IEEE P802.11
Wireless LANs

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| BAR Ack Policy: HTP Ack |
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Abstract

Modify the BAR Ack Policy field encoding for HT-immediate block ack so that responder knows whether the response is expected in HE TB PPDU or some other PPDU.

# Revision History

R0

Introduce the concept and motivation. Discuss whether we need a capability bit.

# Discussion

To flush the recipient reorder buffer when a hole is created from the originator discarding an unacknowledged data frame, the originator must send a BAR frame (at least under certain cercumstatnces). However, the spec currently does not allow Basic Trigger + BAR so the originator must send an MU-BAR Trigger frame for a triggered response:

It would be beneficial if the originator could send Basic Trigger + BAR:

This greatly simplifies the hardware needed to generate an MU PPDU: each A-MPDU has a Trigger frame of equal lengh that differs only in the addressing and User Info field content. There is no coupling between the Trigger frame format and the content of the A-MPDU (BAR or QoS Data).

Cascading is currently not supported with the MU-BAR Trigger frame since the MU-BAR Trigger frame does not carry information necessary for cascading (specficically, the TID Aggregation Limit field > 0 that indicates that UL can include QoS Data frames). Allowing Basic Trigger + BAR solves this problem:

Multi-TID aggregation is also currently not supported with MU-BAR Trigger frame since it is not permitted to aggregate QoS Data frames with an MU-BAR Trigger frame. Thus an AP cannot shift the block ack window for one TID and send QoS Data for another TID. The AP would have to do this in separate exchanges.

If Basic Trigger + BAR is allowed then this case is handled by extension:

Supporting Basic Trigger + BAR means that the same sequences used for both MU and SU with the only difference being the presence of absence of the Basic Trigger frame:


# Proposal

To support BAR in this manner we need two changes to the draft specification:

* The response to a BAR frame is a BlockAck frame, however the PPDU in which it is sent depends on whether or not a Trigger frame is present in the A-MPDU. If a Trigger frame is present but not received then the recipient may incorrectly respond with a PPDU that is not an HE TB PPDU. To fix this we need something similar to the HTP Ack setting in the Ack Policy subfield of the QoS Data frame.
* The rules need to change to allow Trigger + BAR

The rules for multi-TID should also be updated to describe options for including BAR for 1 TID along with QoS Data frames for another TID, however, this is left to a future contribution.

# Editing instructions

9.3.1.8 BlockAckReq frame format9.3.1.8.1 Overview

*Change as follows:*

For BlockAckReq frames sent under Delayed and HT-delayed agreements, the BAR Ack Policy subfield of
the BAR Control field has the meaning shown in Table 9-21. For BlockAckReq frames sent by an HE STA under HT-immediate agreements, the BAR Ack Policy subfield of the BAR Control field has the meaning shown in Table 9-21a. For BlockAckReq frames sent by non-HE STAs under other types of agreement, the BAR Ack Policy subfield is reserved.

**Table 9-21—BAR Ack Policy subfield for a BlockAckReq frame sent under Delayed and HT-delayed aggreements**

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| --- | --- |
| **Value**  | **Meaning** |
| 0  | Normal Acknowledgment.The BAR Ack Policy subfield is set to this value when the sender requires immediate acknowledgment.The addressee returns an Ack frame.See 10.29.2.7.The value 0 is not used in frames transmitted by a DMG STA. |
| 1  | No Acknowledgment.The addressee sends no immediate response upon receipt of the frame.The BAR Ack Policy subfield is set to this value when the sender does not require immediateacknowledgment.The value 1 is not used in a Basic BlockAckReq frame outside a PSMP sequence.The value 1 is not used in an Multi-TID BlockAckReq |

**Table 9-21a—BAR Ack Policy subfield for a BlockAckReq frame sent under HT-immediate aggreements**

|  |  |
| --- | --- |
| **Value**  | **Meaning** |
| 0  | Normal Acknowledgment.The BlockAck frame response is sent in a PPDU that is not an HE TB PPDU. |
| 1  | HTP Ack.The BlockAck frame response sent in an HE TB PPDU. |

* A-MPDU contents

***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 agreement See NOTE 1. | When transmitted by an non-HE non-DMG STA, at most one of the following is present:* One or more QoS Data frames with the Ack Policy field equal to Implicit Block Ack Request
* A BlockAckReq frame

When transmitted by a DMG STA, at most one of the following:* 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

When transmitted by an HE STA, the conditions for including these frames in an A-MPDU are defined in 27.4 (Block acknowledgement), 27.5 (MU operation) and 27.10 (A-MPDU operation). |
| 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 most one BlockAckReq frame with a TID that corresponds to an HT-immediate block ack agreement.This is the last MPDU in the A-MPDU.It is not present if any QoS Data frames for that TID are present.At most one of the following cases:* Multi-TID BlockAckReq frame with TIDs that correspond to an HT-immediate block ack agreement. This is after data and management frames in the A-MPDU.
* This is the last MPDU in the A-MPDU
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| Action | At most one Action frame |
| Trigger | One or more Trigger frames where the Trigger Type field is Basic Trigger, MU-BAR, or BSRP. See NOTE 2 |
| 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 (Ack Request), HTP Ack(#4723) 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 |

**27.4 Block acknowledgement
27.4.1 Overview**

***Insert the following:***

An HE STA that sends a BlockAckReq frame sent under an HE-immediate block ack agreement in an A-MPDU that includes a Trigger frame shall set the Ack Policy subfield of the BAR Control field to HTP Ack. Otherwise, an HE STA that sends a BlockAckReq frame under an HE-immediate block ack agreement shall set the Ack Policy subfield of the BAR Control field to Normal Acknowledgement.

An HE STA that receives an A-MPDU that contains a BlockAckReq frame sent under an HE-immediate block ack agreement and that has the Ack Policy subfield of the BAR Control field equal to HTP Ack shall not respond unless the A-MPDU includes a Trigger frame.