IEEE P802.11
Wireless LANs

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| Channel Selection |
| Date: 2010-09-02 |
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Abstract

CID 338 states:

*And of course with 40 MHz 11n (if between APs with different Primaries in the same 40 MHz), and soon 11ac (80 and 160 MHz), APs can send beacons on different channels but still cause interference to each others' BSSs*

With proposed resolution of:

*Improve proposal to account for multichannel operation. Now 11ac is not in our baseline yet if the lifetime of this feature is "useful until 11ac comes along", then that is cause for concern. E.g. make reports by 20 MHz subchannel, or by 20/40/80/160 MHz, etc*

CID 376 states:

*Helpful to insert sentence related to combining the reports from all APs*

With proposed resolution of:

*Insert sentence/phrase "After combining the potential Qload Ies from nearby cochannel APs …"*

This document proposes normative text to accept the above comment resolutions.

***Instructions to the TGaa editor are marked in purple italics.***

**Changes to the draft are marked in blue to indicate an addition and ~~blue strikethrough indicates deletion~~.**

ANNEX aa

**(Informative)**

**Overlapping BSS (OBSS) Management**

***Remove the 2nd paragraph of P802.11aa D1.01 annex aa.1 as shown:***

aa.1. Introduction

When two or more BSSs overlap, the available bandwidth is shared and hence reduced for each BSS. The basic access mechanism, such as DCF, will work across overlapping BSSs. Similarly, if EDCA is used, the OBSS can be considered a larger network and access to the WM is basically shared according to the EDCA access mechanism. It should be noted however, that for both DCF and EDCA overlapping networks, the sharing is affected by the relative traffic and, if more than two APs are sharing, the problem of ‘neighbor capture’ is present. A BSS is in the middle of two other BSSs that are hidden from each other, suffers a disproportionate degradation in throughput dependent upon the total traffic in all three BSSs. A particular problem arises when there is some expectation of Quality of Service (QoS). If EDCA Admission Control is in use, then it can be used to regulate the QoS traffic on its own BSS but it does not take into account the EDCA Admitted traffic on an overlapping BSS. The result is that the QoS is compromised if each BSS admits traffic up to its local maximum. Similarly a BSS using HCCA may schedule traffic in its own BSS, so as to ‘guarantee’ a service, but, if not controlled, this will affect any overlapping EDCA Admission Control BSS in that the scheduled TXOPs in will silence traffic in the other BSSs. Furthermore, if two HCCA BSSs overlap, if they do not coordinate their scheduled TXOPs, then this may result in a degradation of the quality of service. The features described in this Annex have been introduced in order to allow a degree of management for overlapping BSSs and for mitigation of the basic problems outlined above.

~~The channel selection process for an AP is fundamental to OBSS. If there are sufficient channels for an AP to find a channel with no other APs within range, then an AP should endeavor to do so. If, after scanning all the possible channels an AP is required to choose one that is already occupied then it is recommended that it does so in the following procedure:~~

1. ~~Check if the APs that are advertising Admission Control and/or HCCA support, i.e. QAPs~~
2. ~~Select the channel(s) with the least number of QAPs~~
3. ~~If more than one channel selected in step 2, select channel with least Overlaps advertised in the QLoad elements~~
4. ~~If more than one channel selected as a result of step 3, select channel with lowest Potential QLoads~~

***Modify P802.11aa D1.01 annex aa.3 as shown:***

aa.3 Channel Selection Using QLoad Report

The most effective mitigation to OBSS is for an AP to choose a channel that is either free, or one that is occupied by another AP that is not fully loaded with QoS traffic. It is recommended that the “Overlap” and “QLoad” fields of the QLoad Report element are used by an AP as part of its channel selection procedure. Using the “Overlap” and “QLoad” information, the AP can make an informed decision as to the best channel to select. If there are sufficient channels for an AP to find a channel with no other APs within range, then an AP should ~~endeavor to do~~ ~~so~~ select one of them.

It is recommended that when selecting a channel, the AP should first scan to see if there is a free channel, taking account of BSS channel width and channel spacing. If a free channel is not available, then it should select channels that have the least number of QoS APs present. Note that there may be more than one channel with the same number of QoS APs present. At this point the AP should select, in turn, the candidate channels, and send a QLoad Report Request to each AP on that channel. The AP should then examine the Overlap and QLoad fields to make its final selection.

The recommended method for channel selection can be implemented by adoption of the following procedures:

* Create a list of the available channels. Typically this is the list of channels allowed by regulation in the operating regulatory domain, however this list might be modified by management policy (e.g. removing overlapping channels, avoiding radar detect channels).
* Create an array for each available channel that allows the recording of the QoS AP count, Admission Control Mandatory count, HC count, overlap count and potential load for that channel.
* Step through the list of available channels, listening for beacons for at least dot11OBSSScanPassiveTotalPerChannel TUs per channel.
* Upon completion of the scan of a channel, process the beacons received on that channel, filtered to the set of unique BSSIDs:
1. Using the capabilities signalled in the beacon, modify the QoS AP count, Admission Control Mandatory count, HC count, overlap count and potential load of the channel array for the primary channel indicated in the received beacon.
2. If the overlapping AP is using a channel bandwidth that is greater than the channel spacing (e.g. when using the 2.4GHz band or when the overlapping AP allows 40MHz HT PPDUs in its BSS) also update the channel array for channels that are affected by this overlapping BSS. For example a beacon received on channel 2 indicating a 20MHz BSS also affects channels 1, 3 and 4.
* Upon completion of scanning all of the channels, the AP will have information on the number of APs and the potential load of each channel, including co-channel BSSs.
* If the channel array indicates that there are channels with no other APs, it is recommended to randomly choose one of these “empty” channels.
* Otherwise, create a list of candidate channels by selecting only the channels with the lowest number of QoS APs. For example if the channel scan procedure indicated that there were two QoS APs on channel 3, three QoS APs on channel 6 and two QoS APs on channel 11, the list of candidate channels would contain 3 and 11.
* If this list contains more than one channel, filter the list to the set of channels with QoS APs that indicate support for QLoad reporting (as indicated by the QLoad Report field set to 1 in the Extended Capabilities element).
* If this list contains more than one channel, filter the list to the set of channels with the minimum HC count.
* If this list contains more than one channel and the AP will use Admission Control Mandatory for AC\_VI or AC\_VO, filter the list to the set of channels with Admission Control Mandatory count greater than zero.
* If this list contains more than one channel and the AP has an HC, filter the list to the set of channels with Admission Control Mandatory count greater than zero.
* If this list contains more than one channel, filter the list to the set of channels with the minimum overlap.
* If this list contains more than one channel, filter the list to the set of channels with the minimum potential load.
* From the remaining channels in this list, randomly choose one of these channels.**References:**