IEEE P802.11
Wireless LANs

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| LB168 Handover-SFS-CID342\_1066 |
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Abstract

This document proposes resoltions to CIDs 342 on Handover and 1066 on Spatial Frequency Sharing from LB168 on Draft 1.0 of TGad. For ease of editing, the proposed changes are based on the most recent Draft 1.1 of TGad.

All resolution are based on the text in D1.1

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| --- | --- | --- | --- | --- | --- |
| 1066  | 288 | 25 | T | "The PCP/AP shall transmit a Directional Channel Quality Request to each spatial sharing capable STA involved in a Time-Overlapped and existing SP scheduled under spatial sharing" - when should it do this? | Either specify when this should happen (making it testable), or weaken the normative statement. |

Proposed Resolution: **Agree**.

**Discussion:**

Agree that the current requirement is not testable and should be weakened. It should be up to the PCP/AP to decide, based on its knowledge of the channel condition and ability to act on the measurement results, when a Directional Channel Quality Request need to be sent to the STAs involved in a Time-Overlapped and existing SP scheduled under spatial sharing. It also seems reasonable to recommend that this be done at regular intervals given the variations in channel conditions.

**Proposed Changes:**

*Modify P298L11 in 11.33.2 as shown:*

The PCP/AP ~~shall~~ should periodically transmit a Directional Channel Quality Request to each spatial sharing capable STA

involved in a Time-Overlapped and existing SP scheduled under spatial sharing.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 342 | 282 | 4 | T | AFAIK, the BSSID of the PBSS after handover is unspecified: a) Define this explicitly; b) If the BSSID is unchanged, if the PCP hasn't gone / has been blocked, we have two PBSSs with the same BSSID in the same region - very unsafe | Carefully define the BSSID behavior after handover |

Proposed Resolution: **Agree in Principle**.

**Discussion:**

The goal of Implicit Handover is to allow the member STAs of a PBSS to quickly form a new PBSS and resume previously scheduled pseudostatic SPs after the unannounced departure of the PCP.

The BSSID used by the ith Implicit candidate PCP during DBand Beacon generation shall be its own MAC address following the existing rule:

* 7.1.3.3.3 **BSSID field** states “The value of this field in a PBSS is the MAC address contained in the PCP of the PBSS”

No change is needed regarding the setting of the BSSID.

However, additional clarification is needed on how Implicit Handover will work. The current description does not clearly describe how and when the Candidate PCP will advertise its availability via the DBand Beacon, nor how the member STAs will identify the new PCP.

To clarify the implicit handover operations in 11.30.2.2, we propose that when its Handover LostBeacon threshold is reached, the ith candidate PCP will start transmitting its DBand Beacon for the next several BTI of the current PCP, and insert a PCP Handover IE into the DBand Beacons with a common initial Remaining BI field value. The number of BTIs to transmit such beacons should be at least (dot11MaxLostBeacon – i\*dot11ImplicitHandoverLostBeacons+1) so that other member STAs will start scanning for it. Each candidate PCPs will also monitor for DBand Beacon transmissions and cease its own Beacon transmissions and behave as a member STA if the received DBand Beacon is from a lower indexed candidate PCPs. Member STAs, upon detecting that the PCP has gone, should attempt to associate with the PCP sending DBand Beacons in the current BTI which has the smallest Remaining BI field. After its Remaining BI field value expires, the sending candidate PCP takes over the role of the PCP and should resume the schedule of previous pseudostatic SPs.

These changes also result in some modifications to the definition of the PCP Handover element as well as the Explicit Handover in 11.30.2.1 which uses the same element.

In addition, in Annex D, it is noted that the default values of some MIB variables are wrong:

* The default values of the MIB variable dot11MaxLostBeacons is “4”, which is too small.
* The default value of the MIB variable dot11ImplicitHandoverLostBeacons is “8”, which is greater than that of dot11MaxLostBeacons, violating the recommended behavior.

**Proposed Changes:**

*Modify the 7.3.2.104 PCP Handover element as shown:*

The PCP Handover element is used to indicate which STA will become the new PCP following an explicit or implicit handover procedure. The PCP Handover element is defined in Figure 60.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Element ID | Length | Old BSSID | New PCP Address~~ID~~ | Remaining BIs |
| Octet | 1 | 1 | 6 | ~~1~~6 | 1 |

Figure 60 – PCP Handover

The Old BSSID field contains the BSSID of the PBSS from which control is being handed over.

The New PCP Address~~ID~~ field indicates the ~~AID~~ MAC address of the new PCP following a handover.

The Remaining BIs field indicates the number of BIs, from the BI in which this element is transmitted,

remaining until the handover takes effect.

*In 11.30.2.2 Implicit Handover procedure, Change the 2nd paragraph as indicated:*

The implicit handover process is triggered at the ith Implicit candidate PCP when the ith Implicit candidate PCP fails to receive a DBand Beacon or Announce frames from the PCP for (i \* dot11ImplicitHandoverLostBeacons) beacon intervals. When ~~this happens~~ triggered, the ith Implicit candidate PCP shall send at least one DBand Beacon frame during each of the next dot11MaxLostBeacons BTIs if the following conditions are met:

* No DBand Beacon or Announce frames are received from the PCP; and
* No DBand Beacon frame carrying a PCP Handover element with the value of the Old BSSID field equal to the BSSID of the PBSS is received from an Implicit candidate PCP with a smaller index on the NextPCP List.

Each DBand Beacon sent by the ith Implicit candidate PCP shall contain a PCP Handover element with the Old BSSID field set to the BSSID of the PBSS from which control is being taken, i.e., the previous PBSS, the New PCP Address field set to its MAC address, and the Remaining BIs field initially set to dot11MaxLostBeacons and decremented by 1 at each TBTT. A member non-PCP STA of the PBSS, after failing to receive a DBand Beacon or Announce frame for dot11MaxLostBeacons BIs, should associate with the new PCP sending a DBand Beacon frame containing the PCP Handover element with Old BSSID field equal to the BSSID of the previous PBSS and the smallest Remaining BIs field value. The Implicit ~~handover~~candidate PCP which successfully transmits a DBand Beacon with the Remaining BIs field within the PCP Handover element equal to zero completes the implicit handover by scheduling, if appropriate, pseudo-static SPs between its member STAs following the pseudo-static scheduling information it obtained from the previous PBSS.~~at the next BI to announce that it is taking over the responsibility asthe PCP of the PBSS. The DBand Beacon sent by i~~~~th~~ ~~Implicit candidate PCP repeats all information~~

~~carried in the last DBand Beacon sent by the former PCP.~~

*In 11.30.2.2, Delete the 3rd paragraph since whether a PBSS member receives a DBand Beacon can not be predicted and the normative statement imposes no new behaviour requirements:*

~~If the first n Implicit candidate PCPs fail to take the role of PCP, it will take at least~~

~~dot11ImplicitHandoverLostBeacons \* (n +1) beacon intervals before the PBSS members receive a~~

~~DBand Beacons. The system should make sure that all STAs are capable of maintaining the accuracy~~

~~of the internal clock to remain synchronized with each other.~~

*In 11.30.2.1 Explicit Handover procedure*

*Modify the last sentence of the 2nd to last paragraph as shown:*

The candidate PCP should also request SPs to perform beamforming and, if appropriate, establish a security association with other associated STAs prior to the completion of PCP handover.

*Modify the last paragraph as shown:*

Following the reception or transmission of a successful Handover Response frame, the PCP shall

transmit ~~the~~ a PCP Handover element within ~~its~~ every DBand Beacon or Announce frame for each of the next

dot11NbrOfChangeBeacons BIs with the Old BSSID field set to the BSSID of the PBSS, the New PCP Address field set to the MAC address of the candidate PCP, and the Remaining BIs field ~~within the PCP Handover element~~ set to the number of BIs remaining until the candidate PCP takes over the role of PCP for the PBSS~~‘s PCP~~. The initial value of the Remaining BIs field shall be equal to the Remaining BI field value last transmitted by the PCP in a ~~the Handover Remaining BI field within the last transmitted~~ Handover Request frame to the candidate PCP or equal to the Remaining BI field value last received by the PCP in ~~the Handover Remaining BI field within the last received~~ a Handover Request frame from the candidate PCP, whichever is later. A non-PCP STA receiving a DBand

Beacon or Announce frame containing the PCP Handover element shall set the STA‘s local countdown

counter to the value of the Remaining BIs field contained in the PCP Handover element. The STAs

shall then decrease the local countdown counter by one at each TBTT and shall use the candidate

PCP‘s address found in the New PCP Address field contained in the PCP Handover element as the new beacon filter address once the STA‘s local countdown reaches zero. When the countdown timer ~~hits~~ equals zero, the candidate PCP shall assume the role of PCP.

*In Annex D:*

Change the default values of MIB variable dot11MaxLostBeacons from “4” to “8”.

Change the default value of MIB variable dot11ImplicitHandoverLostBeacons from “8” to “4”.