IEEE P802.11
Wireless LANs

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| Comments resolution related to Differentiated Initial Link Setup |
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| Author(s): |
| Name | Affiliation | Address | Phone | Email |
| Lin Cai | HuaweiTechnologies Co. Ltd. |  |  | Lin.Cai@huawei.com |
| George Calcev | HuaweiTechnologies Co. Ltd. |  |  | George.Calcev@huawei.com |
| Ping fang | HuaweiTechnologies Co. Ltd. |  |  |  |
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Abstract

This contribution proposes resolutions to the CIDs

4844 4679 4677 4676 4675 4674 4606 4605 4601 4291 4845 4880 4843 4842 4841 4836 4834 4833 4832 4831 4600 5018 5129 5128 5109 5108 5107 5106 5105 5068 4684 5019 4685 5017 4998 4997 4996 4995 4994 4977 4972 5130 5067.

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# Conventions

 ‘Track changes’ is used to show changes to revision D2.1.

# Proposed Changes to 802.11ai/D2.1 Specification Text

* Definitions specific to IEEE Std 802.11

**fast initial link setup category (FILSC)**: A [4684]binary value that indicates the priority category of the station (STA) for fast initial link setup.

* Differentiated Initial Link Setup element

The Differentiated Initial Link Setup element includes the conditions for a STA to determine whether it is allowed to attempt initial link setup for the duration specified in the element. [4972] . The Differentiated Initial Link Setup element is optionally present in the Beacon, and Probe Response frames. The Differentiated Initial Link Setup element is defined in Figure 8-401df (Differentiated Initial Link Setup element format).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Element ID | Length | Differentiated FILS Time [5105, 4994][CID 2719] | FILSC Information [CID 2896] |
| Octets: | 1 | 1 | 1 | Variable  |
| * Differentiated Initial Link Setup element format
 |

The Element ID and Length fields are defined in  8.4.2.1 (General)[CID 2010].

The FILS Time field is an unsigned integer that specifies the time, expressed in units of 10 ms starting from, the beginning or the frame transmission of the Differentiated Initial Link Setup element and ending after the FILS Time elapses. [13/1417r1, CIDs 3139,3322,3140,3322,3323, 2672, 2134, 2870]

The FILSC Information field is of variable length. It indicates the conditions to determine FILSC value for the time as indicated in the FILS Time field. [13/1417r1, CID 3054]

The FILSC Information field contains one FILSC Type subfield and at least one of the three optional subfields including FILS User Priority, MAC Address Filter, and Vendor Specific, as specified in Figure 8-401dg (FILSC Information field format).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | FILSC Type | FILS User Priority | MAC Address Filter | Vendor Specific  |
| Octets: | 1 | 0 or 1 | 0 or 1 | 0 or variable length |
| * FILSC Information field format [13/1417r1, CID 2191, 2547, 2020, 2896]
 |

 [13/1417r1, CIDs 3055, 2838, 3116, 2897]

The FILSC Type subfield is 1 octet in length and it is used to indicate the presence of the optional subfields in the FILSC Information field, as defined in Figure 8-401dh (FILSC Type subfield format). A bit value of 1 in the FILS [5067] User Priority, MAC Address Filter and Vendor Specific subfields indicates that the corresponding FILSC subfield is present. At least one of the bits in FILSC Type subfield is set to 1. [4685]

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| [CID 3321, 3138] | FILS User Priority | MAC Address Filter | Vendor Specific  | Reserved |
| Bits:[5068, 5106, 4995] | 1 | 1 | 1 | 5 |
| * FILSC Type subfield format [13/1417r1, CIDs 2547, 2191, 2748, 3056]
 |

 [13/1417r1]

The FILS User Priority subfield is defined in Figure 8-401di (FILS User Priority subfield format).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B3 B7 |
|  | FILS User Priority Bit0 | FILS User Priority Bit1 | FILS User Priority Bit2 | Reserved |
| Bits: | 1 | 1 | 1 | 5 |
| * FILS User Priority subfield format [13/1417r1, CIDs 2095, 3060]
 |

 [13/1417r1, CID 2673,3326,2672,3326,3325,3324]

The MAC Address Filter subfield is 1 octet in length as illustrated in Figure 8-401dj (MAC Address Filter subfield). 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 |
| * MAC Address Filter subfield
 |

The usage of the Bit Pattern Length subfield and Bit Pattern subfield is defined in Table 8-221k (MAC Address Filter subfield). 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. The details of MAC address filtering is described in 10.44.5.2.[5108,4997]

|  |
| --- |
| * MAC Address Filter subfield [13/1417r1, CID 2095]
 |
| Bit Pattern Length valueB2 B1 B0 | Bit Pattern |
| B3 | B4 | B5 | B6 | B7 |
| 001 | Reserved[4880] | Used for MAC address filtering |
| 010 | Reserved[4880] | Used for MAC address filtering |
| 011 | Reserved[4880] | Used for MAC address filtering |
| 100 | Reserved[4880] | Used for MAC address filtering |
| 101 | Used for MAC address filtering |
| 000 | Reserved |
| 110 - 111 | Reserved |

The Vendor Specific subelement has the same format as the Vendor Specific element (see 8.4.2.25 (Vendor Specific element)).

* Differentiated initial link setup

To limit the number of STAs that attempt link setup concurrently, the differentiated link setup procedure provides a method for an AP to moderate the rate non-AP STAs transmit Authentication frames to the AP for link setup. the ar [4831, 4832, 4833, 4600] [4674, 4834]

***Insert new clause as follows:***

* AP procedures for differentiated initial link setup [CID 2094]

An AP with dot11FILSActivated true may include the Differentiated Initial Link Setup element in Beacon and Probe Response frames, and set the FILS Time and [4676, 4601, 4977] FILSC[CID 2719] Information fields to limit the number of STAs that are allowed to attempt link setup concurrently. [4675, 4836][13/1417r1, CIDs 2694, 3173]

The AP may set an FILS Time [CID 2384] reserved for high priority link setup, and may set the FILS User Priority subfield, MAC Address Filter subfield, and/or Vendor Specific[4677] subfield to specify a subset of STAs that may attempt initial link setup during the reserved FILS Time specified in the element [5019]. [13/1417r1, CIDs 2694, 2137, 2138]

An AP may set the FILS user priority B0, B1 and B2 to 1 to indicate high priority link setup without additional delays for the STAs that have frames with user priority 4-7 in their transmission queue(s), STAs that have frames with user priority 0-3 in their transmission queue(s), and STAs that have no frame in their transmission queue(s) respectively and to 0 otherwise. [4679, 4996, 5107, 5109,4998]An AP should always allow a STA that has frames with user priority 4-7 in their transmission queue(s) to attempt initial link setup before STAs that have frames with user priority 0-3 and the STAs that have no frame in their transmission queue(s). [13/1417r1, CIDs 2095, 2140, 2139, 2959, 3345][CID 4067, 4838]

An AP may set the Bit Pattern Length subfield in the MAC Address Filter subfield to decide the number of bits used for MAC address filtering; and specify the bit pattern in the Bit Pattern subfield to allow STAs with specific MAC addresses to transmit initial link setup request frames immediately. The more bits used for MAC address filtering, the fewer number of STAs are allowed to transmit an initial link setup request frame immediately. How an AP sets the bit pattern in the Bit Pattern subfield is beyond the scope of this specification

An AP may set one or more vendor specific criteria in Vendor Specific subfield to allow a set of STAs that satisfy the specified criteria to transmit initial link setup request frames to the AP without additional delays.

[13/1417r1, CIDs 2697, 3144, 3327, 2936, 2097, 2144, 2145, 2696, 2698, 2697, 2679, 2675, 2674, 2146]

***Insert new clause as follows:***

* Non-AP STA procedures for differentiated initial link setup

When a non-AP STA with dot11FILSActivated and dot11DILSActivated equal to true receives a Beacon or , Probe Response[CID 4068] frame that includes a Differentiated Initial Link Setup element, the non-AP [4843] STA shall check the FILSC[CID 3238] information subfield to determine if it satisfies the condition specified in each and every optional subfield that is present. If the non-AP [4843] STA satisfies all of the conditions specified in the present optional subfields, [4842, 5018,5129, 5130] the non-AP[4843] STA has an FILSC value of 1 and it proceeds[4605] with a FILS with the AP without additional delays. Otherwise, the non-AP STA shall have a FILSC value of 0 and shall postpone the link setup with the AP until the time specified in FILS Time field elapses. Each time the non-AP STA [4843] receives a Beacon and/or Probe Response frame which includes Differentiated Initial Link Setup element, the non-AP STA shall check the FILSC information subfield and update its FILSC value; the non-AP STA shall also update its link setup timer to the FILS Time value in the latest received Differentiated Initial Link Setup element if the non-AP STA's FILSC value is 0. All [4844] non-AP STAs [4606] transmit an initial link setup request frame to the AP after this time expires. [13/1417r1, CIDs 3174, 3175, 2148, 2149, 2418, 2417, 2886, 2703, 2138, 2700]

When the FILS User Priority subfield is present, the FILS User Priority condition is satisfied if the non-AP[4843] STA has frames with user priority 4-7 in the transmission queue(s) and the FILS User Priority B0 is 1, or if the non-AP[4843] STA has frames with user priority 0-3 in their transmission queue(s) and the FILS User Priority B1 is 1, or if the non-AP[4843] STA has no frame in their transmission queue(s) and the FILS User Priority B2 is 1. [13/1417r1, CIDs 2096,2150,3058, 2943, 2673,2959,3143.3142,3141, 3059, 2673,3239]

If MAC Address Filter subfield is present, the non-AP[4843] STA shall exclusive-OR (XOR) the last 5 LSBs of its MAC address with B3 to B7 of the Bit Pattern subfield 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. [13/1417r1, CID 2095]

If Vendor Specific subfield is present, the non-AP[4843] STA shall check the OI subfield. If the non-AP[4843] STA can identify [4845] the OI subfield, the non-AP[4843] STA shall check the following Vendor Specific subfield. Otherwise, the non-AP STA shall skip and ignore the Vendor Specific subfield and assume the condition specified in Vendor Specific [4677] is not satisfied. [13/1417r1, CID 2702]

[13/1417r1, CID 2703]