IEEE P802.11
Wireless LANs

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| LB1000 CID5960 NSS support partitioning |
| Date: 2015-05-12 |
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Abstract

This document proposes a resolution for CID 5960 of LB1000 (first sponsor ballot), a comment on TGm Draft 4.0 suggesting the creation of additional partitioning of support indication for NSS values.

**REVISION NOTES:**

*Revisions to 11-14-0793:*

R0: initial

R1: R2: change table 8-251 references to 8-250, remove the word non-contiguous wherever it appeared

R3: changes to describe interaction between new 80+80 and 160 max nss subfields and basic VHT-MCS fields, modifications to indicate VHT-MCS supported set determination per operational bandwidth

R4: no conceptual changes - fix incorrect value indicated for determinant in the RX section of the determinant=1 case for both 80+80 and 160, and fix the phrase “one less than” to “two less than” in the description of the encoding for the value 2 in the Max NSS for 80+80 Adjustment and Max NSS for 160 Adjustment

R5: correct the value of Max VHT-MCS for n SS that is used to determine the maximum NSS for 80 MHz operation from a value of 0 to a value of 3

R6: Limited NSS reduction to half only. Changed MCS support to same or twice the supported NSS.

R8: added more CIDs

R9: add MIB variable

 Add modifications to subclauses affected by the Half Max NSS indication – e.g. Rx Supported VHT-MCS and NSS Set

 Add VHT capability bit, do not modify existing VHT Cap definitions, but only add new functionality, replacing previously reserved bits

Update baseline text to Draft P802.11REVmc\_D4.0

Remove CID information referring to old WG letter balloting process

*Revisions to 11-15-0654:*

R0: initial – beginning with 11-14-0793r9, including the following changes:

 In Rx Supported VHT-MCS and NSS Set and Tx Supported VHT-MCS and NSS Set, change the language to only require interpretation of the half NSS bit if the recipient of the bit is capable of interpreting the bit and in the new subclause Half Maximum NSS Support Signaling, remove the text that restricted the transmission of the half NSS signalling bits only to STA that have indicated support for interpretation of the bits. This change is needed because an AP for example, can broadcast capability in a beacon to all STA, both supporters and non-supporters and the interpretation of the half NSS bits are then left to the recipients of the bits. Those recipients that have the capability are required to interpret the value of 1 and those that do not have the capability are allowed to ignore the bits.

R1: providing the alternative, recipient determined setting of the capability bits

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGmc Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGmc Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGmc Editor: Editing instructions preceded by “Instruction to Editor” are instructions to the TGmc editor to modify existing material in the TGmc draft. As a result of adopting the changes, the TGmc editor will execute the instructions rather than copy them to the TGmc Draft.***

**CID LIST:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 5960 | Matthew Fischer | 1306.9 | 9.7.12.1 | Some implementations could have a maximum VHT NSS value that is dependent on the bandwidth of operation. Signaling to support this behavior is desired. Specifically, there is likely to be a difference between maximum NSS support for the 80+80 and 160 MHz bandwidths vs the 20, 40 and 80 MHz bandwidths. | Provide the necessary signaling to allow bandwidth dependent maximum VHT NSS values to be indicated. A presentation will be provided with specific details as to how to accomplish this. Propagate the changes to TVHT. | Revise - generally agree with commenter, TGmc editor to execute proposed changes from 11-15-0654r1 found under all headings which include CID5960 |

**Discussion:**

Implementations can benefit from subsets of functionality that have a finer resolution than the current capabilities fields allow.

**Proposed changes**

The proposed changes add a few new subfields to describe the partitioning of NSS support over a broader range of BW and MU/SU values than is currently describable.

**CID 5960**

**4.3.13 Television very high throughput (TVHT) STA**

***TGmc editor: add a new item to the list of TVHT replacments within subclause 4.3.13 Television very high throughput (TVHT) STA:***

* “dot11TVHTHalfMaxNSSSignalingOptionImpelemented” replaces “dot11VHTHalfMaxNSSSignalingOptionImplemented”.

**8.4.2.157.2 VHT Capabilities Info field**

***TGmc editor: modify the VHT Capabilities Info field of the VHT Capabilities element by changing the reserved bit B30 of Figure 8-554 – VHT Capabilities Info field within subclause 8.4.2.157.2 VHT Capabilities Info field to become “Half Max NSS for 160 MHz and 80+80 MHz Signaling Support”***

***TGmc editor: add the following paragraph in an appropriate location within subclause 8.4.2.157.2 VHT Capabilities Info field to describe the new bit “Half Max NSS for 160 MHz and 80+80 MHz Signaling Support”of the VHT Capabilities Info field:***

The Half Max NSS for 160 MHz and 80+80 MHz Signaling Support field indicates support for the signalling of Half Max NSS support as described in 9.7.12.1 (Rx Supported VHT-MCS and NSS Set) and 9.7.12.2 (Tx Supported VHT-MCS and NSS Set). The bit is set to 1 to indicate support for the signalling of Half Max NSS operation for 80+80 MHz and 160 MHz operation and set to 0 otherwise.

***TGmc editor: modify the “Supported Channel Width Set” row of Table 8-240 Subfields of the VHT Capabilities Info field within subclause 8.4.2.157.2 VHT Capbilities Info field, as shown:***

**Table 8-240—Subfields of the VHT Capabilities Info field**

|  |  |  |
| --- | --- | --- |
| Supported ChannelWidth Set | Indicates the channel widthssupported by the STA. See10.40 (VHT BSSoperation). | For a non-TVHT STA:Set to 0 if the STA does not support 160 MHz and does not support 80+80 MHz.Set to 1 if the STA supports 160 MHz but not non-contiguous 80+80 MHz.Set to 2 if the STA supports 160 MHz and 80+80 MHz.The value 3 is reserved.For a TVHT STA, the field isstructured into subfields as defined in Figure 8-553a.For a TVHT STA, set the TVHT\_MODE\_2C Support subfield to 1 if it supports TVHT\_MODE\_2C; otherwise set the subfield to 0.For a TVHT STA, set the TVHT\_MODE\_2N Support subfield to 1 if it supports TVHT\_MODE\_2N; otherwise set the subfield to 0. |

***TGmc editor: modify Figure 8-556 Supported VHT-MCS and NSS Set field within subclause 8.4.2.157.3 Supported VHT-MCS and NSS Set field and some of the text in the subclause, as shown:***

**8.4.2.157.3 Supported VHT-MCS and NSS Set field**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 B15 | B16 B28 | B29 | ~~B29-~~B30-B31 | B32 B47 | B48 B60 | B61 | ~~B61-~~B62-B63 |
|  | Rx VHT-MCS Map | Rx Highest Supported Long GI Data Rate | 80+80 MHz Half Max NSS | Reserved | Tx VHT-MCS Map | Tx Highest Supported Long GI Data Rate | 160 MHz Half Max NSS | Reserved |
| Bits: | 16 | 13 | 1 | ~~3~~2 | 16 | 13 | 1 | ~~3~~2 |

The Supported VHT-MCS and NSS Set field’s subfields are defined in Table 8-241 (Supported VHT-MCS and NSS Set subfields).

**Table 8-241—Supported VHT-MCS and NSS Set subfields**

|  |  |  |
| --- | --- | --- |
| **Subfield** | **Definition** | **Encoding** |
| Rx VHT-MCSMap | Indicates the maximum value of the RXVECTOR parameter MCS of a PPDU that can be received at all channel widths supported by this STA for each number of spatial streams. The maximum value of the RXVECTOR parameter MCS of a PPDU might be further limited for 80+80 MHz and 160 MHz channel widths per the combination of the values of the 80+80 Half Max NSS subfield, and the 160 Half Max NSS subfield as described in 8.4.2.157.3 (Supported VHT-MCS and NSS Set field). | The format and encoding of this subfield are defined in Figure 8-556 (Rx VHT-MCS Map and Tx VHT-MCS Map subfields and Basic VHT-MCS and NSS Set field(11ac)) and the associated description. |
| Tx VHT-MCSMap | Indicates the maximum value of the TXVECTOR parameter MCS of a PPDU that can be transmitted at all channel widths supported by this STA for each number of spatial streams. The maximum value of the TXVECTOR parameter MCS of a PPDU might be further limited for 80+80 MHz and 160 MHz channel widths per the combination of the values of the 80+80 Half Max NSS subfield, and the 160 Half Max NSS subfield, as described in 8.4.2.157.3 (Supported VHT-MCS and NSS Set field). | The format and encoding of this subfield are defined in Figure 8-556 (Rx VHT-MCS Map and Tx VHT-MCS Map subfields and Basic VHT-MCS and NSS Set field(11ac)) and the associated description. |

The Rx VHT-MCS Map subfield and the Tx VHT-MCS Map subfield have the structure shown in Figure 8-557 (Rx VHT-MCS Map and Tx VHT-MCS Map subfields and Basic VHT-MCS and NSS Set field).



The Max VHT-MCS For *n* SS subfield (where *n* = 1, ..., 8) is encoded as follows:

— 0 indicates support for VHT-MCS 0-7 for *n* spatial streams

— 1 indicates support for VHT-MCS 0-8 for *n* spatial streams

— 2 indicates support for VHT-MCS 0-9 for *n* spatial streams

— 3 indicates that *n* spatial streams is not supported

The 80+80 MHz Half Max NSS subfield indicates if the maximum supported spatial streams (NSS) for 80+80 MHz operation is limited to one half of the maximum supported NSS value for 20, 40 and 80 MHz operation. A value of 0 in this field indicates that the maximum supported NSS value for 80+80 MHz operation, if supported, is the same as the maximum supported NSS value for 20, 40 and 80 MHz operation. A value of 1 in this field indicates that the maximum supported NSS value for 80+80 MHz operation, if supported, is one half of the maximum supported NSS value for 20, 40 and 80 MHz operation, rounded down to the nearest integer.

The 160 MHz Half Max NSS subfield indicates if the maximum supported spatial streams (NSS) for 160 MHz operation is limited to one half of the maximum supported NSS value for 20, 40 and 80 MHz operation. A value of 0 in this field indicates that the maximum supported NSS value for 160 MHz operation, if supported, is the same as the maximum supported NSS value for 20, 40 and 80 MHz operation. A value of 1 in this field indicates that the maximum supported NSS value for 160 MHz operation, if supported, is one half of the maximum supported NSS value for 20, 40 and 80 MHz operation, rounded down to the nearest integer.

NOTE—A VHT-MCS indicated as supported in the VHT-MCS Map fields for a particular number of spatial streams might not be valid at all bandwidths (see 22.5 (Parameters for VHT-MCSs)) and might be limited by the declaration of Tx Highest Supported Long GI Data Rates and Rx Highest Supported Long GI Data Rates and might be affected by 9.7.12.3 (Additional rate selection constraints for VHT PPDUs).

***TGmc editor: modify subclause 9.7.12.1 Rx Supported VHT-MCS and NSS Set and 9.7.12.2 Tx Supported VHT-MCS and NSS Set as shown:***

**9.7.12.1 Rx Supported VHT-MCS and NSS Set**

The Rx Supported VHT-MCS and NSS Set of a VHT STA is determined for each <VHT-MCS, NSS> tuple NSS = 1,…, 8 and bandwidth (20 MHz, 40 MHz, 80 MHz, and 160 MHz or 80+80 MHz) from its Supported VHT-MCS and NSS Set field as follows:

— If support for the VHT-MCS for NSS spatial streams for a bandwidth is mandatory (see 22.5 (Parameters for VHT-MCSs)), then the <VHT-MCS, NSS> tuple at that bandwidth is supported by the STA on receive.

— Otherwise, if the Max VHT-MCS For *n* SS subfield (*n* = NSS) in the Rx VHT-MCS Map subfield indicates support and the Rx Highest Supported Long GI Data Rate subfield is equal to 0, then the <VHT-MCS, NSS*>* tuple at that bandwidth is supported by the STA on receive, except if the value of dot11VHTHalfMaxNSSSignalingOptionImplemented is true and the 80+80 MHz Half Max NSS subfield has a value of 1, then the NSS value of all tuples for the 80+80 MHz bandwidth is equal to one half of the indicated NSS value rounded down to the next integer and if the value of dot11VHTHalfMaxNSSSignalingOptionImplemented is true and the 160 MHz Half Max NSS subfield has a value of 1, then the NSS value of all tuples for the 160 MHz bandwidth is equal to one half of the indicated NSS value rounded down to the next integer.

— Otherwise, if the Max VHT-MCS For *n* SS subfield (*n* = NSS) in the Rx VHT-MCS Map subfield indicates support and the data rate for long GI of the MCS for NSS spatial streams at that bandwidth (expressed as the largest integer in Mb/s that is less than or equal to the data rate) is less than or equal to the rate represented by the Rx Highest Supported Long GI Data Rate subfield, then the <VHT-MCS, NSS> tuple at that bandwidth is supported by the STA on receive, except if the value of dot11VHTHalfMaxNSSSignalingOptionImplemented is true and the 80+80 MHz Half Max NSS subfield has a value of 1, then the NSS value of all tuples for the 80+80 MHz bandwidth is equal to one half of the indicated NSS value rounded down to the next integer and if the value of dot11VHTHalfMaxNSSSignalingOptionImplemented is true and the 160 MHz Half Max NSS subfield has a value of 1, then the NSS value of all tuples for the 160 MHz bandwidth is equal to one half of the indicated NSS value rounded down to the next integer.

— Otherwise, the <VHT-MCS, NSS> tuple at that bandwidth is not supported by the STA on receive.

The <VHT-MCS, NSS> tuples excluded by 9.7.12.3 (Additional rate selection constraints for VHT PPDUs) are also eliminated from the Rx Supported VHT-MCS and NSS Set.

A VHT STA shall not, unless explicitly stated otherwise, transmit a VHT PPDU unless the <VHT-MCS, NSS> tuple and bandwidth used are in the Rx Supported VHT-MCS and NSS Set of the receiving STA(s).

NOTE—Support for a <VHT-MCS, NSS> tuple at a given bandwidth implies support for both long GI and short GI on receive, if short GI is supported at that bandwidth.

**9.7.12.2 Tx Supported VHT-MCS and NSS Set**

The Tx Supported VHT-MCS and NSS Set of a VHT STA is determined for each <VHT-MCS, NSS> tuple NSS = 1,…, 8 and bandwidth (20 MHz, 40 MHz, 80 MHz, and 160 MHz or 80+80 MHz) from its Supported VHT-MCS and NSS Set field as follows:

— If support for the <VHT-MCS, NSS> tuple at for a bandwidth is mandatory (see 22.5 (Parameters for VHT-MCSs)), then the <VHT-MCS, NSS> tuple at that bandwidth is supported by the STA on transmit.

— Otherwise, if the Max VHT-MCS for n SS subfield (n = NSS) in the Tx VHT-MCS Map subfield indicates support and the Tx Highest Supported Long GI Data Rate subfield is equal to 0, then the <VHT-MCS, NSS> tuple at that bandwidth is supported by the STA on transmit, except that if the value of dot11VHTHalfMaxNSSSignalingOptionImplemented is true and the 80+80 MHz Half Max NSS subfield has a value of 1, then the NSS value of all tuples for the 80+80 MHz bandwidth is equal to one half of the indicated NSS value rounded down to the next integer and if the value of dot11VHTHalfMaxNSSSignalingOptionImplemented is true and the 160 MHz Half Max NSS subfield has a value of 1, then the NSS value of all tuples for the 160 MHz bandwidth is equal to one half of the indicated NSS value rounded down to the next integer.

— Otherwise, if the Max VHT-MCS for n SS subfield (n = NSS) in the Tx VHT-MCS Map subfield indicates support and the data rate for long GI of the <VHT-MCS, NSS> tuple at that bandwidth (expressed as the largest integer in Mb/s that is less than or equal to the data rate) is less than or equal to the rate represented by the Tx Highest Supported Long GI Data Rate subfield, then the <VHT-MCS, NSS> tuple at that bandwidth is supported by the STA on transmit, except that if the value of dot11VHTHalfMaxNSSSignalingOptionImplemented is true and the 80+80 MHz Half Max NSS subfield has a value of 1, then the NSS value of all tuples for the 80+80 MHz bandwidth is equal to one half of the indicated NSS value rounded down to the next integer and if the value of dot11VHTHalfMaxNSSSignalingOptionImplemented is true and the 160 MHz Half Max NSS subfield has a value of 1, then the NSS value of all tuples for the 160 MHz bandwidth is equal to one half of the indicated NSS value rounded down to the next integer.

— Otherwise, the <VHT-MCS, NSS> tuple at that bandwidth is not supported by the STA on transmit.

NOTE—In contrast to reception, support for short GI transmissions by a STA cannot be determined by other STAs.

***TGmc editor: add a new subclause 10.40.8 Half Maximum NSS Support Signaling, to appear immediately following subclause 10.40.7 BSS basic VHT-MCS and NSS set operation as shown:***

**10.40.8 Half Maximum NSS Support Signaling**

If the value of dot11VHTHalfMaxNSSSignalingOptionImplemented is true, a STA shall set the Half Max NSS for 160 MHz and 80+80 MHz Signaling Support bit of the VHT Capabilities Info field to 1 in VHT Capability elements that it transmits, otherwise, the bit shall be set to 0.

A STA shall not transmit a value of 1 in the 80+80 MHz Half Max NSS subfield to a STA from which it has not received a VHT Capabilities Info field with the Half Max NSS for 160 MHz and 80+80 MHz Signaling Support bit set to 1.

A STA shall not transmit a value of 1 in the 160 MHz Half Max NSS subfield to a STA from which it has not received a VHT Capabilities Info field with the Half Max NSS for 160 MHz and 80+80 MHz Signaling Support bit set to 1.

***TGmc editor: add the following new MIB variable to the dot11StationConfig group and add a corresponding value in the group’s SEQUENCE definition and add an appropriate entry to the dot11VHTMACAdditions Object-group:***

**C.3 MIB Detail**

dot11VHTHalfMaxNSSSignalingOptionImplemented OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This is a capability variable.

Its value is determined by device capabilities.

This attribute, when true, indicates that the IEEE 802.11 VHT Half Max NSS Signaling option is implemented."

DEFVAL { false }

::= { dot11StationConfigEntry <ANA> }

**References:**