Specific Category subfield format**

The Length field is 1 octet long that specifies the length of Differentiated Initial Link Setup element in octets

The OI subfield is defined in 8.4.1.31.

The Vendor Specific Category subfield is a variable length subfield whose content is defined by the entity identified in the OI field.

**10.25.10** Differentiated Initial Link Setup

*Instructions to Editor: Modify the Clause 10.25.4 with the following text:*

To alleviate management frame congestion that may occur when excess initial links are set up concurrently, the differentiated link setup procedure provides a method for an AP to moderate non-AP STAs association events with the AP.

**10.25.10.1** AP procedures for differentiated initial link setup

*Instructions to Editor: Modify Clause 10.25.4.1 with the following text:*

An AP with dot11FILSActivated equal to true may limit the number of STAs that are allowed to attempt association concurrently through the setting of the ILS Time and ILSC Information field of the Differentiated Initial Link Setup element.

When an AP detects management frame congestions resulting from excessive initial link setup, the AP may set an ILS Time which is reserved for high priority link setup[1072], and set the ILS User Priority subfield, MAC Address Filter subfield, and/or Vendor Specific Category subfield to allow a smaller subset of STAs to atttempt initial link setup during the reserved ILS Time specified in the element[1073, 1144]. . The AP may include the Differentiated Initial Link Setup element with updated ILS Time and ILSC Information field in Beacon and Probe Response frames as long as it detects the association requests congestion.

An AP may set the ILS UP bit 0, bit 1 and bit 2 to 1 to indicate high priority link setup for the stations that carry traffic with the value of UP between 4 and 7, the stations that carry traffic with the value of UP between 0 and 3, and stations carry no data traffic, respectively. An AP may set ILS UP bit 0, bit 1 and bit 2 to 0 for low priority link setup for the stations stations that carry traffic with the value of UP between 4 and 7, the stations that carry traffic with the value of UP between 0 and 3, and stations carry no data traffic, respectively[1112, 1114, 1115, 1147].

In the case when an AP wants to block all STAs to attempt association during the remaining Beacon interval, the AP should set the value of ILS Time to a value equal to or larger than the remaining Beacon interval duration, and set the values of ILS UP bit 0, bit 1 and bit 2 to 0[1072, 1033].

[1329][1146, 1244]

**10.25.10.2 Non-AP STA procedures for differentiated initial link setup**

*Instructions to Editor: Modify Clause 10.25.4.2 with the following text:*

When a non-AP STA with dot11FILSActivated equal to true receives a Beacon, Probe Response frame that includes Differentiated Initial Link Setup element, the STA shall check the ILSC information subfield to check if it satisfies the condition specified in each and every optional subfield that is present Only if the STA satisfies all of the subfields present, may it proceed with a fast initial link setup Such STA is considered a FILSC STA with its FILSC value set to 1.

If the STA does not satisfy one or more optional subfields present in the ILSC information field, then the STA is not considered an ILSC STA and its FILSC value is set to 0. A STA with FILSC value set to 0 shall check the ILS Time field and postpone the link setup until the time specified in ILS Time field elapses[1148].

If ILS User Priority subfield is present in the Differentiated Initial Link Setup element, the STA shall check the ILS User Priority subfieldsA STA checks its UP values corresponding to the data traffic, and compare them with the corresponding ILS User Priority bit. If a STA carries one or more types of traffic mapped to different ILS UP bits the ILS User Priority condition is satisfied if any of the corresponding bit value is set to 1 in the ILS User Priority subfield.

If Vendor Specific Category subfield is present, a STA shall check the OI subfield . If the STA can understand the OI subfield, the STA shall check the following Vendor Specific Category subfield. Otherwise, the STA shall skip the Vendor Specific Category subfield and assume the condition specified in Vendor Specific Category is satisfied[1443].

If MAC Address Filter subfield is present, a STA shall exclusive-OR (XOR) the last 5 LSBs[1444,1331] of its MAC address with Bit3 to Bit7 of theBit Pattern subfield specified in MAC Address Filter subfield. If the last n bits of the result are zero, where n is specified in the Bit Pattern Length field, the MAC address condition is satisfied. .

A STA with its FILSC value of 1 is allowed to attempt initial link setup with the AP immediately. A STA with its FILSC value of 0 shall set a link setup timer to the value specified in the ILS Time field of the Differentiated Initial Link Setup element. A STA with its FILSC value of 0 can attempt initial link setup when the timer elapses to 0[1277]. Each time a STA receives a Beacon and/or Probe Response frame which includes Differentiated Initial Link Setup element, the STA shall check the ILSC information subfield and update its FILSC value; the STA should also update its link setup timer to the ILS Time value in the latest received Differentiated Initial Link Setup element if the STA’s FILSC value is 0.

If the ILS Synchronization subfield is present, a STA may delay the transmission of the initial link setup for a random delay that is shorter than the Beacon Interval of the target AP.

# References:

1. IEEE Std 802.11ai/D0.5
2. 11-13-0495-10-00ai-tgai-d0-5-call-for-comments-responses-resolutions-cc08