IEEE P802.11
Wireless LANs

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| Resolutions to CIDs 1142, 1220, 1446 and 1447 |
| Date:2013-07-17 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Jarkko Kneckt | Nokia | Otaniementie 19b, 02150 Espoo Finland  |  | Jarkko.kneckt@nokia.com |
| Giwon Park | LG Electronics |  |  | giwon.park@lge.com |

Abstract

The submission resolves the comments for ILS Synchronization detected field.

The ILS Synchronization field indicates that many initial link setup requests are transmitted simultaneously and larger randomization of the link setup messages transmission times is required.

Track changes is used to show changes to revision 6.

The submission describes the situations and causes that lead to FILS frames congestion.

The submission solves CIDS 1142, 1220, 1446 and 1447.

**Solved CIDS:**

**CID1142:**

**Comment:** The AP procedures to use the Synchronization Detected field are not described.

**Proposed change**:

Please add the following paragraph to the end of the clause 10.25.10.1:" The AP should set the Synchronization Detected subfield of ILS Synchronization field of ILSC Information field to 1 if any of the conditions below are met:

- The AP detects a peak of transmitted Association Request frames after the AP has transmitted a Beacon or a Probe Response frame and few or no transmissions of Association Request frame after the peak.

- The AP detects high percent of time after its Beacon frame transmission during which the carrier sense (CS) mechanism, as defined in 9.3.2.1, indicates a channel busy by either the physical or virtual CS mechanism and lower percent of time during which the CS mechanism indicates channel busy after the peak."

**CID1220**

**Comment:**

There are multiple issues with Figure 8-183ap and the paragraph in line 13 page 48, e.g.,

1) what is a "peak"? How much/many association request traffic is a peak?

2) why is called Synchronization detected when detected a Peak? Hard to connect those two words.More importantly, confusing with the synchronication concept in subsection 10.1.

3) why use a 1-byte for a 1-bit info? Why not just use one of the reserved bit in the ILSC bitmap field?

**Proposed change:**

Make the following changes:

1. provideclarificaiton to "Peak";

2. in subsection 8.4.2.187 and subsection 10.25.10, change "synchronization detected" to "detected heavy load of link setup requests"

3. use one of the reserved bits in ILSC bitmap field to indicate "detected heavy load of link setup requests".

**CID1446**

**Comment:**

The behavior of the Synchronization Detected bit is not explained in clause 10.25.10.2

If the logic is based only on condition that the ILS synchronization subfield is present then a optional ILS synchronization subfield of 1 octet length seems redundant. The bit 3, ILS Synchronization bit, in ILSC Type subfield is sufficient.

**Proposed change:**

Explain how Synchronization Detected bit is used to define STA behavior or delect the ILS synchronization subfield and base the logic on just the bit 3 in ILSC Type subfield.

**CID 1447**

**Comment:**

The ILS synchronization subfield seems to define an action and not a condition that needs to be satisfied. However, the line 26 of this page seems to consider this subfield also as resuling in a condition.

**Proposed change:**

Instead of "each and every", modify text to indicate that the ILS synchronization subfield is omited in accessing the STAs ILSC value

**Discussion:**

Many CIDS talk about the name of the subfield.

The ILS Synchronization is poor name, because synchronization refers to the timing and synchronization function.

The name Link Setup Peak was considered as one candidate name. The peak is typically used as “peak throughput”, “peak performance”, i.e. it is maximum obtained value. The peak was not considered to be correct word, because we are not detecting the very maximum, just detecting that there are bursty periods, when many link setup frames are transmitted.

The name Link Setup Burst was considered to express clearly multiple link setup messages transmission after beacon or probe response frame transmission or after the ILS Time expires.

There are three issues that lead to link setup bursts after a Beacon frame:

1. EDCA (CSMA/CA) access category 3 parameters are very aggressive for AC\_VO parameters. The terminals use default AC\_VO parameters, because AP assigns the new EDCA parameters only after association to the AP.

When the channel is congested for some time, the AC\_VO transmitters do not get to transmit their traffic. Thus, the STAs getting a frame to be transmitted will obtain TXOP at the same time after the transmission of the long frame has ended. The aggressive AC\_VO obtaining is the reason, why there should few (less than 3) STAs trying to obtain TXOP with AC\_VO at the same time.



Figure 1 – Example of situation when the media is busy and many STAs try to compete to obtain TXOP with AC\_VO.

1. The traffic load increases after Beacon frame:
	1. After the DTIM beacon all multicast and broadcast traffic are transmitted.
	2. The Traffic Indication Map (TIM) element identifies the buffered traffic for the power saving STAs. When power saving STA receives the Beacon, they will try to receive buffered traffic and transmit APSD trigger frame or PS\_POLL. The trigger frames and PS\_POLL frames increase traffic load after the beacon frame.Similarly the AP will transmit the buffered traffic after the trigger frame.

Together the multicasts and transmissions to power save STAs increase the traffic load after the Beacon.

The use of multicast and broadcast frames is likely in the FILS Scenarios (Tokyo Metro station). Many service discovery protocols rely on the transmission of these frames. Similarly, the devices will be handheld devices that operate in power save.



Figure 2 – Example of the channel congestion as a function of a time.

1. The scanning STAs react to the same messages. Especially the passive scanning STAs try to obtain the beacons from the AP. Some passive scanning enhancements, like the Reduced Neighbor Report element list the TBTTs and the channels of the APs in proximity. The use of reduced neighbor report provides the knowledge when the Beacon is transmitted in other channel and the STAs try to obtain only those frames.

The FILS STAs will perform scanning more often than the current STAs. The FILS STAs try to maintain the best link, or at least avoid situations, where they would lose connectivity. It is likely that many STAs start to do scanning at the same point, when the link performance is considered to be bad.

Similarly, when the link setup is fast operation, the STAs will create links more often. This increases the number of transmitted link setup messages per STA and increases congestion of the link setup messages.

**All the comments are revised with the following changes to 802.11 D0.5:**

**8.4.2.187 Differentiated Initial Link Setup element**

***Instructions to the editor.Change as shown.***

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.

***Instructions to the editor: The ILS Synchronization is deleted from the figure 8.183am.***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | ILSC Type | ILS User Priority | MAC Address Filter | Vendor Specific Category |
| Octets: | 1 | 0 or 1 | 0 or 1 | 0 or variable |

**Figure 8-183am — 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 and the link setup bursty, as defined in Table 8-183al. A bit value of 1 in the ~~bitmap ILS~~ User Priority, MAC Address Filter and Vendor Specific Category subfields indicates that the corresponding ILSC subfield is present.

**Table 8-183al — ILSC Type subfield format**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | ILS User Priority | MAC Address Filter | Vendor Specific Category | ~~ILS Synchronization~~ Link Setup Bursty | Reserved |
| Bits: | 1 | 1 | 1 | 1 | 4 |

The value 1 of the ~~Synchronization Detected subfield of~~ Link Setup Bursty ~~ILS Synchronization~~ subfield indicates that the AP has detected ~~peak~~ a burst of transmitted Initial Link Setup Request frames after the AP has transmitted Beacon ~~or Probe Response~~ frame. Value 0 indicates that the ~~peak~~ burst is not detected.

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

***Instructions to the editor: Add the following paragraphto the end of the clause***.

The Link Setup Bursty subfield of the ILSC Type subfield of ILS Information field of the Differentiated Link Setup element shall be set to 1 when AP considers that it is congested by bursty link setup operations. When AP considers that it congested by bursty link setup operations is out of the scope of the standard.

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

***Instructions to the editor: Change the following paragraph at the end of the clause***.

If the ~~ILS Synchronization~~ Link Setup Bursty subfield of the ILSC Type subfield of ILS Information field of the Differentiated Link Setup element is set to 1 ~~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.