IEEE P802.11
Wireless LANs

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| No Acition frame in multi-TID A-MPDU |
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Abstract

Proposal to limit “multi-TID” to QoS Data frames (exclude Action frames)

# Discussion

There is no performance benefit to allowing Action frames to be aggregated with QoS Data frames and it complicates the receiver implementation:

 Ack handling

 Decryption

 Defragmentation

We propose to simplify multi-TID operation by not allowing a Management frame to be aggregated with QoS Data frames.

# Editing instructions

*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 other than an HE STA: at most one of ~~these~~ Ack and HT-immediate BlockAck MPDUs is present.In an 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 | In an HE STA: If the preceding PPDU that carried a multiple-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 BA 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 | 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 | 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 | QoS Data frames with multiple TIDs which have no HT-immediate block ack agreementSee NOTE 1. | Of these, at most one of the following is present in a non-DMG BSS except HE BSS:* 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 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 Basic Trigger frames
* One EOF-MPDU that is a QoS Data frame with the Ack Policy field set to Normal Ack or HTP Ack zero or more QoS Null frames with Ack Policy set to No Ack and zero or more Trigger frames
* One EOF-MPDU that is a Management frame that solicits acknowledgment
* One or more Basic Trigger frames and one EOF-MPDU that is a Management frame that solicits acknowledgment
* If sent in an HE TB PPDU, one EOF-MPDU that is a Management frame that solicits acknowledgement and one or more QoS Null MPDU with Ack Policy set to No Ack
* One BlockAckReq
* Basic, MU-BAR, GCR MU-BAR, BQRP, or BSRP Trigger frame only when AP transmits the A-MPDU.

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 Basic Trigger frames. There are at least two different values or TID subfield in this context.
* One Multi-TID BlockAckReq frame
* Basic Trigger frame, MU-BAR Trigger frame, GCR MU-BAR Trigger frame, BQRP Trigger frame or BSRP Trigger frame only when AP transmits the A-MPDU

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.
* If transmitted by an AP, a Basic, MU-BAR, GCR MU-BAR, BQRP, or BSRP Trigger frame.
 |
| Data frames sent under an HT-immediate block ack agreement  | QoS Data frames with the same TID, which corresponds to an HT-immediate block ack agreement.QoS Data frames with multiple 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 HE BSS, 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.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 (if present) 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 | At most one Action frame |
| Trigger | 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, Normal Ack, HTP Ack or Block Ack.NOTE 2—An AP including a Trigger frame and BlockAck frame is not required to include QoS Data in that 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**

27.4.4 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(#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 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 or HE 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(#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 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

***Change as follows:***

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 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)
* A-MPDU operation
* Multi-TID A-MPDU and ack-enabled A-MPDU
* Ack-enabled multi-TID A-MPDU operation

***Change the second paragraph as follows:***

An ack-enabled multi-TID A-MPDU is an A-MPDU that contains one of the following combinations of frames:

* One or more QoS Data frames with the Ack Policy field set to Implicit Block Ack Request, HTP Ack, or Block Ack belonging to one or more block ack agreements each carried in an A-MPDU subframe with the EOF field set to 0, and one or more QoS Data frames with the Ack Policy field set to Normal Ack or HTP Ack each with a different TID and carried in an A-MPDU subframe with the EOF field set to 1.
* Zero or more QoS Data frames with the Ack Policy field set to Implicit Block Ack Request, HTP Ack, or Block Ack belonging to one or more block ack agreements each carried in an A-MPDU subframe with the EOF field set to 0, and two or more QoS Data frames with the Ack Policy field set to Normal Ack or HTP Ack each from different TID and carried in an A-MPDU subframe with the EOF field set to 1.

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)).