IEEE P802.11
Wireless LANs

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| CC36 Resolution for CIDs related to MLO BA Procedure (Part 2) |
| Date: September 23, 2021 |
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 Abstract

This submission proposes resolutions for following 11 CID received for TGbe CC36:

7435 4062 6625 7601 7894 6675 6992 6993 6289 5163 5166

**Revisions:**

* Rev 0: Initial version of the document.
* Rev 1: Revised based on offline feedback from several members
* Rev 2:
	+ The contents are split across another document and this contribution focuses on protected BA aspects (2 CIDs)
	+ Baseline updated to TGbe D1.4 and [11-22/0082r3](https://mentor.ieee.org/802.11/dcn/22/11-22-0082-03-000m-lb258-resolution-for-cids-related-to-protected-ba.docx)
* Rev 3:
	+ Baseline updated to TGbe D1.4 and REVme D1.1
	+ Fixed the revision reference in the resolution column and the headers
* Rev 4:
	+ Updated baseline to TGbe D1.5
	+ Resolved several more CIDs
* Rev 5: Live edits when the doc was presented on TGbe MAC call on 3/31/22

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 TGbe Draft. This introduction is not part of the adopted material.

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

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

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| **CID** | **Commenter** | **Clause** | **Pg/Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 7435 | Thomas Derham | 35.1 | 0.00 | Unprotected BAR allows DoS attack by advancing the sliding window of expected SNs. DoS attacks are becoming higher profile, and 11be should protect against them. PBAC mechanism is already defined in baseline | Mandate support and negotiation of PBAC between 11be devices | **Revised**Agree with the comment. However, the choice to support protected BA procedure is left to an implementation. Clause 10.25.7 is updated to provide clarification on PBAC signaling for an MLD and protected BA setup between two MLDs. In addition, the resolution adds a paragraph in clause 35.3.8 to clarify that when both MLDs negotiate a protected BA session between them, the originator MLD can send an ADDBA Request frame on any link to which the TID corresponding to the agreement is mapped to in order to update the WinStartB and WinStartR at the recipient MLD.**TGbe editor, please make changes as shown in doc 11-21/1582r5 tagged as 7435** |
| 4062 | Abhishek Patil | 35.3.7.1.1 | 261.41 | How does protect BA mechanism work in MLO? How does BAR (protected and unprotected) work in MLO - esp. since a successful scoreboard update needs to account for status from all links, which may not be immediate? Please clarify | As in comment | **Revised**Agree with the comment. However, the choice to support protected BA procedure is left to an implementation. Clause 10.25.7 is updated to provide clarification on PBAC signaling for an MLD and protected BA setup between two MLDs. In addition, the resolution adds a paragraph in clause 35.3.8 to clarify that when both MLDs negotiate a protected BA session between them, the originator MLD can send an ADDBA Request frame on any link to which the TID corresponding to the agreement is mapped to in order to update the WinStartB and WinStartR at the recipient MLD.**TGbe editor, please make changes as shown in doc 11-21/1582r5 tagged as 7435** |

***TGbe editor: The baseline for this document is 11be D1.5 and REVme D1.1.***

**10.25.7 Protected block ack agreement**

A STA indicates support for protected block ack by setting the MFPC subfield in the RSN Capabilities field to 1 (see 9.4.2.24.4 (RSN capabilities)) and the PBAC subfield in the Extended RSN Capabilities field to 1 (see 9.4.2.241 (RSN Extension element (RSNXE))). Such a STA is a PBAC STA; otherwise, the STA is a non-PBAC STA. A block ack agreement that is successfully negotiated between two PBAC STAs or between two PBAC capable MLDs is a protected block ack agreement. A block ack agreement that is successfully negotiated between two STAs when either or both of the STAs is not a PBAC STA is a block ack agreement that is not a protected block ack agreement. A block ack agreement that is successfully negotiated between two MLDs when either or both MLDs is not a PBAC capable MLD is a block ack agreement that is not a protected block ack agreement.

NOTE - All STAs affiliated with the same MLD advertise the same PBAC capability (see 12.6.2 and 12.6.3.1).

**35.3.8 Block ack procedures in Multi-Link operation**

***TGbe editor: Please add the following paragraph at the end of this subclause as shown below:***

[7435]If two MLDs have successfully negotiated a protected block ack agreement, they shall follow the procedure described in 10.25.7 (Protected block ack agreement). In a protected block ack agreement between two MLDs, the originator MLD shall transmit a robust ADDBA Request frame, via its affiliated STA that is operating on an enabled link to which the TID belonging to the block ack agreement is mapped, to advance the *WinStartR* and *WinStartB* at the recipient MLD.

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| **CID** | **Commenter** | **Clause** | **Pg/Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 6625 | Po-Kai Huang | 35.3.7.1.1 | 261.38 | It should be clarified that independent scoreboard context control (partial state) can be used in any link. Dynamically coordinate the Block ack received status across links is difficult, and certainly can not be mandated. | add "an recipient MLD may have independent scoreboard context control during partial-state operation for each <peer MLD, TID>tuple under a block ack agreement in each setup link." | **Revised**Agree in principle. A sentence is added to the last paragraph to clarify that in a partial state operation, each STA affiliated with a recipient MLD can have independent scoreboard context.**TGbe editor, please make changes as shown in doc 11-21/1582r5 tagged as 6625** |
| 7601 | Tomoko Adachi | 35.3.7.1.1 | 262.01 | The behavior descibed here means that a partial-state operation is at least required on per-link basis and full-state operation is not necessary. Such description by a note can be helpful. | As in comment. | **Revised**Agree in principle. A sentence is added to the last paragraph to clarify that in a partial state operation, each STA affiliated with a recipient MLD can have independent scoreboard context.**TGbe editor, please make changes as shown in doc 11-21/1582r5 tagged as 6625** |
| 7894 | Yongho Seok | 35.3.7.1 | 262.24 | "It shall maintain its own state independent of the scoreboard context control to perform this reordering as specified in 10.25.6.6 (Receive reordering buffer control operation)."The partial-state operation should be clarified. | As in the comment. | **Revised**Agree in principle. A sentence is added to the last paragraph to clarify that in a partial state operation, each STA affiliated with a recipient MLD can have independent scoreboard context.**TGbe editor, please make changes as shown in doc 11-21/1582r5 tagged as 6625** |
| 6675 | Rajat Pushkarna | 35.3.7.1.1 | 262.23 | "It shall maintain its own state independent of the scoreboard context control to perform this reordering..". Scoreboard context available at MLD or STA level is implementation specific. Scoreboard context control maintained at MLD cannot determine the link for which scoreboarding is done with <peer MLD, TID> tuple | Based on discussion in ARC SC scoreboard context control should be implementation specific. I personally prefer it to be maintained at STA level per link for tracking data frames delivered per link. If it has to maintained at MLD level the tuple should be modified to <peer MLD, TID, link ID> | **Revised**Agree in principle. A sentence is added to the last paragraph to clarify that in a partial state operation, each STA affiliated with a recipient MLD can have independent scoreboard context.**TGbe editor, please make changes as shown in doc 11-21/1582r5 tagged as 6625** |
| 6992 | Sharan Naribole | 35.3.7.1.1 | 262.25 | Per-link Scoreboard context control operation is vague. The only description found is "Each received MPDU shall be analyzed by the scoreboard context control as well as by the receive reordering buffer control." It is not clear how the WinStartR is updated at a specific link's scoreboard context control | Specific operations details should be added how the WinStartR is updated at a specific link's scoreboard context control | **Revised**Agree in principle. A sentence is added to the last paragraph to clarify that in a partial state operation, each STA affiliated with a recipient MLD can have independent scoreboard context.**TGbe editor, please make changes as shown in doc 11-21/1582r5 tagged as 6625** |
| 6993 | Sharan Naribole | 35.3.7.1.1 | 262.25 | Per-link Scoreboard context control operation is vague. The only description found is "Each received MPDU shall be analyzed by the scoreboard context control as well as by the receive reordering buffer control." Considering the different PHY capabilities at each link, it is not clear how the WinSizeR is assigned to each link's scoreboard context control. | Specific operations details should be added how the WinSizeR is assigned for a specific link's scoreboard context control | **Revised**Agree in principle. A sentence is added to the last paragraph to clarify that in a partial state operation, each STA affiliated with a recipient MLD can have independent scoreboard context.**TGbe editor, please make changes as shown in doc 11-21/1582r5 tagged as 6625** |
| 6289 | Ming Gan | 35.3.7.1.1 | 261.51 | Based on the architecture documents 21/577r2, each affiliated STA has a scoreboard, the buffer size of each link should be negotiated by ADDBA request/response exchange. | as in the comment | **Rejected**The BA agreement and relevant parameters (such as buffer size) is negotiated between two MLDs and is maintained at the MLD level. Individual STAs affiliated with the recipient MLD provide reception status of MPDUs received on the link it is operating on. In partial state, each STA is allowed to maintain independent scoreboard context. |
| 5163 | GEORGE CHERIAN | 35.3.14.8 | 281.03 | "If an MLD has established block ack agreement with another MLD for a TID, and the transmission of a QoS Data frame of the TID in a link is unsuccessful, and if the frame is not a fragment, the MLD may attempt retransmissions of the frame on any link that has the TID mapped to it":Remove: "if a fragment", for two reasons: (1) There is no fragmentation allowed in R1. (2) Retransmission procedure should be agnostic to whether an MSDU is fragmentated or not | As in the comment | **Revised**Agree with the comment.**TGbe editor, delete ‘and if the frame is not a fragment,’ from 35.3.16.9 [P422L5 of D1.5]** |
| 5166 | GEORGE CHERIAN | 35.3.7.1.1 | 262.17 | "A STA of a recipient MLD shall provide the receive status on the link where the STA is operating on for any MPDU with ACK policy equal to any value other than No Ack that is received on the link where the STA is operating on"Since the STA may be operating on multiple links, the above text is not very accurate, Suggest to modify as follows:"A STA of a recipient MLD shall provide the receive status on the link, for any MPDU with ACK policy equal to any value other than No Ack that is received on the link, if the MPDU carries QoS data frame which has a TID mapped on to this link" | As in the comment | **Rejected****The comment fails to identify the exact issue.** |

**35.3.8 Block ack procedures in Multi-Link operation**

***TGbe editor: Please add the following sentence to the last paragraph in this subclause as shown below:***

A recipient MLD shall maintain a single common receive reordering buffer for each <peer MLD, TID> tuple under a block ack agreement, independent of the number of links that are setup. The receive reordering buffer shall be responsible for reordering MSDUs or A-MSDUs so that MSDUs or A-MSDUs are eventually passed up to the next MAC process in the order of received sequence number. It shall also be responsible for identifying and discarding duplicate frames (i.e., frames that have the same sequence number as a currently buffered frame) that are part of this block ack agreement. It shall maintain its own state independent of the scoreboard context control to perform this reordering as specified in 10.25.6.6 (Receive reordering buffer control operation). Each received MPDU shall be analyzed by the scoreboard context control as well as by the receive reordering buffer control. A recipient MLD may have independent scoreboard context control in each setup link during partial-state operation for each <peer MLD, TID> tuple under a block ack agreement.[6625]