IEEE P802.11  
Wireless LANs

|  |  |  |  |
| --- | --- | --- | --- |
| VHT160 operation signaling through non-zero CCFS1 | | | |
| **Date:** January 20, 2016 | | | |
| Author: | | | |
| Name | Affiliation | Address | Email |
| Menzo Wentink | Qualcomm | Straatweg 66, Breukelen, The Netherlands | mwentink@qualcomm.com |
| Allert van Zelst | Qualcomm | Straatweg 66, Breukelen, The Netherlands | allert@qti.qualcomm.com |
| Brian Hart | Cisco |  |  |
| Sigurd Schelstraete | Quantenna |  |  |
| Sean Coffey | Realtek |  |  |
| Robert Stacey | Intel |  |  |
| Vinko Erceg | Broadcom |  |  |
| Chao-Chun Wang | Mediatek |  |  |
| Lei Wang | Marvell |  |  |

**Abstract**

This document specifies a VHT 160 and 80+80 MHz operation. The current VHT operation element is limited to signaling up to 80 MHz channel width because legacy (80 MHz) clients in the field have been determined to experience interoperability issues when the channel width in the VHT operation element is set to 160 or 80+80 MHz.

***Modify the following sections as shown in revision marks:***

**9.4.2.159 VHT Operation element**

The operation of VHT STAs in the BSS is controlled by the HT Operation element and the VHT Operation element. The format of the VHT Operation element is defined in Figure 9-561 (VHT Operation element format).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Element ID | Length | VHT Operation Information | Basic VHT-MCS and NSS Set |
| Octets: | 1 | 1 | 3 | 2 |

**Figure 9-561--VHT Operation element format**

The Element ID and Length fields are defined in 9.4.2.1 (General).(Ed)

The structure of the VHT Operation Information field is defined in Figure 9-562 (VHT Operation Information field).

|  |  |  |  |
| --- | --- | --- | --- |
|  | Channel Width | Channel Center Frequency Segment 0 | Channel Center Frequency Segment 1 |
| Octets: | 1 | 1 | 1 |
| **Figure 9-562--VHT Operation Information field(11ac)** | | | |

The VHT STA gets the primary channel information from the HT Operation element. The subfields of the VHT Operation Information field are defined in Table 9-248 (VHT Operation Information subfields).

**Table 9-248--VHT Operation Information subfields**

|  |  |  |
| --- | --- | --- |
| Subfield | Definition | Encoding |
| Channel Width | This field, together with the HT Operation element STA Channel Width field, defines the BSS bandwidth (see 11.40.1 (Basic VHT BSS functionality)). | Set to 0 for 20 MHz or 40 MHz BSS bandwidth.  Set to 1 for 80 MHz, 160 MHz or 80+80 MHz BSS bandwidth.  Set to 2 for 160 MHz BSS bandwidth (deprecated).  Set to 3 for non-contiguous(#3294) 80+80 MHz BSS bandwidth (deprecated).  Values in the range 4 to 255 are reserved. |
| Channel Center Frequency Segment 0 | Defines a channel center frequency for an 80, 160 or 80+80 MHz VHT BSS. See 21.3.14 (Channelization). | For 80 MHz BSS bandwidth, indicates the channel center frequency index for the 80 MHz channel on which the VHT BSS operates.  For 160 MHz BSS bandwidth and the Channel Width subfield equal to 1, indicates the channel center frequency index of the 80 MHz channel segment that contains the primary channel.  For 160 MHz BSS bandwidth and the Channel Width subfield equal to 2, indicates the channel center frequency index of the 160 MHz channel on which the VHT BSS operates.  For 80+80 MHz BSS bandwidth and the Channel Width subfield equal to 1 or 3, indicates the channel center frequency index for the primary 80 MHz channel of the VHT BSS.  Reserved otherwise. |
| Channel Center Frequency Segment 1 | Defines a channel center frequency for a 160 or 80+80 MHz VHT BSS. See 21.3.14 (Channelization). | For a 20, 40 or 80 MHz BSS bandwidth, this subfield is set to 0.  For a 160 MHz BSS bandwidth and the Channel Width subfield equal to 1, indicates the channel center frequency index of the 160 MHz channel on which the VHT BSS operates.  For a 160 MHz BSS bandwidth and the Channel Width subfield equal to 2, this field is set to 0.  For an 80+80 MHz BSS bandwidth and the Channel Width subfield equal to 1 or 3, indicates the channel center frequency index of the secondary 80 MHz channel of the VHT BSS.  See Table 9-248a (BSS bandwidth when the VHT Operation Information field Channel Width subfield is 1).  Reserved otherwise. |

**Table 9-248a--BSS bandwidth when the VHT Operation Information field Channel Width subfield is 1.**

|  |  |
| --- | --- |
| **Channel Center Frequency Segment 1 subfield value** | **BSS bandwidth** |
| CCFS1 = 0 | 80 MHz or less |
| CCFS1 > 0 and  | CCFS1 - CCFS0 | = 8  (40 MHz apart) | 160 MHz  (CCFS0: center frequency of the 80 MHz channel segment that contains the primary channel)  (CCFS1: center frequency of the 160 MHz channel) |
| CCFS1 > 0 and  | CCFS1 - CCFS0 | > 16  (>80 MHz apart) | 80+80 MHz  (CCFS0: center frequency of the primary 80 MHz channel)  (CCFS1: center frequency of the secondary 80 MHz channel) |
| CCFS1 > 0 and  | CCFS1 - CCFS0 | < 8  (<40 MHz apart) | Reserved |
| CCFS1 > 0 and  8 < | CCFS1 - CCFS0 | ≤ 16  (> 40 MHz and ≤ 80 MHz apart) | Reserved |
| NOTE 1— CCFS0 represents the value of the Channel Center Frequency Segment 0 subfield.  NOTE 2— CCFS1 represents the value of the Channel Center Frequency Segment 1 subfield. | |

The Basic VHT-MCS and NSS Set field indicates the VHT-MCSs for each number of spatial streams in VHT PPDUs that are supported by all VHT STAs in the BSS (including IBSS and MBSS). The Basic VHT-MCS and NSS Set field is a bitmap of size 16 bits; each 2 bits indicates the supported VHT-MCS set for *NSS* from 1 to 8. The Basic VHT-MCS and NSS Set field is defined in Figure 9-560 (Rx VHT-MCS Map and Tx VHT-MCS Map subfields and Basic VHT-MCS and NSS Set field).

**11.40 VHT BSS operation**

**11.40.1 Basic VHT BSS functionality**

A VHT STA has dot11VHTOptionImplemented equal to true.

A STA that is starting a VHT BSS shall be able to receive and transmit at each of the <VHT-MCS, NSS> tuple values indicated by the Basic VHT-MCS and NSS Set field of the VHT Operation parameter of the MLME-START.request primitive and shall be able to receive at each of the <VHT-MCS, NSS> tuple values indicated by the Supported VHT-MCS and NSS Set field of the VHT Capabilities parameter of the MLME-START.request primitive.

A STA for which dot11VHTOptionImplemented is true shall set dot11HighThroughputOptionImplemented to true.

A STA that is a VHT AP or a VHT mesh STA declares its channel width capability in the Supported Channel Width Set subfield of the VHT Capabilities element VHT Capabilities Info field as described in Table 9-245 (Subfields of the VHT Capabilities Info field).

A VHT STA shall set the Supported Channel Width Set subfield in its HT Capabilities element HT Capabilities Info field to 1, indicating that both 20 MHz operation and 40 MHz operation are supported.

At a minimum, a VHT STA sets the Rx MCS Bitmask of the Supported MCS Set field of its HT Capabilities element according to the setting of the Rx VHT-MCS Map subfield of the Supported VHT-MCS and NSS Set field of its VHT Capabilities element as follows: for each subfield Max VHT-MCS For *n* SS, 1 ≤ *n* ≤ 4, of the Rx VHT-MCS Map field with a value other than 3 (no support for that number of spatial streams), the STA shall indicate support for MCSs 8(*n–*1) to 8(*n–*1)+7 in the Rx MCS Bitmask, where *n* is the number of spatial streams, except for those MCSs marked as unsupported as described in 10.7.12.3 (Additional rate selection constraints for VHT PPDUs).

A STA that is a VHT AP or a VHT mesh STA shall set the STA Channel Width subfield in the HT Operation element HT Operation Information field, the Channel Width, Channel Center Frequency Segment 0 and Channel Center Frequency Segment 1 subfields in the VHT Operation element VHT Operation Information field to indicate the BSS bandwidth as defined in Table 11-24 (VHT BSS bandwidth).

**Table 11-24--VHT BSS bandwidth**

|  |  |  |  |
| --- | --- | --- | --- |
| HT Operation element STA Channel Width field | VHT Operation element Channel Width field | VHT Operation element Channel Center Frequency Segment 1 subfield value | BSS bandwidth |
| 0 | 0 | 0 | 20 MHz |
| 1 | 0 | 0 | 40 MHz |
| 1 | 1 | 0 | 80 MHz |
| 1 | 1 | CCFS1 > 0 and  | CCFS1 – CCFS0 | = 8 | 160 MHz |
| 1 | 1 | CCFS1 > 0 and  | CCFS1 - CCFS0 | > 16 | 80+80 MHz |
| 1 | 2 | 0 | 160 MHz  (deprecated) |
| 1 | 3 | CCFS1 > 0 and  | CCFS1 - CCFS0 | > 16 | 80+80 MHz  (deprecated) |
| NOTE 1— CCFS0 represents the value of the Channel Center Frequency Segment 0 subfield.  NOTE 2— CCFS1 represents the value of the Channel Center Frequency Segment 1 subfield. | | | |

The setting of the Channel Center Frequency Segment 0 and Channel Center Frequency Segment 1 subfields is shown in Table 11-24a (Setting of the Channel Center Frequency Segment 0 and Channel Center Frequency Segment 1 subfields).

**Table 11-24a--Setting of Channel Center Frequency Segment 0 and Channel Center Frequency Segment 1 subfields**

|  |  |  |  |
| --- | --- | --- | --- |
| BSS bandwidth | VHT Operation element Channel Width field | Setting of the Channel Center Frequency Segment 0 subfield | Setting of the Channel Center Frequency Segment 1 subfield |
| 20, 40 MHz | 0 | dot11CurrentChannelCenterFrequencyIndex0 | 0 |
| 80 MHz | 1 | dot11CurrentChannelCenterFrequencyIndex0 | 0 |
| 160 MHz | 1 | if dot11CurrentPrimaryChannel > dot11CurrentChannelCenterFrequencyIndex0 then dot11CurrentChannelCenterFrequencyIndex0 + 8, else dot11CurrentChannelCenterFrequencyIndex0 - 8 | dot11CurrentChannelCenterFrequencyIndex0 |
| 80+80 MHz | 1 | dot11CurrentChannelCenterFrequencyIndex0 | dot11CurrentChannelCenterFrequencyIndex1 |
| 160 MHz  (deprecated) | 2 | dot11CurrentChannelCenterFrequencyIndex0 | 0 |
| 80+80 MHz  (deprecated) | 3 | dot11CurrentChannelCenterFrequencyIndex0 | dot11CurrentChannelCenterFrequencyIndex1 |

A VHT STA shall determine the channelization using the combination of the information in the HT Operation element Primary Channel field and the VHT Operation element VHT Operation Information field Channel Center Frequency Segment 0 and Channel Center Frequency Segment 1 subfields (see 21.3.14 (Channelization)).

A VHT AP or a VHT mesh STA shall set the HT Operation element HT Operation Information field Secondary Channel Offset subfield to indicate the secondary 20 MHz channel as defined in Table 9-167 (HT Operation element fields and subfields), if the BSS bandwidth is more than 20 MHz.

A VHT STA that is a member of a VHT BSS shall not transmit a 20 MHz VHT PPDU on a channel other than the primary 20 MHz channel of the BSS, except for a 20 MHz VHT PPDU transmission on an off-channel TDLS direct link as constrained by 11.23.6.5.2 (Basic wideband functionality).

A VHT STA that is a member of a VHT BSS with a 40 MHz, 80 MHz, 160 MHz, or 80+80 MHz BSS bandwidth shall not transmit a 40 MHz VHT PPDU that does not use the primary 40 MHz channel of the BSS, except for a 40 MHz VHT PPDU transmission on an off-channel TDLS direct link.

A VHT STA that is a member of a VHT BSS with an 80 MHz, 160 MHz, or 80+80 MHz BSS bandwidth shall not transmit an 80 MHz VHT PPDU that does not use the primary 80 MHz channel of the BSS, except for an 80 MHz VHT PPDU transmission on an off-channel TDLS direct link.

A VHT STA that is a member of a VHT BSS with a 160 MHz or 80+80 MHz BSS bandwidth shall not transmit a 160 MHz or 80+80 MHz VHT PPDU that does not use the primary 80 MHz channel and the secondary 80 MHz channel of the BSS, except for a 160 MHz or 80+80 MHz VHT PPDU transmission on an off-channel TDLS direct link.

A VHT STA shall not transmit to a second VHT STA using a bandwidth that is not indicated as supported in the Supported Channel Width Set subfield in the HT Capabilities element or VHT Capabilities element received from that VHT STA.

A VHT AP shall set the RIFS Mode field in the HT Operation element to 0.