`IEEE P802.11  
Wireless LANs

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| D1.0 Comment Resolution | | | | |
| Date: September 19, 2011 | | | | |
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Abstract

This document provides resolution for the following CIDs:

2609, 2624, 3699, 3322, 3697, 3719.

The comments are based on D1.0.

Edits for the proposed resolutions are based on D1.1.

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| **CommentID** | **Subclause** | **Page** | **Line** | **CommentType** | **Comment** | **SuggestedRemedy** |
| 2609 | 8.4.2.102 | 56 | 45 | T | It is not clear how it is possible to detect that 40MHz operating BSS Channel Width was busy, i.e. clarify how the busy\_bandwidth\_40 parameter value is obtained or calculated. In many instances when the AP transmits or recieves with 20 MHz and cannot monitor larger bandwidth. during these times the larger bandwidths are not monitored and thus the load information is not maintained. | Should there be other conditions to monitor the busy times of the channels and the durations that the BSS reserves the channels? Please clarify |
| 2624 | 8.4.2.102 | 56 | 45 | T | Please clarify the condition to detect that 40MHz operating BSS Channel Width was busy, i.e. clarify how the busy\_bandwidth\_40 parameter value is obtained or calculated. There are many times when the AP transmits or recieves with 20 MHz and cannot monitor larger bandwidth. during these times the larger bandwidths are not monitored and thus the load information is not maintained. Should there be other conditions to monitor the busy times of the channels and the durations that the BSS reserves the channels. | Please clarify. |
| 3699 | 8.4.2.102 | 56 | 45 | T | Please clarify the condition to detect that 40MHz operating BSS Channel Width was busy, i.e. clarify how the busy\_bandwidth\_40 parameter value is obtained or calculated. There are many times when the AP transmits or recieves with 20 MHz and cannot monitor larger bandwidth. during these times the larger bandwidths are not monitored and thus the load information is not maintained. | Should there be other conditions to monitor the busy times of the channels and the durations that the BSS reserves the channels. |

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| 3322 | 8.4.2.102 | 56 | 36 | T | The CS mechanism doesn’t distinguish the cause of busy, especially not whether a transmission is MU-MIMO, does it? | Clarify |
| 3697 | 8.4.2.102 | 56 |  | T | The Extended BSS Load Element does not provide guidance for spatial streams use for SU MIMO transmissions. Currently only the spatial stream inefficiency for MU MIMO tranamissions is provided | Add information element to provide information of the SU-MIMO spatial stream under utilisation. |
| 3719 | 8.4.2.102 | 56 | 36 | T | As an example, supposed the AP indicated maximum number ss supported is 4 (for both MU-MIMO) and the AP is transmitting 4 SU spatial stream all the time. The Spatial Stream Under-Utility would indicate 255 (100%) under-tulitized when in fact all supported spatial streams are utilized during measuring period. For this reason, I suggest to change the above text to MU-MIMO or SU-MIMO. | change the text "MU-MIMO" to "MU-MIMO or SU-MIMO" |

**Discussion:**

These six CIDs address issues pertinent to secion 8.4.2.102.

Comments 2609, 2624, and 3699 are asking how to determine the condition of “40MHz operating BSS Channel Width was busy”.

Comments 3322, 3697, and 3719 are suggesting whether the extended load element should include SU-MIMO.

(1) The definition of busy\_bandwidth\_40

In the current definition, the busy\_bandwidth\_40 field does not differentiate between the two situations in which only the 40MHz channel is used by an 11ac AP.

The reasons that “40MHz channel busy” could be either because the receiver is a HT device and can only operate in a 40MHz channel or because the receiver is a VHT device but only the 40MHz channel is available. A proposed resolution is to add another 40MHz channel utilization field (an octet) in Figure 8-ac16. One of the 40MHz channel utilization field is reserved for HT STA and another 40MHz channel utilization field is reserved for VHT STA.

(2) The Extended Load Element and CS

The current text includes the following statement about channel busy, “the CS mechanism, as defined in 9.3.2.2 (CS mechanism) has indicated that the channel is busy”. The description leads to confusion about what the 11ac extended BSS load element is addressing.

The BSS load element defined in 802.11 (IEEE Std 802.11 - 2007) and 11n (7.3.2.28, 802.11n-2009) specify channel busy according to the following statement, “the AP sensed the medium was busy, as indicated by either the physical or virtual carrier sense (CS) mechanism.”

The definition of channel busy in BSS load element includes the uplink and downlink traffic. Since the extended BSS load element complements the BSS load elemenet by computing the utilization of MU and SU-MIMO operations only, the definition only applies to downlink traffic transmiited by the AP. As a result, there is no need for sensing.

CID 2609 also raised the concern that a VHT AP can’t monitor larger bandwidth, “AP transmits or recieves with 20 MHz and cannot monitor larger bandwidth.” For the reason described above, AP does not need to monitor the bandwidth usage for downlink only BSS load measurement.

The proposed resolution is to eliminate the confusion by revising the text to make it clear that that the channel busy is defined for downlink only and there is no need for channel sensing.

**Proposed Response:**

**AGREE in principle.**

**Proposed Resolution Text:**

*In D1.1, subcluse 8.4.2.102 has been revised and renumbered as 8.4.2.142. We propose to revise 8.4.2.142 as shown below.*

**8.4.2.142 Extended BSS Load element**

The Extended BSS Load element contains information on bandwidth utilization and ~~MU-~~MIMO spatial stream underutilization(#2187). The element format(Ed) is defined in Figure 8-ac16. The element might(#3561) be used by the STA for vendor-specific AP selection algorithm.



**Figure 8-ac16—Extended BSS Load element format(#3564)**

*Instrution to the editor:*

*Replace the lable “40 MHz Utilization” of octet 5 with “40 MHz HT Utilization.”*

*Insert another 1 octet filed labled “40 MHz VHT Utilization” before the field labeled “80MHz Utilization.”*

The MU-MIMO Capable STA Count field indicates the total number of STAs currently associated with this BSS that have a 1 in the MU Rx Capable field of their VHT Capabilities element(#3324).

The Spatial Stream Underutilization(#2187) field is defined as the percentage of time, linearly scaled with 255 representing 100%(#2726), that the AP has underutilized(#2187) spatial domain resources for given busy time of the medium. When more than one channel is in use for the BSS, the spatial stream underutilization(# 2188) is calculated only for the primary channel. This percentage is computed using the formula,



(#3255)(#3428)(#2032)(#3562)where

 is defined to be the maximum number of spatial streams indicated by the Number of Sounding sDimensions subfield of the VHT Capabilities Info field of the AP.

 is defined to be the number of microseconds during which AP is transmitting one or more spatial streams.



is defined to be , where is the time interval during which the ~~CS mechanism has~~

~~indicated~~ channel is busy (Ed)due to the transmission of ~~MU PPDU(#3494)~~ one or more spatial streams by the AP, *NSTS,i* is the number of spatial streams(#3801) transmitted during(#3323) the time interval , *N* is the number of time intervals.

The 40 MHz HT Utilization field is defined as the percentage of time, linearly scaled with 255 representing 100%(#3257), that the 40 MHz of operating BSS Channel ~~Width~~ was busy. This percentage is computed using the formula,



*Instrution to the editor:*

*Change T40 to T40\_HT*

The 40 MHz VHT Utilization field is defined as the percentage of time, linearly scaled with 255 representing 100%(#3257), that the 40 MHz operating BSS Channel Width was busy. This percentage is computed using the formula,



*Instrution to the editor:*

*Change T40 to T40\_VHT*

…………………………

where

*T*busy is defined to be the number of microseconds during which ~~the CS mechanism, as defined in 9.3.2.2 (CS mechanism) has indicated a channel busy indication~~. AP was transmitting two or more spatial streams.

*T*40\_HT\_busy*T*40\_V HT\_busy *T*80\_busyand *T*160\_busyare defined to be the number of microseconds during which the ~~CS mechanism has indicated channel busy~~ AP was transmitting into ~~for the primary~~(#2535) 40 MHz channel to a HT STA, 40 MHz channel to a VHT STA,, 80 MHz, 160 MHz(#3333) channel respectively. ~~An 80+80 MHz channel is considered a 160 MHz channel in this context(#3563). The 40 MHz channel was detected to be busy by the CS mechanism when any of the primary or the secondary parameter of the channel-list indicates busy. The 80 MHz(#3333) channel was detected to be busy by the CS mechanism when any of the primary,~~