IEEE P802.11
Wireless LANs

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| No Action frame in multi-TID A-MPDU |
| Date: 2018-09-04 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Robert Stacey | Intel |  | +1-503-724-0893 | robert.stacey@intel.com |
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Abstract

Proposed resolution for CID 16684.

# Revisions

r0 initial

r1 adds necessary Clause 9 changes per comment from Tomo. Updated for new comment and D3.1.

# Comment

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| --- | --- | --- | --- | --- |
| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** |
| 16684 | 351.63 | 27.10.4.3 | Including management frames in an ack-enabled multi-TID A-MPDU does not make sense. Management frames are sent very infrequently and performance beneift from this type of aggregation is negligable. Supporting management frames complicates the receiver: 1. requires special ack handling. 2. it requires special handling for decryption. | Remove the first and third bullet items so that the definition of an ack-enabled multi-TID A-MPDU does not include the presence of a Management frame. Update table in 9.7. Update ack response text since this combination will no longer be possible. |

# Discussion

The proposal is to simplify by removing management frames from multi-TID operation.

This is easily done by redefining ack-eanbled multi-TID A-MPDU so that it does not include the

Management frame + QoS Data frame combination. Some of the HE acknowledgement procedure rules can be simplified as a result.

# Proposed Resolution

REVISED

Agree in principle with the commenter on the technical change and scope of the edits.

TGax editor to apply the changes in <this doc>.

# Editing instructions

Editing instruction are against P802.11ax/D3.1

*Change Table 9-425 as follows:*

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| --- |
| * A-MPDU contents in the data enabled immediate response context
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| MPDU Description | Conditions |
| Ack | If the preceding PPDU contains an MPDU that requires an Ack frame response, a single Ack frame at the start of the A‑MPDU. | In a non-DMG STA the frame is not transmitted between an HE STA and another HE STA: at most one of ~~these~~ Ack and HT-immediate BlockAck MPDUs is present.When transmitted by an HE STA to another HE STA: at most one of these MPDUs is present.In a DMG STA: at most one Ack frame is present, and zero or more HT-immediate BlockAck frames are present. |
| HT-immediate BlockAck | In a non-DMG STA: if the preceding PPDU contains an implicit or explicit block ack request for a TID for which an HT-immediate block ack agreement exists, at most one BlockAck frame for this TID, in which case it occurs at the start of the A-MPDU.In a DMG STA: if the preceding PPDU contains an implicit or explicit block ack request for a TID for which an HT-immediate block ack agreement exists, one or more copies of the same BlockAck for this TID. |
| Multi-STA BlockAck | When transmitted by an HE STA to another HE STA: If the preceding PPDU that carried a multi-TID A-MPDU contains implicit or explicit block ack requests for multiple TIDs for which HT-immediate block ack agreement exist, at most one Multi-STA BlockAck frame, in which case it occurs at the start of the A-MPDU. |
| Delayed BlockAcks | BlockAck frames with the BA Ack Policy subfield equal to No Acknowledgment with a TID for which an HT-delayed block ack agreement exists. |
| Delayed block ack data | In a non-HE STA: QoS Data frames with a TID that corresponds to a Delayed or HT-delayed block ack agreement.These have the Ack Policy field equal to Block Ack. |
| Action No Ack | Action No Ack frames. |
| Delayed BlockAckReqs | In a non-HE STA: BlockAckReq frames with a TID that corresponds to an HT-delayed block ack agreement in which the BA Ack Policy subfield is equal to No Acknowledgment. |
| Data frames without HT-immediate block ack agreement | If transmitted by an HE STA to another HE STA: One or more QoS Data frames with each with different TIDs where none of the TIDs are associated with an HT-immediate block ack agreementSee NOTE 1. | Of these, at most one of the following is present in a non-DMG BSS except the transmission by an HE STA to another HE STA:* One or more QoS Data frames with the Ack Policy field equal to Implicit Block Ack Request
* A BlockAckReq frame

Of these, at most one of the following is present in a DMG BSS:* One or more QoS Data frames with the Ack Policy field equal to Implicit Block Ack Request
* QoS Null MPDU with Ack Policy set to No Ack
* A BlockAckReq frame with an optional QoS Null MPDU with Ack Policy set to No Ack

In a single TID non-ack-enabled A-MPDU context between two HE STAs at most one of the following is present:* One or more QoS Data frames with a single TID value with the Ack Policy field equal to Implicit Block Ack Request or HTP Ack or Block Ack, zero or more QoS Null frames with Ack Policy set to No Ack, and zero or more Trigger frames. The Trigger frame is one of Basic Trigger, BQRP Trigger or BSRP Trigger, where the content of all Trigger frames in the A-MPDU is the same.
* QoS Null MPDU with Ack Policy set to No Ack
* One BlockAckReq
* One or more Trigger frames. The Trigger frame is one of Basic Trigger, MU-BAR Trigger, GCR MU-BAR Trigger, BQRP Trigger, or BSRP Trigger frame where the content of all Trigger frames in the A-MPDU is the same.

In an ack-enabled A-MPDU the following is present:* One frame with a single TID value with the Ack Policy field equal to Normal Ack or HTP Ack, or one Management frame that solicits an Ack frame, at least one QoS Null frame with Ack Policy set to No Ack and and zero or more Trigger frames. The Trigger frame is one of Basic Trigger, BQRP Trigger or BSRP Trigger, where the content of all Trigger frames in the A-MPDU is the same.

In a non-ack-enabled multi-TID A-MPDU context between two HE STAs, at most one of the following is present:* Two or more QoS Data frames from two or more TIDs with the Ack Policy field equal to Implicit Block Ack Request, HTP Ack, or BlockAck, zero or more QoS Null frames with Ack Policy set to No Ack, and zero or more Trigger frames. The Trigger frame is one of Basic Trigger, BQRP Trigger or BSRP Trigger, where the content of all Trigger frames in the A-MPDU is the same.
* One Multi-TID BlockAckReq frame
* One or more Trigger frames. The Trigger frame is one of Basic Trigger frame, MU-BAR Trigger frame, GCR MU-BAR Trigger frame, BQRP Trigger frame or BSRP Trigger frame where the content of all Trigger frames in the A-MPDU is the same.
 |
| Data frames sent under an HT-immediate block ack agreement  | One or more QoS Data frames with the same TID, which corresponds to an HT-immediate block ack agreement.If transmitted by an HE STA to another HE STA: QoS Data frames with different TIDs, which correspond to multiple HT-immediate block ack agreements.See NOTE 1. |
| QoS Null MPDUs with Ack Policy set to No Ack | In a DMG BSS, QoS Null MPDUs with Ack Policy set to No Ack.In an A-MPDU between two HE STAs: QoS Null MPDUs with Ack Policy set to No Ack. |
| Immediate BlockAckReq | ~~At~~ In a single TID A-MPDU context, at most one BlockAckReq frame with a TID that corresponds to an HT-immediate block ack agreement.If transmitted by an HE STA to another HE STA: In multi-TID A-MPDU context, at most one multi-TID BlockAckReq frame with TIDs that correspond to HT-immediate block ack agreements.This frame is the last MPDU in the A-MPDU.~~It is not~~ Neither a BlockAckReq nor a Multi-TID BlockAckReq frame is present if any QoS Data frames ~~for that TID~~ are present. |
| Action | If transmitted by an HE STA to another HE STA: At most one Action frame | In an ack-enabled multi-TID A-MPDU context between two HE STAs at most one of the following is present:* Zero or more QoS Data frames from one or more TIDs with the Ack Policy field equal to Implicit Block Ack Request, HTP Ack, Normal Ack or BlockAck, zero or more QoS Null frames with Ack Policy set to No Ack, and zero or more Basic Trigger frames. There are at least two nonzero length MPDU delimiters in the A-MPDU of which at least one has the EOF field equal to 1.
* One or more Trigger frames. The Trigger frame is one of Basic Trigger, MU-BAR Trigger, GCR MU-BAR Trigger, BQRP Trigger, or BSRP Trigger frame where the content of all Trigger frames in the A-MPDU is the same.
 |
| Trigger | If transmitted by an HE STA to another HE STA: one or more Trigger frames when the A-MPDU is sent by an HE AP where the Trigger Type field is Basic Trigger, MU-BAR, or BSRP. See NOTE 2 and NOTE 3. |
| NOTE 1—~~These~~ The MPDUs from the same TID all have the Ack Policy field equal to the same value, which is either Implicit Block Ack Request, HTP Ack or Block Ack.NOTE 2—Only an AP is allowed to include a Trigger frame in the A-MPDU.NOTE 3—The BSRP and BQRP Trigger frames can be aggregated with other MPDUs in the A-MPDU if the receiver has indicated the support of receiving these trigger types in the BSRP BQRP A-MPDU Aggregation field of the HE Capabilities element. |

**27.4 HE acknowledgment procedure**

**27.4.2 Acknowledgment context in a Multi-STA BlockAck frame**

***Change as follows:***

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 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.

27.4.4 Per-PPDU acknowledgment selection rules

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

***Change as follows:***

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, 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 10.24.7.5 (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 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 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, HE SU PPDU or HE ER SU PPDU with an HE TB PPDU

***Change as follows:***

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 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 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 HTP Ack for at least one MPDU, then the STA shall respond with a Compressed BlockAck frame 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 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 a DL SU PPDU

***Change as follows:***

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 10.24.7.5 (Generation and transmission of BlockAck frames by an HT STA or DMG 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 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),
* A-MPDU operation
* Multi-TID A-MPDU and ack-enabled A-MPDU
* Ack-enabled multi-TID A-MPDU operation

***Change the 2nd paragraph as follows:***

An ack-enabled multi-TID A-MPDU is an A-MPDU that meets the following conditions:

* Contains at least one EOF-MPDU that is a QoS Data frame with Ack Policy field set to Normal Ack or HTP Ack
* Contains two or more QoS data frames with the Ack Policy field set to Normal Ack/Implicit Block Ack Request, HTP Ack or Block Ack that have different TIDs
* Does not contain a Management frame that solicits acknowledgment

NOTE—An ack-enabled multi-TID A-MPDU might include other frames, such as a Trigger frame, BlockAck frame, or QoS Null frame (see Table 9-425 (A-MPDU contents in the data enabled immediate response context)).