IEEE P802.11
Wireless LANs

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| REVmd CID 4574 resolution |
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| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Mark Hamilton | Ruckus/CommScope | 350 W Java DrSunnyvale, CA 94089 | +1.303.818.8472 | mark.hamilton2152@gmail.com |

Abstract

This submission contains discussion and proposed resolution for REVmd CID 4574.

R0 – initial version. NOTE: This captures off-line discussion, as of early June 2020.

**CID 4574**

**All page/line references are per REVmd D3.0.**

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| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** |
| 4574 | 1828.11 | 10.23.2.2 | "The transmission of the MPDU in the final PPDU transmitted by the TXOP holder during the TXOP for that AC has completed" -- has a number of issues:* what does "has completed" mean (just "has been put on the air, don't care about response if needs one"?)
* what is the "AC was a primary AC" about? Presumably this is the MPDU at the start of the sentence?
* so you start backoff immediately, even if you then transmit a secondary AC MPDU in the TXOP? Or you don't do backoff at all if the last MPDU you transmitted in the TXOP was a secondary AC MPDU?
* what does "the MPDU in the final PPDU" mean if there is more than one MPDU in the final PPDU?
* what if there isn't a TXNAV (i.e. multiple protection is not being used)?
* - so if the TXNAV timer has not expired you need to wait until it does and then do backoff? (More plausible than "you don't do backoff at all if the TXNAV hadn't expired at the same time as the "completion" of the last transmission!)
 | As it says in the comment |
| 4422 | 1834.17 | 10.23.2.7 | "Frames from the primary AC shall be transmitted first." is not clear: does it mean at least one (or two?) shall be transmitted, or does it mean all available shall be transmitted (cf.previous bullet) | Change to "All frames from the primary AC shall betransmitted first" |
| 4154 | 1827.61 | 10.23.2.2 | The subbullets all refer to "that AC" but there is no reference for "that" | Add the words "corresponding to an AC" in the introductory phrase which immediately precedes item a), so that it reads, "The backoff procedure shall be invoked by an EDCAF corresopnding to an AC when" |

Discussion:





This text has a lot of background and history (TL;DR):

1. In 802.11-2012: Life was simpler, a PPDU transmission worked, or it didn’t. Such a PPDU was only for one AC. So, the rule was:

The final transmission by the TXOP holder initiated during the TXOP for that AC was successful

1. 11ac D0.1 added “All the MPDUs in the final PPDU” (where/why??)
2. Per 11-11/0606r1 (TGac, May 2011), deleted superfluous “or MU-MIMO PPDU” (must have been added somewhere??), so changed back to: May 10, 2011

All the MPDUs in the final PPDU transmission by the TXOP holder initiated during the TXOP for that AC was successful

1. Per 11-11/1378r1 (Oct 2011), 802.11ac-D2.0, changed back to original text, since “without receiving any kind of ACKs/BAs, there is no way to know whether the transmission was successful or not.”
2. Per 11-11/1472r1 (Nov 2011), added a paragraph after the bullets, mostly about case (d) and sharing upon an internal collision. But, also added that in cases (b) and (c) “a secondary AC shall invoke different backoff procedures defined for either event b) or event c).” No idea what this means.
3. Per 11-12/0431r3 (May 2012), “since the channel access was acquired by the primary AC, the outcome of the initial or last frame exchange feeds back on the backoff for primary AC only. This keep the backoff procedure aligned with the SU case.” This deleted the part in the paragraph after the bullets, about cases (b) and (c).
4. Also Per 11-12/0431r3, to interpret case (b), noted the definition of successful transmission:

*For the purposes of this subclause, successful transmission and transmission failure of an MPDU are defined as follows:*

*After transmitting an MPDU (regardless of whether even if it is carried in an A-MPDU or as part of an MU PPDU) that requires an immediate frame as a response, the STA shall wait for a timeout interval of duration of aSIFSTime + aSlotTime + aPHY-RX-START-Delay, starting at the PHYTXEND.confirm. If a PHYRXSTART.indication does not occur during the timeout interval, the STA concludes that the transmission of the MPDU has failed.*

*The transmission of an MPDU that does not require an immediate frame as a response is defined as a successful transmission, unless it is one of the non-final (re)transmissions of an MPDU that is delivered using the GCR unsolicited retry retransmission policy (9.19.2.6.2)*

But chose to clarify, changing (b) text to:

The ~~final~~ transmission of all the MPDUs in the final PPDU transmitted by the TXOP holder ~~initiated~~ during the TXOP for that AC was successful as defined in this subclause and the TXNAV timer has expired*”*

1. (Per 11-12/0509r4, CID 4617 (May 2012), also delete the sentence at the end, because “we are talking about the behavior of ‘now’ “. Huh??)
2. Per 11-12/0855r5, CID 6111 (Sept 2012), D4.0 changed “of all MPDUs” to “of the MPDU”.
3. 11ac D4.0 comments, CID 7220 (in 11-12/1277r11) (Nov 2012): These “invoke a backoff procedure” rules must not apply to any EDCAF (any AC) that isn’t the one doing the transmitting now. That is, the transmitting EDCAF (AC) “grabs frames” from other AC queues (per the sharing rules), but those other AC’s EDCAFs are not affected in any way. CID resolution added the “and the AC was a primary AC” to the end, to capture this. (Youhan KIM’s comment and proposal, Allan ZHU reviewed, it was ACCEPTED.)
4. 11ac D5.0 result, and the final wording in 802.11ac:

The ~~final~~ transmission of the MPDU in the final PPDU transmitted by the TXOP holder ~~initiated~~ during the TXOP for that AC was successful as defined in this subclause and the TXNAV timer has expired, and the AC was a primary AC.

1. REVmc, CID 285 said, and was accepted:

In item b) The success or failure should not matter here - there should always be a backoff after finishing a TXOP. And there is the question of whether one should wait for the expiration of the TXNAV value first, but I think that part is covered. Change "was successful" to "was completed"

1. So, 802.11-2016 has:

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.

And this remains in the current REVmd draft.

So, considering the points in the comment:

**- what does "has completed" mean (just "has been put on the air, don't care about response if needs one"?)**

MAH: Agree with the comment, this is vague. The current wording is the result of REVmc CID 285, which stated that the success or failure of the transmission is not relevant to invoking the backoff procedure. However, in the failure case, rules in the Acknowledgement procedure (subclause 10.3.2.11) state:

After transmitting an MPDU that requires an Ack or BlockAck frame as a response (see Annex G), the STA shall wait for an AckTimeout interval, with a value of aSIFSTime + aSlotTime + aRxPHYStartDelay, starting at the PHY-TXEND.confirm primitive. If a PHY-RXSTART.indication primitive does not occur during the AckTimeout interval, the STA concludes that the transmission of the MPDU has failed, and this STA shall invoke its backoff procedure upon expiration of the AckTimeout interval.

If a PHY-RXSTART.indication primitive does occur during the AckTimeout interval, the STA shall wait for the corresponding PHY-RXEND.indication primitive to determine whether the MPDU transmission was successful. If the STA recognizes a valid Ack frame addressed to the STA and corresponding to this PHYRXEND. indication primitive, this recognition shall be interpreted as successful acknowledgment.

If the STA does not recognize a valid Ack frame addressed to the STA, this condition shall be interpreted as failure of its MPDU transmission(11ah), except as defined below.

So, the failure case is already covered, and properly includes the Acktimeout extra time, or waiting for the response frame to complete (which the change in REVmc lost, except in the case that TXNAV covered it).

The successful case needs to be covered, here, however.

**Propose**: Replace “has completed” with “was successful”.

**- what is the "AC was a primary AC" about? Presumably this is the MPDU at the start of the sentence?**

MAH: This text comes from 802.11ac D4.0 comments, CID 7220 (as can be found in 11-12/1277r11): These “invoke a backoff procedure” rules must not apply to any EDCAF (any AC) that isn’t the one doing the transmitting now. That is, the transmitting EDCAF (AC) can “grab frames” from other AC queues (per the sharing rules), but those other AC’s EDCAFs are not affected in any way.

Since the bullet list starts:

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

the “and the AC was a primary AC” was added to the end, to be clear that only applies to the EDCAF for the primary AC (the one doing the transmitting). So, this is correct, and needed. It could perhaps be reworded.

**Propose:** Delete “and the AC was a primary AC” at the end of (b) and (c). Insert “For the EDCAF associated with the primary AC,” at the start of (b) and (c).

As an aside, note that bullet (e) has the same issue, in that it is not clear that only the EDCAF that is the TXOP holder will invoke the backoff procedure.

Propose: Change the start of bullet (e) to, “For the EDCAF that is the TXOP holder, the transmission of an MPDU …”

**- so you start backoff immediately, even if you then transmit a secondary AC MPDU in the TXOP? Or you don't do backoff at all if the last MPDU you transmitted in the TXOP was a secondary AC MPDU?**

MAH: It’s not about the AC of the MPDU, it’s trying to limit to the EDCAF for the primary AC, per above. The change above addresses this.

**Propose:** No change needed.

**- what does "the MPDU in the final PPDU" mean if there is more than one MPDU in the final PPDU?**

MAH: This text is the result of 802.11ac D3.0 CID 6111:

This changes the behavior that is defined in 11n. In 11n, if the blkack of the last A-MPDU is received, the value of CW[AC] shall be reset to CWmin[AC]. The text here says that the value of CW[AC] will not be reset to CWmin[AC] if blkack does not acknowledge all MPDUS in the last A-MPDU.

That CID has this resolution:

Revise. Discussion: transmission result of “all MPDUs” is not described in P130L9 to P130L39. It is better to remove it. See change in 11-12/855.

Editorial Instruction: Change P131L45 to P131L48 as following:

“b) The ~~final~~ transmission of the MPDU in the final PPDU transmitted by the TXOP holder…

Agree with the current comment, this change seems incorrect, or at least insufficient/unclear.

There is considerable contemporary discussion about whether all MPDUs in an A-MPDU need to be acknowledged, or if any one MPDU being acknowledged is sufficient. Let alone discussion about what it all the MPDUs are sent with a delayed (block) ack policy.

In the current Draft (REVmd D3.0), we now have a definition of “successful transmission”:

**successful transmission:** A transmission and the reception of its expected immediate response or a transmission for which no immediate response is expected

Given this definition, the only ambiguity seems to be to identify what is transmitted that is expecting an immediate response (or not). ***I need terminology help here, in the current world of MPDUs inside A-MPDUs which are themselves MPDUs (right?). Can we just say “an MPDU” instead of “the MPDU”?***

**- what if there isn't a TXNAV (i.e. multiple protection is not being used)?**

MAH: Per REVmd D3.0 P1827.50 in combination with subclause 9.2.5.2, there is always a TXNAV. For single protection is it just the same as the single frame exchange’s Duration/ID. For multiple protection, the TXNAV covers up to the expected end of a sequence of frame exchanges. In either case, the TXNAV needs to expire before the end-of-transmit backoff is invoked.

P1827.50:





**Propose:** No change needed.

**- so if the TXNAV timer has not expired you need to wait until it does and then do backoff? (More plausible than "you don't do backoff at all if the TXNAV hadn't expired at the same time as the "completion" of the last transmission!)**

MAH: Yes, you need to wait until it does expire, to be fair to the other devices that are aware of the TXNAV/NAV and are waiting before they can start their backoff.

**Propose:** No change needed.

Proposed Resolution:

Revised. At the cited location, modify as shown:

1. For the EDCAF associated with the primary AC, t~~T~~he transmission of ~~the~~ an MPDU in the final PPDU transmitted by the TXOP holder during the TXOP for that AC ~~has completed~~ was successful and the TXNAV timer has expired~~, and the AC was a primary AC~~. (See 10.23.2.7 (Sharing an EDCA TXOP)).

NOTE—For the procedure to determine of the transmission was not successful, and how to invoke the backoff procedure, see 10.3.2.11 (Acknowledgement procedure).

1. For the EDCAF associated with the primary AC, t~~T~~he transmission of an MPDU in the initial PPDU of a TXOP fails, as defined in this subclause~~, and the AC was a primary AC~~.

…

1. For the EDCAF that is the TXOP holder, the transmission ~~The transmission by the TXOP holder~~ of an MPDU in a non-initial PPDU of a TXOP fails, as defined in this subclause.