IEEE P802.11  
Wireless LANs

|  |
| --- |
| **Ack related CRs** |
| **Date:** 2019-07-11 |
| **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 **6 CIDs**

20996, 21174, 21179, 21185, 21186, 20792

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** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 20996 | Mark RISON | 314.54 | Re CID 16374: "The recipient determines that all the MPDUs carried in the eliciting A-MPDU are received if all the MPDUs that precede the first MPDU delimiter with EOF equal to 1 and MPDU Length field equal to 0 are received." is not tight enough. If an MPDU delimiter with a non-zero Length field is corrupted to one that has a zero Length field, this could cause false positives. The only safe option is to be very conservative | Change the cited text to "The recipient determines that all the MPDUs carried in the eliciting A-MPDU were received if there were no MPDU delimiter CRC errors and no MPDU FCS errors in that A-MPDU." | Revised  Agree in principle. Made the requested change.  TGax editor shall incorporate changes in 11-19-1211-00-00ax |
| 21174 | Pooya Monajemi | 235.36 | The AP can also include multiple Multi-STA BlockAck frames in HE MU PPDU. This might be to cover Multi-TID, or some STA in a Broadcast RU and others in single User RU with more DL Data. | "may send either multiple BlockAck frames (or Ack frames, or a Multi-STA BlockAck frames) in an HE MU PPDU, or a Multi-STA BlockAck frame (see 26.4 (HE acknowledgment procedure))." | Accepted. |
| 21179 | Pooya Monajemi | 262.06 | When changing the text from a single bit field to a BA Type, errors were inserted into this section. The 2 statements of the form "shall be set to 0 otherwise" now prohibits most of the types in Table 9-30. | Remove those restrictions. | Revised.   Remove the phrase "and shall be set to 0 otherwise" from both lines 6 and line 8 |
| 21185 | Pooya Monajemi | 313.03 | The list appears to be missing the All ACK case | Add it to the list | Rejected.  The paragraph is about a Multi-STA BA that is sent as a response to frames requiring acknowledgment but that do not belong to an established a block ack agreement |
| 21186 | Pooya Monajemi | 317.18 | There is one missing case for a PS-Poll | Add that to case (1) text. | Revised.  Agree in principle. Made the requested change.  TGax editor shall incorporate changes in 11-19-1211-00-00ax |
| 20792 | Mark RISON |  | Re CID 16378: for Management frames, if in MU PPDU, then since no Ack Policy Indicator field, only respond if got TF/TRS. So could apply same rule for Data frames. The benefit of being able to get an SU response to Data frames sent in MU PPDU is rather limited (only one STA can respond) | Delete the references to HTP Ack throughout the draft and instead state that the rules previously described as pertaining to that ack policy instead pertain to frames received by a non-AP STA in an HE MU PPDU | Rejected.  When a non-AP STA receives an AMPDU, without HTP-Ack, the non-AP STA would not know whether to respond using HE TB PPDU or HE SU PPDU.The restriction for management frame was added because of the lack of Ack policy fields. |

* 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 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
* Acknowledging MPDUs from multiple associated STAs using a single Multi-STA BlockAck frame(#21299)
* Acknowledging MPDUs from multiple unassociated STAs with a single Multi-STA BlockAck frame(#21299)

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 (26.6.3 (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 not sent in response to an HE TB PPDU shall set the RA field of the Multi-STA BlockAck frame 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(#20972), <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(#20943) 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 26.4.2 (Acknowledgment 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 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(#20925) that is a QoS Data frame with the indicated TID. The BA Information field is addressed 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 26.4.2 (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(#20925) that is a Management frame that solicits acknowledgment or a PS-Poll frame. The BA Information field is addressed 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 26.4.2 (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 of an EOF MPDU(#20925) 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 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 26.4.2 (Acknowledgment context in a Multi-STA BlockAck frame).

An HE AP with dot11MultiBSSIDImplemented equal to true shall not send to a non-AP STA that is associated with a nontransmitted BSSID in the multiple BSSID set a Multi-STA BlockAck frame with the TA field set to the transmitted BSSID unless the HE AP has received from the non-AP STA an HE Capabilities element with the Rx Control Frame To MultiBSS subfield in HE MAC Capabilities Information field equal to 1.(#20582, #20315)

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 unless dot11MultiBSSIDImplemented 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.

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.

* 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(#20925) 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(#20925) but does include one or more non-EOF MPDUs(#20925) that are QoS Data frames with Normal Ack or Implicit BAR ack policy(#20545) 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 as defined below.
* Otherwise, the recipient shall follow the procedure described in the BlockAck context defined below.
* If an HE STA supports ack-enabled aggregation by setting the Ack-Enabled Aggregation Support subfield in the HE MAC Capabilities Information field to 1 and the A-MPDU includes(#20982) an EOF MPDU(#20925) that is a Management frame that solicits acknowledgment, and one or more MPDUs (either EOF MPDUs or non-EOF MPDUs(#20925)) that are QoS Data frames with Normal Ack or Implicit BAR ack policy(#20545), 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.
* 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(#20925) 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(#20925) 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
* If an HE STA supports multi-TID aggregation and the A-MPDU does not include(#20982) an EOF MPDU but does include non-EOF MPDUs(#20925) that are QoS Data frames with Implicit BAR ack policy(#20545) 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—A STA indicates the maximum number of Per AID TID Info fields with the same AID excluding the one for a(#20213) Management frame that it can include in the Multi-STA BlockAck frame in the Multi-TID Aggregation Rx Support field in the HE Capabilities element it transmits.

The procedure for different acknowledgment contexts 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 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. The recipient determines that all the MPDUs carried in the eliciting A-MPDU are received [#20996] if there were no MPDU delimiter CRC errors and no MPDU FCS errors for all MPDUs in that A-MPDU that precede the first MPDU delimiter with EOF equal to 1..
* Pre-association ack context: A recipient receiving a Management frame from an 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(#20925) soliciting acknowledgment shall set the Ack Type field to 1 and, if the EOF MPDU(#20925) is a QoS Data frame, set the TID field to the TID of the QoS Data frame, or, if the EOF MPDU(#20925) is a Management frame or PS-Poll frame, set the TID field to 15.  
    
  If a received A-MPDU contains more than one EOF MPDU(#20925) 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 received(#20724) EOF MPDU(#20925) 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.
* 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 26.3 (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 26.4.3 (Negotiation of block ack bitmap lengths).

The Ack Type subfield(s) in a Multi-STA BlockAck frame shall be set to 0 if the Multi-STA BlockAck frame is sent in response to an MU-BAR Trigger frame.(#20105)

Upon receipt of a Multi-STA BlockAck frame the originator shall examine each Per AID TID Info field and shall perform the following operations:

* If the AID subfield is 0 for an AP originator or the non-AP STA's AID for a non-AP STA originator, the Ack Type field is 0 and the TID field is less than 8 then the BlockAck Starting Sequence Control, TID and Block Ack Bitmap fields of the Per AID TID Info field are processed according to 10.24.7 (HT-immediate block ack mechanism), 26.3 (Fragmentation and defragmentation), and as defined below.
* If the AID subfield is 2045, 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 AID subfield is 0 for an AP originator or the non-AP STA's AID for a non-AP STA originator, 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(#20925) that is a QoS Data frame identified by the value of the TID, a Management frame or a PS-Poll frame.
* If the AID subfield is 0 for an AP originator or the non-AP STA's AID for a non-AP STA originator, 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 A-MPDU 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). The allowed Block Ack Bitmap lengths for each of the negotiated buffer sizes are defined in Table 26-1 (Negotiated buffer size and Block Ack Bitmap subfield length).

|  |  |  |
| --- | --- | --- |
| * 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 |
| NOTE—A 32-bit Block Ack Bitmap subfield length is not allowed unless the originator has set the 32-bit BA Bitmap Support field in the HE MAC Capabilities Information field in the HE Capabilities element to 1.(#20608) | | |

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 26-1 (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 is allowed to(#20607) 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. 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 but shall 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*.

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 26-1 (Negotiated buffer size and Block Ack Bitmap subfield length) for the negotiated buffer size of the block ack agreement.

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.

The originator of a BlockAckReq frame, MU-BAR Trigger frame, GCR MU-BAR Trigger frame or a A-MPDU that includes QoS Data frames that solicits an immediate BlockAck frame response or Mangement frame that solicits acknowledgment(#20890) shall set the Duration field value accounting for the largest BlockAck Bitmap length based on negotiated buffer size.

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 Dynamic Fragmentation Support subfield equal to 3. If the LSB of the Fragment Number subfield of the BlockAck frame is set to 1, then the Block Ack Bitmap fields are set as defined in 26.3.2.4 (Level 3 dynamic fragmentation)(#21307).

* 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 Indication subfield(#20545) of QoS Data or QoS Null frames, the type of the frame, PPDU format, 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 an A-MPDU that includes MPDUs that solicits acknowledgment and that does not include a triggering frame(#21348)(#20943) shall respond using an SU PPDU as follows:

* If the A-MPDU includes only one MPDU and the MPDU is an EOF MPDU(#20925) that is either a QoS Data frame or QoS Null frame with Normal Ack ack policy(#20545), [#21186] PS-Poll frame or a 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 and the MPDU that solicits acknowledgment is an EOF MPDU that is a QoS Data frame or a QoS Null frame with Normal Ack ack policy(#20545), or a Management frame that solicits acknowledgment, 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(#20925) that are QoS Data frames belonging to the same block ack agreement and with the Ack Policy Indication subfield equal to Implicit BAR(#20545) 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 26.4.2 (Acknowledgment context in a Multi-STA BlockAck frame) if the recipient has indicated support for the all ack context(#20893) 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, and one or more QoS Data frames with ack policy Normal Ack or Implicit BAR(#20317), then the STA shall respond with a Multi-STA BlockAck frame as defined in 26.4.2 (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 ack policy Implicit BAR(#20317) and belonging to more than one block ack agreement, then the STA shall respond with a Multi-STA BlockAck frame as defined in 26.4.2 (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 Indication subfield in the QoS Data and QoS Null frames to Normal Ack or Implicit BAR(#20545) 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 PPDU) for an example of this sequence).
* The A-MPDUs in the HE MU PPDU shall not contain a Management frame that solicits acknowledgment.

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 triggering frame(#21348) shall respond using an SU PPDU as follows:

* If the A-MPDU carries only one MPDU and the MPDU is an EOF MPDU(#20925) that is either a QoS Data frame or QoS Null frame with Normal Ack ack policy(#20545), 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 and the MPDU that solicits acknowledgment is an EOF MPDU(#20925) that is a QoS Data frame or a QoS Null frame with Normal Ack ack policy(#20545), then the HE STA shall respond with an Ack frame.
* If the A-MPDU does not include an EOF MPDU(#20925) but does include one or more non-EOF MPDUs(#20925) that are QoS Data frame belonging to the same block ack agreement and with the Ack Policy Indication subfield equal to Implicit BAR(#20545) 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)(#20893) or a Multi-STA BlockAck frame with the Ack Type set to 1 and the TID field set to 14 as defined in 26.4.2 (Acknowledgment context in a Multi-STA BlockAck frame) if the recipient has indicated support for the all ack context(#20893) 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 with Implicit BAR ack policy addressed to it (#20545)and belonging to more than one block ack agreement, then the STA shall respond with a Multi-STA BlockAck frame as defined in 26.4.2 (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 Indication subfield to Normal Ack or Implicit BAR(#20545) 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.

* 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 contains an MPDU that solicits an immediate response carried in an HE TB PPDU shall set the Ack Policy Indication subfield(#20545) 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 a QoS Data frame addressed to it and with HTP Ack ack policy(#20545), or a Management frame that solicits an immediate acknowledgment 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 MPDUs that solicits acknowledgment and includes a triggering frame(#21348) shall respond with an HE TB PPDU as follows:

* If the A-MPDU includes only one MPDU, and the MPDU is an EOF MPDU(#20925) that is either a QoS Data or QoS Null frame with HTP Ack ack policy(#20545) or a 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 and the MPDU that solicits acknowledgment is an EOF MPDU that is a QoS Data or QoS Null frame with HTP Ack ack policy(#20545), or a Management frame that solicits acknowledgment, then the HE STA shall respond with an Ack frame.
* If the A-MPDU does not include an EOF MPDU(#20925) but does include one or more non-EOF MPDUs(#20925) that are QoS Data frames belonging to the same block ack agreement and with the Ack Policy Indication subfield equal to HTP Ack(#20545) 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) or a Multi-STA BlockAck frame with the Ack Type set to 1 and the TID field set to 14 as defined in 26.4.2 (Acknowledgment context in a Multi-STA BlockAck frame) if the recipient has indicated support for the all ack context(#20893) 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, and one or more QoS Data frames with ack policy HTP Ack or Implicit BAR(#20318), then the STA shall respond with a Multi-STA BlockAck frame as defined in 26.4.2 (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 HTP Ack ack policy and belonging to more than one block ack agreement(#20545), then the STA shall respond with a Multi-STA BlockAck frame.
* Responding to an HE TB PPDU with an SU PPDU

A non-AP STA that sends an HE TB PPDU as a response to a Basic Trigger frame shall set the Ack Policy Indication subfield of the QoS Data frames or QoS Null frames to Normal Ack or Implicit BAR(#20545)(#20319) (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, then the HE AP shall respond using an SU PPDU as follows:

* If the A-MPDU includes only one MPDU, and the MPDU is an EOF MPDU(#20925) that is either a QoS Data frame or QoS Null frame with Normal Ack ack policy(#20545), 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 and the MPDU that solicits acknowledgment is an EOF MPDU that is a QoS Data or QoS Null frame with Normal Ack ack policy(#20545), or a Management frame that solicits acknowledgment, 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(#20925) that are QoS Data frames belonging to the same block ack agreement and with Ack Policy Indication subfield equal to Implicit BAR(#20545) 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)(#20893), a Multi-STA BlockAck with the Ack Type field set to 1 and the TID field set to 14 if the recipient has indicated support for the all ack context(#20893) 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 26.4.2 (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, and one or more QoS Data frames with Implicit BAR ack policy(#20545), then the HE AP shall respond with a Multi-STA BlockAck frame as defined in 26.4.2 (Acknowledgment context in a Multi-STA BlockAck frame)(#20975).
* If the HE AP supports multi-TID aggregation and if the A-MPDU includes two or more QoS Data frames with Normal Ack or Implicit BAR ack policy(#20545) and belonging to more than one block ack agreement, then the HE AP shall respond with a Multi-STA BlockAck frame as defined in 26.4.2 (Acknowledgment context in a Multi-STA BlockAck frame)(#20975).

If the AP receives HE TB PPDUs (#21021, #20763)from more than one STA, and if the AP intends to send the response in an SU PPDU, then the AP shall respond with a Multi-STA BlockAck frame carried in an SU PPDU that contains the appropriate settings in each Per AID TID Info field addressed to each STA as defined in 26.4.2 (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 Indication subfield to Normal Ack or Implicit BAR(#20545)(#20320) 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(#20925) that is either a QoS Data frame or QoS Null frame with Normal Ack ack policy(#20545), or a Management frame that solicits acknowledgment, 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 and the MPDU that solicits acknowledgment is an EOF MPDU that is a QoS Data frame (#21065)with Normal Ack ack policy, or a Management frame that solicits acknowledgment, 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(#20925) that are QoS Data frames belonging to the same block ack agreement and with the Ack Policy Indication subfield equal to Implicit BAR(#20545) 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 26.4.2 (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 the A-MPDU carries a Management frame that solicits acknowledgment and one or more QoS Data frames with Implicit BAR ack policy(#20545), then the HE AP shall respond with a Multi-STA BlockAck frame as defined in 26.4.2 (Acknowledgment context in a Multi-STA BlockAck frame)(#20975), 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 Implicit BAR ack policy(#20545) and are belonging to more than one block ack agreement, then the HE AP shall respond with a Multi-STA BlockAck frame as defined in 26.4.2 (Acknowledgment context in a Multi-STA BlockAck frame),

In addition, an(#20582, #20315) AP with dot11MultiBSSIDImplemented 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 26.11.1 (STA\_ID\_LIST).(#20933)
* The AP may respond with a Multi-STA BlockAck frame with the TA field set to the transmitted BSSID and carried in a DL HE MU PPDU to acknowledge the STA's transmission, if the recipient non-AP STA is associated with a nontransmitted BSSID of the multiple BSSID set and the AP has received an HE Capabilities element from the STA with the Rx Control Frame To MultiBSS subfield equal to 1.(#20582, #20315) 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.(#20933)

NOTE—An AP includes at most one Ack or BlockAck frame (group addressed Multi-STA BlockAck frame included) in an A-MPDU as specified in Table 9.7.3 (A-MPDU contents).(#20933)

* 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 User Info fields(#21541). An HE AP shall not send a Multi-TID BlockAckReq (neither as part of a User Info field(#21541) addressed to 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 26.4.3 (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 26.4 (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 26.4.3 (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 26.4.3 (Negotiation of block ack bitmap lengths).

A non-AP HE STA that responds to a Compressed BlockAckReq frame, Multi-TID BlockAckReq frame, MU-BAR Trigger frame, or GCR MU-BAR Trigger frame with a Multi-STA BlockAck frame shall set the Ack Type subfield of the Multi-STA BlockAck frame to 0.