IEEE P802.11
Wireless LANs

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| LB190-Once-Upon-A-Comment-Response |
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Abstract

Proposed resolutions for LB190 CID 7180, 7168, 7167, 26, 7324, 7331, 7397, 7398, 7232, 7233, 7328, 7336, 7335, 7396, 7213, most of which are comments on the use of the Operating Mode Notification element and frame.

**Revision Notes**

**R2:**

Greenify resolved comments.

Yellowify comments that have been discussed but not yet resolved.

Updates to some resolutions as a result of discussion during January 11 adhoc meeting.

**R1:**

Greenify resolved comments.

Updates to some resolutions as a result of discussion during January 10 adhoc meeting.

**R0:**

Initial

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| **CID** | **Commenter** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 7180 | Yusuke Asai | 161.52 | 9.28.3 | The "RXVECTOR" parameter N\_TX is referred on P161L52; however, in TGad D4.0, a receiver cannot know the number of transmit chains of the received PPDU. Actually, the RXVECTOR parameter N\_TX is not present on Table 22-1. | Delete "N\_TX" on P161L52. | Accept |

**CID 7180**

**9.28.3 Link adaptation using the VHT variant HT Control field**

***TGac editor, in TGac D4.1, modify the nth paragraph of 9.28.3 as shown:***

In an MFB response solicited by an MRQ that was not carried in a VHT NDP Announcement frame, the MFB

is computed based on RXVECTOR parameters CH\_BANDWIDTH, GROUP\_ID, NUM\_STS,

FEC\_CODING, BEAMFORMED(#7181) and STBC of the received PPDU that carried the MRQ and might

additionally be based on other factors that are not part of the RXVECTOR. The NUM\_STS subfield of the

MFB subfield of VHT variant HT Control field shall be set to an equal or smaller value than the RXVECTOR

parameter NUM\_STS of the received PPDU from which the MRQ was triggered.

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| 7168 | David Hunter | 191.26 | 10.41 | Where is it specified that reducing the number of space time streams is only posible if the AP has a single receive chain? | A pointer to an explanation, or additonal words, is needed to explain this relationship. | Reject – The NOTE is correct. It instructs the VHT AP in the manner of behavior that is necessary to communicate its modified capability to associated STAs that are incapable of interpreting the Operating Mode Notification - see 10.2.4,which indicates that SM power save mode can only indicate that the STA is operating with a single RX chain instead of the maximum capable. |

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| 7167 | David Hunter | 190.58 | 10.41 | "A STA that has the Operating Mode Notification field in the Extended Capabilities element equal to 1 ...". Huh? What does this mean? A STA does not have either a field or an element, so how can it have these? Are these values of a field and an element found in the most recent Xyz frame transmitted by the STA? Or something else? | Specify exactly what are the actual criteria for a STA to be identified as "operating mode notification capable". | Revised – Tgac editor to make changes to 10.41 as shown in 11-13-0048r1 under the heading CID 7167 which replaces the reference to the field of the element with a reference to the MIB variable which is functionally equivalent because the MIB variable value forces a direct requirement on the field value. |

**CID 7167**

**10.41 Notification of operating mode changes**

***TGac editor, in TGac D4.1, modify the 1st paragraph of 10.41 as shown:***

A STA whose dot11OperatingModeNotificationImplemented is true(#7166) shall set the Operating Mode

Notification field in the Extended Capabilities element(#7338) to 1. A VHT STA shall set

dot11OperatingModeNotificationImplemented to true. A STA that has the value true for dot11OperatingModeNotificationImplemented is referred to as operating mode notification capable.

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| 26 | Brian Hart | 191.28 | 10.41 | Consider a VHT AP with associated 11n clients changing from 20 to 80 MHz. To help its 11n clients, the AP would also use 11n's Notify Channel Width frame ... but this maxes out at 40 MHz. What does a VHT STA do if it sees in close proximity (how close!?) broadcast frames to switch to 80 MHz and 40 MHz!!?? | a) Mention that Notify Channel Width frames are allowed here. b) Define rules related to how a VHT AP can send (and a VHT client should process) unicast/broadcast Notify Channel Width frames that indicates that the BSS is switching to 40 MHz, so there is no ambiguity with other frames sent at a similar (before/after) time indicating that the BSS is switching to a wider BW | Revised – Tgac editor to make changes found in doc 11-13-0048r1 under the heading CID 26 which generally conform with the commenter’s suggestion. |
| 7324 | Mark RISON |  |  | How does the Notify Channel Width mechanism interact with the Operating Mode Notification mechanism? | Disallow a VHT STA from using the NCW mechanism, or say the last one of NCW and OMN wins | Revised – Tgac editor to make changes found in doc 11-13-0048r1 under the heading CID 7324 which generally conform with the commenter’s suggestion. |

**CID 26, 7324**

**Discussion**

The first comment correctly points out that in the exampled transition from 20 to 80, both Notify Channel Width and Operating Mode Notification frames are needed if the BSS contains both VHT and HT STAs, so one cannot instruct the AP to NOT send the NCW in this example. Similarly, the associated STA cannot be instructed to ignore Notify Channel Width frames because of the possibility that an AP might decide in the case, for example, of an 80 MHz to 20 MHz transition, to send only the NCW frame and not the OMN.

A viable alternative would be to force a requirement at the VHT AP to always follow a defined order of transmission of the two frames (first NCW and second OMN) when both frames are to be transmitted and require VHT STA to obey both frames.

Another workable solution is to require a VHT AP to always use the OMN for all transitions (and optionally allow the use of NCW) and require the VHT STA associated with a VHT AP to ignore NCW.

**10.41 Notification of operating mode changes**

***TGac editor, in TGac D4.1, insert the following text to become the nth and mth paragraphs of 10.41 as shown:***

A VHT AP that has at least one VHT STA associated and that indicates a channel width change using management action frame(s) shall transmit Operating Mode Notification frame(s) to signal the channel width change. A VHT AP that has at least one non-VHT HT STA associated and that indicates a channel width change using management action frame(s) shall transmit Notify Channel Width frame(s) to signal the channel width change.

A VHT STA shall not transmit an individually addressed Notify Channel Width frame to a VHT STA.

A VHT STA associated with a VHT AP shall ignore Notify Channel Width frames received from the VHT AP.

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| 7331 | Mark RISON | 191.54 | 10.41 | If you're not allowed to transmit an OMN with a Rx Nss or BW not supported by the peer, doesn't that imply a single limited STA will prevent you from broadcasting an OMN? | Change the rule to only apply to unicast OMNs. For group OMNs, specify that a STA shall treat any Rx Nss/BW notification in excess of its capabilities as if there was no restriction | Reject – There really is no ambiguity in the case of the D4.0 language – there is only one STA mentioned in the paragraph before the first definitive reference, so that reference must refer to the first named STA and when this is established, the sentence is clearly indicating that a STA shall not advertise capabilities that it does not possess. |

**UNDO 7169 (see 1277r7)**

**CID 7331**

**Discussion**

I could maybe really be missing something here, but so far, I just don’t see it.

The cited language has changed slightly between D4.0 and D4.1, and I think, for the worse, due to someone else having the same mistaken interpretation of the language from D4.0 as the commenter, thanks to the insertion of an ambiguity into the language on the part of the commenter.

Does it make any sense to have a restriction on the transmitted RXNSS value based on the TX capability of the recipient?

“Hey, I can handle 4 streams!”

“Oh, no! I can only transmit 2 streams! A fancy 4 stream receiver like you is too classy for a cheap transmitter like me to talk to, so I won’t even bother trying.”

The RXNSS indication is expressing the capability of the RX function of the STA sending the RXNSS information and if the recipient is not capable of transmitting at such high RXNSS values, why should it matter?

Here is the D4.0 language:

A STA shall not transmit an Operating Mode field with the value of the Rx Nss subfield indicating a number

of spatial streams not supported by the STA, as reported in any Supported Rates element, Extended Supported

Rates element, Supported MCS Set or Supported VHT-MCS and NSS Set field in management frames transmitted

by the STA.

Here is the D4.1 language:

A STA shall not transmit an Operating Mode field with the value of the Rx NSS(#7360) subfield indicating

a number of spatial streams not supported by the recipient STA. The number of spatial streams supported by the recipient STA is reported in the Supported Rates element, Extended Supported Rates element, Supported MCS Set or Supported VHT-MCS and NSS Set field transmitted in management frames by the recipient STA(#7169).

A STA shall not transmit an Operating Mode field with the value of the Channel Width subfield indicating a

bandwidth not supported by the STA, as reported in the Supported Channel Width Set subfield in the HT Capabilitites Info field or the VHT Capabilities Info field in management frames transmitted by the STA.

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| 7397 | Mark RISON | 191.00 | 10.41 | "An AP should notify" -- a) why not a shall and b) what about non-APs? | Make them shalls and generalise them to STAs | Revise – TGac editor shall make changes shown in 11-13-0048r2 under the heading CID 7397. Should is ok, because the AP does not need to be required to signal the changes – there is an attempt at generalization in the second paragraph of 10.41, but it needs improvement. |
| 7398 | Mark RISON | 191.22 | 10.41 | "The notification should occur prior to a decrease in the maximum number of space-time streams and following an increase in the maximum number of space-time streams." -- but there's no similar statement for changes in the operating width | Add a similar statement for operating width | Revise – Tgac editor to make changes found in doc 11-13-0048r2 under the heading CID 7398 which generally implement the commenter’s suggested change. |

**CID 7397, 7398**

**Discussion**

Generalization is not necessary, as it is already provided - commenter should see the second paragraph of the section, quoted here:

A STA notifies other STAs that are operating mode notification capable of a change in its operating mode

using the Operating Mode Notification frame or by including the Operating Mode Notification element in the

Beacon, Probe Response, Association Request, Association Response, Reassociation Request, or Reassociation

Response , TDLS Setup Response, TDLS Setup Confirm, Mesh Peering Open or Mesh Peering Confirm

frames. The Operating Mode field in the Operating Mode Notification frame or the Operating Mode Notification

element is set to indicate that the STA is capable of receiving frames with a bandwidth up to and including

the indicated channel width and with a number of spatial streams up to and including the value

indicated by the Rx NSS(#7360) subfield.

I’m guessing that it says “should” at the cited location because the AP is free to do whatever it pleases, including:

Make an NSS or BW change without announcing this and then pay the price for its rudeness.

Make an NSS or BW change by dissociating all STAs and then restarting the BSS with different values for NSS and BW.

Perhaps no STA in the BSS is capable of operating at the increased capability of the AP, and therefore, there is no need to inform any STA of the change, such notification would be a waste of resources.

**Proposed changes**

**10.41 Notification of operating mode changes**

***TGac editor, in TGac D4.1, modify the second paragraphs of 10.41 as shown:***

A STA that is operating mode notification capable and that transmits an Association Request, Reassociation Request, TDLS Setup Response, TDLS Setup Confirm, Mesh Peering Open or Mesh Peering Confirm frame to a STA that is operating mode notification capable should notify the recipient STA of a change in its operating mode by including the Operating Mode Notification element in the frame.

A first STA that is operating mode notification capable and that has established any of the following with a second STA that is operating mode notification capable:

an association with an AP

a TDLS link

a DLS link

a Mesh Peer relationship

should notify the second STA of a change in its operating mode by transmitting an Operating Mode Notification frame to the second STA.

NOTE – Notify Channel Width frames and elements are used to signal STA operating beandwidth changes to and from STAs that are not operating mode notification capable.

The Operating Mode field in the Operating Mode Notification frame or the Operating Mode Notification element is set to indicate that the transmitting STA is capable of receiving frames with a bandwidth up to and including the indicated channel width and with a number of spatial streams up to and including the value.

The notification of a change in supported space-time streams should occur prior to a decrease in the maximum number of space-time streams and following an increase in the maximum number of space-time streams.

The notification of a change in operating bandwidth should occur prior to a decrease in the operating channel width and following an increase in the operating channel width

***TGac editor, in TGac D4.1, modify the following paragraphs of 10.41 as shown:***

An AP should notify associated STAs of a change in the maximum number of spatial streams it is able to receive through one or more of the following mechanisms:

— Using individually addressed Operating Mode Notification frames

— Including the Operating Mode Notification element in Beacon frames for a period of time that ensures that STAs in PS mode will receive the notification

— Using the SM power save mechanism defined in 10.2.4 for HT STAs that are not operating mode

notification capable

The notification should occur prior to a decrease in the maximum number of spatialstreams and following an increase in the maximum number of spatialstreams.

NOTE—An AP that is reducing the maximum number of spatialstreams the AP is able to receive and that has associated HT STAs that are not operating mode notification capable would use the SM power save mechanism to notify the

STAs that the AP is operating with a single receive chain.

An AP should notify associated STAs of a change in its operating channel width through one or more of the

following mechanisms:

— Using the Channel Switch Announcement element, Channel Switch Announcement frame or both

following the procedure defined in 10.9.8.2 (Selecting and advertising a new channel in an infrastructure

BSS)

— Using the Extended Channel Switch Announcement element, Extended Channel Switch Announcement

frame or both, following the procedure described in 10.10 (Extended channel switching (ECS))

— Using individually addressed Operating Mode Notification frames and/or Notify Channel Width frames

— Using the STA Channel Width field in the HT Operation element and/or Channel Width field in the

VHT Operation element

The notification should occur prior to a decrease in the operating channel width and following

an increase in the operating channel width.

***TGac editor, in TGac D4.1, modify the following paragraph of 10.41 as shown:***

An AP shall not include the Operating Mode Notification element in Beacon, Probe Response, Association

Response and Reassociation Response frames when not changing the maximum number of spatial

streams the AP is able to receive.

***TGac editor, in TGac D4.1, modify the following paragraph of 10.41 as shown:***

A STA that is operating mode notification capable shall not transmit a PPDU to a STA that uses a bandwidth

that is greater than the channel width indicated in the most recently received Operating Mode Notification

element or Operating Mode Notification frame from that STA. A STA that is operating mode notification capable

shall not transmit a PPDU to a STA that uses a greater number of spatial streams than indicated in

the most recently received Operating Mode Notification element or Operating Mode Notification frame received

from that STA.

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| 7232 | Liwen Chu | 190.61 | 10.41 | AP changes the operating mode through Beacon, Probe Response etc. VHT Operation element already includes all the information of Operating Mode Notification element. So It is not necessary to include Operating Mode Notification element in Beacon etc. in order to change the BSS operating mode. | Change to "A STA notifies other STAs that are operating mode notification capable of a change in its operating mode using the Operating Mode Notification frame or by changing the VHT/HT Operation element in the Beacon, Probe Response, Association Request, Association Response......" | Reject – dynamic AP capability is not signaled in the XX Capabiliity IE (such signaling should take place in the XX Operation IE), dynamic RXNSS information is not contained in the VHT Operation element and indicating changes to the width by using the VHT Operation IE is already stated in the draft. |

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| 7233 | Liwen Chu | 190.52 | 10.41 | Once an AP change the operation mode, the whole BSS operation mode is changed. In a VHT BSS with VHT TDLS connection that does not support TDLS Wider Bandwidth, the AP changes its operation channel from 80MHz to 40MHz without changing the 20MHz primary channel. Does the TDLS link use 40MHz width? | Clarify it. | Reject – the issue is clarified and unambiguous as can be seen in the changes to the TDLS language in 10.22.1. which allows TDLS STAs to operate with a BW that is wider than the BW of the BSS if both TDLS STA indicate that they are capable of doing so. |

**CID 7233**

**Discussion**

Language already exists which suggests that this is true.

See 10.22.1:

**10.22.1 General**

Features that are not supported by the BSS but that are supported by both TDLS peer STAs may be used on

a TDLS direct link between those STAs, except PCO. An example is the use of an HT MCS on a TDLS

direct link between HT STAs when these STAs are associated with a non-HT BSS. Features that are supported

by the BSS shall follow the BSS rules when they are used on a TDLS direct link on the base channel.

The channel width of the TDLS direct link on the base channel shall not exceed the channel width of the

BSS to which the TDLS peer STAs are associated, except when the TDLS Wider Bandwidth subfield in the

Extended Capabilities element of the TDLS Setup Request frame or the TDLS Setup Response frame is 1

for both TDLS peer STAs. A TDLS direct link on the base channel shall not have a wider bandwidth than

the BSS bandwidth if either of the STAs indicate that they are incapable of supporting wider bandwidth

operation on the base channel.

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| 7328 | Mark RISON |  |  | It is not clear how channel width support requirements work in IBSSes (they can't be signalled in a VHT Operation IE, since this only indicates MCS and NSS support requirements) | Clarify | Reject – channel width requirements are signalined in VHT OP IE in the VHT Operation Information subfield |

**CID 7328**

**Discussion**

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| 7336 | Mark RISON | 73.00 | 8.4.1.50 | There is no point sending an OMN with Rx Nss Type set to 1 to a STA which does not support being an MU BFee | Say so | Revised – TGac editor to make changes for CID 7336 as found in 11-13-0048r2. The existing text implies the relationship (although, in the opposite direction, which is actually correct) but the text could be made more clear. |
| 7335 | Mark RISON | 73.45 | 8.4.1.50 | Can a non-AP set Rx Nss Type to 1? It can't receive VHTCBfs with FT set to MU, can it? | Add a NOTE to say 1 is only used by APs | Revise – TGac editor to make changes shown under the heading CID 7335 found in 11-13-0048r2, The opposite of the commenter’s assertion is true – it is the AP that cannot set RX NSS Type to 1 – the edit adds such a note. |

**CID 7336, 7335**

**Discussion**

NSS Type 1 value is set by a STA that has received an MU transmission, so this value would not be set to 1 when the OMN recipient is not capable of being an MU BFER, not MU BFEE. Conversely, if the OMN recipient is not capable of being an MU BFER, then it would not have sent an MU PPDU, and then the OMN transmitter would not be setting the bit, because it can only be setting the bit if it received an MU PPDU from the OMN recipient!

I.e. there is no need to say anything more than what is already said, but maybe it can be a bit clearer.

I.e. as the bit description already says, the value of 1 is used when the RXNSS value is a restriction in RX NSS that is based on analysis of an MU PPDU. The direct implication is the sender of the OMN is MU RX capable and the receiver of the OMN is MU TX capable.

see **8.4.1.50 Operating Mode field Table 8-53k—Subfield values of the Operating Mode field**

**Proposed changes**

***TGac editor, in TGac D4.1, modify the description entry for the row containing RX NSS in the Subfield column of Table 8-53k Subfield values of the Operating Mode field in subclause 8.4.1.50 as shown:***

If the Rx NSS Type(#7360) subfield is 1, indicates the maximum number of spatial streams that the STA can receive as a beamformee in an SU PPDU using a beamforming steering matrix derived from a VHT Compressed Beamforming report(#7377) with Feedback Type subfield indicating MU in the corresponding VHT Compressed Beamforming frame sent by the STA.

***TGac editor, in TGac D4.1, modify the description entry for the row containing RX NSS Type in the Subfield column of Table 8-53k Subfield values of the Operating Mode field in subclause 8.4.1.50 as shown:***

Set to 0 to indicate that the Rx NSS(#7360) subfield carries the maximum number of spatial streams that the STA can receive. Set to 1 to indicate that the Rx NSS(#7360) subfield carries the maximum number of spatial streams that the STA can receive in an SU PPDU using a beamforming steering matrix derived from a VHT Compressed Beamforming report(#7377) with the Feedback Type subfield indicating MU in the corresponding VHT Compressed Beamforming frame sent by the STA.

NOTE – An AP always sets this field to 0.

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| 7396 | Mark RISON | 107.10 | 8.4.2.168 | One cannot send more than one Operating Mode Notification in a given MMPDU. So what if a device wants to notify both a max NSS and a max NSS BFee SU from MU feedback? | Allow two OMNs per MMPDU? | Revise – Tgac editor to make changes found in doc 11-13-0048r2 under the heading CID 7396 which generally implement the commenter’s suggested change. |

**CID 7396**

**Discussion**

Several choices, among them:

Allow multiple fields to be present in frames, and in elements, and/or allow multiple elements to be present in frames (not sure this applies because only non-AP STAs can send multiple different values for RX NSS Type, and they cannot send the info as elements in any frame – is this really true?)

Require than any STA that wishes to do this must send separate MMPDUs.

**Proposed changes**

**8.5.23.4 Operating Mode Notification frame format**

***TGac editor, in TGac D4.1, modify 8.5.23.4 by showing in the frame format table that a second, optional, Operating Mode field may be present, and add text indicating that the second field may only be present if the RX NSS Type value is different from the RX NSS Type of the first Operating Mode field.***

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| 7213 | Wei Shi | 115.64 | 8.6.1 | A-MPDU pre-EOF padding is defined to include "subframe" padding when there are zero-length EOF subframes after the last subframe. In 9.12.6, line 51 says A-MPDU\_Length[n] is initialized as the length of the resulting A-MPDU pre-EOF padding. However, subframe padding cannot be determined until the steps taken in lines 16-26, pg 143. So this all appears a bit circular. | Add text in 9.12.6 to say that the initial value of A-MPDU\_Length[n] does not contain any padding (subframe or EOF) for the last subframe. | Revise – Tgac editor to make changes found in 11-13-0048r2 under the heading CID 7213 which redefine the A-MPDU pre-EOF padding to remove the subframe padding that might be present in the last subframe. |

**CID 7213**

**Discussion**

YES

**Proposed changes**

**8.6.1 A-MPDU format**

***TGac editor, in TGac D4.1, change the following text from 8.6.1 A-MPDU format as shown:***

Each non-final A-MPDU subframe in an A-MPDU, , has ~~Except when an A-MPDU subframe is the last one in an A-MPDU, padding octets are~~ pad octets appended to make ~~each A-MPDU subframe~~ the subframe a multiple of 4 octets in length. In a VHT PPDU, the final A-MPDU subframe is padded to the last octet of the PSDU or to a multiple of 4 octets in length, whichever comes first (see 9.12.6 (A-MPDU padding for VHT PPDU)). In an HT PPDU, the final A-MPDU subframe is not padded.

An A-MPDU pre-EOF padding is

— the portion of the A-MPDU up to but excluding the first A-MPDU subframe with 0 in the MPDU Length field and 1 in the EOF field and also excluding any subframe padding in the last subframe, or

* the portion of the A-MPDU up to and including the last A-MPDU subframe if no A-MPDU subframes

with 0 in the MPDU Length field and 1 in the EOF field are present, but excluding any subframe padding in the last subframe.

***TGac editor, in TGac D4.1, change the following text from 9.12.6 A-MPDU padding for VHT PPDU as shown:***

An A-MPDU pre-EOF padding (see 9.12.2 (A-MPDU length limit rules)) is constructed for each user from

any of the following:

— A-MPDU subframes constructed from the MPDUs available for transmission that have a TID value

that maps to the primary AC

— A-MPDU subframes with 0 in the MPDU Length field

provided that each added subframe and the complete A-MPDU meet all the following:

— A-MPDU content constraints (see 9.12.1 (A-MPDU contents)) for the intended recipient

— format and length limit constraints (see 8.6.1 (A-MPDU format) and 9.12.2 (A-MPDU length limit rules)) for

the intended recipient

— minimum MPDU start spacing constraints (see 9.12.3 (Minimum MPDU Start Spacing field)) for the

intended recipient

— TXOP duration limits (see 9.19.2.2 (EDCA TXOPs)) for the primary AC

The A-MPDU\_Length[*n*] for user *n* is initialized as the length of the resulting A-MPDU pre-EOF padding.

**References:**