IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| BF Correction | | | | |
| Date: 2012-06-21 | | | | |
| Author(s): | | | | |
| Name | Company | Address | Phone | email |
| Assaf Kasher | Intel Corporation |  |  | assaf.kasher@intel.com |
|  |  |  |  |  |

Abstract

This document proposes corrections to bugs in MIDC in TGad D8.0.

MIDC issues:

The MIDC subphase enables improvement of the sector sweep results as input to beam refinement transactions. Although the MIDC protocol uses BRP packets, it does not follow the normal BRP transactions that are managed almost from packet to packet. It is set up in the BRP setup sub-phase, and then has to be followed completely. There are also contradictions between the BRP setup sub-phase subclause and the MID subclauses.

***TGad Editor: Modify 9.35.3.2 as follows:***

The BRP setup sub-phase is used to exchange the intent and capabilities to conduct some or all of the sub-phases and beam refinement transactions in a subsequent BRP phase. The BRP setup sub-phase is used to set up the MIDC sub-phase, but can also be used to set up beam refinement transactions.

The BRP setup sub-phase shall be used in the following two cases:

1. When the RSS part of the SLS phase occurred in an A-BFT, in which case the SSW-ACK frame was not part of the SLS
2. When the initiator set the MID-REQ or BC-REQ fields in the SSW-Feedback frame to one, or the responder set the MID-REQ or BC-REQ fields in the SSW-ACK frame to one.

The BRP setup sub-ph-ase starts with the initiator sending a BRP packet with the Capability Request subfield set to 1 and with the remaining subfields within the BRP Request field set according to the initiator’s need for an MID sub-phase, a BC sub-phase and a beam refinement sub-phase. The BRP setup sub-phase can also starts when the responder grants a MID-REQ or BC-REQ within the SS-ACK frame or when it request MID or BC in the SS-ACK frame. Upon receiving a BRP packet with the Capability Request field set to 1, the responder shall respond with a BRP packet with the subfields within the BRP Request field set according to the responder’s desire for an MID sub-phase, a BC sub-phase and a beam refinement sub-phase. This process is repeated until the responder transmits to the initiator a BRP packet with the Capability Request subfield set to 0 and the initiator sends as a response a BRP packet with the Capability Request subfield also set to 0. The BRP packet from the initiator that initiates the termination of the BRP setup sub-phase can be the first BRP packet of the BRP phase, either as part of beam refinement or as part of an MID or BC sub-phase.

A DMG STA (either initiator or responder) requests an MID sub-phase with MID and BC sub-phases (see 9.35.6.3.2) by setting both the MID-REQ and BC-REQ subfields to 1 in the BRP Request field of an SSW-Feedback, SSW-ACK or BRP frame. It shall also set the L-RX subfield in the BRP Request field to the number of RX AWV settings it needs in each BRP-RX packet during the MID sub-phase. The peer DMG STA grants the request by setting the MID-Grant and BC-Grant subfields to 1 in the BRP Request field within the next SSW-ACK or BRP frame transmitted to the requesting DMG STA. If either the MID or BC were not granted by the peer STA, the MID and BC sub-phases shall not occur.

A DMG STA (either initiator or responder) request an MID only sub-phase (see 9.35.6.3.3) by setting the MID-REQ subfield to 1 in the BRP Request field of an SSW-Feedback, SSW-ACK or BRP frame. It shall also set the L-RX subfield in the BRP request field to the number of RX AWV settings it needs in each BRP-RX packet during the MID-sub-phase. The peer DMG STA grants the request by setting the MID-Grant subfield to 1 in the BRP Request field within the next SSW-ACK or BRP frame transmitted to the requesting DMG STA. The Capability Request subfield within the granting frame shall be set to 0. The request subfields (TX-TRN-REQ, L-RX, MID-REQ, BC-REQ) within the granting frame shall be set to zero. If the MID-REQ was granted (either in an SSW-ACK or BRP frame), the requesting STA shall transmit a BRP frame with the SNR Present and Sector ID Order Present subfields set to 1, and the Nmeas field in the FBCK-TYPE field indicating the number of SNR measurements from the last SLS phase. In the Channel Measurement Feedback element the requesting STA sets the SNR subfields to the SNRs corresponding to the TX sectors received during the SLS phase. In the Sector ID Order subfield, the requesting STA lists the sector IDs of the received sectors. The Capability Request field within this packet shall be set to 0. The MID sub-phase starts with the transmission of a BRP packet from the peer STA after the reception of the list of sectors. A STA that has granted a MID only request shall not request MID or BC in the response packet. The STA may request MID or BC in the last packet it transmits to the requesting STA as part of the MID. The MID only sub-phase shall not occur if it was not granted by the peer STA.

A DMG STA (either initiator or responder) requests a BC only sub-phase (see 9.35.6.3.4) by setting the BC-REQ subfield to 1 in the BRP Request field of an SSW-Feedback, SSW-ACK or BRP frame. The peer DMG STA (either a responder or initiator) grants the request by setting the BC-Grant subfield to 1 in the BRP Request field within the next SSW-ACK or BRP frame transmitted to the requesting STA. The BC sub-phase shall not occur if the peer STA does not grant the request.

A DMG STA indicates that beam refinement transactions (9.35.6.4.2) occur by setting the L-RX field to a value greater than 0 to indicate the need for receive beam refinement or by setting the value of the TX-TRN-REQ field to 1 to indicate the need for transmit beam refinement or by setting both. The beam refinement transactions shall occur if at least one of these conditions is met.

If the initiator has requested an MID sub-phase by setting the MID-REQ subfield or the BC-REQ subfield to 1 and the responder rejected by setting the MID-Grant subfield or the BC-REQ subfield to 0, respectively, the initiator should send a BRP frame with the MID-REQ field set to 0 and the L-RX field set to indicate the number of TRN-R fields the initiator requests for use in the BRP phase.

If the responder has requested an MID sub-phase by setting the MID-REQ subfield or the BC-REQ subfield to 1 and the initiator has rejected by setting the MID-Grant or the BC-Grant subfield to 0, respectively, the initiator should send a BRP frame with the Capability Request subfield set to 1. The responder shall respond with a BRP frame with the MID-REQ field set to 0 and the L-RX field set to indicate the number of TRN-R fields the responder requests for use in the BRP phase.

Beam refinement transactions shall occur following a MIDC sub-phase when one or both of the following conditions are met at the last BRP frame transmitted by either the initiator or responder as part of the MID or BC sub-phases:

1. Either the initiator or the responder set the L-RX field to a value greater than 0.
2. Either the initiator or responder has set the value of the TX-TRN-REQ field to 1.

If the initiator does not receive a response from the responder to a packet transmitted to the responder within the appropriate IFS, the initiator may retransmit the previous packet.

After the BRP setup sub-phase, beamforming training shall immediately continue to the next phase (i.e., either MIDC sub-phase or the beam refinement transactions). Examples of BRP setup sub-phase procedures are illustrated in Figure 9-54, Figure 9-55, Figure 9-59, Figure 9-60 and Figure 9-66.

***TGad: Editor Modify 9.35.6.3.3 as follows:***

The MIDC sub-phase may also be implemented such that multiple TX sectors, obtained from the TXSS in the SLS phase, are used instead of wide TX beams. Here, the receiver employs multiple RX AWVs for each TX sector chosen by the transmitter. Based on this joint trial of TX and RX AWVs, the optimal starting TX and RX AWV pair is chosen for further refinement in the BRP phase. In this case, the MIDC sub-phase consists only of the MID sub-phase. This is conceptually illustrated in Figure 65.

**STA1**

(a) I

-

TXSS in SLS

**STA1**

**STA2**

**STA2**

(b) I

-

MID

Total number of

RX sectors/AVWs; N

RX

MID extension

TX

Sector ID

1

TX

Sector ID

2

TX

Sector ID

Nbeam

(I,

TX)

TX

Sector ID

1

TX

Sector ID

2

TX

Sector ID

Nbeam

(I, TX)

1

st

RX sector/AWV

2

nd

RX sector/AWV

(N

RX

)

-

th

RX sector/AWV

**Verification by Nbeam(I, TX) x NRX beamformed trials**

**Best TX Sector IDs up to Nbeam(I, TX)**

Figure 121 Conceptual flow of a sample MIDC sub-phase execution with only the MID sub-phase for the initiator link

Setting up the MID sub-phase: The process of setting up a MID only sub-phase is described in 9.35.3.2.

In the example of Figure -66, the initiator transmits an SSW-Feedback with the MID-REQ subfield set to 1 and the BC-REQ subfield set to 0 in the BRP Request field, thus requesting an MIDC with only the R-MID sub-phase.The responder grants the MID-REQ by setting the MID-Grant subfield to 1 in the SSW-ACK frame. The initiator then sends a frame with the SNR Present and Sector ID Order Present subfields both set to 1, the *Nmeas*field in the FBCK-TYPE field indicating the number of SNR measurements from the last SLS phase, and the SNR subfield and Sector ID subfield with the SNRs measured during the SLS phase and the list of received sectors respectively. The L-RX subfield is set according to the number of training fields the initiator needs in each packet as part of the R-MID. The responder then starts the R-MID process by transmitting BRP-RX packets.