IEEE P802.11
Wireless LANs

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| Resolution for CID on UL OFDMA-based Random Access |
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Abstract

This submission proposes resolutions of comments received from TGax LB225. (The proposed change is based on TGax Draft 1.0.)

* CIDs: 5036, 7254, 7546, 8140, 8520, 8527 8157 9332 9119 9120(10 CIDs)

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Minor change.

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** | **Clause** | **Page No.** | **Comment** | **Proposed Change** | **Resolution** |
| **5036** | 27.5.2.6.2 | 173.61 | It is mentioned that the acknowledgement procedure for random access is as defined in10.3.2.10.3; however, for an unassociated STA, due to its absence of an AID, may not beacknowledged as similar to an associated STA; | Suggest to define an MU acknowledgement procedure for unassociated STAsusing UL OFDMA-based random access, following a definition of an AID for theTBD in Subclause 27.5.2.3. | RevisedAgree with the comment. Proposed resolution accounts for the suggested changeTGax editor please make the changes as shown in 11-17/0395 r1 |
| **7254** | 27.5.2.6.2 | 173.64 | Acknowledgment procedure in response to the OFDMA random access request from unassociated STAs needs to be specified. | As in the comment | RevisedAgree with the comment. Proposed resolution accounts for the suggested changeTGax editor please make the changes as shown in 11-17/0395 r1 |
| 7546 | 27.5.2.6.2 | 173.62 | It is not clear how STA without AID could participate the UL MU ack procedure in 10.3.2.10.3. | describe specifically how STA without AID acquires its ack following the procedure in 10.3.2.10.3, when there are multiple acks to multiple STA without AID | RevisedAgree with the comment. Proposed resolution accounts for the suggested changeTGax editor please make the changes as shown in 11-17/0395 r1 |
| 8140 | 27.5.2.2.1 | 164.47 | Random Access UL OFDMA for unassociated STAs is mentioned here, but how does such a STA recognize the DL OFDMA response? Such a STA needs some sort of AID value to identify its DL RU allocation - the text refers me to 27.5.2.6 but there is nothing here mentioning what to do for unassociated STA, while over in 27.5.2.3, there is a TBD in a sentence that refers to unassociated STA | Define the rules for unassociated STA operation within UL OFDMA Random Access | RevisedAgree with the comment. Proposed resolution accounts for the suggested changeTGax editor please make the changes as shown in 11-17/0395 r1 |
| 8520 | 27.5.2.6.2 | 173.01 | The UL OFDMA-based random access procedure for unassociated STAs is not defined | Define | RevisedAgree with the comment. Proposed resolution accounts for the suggested changeTGax editor please make the changes as shown in 11-17/0395 r1 |
| 8527 | 27.5.2.6 | 174.20 | Random access behavior for unassociated STAs is not defined | Define behavior for unassociated STAs | RevisedAgree with the comment. Proposed resolution accounts for the suggested changeTGax editor please make the changes as shown in 11-17/0395 r1 |
| 8157 | 9.3.1.9.7 | 38.04 | Now Multi-STA BlockAck can not be used to acknowledge the association request frame because of unassociated STA is not assigned an AID | define a common special AID for all the unassociated STAs such that they can parse the M-BA frame correctly | RevisedAgree with the comment. Proposed resolution accounts for the suggested changeTGax editor please make the changes as shown in 11-17/0395 r1 |
| 9332 | 172.25 | 27.5.2.6 | Currently, it is considered that both the associated STAs and unassociated STAs are allowed to join the UL OFDMA-based random access. However, the real state that the STA is in and the state that the AP thinks the STA is in according to the association may be different. This is because there is no complete mechanism for the AP to syncrhonize with the STA. Therefore, when the AP acknowledges to those STAs that the AP thinks they are still associated with the Multi-STA BlockAck, some of the STAs that already disassociated may not distinguish the AIDs that the AP used for those STAs. The opposite perception gap may also occur. And as the unassociated STAs don't have their AIDs assigned, the AP can't acknowledge those unassociated STAs with the regular Multi-STA BlockAck procedure. | If both the associated STAs and unassociated STAs are handled together in the UL OFDMA-based random access, the way to solve the problems described in the comment will be to have the STAs responding to the UL OFDMA-based random access to set their AIDs if they are associated and temporary AIDs if they are unassociated in the Duration/ID field of the MPDUs. The temporary AIDs will be selected randomly from the range other than the one for AIDs. The AP will use the AIDs and/or temporary AIDs set in the Duration/ID fields for the Multi-STA BlockAck to respond to those transmission sent through UL OFDMA-based random access. For the probability of temporary AIDs colliding, as the unassociated STAs will only transmit management request frames and have timeout to wait for management response frames, the unassociated STAs can solve by themselves.The other way will be to divide the STAs to those associated and unassociated for the UL OFDMA-based random access. Specify in the Trigger frame such as AID=0 for only the associated STAs and AIDs with special values to allocate random access RUs for the unassociated STAs. The special AID values are assigned to each of the RUs and the AP will use that special AIDs when acknowledging with the Multi-STA BlockAck. The AP will acknowledge with the regular Multi-STA BlockAck procedure for the STAs that accessed in the "associated" RUs. But with this method, the behavior at the AP has to be different for the "associated" RUs and "unassociated" RUs. So, only assigning random access RUs to unassociated STAs may make the mechanism more simple. | RevisedAgree with the comment. Proposed resolution accounts for the suggested changeTGax editor please make the changes as shown in 11-17/0395 r1 |
| 9119 | 295.18 | 28.3.10.8.5 | In this spec, STAID 0 is only for broadcast frame. If an AP want to send a data or management frame to an unassociated STA, STA-ID field in HE-SIG-B would be 0 because the receiver STA doesn't have an AID yet. In this case, all stations near the AP will decode this frame unnessocery becase its STA-ID field is 0. It is desirable to avoid. | Define broadcast STAID value for unassociated STA only | RevisedAgree with the comment. Proposed resolution accounts for the suggested change.Assign a Pre-AID to an unassociated STA to join the MU transmissionTGax editor please make the changes as shown in 11-17/0395 r1 |
| 9120 | 163.09 | 27.5.1.2 | In this spec, STAID 0 is only for broadcast frame. If an AP want to send a data or management frame to an unassociated STA, STA-ID field in HE-SIG-B would be 0 because the receiver STA doesn't have an AID yet. In this case, all stations near the AP will decode this frame unnessocery becase its STA-ID field is 0. It is desirable to avoid. | Define broadcast STAID value for unassociated STA only | RevisedAgree with the comment. Proposed resolution accounts for the suggested change.Assign a Pre-AID to an unassociated STA to join the MU transmissionTGax editor please make the changes as shown in 11-17/0395 r1 |

**Discussion: *…***

**TGax Editor*: Please modify 9.3.1.9.7 (Multi-STA BlockAck variant) of 11ax Draft 1.0 as follows (#***5036, 7254, 7546, 8140, 8520, 8527 8157 9332 9119 9120***):***

##### 9.3.1.9.7 Multi-STA BlockAck variant

The format defined below is used for multi-STA multi-TID, and multi-STA single TID BlockAck variant. Multi STA BA frames shall be supported if either UL MU or multi-TID A-MPDU operation is supported.

The TID\_INFO subfield of the BA Control field of the Multi-STA BlockAck frame is reserved.

The BA Information field of the Multi-STA BlockAck frame comprises one or more Per STA Info subfields. The Per STA Info subfield without a value 2045 in the AID subfield of Per AID TID Info subfield is shown in Figure 9-38a (Per STA Info subfield format without a value 2045 in the AID subfield of Per AID TID Info subfield).

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
|  | Per-AID TID Info | Block Ack Starting Sequence Control | Block Ack Bitmap |
| Octets | 2 | 0 or 2 | 0, 4, 8, 16, or 32 |

Figure 9‑38a - Per STA Info subfield format without a value 2045 in the AID subfield of Per AID TID Info subfield

The Per STA Info subfield with a value 2045 AID subfield of Per AID TID Info subfield is shown in Figure 9-38x (Per STA Info subfield format with a value 2045 AID subfield of Per AID TID Info subfield).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  | Per-AID TID Info | Block Ack Starting Sequence Control (0) | Reserverd | RA |
| Octets | 2 |  2 |  2 | 6 |

Figure 9‑38x - Per STA Info subfield format with a value 2045 in the AID subfield of Per AID TID Info subfield

Where Block Ack Starting Sequence Control subfield is set to 0 and RA subfield indicates the MAC address of an unassociated STA for which the Per STA Info subfield is intended.

The Per AID TID Info subfield is shown in Figure 9-38b (Per AID TID Info subfield format).

|  |  |  |  |
| --- | --- | --- | --- |
|  | B0 B10 | B11 | B12-B15 |
|  | AID11 | ACK Type | TID |
| Bits | 11 | 1 | 4 |

Figure 9‑38b - Per AID TID Info subfield format

Where a value 2045 in the AID11 subfield is used as an unique identifier for any unassociated STA. Ack Type subfield and TID subfield are set to 0 and 15, respectively, when AID11 subfield is set to 2045.

When Multi-STA BlockAck variant is intended for a non-AP STA, the AID subfield carries the AID of the non-AP STA for which the Per STA Info field is intended. When Multi-STA BlockAck variant is intended for an AP, the AID field is set to 0.

NOTE—One or more Per STA Info subfields with same value of the AID subfield and different values of the TID subfields can be present in the Multi-STA BlockAck frame.

The TID field contains the TID for which the acknowledgement or block acknowledgement contained in the Per AID TID Info subfield applies.

NOTE—When Multi-STA BlockAck is used to acknowledge a management frame, the TID value is set to 15.

If the ACK Type field is 1 and the TID value of the Per AID TID Info subfield is smaller than 8 or equal to 15, then the Block Ack Starting Sequence Control and Block Ack Bitmap fields are not present and the Per STA Info field indicates the acknowledgement of successful reception of a single MPDU indicated by TID of the Per AID TID Info subfield. If the ACK Type field is 1 and the TID value of the Per AID TID Info subfield is set to 14, then the Block Ack Starting Sequence Control and Block Ack Bitmap are not present and the Per STA Info field indicates the acknowledgement of successful reception of all the MPDUs carried in the eliciting A-MPDU. The Ack Type field is not set to 1 when responding to a BlockAckReq frame or an MU-BAR. If the ACK Type subfield is 0 and the TID value of the Per AID TID Info subfield is smaller than 8, then the Block Ack Starting Sequence Control and Block Ack Bitmap fields are present. If the ACK Type subfield is 0 and the TID value of the Per AID TID Info subfield is set to 15, then the Block Ack Starting Sequence Control, 2 bytes reserved and RA fields are present.

The context and the presence of each optional subfields in a Per STA Info subfield in a Multi-STA BlockAck frame is as defined in Table 9-24b (Context of the Per STA Info subfield and presence of optional subfields).

Table 9-24b—Context of the Per STA Info subfield and presence of optional subfield

|  |  |  |  |
| --- | --- | --- | --- |
| **Ack Type subfield value** | **TID subfield value** | **Presence of optional subfields in the Per STA Info field** | **Context of a Per STA Info field in a MultiSTA BlockAck frame** |
| 0 | 0-7 | Block Ack Starting Sequence Control | Present | Block acknowledgment context: Sent as a response to an A-MPDU that solicits an immediate block acknowledgement or to a BAR frame |
| Block Ack Bitmap | Present |
| 1 | 0-7 | Block Ack Starting Sequence Control | Not present | Acknowledgment context: Sent as a response to an MPDU or VHT Single MPDU that solicits an immediate acknowledgment |
| Block Ack Bitmap | Not present |
| 0 or 1 | 8 to 13 | N/A | N/A | Reserved |
| 0 | 14 | N/A | N/A | Reserved |
| 1 | 14 | Block Ack Starting Sequence Control | Not present | All block acknowledgment context: Sent as a response to an A-MPDU that solicits an immediate response and all MPDUs contained in the A-MPDU are received successfully |
| Block Ack Bitmap | Not present |
| 0 | 15 |  Block Ack Starting Sequence Control (0) |  Present | Request management frame sended by unassociated non-AP STA acknowledgment context:Sent as a response to a request management frame in S-MPDU that solicits an immediate acknowledgment |
| 2 bytes reserved | Present |
| RA | Present |
| 1 | 15 | Block Ack Starting Sequence Control | Not present | Action Ack frame acknowledgment context: Sent as a response to an Action Ack frame carried in an A-MPDU that solicits an immediate acknowledgment |
| N/A | Not present |

**27.4 Block acknowledgement**

**27.4.1 Overview**

**TGax Editor*: Please modify subsection 27.4.1 (Overview) of 11ax Draft 1.0 as follows (#***5036, 7254, 7546, 8140, 8520, 8527 8157 9332 9119 9120***):***

An HE STA can use Compressed BlockAck frame or Multi-STA BlockAck frame after setting up a block ack agreement. An HE STA shall support generation of Compressed BlockAck frames if HT-immediate BA is supported in the role of recipient (see 10.24.7.1 (Introduction). An HE STA shall support generation of Multi-STA BlockAck frame if either UL MU operation (see 27.5.2 (UL MU operation)) or multi-TID AMPDU operation (27.10.4 (A-MPDU with multiple TIDs)) is supported in the role of recipient.

An HE non-AP STA that sends a Multi-STA BlockAck frame shall set the AID subfield in the Per STA Info field of the Multi-STA BlockAck frame to 0 and the RA field to the BSSID when the intended receiver of the frame is the AP，and shall set the AID subfield in the Per STA Info field of the Multi-STA BlockAck frame to 2045 when the intended receiver of the frame is the unassociated HE STA. When sending Multi-STA BlockAck frame, the HE STA shall transmit the Multi-STA BlockAck using one of rate, MCS, NSS that all of the acknowledgement receivers support.

An HE STA may send a Multi-STA BlockAck frame in response to an HE trigger-based PPDU. A Multi- STA BlockAck frame contains one or more BA Information fields with one or more AIDs and one or more different TIDs. An HE AP that transmits a Multi-STA BlockAck frame with different AID subfield values shall set the RA field to the broadcast address. An HE AP that transmits a Multi-STA BlockAck frame with a single AID subfield or with the same values of the AID subfield in Per STA Info subfields shall set the RA field to the address of the recipient STA that requested the Block Ack or to the broadcast address. An HE non-AP STA shall transmit a Multi-STA BlockAck frame with a single AID subfield or with the same values of the AID subfield in Per STA Info subfields and shall set the RA field to the address of the recipient STA that requested the Block Ack frame.

An HE STA that supports Multi-STA BlockAck shall examine each received Multi-STA sent by an STA with which it has a BA agreement. On receiving such a Multi-STA BlockAck frame a STA performs the following for each BA Information field with its AID:

— If the Ack Type field is 0 then the Block Ack Starting Sequence Control, TID and Block Ack Bitmap fields of the STA Info field are processed according to 10.24.7 (HT-immediate block ack extensions) and 27.3 (Fragmentation) when the TID field is set to less than 8.

— If the Ack Type field is 0, then RA is the MAC address of an unassociated STA for which the Per STA Info subfield is intended when the the TID field is set to 15.

— If the Ack Type field is 1, then the STA Info field indicates either the acknowledgement of a single MPDU identified by the value of the TID or of all MPDUs carried in the eliciting PPDU, when the TID field is set to 14.

**27.4.2** **Acknowledgement, block acknowledgment or all acknowledgement selection in a Multi-STA BlockAck frame**

**TGax Editor*: Please modify subsection 27.4.2 (Acknowledgement, block acknowledgment or all acknowledgement selection in a Multi-STA BlockAck frame ) of 11ax Draft 1.0 as follows (#***5036, 7254, 7546, 8140, 8520, 8527 8157 9332 9119 9120***):***

A recipient sets the Ack Type and TID subfields in a Per AID TID Info field of the Multi-STA BlockAck frame sent as a response depending on the acknowledgement context.

a) All Ack context: if the originator had set the All Ack Support subfield to 1 in the HE Capabilities element, then the recipient may set the Ack Type field to 1 and the TID subfield to 14 to indicate the successful reception of all the MPDUs intended to it carried in the eliciting A-MPDU or multi-TID A-MPDU only. 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 STA Info field addressed to an orig-inator in the Multi-STA BlockAck frame.

a) Pre-association Ack context: if the originator had set the OFDMA RA Support subfield to 1 in the HE Capabilities element, then the recipient shall set the Ack Type field to 0 and the TID subfield to 15 to indicate the successful reception of MMPDU sent by the unassociated HE STA.

b) Ack context: A recipient receiving a single MPDU, that requires an acknowledgment, shall set the Ack Type field to 1 and the TID field to the TID value of that MPDUs to indicate the successful reception of that MPDU. 

If multiple single MPDUs in a Multi-TID A-MPDUs are received by a recipient that supports its reception, the Multi-STA BlockAck frame may contain multiple occurrences of these Per STA Info fields that are intended to an originator, one for each successfully received single MPDU requesting an acknowledgment. 

The allowed values for the TID field in this context are 0 to 7 (for indicating acknowledgement of QoS Data or QoS Null frames) or 15 (for indicating acknowledgement of an Action frame or a request management frame sent by the unassociated HE STA, e.g., Probe Request).

c) BlockAck context: The recipient shall set the Ack Type field to 0 and the TID field of a Per STA Info field to the TID value of MPDUs requesting block acknowledgement that are carried in the elic-iting A-MPDU or multi-TID A-MPDU.

The Multi-STA BlockAck frame may contain multiple occurrences of these Per STA Info fields addressed to an originator, one for each MPDU that is requesting block acknowledgement, 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 27.3 (Fragmentation) 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 acknowledge-ment of QoS Data frames).

Variable bitmap lengths can be included in the Per STA Info field when the originator and recipient negotiate their use as defined in 27.4.3 (Negotiation of block ack bitmap lengths).

An originator shall examine each received Multi-STA BlockAck frame sent by an STA as a response to a soliciting PPDU.

Upon reception of the Multi-STA BlockAck frame the originator performs the following operations for each Per STA Info field that has an AID field addressed to the originator (i.e., the AID subfield is an AID if the originator is a non-AP STA and is 0 when the originator is an AP and is 2045 when the originator is an unassociated HE STA):

 — If the Ack Type field is 0 and the TID subfield of Per AID TID Info field is less than 8 then the BlockAck Starting Sequence Control, TID and BA Bitmap fields of the Per STA Info field are processed according to 10.24.7 (HT-immediate block ack mechanism), 27.3 (Fragmentation), and as defined below.

— If the Ack Type field is 0 and the TID subfield of Per AID TID Info field is 15, then the Per STA Info field indicates the acknowledgement of a single MMPDU sent by the unassociated STA as defined by the acknowledgement context.

 — If the Ack Type field is 1 and the TID subfield of Per AID TID Info field is less than 8 then the Per STA Info field indicates either the acknowledgement of a single MPDU identified by the value of the TID.

— If the Ack Type field is 1 and the TID subfield of Per AID TID Info field is 14, then the Per STA Info field indicates the acknowledgement of all MPDUs carried in the eliciting PPDU as defined by the acknowledgement context.

**TGax Editor*: Please add subsection 27.17 (Pre-AID assignment for unassociated STA) of 11ax Draft 1.0 as follows (#***5036, 7254, 7546, 8140, 8520, 8527 8157 9332 9119 9120***):***

**27.17 Pre-AID assignment for unassociated STA**If the received the request manage frame carries the Pre-AID Assignment element sent by the unassociated STA, then the AP shall include the Pre-AID Assignment element in the solicited response management frame except for association response frame. Otherwise, the AP shall not include the Pre-AID Assignment element in the solicited response management frame. HE AP may assign the Pre-AID to the unassociated HE STA through Pre-AID Assignment element. The assigned Pre-AID is automatically released once the association procedure is completed or Pre-AID Lifetime Timer expires. The Pre-AID and the Pre-AID Lifetime Timer are defined in the Pre-AID Assignment element. The solicited response management frame which carries the Pre-AID Assignment element shall not be transmitted in HE MU PPDU.

Before the Pre-AID Lifetime Timer expires, the AP may use the assigned pre-AID for the unassociated non-AP HE STA to transmit the HE trigger-based PPDU solicited by the Trigger frame or receive a frame in the HE MU PPDU.

**TGax Editor*: Please add the subsection 9.4.2.227 (Pre-AID assignment element) of 11ax Draft 1.0 as follows (#***5036, 7254, 7546, 8140, 8520, 8527 8157 9332 9119 9120***):***

**9.4.2.227 Pre-AID Assignment element**

The Pre-AID Assignment element is used to assign the pre-AID to the unassociated STA. The Pre-AID Assignment element may be included in the Request management frame (e.g., Probe Request) and the solicited Response management frame (e.g., Probe Response). The format of the Pre-AID Assignment element is defined in Figure 9-589de (Pre-AID Assignment element).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Element ID | Length | Element ID Extension | Pre-AID Request /Response | Pre-AID | Reserved | Pre-AID Lifetime Timer |
| Bits: | 8 | 8 | 8 | 1 | 11 | 4 | 16 |

**Figure 9-589de—Pre-AID Assignment element**

The Element ID, Element ID extension and Length fields are defined in 9.4.2.1 (General).

The Pre-AID Request/Response field indicates whether the element is for Request or Response frame. If the value is set to 0 (i.e., indicating Pre-AID Request), the Pre-AID field and the Pre-AID Lifetime Timer field are reserved.

The Pre-AID field indicates the pre-AID assigned by the AP to the unassociated STA identified by the MAC address in the Response management frame. The value is randomly selected from a set of AIDs which are not assigned to the associated STAs.

The Pre-AID Lifetime Timer indicates a timer after which the pre-AID assigned to an unassociated STA will expire. The unit of the timer is expressed in 1 TU.

**TGax Editor*: Please add the subsection 27.5.2.6.4 (Acknowledgement for random access) of 11ax Draft 1.0 as follows (#***5036, 7254, 7546, 8140, 8520, 8527 8157 9332 9119 9120***):***

**27.5.2.6.4 Acknowledgement for random access**

If the received request management frame, such as Probe Request frame, Authentication Request frame, Association Request frame, sent by the unassociated non-AP HE STA through OFDMA random accss, AP shall respond with the Multi-STA BlockAck Frame.