IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Setting of Duration field during SLS | | | | |
| Date: 2014-11-25 | | | | |
| Author(s): | | | | |
| Name | Company | Address | Phone | email |
| Carlos Cordeiro | Intel |  |  | [carlos.cordeiro@intel.com](mailto:carlos.cordeiro@intel.com) |
| Payam Torab | Broadcom |  |  | [ptorab@broadcom.com](mailto:ptorab@broadcom.com) |
| Erez Kirshenbaum | Qualcomm |  |  | erezk@qti.qualcomm.com |
| Mordechay Aharon | Qualcomm |  |  | [maharon@qti.qualcomm.com](mailto:maharon@qti.qualcomm.com) |
| Joe Andonieh | Peraso |  |  | [joe@perasotech.com](mailto:joe@perasotech.com) |
| Gaius Yao Huang Wee | Panasonic |  |  | yaohuang.wee@sg.panasonic.com |
| Sai Shankar | Tensorcom |  |  | [nsai@tensorcom.com](mailto:nsai@tensorcom.com) |
| James Wang | MediaTek |  |  | james.wang@mediatek.com |
| Solomon Trainin | Intel |  |  | [solomon.trainin@intel.com](mailto:solomon.trainin@intel.com) |

Abstract

This submission addresses an issue identified with the setting of the Duration field during beamforming.

There is no CID associated with this change.

The proposed changes are in reference to Draft P802.11REVmc\_D3.3.

Discussion 1: When a DMG STA initiates an ISS in a CBAP with an SSW frame transmission (i.e., Grant frame not used), the Duration field is set to the end of the ISS according to (**8.3.1.16**) and (**9.38.2.2.1**). This means that the responder has to obtain a new TXOP before it can respond with an RSS. The same issue happens with the RSS.

The problem with the above is that it requires a STA to obtain a new TXOP before it can begin the RSS. This was not the original intent and introduces “considerable” implementation complexity/changes. To solve this problem, at least the 3 options highlighted in the table below were considered. We would like to propose option 3 to address this issue, since we believe it offers the best compromise.

|  |  |  |  |
| --- | --- | --- | --- |
| **Option** | **Description** | **Pros** | **Cons** |
| **1** | Change the Duration field setting to cover an estimate of the entire SLS | Simplifies implementation, since STAs can determine how long the allocation should be | Setting the NAV in all directions.  STA needs to determine end of ISS/RSS on the basis of CDOWN; i.e., Duration field can no longer be used. |
| **2** | When using MBIFS, a STA is allowed to access the medium without contending. This solution is similar to response within SIFS (except for CTS). | No change to Duration field setting, which maximizes spatial reuse and allows Duration field to be used to determine end of allocation. | Creates another channel access rule.  MBIFS is greater than SIFS, which increases the chances of collision. |
| **3** | Add MBIFS to the calculation of the Duration field in SSW frames of both ISS and RSS | Overcomes the issues with option 2, in the sense that it avoids collision  Implementations can still rely on the Duration field to determine the end of the ISS/RSS | Creates another channel access rule, but prevents collision.  Only change to implementations that rely on the Duration field is to subtract MBIFS from calculation |

Discussion 2: We are proposing extra language to disallow all of the following, (1) ISS fragmentation across multiple (SP or CBAP) allocations in one or multiple BIs, (2) RSS fragmentation across multiple allocations in one or multiple BIs, (3) ISS and RSS happening in two separate allocations. A partial/incomplete RSS following an ISS inside a single allocation is still allowed and optional.

Discussion 3: We propose to delete the following paragraph in 9.38.6.2 (SLS phase execution) during DTI, because a DMG STA can initiate and re-initiate SLS as many times as it sees fit.

“The initiator may restart the ISS up to dot11BFRetryLimit times if it does not receive an SSW frame from the responder in dot11BFTXSSTime time following the end of the ISS. The initiator shall restart the ISS SIFS time following dot11BFTXSSTime time, provided there is sufficient time left in the allocation for the initiator to transmit an SSW frame. If there is not sufficient time left in the allocation for the transmission of an SSW frame, the initiator shall restart the ISS at the start of the following allocation between the initiator and the responder.”

Discussion 4: Timing between SSW-Feedback and SSW-ACK frames is MBIFS, but the SIFS definition (9.3.2.3.3) lists the timing as SIFS. Inconsistency is removed.

**8.3.1.16 Sector sweep (SSW) frame format**

*Change the second paragraph as follows*

The Duration field is set to the time until the end of the current SSW slot when the SSW frame is transmitted within an association beamforming training (A-BFT). Otherwise, it is set to the time until the end of the SSW frame transmission that has the CDOWN subfield within the SSW field equal to 0, plus MBIFS, or until the end of the current allocation (see 9.38 (DMG beamforming)), whichever comes first.

**8.3.1.17 Sector sweep feedback (SSW-Feedback) frame format**

*Editor - Change the second paragraph as follows*

The Duration field is set to 0 when the SSW-Feedback frame is transmitted within an association beamforming training (A-BFT). Otherwise, it is set to the time, in microseconds, required to transmit an SSW-Ack frame, plus MBIFS, or until the end of the current allocation, whichever comes first.

**9.3.2.3.3 SIFS**

*Change the 1st paragraph as follows*

The SIFS shall be used prior to transmission of an Ack frame, a CTS frame, a PPDU containing a BlockAck frame that is an immediate response to either a BlockAckReq frame or an A-MPDU, a DMG CTS frame, a DMG DTS frame, , a Grant Ack frame, a response frame transmitted in the ATI, the second or subsequent MPDU of a fragment burst, and by a STA responding to any polling by the PCF.

**9.22.2.8 TXOP Limits**

*Change item (d) under the 3rd paragraph as follows*

d) Any frames required for beamforming as specified in 9.30 (Sounding PPDUs), in 9.34.5 (VHT sounding protocol), and in 9.38 (DMG beamforming).

**9.38.1 General**

*Change the second paragraph as follows*

In this subclause, the STA that initiates BF training through the transmission of a BF frame is referred to as the initiator, and the recipient STA of the BF frame that participates in BF training with the initiator is referred to as the responder. For BF training that occurs within the A-BFT allocation, the AP or PCP is the initiator and a non-AP and non-PCP STA becomes the responder. For BF training that occurs during an SP allocation, the source DMG STA of the SP is the initiator and the destination DMG STA of the SP becomes the responder. For BF training during a CBAP allocation, the TXOP holder is the initiator and the TXOP responder is the responder.

**9.38.2.2 Initiator Sector Sweep (ISS)**

**9.38.2.2.1 General**

*Delete the 4th paragraph (duplicate text)*

**9.38.2.3 Responder Sector Sweep (RSS)**

**9.38.2.3.1 General**

*Delete the 5th paragraph (duplicate text)*

**9.38.6 Beamforming in DTI**

**9.38.6.1 General**

*Change the first and second paragraphs as follows*

An initiator and responder may perform BF training within an SP or CBAP.

An initiator shall determine the capabilities of the responder prior to initiating BF training with the responder if the responder is associated. A STA may obtain the capabilities of other STAs through the Information Request and Information Response frames (10.30.1 (Information Request and Response(11ad))) or following a STA’s association with the PBSS/infrastructure BSS. The initiator should use its own capabilities and the capabilities of the responder to compute the required allocation size and TXOP duration to perform BF training and BF training related timeouts.

**9.38.6.2 SLS phase execution**

*Change the indicated paragraphs as follows*

The initiator shall begin an ISS (9.38.2.2 (Initiator Sector Sweep (ISS)(Ed)(11ad))) at the start of an SP allocation or TXOP with an initiator TXSS, except in the case of an SP allocation that has the IsInitiatorTXSS field for this SP is equal to 0 in which case the initiator shall begin an ISS with an initiator RXSS.

If the responder has more than one DMG antenna, the initiator shall repeat its ISS *k*+1 times, where *k* is the value indicated by the responder in the last negotiated Number of RX DMG Antennas field transmitted by the responder. Repetitions of the ISS are separated by an interval equal to LBIFS. The value of the CDOWN field within SSW frames transmitted in the ISS indicates the number of sectors until the end of transmissions from all of the initiator’s DMG antennas to all of the responder’s DMG antennas. The ISS phase shall not be fragmented across multiple allocations.

The RSS comprises a responder TXSS unless the allocation is an SP and the IsResponderTXSS field for this SP is equal to 0 or the allocation is a CBAP and the RXSS Length field within the SSW frame received by the responder during the ISS is equal to a nonzero value. The responder shall begin an RSS (9.38.2.3 (Responder sector sweep (RSS))) MBIFS time following the completion of an ISS, provided the responder received an SSW frame from the initiator during the ISS and there is sufficient time in the allocation for the responder to transmit all SSW frames necessary to complete the RSS phase. The responder shall not begin or continue the RSS phase in a different allocation from the allocation that contained the ISS phase.

NOTE—The responder can begin an RSS if there is not sufficient time in the allocation to complete the RSS phase. The RSS phase does not continue in a subsequent allocation in this case.

The initiator shall begin an SSW Feedback (9.38.2.4 (Sector Sweep Feedback)) MBIFS time following the completion of an RSS, provided the initiator received an SSW frame from the responder during the RSS and there is sufficient time left in the allocation to complete the SSW Feedback followed by an SSW-Ack (9.38.2.5 (Sector Sweep Ack)) from the responder in MBIFS time. If there is not sufficient time left in the allocation for the completion of the SSW Feedback and SSW-Ack, the initiator may begin the SSW Feedback in the following allocation between the initiator and the responder.

The responder shall begin an SSW-Ack (9.38.2.5 (Sector Sweep Ack)) to the initiator in MBIFS time following the reception of a SSW-Feedback frame from the initiator.

The initiator may restart the SSW Feedback up to dot11BFRetryLimit times if it does not receive an SSW-Ack frame from the responder in MBIFS time following the completion of the SSW Feedback. The initiator shall restart the SSW Feedback PIFS time following the expected end of the SSW-Ack by the responder, provided there is sufficient time left in the allocation for the initiator to begin the SSW Feedback followed by an SSW-Ack from the responder in MBIFS time. If there is not sufficient time left in the allocation for the completion of the SSW Feedback and SSW-Ack, the initiator may restart the SSW Feedback in the following allocation between the initiator and the responder.

Once started, the initiator and responder shall complete the SLS phase before any additional frame exchange takes place between these STAs.

**9.38.7 Beam tracking**

*Remove subclause (9.38.8 State machines), including “Figure 9-84—SLS phase state machine (initiator)” and “Figure 9-85—SLS phase state machine (responder)”*