IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Assorted CRs | | | | |
| Date: August 21, 2019 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Menzo Wentink | Qualcomm | Utrecht, The Netherlands | +31-65-183-6231 | mwentink  @qualcomm.com |

Abstract

This document contains assorted comment resolutions for REVmd, addressing CIDs

1. 2099 2100 2111 2117 2248 2359 2394 2424 2425 2426
2. 2429 2430 2432 2433 2434 2474 2477 2478 2481 2520
3. 2521 2549 2610 2664 2666

The baseline for this document is Draft P802.11REVmd D2.0.

R5: Resolutions to CIDs 2474, 2477, 2478, 2481 agreed on 2019-08-21 ad-hoc session

|  |  |  |  |
| --- | --- | --- | --- |
| **Identifiers** | **Comment** | **Proposed Change** | **Resolution** |
| 2099 10.3.3 1880.37 | (1) NOTE 2 is normative, and (2) Specified normative behavior does not apply to SP channel access in DMG case (deassertion of CS does not apply). | Turn the NOTE into normative sentence. Also include the channel access schmes it applis to (or exclude those it doesn't apply to). | Revised - agree with the comment.  The cited note is  "NOTE 2—After transmitting a PPDU containing an RDG, if the response is corrupted so that the state of the RDG/More PPDU subfield is unknown, the RD initiator of the RD exchange is not allowed to transmit after a SIFS. Transmission can occur a PIFS after deassertion of CS."  1880.37 delete NOTE 2  1880.35 insert  "After transmitting a PPDU containing an RDG, if the response is not received, so that the state of the RDG/More PPDU subfield is unknown, the RD initiator of the RD exchange shall not transmit after a SIFS.  NOTE---Transmission can occur a PIFS after deassertion of CS."  [Ask Carlos for feedback as to what need to be changed to address the second part of the comment.] |
| 2100 10.3.4 1882.1 | NOTE is normative. | Turn the NOTE into normative sentence. | Revised - agree with the comment.  The cited note is  "NOTE 2—After transmitting a PPDU containing an RDG, if the response is corrupted so that the state of the RDG/More PPDU subfield is unknown, the RD initiator of the RD exchange is not allowed to transmit after a SIFS. Transmission can occur a PIFS after deassertion of CS."  1880.37 delete NOTE 2  1880.35 insert  "After transmitting a PPDU containing an RDG, if the response is not received, so that the state of the RDG/More PPDU subfield is unknown, the RD initiator of the RD exchange shall not transmit after a SIFS.  NOTE---Transmission can occur a PIFS after deassertion of CS."  [Ask Carlos for feedback as to what need to be changed to address the second part of the comment.]  Copy of CID 2099 |
| 2111 10.24.2.8 1805.19 | The sentence containing this text is incomplete:  "and, if dot11MCCAActivated is true, the remaining RAV timer value," | Change to "and, if dot11MCCAActivated is true, also the remaining RAV timer value," | Rejected -- the sentence correctly refers to the remaining NAV timer value and the remaining RAV timer value with this text:  "is less than the remaining TXNAV timer value and, if dot11MCCAActivated is true, the remaining RAV timer value" |
| 2117 10.3.2.3.2 1697.12 | "The use of RIFS for a non-DMG STA is obsolete, and support for such use might be subject to removal in a future revision of the standard. A VHT or S1G STA shall not transmit frames separated by a RIFS."  To avoid using RIFS, perhaps, the best way to do is to set the RIFS Mode field of the HT Operation element to 0. | Add a sentence to the end of the cited paragraph (1697.14) as: "A non-DMG STA shall set the RIFS Mode field of the HT Operation element to 0." | Rejected - the mention of obsolete should be sufficient indication to set the cited field to 0. |
| 2248 10.26.2 1844.47 | 10.26.2 says  "Where the generic terms ADDBA ... are used ... in reference to a block ack agreement between S1G STAs"  and also  "A block ack agreement shall not be set up between a non-HT non-DMG STA and another STA."  These are in contradiction. A better way to specify features' mapping to STA types needs to be used. | TGm needs to discuss this issue, and a submission will be provided once direction is chosen. | Revised - agree with the comment. The second statement is likely missing non-S1G.  At 1844.56 add "non-S1G" after "non-HT non-DMG". |
| 2359 10.24.2.2 1797.62 | "NOTE---A STA can perform a PIFS recovery, as described in 10.24.2.8 (Multiple frame transmission in an EDCA TXOP), or perform a backoff, as described in the previous paragraph, as a response to transmission failure within a TXOP. How it chooses between these two is implementation dependent."  -- there is no normative statement that the STA must do one of these two things. | Change the cited text at the referenced location to  "A STA shall perform a PIFS recovery, as described in 10.24.2.8 (Multiple frame transmission in an EDCA TXOP), or perform a backoff, as described in the previous paragraph, as a response to transmission failure within a TXOP.  NOTE---How it chooses between these two is implementation dependent." | Revised - make changes shown under CID 2394 in 11-19-1195-04-000m-assorted-crs.docx.  There are three options defined in normative text,  for PIFS recovery, intra-TXOP backoff and waiting for the TXNAV timer to expire. The Note ties these three together, with the changes included.  In addition, the proposed changes remove a spurious reference to item f). |
| 2394 10.24.2.2 1798.6 | When RTS/CTS is successful, and the following PPDU fails, then the CW should not be increased. This is because that failure cannot be due to a contention collision, i.e. any device that has received the RTS or CTS has updated its NAV so should not collide with us. The reason for the failure is either bad (too high) rate, or interference. In both these case, increased backoff is unnecessary and it only exacerbates the effect of the interference. [xxmk] | In the referenced subclause at the end of bullet e) add  "However, the backoff procedure should not be invoked by an EDCAF when the initial PPDU of the TXOP contained an RTS frame." | Revised - make changes shown under CID 2394 in 11-19-1195-04-000m-assorted-crs.docx.  Doubling CW for an intra-TXOP backoff may indeed not always be an optimal choice. However, PIFS recovery is also already an option. The group did not come to a consensus on whether additional (intermediate) options should be added.  In addition, the proposed changes remove a spurious reference to item f). |
| 2424 10.24.2.7 1804.45 | A figure is needed to illustrate higher-AC TXOP sharing with non-A-MPDUs | Copy Figure 10-27, keep the top unchanged except for making AC\_BE the primary and only having one frame in it, and then show below a sequence where the following are under a "TXOP" arrow: the striped BE frame, an Ack frame, the spotty VO frame, an Ack frame, the lowest VI frame and an Ack frame | Rejected - the figure is for illustration only. The rules are defined in 10.24.2.7 (Sharing an EDCA TXOP). The comment does not provide a rationale as to why the extra figure is needed. |
| 2425 10.24.2.7 1804.45 | A figure is needed to illustrate higher-AC TXOP sharing with A-MPDUs | Copy Figure 10-17, keep the top unchanged except for making AC\_BE the primary, and then show below a PPDU containing the two AC\_BE frames to STA-2 and then the AC\_VO frame to STA-2, followed by BA, BAR and BA | Rejected - the figure is for illustration only. The rules are defined in 10.24.2.7 (Sharing an EDCA TXOP). The comment does not provide a rationale as to why the extra figure is needed. |
| 2426 10.24.2.7 1803.46 | "When an AP supports DL-MU-MIMO, frames from a higher or lower priority AC may be included in a VHT or S1G MU PPDU with TXVECTOR parameter NUM\_USERS > 1 when these frames do not increase the duration of the VHT or S1G MU PPDU beyond that required for the transmissions of the frames of the primary AC, targeting up to four STAs"  -- the "targeting up to four STAs" is not clear (what is targeting <= 4 STAs?).  Also liable to spec rot when e.g. ax comes in | Delete  ", targeting up to four STAs"  and change  "VHT or S1G MU PPDU" to  "DL MU-MIMO PPDU".  In 3.2 add a definition  "downlink (DL) multi-user multiple input, multiple output (MU-MIMO) physical layer (PHY) protocol data unit (PPDU): A PPDU using the DL-MU-MIMO technique."  (this refers to the existing definition for this (note extra hyphen)) | Accepted |
| 2429  . | CID 1505 got rid of QLRC and QSRC, but did not touch QLDRC and QSDRC | Delete "QLDRC" and "QSDRC" throughout | Revised - agree with the comment. Make changes in 11-19-1195-04-000m-assorted-crs.docx under CID 2429.  The existing QLDRC/QSDRC text appears to have blended together the frame retry counter and the STA retry counter. The proposed changes fix this.  The proposed changes also add that the retry counters are reset when CW is reset. |
| 2430  . | CID 1505 got rid of QLRC and QSRC, but did not touch LRC and SLRC and SRC and SSRC | Delete "LRC" and "SLRC" and "SRC" and "SSRC" throughout | Rejected - the comment does not identify a technical issue with LRC, SLRC, SRC, and SSRC. |
| 2432 10.24.2.12.1 1811.53 | "Retries for failed transmission attempts shall continue until one or more of the following conditions occurs" is missing lifetime | Add a bullet at the end  "The MSDU, A-MSDU or MMPDU has been in the MAC for dot11EDCA TableMSDULifetime (for a non-AP STA) or dot11EDCATableMSDU Lifetime (for an AP)" | Revised - agree with the comment.  Make changes under CID 2432 in 11-19-1195-04-000m-assorted-crs.docx, which add a bullet item  "- The transmit MSDU timer for the MSDU or any undelivered fragments of that MSDU exceeds dot11EDCATableMSDU Lifetime"  and which move the following two paragraphs at 1812.19 to above the bulleted list  "A QoS STA shall maintain a transmit MSDU timer for each MSDU passed to the MAC. dot11 EDCATableMSDULifetime specifies the maximum amount of time allowed to transmit an MSDU for a given AC. The transmit MSDU timer shall be started when the MSDU is passed to the MAC. If the value of this timer exceeds the appropriate entry in dot11EDCATableMSDU Lifetime, then the MSDU, or any remaining, undelivered fragments of that MSDU, shall be discarded by the source STA without any further attempt to complete delivery of that MSDU.  When A-MSDU aggregation is used, the HT STA maintains a single timer for the whole A-MSDU. The timer is restarted each time an MSDU is added to the A-MSDU. The result of this procedure is that no MSDU in the A-MSDU is discarded before a period of dot11EDCATableMSDULifetime has elapsed."  but which delete the normative requirement related to the new bullet item from the first moved paragraph  "If the value of this timer exceeds the appropriate entry in dot11EDCATableMSDU Lifetime, then the MSDU, or any remaining, undelivered fragments of that MSDU, shall be discarded by the source STA without any further attempt to complete delivery of that MSDU." |
| 2433 10.24.2.12.1 1811.53 | "Retries for failed transmission attempts shall continue until one or more of the following conditions occurs" is missing lifetime | Add a bullet at the end  "The MSDU, A-MSDU or MMPDU has been in the MAC for dot11EDCA TableMSDULifetime (for a non-AP STA) or dot11EDCATableMSDU Lifetime (for an AP)"  and extend the definition in C.3 to account for A-MSDUs and MMPDUs.  Also similarly change 1732.62 in 10.3.4.4 and dot11MaxTransmitMSDU Lifetime in C.3 | Rejected - the comment provides insufficient detail. |
| 2434  . | CID 1505 follow-up. There are still references to short/long retry count(er) in 10.3.3:  "The SSRC shall be incremented when any short retry count (SRC)"  "The SLRC shall be incremented when any long retry count (LRC)"  and in 11.8.3  "The short retry counter and long retry counter for the MSDU or A-MSDU are not affected."  Also  "A STA shall maintain a SRC and an LRC for each MSDU or MMPDU awaiting transmission." "The SRC for an MPDU [...]. This SRC and the SSRC shall be reset when [...]. The LRC for an MPDU [...]. This LRC and the SLRC shall be reset when"  "Retries for failed transmission attempts shall continue until the SRC for the MPDU [...] or until the LRC for the MPDU [...]"  in 10.3.4.4 | Delete all references to short/long retry count(er)s throughout | Rejected - the cited references are for DCF, which was not addressed when deleting the long retry counters for EDCA.  The comment does not identify a technical issue. |
| 2474 10.26.2 1846.45 | "Once the block ack exchange has been set up, Data and Ack frames are transferred using the procedure described in 10.26.3 (Data and acknowledgment transfer using immediate block ack policy and delayed block ack policy(#1308))."  -- 10.26.3 says nothing about Data and Ack frames | Delete the cited text at the referenced location | Revised. Change the cited text to:  Once the block ack exchange has been set up, QoS Data frames are transferred in A-MPDUs and acknowledged using the proceduredescribed in 10.26.3 (Data and acknowledgment transfer using immediate block ack policy and delayed block ack policy(#1308))." |
| 2477 10.24.2.8 . | This subclause is confusing. On the one hand it says things are to be SIFS- or RIFS-separated:  " If a TXOP holder has in its transmit queue an additional frame of the primary AC and [stuff], then the TXOP holder may commence transmission of that frame a SIFS (or RIFS, if the conditions defined in 10.3.2.3.2 (RIFS) are met) after the completion of the immediately preceding frame exchange sequence",  but on the other it sometimes requires PIFS:  " A STA shall not commence the transmission of an RTS with a bandwidth signaling TA until at least a PIFS after the immediately preceding frame exchange sequence." [xat] | On the assumption these are about TXOP initiation, delete  "A STA shall not commence the transmission of an RTS with a bandwidth signaling TA until at least a PIFS after the immediately preceding frame exchange sequence. (11aj)A CMMG STA shall not commence the transmission of an RTS frame until at least PIFS time after the immediately preceding frame exchange sequence."  from this subclause | Revised - the use of PIFS is required before transmission of an RTS with a bandwidth signaling TA, to allow determining the CCA conditions on the non-primary channels.  TGmd Editor: at 1805.21(D2.0), modify as shown:  (or RIFS, if the conditions defined in 10.3.2.3.2  (RIFS) are met, or PIFS, if the frame contains a bandwidth signaling TA) |
| 2478 10.24.2.8 1805.16 | This subclause places reasonable constraints on the duration of primary AC traffic included in the TXOP. However, the rules for secondary AC traffic are less constrained. [xat] | Change  "an additional frame of the primary AC "  to  "an additional frame of the primary AC (or, where permitted, a secondary AC)" | Accepted |
| 2481 10.26 1843.51 | There are various items of arithmetic and comparison (> / < / >= / <=) in this subclause, but they don't take into account sequence number whap | At the end of 10.26.1 add  "All arithmetic and equations (including inequalities) in Subclause 10.26 are to be understood as being modulo the size of the relevant counter space (typically 4096)." | Accepted |
| 2520  . | "QoS STA retry counter"  is odd since by definition it's for the STA | Change "QSRC" to "QRC" throughout  and delete the "STA" in the expansion in 3.4 | Rejected - the referenced counter is a STA counter, as opposed to a frame counter.  1811.6:  "A QoS STA shall maintain a short retry counter for each MSDU, A-MSDU, or MMPDU that belongs to a TC that requires acknowledgment"  which is modified by CID 2429 in <this document> to  "A QoS STA shall maintain a frame retry counter for each MSDU, A-MSDU, or MMPDU that belongs to a TC that requires acknowledgment." |
| 2521 10.3.4.4 1732.36 | We don't have unlucky packets, just unlucky connections. The next packet to a given peer is just as likely to fail as the previous given the same Tx vector.  It makes sense to have a Tx lifetime per AC as delivering a late real-time packet is a worthless whereas best effort frames should be retried until the link times out, but for a given AC there's no point hitting a retry limit and then just moving on to the next packet to that AC+destination. [xxnj] | In 10.3.4.4 change  "Error recovery shall be attempted by retrying transmissions for frame exchange sequences that the initiating STA infers have failed. Retries shall continue, for each failing frame exchange sequence, until the transmission is successful, or until the relevant **retry limit** is reached, whichever occurs first."  to  "Error recovery shall be attempted by retrying transmissions for frame exchange sequences that the initiating STA infers have failed. Retries shall continue, for each failing frame exchange sequence, until the transmission is successful, or until the relevant **lifetime** is reached, whichever occurs first.".  In 10.24.2.12.1 delete from  "Retries for failed transmission attempts shall continue until one or more of the following conditions occurs:"  to  "When any of these limits is reached, retry attempts shall cease, and the MSDU, A-MSDU, or MMPDU shall be discarded."  inclusive | Rejected -  The proposal effectively removes the frame retry counters, and ties frame discards only to the lifetime.  The effect of retry count based frame discards appears to be that in the presence of frequent unsuccessful frame transmissions frames get discarded before their lifetime expires.  Discarding frames before the end of their lifetime, for example in the presence of excessive interference, may provide feedback to higher layers to throttle their output. At least for TCP it would have that effect, but for RTP/RTCP it might have the same effect.  Therefore it seems that frame retry count based discards may have a positive effect and should not be removed. |
| 2549 10.24.2.2 1798.12 | There is no reason to reset CW to CWmin if the MPDU is not discarded | At the referenced location after  "If QSRC[AC] is less than dot11Short RetryLimit,"  append  "or the MPDU is not being discarded" | Rejected - resetting CW to CWmin provides a periodic exit out of a very large CW. This mitigates at least somewhat the adverse effects of exponential backoff, wherein a successful transmitter keeps winning the medium successively at the expense of transmitters with a high CW. Sort of like a temporary capture effect.  (Note that the access probabilities across nodes will be the same on average, but this capture effect is an important source of jitter in exponential backoff.) |
| 2610 10.24.2.8 1805.6 | "a VHT NDP Announcement frame followed after SIFS by a VHT NDP followed after SIFS by a PPDU containing one or more VHT Compressed Beamforming frames, or"  would be clearer if it referred to an A-MPDU | Change  "a PPDU"  to  "an A-MPDU"  in the cited text at the referenced location | Accepted |
| 2664 10.24.2.12.1 1811.1 | The QLRC was eliminated for EDCA, but not yet the QLDRC. | Eliminate the QLDRC for dot11Robust AVStreamingImplemented equal to true. | Revised - agree with the comment. Make changes in 11-19-1195-04-000m-assorted-crs.docx under CID 2429. |
| 2666 10.3.2.3.7 1700.49 | It is unclear that the case identified in the first sentence of this paragraph  ("EIFS shall not be invoked if the NAV is updated by the frame that would have caused an EIFS.")  can ever occur.  In the first paragraph of this subclause, EIFS is stated to be invoked if PHY-RXEND.indication contained an error or if the frame had incorrect FCS. In either of these cases the frame is invalid and NAV update does not occur (per 10.3.2.4).  The case of an A-MPDU where some, but not all, frames are valid is covered in the second sentence of this paragraph. Accordingly, there does not appear to be a situation where a NAV update can occur based on a reception that would otherwise invoke EIFS. | If the analysis in the comment statement is correct, delete the first sentence of this paragraph.  If there is a case where NAV update can occur despite the PHY-RXEND. indication with error and/or the invalid FCS, add a cross-reference to the subclause where that NAV update is specified. | Revised - agree with the comment.  At 1700.49, delete  "EIFS shall not be invoked if the NAV is updated by the frame that would have caused an EIFS." |

|  |  |  |  |
| --- | --- | --- | --- |
| **Identifiers** | **Comment** | **Proposed Change** | **Resolution** |
| 2567  . | The "sync frame"s introduced by 11ah seem to be some kind of NDP so should be described as such, not as frames | Throughout except in 11.6 change "sync frame" to "sync PPDU" |  |
| 2398  . | "NDP CMAC frame"s are not MPDUs and it is confusing to call them this | Change "NDP CMAC frame" to "NDP CMAC PPDU" throughout |  |
| 2349  . | There are various references to "NDP frames" and "non-NDP frames". The first is a misnomer because NDPs are NDPs not frames; the second is pleonastic since all frames (MPDUs) are not NDPs | This appears to be some 11ah horror, so change all instances of "non-NDP frame" to "non-NDP-CMAC frame", all instances of "sounding NDP frame" to "sounding NDP", and all remainng instances of "NDP frame" to "NDP CMAC frame". Dieu reconnaitra les siens |  |
| 2348  . | "VHT NDP frame" is a misnomer; they're just "VHT NDP"s | Change each of the 3 instances of "VHT NDP frame" to "VHT NDP" |  |
| 2305  . | An NDP is a PPDU, so "NDP PPDU" is pleonastic | Change "NDP PPDU" to "NDP" throughout |  |
| 2580 3.2 199.42 | The definition of TDLS peer STA (A STA with a TDLS direct link) is broken: the term is also used for the peer during link establishment, and also it is used to refer to a peer STA with which a STA has a TDLS link, not just any STA that happens to have a TDLS link to a third STA | Change to "A STA with which another STA has, or is in the process of establishing, a TDLS direct link." |  |

**CID 2429**

**3.4 Abbreviations and acronyms**

212.44 delete

QLDRC QoS long drop-eligible retry counter(#1505)

212.50

QSDRC QoS STA drop-eligible retry counter

**10.24.2.2 EDCA backoff procedure**

1798.6

If the backoff procedure is invoked for reason a) above, CW[AC] shall be left unchanged.

If the backoff procedure is invoked for reason b) above, CW[AC] shall be set to CWmin[AC], QSRC[AC] shall be set to 0, and, if dot11RobustAVStreamingImplemented is true, QSDRC[AC] shall be set to 0.

(#1505)If the backoff procedure is invoked for reason c), d), e), or f) above, CW[AC] and QSRC[AC] shall be updated as follows:

— If QSRC[AC] is less than dot11ShortRetryLimit,

— QSRC[AC] shall be incremented by 1

— CW[AC] shall be set to the lesser of CWmax[AC] and 2QSRC[AC] × (CWmin[AC] + 1) – 1

— Else

— QSRC[AC] shall be set to 0

— CW[AC] shall be set to CWmin[AC]

* If dot11RobustAVStreamingImplemented is true, and the MPDU for which the backoff procedure was invoked contains an HT variant HT Control field with the DEI field equal to 1, QSDRC[AC] and possibly CW[AC] shall be updated as follows:
* If QSDRC[AC] is less than dot11ShortDEIRetryLimit,

— QSDRC[AC] shall be incremented by 1

— Else

— QSDRC[AC] shall be set to 0

— CW[AC] shall be set to CWmin[AC]

**10.24.2.12 Retransmit procedures**

**10.24.2.12.1 General**

(#1505)A QoS STA shall maintain a frame retry counter for each MSDU, A-MSDU, or MMPDU that belongs to a TC that requires acknowledgment. The initial value for the short retry counter shall be 0.

<editor please also include the new whitelines>

QoS STAs shall also maintain a QoS STA retry counter for each AC, QSRC[AC]. The initial value for the QSRC[AC] counters shall be 0.

When dot11RobustAVStreamingImplemented is true, a QoS STA shall maintain a drop-eligible frame retry counter for each QoS Data frame with an HT variant HT Control field with the DEI field equal to 1. The initial value for the drop-eligible frame retry counter shall be 0.

When dot11RobustAVStreamingImplemented is true, QoS STAs shall also maintain a QoS STA drop-eligible retry counter for each AC, QSDRC[AC]. The initial value for the QSDRC[AC] counters shall be 0.

APs with dot11RobustAVStreamingImplemented equal to true and mesh STAs with dot11MeshGCRImplemented equal to true, shall maintain an unsolicited frame retry counter. The initial value for the unsolicited frame retry counter shall be 0.

After transmitting a frame that requires an immediate acknowledgment, the STA shall perform either of the acknowledgment procedures, as appropriate, that are defined in 10.3.2.11 (Acknowledgment procedure)(Ed)(#57). (#1505)The frame retry counter for an MSDU or A-MSDU that is not part of a block ack agreement or for an MMPDU shall be incremented every time transmission fails for that MSDU, A-MSDU, or MMPDU, including of an associated RTS.

For APs with dot11RobustAVStreamingImplemented equal to true and mesh STAs with dot11MeshGCRImplemented equal to true, the unsolicited frame retry counter shall be incremented after the transmission of every A-MSDU that is transmitted using the GCR unsolicited retry retransmission policy.

All retransmission attempts by a non-DMG STA for an MPDU with the Type subfield equal to Data or Management that is not sent under a block ack agreement and that has failed the acknowledgment procedure one or more times shall be made with the Retry subfield set to 1.

All retransmission attempts by a DMG STA for an MPDU with the Type subfield equal to Data or Management that has failed the acknowledgment procedure one or more times shall be made with the Retry subfield set to 1.

(#1505)Retries for failed transmission attempts shall continue until one or more of the following conditions

occur:

— The frame retry count for the MSDU, A-MSDU, or MMPDU is equal to dot11ShortRetryLimit.

— The drop-eligible frame retry count for the MSDU, A-MSDU, or MMPDU is equal to dot11ShortDEIRetryLimit.

— The unsolicited frame retry count for the A-MSDU is equal to dot11UnsolicitedRetryLimit.

When any of these limits is reached, retry attempts shall cease, and the associated MSDU, A-MSDU, or MMPDU shall be discarded.

(#1505)For internal collisions, the frame retry counters associated with the MSDUs, A-MSDUs, or MMPDUs involved in the internal collision shall be incremented.

With the exception of a frame belonging to a TID for which a block ack agreement is set up, a QoS STA shall not initiate the transmission of any Management or Data frame to a specific RA while the transmission of another Management or Data frame with the same RA and having been assigned its sequence number from the same sequence counter has not yet completed to the point of success, retry fail, or other MAC discard (e.g., lifetime expiration).

A QoS STA shall maintain a transmit MSDU timer for each MSDU passed to the MAC. dot11EDCATableMSDULifetime specifies the maximum amount of time allowed to transmit an MSDU for a given AC. The transmit MSDU timer shall be started when the MSDU is passed to the MAC. If the value of this timer exceeds the appropriate entry in dot11EDCATableMSDULifetime, then the MSDU, or any remaining, undelivered fragments of that MSDU, shall be discarded by the source STA without any further attempt to complete delivery of that MSDU.

When A-MSDU aggregation is used, the HT STA maintains a single timer for the whole A-MSDU. The timer is restarted each time an MSDU is added to the A-MSDU. The result of this procedure is that no MSDU in the A-MSDU is discarded before a period of dot11EDCATableMSDULifetime has elapsed.

**CID 2394**

1797.33

The backoff procedure shall be invoked by an EDCAF when any of the following events occurs:

a) An MA-UNITDATA.request primitive is received that causes a frame with that AC to be queued for transmission such that one of the transmit queues associated with that AC has now become nonempty and any other transmit queues associated with that AC are empty; the medium is busy on the primary channel as indicated by any of the following:

— physical CS;

— virtual CS;

— a nonzero TXNAV timer value;

— a mesh STA that has dot11MCCAActivated true and a nonzero RAV timer value, and the backoff counter has a value of 0 for that AC.

b) The transmission of the MPDU in the final PPDU transmitted by the TXOP holder during the TXOP for that AC has completed and the TXNAV timer has expired, and the AC was a primary AC. (See 10.24.2.7 (Sharing an EDCA TXOP)).

c) The transmission of an MPDU in the initial PPDU of a TXOP fails, as defined in this subclause, and the AC was a primary AC.

d) The transmission attempt collides internally with another EDCAF of an AC that has higher priority, that is, two or more EDCAFs in the same STA are granted a TXOP at the same time.

In addition, the backoff procedure may be invoked by an EDCAF when:

e) The transmission by the TXOP holder of an MPDU in a non-initial PPDU of a TXOP fails, as defined in this subclause.

NOTE—If the transmission by the TXOP holder of an MPDU in a non-initial PPDU of a TXOP failed, the STA can perform either a PIFS recovery, as described in 10.24.2.8 (Multiple frame transmission in an EDCA TXOP), perform a backoff as described in item e) above, or wait for the TXNAV timer to expire and invoke the backoff procedure per item b) above. How it chooses between these is implementation dependent.

A STA that performs a backoff within its existing TXOP per item e) above shall not extend the TXNAV timer value (see 10.24.2.8 (Multiple frame transmission in an EDCA TXOP)).

NOTE—In other words, the backoff is a continuation of the TXOP, not the start of a new TXOP.

If the backoff procedure is invoked for reason a) above, the value of CW[AC] shall be left unchanged.

If the backoff procedure is invoked for reason b) above, the value of CW[AC] shall be reset to CWmin[AC].

If the backoff procedure is invoked for reason c), d), or e) above, the value of CW[AC] shall be updated as follows before invoking the backoff procedure:

etc.

**CID 2432**

1811.53

A QoS STA shall maintain a transmit MSDU timer for each MSDU passed to the MAC. dot11EDCATableMSDULifetime specifies the maximum amount of time allowed to transmit an MSDU for a given AC. The transmit MSDU timer shall be started when the MSDU is passed to the MAC.

When A-MSDU aggregation is used, the HT STA maintains a single timer for the whole A-MSDU. The timer is restarted each time an MSDU is added to the A-MSDU. The result of this procedure is that no MSDU in the A-MSDU is discarded before a period of dot11EDCATableMSDULifetime has elapsed.

(#1505)Retries for failed transmission attempts shall continue until one or more of the following conditions occurs:

— The short retry count for the MSDU, A-MSDU, or MMPDU is equal to dot11ShortRetryLimit.

— The short drop-eligible retry count for the MSDU, A-MSDU, or MMPDU is equal to dot11ShortDEIRetryLimit.

— The long drop-eligible retry count for the MSDU, A-MSDU, or MMPDU is equal to dot11LongDEIRetryLimit.

— The unsolicited retry count for the A-MSDU is equal to dot11UnsolicitedRetryLimit

— The transmit MSDU timer for the MSDU or any undelivered fragments of that MSDU exceeds dot11EDCATableMSDU Lifetime

When any of these limits is reached, retry attempts shall cease, and the MSDU, A-MSDU, or MMPDU shall be discarded.

(#1505)For internal collisions, the short retry counters associated with the MSDUs, A-MSDUs, or MMPDUs involved in the internal collision shall be incremented. When dot11RobustAVStreamingImplemented is true, for internal collisions, the appropriate drop-eligible retry counters (QSDRC[AC], and QLDRC[AC]) are incremented when the collision occurs for an MSDU, A-MSDU, or MMPDU that has drop eligibility equal to 1.

With the exception of a frame belonging to a TID for which block ack agreement is set up, a QoS STA shall not initiate the transmission of any Management or Data frame to a specific RA while the transmission of another Management or Data frame with the same RA and having been assigned its sequence number from the same sequence counter has not yet completed to the point of success, retry fail, or other MAC discard (e.g., lifetime expiration).