IEEE P802.11  
Wireless LANs

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| Fragmentation – 25.3.3 – Part 2 | | | | |
| Date: 2016-04-17 | | | | |
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Abstract

This submission proposes resolutions for multiple comments related to TGax D0.1 with the following CIDs (**53 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 for Pars I)
* 1477, 675, 423, 166, 1823, 2270, 2268, 2254, 2198, 1824, 1818, 1800, 1796, 1663, 1491, 1489, 1488, 2630 (18 CIDs for Pars II)

Revisions:

* Rev 0: Initial version of the document: Contains resolutions for Pars II (Frag L3). Pars I (General) is addressed in another 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 II (Fragmentation level 3)

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| --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 1477 | Mark RISON | 54.43 | "The A-MPDU should contain MPDUs whose range of the Sequence Number subfields does not exceed 16." -- a "should" is useless in this context | Change "should" to "shall" | Accepted –  TGax editor to make the changes shown in 11-16/0941r0 under all headings that include CID 1477. |
| 423 | Brian Hart | 54.43 | "should" is so hopelessly vague here | Make it a shall. If there are reasons why this is a bad idea, list them as explicit exceptions ot the should | Revised –  Agree with the commenter. Proposed resolution accounts for the suggested change **and is the same as that of CID 1477**.  TGax editor to make the changes shown in 11-16/0941r0 under all headings that include CID 423. |
| 675 | Huizhao Wang | 55.33 | BlockAck, responding to A-MPDU with one or more fragments for each MSDU, its bitmap construction rule should follow subclause 9.3.1.9.3 | Instead of stating the bitmap construction rule (it is actually wrong) here, change it to: The bitmap construction rule of responding A-MPDU with one or more fragments of each MSDU, is defined in 9.3.1.9.3 | Revised –  Agree in principle with the comment. The proposed resolutionis to provide the bitmap setting rule that is consistent with 9.3.1.9 in this Subclause as it is a normative description of the bit settings.  TGax editor to make the changes shown in 11-16/0941r0 under all headings that include CID 675. |
| 166 | Alfred Asterjadhi | 72.44 | The length of the BlockAck Bitmaps for C-BA and Multi-STA BA varies (see motions in the SFD related to these aspects) as such the value 16 needs to be updated to account for these length changes. Also what other conditions need to be specified in this operation? If other conditions are needed then add them and remove this statement "Other conditions may be TBD". | 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 11-16/0941r0 under all headings that include CID 166. |
| 1818 | Rojan Chitrakar | 54.44 | 16 may no longer be valid since the bitmap length may vary. | Change 16 to "BA Bitmap length"/4. | Revised –  Agree in principle with the comment. Proposed resolution accounts for the suggested change **and is the same as that of CID 1818**.  TGax editor to make the changes shown in 11-16/0941r0 under all headings that include CID 1818. |
| 1823 | Rojan Chitrakar | 55.30 | Since some of the bits of the fragment number subfield may be used for other purposes (for e.g. to indicate the Bitmap length), it is incorrect to say "fragment number subfield is 1." | Change "fragment number subfield" to the specific bit/s used to indicate use of dynamic fragmentation. | Revised –  Agree with the commenter. Proposed resolution is inline with the suggested change.  TGax editor to make the changes shown in 11-16/0941r0 under all headings that include CID 1823. |
| 2630 | Young Hoon Kwon | 55.30 | Fragment Number subfield may be used not only for indicating Fragment level 3 but also for other purposes such a different bitmap size. Therefore, it may be helpful to describe the indication of Fragment Number subfield in different way. | Modify the second sub-bullet in line 30 to "Set the LSB of the Fragment Number subfield in the Block Ack Starting Sequence Control subfield of the BlockAck frame to 1". | Revised –  Agree in principle with the comment. Proposed resolution accounts for the suggested change **and is the same as that of CID 1823**.  TGax editor to make the changes shown in 11-16/0941r0 under all headings that include CID 2630. |
| 2270 | Woojin Ahn | 55.33 | The formula of the bit location B is not clear. Replace it with B = 4 ├ù (SN - SSN) + FN | Change the following paragraph at 25.3.3 line 32 "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 = 4 ├ù (SN - SSN) + FN, where SN is the sequence number value, SSN is the value of the Starting Sequence Number subfield of the Block Ack Starting Sequence Control subfield, and FN is the fragment number value." | Revised –  Agree in principle with the comment. The proposed resolution is inline with the suggested change.  TGax editor to make the changes shown in 11-16/0941r0 under all headings that include CID 2270. |
| 1489 | Mark RISON | 55.34 | This equation needs some kind of mod operator, otherwise the location will go negative when SC wraps around but SSN is still at the top | Add a suitable mod | Revised –  Agree in principle with the comment. Proposed resolution fixes the issue **and is the same as that of CID 2270** .  TGax editor to make the changes shown in 11-16/0941r0 under all headings that include CID 1489. |
| 1491 | Mark RISON | 55.36 | The Sequence Control field is a 16-bit field with FN in b0-3 and SN in b4-15. I'm not even sure this can be considered a number per se, let alone something that can have the SSN subtracted off it | Clarify exactly how the numeric value of SC is determined, and how it is valid to subtract this from the value in the SSN subfield | Revised –  Agree in principle with the comment. Proposed resolution fixes the issue **and is the same as that of CID 2270**.  TGax editor to make the changes shown in 11-16/0941r0 under all headings that include CID 1491. |
| 1824 | Rojan Chitrakar | 55.35 | Calculation of B as shown may not be correct, since the Fragment Number subfield and the Sequence Number subfields may not be contiguous. Also 14 bits of SC will not cover fragment numbers 0 to 3. | Clarify the formula B = SC - SSN | Revised –  Agree in principle with the comment. Proposed resolution fixes the issue **and is the same as that of CID 2270**.  TGax editor to make the changes shown in 11-16/0941r0 under all headings that include CID 1824. |
| 2254 | Weimin Xing | 55.35 | SC is the value of the Sequence Control subfield which is 16bits (4bits for fragment number), and SSN is the value of the Starting Sequence Number subfield which is 12bits, but here we say "B= SC- SSN, where SC and SSN are treated as 14-bit unsigned integers" , this will make a wrong position B and not clear how to tansfer a 16/12bits value to 14bits value. | change this paragraph to "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:∩Çá B= ((SN- SSN) mod 4096)\*4+FN SN is the value of the Sequence Number subfield of an MPDU containing the fragment for which the receive status is indicated∩Çá. FN is the value of the Fragment Number subfield of an MPDU containing the fragment for which the receive status is indicated∩Çá SSN is the value of the Starting Sequence Number subfield of the Block Ack Starting Sequence Control subfield of the BlockAck frame " | Revised –  Agree in principle with the comment. Proposed resolution fixes the issue **and is the same as that of CID 2270**.  TGax editor to make the changes shown in 11-16/0941r0 under all headings that include CID 2254. |
| 2268 | Woojin Ahn | 53.12 | Upon a reception of an A-MPDU, the receiver cannot assure how many fragments per MSDU were transmitted in the A-MPDU in case some MPDUs were lost. Therefore a receiver whose fragment support level is 3 should always respond with BA that the Fragment Number subfield in the Block Ack Starting Sequence Control subfield is set to 1. It is redundant when the originator transmits the A-MPDU that contains not more than one fragment per MSDU to the receiver whose fragmentation support level 3. It is recommended that the originator indicates whether the transmitting A-MPDU contains multiple fragments per MSDU, so that the receiver could choose the BA bitmap type adaptively. | insert the following at 25.3.2 line 23 "--The originator STA shall indicates whether the transmitting A-MPDU contains more than one fragment for at least one MSDU in an A-MPDU. The method of indication is TBD."  Change the following paragraph at the 25.3.2 line 24 "An HE STA may transmit to a receiver STA an individually addressed (A)-MPDU that contains: --One dynamic fragment of an MSDU or MMPDU in a VHT single MPDU if the receiver STA has indicated a nonzero value 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 --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 \*The originator STA shall follow the rules defined in 10.24.7 (HT-immediate block ack extensions) for generating the A-MPDU --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 \*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 (HT-immediate block ack extensions) for generating the A-MPDU with the following exceptions: \*The A-MPDU should contain MPDUs whose range of the Sequence Number subfields does not exceed 16. Other conditions may be TBD. \*The originator STA shall indicates that the transmitting A-MPDU contains more than one fragment for at least one MSDU in an A-MPDU. The method of indication is TBD." | Revised –  Agree in principle with the commenter. Proposed resolution is to specify when to responds the Fragment Level 3 bitmap and Level 2 bitmap even when recipient indicates a value 3 in its capabilities element.  TGax editor to make the changes shown in 11-16/0941r0 under all headings that include CID 2268. |
| 2198 | Tomoko Adachi | 55.23 | How to respond with the BA Bitmap at a STA supporting Fragment Level 3 should be specified.  When such a STA receives an A-MPDU as a responder, when it cannot distinguish between one dynamic fragment or more than one dynamic fragments, it needs to respond by a BA Bitmap of Fragment Level 3. There are cases that the responder supporting Fragment Level 3 cannot distinguish whether the originator intended to send data frames in Fragment Level 2 or Fragment Level 3. For example, it happens when the originator sent data frames in more than one dynamic fragments but the responder didn't receive the frames with fragment numbers 1 or larger, i.e., the responder only received the frame with fragment number 0. In such case, when the responder sends a BA with the BA Bitmap formart in Fragment level 2, it is unclear at the originator how to treat the received BA Bitmap. | For a STA supporting Fragment Level 3, specify when to respond with BA Bitmap in Fragment Level 2 and when to respond with BA Bitmap in Fragment Level 3. | Revised –  Agree in principle with the commenter. Proposed the same resolution **as that of CID 2268**.  TGax editor to make the changes shown in 11-16/0941r0 under all headings that include CID 2198. |
| 1663 | NARENDAR MADHAVAN | 55.23 | The response of BA Bitmap at a STA supporting Fragmentation Level 3 should be clearly specified.  When a fragmentation level 3 STA receives an A-MPDU as a recipient, it cannot determine whether the originator intended to send data frames in Fragmentation Level 2 or Fragmentation Level 3. For example, when the originator sends data frames with more than one dynamic fragments but the recipient receives only one fragment and all the other fragments are lost, the recipient responds with a BA with the BA Bitmap format assuming Fragment level 2. In such a case, the origniator will not know how to treat the received BA bitmap. | For a STA supporting Fragmentation Level 3, specify when to respond with BA Bitmap assuming Fragmentation Level 2 and Fragmentation Level 3. | Revised –  Agree in principle with the commenter. Proposed the same resolution **as that of CID 2268**.  TGax editor to make the changes shown in 11-16/0941r0 under all headings that include CID 1663. |
| 1800 | Robert Stacey | 54.37 | Level 3 fragmentation imposes a significant performance penalty by limiting WinSizeO to 16. This restricts the size of the A-MPDU thus limiting efficiency at high data rates. Comparing level 2 and level 3 framgmentaton performance it would seem that level 2 has the same or better performance under all circumstances. | Remove the level 3 fragmentation option | Revised –  Agree in principle with the commenter. Every buffered MPDU that is associated with this block ack agreement consumes one of these buffers regardless of whether the frame contains a whole MSDU (or a fragment thereof) or an A-MSDU and Fragment level 3 bitmap length is not changed. Hence, buffer size WinSizeO is not limited to 16 in L3 fragmentation.  Proposed resolution fixes the issue where STA can not transmit more than 16 MSDU in one A-MPDU of multiple fragments  TGax editor to make the changes shown in 11-16/0941r0 under all headings that include CID 1800. |
| 1796 | Robert Stacey | 54.37 | With level 3 fragmentation, the bitmap can only acknowledge 16 MSDUs. Add a rules to the ADDBA Request and ADDBA Response exchange to accommodate this contstraint. Specifically, the orignator must not set Buffer Size to a value greater than 16 or, at least not limit WinSizeO to a value less than or equal to 16 when receiving the ADDBA Response frame. | As in comment. | Revised –  Agree in principle with the commenter. Proposed the same resolution **as that of CID 1800**.  TGax editor to make the changes shown in 11-16/0941r0 under all headings that include CID 1796. |
| 1488 | Mark RISON | 55.32 | "location B of the Block Ack Bitmap field" -- what is a "location" in a field? | Refer to bit positions or something | Revised –  Agree in principle with the comment. Proposed resolution fixes the issue.  TGax editor to make the changes shown in 11-16/0941r0 under all headings that include CID 1488. |

**Discussion: *…***

**25.3 Fragmentation**

**25.3.1 General**

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.

**25.3.2 Procedure at the originator**

A dynamic fragment is an MPDU, the payload of which carries a portion of an MSDU or MMPDU, which generation follows the rules defined in 9.5 (Fragmentation), except for:

* 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 below.
* The length of each fragment is not required to be equal for all fragments. The length of each fragment may be of any nonzero value. Other conditions may be TBD.

**TGax Editor: *Insert a new note in this subclause as follows (#CID 2268, 2198, 1800, 1796, 1663):***

An HE STA may transmit an L3 Frag BA Request frame to a receiver STA that has indicated a value of 3 in the HE Fragmentation Support field of the HE Capabilities element it transmits. The receiver STA that accepts the HT-Immediate block ack session shall respond with an L3 Frag BA Response if it has allocated resources for operating in a block ack session with level 3 fragmentation enabled. Otherwise, it shall respond with a BA Response frame to indicate that it has not allocated resources for operating in a block ack session where level 3 fragmentation is enabled.*(#2268, 2198, 1800, 1796, 1663)*

NOTE—A block ack session with level 3 fragmentation enabled requires a block acknowledgment record that maintains up to 4 bits per MSDU (one bit for each fragment of the MSDU).*(#2268, 2198, 1800, 1796, 1663)*

An HE STA may transmit to a receiver STA an individually addressed (A)-MPDU that contains:

* One dynamic fragment of an MSDU or MMPDU in a VHT single MPDU if the receiver STA has indicated a nonzero value in the HE Fragmentation Support field of its HE Capabilities element
  + The originator STA shall follow the rules defined in 9.13.8 (Transport of VHT single MPDUs) for generating the VHT single MPDU
* Up to one dynamic fragment for each MSDU in an A-MPDU if the receiver STA has either indicated a value of 2 in the HE Fragmentation Support field of its HE Capabilities element or has indicated a value of 3 in the HE Fragmentation Support field of its HE Capabilities element and the response during the BA setup for that TID was not L3 FRAG ADD BA Response frame*(#2268, 2198, 1800, 1796, 1663)*
  + The originator STA shall follow the rules defined in in 9.24.7 (HT-immediate block ack extensions) for generating the A-MPDU
* 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 and the response during the BA setup for that TID was L3 FRAG ADD BA Response frame*(#2268, 2198, 1800, 1796, 1663)*
  + 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 (HT-immediate block ack extensions) for generating the A-MPDU with the following exceptions:

**TGax Editor: *Change the item below as follows (#CID 1477, 423, 166, 1818):***

* + - The A-MPDU shall*(#1477, 423)* contain MPDUs whose range of the Sequence Number subfields does not exceed *BL*/4, where *BL* is the length of the Block Ack Bitmap field of the BlockAck or M-BA frame that corresponds to a TID of a transmitted fragment (see 10.24.7 (HT-immediate block ack extensions) and 25.4 (Block acknowledgement) . *(#166, 1818)* (#)

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 or that are carried in an A-MPDU format that is not supported by the receiver STA, as determined by the value of the HE Fragmentation Support field of the HE Capabilities element sent by the receiver STA.

**25.3.3 Procedure at the receiver**

An HE STA that transmits an HE Capabilities element with a nonzero value in the HE Fragmentation Support subfield shall set dot11DynamicFragmentation to true. Otherwise, the HE STA may set dot11DynamicFragmentation to false.

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

* The receiver STA may support the concurrent reception of dynamic fragments of TBD number of MSDUs/MMPDUs under TBD conditions

NOTE— The receiver STA is still subject to the Receive Timer rules for each fo the MSDUs/MMPDUs as defined in 9.6 (Defragmentation).

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 is sent by an HE STA whose HE Fragmentation Support subfield in its HE Capabilities element is 2
  + 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)).

**TGax Editor: *Change the items below as follows (#CID 2268, 2198, 1800, 1796, 1663):***

* A BlockAck frame when the received fragments, one or more fragments for each MSDU, are contained in an A-MPDU where at least one MPDU’s fragment number filed is of non-zero value that solicits the immediate response *(#2268, 2198, 1663)* and is sent during a BA session that was setup with an L3 FRAG ADDBA Response frame. *(#2268, 2198, 1800, 1796, 1663)*
  + 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:

**TGax Editor: *Change the items below as follows (#CID 675, 1823, 2270, 2254, 1824, 1491, 1489, 1488, 2630):***

* + - Set to 1 the LSB of the*(#1823, 2630)* 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 position*B(#1488)* 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* = 4 × (SN – SSN) + FN , where the operations on the sequence numbers are performed module 4096*(#675, 2270, 2254, 1824, 1491, 1489)* (#)  
      *SN* is the value of the Sequence Number 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 9.6 (Defragmentation)).

9.6.5 Block Ack Action frame details

9.6.5.1 General

**TGax Editor: *Insert the following rows in Table 9-286 (#CID******2268, 2198, 1800, 1796, 1663):***

|  |  |
| --- | --- |
| Table 9-286 Block Ack Action field values | |
| **Block Ack Action field values** | **Meaning** |
| 0 | ADDBA Request |
| 1 | ADDBA Response |
| 2 | DELBA |
| 3 | L3 FRAG ADDBA Request |
| 4 | L3 FRAG ADDBA Response |
| 5 | L3 FRAG DELBA |
| 6–127 (#3130) | Reserved |
| … | … |