IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Normative text for Differentiated Initial Link Setup | | | | |
| Date: 2013-03-18 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | Email |
| Lin Cai | Huawei  Technologies Co. Ltd. |  |  | Lin.Cai@huawei.com |
| George Calcev | Huawei  Technologies Co. Ltd. |  |  | George.Calcev@huawei.com |
| Phillip Barber | Huawei  Technologies Co. Ltd. |  |  |  |
| Ping Fang | Huawei  Technologies Co. Ltd. |  |  |  |
| Giwon Park | LG Electronics | LG R&D Complex 533, Hogye-1dong, Dongan-Gu, Anyang, Kyungki, 431-749, Korea | +82-31-450-1879 | giwon.park@lge.ccom |
| Kiseon Ryu | LG Electronics | 10225 Willow Creek Rd, San Diego, CA, 92131, USA | +1 (858)-635-5209 | [Kiseon.ryu@lge.com](mailto:Kiseon.ryu@lge.com) |

Abstract

The submission provides normative text for differentiated initial link setup as identified in 6.1.1 of the SFD ([11-12-0151-12-00ai-proposed-specification-framework-for-tgai](https://mentor.ieee.org/802.11/dcn/12/11-12-0151-12-00ai-proposed-specification-framework-for-tgai.docx)) as:

### 6.1.1 Link setup

FILS devices shall support differentiated initial link setup (11-12/0909r10).

**3.1 Definitions**

*Instructions to Editor: Append the Clause 3.1 with the following text:*

**initial link setup category (ILSC):** A binary value label to indicate the category of the STA for fast initial link setup .

**6.3.3.3 MLME-SCAN.confirm**

**6.3.3.3.2 Semantics of the service primitive**

*Instructions to Editor: Insert new rows in the corresponding tables at the end of the table as the following:*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Type** | **Valid range** | **Description** | **IBSS adoption** |
| Differentiated initial link setup information | Differentiated initial link setup information element includes ILSC information field and ILS Time field | As defined in  8.4.2.ai | Differentiated initial link setup information includes ILSC information field and ILS Time field;  This parameter is optional. | Do not adopt. |

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid range** | **Description** |
| Differentiated initial link setup information | Differentiated initial link setup information element includes ILSC information field and ILS Time field | As defined in  8.4.2.ai1 | Differentiated initial link setup information includes ILSC information field and ILS Time field;  This parameter is optional. |

**8.3.3.2 Beacon frame format**

*Instructions to Editor: Insert the new row before the Vendor Specific element in the Table 8-20 as follows:*

**Table 8-20 Beacon frame body**

|  |  |  |
| --- | --- | --- |
| ANA | Differentiated Initial Link Setup element | The Differentiated Initial Link Setup element, as specified in 8.4.2.ai1, is optionally present when dot11FILSActivated is true. |

**8.3.3.10 Probe Response frame format**

*Instrocutions to Editor: Insert a new row to the Table 8-27before the Vendor Specific element as follows:*

**Table 8-27 Probe response frame body**

|  |  |  |
| --- | --- | --- |
| ANA | Differentiated Initial Link Setup element | The Differentiated Initial Link Setup element, as specified in 8.4.2.ai1, is optionally present when dot11FILSActivated is true. |

**8.5.8.34 FILS Discovery frame format**

*Instructions to Editor: Insert a new row in the corresponding table as follows:*

**Table 8-221g — FILS Discovery frame action field format**

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| ANA | Differentiated Initial Link Setup element | The Differentiated Initial Link Setup element, as specificed in 8.4.2.ai1, is optionally present when dot11FILSActiveated is true. |

**8.4.2.1 General**

*Instructions to Editor: Insert new rows in the corresponding tables as the following:*

**Table 8-54—Element IDs**

|  |  |  |  |
| --- | --- | --- | --- |
| **Element** | **Element ID** | **Length of indicated element (in octets)** | **Extensible** |
| Differentiated Initial Link Setup Element ( see 8.4.2.ai1) | ANA | Variable | **Yes** |

**8.4.2.ai1** Differentiated Initial Link Setup element

*Instructions to Editor: Append the Clause 8.4.2.ai1 with the following text:*

The Differentiated Initial Link Setup element includes the conditions for a STA to determine the initial link setup category (ILSC) value for the duration specified in the element. The Differentiated Initial Link Setup element is optionally present in the Beacon, Probe Pesponse and FILS Discovery (FD) frames. The Differentiated Initial Link Setup element is defined in Fig. 8-ai\*\*01.

**Figure 8-ai\*\*01 Differentiated Initial Link Setup element format**

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

**Octets: 1 1 Variable 1**

**length**

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 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 Table 8-ai02.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ILSC Type bitmap** | **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-ai02 ILSC Information field format**

The ILSC Type bitmap 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 Table 8-ai03. A bit value of 1 in the bitmap indicates that the corresponding ILSC subfield is present.

**Table 8-ai03 ILSC Type subfield format**

|  |  |
| --- | --- |
| **ILSC Type bitmap** | **Description** |
| **Bit 0** | **ILS User Priority** |
| **Bit 1** | **Vendor Specific Category** |
| **Bit 2** | **MAC Address Filter** |
| **Bit 3** | **ILS Synchronization** |
| **Bit 4 – 7** | **Reserved** |

The ILS User Priority subfield is defined in Table 8-ai04, and the ILS user priorities are mapped from user priority (UP). The bit 2 of the ILS user priority subfield refers to a STA with no traffic.

**Table 8-ai04 ILS User Priority subfields**

|  |  |  |
| --- | --- | --- |
| **Bit** | **ILS User Priority** | **Description** |
| **Bit 0** | **0** | **UP 4 - UP 7** |
| **Bit 1** | **1** | **UP 0 – UP 3** |
| **Bit 2** | **2** | **No Traffic** |
| **Bit 3-7** | **NA** | **Reserved** |

The Vendor Specific Category subfield is defined in Table 8-ai05, which includes 1 byte length subfield, variable length OI subfield and Vendor Specific Category subfield.

**Table 8-ai05 Vendor Specific Category subfield format**

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

**Octets: 1 variable length vairable length**

The OI subfield is defined in 8.4.1.31.

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

The MAC Address Filter subfield is 1 octet in length as illustrated in figure 8-ai03. The Bit Pattern Length field is 3 bits in Length, and the Bit Pattern field is 5 bits in Length...

B0 B2 B3 B7

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

Bits: 3 5

**Figure 8-ai03 MAC Address Filter subfield**

The usage of The Bit Pattern Length field and Bit Pattern field is defined in Table 8-ai07. The Bit Pattern Length field specifies the number of bits and the position of the bits of the Bit Pattern field that are used for MAC address filtering. The values of the bits specify the MAC addresses of the STAs that are allowed to transmit the initial link setup request.

**Table 8-ai07 MAC Address Filter subfield**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Bit Pattern Length value**  **b2 b1 b0** | **Bit Pattern** | | | | |
| **Bit 3** | **Bit4** | **Bit 5** | **Bit 6** | **Bit 7** |
| 001 | Reserved | | | | Used for MAC address filtering |
| 010 | Reserved | | | Used for MAC address filtering | |
| 011 | Reserved | | Used for MAC address filtering | | |
| 100 | Reserved | Used for MAC address filtering | | | |
| 101 | Used for MAC address filtering | | | | |
| 000 | Reserved | | | | |
| 110-111 | Reserved | | | | |

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

**Figure 8-ai04 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 Request frames after the AP has transmitted Beacon orProbe Response frame. Value 0 indicates that the peak is not detected.**

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 ILSC value equal to 1 are allowed to transmit initial link setup requests to the AP; all categories of STAs can attempt initial link setup with the AP after this time expires.

**10.25.4** Differentiated Initial Link Setup

*Instructions to Editor: Append 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.

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

*Instructions to Editor: Add the new 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 ILSC in the ILSC Information field of the Differentiated Initial Link Setup element.

The AP should set the ILS User Priority subfield, MAC Address Filter subfield, and/or Vendor Specific Category subfield to allow a number of STAs to transmit initial link setup requests. The exact decision which STAs are allowed for initial link setup is implementation specific.

The exact logic how the AP sets the value of the ILS Time is implementation specific.

The AP should ignore initial link setup requests from STAs that are not allowed access at the time specified in ILS Time subfield of the ILSC Information field, if the AP can identify these STAs.

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

*Instructions to Editor: Add the new Clause 10.25.4.2 with the following text:*

When a non-AP STA with dot11FILSActivated equal to true receives a Beacon, Probe Response or FD frame including Differentiated Initial Link Setup element, the STA shall check the ILSC information subfield of the Differentiated Initial Link Setup element.

A STA is considered an ILSC STA with its ILSC value set to 1 that is allowed for fast initial link setup only when it satisfies the condition specified in each and every optional subfield that is present in the ILSC information field. 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 ILSC value is set to 0. A logical AND operation of all the conditions in the present optional subfields is used to determine whether the STA is an ILSC STA. The logical AND is not needed if only one optional subfield is present.

If ILS User Priority subfield is present, the STA shall check the bit position in the present subfield. A bit value of 1 in the bitmap indicates that the STA of the corresponding user priority is an ILSC STA with its ILSC value set to 1, which is allowed to attempt FILS with the AP. A bit value of 0 in the bitmap indicates that STAs of the corresponding User Priority are not allowed to attempt initial link setup before the time specified in the ILS Time field expires. If a STA carries more than one types of traffic, a STA identifies itself as an ILSC STA and set its ILSC value to 1 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 and ignore the Vendor Specific Category subfield.

If MAC Address Filter subfield is present, a STA shall compare the corresponding MSBs of its MAC address with the bits used for MAC address filtering in Bit Pattern Value field in MAC Address Filter subfield, with MSB comparing to bit 7. If they are the same, the STA sets the ILSC to 1 and is allowed to transmit link setup request before the time indicated in the ILS Time expires.

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

**Motion-1:** To authorize the Editor to incorporate the text changes proposed in contribution 11-13-0264-02-00ai-normative-text-for-differentiated-initial-link-setup to the draft TGai Specification Document.

Yes: \_\_\_\_\_\_\_\_\_\_\_\_;  No: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_;  Abstain: \_\_\_\_\_\_\_\_\_\_\_\_\_

[Result of Motion]