IEEE P802.11  
Wireless LANs

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| Fragmentation – 25.3.3 – Part I | | | | |
| Date: 2016-07-10 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Alfred Asterjadhi | Qualcomm Inc. | 5775 Morehouse Dr, San Diego, CA 92109 | +1-858-658-5302 | aasterja@qti.qualcomm.com |
| Abhishek Patil | Qualcomm Inc. |  |  | appatil@qti.qualcomm.com |
| Ming Gan | Huawei |  |  | ming.gan@huawei.com |
| Mark Rison | Samsung |  |  | m.rison@samsung.com |
| Laurent Cariou | Intel |  |  | laurent.cariou@intel.com |
| Woojin Ahn | Wilus |  |  | woojin.ahn@wilusgroup.com |
| Narendar Madhavan | Toshiba |  |  | narendar.madhavan@toshiba.co.jp |

Abstract

This submission proposes resolutions for multiple comments related to TGax D0.1 with the following CIDs:

* 1482, 1481, 1480, 1479, 1478, 1476, 1475, 1474, 1473, 30, 1225, 1486, 967, 750, 697, 696, 1793, 424, 167, 2629, 2628, 2627, 2626, 2269, 1484, 1485, 1794, 1662, 1487, 2197, 2464, 2465, 1470, 165, 1217 (**35 CIDs**)

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.***

# PARS I (General)

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| **CID** | **Commenter** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 1482 | Mark RISON | 54.61 | "The receiver STA may support the concurrent reception of dynamic fragments" -- well no, if it declared the support per the rules in the previous subclause, then it shall support | Change to "shall" and add something about "as indicated in the blahblah field of its HE Capabiltiies element" | Revised –  Agree in principle with the comment. Proposed resolution accounts for the suggested changes.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 1482. |
| 1481 | Mark RISON | 54.55 | dot11DynamicFragmentation is not defined in C.3 and anyway it's the wrong way round: dot11DynamicFragmentation should indicate the device capabilities and the SME should decide what to advertise in the HE Capabilities | As it says in the comment | Revised –  Agree in principle with the comment. Proposed resolution clarifies this ambiguity and adds the respective text in Annex C.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 1481. |
| 1480 | Mark RISON | 54.49 | "as determined by the value of the HE Fragmentation Support field of the HE Capabilities element sent by the receiver STA" -- ah, so "A-MPDU format" refers to the contents of the A-MPDU? | Reword to be clearer (or delete the whole para; perhaps line 24 could say something like "a dynamic fragment shall not be transmitted except when the following conditions apply") | Revised –  Agree in principle with the comment. Proposed resolution accounts for the suggested changes.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 1480. |
| 1479 | Mark RISON | 54.48 | "that are carried in an A-MPDU format that is not supported by the receiver STA" -- what does this mean? There is only one A-MPDU format (see baseline) | Delete this text (or the whole para) | Revised –  That particular portion of the paragraph is removed due to the proposed comment resolution for CID 1480. To answer the question of the commenter: The intention of that statement is to differentiate between a VHT single MPDU and an A-MPDU format.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 1479. |
| 1478 | Mark RISON | 54.46 | "An HE STA shall not transmit a PSDU that contains dynamic fragments of an MSDU or MMPDU whose number is greater than the maximum number of fragments" -- what is the maximum number? 16? | Delete this text (or the whole para) | Revised –  That particular portion of the paragraph is removed due to the proposed comment resolution for CID 1480. To answer the question of the commenter: The intention of that statement is to differentiate between an A-MPDU that carries up to one dynamic fragment for each MSDU and an A-MPDU that carries up to four fragments for each MSDU.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 1478. |
| 1476 | Mark RISON | 54.31 | "Up to one dynamic fragment for each MSDU in an A-MPDU" -- what about MMPDUs? Similarly for the next bullet | Change to "each MSDU and each MMPDU", and similarly tweak Table 9-ax13; similarly for the next bullet | Revised –  MMPDUs cannot be acknowledged using a Blockack frame. We do have a means of acknowledging an MMPDU carried in a multi-TID A-MPDU by using a special TID of 15 in the M-BA to specify that that particular BA Information field carries an Ack for that MGMT frame carried in the soliciting A-MPDU . The proposed resolution clarifies these parts by referring to the subclauses where the generation of these types of A-MPDUs will be described.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 1476. |
| 1475 | Mark RISON | 54.31 | "Up to one dynamic fragment for each MSDU in an A-MPDU" -- what does this mean? If the MSDU is fragmented there isn't necessarily an MSDU in the A-MPDU; similarly for the next bullet | Change to "Up to one dynamic fragment for each MSDU (or fragment thereof) in an A-MPDU"; similarly for the next bullet | Revised –  Proposed resolution clarifies that the dynamic fragment refers to that of an MSDU or MMPDU.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 1475. |
| 1474 | Mark RISON | 54.26 | MPDU that contains "One dynamic fragment of an MSDU or MMPDU in a VHT single MPDU" -- an MPDU does not contain anything in a VHT single MPDU | Split into two sentences: "One dynamic fragment. This dynamic fragment is sent in a VHT single MPDU." Or make the second sentence the first subbullet | Revised –  Proposed resolution clarifies that the terminology refers to the two different formats of the A-MPDU.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 1474. |
| 1473 | Mark RISON | 54.24 | A-MPDUs are not individually-addressed, MPDUs are | Delete "(A)-" | Revised –  Deleting (A-) is incorrect since an MPDU cannot carry multiple fragments as listed in the itemized list. The proposed resolution is to remove “individually addressed” since fragments are already specified as portions of individually addressed MSDUs or MMPDUs (please refer to 10.5 (Fragmentation).  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 1473. |
| 30 | Ahmadreza Hedayat | 54.21 | Not sure if elsewhere a lower limit is defined for dynamic fragment, but certainly the benefits of having no lower-limit as in "The length of each fragment may be of any nonzero value" is questionable. | Limit the size of dynami fragmnet. Or the benefits of having a tiny dynamic fragmnet should be described here. | Revised –  Proposed resolution adds a sentence to clairify one of the benefits of dynamic fragmentation in the general subclause. In addition we add the lower limit of the length of the first fragment as specified in the TGax SFD.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 30. |
| 1225 | Liwen Chu | 72.01 | In level 2, if a fragment is not received by the receier, the tranmitter should send the whole MSDU if possible. | As in comment. | Revised –  Agree in principle with the comment. Please note that the only case that this would not cause any security issues or ambiguities at the receiver is when the recipient has sent an explicit negative acknowledgement as an immediate response.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 1225. |
| 1486 | Mark RISON | 55.19 | What is "the block acknowledgement record"? This term is only used twice in this document, and nowhere in the baseline. Ditto below | Delete the bullet " Update the corresponding block acknowledgement record when an MSDU that is received in fragments is successfully reconstructed (see 10.6 (Defragmentation))"; ditto below | Revised –  There is a typo in the “acknowledge[e]ment”. The proposed resolution is to fix the typo. The Block Acknowledgment record is defined in 10.24.7.3 and it includes the parameters for maintaining the block ack bitmap record, winstart, winend, winsize, and the bitmap.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 1486. |
| 967 | kaiying Lv | 55.00 | How to set the Fragment Number subfield of the BlockAck frame solicited by the A-MPDU that is sent by an HE STA whose HE Fragment Support subfield in its HE Capabilities element is 2? | Please clarify it | Revised –  Agree in principle with the comment. The proposed resolution is to specify that it is set to 0 (actually the LSB since the other values of the Fragment Numbers are going to be used for signaling different Bitmap lengths).  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 967. |
| 750 | Jarkko Kneckt | 54.48 | What is the number the specification is talking about. Is it a fragment number of a sequence number or something else. | write "whose sequence number". | Revised –  That portion of the paragraph is correct though it has been remove as suggested by CID 1480. To clarify the intention to the commenter: The number was talking about the maximum number of fragments that can be carried in an A-MPDU (i.e., either one for each MSDU for fragmentation level 2 or up to four for each MSDU for fragmentation level 3).  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 750. |
| 697 | Jae Seung Lee | 54.62 | There are TBDs in the subclause. | Remove the TBDs. | Revised –  Agree in principle with the commenter. Proposed resolution defines the TBDs of this subclause.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 697. |
| 696 | Jae Seung Lee | 54.23 | TBD conditions | Define the other conditions | Revised –  Agree in principle with the commenter. Proposed resolution defines the TBDs of this subclause.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 696. |
| 1793 | Robert Stacey | 54.34 | 10.24.7 does not define rules for generating an A-MPDU. It defines rules for acknowledging Data MPDUs. Also, the rules for HT-immediate block must be changed to accommodate level 2 fragmentation. Specifically, full state cannot be supported and even partial state cannot be supported as described. Partial state allows the recipient to remember state, i.e., it does not require it to forget the receipt state for a specific SN. However, this is exactly what is required with fragmentation: the recipient must only set the the bit for a particular SN if an MPDU with that SN was received in the immediately preceding A-MPDU. | Remove bullet. Add rules to the block ack section that capture the required changes to HT-immediate block ack to support level 2 fragmentation. | Revised –  Agree in principle with the commenter. Proposed resolution is to provide the correct references where the behavior is defined and additionally to clarify that the blockack record is only updated when the MSDU is successfully reconstructed.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 1793. |
| 424 | Brian Hart | 54.56 | MIB variable naming is all over the map | In general new MIB variables should be dot1HE\* unless they are available to all STAs. Rename | Revised –  Agree with the comment. Proposed resolution accounts for the suggested change.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 424. |
| 167 | Alfred Asterjadhi | 72.44 | MAC Motion 78 specifies the max number of fragmented MSDUs/MMPDUs supported by the RX. Replace the TBD with that field and define any missing behavior (including what the TBD conditions are). | As in comment. | Revised –  Agree in principle with the comment. Proposed resolution is to add the necessary normative text to cover the following motion in the SFD:  “An HE STA specifies the following parameters related to fragmentation:  -Minimum Fragment Size: The minimum payload size for the first fragment of an MSDU supported by the STA  -- Possible values: 128, 256, 512, Unspecified/No Limit  - Maximum Number of F-MSDUs: The maximum number of fragmented MSDUs/MMPDUs that can be concurrently received by the STA  -- Possible values: 1, 2, 4, 8, 16, 32, Unspecified/No Limit  -- Note: Whether the counter is per <RA, TA> or per <RA, TA, TID> is currently TBD.”  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 167. |
| 2629 | Young Hoon Kwon | 55.20 | When Fragmentation Support subfield is set to 2, as BA bitmap field is tied to a Sequence Number, after receiving a fragment for an MSDU, if the subsequent fragment is not coming right away but in a delayed fashion, it is unclear how to manage the BA bitmap. Therefore, additional rule needs to be clarified for the usage case of Fragmentation level 2. | Clarify how to set BA Bitmap in case fragments are sent in delayed manner. Or, clarify that transmission of fragments in delayed manner is not allowed for dynamic fragment level 2. | Revised –  Agree in principle with the comment. The proposed resolution is the same as the suggested resolution provided by CID 1794, i.e., to always solicit an immediate response.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 2629. |
| 2628 | Young Hoon Kwon | 55.06 | In case a received fragment is transmitted in trigger-based MU PPDU together with MPDUs from other STA, a serving AP is allowed to send the immediate response frame in multi-STA BA frame, where the response occupies one Per STA Info subfield. Therefore, the response to VHT single MPDU does not need to be limited to an Ack frame. | In the first bullet in line 6, add the case that the VHT single MPDU is transmitted in UL MU transmission and the response frame is in multi-STA BA. | Revised –  Agree in principle with the comment. The proposed resolution accounts for the suggested change.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 2628. |
| 2627 | Young Hoon Kwon | 54.17 | Based on current REVmc\_D5.2 spec. (10.2.7), an MSDU transmitted under HT-immediate or HT-delayed block ack agreement shall not be fragmented even if its length exceeds dot11FragmentationThreshold. However, to efficiently schedule MU PPDU, it is necessary to allow fragmentation for MSDUs under (HE variant of) HT-immediate block ack agreement. In this sense, this exception needs to be clarified in this subclause. | At the end of the second bullet, add additional bullet stating "Dynamic fragmentation is allowed for an MSDU or MMPDU transmitted (HE variant) HT-immediate block ack agreement.". | Revised –  Agree in principle with the comment. The proposed resolution accounts for the suggested change.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 2627. |
| 2626 | Young Hoon Kwon | 54.17 | Based on current REVmc\_D5.2 spec. (10.2.7), an MSDU or MMPDU transmitted within an A-MPDU that does not contain a VHT single MPDU shall not be fragmented even if its length exceeds dot11FragmentationThreshold. However, to efficiently schedule MU PPDU, it is necessary to allow fragmentation within an A-MPDU. In this sense, this exception needs to be clarified in this subclause. | At the end of the second bullet, add additional bullet stating "Dynamic fragmentation is allowed for an MSDU or MMPDU transmitted within an A-MPDU.". | Revised –  Agree in principle with the comment. The proposed resolution accounts for the suggested change.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 2626. |
| 2269 | Woojin Ahn | 53.23 | Regardless of the fragmentation support level of an originator, originator can transmit multiple fragments per MSDU in an A-MPDU as long as the receiver supports A-MPDU with multiple fragments. However, the spec can be read that the receiver cannot set to 1 the Fragment Number subfield in the BA frame, unless the Fragmentation Support level of the originator is 3. As a result, it is prohibited that an originator with Fragmentation Support level below 3 transmits multiple fragments per MSDU in an A-MPDU. | Change the following paragraph at 25.3.3 line 4 Upon reception of a PSDU that carries one or more dynamic fragments, the receiver STA responds with: --An Ack frame when the received fragment is contained in a VHT single MPDU that solicits the immediate response \*The receiver STA shall follow the rules defined in 10.3.2.9 (Ack procedure) for generating the Ack frame --A BlockAck frame when the received fragments, up to one fragment for each MSDU, are contained in the A-MPDU that solicits the immediate response and the received A-MPDU does not indicate that the A-MPDU contains more than one fragment for at least one MSDU in an A-MPDU. The method of indication is TBD. \*The receiver STA shall follow the rules defined in 10.24.7 (HT-immediate block ack extensions) for generating the BlockAck frame, except that the STA shall: \*Set to 1 each bit of the Block Ack Bitmap field that corresponds to a Sequence Number subfield of a successfully received fragment contained in the soliciting A-MPDU \*Update the corresponding block acknowledgement record when an MSDU that is received in fragments is successfully reconstructed see 10.6 (Defragmentation)). --A BlockAck frame when the received fragments, one or more fragments for each MSDU, are contained in an A-MPDU that solicits the immediate response and the received A-MPDU indicates that the A-MPDU contains more than one fragment for at least one MSDU in an A-MPDU. The method of indication is TBD. \*The receiver STA shall follow the rules in 10.24.7.5 (Generation and transmission of BlockAck frames by an HT STA or DMG STA) for generating the BlockAck frame, except that the STA shall: \*Set to 1 the Fragment Number subfield in the Block Ack Starting Sequence Control subfield of the BlockAck frame \*Set to 1 each bit in location B of the Block Ack Bitmap field that corresponds to a successfully received fragment and shall set it to 0 otherwise, with B calculated as: B = SC - SSN, where SC and SSN are treated as 14-bit unsigned integers SC is the value of the Sequence Control subfield of an MPDU containing the fragment for which the receive status is indicated SSN is the value of the Starting Sequence Number subfield of the Block Ack Starting Sequence Control subfield of the BlockAck frame \*Update the corresponding block acknowledgement record when an MSDU that is received in fragments is successfully reconstructed (see 10.6 (Defragmentation)). | Rejected –  The spec language is inline with the intention. And the intention is to not have the recipient send a BlockAck frame with LSB of the Fragment Number equal to 1 to the originator that does not support the reception of such a BlockAck frame. Also please note that the originator can always transmit as many fragments as supported by the recipient. |
| 1484 | Mark RISON | 54.00 | This all seems fantastically complicated | Add an informative annex with examples of A-MPDUs and BA bitmaps and so on, for all the flavours of dynamic fragmentation | Revised –  The fragmentation procedures defined in this subclause are inline with the sequences defined in Annex G with the only differences that depending on the fragmentation level that is supported by the originator or recipient the (A-)MPDU soliciting a response may contain one or more MPDUs, each of which may contain a fragment. And the response is going to be an acknoweldgement or block acknowledgement following the rules defined in this subclauase and in the subclauses where generation of Ack/BA/Multi-STA BAs is defined.  Proposed resolution is to re-organize the subclause in independent subclauses for each level of fragmentation to help the reader in following the logic for each of them. We also explicitly call out the difference with respect to baseline fragmentation.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 1484. |
| 1485 | Mark RISON | 55.12 | "A BlockAck frame when the received fragments, up to one fragment for each MSDU, are contained in the A-MPDU that solicits the immediate response and is sent by an HE STA whose HE Fragmentation Support subfield in its HE Capabilities element is 2" -- from the grammar it seems the HE capabilities are those of the STA sending the A-MPDU (that solicits the immediate response) but why does the HE Frag support of the sending STA matter? The HE Frag indicates what you support on rx, and by definition if a peer sends you something it supports it on tx; ditto for the next bullet | Delete "and is sent by an HE STA whose HE Fragmentation Support subfield in its HE Capabilities element is 2"; similarly for the next bullet | Accepted |
| 1794 | Robert Stacey | 54.12 | It would simplify the receiver implementation if fragments are transmitted in order, i.e., transmit and retransmit the lowest FN until it is acknowledged. | Add a rule that requires the transmitter to send and resend fragments in order until acknowledged. | Revised –  Agree in principle with the comment. This is the baseline fragment generation rule defined in 10.5, however since this procedure is being defined within block ack sessions it is beneficial to specify the rule in this subclause as well.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 1794. |
| 1662 | NARENDAR MADHAVAN | 55.15 | The reorder buffer operation or the update of BA Bitmap at an HE STA supporting Fragmentation Level 2 needs to be redefined.  The recipient flushes its reorder buffer using BAR. However, in HE fragmentation level 2, upto one fragment per MSDU is aggregated and transmitted in the first A-MPDU. The second and subsequent A-MPDUs may carry the remaining fragmented MPDUs of the same sequence number. After receiving the first A-MPDU with fragmented MPDUs, the current operation facilitates the flushing of the BA bitmap, if all the fragmented MPDUs are successfully received in the first A-MPDU or when it receives a BAR. This BA bitmap record is used for the second A-MPDU, and it would seem that the STA has received all the fragments in the same sequence number successfully. Hence, when an HE STA transmits a BA frame as a recipient, the update rule needs to be modified. The recipient needs to flush its BA Bitmap every time it receives a new PSDU but not when receiving a BAR, because it may not be able to respond to the BAR with an appropriate bitmap. Therefore, the recipient shall not flush the BA Bitmap after receiving a BAR. | A recipient with fragmentation level 2 will not flush the BA bitmap when receiving a BAR. | Revised –  Agree in principle with the comment that some issues with a BAR frame may arise. The proposed resolution is to specify that all fragments with a sequence number that precede the SSN of a received BAR frame shall be discarded by the recipient STA. This way there is no ambiguity.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 1662. |
| 1487 | Mark RISON | 55.17 | " Set to 1 each bit of the Block Ack Bitmap field that corresponds to a Sequence Number sub- field of a successfully received fragment contained in the soliciting A-MPDU" -- isn't this the normal behaviour for BA? You get the SN, you set the bitmap bit to 1 | Delete the bullet " Set to 1 each bit of the Block Ack Bitmap field that corresponds to a Sequence Number sub- field of a successfully received fragment contained in the soliciting A-MPDU" | Rejected –  The normal behavior of the BA is for non-fragmented MSDUs. Here we are defining the behavior of setting the bit to 1 when one fragment is received and the block ack record is not updated. |
| 2197 | Tomoko Adachi | 55.15 | How to update the BA Bitmap at a STA supporting Fragment Level 2 should be redefined.  When such a STA transmits a BA frame as a responder, the updating rule should be modified from the basic rule. The responder needs to flush its BA Bitmap each time when it receives a new PSDU but not when receiving a BAR. This is because, when fragmented MPDUs are transmitted in the first A-MPDU, the second A-MPDU may carry the remaining fragmented MPDUs in the same sequence number. When receiving such A-MPDUs, if all the fragmented MPDUs are successfully received in the first A-MPDU and the record is kept to be reused as the BA Bitmap for the second A-MPDU, it will be as though the STA received all the fragments in the same sequence number successfully even when some of the fragmented MPDUs fail. On the other hand, when the STA flushes the BA Bitmap when it receives a BAR, it cannot respond to the BAR with an appropriate bitmap. Therefore, the responder shall not flush the BA Bitmap when receiving a BAR. | As in comment. | Revised –  Agree in principle with the comment that some issues with a BAR frame may arise. The proposed resolution is to specify that all fragments with a sequence number that precede the SSN of a received BAR frame shall be discarded by the recipient STA. This way there is no ambiguity.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 2197. |
| 2464 | Yongho Seok | 54.31 | "Up to one dynamic fragment for each MSDU in an A-MPDU if the receiver STA has indicated a value of 2 in the HE Fragmentation Support field of its HE Capabilities element" Since an MMPDU carried in an A-MPDU can be fragemented, change it as the following: "Up to one dynamic fragment for each MSDU or MMPDU in an A-MPDU if the receiver STA has indicated a value of 2 in the HE Fragmentation Support field of its HE Capabilities element" | As per comment | Revised –  Agree in principle with the comment. The proposed resolution is inline with the suggested change and with that of CID 1476.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 2464. |
| 2465 | Yongho Seok | 54.37 | "Up to four dynamic fragments for each MSDU in an A-MPDU if the receiver STA has indicated a value of 3 in the HE Fragmentation Support field of its HE Capabilities element" Since an MMPDU carried in an A-MPDU can be fragemented, change it as the following: "Up to four dynamic fragments for each MSDU or MMPDU in an A-MPDU if the receiver STA has indicated a value of 3 in the HE Fragmentation Support field of its HE Capabilities element" | As per comment | Revised –  Agree in principle with the comment. The proposed resolution is inline with the suggested change and with that of CID 1476.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 2465. |
| 1470 | Mark RISON | 54.21 | "The length of each fragment may be of any nonzero value." -- so the length may be 1? | Delete this sentence | Revised –  The length can be of any length as fragments in this case can be used instead of padding, except for the first fragment whose length is constrained as specified in the SFD. The proposed resolution is the same as for CIDs 30, 165, etc, that provide a description when dynamic fragmentation can be used and the normative restrictions for the first fragment.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 1470. |
| 165 | Alfred Asterjadhi | 72.22 | "Other conditions may be TBD". There is one condition that needs to be added here which is the "Minimum Fragment Size" as defined in MAC Motion 78 of the 11ax SFD. Add the field, and the respective normatvie behavior for this part of the motion. | As in comment. | Revised –  Agree in principle with the comment. Proposed resolution accounts for the suggested change.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 165. |
| 1217 | Liwen Chu | 55.53 | The updating rules of receiving window should be updated. | As in comment. | Revised –  Agree in principle with the comment (note that Page and Line numbers are incorrect. The comment is related to fragmentation as it is located in subclause 25.3.3). Proposed resolution accounts for the suggested change.  TGax editor to make the changes shown in 11-16/0828r0 under all headings that include CID 1217. |

**Discussion:** This document also includes motioned conceps passed during the IEEE F2F meeting in March: <https://mentor.ieee.org/802.11/dcn/16/11-16-0347-00-00ax-fragmentation-for-mu-frames-follow-up-on-parameters.pptx>.

## 10.5 Fragmentation

**TGax Editor: *Change the 2nd paragraph as follows (#CID 1484):***

With static fragmentation, the length of each fragment shall be an equal number of octets for all fragments except the last, which may be smaller. The length of each fragment shall be an even number of octets, except for the last fragment of an MSDU or MMPDU, which may be either an even or an odd number of octets. The length of a static fragment shall never be larger than dot11FragmentationThreshold unless security encapsulation is invoked for the MPDU. If security encapsulation is active for the MPDU, then the MPDU shall be expanded by the encapsulation overhead and this may result in a fragment larger than dot11FragmentationThreshold. Unless the conditions described in 25.3.2 (Support and requirements for dynamic fragmentation) are met, static fragmentation is used. *(#1484)*

**25.3 Fragmentation**

**25.3.1 General**

**TGax Editor: *Change the paragraphs below as follows (#CID 30, 1484):***

An HE STA supports the static fragmentation procedure defined in 10.2.7 (Fragmentation/defragmentation overview), 10.5 (Fragmentation), and 10.6 (Defragmentation). In addition, an HE STA can support the dynamic fragmentation procedure defined in this subclause. *(#1484)*

An HE STA can dynamically fragment individually addressed MSDUs or MMPDUs and defragment received MPDUs as defined in this subclause, and using the fragmentation/defragmentation processes defined in 10.2.7 (Fragmentation/defragmentation overview) without being subject to the rules defined in that subclause. Dynamic fragmentation provides further flexibility in aggregating the data so that padding can be minimized (see 25.5 MU operation) *(#30)*.

**25.3.2 Support and requirements for dynamic fragmentation***(#1484)*

**TGax Editor: *Change the paragraphs below as follows (#CID 30, 697, 696, 167, 2627, 2626, 1470, 165):***

A dynamic fragment is an MPDU, the payload of which carries a portion of an MSDU or MMPDU. The generation of dynamic fragments follows the rules defined in 10.2.7 (Fragmentation/defragmentation overview) and 10.5 (Fragmentation), except for:

* Generation of dynamic fragments and their transmission within an MPDU or A-MPDU under HT-immediate block ack agreements is allowed for an HE STA under the conditions defined in 25.3.3 (Procedure at the originator). *(#2627, 2626)*
* Reception of dynamic fragments is not mandatory. An HE STA declares its capability of receiving dynamic fragments by setting the HE Fragmentation Support field of the HE Capabilities element it transmits to a nonzero value as described in 25.3.3 (Procedure at the receiver).
* The length of each fragment is not required to be equal for all fragments of the MSDU or MMPDU. The length of each fragment may be of any nonzero value, except that the length of the first fragment of an MSDU shall be greater than or equal to the minimum fragment size specified by the receiver STA in the Minimum Fragment Size subfield of the HE Capabilities element it transmits. An MSDU with a size that is less than the minimum fragment size shall not be fragmented*(#30, 697, 696, 1470, 165)*.

**TGax Editor: *Insert new subclause headings (#CID 1484):***

**25.3.3 Procedure at the originator***(#1484)*

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 1476, 1475, 1473, 1474, 697, 2464, 2465):***

**25.3.3.1 Level 1 dynamic fragmentation***(#1484)*

* An originator STA may transmit to a recipient STA an MPDU or VHT single MPDU*(#1473)* that contains:One dynamic fragment of an MSDU or MMPDU if the recipient STA has indicated a value 1 in the HE Fragmentation Support field of its HE Capabilities element
* The originator STA shall follow the rules defined in 10.13.8 (Transport of VHT single MPDUs) for generating the VHT single MPDU.

**25.3.3.2 Level 2 dynamic fragmentation***(#1484)*

An originator STA may transmit to a recipient STA, which has indicated a value 2 in the HE Fragmentation Support field of its HE Capabilities element, an MPDU, VHT single MPDU, or A-MPDU*(#1473)* that contains:

* One dynamic fragment of an MSDU or MMPDU in an MPDU or VHT single MPDU*(#1474)*
* The originator STA shall follow the rules defined in 10.13.8 (Transport of VHT single MPDUs) for generating the VHT single MPDU.
* Up to one dynamic fragment of an MSDU or MMPDU*(#1475)* for each MSDU and for the MMPDU*(#1476)* in an A-MPDU format*(#1474, 2464)*
* The originator STA shall follow the rules defined in 10.24.7.7 (Originator’s behavior) for generating the A-MPDU and the rules defined in 25.10.3 (A-MPDU with multiple TIDs for generating the multi-TID A-MPDU (that can contain the fragment of the MMPDU) *(#1476)*

**25.3.3.3 Level 3 dynamic fragmentation***(#1484)*

An originator STA may transmit to a recipient STA, which has indicated a value 3 in the HE Fragmentation Support field of its HE Capabilities element, an MPDU, VHT single MPDU, or A-MPDU*(#1473)* that contains:

* One dynamic fragment of an MSDU or MMPDU in an MPDU or VHT single MPDU*(#1474)*
* The originator STA shall follow the rules defined in 10.13.8 (Transport of VHT single MPDUs) for generating the VHT single MPDU.
* Up to four dynamic fragments of an MSDU*(#1475)* for each MSDU and up to one dynamic fragment of an MMPDU*(#1476, 1475, 2465)* in an A-MPDU format
* The originator STA shall set the Fragment Number subfield of each MPDU to a value less than 4
* The originator STA shall follow the rules defined in 10.24.7.7 (Originator’s behavior) for generating the A-MPDU and the rules defined in 25.10.3 (A-MPDU with multiple TIDs) for generating the multi-TID A-MPDU (that can contain the fragment of the MMPDU) *(#1476)* with the following exceptions:
  + The A-MPDU should contain MPDUs whose range of the Sequence Number subfields does not exceed 16.*(#697)*

**TGax Editor: Move all the paragraphs below (after incorporating the changes) as the first (and only) paragraph of subclause 25.3.3.** *(#1484)*

**TGax Editor: *Insert the paragraph below as follows (#CID 1225, 2629, 1794):***

An originator STA transmitting an MPDU or A-MPDU that contains one or more dynamic fragments shall solicit an immediate response from the recipient STA for each of the fragments contained in the MPDU or A-MPDU, except when the fragments are sent under level 3 dynamic fragmentation (see 25.3.3.3 (Level 3 dynamic fragmentation)). *(#2629, 1794)*.

NOTE—The originator STA sends the fragments in order as defined in 10.5 (Fragmentation), except for level 3 dynamic fragmentation.

If the originator STA received explicit indications in response frames that none of the transmissions of previously transmitted fragment(s) of an MSDU or MMPDU have been successfully received then the STA may retransmit the full MSDU or MMPDU instead of retransmitting all the failed fragments. Otherwise, the originator STA may retransmit the failed fragment, in which case the frame body length and contents of the retransmitted fragment shall be the same as the first transmitted fragment and shall remain fixed for the lifetime of the MSDU or MMPDU at that STA. *(#1225)*

NOTE—An explicit indication is the absence of a valid Ack frame, BA frame or M-BA frame that is expected to be present in the first MPDU of the immediately received A-MPDU, or the absence of a BA Information field in the immediately received M-BA frame for the TID of the transmitted fragment(s). *(#1225)*

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 1480, 1479, 1478, 750):***

An originator STA shall not transmit to a recipient STA an MPDU or A-MPDU containing dynamic fragments that do not satisfy the conditions specified in the subclauses below.  *(#1480, 1479, 1478, 750)*

**25.3.4 Procedure at the recipient**

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 424, 1481):***

An HE STA shall set the HE Fragmentation Support subfield of the HE Capabilities element it transmits to 0 if its dot11HEDynamicFragmentationImplemented is false; otherwise the HE STA shall set the HE Fragmentation Support subfield to:

* 1 if it supports reception of dynamic fragments following the procedure defined in 25.3.4.1 (Level 1 dynamic defragmentation)
* 2 if it supports reception of dynamic fragments following the procedure defined in 25.3.4.2 (Level 2 dynamic defragmentation)
* 3 if it supports reception of dynamic fragments following the procedure defined in 25.3.4.3 (Level 3 dynamic defragmentation)

.*(#1481, 424)*

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 1482, 697, 167, 1484):***

Defragmentation of dynamic fragments shall follow the rules defined in 10.6 (Defragmentation), except for:

* The recipient STA shall support the concurrent reception of dynamic fragments of a number of *outstanding* MSDUs or MMPDUs from a transmitting STA that is equal to *Nmax­­­*, where *Nmax* for MSDUs is indicated in the Maximum Number of Fragmented MSDUs subfield of the HE Capabilities element transmitted by the STA, and *Nmax* is equal to 1 for MMPDUs.
  + The term *outstanding* refers to an MPDU containing all or part of an MSDU or MMPDU for which transmission has been started, and for which delivery of the MSDU or MMPDU has not yet been completed (i.e., an acknowledgment of the final fragment has not been received and the MSDU or MMPDU has not been discarded due to retries, lifetime, or for some other reason). *(#1482, 697, 167, 1484)*
* The recipient STA is not subject to the Receive Timer rules for each of the MSDUs/MMPDUs as defined in 9.6 (Defragmentation).

(#Author’s note: Whether the *Nmax*value is per <RA, TA> or per <RA, TA, TID> is TBD in the motion (Proposed resolution is to set it to be per <RA, TA>).

**25.3.4.1 Level 1 dynamic defragmentation***(#1484)*

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 1485, 1486, 967, 1793, 2628):***

Upon reception of an MPDU or VHT single MPDU that carries one or more dynamic fragments, the recipient STA responds with:

* An Ack frame when the received fragment is contained in an MPDU or VHT single MPDU that solicits the immediate response
  + The receiver STA shall follow the rules defined in 10.3.2.9 (Ack procedure) for generating the Ack frame and the rules defined in 25.4 (Block acknowledgment) for generating the Multi-STA BlockAck frame that contains the acknowledgement for the soliciting VHT single MPDU carried in a Trigger-based PPDU*(#1793, 2628)*.

**25.3.4.2 Level 2 dynamic defragmentation***(#1484)*

Upon reception of an MPDU or A-MPDU that carries one or more dynamic fragments, the recipient STA responds with:

* An Ack frame when the received fragment is contained in an MPDU or VHT single MPDU that solicits the immediate response
* The recipient STA shall follow the rules defined in 10.3.2.9 (Ack procedure) for generating the Ack frame and the rules defined in 25.4 (Block acknowledgment) for generating the Multi-STA BlockAck frame that contains the acknowledgement for the soliciting VHT single MPDU carried in a Trigger-based PPDU*(#1793, 2628)*.
  + A BlockAck frame when the received fragments, up to one fragment for each MSDU, are contained in an A-MPDU that solicits the immediate response*(#1485) (Author’s note: CID 2269 proposes the following addition: and the received A-MPDU does not indicate that the A-MPDU contains more than one fragment for at least one MSDU in an A-MPDU. The method of indication is TBD. This is not something that concerns Level 2 since L2 is using baseline A-MPDU EOF settings signaling.)*The recipient STA shall follow the rules defined in 10.24.7.5 (Generation and transmission of BlockAck frames by an HT STA or DMG STA) for generating the BlockAck frame and the rules in 25.4 (Block acknowledgment) for generating the Multi-STA BlockAck frame*(#1793)*, except that the STA shall:
    - Set to 0 the LSB of the Fragment Number subfield in the Block Ack Starting Sequence Control subfield of the BlockAck frame or M-BA frame that corresponds to a TID of a received fragment*(#967)*
    - Set to 1 each bit of the Block Ack Bitmap field that corresponds to a Sequence Number subfield and TID subfield of a successfully received fragment contained in the soliciting A-MPDU or multi-TID A-MPDU
    - Update the corresponding block acknowledgment record*(#1486)* only when an MSDU that is received in fragments is successfully reconstructed (see 10.6 (Defragmentation)); otherwise it shall not update the block acknowledgement record for that MSDU. *(#1793, 1217)*

**TGax Editor: *Insert a new paragraph in this subclause as follows (#CID 2197, 1662):***

A recipient STA shall discard any fragments that have been received during an HT-immediate BA session for a TID if it receives a BAR frame from the originator STA for that TID when the fragments have a Sequence Number field value that is less than the value of the Starting Sequence Number field of the BAR frame (where the comparison of the two values is performed modulo 4096) *(#1662, 2197, 1217)*.

**25.3.4.3 Level 3 dynamic defragmentation***(#1484)*

Upon reception of an MPDU or A-MPDU that carries one or more dynamic fragments, the recipient STA responds with:

* An Ack frame when the received fragment is contained in an MPDU or VHT single MPDU that solicits the immediate response
* The recipient STA shall follow the rules defined in 10.3.2.9 (Ack procedure) for generating the Ack frame and the rules defined in 25.4 (Block acknowledgment) for generating the Multi-STA BlockAck frame that contains the acknowledgement for the soliciting VHT single MPDU carried in a Trigger-based PPDU*(#1793, 2628)*.
* A BlockAck frame when the received fragments, one or more fragments for each MSDU, are contained in an A-MPDU that solicits the immediate response*(#1485) (Author’s Note: CID 2269 proposes the following addition: and the received A-MPDU indicates that the A-MPDU contains more than one fragment for at least one MSDU in an A-MPDU. The method of indication is TBD) (Pending resolution of CID 2268 that asks the same for Frag L3).*
* The recipient STA shall follow the rules in 10.24.7.5 (Generation and transmission of BlockAck frames by an HT STA or DMG STA) for generating the BlockAck frame and the rules in 25.4 (Block acknowledgment) for generating the Multi-STA BlockAck frame*(#1793)*, except that the STA shall:
  + Set to 1 the LSB of the Fragment Number subfield in the Block Ack Starting Sequence Control subfield of the BlockAck frame or M-BA frame that corresponds to a TID of a received fragment
  + Set to 1 each bit in location *B* of the Block Ack Bitmap field that corresponds to a successfully received fragment and shall set it to 0 otherwise, with *B* calculated as:  
    *B* = *SC* – *SSN*, where *SC* and *SSN* are treated as 14-bit unsigned integers  
    *SC* is the value of the Sequence Control subfield of an MPDU containing the fragment for which the receive status is indicated   
    *SSN* is the value of the Starting Sequence Number subfield of the Block Ack Starting Sequence Control subfield of the BlockAck frame
  + Update the corresponding block acknowldgement record*(#1486)* only when an MSDU that is received in fragments is successfully reconstructed (see 10.6 (Defragmentation)); otherwise it shall not update the block acknowledgement record for that MSDU. *(#1793, 1217)*

**TGax Editor: *Insert a new paragraph in this subclause as follows (#CID 2197, 1662):***

A recipient STA shall discard any fragments that have been received during an HT-immediate BA session for a TID if it receives a BAR frame from the originator STA for that TID when the fragments have a Sequence Number field value that is less than the value of the Starting Sequence Number field of the BAR frame (where the comparison of the two values is performed modulo 4096) *(#1662, 2197, 1217)*.

#### **9.4.2.213 HE Capabilities element**

The format of the HE Capabilities Information field is defined in Figure 9-554ab (HE Capabilities field format).

**TGax Editor: *Change the figure below of this subclause as follows (#CID 1482, 167, 165, 1475):***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B3 B4 | B5 B7 | B8 B9 | B10 B15 |
|  | PPE Thresholds Present | TWT Requester Support | TWT Responder Support | Fragmentation Support | Maximum Number of Fragmented MSDUs | Minimum Fragment Size | Reserved |
| Bits: | 1 | 1 | 1 | 2 | 3 | 2 | 7 |

Figure 9‑554b - HE Capabilities field format

The Fragmentation Support field indicates the level of HE fragmentation that is supported by a STA. The encoding of this field is described in Table 9-554ae (Fragmentation Support field encoding).

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 1476, 30, 167, 165, 1475):***

Table 9‑554ae - Fragmentation Support field encoding

|  |  |
| --- | --- |
| **Fragmentation**  **Support field value** | **Meaning** |
| 0 | No support for HE Fragmentation |
| 1 | Support for fragments that are contained within a VHT single MPDU, no support for fragments within an A-MPDU |
| 2 | Support for up to one fragment for each MSDU and each MMPDU within a single A-MPDU or multi-TID A-MPDU |
| 3 | Support for multiple fragments per MSDU within an A-MPDU or multi-TID A-MPDU and up to one fragment for each MMPDU in a multi-TID A-MPDU |

The Maximum Number of Fragmented MSDUs subfield indicates the maximum number of fragmented MSDUs that can be concurrently received by a STA. The maximum number of fragmented MSDUs, *Nmax*, defined by this field is *Nmax* = 2Maximum Number Of F-MPDUs, except for a value of the Maximum Number of Fragmented MSDUs equal to 7 which indicates that there is no restriction.The Minimum Fragment Size field indicates the minimum payload size for the first fragment of an MSDU that is supported by a STA. The encoding of this field is described in Table 9-554af (Minimum Fragment Size field encoding). *(#1482, 167, 165, 1475)*

Table 9‑554af – Minimum Fragment Size field encoding

|  |  |
| --- | --- |
| **Minimum Fragment**  **Size field value** | **Minimum payload**  **size (Octets)** |
| 0 | Not restricted |
| 1 | 128 |
| 2 | 256 |
| 3 | 512 |

Annex C

(normative)

ASN.1 encoding of the MAC and PHY MIB

**C.3 MIB Detail**

**TGax Editor: *Insert the following entries (#CID 1481):***

Dot11HEStationConfigEntry ::=

SEQUENCE {

dot11HEDynamicFragmentationImplemented, TruthValue

}

dot11HEDynamicFragmentationImplemented OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This is a capability variable.

Its value is determined by device capabilities.

This attribute, when true, indicates that the STA implementation is capable of receiving dynamic fragments. The capability is disabled, otherwise"

DEFVAL { false }

::= { dot11HEStationConfigEntry <XX>}

dot11HEComplianceGroup OBJECT-GROUP

OBJECTS {

dot11HEDynamicFragmentationImplemented }

STATUS current

DESCRIPTION

"Attributes that configure the HE Group for IEEE 802.11."

::= { dot11Groups <XX> }*(#1481)*