IEEE P802.11
Wireless LANs

|  |
| --- |
| **Remaining Ack related CRs** |
| **Date:** 2018-11-02 |
| **Author(s):** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Affiliation** | **Address** | **Phone** | **Email** |
| George Cherian | Qualcomm | 5775 Morehouse Dr. San Diego, CA, USA |   | gcherian@qti.qualcomm.com |
| Alfred Asterjadhi |  |  |  |  |
| Abhishek Patil |  |  |  |  |
| Raja Banerjea |  |  |  |  |

Abstract

Resolved the following **18 CIDs**

15050, 15052, 15859, 15942, 16162, 16186, 16372, 16497, 16501, 16652,

16654, 16656, 16660, 16919, 16920, 16927, 16942, 16944

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

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

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Page** | **Comment** | **Proposed Change** | **Resolution** |
| 15050 | Abhishek Patil | 229.18 | The section is about GCR therefore, the paragraph in 10.24.10.1 can be deleted. If the group decided to keep the paragraph, change the AND to OR. AP should be allowed to send a GCR MU BAR to a STA that either supports Robust AV Streaming or GCR-BA | Either delete the paragraph or replace 'and' with 'or' | Revised - Agree in principle. It should be OR instead of ANDTGax editor shall incorporate changes in 11-18-1777-00-00ax |
| 15052 | Abhishek Patil | 230.42 | The title for figure 10-36a is same as that for figure 10-36. Change the title to say GCR-MU BAR | As in comment | Accepted - TGax editor to rename the title as suggested by the commentor |
| 15859 | Li-Hsiang Sun | 273.05 | The original intention of HTP ack policy is to let rx know not to use the entire 20MHz to ack if no UL schedule info is decoded in the solicting PPDU. It is because ack with 20MHz would interfere with other STA's HE TB PPDU. This is not an issue if the soliciting PPDU is a HE (ER) SU PPDU whether it carries trigger frame or not. | remove 'and that does not include a Trigger frame or a frame with TRS Control subfield' | Rejected - Ack response rules should not depend on the PPDU that carries the MPDU. Response rules/format should be self-contained within MPDU. Agree with the usecase cited - however, there is no motivation for elicting STA to set Ack policy to HTP Ack if it is not expecting an HE TB PPDU response (which may be needed for link imbalance cases)  |
| 15942 | Mark Hamilton | 227.01 | Admission Control for UL MU is not clear. Since the amendment doesn't significantly change 10.22.4.2.3, it currently would imply that all transmissions happening in parallel during an MU uplink period would be "charged" the full air time as used\_time against their admittedItime limit. This results in "under selling" the medium capacity. The AP could (potentially) pre-compute the expected portion of the full bandwidth that a given non-AP STA is expected to use, and "over book" the total medium time, taking into account each individual STA's likely portion of any MU periods. This requires considerable pre-computation information available to the AP, and could become invalid as channel conditions (and MU options) change. Alternatively, admission control could be recast for MU channels, to account for the product of air time and RU subcarriers, out of a total channel capacity based on the total bandwidth. Either way, hints for use of admission control with MU should be added to Annex K. | Either modify admission control when used on a BSS with MU capability to include a factor for bandwidth (number of subcarriers), or clarify recommendations for AP behavior with the traditional metrics and "over selling" the available medium capacity, at least in Annex K, if not also in clause 10. | Rejected - This point was discussed in the group during early stages of development and decided to keep the current rules. Given the draft where it is now, suggest not to change the rules to avoid spec instability. |
| 16162 | Mark RISON | 204.44 | The rules for HE MU PPDUs related to HTP Ack (i.e. only ack if received with Trigger or UMRS) don't apply to UL or direct links | Add "A non-AP STA shall not set the ack policy to HTP Ack." | Accepted - Agree with the commentor. TGax editor to add the suggested sentence by the commentor |
| 16186 | Mark RISON | 204.01 | The "carried in SU format" is not clear. Does it refer to HE SU PPDUs only or also to HE TB PPDUs? | Change "in SU format" to "in an SU PPDU" throughout the referenced subclause (including the heading) | Accepted - Agree with the commentor. TGax editor to incorporate the suggested change by the commentor |
| 16372 | Mark RISON |  | Responder should not use M-BA if it could use C-BA or Ack | Specify that if a STA can ack using just an Ack frame, it shall do so, otherwise if it can ack using just a C-BA frame it shall do so, otherwise it uses an M-BA | Rejected - Depends on the context. Please see section 27.4.4 for different conditions and rules |
| 16497 | Naveen Kakani | 274.00 | If the frame is carried in an HE MU PPDU, HE SU PPDU or HE ER SU PPDU thatcarries an MPDU that solicits a response in an HE TB PPDU the addressed recipientreturns an Ack, Compressed BlockAck, or Multi-STA BlockAck frame carried in anHE TB PPDU a SIFS after the PPDU. However, in Section 27.4.4.4 "If the A-MPDU does not include an EOF-MPDU but does include one or more non-EOF-MPDUsthat are QoS Data frames belonging to the same block ack agreement and with the Ack Policy fieldequal to HTP Ack for at least one MPDU " and ACK is not allowed. If there is one non-EoF-MPDU with ACK Policy = HTP ACK an ACK frame should be allowed. | Clarify and allow ACK frame as an allowed response if there is one non-EOF-MPDU with ACK Policy = HTP ACK. | Rejected - Proposed change will introduce ambiguity in response, since responding STA might have missed the other non-EOF MPDUs. |
| 16501 | Oghenekome Oteri | 273.05 | The original intention of HTP ack policy is to let rx know not to use the entire 20MHz to ack if no UL schedule info is decoded in the solicting PPDU. It is because ack with 20MHz would interfere with other STA's HE TB PPDU. This is not an issue if the soliciting PPDU is a HE (ER) SU PPDU whether it carries trigger frame or not. | remove 'and that does not include a Trigger frame or a frame with TRS Control subfield' | Rejected - Duplicate of CID 15859. |
| 16652 | Robert Stacey | 228.18 | The parameter BitmapLength is defined for a non-HE STA, but is undefined for an HE STA. Also, a description of what this parameter represents would be beneficial. | Change to read: "The parameter BitmapLength represents the maximum length, in bits, of the Block Ack Bitmap field in the Compressed BlockAck frame and Multi-STA BlockAck frame for a particular TID. For a non-HE STA, BitmapLength is always 64. For an HE STA, BitmapLenth is negotiated when the block ack agreement is established as defined in 27.4.3." Add a description to 27.4.3 on how BitmapLength is negotiated (Negotiated buffer size 1-64: BitmapLength=64, Negotiated buffer size 65-128: BitmapLength=128, Negotiated buffer size 129-256, BitmapLength=256) | Revised - Agree in principle. TGax editor shall incorporate changes in 11-18-1777-00-00ax |
| 16654 | Robert Stacey | 268.02 | There is are no statements in 27.4 that provide guidance on how the different Block Ack Bitmap field lengths are used. There are restrictions on the maximum length but this is not sufficient. Further implementation guidance is required. This is particualrly true for the BlockAck frame that is sent in response to a BAR. For BlockAckReq, there is a statement in 10.24.7.4 (802.11-2016) to the effect that if the state is lost, then WinEndR = WinStartR + WinSizeR -1. In the second paragraph of 10.24.7.6 there is a statement "The values in the recipient's record of status of MPDUs beginning with the MPDU for which the Sequence Number subfield value is equal to WinStartR and ending with the MPDU for which the Sequence Number subfield value is equal to WinEndR shall be included in the bitmap of the BlockAck frame." Does this mean that the maximum size bitmap is returned even though it contains no more information than the smallest bitmap? | Provide implementation guidance for the use of the different bitmap lengths. For example, "The length of the Block Ack Bitmap subfield in a Compressed BlockAck frame or the BA Information field of a Multi-STA BlockAck frame may be less than the negotiated buffer size. The length selected by the recipient should be sufficient to include the recipient's scoreboard state for MPDUs begining with the MPDU for which the Sequence Number subfield value is WinStartR and ending with the MPDU for which the Sequence Number subfield is WinEndR. If the BlockAck frame is in response to a BlockAckReq frame and under partial state operation with no scoreboard state available, then the length of the Block Ack Bitmap subfield may be the shortest permitted for the frame type provided the capability requirements of the originator are met." | Revised - Agree in principle. TGax editor shall incorporate changes in 11-18-1777-00-00ax |
| 16656 | Robert Stacey | 271.61 | In 10.24.7.1 the parameter BitmapLength is introduced. This parameter is not described, but presumably represents the maximum Block Ack Bitmap field length in bits for a particular TID. This section should define that parameter and how it is derviced. Note that (I have another comment 11.24.7.1 on defining it for an HE STA. | The best way to define BitmapLength would be to replace the Compressed and Multi-STA columns in Table 27-1 with a BitmapLength column with entires 64, 128 and 256 in each of the three rows. Then add statements on the permissible Block Ack Bitmap subfield lenghts given the negotiated BitmapLength. For example, "If the negotiated BitmapLength is 64, then the Block Ack Bitmap subfield in the Compressed BlockAck frame shall be 64 and the Block Ack Bitmap subfield in the Multi-STA BlockAck frame shall be either 32 or 64." Etc. | Revised - Agree in principle. TGax editor shall incorporate changes in 11-18-1777-00-00ax |
| 16660 | Robert Stacey | 272.53 | What are the BA Bitmap fields? Who is doing the remapping? I can't find any description of a remapping operation in 27.3? | If this is frame format description, then it belongs in Clause 9. If this is behavior, then fix it. | Revised - Agree in principle. TGax editor shall incorporate changes in 11-18-1777-00-00ax |
| 16919 | Tomoko Adachi | 206.25 | The explanation of Figure 10-12b says the BlockAck frames are sent by DL OFDMA in pp.ll 206.1, not just DL MU. The title of Figure 10-12b should align with it. Moreover, it looks like the UL MU transmission is also UL OFDMA. | Change the title of Figure 10-12b to "An example of an UL OFDMA transmission with an immediate DL OFDMA transmission containing individually addressed BlockAck frames acknowledging the frames received from the respective STAs".Or, change the sentence starting from pp.ll 206.1 to "An example of multiple BlockAck frames sent in DL MU is shown in Figure 10-12b (...)." | Rejected - Agree in principle. It is already corrected in D3.2. So, no change needed |
| 16920 | Tomoko Adachi | 207.08 | Figures 10-12a to 10-12c all have n STAs, but only Figure 10-12d has 4. If there is no special intention, the figure should align with others in series. | Change Figure 10-12d to show n STAs are involved in the sequence. | Accepted - TGax editor to incorporate the suggested modification to the figure |
| 16942 | Xiaofei Wang | 269.39 | The sentences "An HE STA that transmits a Multi-TID BlockAckReq frame shall contain the TID Values of the Per TIDInfo subfields of the BAR Information field of the Multi-TID BlockAckReq frame for the MPDUs of whichTIDs correspond to AC that has the same or higher priority with respect to the primary AC, except when theMulti-TID BlockAckReq frame is carried in an HE TB PPDU in which case the HE STA contains the TIDValues of the Per TID Info subfields of the BAR Information field of the Multi-TID BlockAckReq frame forthe MPDUs of which TIDs correspond to any AC." are unclear and confusing. Please clarify and rewrite what these sentences meant. | please clarify and reformulate | Rejected - This comment is already incorporated in D3.2. No further change is needed |
| 16944 | Xiaofei Wang | 273.45 | Does these conditions apply for a non-AP STA that transmit a HE MU PPDU since a non-AP STA can transmit a HE MU PPDU as well? | Please clarify whether the requirements apply to non-AP STA as well. If so, please add the appropriate text or otherwise change the title of this section to indicate the appropriate content. | Revised - Agree in principle. TGax editor shall incorporate changes in 11-18-1777-00-00ax |

* Introduction to HT-immediate block ack extensions

Insert the following as the last paragraph in this subclause:

(#16652) The parameter BitmapLength represents the maximum length, in bits, of the Block Ack Bitmap field in the Compressed BlockAck frame and Multi-STA BlockAck frame for a particular TID. For a non-HE STA, BitmapLength is 64. For an HE STA, BitmapLenth is negotiated when the block ack agreement is established as defined in 27.4.3.

[…]

* GCR and GLK-GCR block ack
* Introduction

Insert as the last paragraph of 10.26.9.1:

An HE AP shall not send a GCR MU-BAR Trigger frame to a non-AP HE STA if the most recently received Extended Capabilities element from the STA does not indicate support for Robust AV Streaming (#15050) or Advanced GCR.

[…]

* HE acknowledgment procedure
* Overview

The HE acknowledgment procedure builds on the features defined for HT-immediate block ack (see 10.24.7 (HT-immediate block ack extensions)), with the following extensions:

* Support for a Multi-STA BlockAck frame
* Support for a MU-BAR Trigger frame
* Support for a Multi-TID BlockAckReq frame
* Support for BlockAck Bitmap field lengths of 32, 64, 128 and 256
* Acknowledging MPDUs from multiple STAs using a single Multi-STA BlockAck frame
* Acknowledging QoS Data frames with two or more TIDs using a Multi-STA BlockAck frame
* Acknowledging QoS Data frames with one or more TIDs, and a Management frame using a Multi-STA BlockAck frame
* Acknowledging all MPDUs in a PPDU using a variant of the Multi-STA BlockAck frame
* Pre-Association acknowledgment, which acknowledges pre-association Management frames for multiple STAs using a single Multi-STA BlockAck frame

An HE STA shall be able to respond with Compressed BlockAck frames if HT-immediate block ack is supported in the role of recipient (see 10.24.7.1 (Introduction)). An HE STA shall be able to respond with a Multi-STA BlockAck frame if multi-TID A-MPDU operation (27.10.4 (Multi-TID A-MPDU and ack-enabled A-MPDU)) is supported in the role of recipient.

A non-AP HE STA that is associated with an AP and that sends a Multi-STA BlockAck frame shall set the AID11 subfield in the Per AID TID Info field of the Multi-STA BlockAck frame to 0 and the RA field to the MAC address of the intended recipient. A non-AP HE STA that is not associated with an AP shall not send a Multi-STA BlockAck frame.

An HE AP that sends a Multi-STA BlockAck frame where the Per AID TID Info fields are addressed to more than one STA shall set the RA field to the broadcast address. An HE AP that sends a Multi-STA BlockAck frame where the Per AID TID Info fields are all addressed to a single recipient STA and that is sent in response to an HE TB PPDU may set the RA field of the Multi-STA BlockAck frame to either the address of the recipient STA or to the broadcast address. An HE AP that sends a Multi-STA BlockAck frame where the Per AID TID Info fields are all addressed to a single recipient STA and that is sent in response to an HE SU PPDU, HE ER SU PPDU or HE MU PPDU shall set the RA field to the address of the recipient STA.

An HE AP that sends a Multi-STA BlockAck frame to an associated STA shall set the AID11 subfield in the Per AID TID Info field of the Multi-STA BlockAck frame to the 11 LSBs of the AID of the intended STA. An HE AP that sends a Multi-STA BlockAck frame to an unassociated STA shall set the AID11 subfield in the Per AID TID Info field of the Multi-STA BlockAck frame to 2045.

An HE STA that transmits a Multi-STA BlockAck frame shall use a rate, HT MCS, <VHT-MCS, NSS> tuple or <HE-MCS, NSS> tuple that is supported by all recipient STAs.

An HE STA that receives a Multi-STA BlockAck frame that is a response to frames requiring acknowledgment(#17029), shall examine Per AID TID Info field received in the Multi-STA BlockAck frame, and shall process each Per AID TID Info field using the procedure defined in 27.4.2 (Acknowledgement context in a Multi-STA BlockAck frame).

A non-AP HE STA that receives a Multi-STA BlockAck frame that is a response to frames requiring acknowledgment(#17029) but that do not belong to an established a block ack agreement shall examine each Per AID TID Info field received in the Multi-STA BlockAck frame as follows:

* If the Ack Type field is 1 and the TID field is less than 8, then the Per AID TID Info field indicates the acknowledgment of an EOF-MPDU that is a QoS Data frame with the indicated TID. The BA Information field is addressed to(#16334) the STA if the AID of the BA Information field contains the STA's AID, and is processed according to the procedure defined in 27.4.2 (Acknowledgment context in a Multi-STA BlockAck frame).
* If the Ack Type field is 1 and the TID field is 15, then the Per AID TID Info field indicates the acknowledgment of an EOF-MPDU that is a Management frame that solicits acknowledgment or a PS-Poll frame. The BA Information field is addressed to(#16334) the STA if the AID of the BA Information field contains the STA's AID, and is processed according to the procedure defined in 27.4.2 (Acknowledgment context in a Multi-STA BlockAck frame).
* If the Ack Type field is 0, and the AID field is 2045, and the TID field is 15, then Per AID TID Info field indicates the acknowledgment(#17029) of an EOF-MPDU that is a Management frame soliciting immediate acknowledgment. The RA field in the Per AID TID Info field is the MAC address of an unassociated STA for which the Per AID TID Info subfield is intended. The BA Information field is addressed to(#16334) the STA if the RA field of the BA Information field contains the STA's MAC address, and is processed according to the procedure defined in 27.4.2 (Acknowledgment context in a Multi-STA BlockAck frame).

An HE AP shall not send to the STA a Multi-STA BlockAck frame that has Per AID TID Info fields for STAs associated with more than one BSS in a multiple BSSID set unless the HE AP has received from the STA an HE Capabilities element with the Rx Control Frame To MultiBSS subfield in HE MAC Capabilities Information field set to 1.

An AP that transmits a Multi-STA BlockAck frame addressed to HE STAs shall set the TA field of the frame to the MAC address of the AP, except when dot11MultiBSSIDActivated is true and the Multi-STA BlockAck frame is directed to STAs from at least two different BSSs of the multiple BSSID set, in which case, the AP shall set the TA field of the frame to the transmitted BSSID.

An HE STA that transmits a Multi-TID BlockAckReq frame in a PPDU that is not an HE TB PPDU shall set the TID subfields in the AID TID Info fields in the Per TID Info subfields of the BAR Information field of the Multi-TID BlockAckReq frame to TIDs that correspond to ACs that have the same or higher priority as the primary AC. An HE STA that transmits a Multi-TID BlockAckReq frame in an HE TB PPDU may set the TID subfields in the AID TID Info fields in the Per TID Info subfields of the BAR Information field of the Multi-TID BlockAckReq frame to a TID that corresponds to any AC.(#16942)

An HE STA that transmits a BlockAckReq frame in an HE TB PPDU may set the TID subfield in the AID TID Info field in the BAR Information field of the BlockAckReq frame to a TID that corresponds to any AC.(#16941)

* Acknowledgment context in a Multi-STA BlockAck frame

A recipient of an A-MPDU shall set the Ack Type subfield and TID subfield in the Per AID TID Info field of the Multi-STA BlockAck frame sent as a response depending on the acknowledgment context as follows:

* An HE AP that receives an A-MPDU that includes one MPDU, and the MPDU is an EOF-MPDU that is a Management frame that solicits an acknowledgment prior to association may generate a Multi-STA BlockAck frame using the procedure described in the pre-association ack context defined below.
* An HE STA that receives an A-MPDU that does not include an EOF-MPDU but does include one or more non-EOF-MPDUs that are QoS Data frames with Ack Policy field equal to Normal Ack or Implicit Block Ack Request belonging to the same block ack agreement may generate a Multi-STA BlockAck frame as follows:
* If all MPDUs in the A-MPDU are received successfully, then the recipient may follow the procedure described in the all ack context(#16049) as defined below.
* Otherwise, the recipient shall follow the procedure described in the BlockAck context defined below.
* An HE STA that supports ack-enabled aggregation by setting the Ack-Enabled Aggregation Support subfield in the HE MAC Capabilities Information field to 1, and if the A-MPDU includes an EOF-MPDU that is a Management frame that solicits acknowledgment, and one or more MPDUs (either EOF-MPDUs or non-EOF-MPDUs) that are QoS Data frames with the Ack Policy field equal to Normal Ack, or Implicit Block Ack Request, then the recipient shall generate Multi-STA BlockAck frame as follows:
* If all the MPDUs in the A-MPDU are received successfully, then the recipient may follow the procedure described in the all ack context(#16049).
* Otherwise:
* For the MPDU that is a Management frame, the recipient shall create a Per AID TID info field using the procedure described below in Ack context with the TID value set to 15.
* For the EOF-MPDUs that are QoS Data frames(#16236), the recipient shall create a Per AID TID info field using the procedure described below in Ack context with the TID set to the TID of the QoS Data frame
* For the non-EOF-MPDUs that are QoS Data frames(#16236), the recipient shall create a Per AID TID info field using the procedure described below in BlockAck context with the TID set to the TID of the QoS Data frame
* An HE STA that supports multi-TID aggregation and if the A-MPDU does not include an EOF MPDU but does include non-EOF-MPDUs that are QoS Data frames with Ack Policy field equal Implicit Block Ack Request and are belonging to more than one block ack agreement, then the recipient shall generate a Multi-STA BlockAck frame as follows:
* If all MPDUs in the A-MPDU are received successfully, then the recipient may follow the procedure described in the all ack context(#16049)
* Otherwise, for each TID included the received A-MPDU, the recipient shall create a per AID TID info field using the procedure described in BlockAck context with the TID set to the TID of the QoS Data frame

NOTE—The maximum number of Per AID TID Info fields that the STA is capable of including in the Multi-STA BlockAck frame for the same value of the AID field is indicated in the Multi-TID Aggregation Rx Support field of HE Capabilities element it transmits.

The procedure for different acknowledgment contexts for generating Multi-STA BlockAck frame is defined below:

* All ack context(#16049): if the originator had set the All Ack Support subfield in the HE Capabilities element to 1, then the recipient may set the Ack Type field to 1 and the TID subfield to 14 to indicate the successful reception of all the MPDUs carried in the eliciting A-MPDU or multi-TID A-MPDU. Otherwise the recipient shall not set the Ack Type field to 1 and the TID subfield to 14. The Multi-STA BlockAck frame shall contain only one Per AID TID Info field addressed to an originator in the Multi-STA BlockAck frame.
* Pre-association ack context: A recipient receiving a Management frame from an(#16256) unassociated STA, that requires an acknowledgment, shall set the Ack Type field to 0, AID subfield to 2045, and the TID field to 15 in the Per AID TID Info field, and the RA field of the Per AID TID Info field to the intended recipient's MAC address to indicate the successful reception of that Management frame.
* Ack context: A recipient that sets the Ack-Enabled Aggregation Support subfield in the HE Capabilities element to 1 and that receives an EOF-MPDU soliciting acknowledgment shall set the Ack Type field to 1 and, if the EOF-MPDU is a QoS Data frame, set the TID field to the TID of the QoS Data frame, or, if the EOF-MPDU is a Management frame or PS-Poll frame, set the TID field to 15.(#16400)

If a received A-MPDU contains more than one EOF-MPDU that solicits an immediate acknowledgment, then the Multi-STA BlockAck frame shall contain multiple Per AID TID Info fields, with Ack Type field equal to 1, one for each such successfully received EOF-MPDU requesting an acknowledgment.

The TID field is set to the TID of the QoS Data or QoS Null frame that is being acknowledged and set to 15 for a PS Poll frame or Management frame that is being acknowledged(#16497, #16655, #17039).
* BlockAck context: The recipient shall set the Ack Type field to 0 and the TID field of a Per AID TID Info field to the TID value of MPDUs requesting block acknowledgment that are carried in the eliciting A-MPDU or multi-TID A-MPDU.

The Multi-STA BlockAck frame may contain multiple occurrences of these Per AID TID Info fields addressed to an originator, one for each MPDU that is requesting block acknowledgment, in which case the Block Ack Starting Sequence Control and Block Ack Bitmap fields shall be set according to 10.24.7 (HT-immediate block ack extensions) for each block ack session, and according to 27.3 (Fragmentation and defragmentation) for each block ack session with dynamic fragmentation.

The allowed values for the TID field in this context are 0 to 7 (for indicating block acknowledgment of QoS Data frames).

Variable bitmap lengths may be included in the Per AID TID Info field when the originator and recipient negotiate their use as defined in 27.4.3 (Negotiation of block ack bitmap lengths).

Upon reception of the Multi-STA BlockAck frame the originator shall examine each Per AID TID Info field and shall perform the following operations for each Per AID TID Info field that has an AID field addressed to the originator (i.e., the AID subfield is an AID if the originator is a non-AP STA, is 0 if(#15315) the originator is an AP, and is 2045 if(#15315) the originator is an unassociated HE STA):

* If the Ack Type field is 0 and the TID field is less than 8 then the BlockAck Starting Sequence Control, TID and (#16660) Block Ack Bitmap fields of the Per AID TID Info field are processed according to 10.24.7 (HT-immediate block ack mechanism), 27.3 (Fragmentation and defragmentation), and as defined below.
* If the Ack Type field is 0 and the TID field is 15, then the Per AID TID Info field indicates the acknowledgment of a single Management frame sent by the unassociated STA as defined by the acknowledgment context.
* If the Ack Type field is 1 and the TID is less than or equal to 7 or is equal to 15, then the Per AID TID Info field indicates the acknowledgment of an EOF-MPDU that is a QoS Data frame identified by the value of the TID, a Management frame or a PS-Poll frame.
* If the Ack Type field is 1 and the TID subfield of AID TID Info field is 14, then the Per AID TID Info field indicates the acknowledgment of all MPDUs carried in the eliciting PPDU as defined by the acknowledgment context.
* Negotiation of block ack bitmap lengths

Both the Compressed BlockAck frame and Multi-STA BlockAck frame allow different Block Ack Bitmap subfield lengths. The length of the Block Ack Bitmap subfield is indicated in the Fragment Number subfield of the Block Ack Starting Sequence Control field as defined in 9.3.1.8 (BlockAck frame format). (#16656) Table 27-1 indicates the allowed Block Ack Bitmap lenthgs for each of the negotiated buffer size. An HE STA that transmits a Compressed BlockAck frame or a Multi-STA BlockAck frame shall use a Block Ack Bitmap subfield length identified in Table 27-1 (Negotiated buffer size and Block Ack Bitmap subfield length) for the negotiated buffer size of the block ack agreement to which the BA Information field corresponds.

The recipient may respond with a Block Ack Bitmap subfield in the BA Information field that is less than the maximum allowed Block Ack Bitmap for the negotiated buffer size. (#16654) The length of the Block Ack Bitmap subfield in a Compressed BlockAck frame or a Multi-STA BlockAck frame may be less than the negotiated buffer size. The length selected by the recipient shall be such that the bitmap will be sufficient to include the recipient's scoreboard state for MPDUs beginning with the MPDU for which the Sequence Number subfield value is WinStartR and ending with the MPDU for which the Sequence Number subfield is WinEndR..

|  |
| --- |
| * Negotiated buffer size and Block Ack Bitmap subfield length
 |
| Negotiated buffer size | Block Ack Bitmap subfield length (bits) in a Compressed BlockAck frame | Block Ack Bitmap subfield length (bits) in a Multi-STA BlockAck frame |
| 1–64 | 64 | 32 or 64 |
| 65–128 | 64 or 256 | 32, 64 or 128 |
| 129–256 | 64 or 256 | 32, 64, 128 or 256 |

The recipient shall not include in the Buffer Size field of an ADDBA Response frame a value that would cause the BlockAck Bitmap length of its block ack responses to exceed the BlockAck Bitmap length that is derived by the Buffer Size field of the ADDBA Request frame sent by the originator. When the Buffer Size field in the ADDBA Request frame is set to 0, the Buffer Size field of an ADDBA Response frame is in the range 1 to 64.

NOTE—Refer to Block Ack Bitmap subfield length identified in Table 27-1 (Negotiated buffer size and Block Ack Bitmap subfield length) for the negotiated buffer size of the block ack agreement.(#16320)

A recipient shall not include in a Multi-STA BlockAck frame a Per AID TID Info field with a 32-bit BlockAck Bitmap field addressed to an originator if the 32-bit BA Bitmap Support field in the HE MAC Capabilities Information field in the HE Capabilities element received from that originator is 0.

NOTE—A Multi-STA BlockAck frame might include Per AID TID Info fields with a 32-bit BlockAck Bitmap field addressed to other originators and the nonsupporting originator needs to able to parse these fields to locate a possible Per AID TID Info field addressed to it.

(#16658)The originator of a BlockAckReq frame, MU-BAR Trigger frame, GCR MU-BAR Trigger frame or a A-MPDU that includes QoS Data frames or Management frame that solicits an immediate BlockAck frame response shall set the Duration field value accounting for the largest BlockAck Bitmap length based on negotiated buffer size.

(#16660) A recipient shall not transmit a Compressed BlockAck frame or a Multi-STA BlockAck frame with the LSB of the Fragment Number subfield set to 1 unless the recipient has received from the originator an HE Capabilities element with the HE Fragmentation Support subfield equal to 3(#16659). If the LSB of the Fragment Number subfield of the BlockAck frame is set to 1, then the Block Ack Bitmap fields are re-mapped as defined in 27.3 (Fragmentation and defragmentation).

* Per-PPDU acknowledgment selection rules
* General

A STA that transmits a PPDU can solicit different immediate responses for frames contained in the PPDU by using the Ack Policy field of QoS Data or QoS Null frames, the type of the frame, PPDU format(#16198), number of TIDs in the A-MPDU and the EOF field setting of the A-MPDU delimiter.

* Responding to an HE SU PPDU or HE ER SU PPDU with an SU PPDU

An HE STA that receives an HE SU PPDU or HE ER SU PPDU carrying(#16943) an A-MPDU that includes MPDUs that solicits acknowledgment and that does not include a Trigger frame or a frame with TRS Control subfield, shall respond using an SU PPDU as follows:

* If the A-MPDU includes only one MPDU and the MPDU is an EOF-MPDU that is either a QoS Data frame or QoS Null frame with the Ack Policy field equal to Normal Ack, or an Management frame that solicits acknowledgment, then the STA shall respond with an Ack frame.
* If the HE STA supports ack-enabled aggregation by setting the Ack-Enabled Aggregation Support subfield in the HE MAC Capabilities Information field to 1, and if the A-MPDU includes more than one MPDU, only one of which solicits acknowledgment(#17029) and the MPDU that solicits acknowledgment(#17029) is an EOF MPDU that is a QoS Data frame or a QoS Null frame with Ack Policy subfield equal to Normal Ack, or a Management frame that solicits acknowledgment(#17029), then the HE STA shall respond with an Ack frame.
* If the A-MPDU does not include an EOF MPDU but does include one or more non-EOF-MPDUs that are QoS Data frames belonging to the same block ack agreement and with the Ack Policy field equal to Implicit Block Ack Request for at least one MPDU, then the STA shall either respond with a Compressed BlockAck frame as defined in 10.26.6.5 (Generation and transmission of BlockAck frames by an HT STA, DMG STA, or S1G STA) or a Multi-STA BlockAck frame with Ack Type field set to 1 and the TID field set to 14 as defined in 27.4.2 (Acknowledgment context in a Multi-STA BlockAck frame) if the recipient has indicated the all ack support by setting the All Ack Support subfield in the HE MAC Capabilities Information field to 1.
* If the HE STA supports ack-enabled aggregation by setting the Ack-Enabled Aggregation Support subfield in the HE MAC Capabilities Information field to 1, and if the A-MPDU includes a Management frame that solicits an acknowledgment(#17029), and one or more QoS Data frames with the Ack Policy field equal to Normal Ack, or Implicit Block Ack Request, then the STA shall respond with a Multi-STA BlockAck frame as defined in 27.4.2 (Acknowledgment context in a Multi-STA BlockAck frame).
* If the HE STA supports multi-TID aggregation and if the A-MPDU includes two or more QoS Data frames with the Ack Policy field equal to Implicit Block Ack Request and belonging to more than one block ack agreement, then the STA shall respond with a Multi-STA BlockAck frame as defined in 27.4.2 (Acknowledgment context in a Multi-STA BlockAck frame).
* Responding to an HE MU PPDU with an SU PPDU

If an AP intends to solicit an immediate response in an SU PPDU the following apply:

* An AP shall set the Ack Policy field of the QoS Data and QoS Null frames to Normal Ack or Implicit Block Ack Request in at most one A-MPDU in the HE MU PPDU (see 10.3.2.13.1 (Acknowledgment procedure for DL MU PPDU in SU format) for an example of this sequence).
* The A-MPDUs in the HE MU PPDU shall not contain a Management frame that solicits acknowledgment.

(#16944) An HE STA that receives an HE MU PPDU with an A-MPDU that contains MPDUs that solicit acknowledgment and that does not include a Trigger frame or a frame with a TRS Control subfield shall respond using an SU PPDU as follows:

* If the A-MPDU carries only one MPDU and the MPDU is an EOF-MPDU that is either a QoS Data frame or QoS Null frame with the Ack Policy field equal to Normal Ack, then the STA shall respond with an Ack frame.
* If the HE STA supports ack-enabled aggregation by setting the Ack-Enabled Aggregation Support subfield in the HE MAC Capabilities Information field to 1, and if the A-MPDU includes more than one MPDU, only one of which solicits acknowledgment(#17029) and the MPDU that solicits acknowledgment(#17029) is an EOF-MPDU that is a QoS Data frame or a QoS Null frame with Ack Policy subfield equal to Normal Ack, then the HE STA shall respond with an Ack frame.
* If the A-MPDU does not include an EOF-MPDU but does include one or more non-EOF-MPDUs that are QoS Data frame belonging to the same block ack agreement and with the Ack Policy field equal to Implicit Block Ack Request for at least one MPDU, then the STA shall either respond with a Compressed BlockAck frame as defined in 10.24.7.5 or a Multi-STA BlockAck frame with the Ack Type set to 1 and the TID field set to 14 as defined in 27.4.2 (Acknowledgment context in a Multi-STA BlockAck frame) if the recipient has indicated the all ack support by setting the All Ack Support subfield in the HE MAC Capabilities Information field to 1.
* If the HE STA supports multi-TID aggregation and if the A-MPDU includes two or more QoS Data frames addressed to it with the Ack Policy field equal to Implicit Block Ack Request and belonging to more than one(#15674) block ack agreement, then the STA shall respond with a Multi-STA BlockAck frame as defined in 27.4.2 (Acknowledgment context in a Multi-STA BlockAck frame).

NOTE—A control response frame carried in an SU PPDU that is an immediate response to an HE MU PPDU follows the rules defined in 10.7.6.5 (Rate selection for control response frames).

An AP that sends an HE MU PPDU shall not set the Ack Policy to Normal Ack or Implicit Block Ack Request for any of the MPDUs carried in the HE MU PPDU if the solicited PPDU containing a control response would occupy one or more 20 MHz channels where pre-HE modulated fields of the soliciting PPDU are not located.(#15316)

* Responding to an HE MU PPDU, HE SU PPDU or HE ER SU PPDU with an HE TB PPDU

An AP that sends an HE MU PPDU, HE SU PPDU or HE ER SU PPDU that solicits an immediate response carried in an HE TB PPDU shall set the Ack Policy to HTP Ack for each of the QoS Data frames for which it intends to solicit an immediate response (see 10.3.2.13.2 (Acknowledgment procedure for DL MU PPDU in MU format)). If a Management frame that solicits acknowledgment is carried in an HE MU PPDU, then the response is carried in an HE TB PPDU. A non-AP STA that receives an HE MU PPDU, HE SU PPDU or HE ER SU PPDU with an A-MPDU that contains QoS Data addressed to it with Ack Policy field equal to HTP Ack, or a Management frame that solicits an immediate acknowledgment(#17029) shall not respond if it has not received the UL resource allocation information either through TRS Control subfield or a Trigger frame in the soliciting PPDU.

A non-AP STA that receives an HE MU PPDU, HE SU PPDU or HE ER SU PPDU with an A-MPDU that contains one or more(#16270) MPDUs that solicits acknowledgment and includes a Trigger frame or a frame with TRS Control subfield shall respond with an HE TB PPDU as follows:

* If the A-MPDU includes only one MPDU, and the MPDU is an EOF-MPDU that is either a QoS Data frame or QoS Null frame with the Ack Policy field equal to HTP Ack or a Management frame solicits acknowledgment, then the STA shall respond with an Ack frame.
* If the HE STA supports ack-enabled aggregation by setting the Ack-Enabled Aggregation Support subfield in the HE MAC Capabilities Information field to 1, and if the A-MPDU includes more than one MPDU, only one of which solicits acknowledgment(#17029) and the MPDU that solicits acknowledgment(#17029) is an EOF MPDU that is a QoS Data frame or a QoS Null frame with Ack Policy subfield equal to HTP Ack(#16661), or a Management frame that solicits acknowledgment(#17029), then the HE STA shall respond with an Ack frame.
* If the A-MPDU does not include an EOF-MPDU but does include one or more non-EOF-MPDUs that are QoS Data frames belonging to the same block ack agreement and with the Ack Policy field equal to HTP Ack for at least one MPDU, then the STA shall respond with a Compressed BlockAck frame as defined in 10.26.6.5 (Generation and transmission of BlockAck frames by an HT STA, DMG STA, or S1G STA)(18/1501r1) or a Multi-STA BlockAck frame with the Ack Type set to 1 and the TID field set to 14 as defined in 27.4.2 (Acknowledgment context in a Multi-STA BlockAck frame) if the recipient has indicated the all ack support by setting the All Ack Support subfield in the HE MAC Capabilities Information field to 1.
* If the HE STA supports ack-enabled aggregation by setting the Ack-Enabled Aggregation Support subfield in the HE MAC Capabilities Information field to 1, and if the A-MPDU includes a Management frame that solicits an acknowledgment(#17029), and one or more QoS Data frames with the Ack Policy field equal to HTP Ack(#16662), or Implicit Block Ack Request, then the STA shall respond with a Multi-STA BlockAck frame as defined in 27.4.2 (Acknowledgment context in a Multi-STA BlockAck frame).
* If the HE STA supports multi-TID aggregation and if the A-MPDU includes two or more QoS Data frames belonging to more than one block ack agreement and with the Ack Policy field equal to HTP Ack, then the STA shall respond with a Multi-STA BlockAck frame.
* Responding to an HE TB PPDU with an SU PPDU(#16402)

A non-AP STA that sends an HE TB PPDU as a response to a Basic Trigger frame shall set the Ack Policy field of the QoS Data frames or QoS Null frames to Normal Ack/Implicit Block Ack Request (see 10.3.2.13.3 (Acknowledgment procedure for an UL MU transmission) for an example of this sequence).

If the HE TB PPDU carries MPDUs only from one STA and if the HE AP intends to send the response in an SU PPDU(#16402), then the HE AP shall respond using an SU PPDU(#16402) as follows:

* If the A-MPDU includes only one MPDU, and the MPDU is an EOF-MPDU that is either a QoS Data frame or QoS Null frame with the Ack Policy field equal to Normal Ack, or a Management frame that solicits acknowledgment then the HE AP shall respond with either an Ack frame or a Multi-STA BlockAck frame with the Ack Type field set to 1.
* If the HE AP supports ack-enabled aggregation by setting the Ack-Enabled Aggregation Support subfield in the HE MAC Capabilities Information field to 1, and if the A-MPDU includes more than one MPDU, only one of which solicits acknowledgment(#17029) and the MPDU that solicits acknowledgment(#17029) is an EOF MPDU that is a QoS Data frame or a QoS Null frame with Ack Policy subfield equal to Normal Ack, or a Management frame(#16751) that solicits acknowledgment(#17029), then the HE AP shall respond with an Ack frame or a Multi-STA BlockAck frame with the Ack Type field set to 1.
* If the A-MPDU does not include an EOF MPDU but does include one or more non-EOF-MPDUs that are QoS Data frames belonging to the same block ack agreement and with Ack Policy field equal to Implicit Block Ack Request for at least one MPDU, then the HE AP shall respond with a Compressed BlockAck frame as defined in 10.24.7.5, a Multi-STA BlockAck with the Ack Type field set to 1 and the TID field set to 14 if the recipient has indicated the all ack support by setting the All Ack Support subfield in the HE MAC Capabilities Information field to 1 or a Multi-STA BlockAck frame with the Ack Type field set to 0 as defined in 27.4.2 (Acknowledgment context in a Multi-STA BlockAck frame).
* If the HE AP supports ack-enabled aggregation by setting the Ack-Enabled Aggregation Support subfield in the HE MAC Capabilities Information field to 1, and if the A-MPDU carries a Management frame that solicits acknowledgment(#17029), and one or more QoS Data frames with the Ack Policy field equal to Implicit Block Ack Request, then the HE AP shall respond with a Multi-STA BlockAck frame as defined in Acknowledgement context in a Multi-STA BlockAck frame as defined in 27.4.2 (Acknowledgment context in a Multi-STA BlockAck frame).
* If the HE AP supports multi-TID aggregation and if the A-MPDU includes two or more QoS Data frames with Ack Policy field equal to Normal Ack or Implicit Block Ack Request and belonging to more than one block ack agreement, then the HE AP shall respond with a Multi-STA BlockAck frame as defined in Acknowledgement context in a Multi-STA BlockAck frame.

If the HE TB PPDUs carry MPDUs from more than one STA, and if the AP intends to send(#16203) the response in an SU PPDU(#16402), then the AP shall respond with a Multi-STA BlockAck frame carried in an SU PPDU(#16402) that contains the appropriate settings in each Per AID TID Info field addressed to(#16334) each STA as defined in 27.4.2 (Acknowledgment context in a Multi-STA BlockAck frame).

* Responding to an HE TB PPDU with an HE MU PPDU

A non-AP STA that sends an HE TB PPDU as a response to a Basic Trigger frame that solicits an immediate response shall set the Ack Policy to Normal Ack/Implicit Block Ack Request for each of the QoS Data frames carried in the A-MPDU (see 10.3.2.13.3 (Acknowledgment procedure for an UL MU transmission) for an example of this sequence).

If an HE AP sends response to an HE TB PPDU that it received using an HE MU PPDU, then the AP shall respond to each A-MPDU that it received using the following procedure:

* If the A-MPDU received from a STA includes only one MPDU, and the MPDU is an EOF-MPDU that is either a QoS Data frame or QoS Null frame with the Ack Policy field equal to Normal Ack, or a Management frame that solicits acknowledgment(#17029), then the STA shall respond with an Ack frame or a Multi-STA BlockAck frame with the Ack Type field set to 1 carried in the HE MU PPDU.
* If the HE AP supports ack-enabled aggregation by setting the Ack-Enabled Aggregation Support subfield in the HE MAC Capabilities Information field to 1, and if the A-MPDU includes more than one MPDU, only one of which solicits acknowledgment(#17029) and the MPDU that solicits acknowledgment(#17029) is an EOF MPDU that is a QoS Data frame or a QoS Null frame with Ack Policy subfield equal to Normal Ack, or a Management frame(#15317) that solicits acknowledgment(#17029), then the HE AP shall respond with an Ack frame or a Multi-STA BlockAck frame with the Ack Type field set to 1 carried in the HE MU PPDU.
* If the A-MPDU does not include an EOF MPDU but does include one or more non-EOF-MPDUs that are QoS Data frames belonging to the same block ack agreement and with the Ack Policy field equal to Implicit Block Ack Request for at least one MPDU, then the HE AP shall respond with a Compressed BlockAck frame as defined in 10.26.6.5 (Generation and transmission of BlockAck frames by an HT STA, DMG STA, or S1G STA), a Multi-STA BlockAck with the Ack Type field set to 1 and the TID field set to 14 or a Multi-STA BlockAck frame with the Ack Type field set to 0 as defined in 27.4.2 (Acknowledgment context in a Multi-STA BlockAck frame) carried in the HE MU PPDU.
* If the HE AP supports ack-enabled aggregation by setting the Ack-Enabled Aggregation Support subfield in the HE MAC Capabilities Information field to 1 and(#15320) the A-MPDU carries a Management frame that solicits acknowledgment(#17029) and one or more QoS Data frames with the Ack Policy field equal to Implicit Block Ack Request, then the HE AP shall respond with a Multi-STA BlockAck frame as defined in Acknowledgement context in a Multi-STA BlockAck frame as defined in 27.4.2 (Acknowledgment context in a Multi-STA BlockAck frame), carried in the HE MU PPDU.
* If the HE AP supports multi-TID aggregation and if the A-MPDU includes two or more QoS Data frames, with the Ack Policy field equal to Implicit Block Ack Request and are belonging to more than one block ack agreeement, then the HE AP shall respond with a Multi-STA BlockAck frame as defined in 27.4.2 (Acknowledgment context in a Multi-STA BlockAck frame),

(#16129)An AP with dot11MultiBSSIDActivated equal to true may do one of the following:

* For each BSS belonging to the multiple BSSID set for which the AP has received an HE TB PPDU, the AP responds with a Multi-STA BlockAck frame with RA field set to the broadcast address and carried in a DL HE MU PPDU. The Ack Type field and AID11 field of the Multi-STA BlockAck frame are set as described in 9.3.1.8.7 (Multi-STA BlockAck variant). The AP shall set the element of the TXVECTOR parameter STA\_ID\_LIST for the RU carrying the Multi-STA BlockAck frame to the value of the BSSID Index field as defined in 27.11.1 (STA\_ID\_LIST)(#Ed). An AP shall not include more than one group addressed Multi-STA BlockAck frame in the A-MPDU carried in a BSS specific broadcast RU of a DL HE MU PPDU.
* If all the recipient non-AP STAs that sent an HE TB PPDU have indicated support for receiving Control frames addressed to STAs from two or more BSSs of a multiple BSSID set by setting the Rx Control Frame to MultiBSS subfield in the HE Capabilities element to 1, the AP may respond with a Multi-STA BlockAck frame with RA field set to the broadcast address and carried in a DL HE MU PPDU. The Ack Type field and AID11 field of the Multi-STA BlockAck frame are set as described in 9.3.1.8.7 (Multi-STA BlockAck variant). The AP shall set the element of the TXVECTOR parameter STA\_ID\_LIST for the RU carrying the Multi-STA BlockAck frame to 2047(#Ed). An AP shall not include more than one group addressed Multi-STA BlockAck frame in the A-MPDU carried in a broadcast RU in a DL HE MU PPDU(#Ed).
* HE block acknowledgment request and response rules

An HE AP may solicit BlockAck frame responses from multiple HE STAs using an MU-BAR Trigger frame or GCR MU-BAR Trigger frame. The MU-BAR Trigger frame shall contain either Compressed BlockAckReq variant or Multi-TID BlockAckReq variant in each of the Per User Info fields. An HE AP shall not send a Multi-TID BlockAckReq (neither as part of a Per User Info field addressed to(#16334) the STA in an MU-BAR Trigger frame nor as a BlockAckReq frame) to a STA that has not indicated support for multi-TID A-MPDU. The Block Ack Bitmap length of the block ack sent in response to an eliciting Multi-TID BlockAckReq frame, BlockAckReq frame, GCR MU-BAR Trigger frame, or MU-BAR Trigger frame is determined as defined in 27.4.3 (Negotiation of block ack bitmap lengths).

An HE STA that receives a BlockAckReq frame or an MU-BAR Trigger frame that contains a Compressed BlockAckReq variant in the User Info field addressed to the STA, or a GCR MU-BAR Trigger frame that contains a Compressed BlockAckReq variant in the Common Info field shall respond with a Compressed BlockAck frame as defined in 10.24.7 (HT-immediate block ack extensions) or a Multi-STA BlockAck frame as defined in 27.4 (HE acknowledgment procedure), with Starting Sequence Number subfield set to the Starting Sequence Number subfield of the Block Ack Request Starting Sequence Control subfield and the length of the Block Ack Bitmap subfield calculated as defined in 27.4.3 (Negotiation of block ack bitmap lengths).

An HE STA that receives a Multi-TID BlockAckReq frame or an MU-BAR Trigger frame that contains a Multi-TID BlockAckReq variant in the User Info field addressed to the STA or a GCR MU-BAR Trigger frame that contains a Multi-TID BlockAckReq variant in the Common Info field shall respond with a Multi-STA BlockAck frame that contains a Per AID TID Info field with a Block Ack Bitmap subfield for each of the TIDs (with values less than 8) contained in the BlockAckReq frame, with Starting Sequence Number subfield set to the Starting Sequence Number subfield of the Block Ack Request Starting Sequence Control subfield and the length of the Block Ack Bitmap subfield calculated as defined in 27.4.3 (Negotiation of block ack bitmap lengths).