IEEE P802.11  
Wireless LANs

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| **Remaining Ack related CRs** |
| **Date:** 2018-03-01 |
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Abstract

Resolved the following **21 CIDs**

12480, 12498, 12574, 12903, 13259, 13268, 13273, 13274, 13275, 13280,

13666, 13667, 13723, 13907, 13908, 13909, 14111, 14248, 14249, 14250,

14251

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.***

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| **CID** | **Commenter** | **Page** | **Comment** | **Proposed Change** | **Resolution** |
| 12480 | Liwen Chu | 236.32 | All Ack is not allowed in HE SU/MU PPDU scenario 27.4.4. | Harmonize them. | Revised -   Agree with the comment. However it is already addressed in D2.3. So, no further change is needed. |
| 12498 | Liwen Chu | 245.22 | All Ack context is missing if referd to clause 10 | Fix the issue mentioned in comment. | Rejected -   All Ack is part of the M-BA tha is already covered |
| 12574 | Mark Hamilton | 237.34 | Use normative verbs. | Change "can" to "may" | Revised -   Agree in principle. Updated the text.   TGax editor shall incorporate changes in 11-18-xxx-xx-00ax |
| 12903 | Mark RISON | 240.53 | If the single-TID A-MPDU has an Action frame too, the M-BA will have to have a mix of Ack Types (if "all-ack" is not used) | Change "a Multi-STA Block- Ack 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 carried in a DL SU PPDU format" to "a Multi-STA BlockAck with one Per TID AID Info subfield, 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 in one Per TID AID Info subfield and optionally the Ack Type field set to 1 and the TID field set to 15 in another Per TID AID Info subfield, carried in a DL SU PPDU format" | Revised -   Agree with the comment. However it is already addressed in D2.3. So, no further change is needed. |
| 13259 | Robert Stacey | 235.26 | This statement should be a part of 10.7.6. We could probably have a general statement for any control frame with broadcast RA the addresses multiple STAs in the frame body (e.g., HE NDP Announcement, Trigger frame) | Generalize the statement and move it to 10.7.6 | Revised.  Agree in principle.  TGax editor shall add the following sentence to section 10.7.6.1  "An HE STA that transmits a Trigger frame, Multi-STA Block Ack frame or NDP Announcement frame addressed to more than one STA shall use a rate, HT MCS, <VHT-MCS, NSS> tuple or <HE-MCS, NSS> tuple that is supported by all recipient STAs." |
| 13268 | Robert Stacey | 238.10 | Suppose a 256-bit WinSizeR has been negotiated. Under what conditions is a 64-bit bitmap sent? Based on the procedure defined in 10.24.7.4 it would seem that sending anything shorter than 256-bits is useless. Unless the SSN is updated the bitmap sent will not include the receipt state of the most recent MSDUs (SN > SSN+64). | Update the procedure in 10.24.7.5 to defiine the conditions under which a 64-bit bitmap can be sent when a 256-bit WinSizeR has been negotiated. Define the SSN used, etc. At a minimum, the decision should be made based on the SN range in the soliciting A-MPDU. NOte also that we want to allow for simple implementations that always return the max bitmap length. | Revised -   Agree in principle. Updated the text.   TGax editor shall incorporate changes in 11-18-0717-00-00ax |
| 13273 | Robert Stacey | 238.44 | This statement has nothing to do with BlockAck frame response. WinSizeR is a static value set during the block ack agreement negotiation. We already have an amednded statement in 10.24.7.3 on how this is set. | Remove statement | Revised -   Agree in principle. Updated the text.   TGax editor shall incorporate changes in 11-18-0717-00-00ax |
| 13274 | Robert Stacey | 238.48 | This statement is not an exception; it is a repeat of a amended statement in 10.24.7.5. | Remove statement | Revised -   Agree in principle. Updated the text.   TGax editor shall incorporate changes in 11-18-0717-00-00ax |
| 13275 | Robert Stacey | 238.51 | This statement contradicts other statements that allow bitmap length to be different lenghts (sometimes 32 and sometimes 64 for example). WinStartR and WinEndR are always related to each other by: WinStartR = WinEndR = WinSizeR + 1 (sometimes WinStartR is set based on WinEndR and sometimes vice versa, but they are always WinSizeR apart). This statment basically requires the same bitmap length always be sent. | Remove this statement. Add a more accurate statement on how to derive the bitmap length. | Revised -   Agree in principle. Updated the text.   TGax editor shall incorporate changes in 11-18-0717-00-00ax |
| 13280 | Robert Stacey | 241.49 | The "FN settings" of the BlockAck frame indicate the bitmap length carried. The "FN settings" for the BlockAckReq frame is defined in the baseline (802.11-2016, P674 and Figure 9-28) as "The Fragment Number subfield is set to 0." The soliciting frame (BlockAckReq, MU-BAR Trigger) does not tell the recipient what length to use; this would be inconsistent with Implicit Block Ack Request. | Remove statement. | Revised -   Agree in principle. Updated the text.   TGax editor shall incorporate changes in 11-18-0717-00-00ax |
| 13666 | Tomoko Adachi | 240.21 | How can a recipient know the received HE SU PPDU is either of 1) to 3) cases? Similar comment to the one in 27.4.4.2, pp.ll 239.16. | Change as follows: 1) If the HE MU PPDU or HE SU PPDU has no errors and is detected to carry an S-MPDU that is ... an Action frame soliciting an Ack frame, ... 2) If the HE MU PPDU or HE SU PPDU has no errors and is detected to carry a single-TID A-MPDU ... 3) Otherwise, the STA shall respond with a Multi-STA BlockAck frame as defined in 27.4.2 (Acknowledgement context in a Multi-STA BlockAck frame), carried in an SU PPDU. | Revised -   Agree in principle. Updated text in D2.3 already reflects the requested change. No further change needed. |
| 13667 | Tomoko Adachi |  | (Resubmitting the same problem pointed out by CID 9351.) What happens if the AP transmits in an A-MPDU with a Trigger frame, an Action frame soliciting an Ack frame, and QoS Data frames aggregated, but the non-AP STA only receives the Action frame? The STA should not respond for this case, however, it is not restricted to aggragate a Trigger frame, so the STA cannot determine whether it can respond or not. One approach would be to add a rule that when the STA received the PPDU with no errors and confirmed that it is an S-MPDU, it transmits an Ack frame, when the STA recieved an A-MPDU and received the first two MPDUs successfully (within these two MPDUs, there should be a Trigger frame if there is), it transmits a response frame accordingly, and otherwise the STA shall not transmit a response frame. But this is quite complicated. The other approach would be to just give it up, rely on the recovery mechanism, and follow the rules in 27.4.4 (in this case, as there are errors and cannot determine if it is a single TID A-MPDU, a response frame should be a M-BA by the rules in 27.4.4.2 or 27.4.4.3), but add a note in 27.4.4.4 that there is such risk. | Add a note at the end of 27.4.4.4 as follows: "NOTE--As an Action frame soliciting an Ack frame does not contain Ack Policy field, the non-AP STA responds with an SU PPDU when it fails to receive a Trigger frame or a frame with a UMRS Control field is present. This results in colision with the HE TB PPDU sent by the other non-AP STAs." | Rejected -   The usecase raised does not lead to a problem. See explaination below:  When management frame that solicits immediate response is carried in HE MU PPDU, the response is always sent using HE TB PPDU  When management frame that solicits immediate response is carried in HE SU PPDU, the response may be using HE TB PPDU or using HE SU PPDU. There is no conflict of UL resource. AP will be able to receice the response either in HE TB PPDU, or in HE SU PPDU format |
| 13907 | Yongho Seok | 240.01 | "Responding to an HE MU PPDU or HE SU PPDU with an HE TB PPDU" How about is an HE ER SU PPDU? If an HE SU PPDU can solicit an HE TB PPDU, an HE ER SU PPDU can also solicit an HE TB PPDU. | Include an HE ER SU PPDU that solicit an HE TB PPDU. Otherwise, remove an HE SU PPDU. | Revised -   Already resolved in D2.3 draft (see 18-207r4) |
| 13908 | Yongho Seok | 240.07 | "If an Action frame or an MMPDU that solicits an immediate acknowledgement 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 or HE SU PPDU with an A-MPDU that contains QoS Data or QoS Null frames addressed to it with Ack Policy field equal to HTP Ack, or an Action-Ack frame shall not respond if it has not received the UL resource allocation information either through UMRS Control field or a Trigger frame in the soliciting PPDU." How about is an action frame or an MMPDU carried in an HE SU PPDU? Can the response frame be carried in an HE TB PPDU? | Please clarify if the response frame of an action frame or an MMPDU carried in an HE SU PPDU can be carried in an HE TB PPDU. | Revised -   Already resolved in D2.3 draft (see 18-207r4) |
| 13909 | Yongho Seok | 240.33 | "If the HE MU PPDU or HE SU PPDU carries a multi-TID A-MPDU that includes QoS Data frames or QoS Null frames with the Ack Policy field equal to HTP Ack, and an Action Ack frame, and either a Trigger frame or a frame with a UMRS Control field is present, then the STA shall respond with a Multi-STA BlockAck frame carried in the HE TB PPDU sent as a response." An ack-enabled A-MPDU can include an Action Ack frame. But, it is not covered by this bullet when an ack-enabled A-MPDU is an single-TID A-MPDU. | Add the rule for an ack-enabled A-MPDU. | Revised -   Already resolved in D2.3 draft (see 18-207r4) |
| 14111 | Yuichi Morioka | 245.51 | Should the trigger frame immediately follow the ACKs? | Add the word "immediately" before "follow the Ack, ..." | Rejected -   Comment is not clear. |
| 14248 | Yusuke Tanaka | 237.45 | The condition says "as defined below" but there may not be more definition below. | Remove ", and as defined below". | Revised -   Agree in principle. Updated text in D2.3 already reflects the requested change. No further change needed. |
| 14249 | Yusuke Tanaka | 237.53 | "single MPUD" looks similar with "S-MPDU". Use other expression. | As commented. | Revised -   Agree in principle. Updated text in D2.3 already reflects the requested change. No further change needed. |
| 14250 | Yusuke Tanaka | 237.61 | The rules in this subclause need to be limited in HE devises but no description like "an HE STA shall" | As commented. | Revised -   Agree in principle. Updated text in D2.3 already reflects the requested change. No further change needed. |
| 14251 | Yusuke Tanaka | 237.63 | What is it "different" from? | Clarify. | Rejected -   The intention is to imply different BA bitmap length, since a variable bitmap is allowed in 11ax |

* HE acknowledgment(#11208) procedure(#13250)
* Overview

The HE acknowledgment procedure(#13251) builds on the features defined for HT-immediate block ack (see 10.24.7 (HT-immediate block ack extensions))(#11806), with the following extensions:

* Support for a Multi-STA BlockAck frame
* Support for a MU-BAR Trigger frame(#11085)
* Support for a Multi-TID BlockAckReq frame
* Support for BlockAck Bitmap field lengths of 32, 64, 128 and 256(#13022, #Ed)
* (#13022)Acknowledging MPDUs from(#13254) multiple STAs using a single Multi-STA BlockAck frame
* Acknowledging QoS Data frames with two or more TIDs using a Multi-STA BlockAck frame(18/27r4)
* Acknowledging QoS Data frames with one or more TIDs, and a Management frame(#12597) using a Multi-STA BlockAck frame(18/27r4)
* Acknowledging all MPDUs in a(#11087) PPDU using a variant of the Multi-STA BlockAck frame(#13255)
* Pre-Association acknowledgment, which acknowledges pre-association Management frames(#12597) for multiple STAs using a single Multi-STA BlockAck frame(#13256)

An HE STA shall be able to respond with(#13257) 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(#13257) 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.(#13258)

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(#12478, #Ed) may set the RA field of the Multi-STA BlockAck frame(#12478) to either the address of the recipient STA or to(#11809) 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.(#12478, #Ed)

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.(#11088)

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 acknowledgement, 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).(#13260)

A non-AP HE STA that receives a Multi-STA BlockAck frame that is a response to frames requiring acknowledgement 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:(#12360)

* 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(#11208) of an EOF-MPDU that is a QoS Data frame with the indicated TID. The BA Information field is intended to 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(#11208) context in a Multi-STA BlockAck frame).(#11740)
* 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 intended to 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(#11208) context in a Multi-STA BlockAck frame).(#11740)
* 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 acknowledgement 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 intended to 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(#11208) context in a Multi-STA BlockAck frame).(#11740)

An HE AP shall not send to the STA a Multi-STA BlockAck frame that has Per AID TID Info fields(#13748) 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.

(#13189)An HE STA that transmits a Multi-TID BlockAckReq frame shall contain(#14247) the TID Values of the Per TID Info subfields of the BAR Information field of the Multi-TID BlockAckReq frame for the MPDUs of which TIDs correspond to AC that has the same or higher priority with respect to the primary AC, except when the Multi-TID BlockAckReq frame is carried in an HE TB PPDU in which case the HE STA contains the TID Values of the Per TID Info subfields of the BAR Information field of the Multi-TID BlockAckReq frame for the MPDUs of which TIDs correspond to any AC.

An HE STA that transmits a BlockAckReq frame carried in an HE TB PPDU contains the TID Values of the Per TID Info subfields of the BAR Information field of the BlockAckReq frame for the MPDUs of which TIDs correspond to any AC.

* Acknowledgment(#11208) 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(#12820, #13263) of the Multi-STA BlockAck frame sent as a response depending on the acknowledgment(#11208) 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(#12832, #11755, #13264) prior to association may generate a Multi-STA BlockAck frame using the procedure described in the pre-association ack context defined below(#12821).
* 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 fiel dequal to Normal Ack or Implicit Block Ack Request belonging to the same block ack agreement may generate a Multi-STA BlockAck frame as follows:(#12822, #13265)
* If all MPDUs in the A-MPDU(#12824) are received successfully, then the recipient may follow the procedure described in the All Ack context as defined below.
* Otherwise, the recipient shall(#11089, #12823) follow the procedure described in the BlockAck context defined below.
* (#13265, #11756)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(#12824) are received successfully, then the recipient may follow the procedure described in the All Ack context.
* Otherwise:
* For the MPDU that is a Management frame(#12597), 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, 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, 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
* 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.(18/27r4)

The procedure for different acknowledgment contexts(#11482) for generating Multi-STA BlockAck frame is defined below:

* All Ack context: 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(#12745) from the 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: If the recipient had set the Ack-Enabled Aggregation Support subfield(#12739) in the HE Capabilities element to 1, then the recipient receiving an EOF-MPDU(#11740), that requires an acknowledgment, shall set the Ack Type field to 1 and the TID field to the TID value of if that EOF-MPDU is a QoS Data frame or to the TID value of 15 if the EOF-MPDU is a Management frame or PS-Poll frame.  
    
  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(#13749), with Ack Type field equal to 1, one for each such successfully received EOF-MPDU requesting an acknowledgment.(#12479)  
    
  The allowed values for the TID field in this context are 0 to 7 (for indicating acknowledgment(#11208) of QoS Data or QoS Null frames) or 15 (for indicating acknowledgment(#11208) of an Action frame or a Management frame sent by the unassociated HE STA, e.g., Association Request).
* 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(#11208) 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(#11208), 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(#11208) 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 when the originator is an AP, and is 2045 when 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 BA 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(#11208) of a single Management frame sent by the unassociated STA as defined by the acknowledgment(#11208) 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(#11208) of an EOF-MPDU(#11740) that is a QoS Data frame identified by the value of the TID, a Management frame(#12631) 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(#11208) of all MPDUs carried in the eliciting PPDU as defined by the acknowledgment(#11208) 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 9.3.1.9 (BlockAck frame format). The length of the Block Ack Bitmap subfield in the BA Information field of a BlockAck frame [#13268] shall not exceed the buffer size negotiated for the block ack agreement corresponding to the BA information field, [#13268] and shall be at least equal to the number of successfully received MPDUs for that block ack agreement that is included in the A-MPDU that solicitis immediate acknowledgment. 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.

|  |  |  |
| --- | --- | --- |
| * 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 |

(#12693)

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(#12693).

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.

A recipient that is the intended receiver of a BlockAckReq frame(#13271), MU-BAR Trigger frame, GCR MU-BAR Trigger frame, or an A-MPDU(#13272) that solicits an immediate BlockAck frame response for each TID shall follow the rules defined in 10.24.7 (HT-immediate block ack extensions) [13275] with the restriction that the BlockAck Bitmap field shall be greater than or equal to *WinEndR*  *WinStartR*

* *[*13273 *]*
* [13274 ]

[13275]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(#12597) 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.(#12484, #13270, #13276, #11091)

If a STA sets the HE Fragmentation Support subfield in the HE Capabilities element to 3, then the LSB of the Fragment Number subfield of the BlockAck frame(#13277) may be set to 1. If the LSB of the Fragment Number subfield of the BlockAck frame(#13277) is set to 1, then the BA Bitmap fields are re-mapped as defined in 27.3 (Fragmentation and defragmentation).

* Per-PPDU acknowledgment selection rules
* General

A STA that transmits(#11092, #11810) 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 (#12852), number of TIDs in the A-MPDU(#12891) 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 with an A-MPDU that includes MPDUs that solicits acknowledgment and that does not include a Trigger frame or a frame with TRS Control subfield(#13136), shall respond using an SU PPDU as follows:(#13663)

* 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 acknowledgement and the MPDU that solicits acknowledgement 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 acknowledgement, 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 10.24.7.5 (Generation and transmission of BlockAck frames by an HT STA or DMG 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(#11208) 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.(#11758, #12888, #12487)
* 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(#12597) that solicits an acknowledgement, 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(#11208) 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(#11208) context in a Multi-STA BlockAck frame).(#11759, #12888, #12486, #12887)
* 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 10.3.2.10.1 (acknowledgment(#11208) 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.(#12630)

A non-AP 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(#13136) 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 (#12825)with the Ack Policy field equal to Normal Ack, then the STA shall respond with an Ack frame(#Ed).
* 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 acknowledgement and the MPDU that solicits acknowledgement 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(#12885) 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(#11208) 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.(#11762)
* If the HE STA(#12072) supports multi-TID aggregation and if the A-MPDU includes two or more QoS Data frames addressed to it (#12825)with the Ack Policy field equal to Implicit Block Ack Request and belonging to more than on block ack agreement, then the STA shall respond with a Multi-STA BlockAck frame as defined in 27.4.2 (Acknowledgment(#11208) context in a Multi-STA BlockAck frame).(#11763, #12486)

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).

* 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 10.3.2.10.2 (Acknowledgment(#11208) procedure for DL MU PPDU in MU format)). If a Management frame that solicits acknowledgment(#11208) 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(#12584) that solicits an immediate acknowledgement shall not respond if it has not received the UL resource allocation information either through TRS Control subfield(#13136)(#14137) 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 MPDUs that solicits acknowledgment and includes a Trigger frame or a frame with TRS Control subfield(#13136) 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.(#12486, #13666)
* 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 acknowledgement and the MPDU that solicits acknowledgement 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 acknowledgement, 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 27.4.2 (Acknowledgment(#11208) 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.(#11763, #12488, #13520, #12487, #13909)
* 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(#12597) that solicits an acknowledgement, 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(#11208) 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.(#11763, #12828, #12486, #12898)
* Responding to an HE TB PPDU with a DL SU PPDU

A non-AP STA that sends an HE TB PPDU as a response to a Basic Trigger frame (#13706)shall set the Ack Policy field of the QoS Data frames or QoS Null frames to Normal Ack/Implicit Block Ack Request (see 10.3.2.10.3 (acknowledgment(#11208) procedure for an UL MU transmission) for an example of this sequence).(#12899, #13279)

If the HE TB PPDU carries MPDUs only from one STA and if the HE AP intends to send the response in a DL SU PPDU format, then the HE AP shall respond using a DL 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 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 acknowledgement and the MPDU that solicits acknowledgement 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 manamgement frame that solicits acknowledgement, 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(#11208) context in a Multi-STA BlockAck frame).(#12902)
* 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(#12597) that solicits acknowledgement, 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(#11208) context in a Multi-STA BlockAck frame).(#11740)
* 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.(#12143, #12904)

If the HE TB PPDUs carry MPDUs from more than one STA, and the if the AP ends the response in a DL SU PPDU, then the AP shall respond with a Multi-STA BlockAck frame carried in a DL SU PPDU format that contains the appropriate settings in each Per AID TID Info field intended to each STA as defined in 27.4.2 (Acknowledgment(#11208) context in a Multi-STA BlockAck frame).(#12906, #13521)

* 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(#12908) carried in the A-MPDU (see 10.3.2.10.3 (acknowledgment(#11208) procedure for an UL MU transmission) for an example of this sequence).

(#12909, #12491, #12910)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:(#12911, #12912, #12914)

* 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(#12597) that solicits acknowledgement, 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 acknowledgement and the MPDU that solicits acknowledgement 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 manamgement frame that solicits acknowledgement, 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 10.24.7.5, 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 (Acknowledgement 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 if the A-MPDU carries a Management frame(#12597) that solicits acknowledgement, 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 (Acknowledgement 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 (Acknowledgement context in a Multi-STA BlockAck frame),

(#12913)For each BSS, an AP responds(#12830) with a Multi-STA BlockAck frame with RA field set to the broadcast address in a DL HE MU PPDU. The Ack Type field shall be set according to the acknowledgment(#11208) context. The AP shall set the STA\_ID\_LIST field as defined in 27.11.1 (STA\_ID\_LIST). There shall be no more than one group addressed Multi-STA BlockAck frame carried in a broadcast RU of the DL HE MU PPDU.(#12490)

* 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 intended to the STA in an MU-BAR Trigger frame nor as a BlockAckReq frame(#12853)) to a STA that has not indicated support for multi-TID A-MPDU. [13280] The Block Ack Bitmap length of the block ack sent in response to an eliciting Multi-TID BlockAckReq, BlockAckReq, GCR MU-BAR Trigger, and MU-BAR Trigger frames shall be set to the buffer size negotiated for the block ack agreement corresponding to the BA information field.

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(#11208) procedure(#13250)), 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).