IEEE P802.11
Wireless LANs

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| Comment resolutions for MPDU start spacing (A-MPDU content section 10.13) |
| Date: 2017-02-22 |
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Abstract

This submission proposes resolutions for multiple comments related to TGax D1.0 with the following CIDs:

* 5050 (1 CID)

Revisions:

* Rev 0: Initial version of the document.

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** | **clause** | **Comment** | **Proposed Change** | **Resolution** |
| 5050 | Chunyu Hu | 10.13 | In IEEE 802.11-2016 publication, 10.13.3, page 1368, it's stated that QoS Null frame transmitted by DMG STA are not subject to this spacing, i.e., no MPDU delimiters with zero length need to be inserted after the MPDU immediately preceding the QoS Null frame in an A-MPDU. 11ax allows certain control and management frames to be aggregated with DATA frames. BAR/ACK/BA/MBA/Action/Trigger frame in A-MPDU doesn't need to comply the minimum MPDU spacing time following this QoS-Null example. | Shuold be ammended to 10.13 | Accepted-TGax editor to make the changes shown in 11-17/0363r0 under all headings that include CID 5050. |

## Discussion:

A-MPDU aggregation was introcued by 802.11n for throughput improvement. At the same time, the MPDU spacing constraint was introduced to the standard to prevent an overflow at a recipient that might occur because of the overhead of per-MPDU processing of short MPDUs. I.e. while the receive processing capability of an implementation should match or exceed the maximum supported receive PHY rate, there can be receive processing steps that are performed at the start and end of each MPDU reception that create a minimum per-MPDU processing delay which is lower than the maximum supported receive PHY rate for very short MPDUs.

The original A-MPDU aggregation rules allowed for some control MPDUs to be aggregated with DATA-bearing MPDUs and 802.11ax further enhanced A-MPDU aggregation by allowing additional control MPDUs to be aggregated (e.g. trigger frame and M-BA). This enhancement exists to reduce the number of IFSs between within a sequence of MPDU transmissions for DL/UL MU operations so that system throughput is improved. However throuput performance may be compromised because the MPDU delimiter padding requirement is generically specified, even though control MPDU processing time is probably less than DATA PPDU processing, where decryption tends to dominate the processing delay.

Trigger frames already have a separate timing constraint which may be achieved using trigger padding or MPDU delimiters.

In general, MPDU type, encryption/decription and Ack policy all need to be considered to determine if any extra processing time is needed at the receiver. For example, Ack/BlockAck/Multi-STA BlockAck need no decryption and require no response to be generated and therefore the processing dely for these MPDUs is relatively short.

Therefore, we propose that Trigger frames and Ack/BlockAck/Multi-STA BlockAcks should be exmempted from the MPDU spacing constraint. We also propose that Management frame should be exmempted from the MPDU spacing constraint because the processing delay for a Management frame due to decryption can be absorbed by multiple data MPDUs that are aggregated in the same A-MPDU.

10.13 A-MPDU operation

10.13.3 Minimum MPDU Start Spacing field

**TGax Editor: *Change the following paragraphs below of this subclause as follows (#CID 5050):***

If the recipient of an A-MPDU is a non-HE STA, A STA shall not start the transmission of more than one MPDU within the time limit described in the Minimum MPDU Start Spacing field declared by the intended receiver. If the recipient of an A-MPDU is a HE STA, A HE STA shall not start the transmission of more than one QoS Data frame or Management frame within the time limit described in the Minimum MPDU Start Spacing field declared by the intended receiver. To satisfy this requirement, the number of octets between the start of two consecutive MPDUs in an A-MPDU, measured at the PHY SAP, shall be equal to or greater than

$$t\_{MMSS}×r/8$$

where

$t\_{MMSS}$

is the time (in microseconds) defined in the “Encoding” column of Table 9-163 (Subfields of the A-MPDU Parameters field) for an HT STA, ~~and~~ of Table 9-229 (Subfields of the A-MPDU Parameters subfield) for a DMG STA for the value of the Minimum MPDU Start Spacing field~~.~~, and of Table 9-163 and Table 9-25h for a HE STA.

$$r$$

is the value of the PHY Data Rate (in megabits per second) defined in 19.5 (Parameters for HT MCSs) for HT PPDUs, in 21.5 (Parameters for VHT-MCSs) for VHT PPDUs, ~~and~~ in Clause 20 (Directional multi-gigabit (DMG) PHY specification) for a DMG STA, and in Clause 28 (HE PHY specification) for a HE STA.

If necessary, in order to satisfy this requirement, a STA shall add padding between MPDUs in an A-MPDU. Any such padding shall be in the form of one or more MPDU delimiters with the MPDU Length field set to 0.

QoS Null frames transmitted by DMG STAs are not subject to this spacing, i.e., no MPDU delimiters with zero length need to be inserted after the MPDU immediately preceding the QoS Null frame in an A-MPDU.