IEEE P802.11
Wireless LANs

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| Resolution CID 5144 on 11mc/D4.0  |
| Date: 2015-09-08 |
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Abstract

This submission proposes resolution for CID 5144 on 11mc/D4.0.

Green indicates material agreed to in the group,

yellow material to be discussed, red material rejected by the group and

cyan material not to be overlooked.

The “Final” view should be selected in Word.

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| Identifiers | Comment | Proposed change |
| CID 5144Adrian9.23.11347.21 | "EDCA TXOPs of a mesh STA that has dot11MCCAActivated true shall not overlap with the time periods of any of its tracked MCCAOP reservations." -- but the section on EDCA doesn't describe how to do it, and contains lots of "may transmit" statements. | In 9.22.2 add constraints that a TXOP cannot be gained under EDCA during one of these tracked time conditions, and the TXOP duration is limited so the TXOP does not extend into any such period. |

Discussion:

“The MCCAOP is an interval of time for frame transmissions that has been reserved by means of the exchange of MCCA frames (see 9.23.3 (MCF controlled channel access (MCCA))).

EDCA TXOPs of a mesh STA that has dot11MCCAActivated true shall not overlap with the time periods of any of its tracked MCCAOP reservations.”

9.22.2.4 Obtaining an EDCA TXOP

(Note: EDCAF is EDCA function of which there are 4.)

The idea of a TXOP is that when the STA gains access it gains the TXOP. Within the TXOP the STA obtaining a TXOP (the TXOP holder) maintains uninterrupted control of the medium (not exceeding the TXOP Limit).

MCCAOP Reservations are explained in 9.23.3.3. An MCCAOP reservation specifies a schedule for frame transmissions. However, during an MCCAOP the mesh STA still contends using EDCA.



So the MCCAOP Duration is 1 octet in length and specifies the MCCAOP in multiples of 32 us

ASIDE: 8 bits is 256, 256 x 32us = 8192us. However, 6.3.79.3.2 (P415.53) gives the “Valid Range” as 0 – 65535, it should be 0 – 255. Correct this as well?

So it is perfectly possible, that an EDCA TXOP can be longer than an MCCAOP duration.

Now the commenter wants to

1. Stop any TXOP during an MCCAOP
2. Restrict the TXOP during an MCCAOP.

If we do a) then we do not need b). Is the cited text saying a) or b)? Also need to clarify what is meant by ‘overlap’ and what is a ‘tracked’ MCCAOP reservation.

Tracked MCCAOP Reservation, for me, would include those for me and those for my neighbors. Hence, only if the MCCAOP is for my neighbors should I restrain from transmitting. If it is for me, then of course I may transmit.

Hence, the idea, as I see it, is to

1. **If a neighbour**, do not transmit within an MCCAOP for which you are not a member
2. Do not transmit outside of the MCCAOP for which you are a member.

I think that 1 is covered clearly in 9.23.3.9

1347.56 states:

The MCCA enabled neighbor mesh STAs that could cause interference to transmissions during these reserved time periods, or that would experience interference from them, shall not transmit during these reserved time periods.

Also 1357.59 “…,a neighboring STA shall not access the WM during an MCCAOP, until it receives a frame

from either the MCCAOP owner or the MCCAOP responder.”

So we need to cover 2) do not exceed the TXOP limit.

The place to add text seems to be in 9.22.2.8 TXOP limits which is the only section that talks about “The duration of a TXOP”. At the end seems appropriate.

The suggested text (below):

The first part of the proposed text is to deal with the transmission of packets within the TXOP and MCCAOP, the second is to stop the transmission of even one packet if is exceeds the MCCAOP.

Proposed Resolution

REVISED

“At the end of 9.22.2.8 P 1332.12 add the following:

“The duration of a TXOP for a mesh STA that has dot11MCCAActivated true shall not exceed the time between the start of the TXOP and the end of the MCCAOP reservation ends. A mesh STA that has dot11MCCAActivated true that obtains a TXOP shall not transmit or cause to be transmitted (as responses) any PPDU or MMPDU that will extend beyond the end of the MCCAOP reservation.”

Adrian:

The intentent of the MCCAOP reservation is clear. A sta wants its neighbors not to transmit during this reservation.

If a STA is using EDCA, then this means exactly:

1. Don’t start a TXOP during a reserved period
2. Stop a TXOP before any next reserved period.

You can handle 1 possibly by adding MCCAOP reservation as a type of virtual carrier sense.

I don’t see any way to avoid adding a statement to handle this.

I think the “starting” case is pretty similar to the TXNAV case, and resolution of comment 5141 in doc 1010r13 hopefully addresses this with the following changes:

Just to be clear, it should read

1. If a neighbour, do not transmit within an MCCAOP for which you are not a member
2. Do not transmit outside of the MCCAOP for which you are a member.

Adrian has proposed proposed edits to EDCA procedure to correct applications of TXNAV and then, once that is done, add MCCAOP to it.

First of all TXNAV:

“The TXNAV timer is a timer that is initialized with the duration from the Duration/ID field in the frame most recently successfully transmitted by the TXOP holder, except for PS-Poll frames. The TXNAV timer begins counting down from the end of the transmission of the PPDU containing that frame.”

All below, at first sight, appears to be the solution to a different comment, i.e. back off procedure decription. Adrian’s point is that the instruction to stay off the medium until the NAV timer has extinguished is valid and not included in the instructions. Then, once having added the TXNAV time, we can add in the MCCAOP reservation time. Now, however, we probably need another timer that counts down from the start of the MCCAOP.

While we are at it, the description for TXNAV timer, and proposed TXMCCAOP timer should precede their use in text.

I have tried to look at all instances of “TXNAV” plus Adrian’s additions, and made an attempt to include, if relevant, the TXMCCAOP timer.

Here first are Adrian’s changes as sent to me, but you may wish to jump to the proposed Resolution Page 11.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| * HCF
* HCF (#2203)contention based channel access (EDCA)(11ad)
* EDCA backoff procedure

Each EDCAF shall maintain a state variable CW[AC], which shall be initialized to the value of the parameter CWmin[AC], for that EDCAF’s AC.(#2458)For the purposes of this subclause, (#2458)transmission failure of an MPDU(11ac) is defined as follows:* After transmitting an MPDU (even if(11ac) it is carried in an A‑MPDU or as part of a VHT MU PPDU that might have TXVECTOR parameter NUM\_USERS > 1)(11ac) that requires an immediate frame as a response, the STA shall wait for a timeout interval of duration of aSIFSTime + aSlotTime + aRxPHYStartDelay(#1486), starting at the PHY-TXEND.confirm primitive. If a PHY-RXSTART.indication primitive does not occur during the timeout interval, the STA concludes that the transmission of the MPDU has failed.
* If a PHY-RXSTART.indication primitive does occur during the timeout interval, the STA shall wait for the corresponding PHY-RXEND.indication primitive to recognize(#2458) a valid response frame sent by the recipient of the MPDU requiring a response. The recognition of anything else, including any other valid frame, shall be interpreted as failure of the MPDU transmission.(#2458)
* The nonfinal (re)transmission of an MPDU that is delivered using the GCR unsolicited retry retransmission policy (9.22.2.10.2 (Unsolicited retry procedure))) is defined to be a failure.(11aa)(#2458)

The backoff procedure shall be invoked by(#2458) an EDCAF when any of the following events occurs:* 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 non-empty and any other transmit queues associated with that AC are empty;(#1439) the medium is busy on the primary channel(11ac) as indicated by physical CS, virtual CS, or a non-zero TXNAV timer value; and the backoff timer has a value of 0 for that AC.
* The transmission of the MPDU in the final PPDU transmitted(11ac) by the TXOP holder during the TXOP for that AC has completed(#285) and the TXNAV timer has expired, and the AC was a primary AC.(11ac) (See 9.22.2.6 (Sharing an EDCA TXOP))(#2458)
* The expected immediate response to(11ac) the initial frame of a TXOP of that AC is not received and the AC was a primary AC.(11ac)
* 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.(11ac)

The transmission attempt of a STA coordinated by an MM-SME collides internally with another STA coordinated by the same MM-SME (see 10.34 (MMSL cluster operation)), which is indicated to the first MAC entity with a (#2123)PHY-TXBUSY.indication(BUSY) (MDR)primitive as response to the PHY-TXSTART.request primitive. (11ad)(#2458)In addition, the backoff procedure may be invoked for an EDCAF when the transmission of the MPDUs in a non-initial PPDU by the TXOP holder fails.(11ac)NOTE 2(#1101)—A STA can perform a PIFS recovery, as described in 9.22.2.7 (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.A STA that performs a backoff within its existing TXOP shall not extend the TXNAV timer value (see 9.22.2.7 (Multiple frame transmission in an EDCA TXOP)).(#2458)NOTE 3(#1101)—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 because of reason b) above, the value of CW[AC] shall be reset to CWmin[AC].NOTE 4—If condition b) or c) occurs for a secondary AC, the backoff for the associated EDCAF continues without change to the backoff counter or to the value of CW[AC].(11ac)If the backoff procedure is invoked because of a failure event [reason c), d), or e)(11ad) above or the transmission failure of a non-initial frame by the TXOP holder], the value of CW[AC] shall be updated as follows before invoking the backoff procedure:* If the QSRC[AC] or the QLRC[AC] (#1056)has reached dot11ShortRetryLimit or dot11LongRetryLimit respectively, CW[AC] shall be reset to CWmin[AC].
* If dot11RobustAVStreamingImplemented is true and either(#1056) the QSDRC[AC] or the QLDRC[AC] has reached dot11ShortDEIRetryLimit or dot11LongDEIRetryLimit, respectively, CW[AC] shall be reset to CWmin[AC].(11aa)
* Otherwise,
* If CW[AC] is less than CWmax[AC], CW[AC] shall be set to the value (CW[AC] + 1)×2 – 1.
* If CW[AC] is equal to CWmax[AC], CW[AC] shall be left(#2458) unchanged.(#2458)
* EDCA TXOPs

There are three(11ac) modes of EDCA TXOP defined:(Ed) initiation of an EDCA TXOP, sharing an EDCA TXOP,(11ac) and multiple frame transmission within an EDCA TXOP. Initiation of the TXOP occurs when the EDCA rules permit access to the medium. Sharing of the EDCA TXOP occurs when an EDCAF within an AP that supports DL-MU-MIMO(#2458) has obtained access to the medium, making the corresponding AC the primary AC, and includes traffic from queues associated with other ACs in VHT MU PPDUs transmitted during the TXOP.(11ac) Multiple frame transmission within the TXOP occurs when an EDCAF retains the right to access the medium following the completion of a frame exchange sequence, such as on receipt of an (#1198)Ack frame.* Obtaining an EDCA TXOP

Each EDCAF(#2458) shall maintain a backoff timer, which has a value measured in backoff slots as described below.(#2458)When the backoff procedure is invoked, the(#2458) backoff timer is set to an integer value chosen randomly with a uniform distribution taking values in the range [0,CW[AC]] inclusive.The duration AIFS[AC] is a duration derived from the value AIFSN[AC] by the relationAIFS[AC] = AIFSN[AC] × aSlotTime + aSIFSTime.In an infrastructure BSS, AIFSN[AC] is advertised by an EDCA AP in the EDCA Parameter Set element in Beacon and Probe Response frames transmitted by the AP.(#2458) The value of AIFSN[AC] shall be greater than or equal to 2 for non-AP STAs.(#2437)(#2458) The value of AIFSN[AC] shall be greater than or equal to 1 for APs. An EDCA TXOP is granted to an EDCAF when the EDCAF determines that it shall initiate the transmission of a frame exchange sequence. Transmission initiation shall be determined according to the following rules:EDCAF(#2458) operations shall be performed at slot boundaries, defined as follows on the primary channel,(#2458) for each EDCAF:* Following AIFSN[AC] × aSlotTime – aRxTxTurnaroundTime of idle medium after SIFS (not necessarily idle medium during the SIFS(#156)) after the last busy medium on the antenna that was the result of a reception of a frame with a correct FCS.
* Following EIFS – DIFS + AIFSN[AC] × aSlotTime + aSIFSTime – aRxTxTurnaroundTime of idle medium after the last indicated busy medium as determined by the physical CS mechanism that was the result of a frame reception that has resulted in FCS error, or PHY-RXEND.indication (-RXERROR) primitive where the value of RXERROR is not NoError.
* When any other EDCAF at this STA transmitted a frame requiring acknowledgment, the earlier of
* The end of the (#1627)(#3338)AckTimeout interval timed from the (#1601)PHY‑TXEND.confirm primitive, followed by AIFSN[AC] (#1630)× aSlotTime + aSIFSTime – aRxTxTurnaroundTime of idle medium, and
* The end of the first AIFSN[AC] × aSlotTime – aRxTxTurnaroundTime of idle medium after SIFS (not necessarily medium idle during the SIFS(#156), the start of the SIFS(#156) implied by the length in the PHY(#61) header of the previous frame) when a PHY-RXEND.indication primitive occurs as specified in 9.3.2.9 (Ack procedure).
* Following AIFSN[AC] × aSlotTime – aRxTxTurnaroundTime of idle medium after SIFS (not -necessarily medium idle during the SIFS(#156)) after the last busy medium on the antenna that was the result of a transmission of a frame for any EDCAF and which did not require an –acknowledgment and after the expiration of the TXNAV timer, if non-zero.
* Following AIFSN[AC] × aSlotTime + aSIFSTime – aRxTxTurnaroundTime of idle medium after the last indicated idle medium as indicated by the CS mechanism that is not covered by a) to d).
* Following aSlotTime of idle medium, which occurs immediately after any of these conditions, a) to f), is met for the EDCAF.

On these(#2458) specific slot boundaries(#2458) each EDCAF shall make a determination to perform one and only one of the following functions:* Decrement the backoff timer.(#2458)
* Initiate the transmission of a frame exchange sequence.(#2458)
* Invoke the backoff procedure due to an internal collision.
* Do nothing.(#2458)

NOTE—In the case that an EDCAF gains access to the channel and transmits MSDUs, A-MSDUs, or MMPDUs from a secondary AC, the EDCAF of the secondary AC is not affected by this operation. If the EDCAF of a secondary AC experiences an internal collision with the EDCAF that gained access to the channel, it performs the backoff procedure regardless of the transmission of any of its MSDUs, A-MSDUs, or MMPDUs (See 9.22.2.6 (Sharing an EDCA TXOP)).(11ac)At each of the above-described specific slot boundaries, each EDCAF shall decrement the backoff timer if the backoff timer for that EDCAF has a nonzero value.At each of the above-described specific slot boundaries, each EDCAF shall initiate a transmission sequence if* There is a frame available for transmission at that EDCAF, and
* The backoff timer for that EDCAF has a value of 0, and
* Initiation of a transmission sequence is not allowed to commence at this time for an EDCAF of higher UP.

At each of the above-described specific slot boundaries, each EDCAF shall report an internal collision (which is handled in 9.22.2.10 (Retransmit procedures)) if* There is a frame available for transmission at that EDCAF, and
* The backoff timer for that EDCAF has a value of 0, and
* Initiation of a transmission sequence is allowed to commence at this time for an EDCAF of higher UP.

An example showing the relationship between AIFS, AIFSN, DIFS, and slot times immediately following a medium busy condition (and assuming that medium busy condition was not caused by a frame in error) is shown in Figure 9-26 (EDCA mechanism timing relationships). In this case, with AIFSN = 2, the EDCAF may decrement the backoff counter for the first time at 2 × aSlotTime following the (#1610)TxSIFS (where (#1610)TxSIFS is the time at which the MAC responds to the end of the medium busy condition if it is going to respond “after SIFS”). If, in this example, the backoff counter contained a value of 1 at the time the medium became idle, transmission would start as a result of an EDCA TXOP on-air at a timeaSIFSTime + 3 × aSlotTimefollowing the end of the medium busy condition.A STA shall save the TXOP holder address for the BSS in which it is associated, which is the MAC address from the Address 2 field of the frame that initiated a frame exchange sequence except when this is a CTS frame, in which case the TXOP holder address is the Address 1 field. If the TXOP holder address is obtained from a Control frame(Ed), a VHT STA shall save the (MDR)nonbandwidth signaling TA value obtained from the Address 2 field. If a non-VHT STA receives(11ac) an RTS frame with the RA address matching the MAC address of the STA and the MAC address in the TA field in the RTS frame matches the saved TXOP holder address, then the STA shall send the CTS frame after SIFS, without regard for, and without resetting, its NAV. If a VHT STA receives an RTS frame with the RA address matching the MAC address of the STA and the (MDR)nonbandwidth signaling TA value obtained from the Address 2 field in the RTS frame matches the saved TXOP holder address, then the STA shall send the CTS frame after SIFS, without regard for, and without resetting, its NAV.(11ac) When a STA receives a frame addressed to it that requires an immediate response, except for RTS, it shall transmit the response independent of its NAV. The saved TXOP holder address shall be cleared when the NAV is reset or when the NAV counts down to 0.* EDCA channel access in a VHT or TVHT(11af)(Ed) BSS(11ac)

If the MAC receives a PHY-CCA.indication primitive with the channel-list parameter present, the channels considered idle are defined in Table 9-10 (Channels indicated idle by the channel-list parameter).

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| * Channels indicated idle by the channel-list parameter(11ac)
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| PHY-CCA.indication (MDR)primitive channel-list element | Idle channels |
| primary | None |
| secondary | Primary 20 MHz channel |
| secondary40 | Primary 20 MHz channel and secondary 20 MHz channel |
| secondary80 | Primary 20 MHz channel, secondary 20 MHz channel, and secondary 40 MHz channel |

When a STA and the BSS, of which the STA is a member, both support multiple channel widths, an EDCA TXOP is obtained based solely on activity of the primary channel. “Idle medium” in this subclause means “idle primary channel.” Likewise “busy medium” means “busy primary channel.” Once an EDCA TXOP has been obtained according to this subclause, further constraints defined in 10.16.9 (STA CCA sensing in a 20/40 MHz BSS) and 9.22.3 (HCF controlled channel access (HCCA)) might limit the width of transmission during the TXOP or deny the channel access, based on the state of CCA on secondary channel, secondary 40 MHz channel, or secondary 80 MHz channel.(11ac)In the following description, the CCA is sampled according to the timing relationships defined in 9.3.7 (DCF timing relations). Slot boundaries are determined solely by activity on the primary channel. “Channel idle for an interval of PIFS” means that the STATE parameter of the most recent PHY-CCA.indication primitive was IDLE, and no PHY-CCA.indication(BUSY) occurred during the period of PIFS that ends at the start of transmission(#3510), the CCA for that channel was determined to be idle.If a STA is permitted to begin a TXOP (as defined in 9.22.2.4 (Obtaining an EDCA TXOP)) and the STA has at least one MSDU pending for transmission for the AC of the permitted TXOP, the STA shall perform exactly one of the following actions:(#2458)* Transmit a 160 MHz or 80+80 MHz mask PPDU if the secondary channel, the secondary 40 MHz channel, and the secondary 80 MHz channel were idle during an interval of PIFS immediately preceding the start of the TXOP.
* Transmit an 80 MHz mask PPDU on the primary 80 MHz channel if both the secondary channel and the secondary 40 MHz channel were idle during an interval of PIFS immediately preceding the start of the TXOP.
* Transmit a 40 MHz mask PPDU on the primary 40 MHz channel if the secondary channel was idle during an interval of PIFS immediately preceding the start of the TXOP.
* Transmit a 20 MHz mask PPDU on the primary 20 MHz channel.
* Restart the channel access attempt by invoking the backoff procedure as specified in 9.22.2 (HCF contention based channel access (EDCA)) as though the medium is busy on the primary channel as indicated by either physical or virtual CS, the TXNAV timer value has a value of 0, and the backoff timer has a value of 0.
* Transmit a TVHT\_4W or TVHT\_2W+2W mask PPDU if the secondary TVHT\_W channel and the secondary TVHT\_2W channel were idle during an interval of PIFS immediately preceding the start of the TXOP.(11af)
* Transmit a TVHT\_2W or TVHT\_W+W mask PPDU if the secondary TVHT\_W channel was idle during an interval of PIFS immediately preceding the start of the TXOP.(11af)
* Transmit a TVHT\_W mask PPDU on the primary TVHT\_W channel.(11af)

NOTE 1—In the case of rule e), the STA selects a new random number using the current value of CW[AC], and the retry counters are not updated (as described in 9.22.2.7 (Multiple frame transmission in an EDCA TXOP); backoff procedure invoked for event a)).NOTE 2—For both an HT and a VHT STA, an EDCA TXOP is obtained based on activity on the primary channel (see 9.22.2.4 (Obtaining an EDCA TXOP)). The width of transmission is determined by the CCA status of the (MDR)nonprimary channels during the PIFS interval before transmission (see VHT description in 9.3.2 (Procedures common to the DCF and EDCAF)).(#2458)* Multiple frame transmission in an EDCA TXOP

A frame exchange may be one of the following:(11ac)* A frame not requiring immediate acknowledgment (such as a group addressed frame or a frame transmitted with an acknowledgement policy that does not require immediate acknowledgement) or an A-MPDU containing only such frames
* A frame requiring acknowledgment (such as an individually addressed frame transmitted with an acknowledgement policy that requires immediate acknowledgement) or an A-MPDU containing at least one such frame, followed after SIFS by a corresponding acknowledgment frame
* Either
* a VHT NDP Announcement frame followed after SIFS by a VHT NDP, or
* a Beamforming Report Poll frame

followed after SIFS by a PPDU containing one or more VHT Compressed Beamforming framesThe TXNAV timer is a single timer, shared by the EDCAFs within a STA, that is initialized with the duration from the Duration/ID field in the frame most recently successfully transmitted by the TXOP holder, except for PS-Poll frames.(#2458) The TXNAV timer begins counting down from the end of the transmission of the PPDU containing that frame. An(#2458) HT STA may retransmit unacknowledged MPDUs within the same TXOP or in a subsequent TXOP.Multiple frames may be transmitted in an EDCA TXOP that was acquired following the rules in 9.22.2.4 (Obtaining an EDCA TXOP) if there is more than one frame pending in the primary(11ac) AC for which the channel has been acquired. However, those frames that are pending in other ACs shall not be transmitted in this EDCA TXOP except when sent in a VHT MU PPDU with TXVECTOR parameter NUM\_USERS > 1 and if allowed by the rules in 9.22.2.6 (Sharing an EDCA TXOP).(11ac) If a TXOP holder has in its transmit queue an additional frame of the primary(11ac) AC and the duration of transmission of that frame plus any expected acknowledgment for that frame is less than the remaining TXNAV timer value, then the TXOP holder(11ac) may commence transmission of that frame a SIFS (or RIFS, if the conditions defined in 9.3.2.3.2 (RIFS) are met(11ac)) after the completion of the immediately preceding frame exchange sequence, subject to the TXOP limit restriction as described in Figure 9.22.2.8 (TXOP limits)(#3382). A STA shall not commence the transmission of an RTS with a bandwidth signaling TA until at least PIFS time after the immediately preceding frame exchange sequence.(11ac) An HT STA that is a TXOP holder may transmit multiple MPDUs of the same AC within an A‑MPDU as long as the duration of transmission of the A‑MPDU plus any expected (#192)BlockAck frame response is less than the remaining TXNAV timer value. NOTE 1—PIFS is used by a VHT STA to perform CCA in the secondary 20 MHz, 40 MHz, and 80 MHz channels before receiving RTS (see 9.3.2 (Procedures common to the DCF and EDCAF)).(11ac)NOTE 2—An RD responder can transmit multiple MPDUs as described in 9.28.4 (Rules for RD responder).(#241)After a valid response to the initial frame of a TXOP, if the Duration/ID field is set for multiple frame transmission and there is a subsequent transmission failure, the corresponding channel access function may transmit after the CS mechanism (see 9.3.2.1 (CS mechanism)) indicates that the medium is idle at the TxPIFS slot boundary (defined in 9.3.7 (DCF timing relations)) provided that the duration of that transmission(Ed) plus the duration of any expected acknowledgment and applicable IFS is less than the remaining TXNAV timer value.(#251) At the expiry of the TXNAV timer, if the channel access function has not regained access to the medium, then the EDCAF shall invoke the backoff procedure that is described in 9.22.2.10 (Retransmit procedures). Transmission failure is defined in 9.22.2.10 (Retransmit procedures).Note that, as for an EDCA TXOP, a multiple frame transmission is granted to an EDCAF, not to a STA, so that the multiple frame transmission is permitted only for the transmission of a frame of the same AC as the frame that was granted the EDCA TXOP, unless the EDCA TXOP obtained is used by an AP for a PSMP sequence or a VHT MU PPDU with TXVECTOR parameter NUM\_USERS > 1.(11ac) In the case of PSMP,(11ac) this AC transmission restriction does not apply to either the AP or the STAs participating in the PSMP sequence, but the specific restrictions on transmission during a PSMP sequence described in 9.29 (PSMP Operation) do apply.(#2458)If a TXOP is protected by an RTS or CTS frame carried in a non-HT or a non-HT duplicate PPDU, the TXOP holder shall set the TXVECTOR parameter CH\_BANDWIDTH of a PPDU as follows:(11ac)* To be the same or narrower than RXVECTOR parameter CH\_BANDWIDTH\_IN\_NON\_HT of the last received CTS frame in the same TXOP, if the RTS frame with a bandwidth signaling TA and TXVECTOR parameter DYN\_BANDWIDTH\_IN\_NON\_HT set to Dynamic has been sent by the TXOP holder in the last RTS/CTS exchange.
* Otherwise, to be the same or narrower than the TXVECTOR parameter CH\_BANDWIDTH of the RTS frame that has been sent by the TXOP holder in the last RTS/CTS exchange(Ed) in the same TXOP.

If there is no RTS/CTS exchange in non-HT duplicate format in a TXOP and there is at least one non-HT duplicate frame exchange in a TXOP, the TXOP holder shall set the CH\_BANDWIDTH parameter in TXVECTOR of a PPDU sent after the first non-HT duplicate frame to be the same or narrower than the CH\_BANDWIDTH parameter in TXVECTOR of the initial frame in the first non-HT duplicate frame exchange in the same TXOP.(11ac)If there is no non-HT duplicate frame exchange in a TXOP, the TXOP holder shall set the TXVECTOR parameter CH\_BANDWIDTH of a non-initial PPDU to be the same or narrower than the TXVECTOR parameter CH\_BANDWIDTH of the preceding PPDU that it has transmitted in the same TXOP.(11ac)If a TXOP is protected by a CTS-to-self frame carried in a non-HT or non-HT duplicate PPDU, the TXOP holder shall set the TXVECTOR parameter CH\_BANDWIDTH of a PPDU to be the same or narrower than the TXVECTOR parameter CH\_BANDWIDTH of the CTS-to-self (#3236)frame in the same TXOP.(11ac)NOTE—The bandwidth of a PS-Poll frame does not constrain the bandwidth of an immediate data response to that PS-Poll frame.(11ac)Note that(#1288) when transmitting multiple frames in a TXOP using acknowledgment mechanisms other than Normal Ack, a protective mechanism should be used (such as RTS/CTS or the protection mechanism described in 9.26 (Protection mechanisms)). A QoS AP or a mesh STA may send group addressed frames without using any protection mechanism. In a QoS IBSS, group addressed frames shall be sent one at a time, and backoff shall be performed after the transmission of each of the group addressed frames. In an MBSS, a mesh STA may send multiple group addressed frames in a TXOP, bounded by the TXOP limit, without performing backoff after the TXOP is obtained. |

So it may be you can get away with adding “or no current MCCAOP reservation is active” where TXNAV is mentioned.

Regarding limiting the TXOP, you need new text probably in 9.22.2.8 that says something like:

A mesh STA that has MCCAOP reservations active ***(this needs improvement)*** shall truncate its TXOP so that the TXOP completes before the next MCCAOP reservation starts.

Proposed Resolution

REVISED

At the end of 9.22.2.8 P 1332.12 add the following:

“The duration of a TXOP for a mesh STA that has dot11MCCAActivated true shall not exceed the time between the start of the TXOP and the end of the MCCAOP reservation. A mesh STA that has dot11MCCAActivated true that obtains a TXOP shall not transmit or cause to be transmitted (as responses) any PPDU or MMPDU that will extend beyond the end of the MCCAOP reservation.”

Move text from 1329.16 and insert at 1323.18 with the following changes:

“The TXNAV timer is a single timer, shared by the EDCAFs within a STA, that is initialized with the duration from the Duration/ID field in the frame most recently successfully transmitted by the TXOP holder, except for PS-Poll frames.(#2458) The TXNAV timer begins counting down from the end of the transmission of the PPDU containing that frame. An(#2458) HT STA may retransmit unacknowledged MPDUs within the same TXOP or in a subsequent TXOP.

Then insert the following text after the text above:

“TXMCCAOP time is a timer for a mesh STA that has dot11MCCAActivated true that is initialized with the MCCAOP Duration in the MCCAOP Reservation field at the start of an MCCAOP reservation. The TXMCCAOP timer begins counting down from the start of an MCCAOP reservation.”

At 1323.19 Make changes as shown

“The backoff procedure shall be invoked by(#2458) an EDCAF when any of the following events occurs:

* 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 non-empty and any other transmit queues associated with that AC are empty;(#1439) the medium is busy on the primary channel(11ac) as indicated by physical CS, virtual CS, a non-zero TXNAV timer value; or, for a mesh STA that has dot11MCCAActivated true, a non-zero TXMCCAOP timer value and the backoff timer has a value of 0 for that AC.”

At 1325.4, make changes as shown

* Following AIFSN[AC] × aSlotTime – aRxTxTurnaroundTime of idle medium after SIFS (not -necessarily medium idle during the SIFS(#156)) after the last busy medium on the antenna that was the result of a transmission of a frame for any EDCAF and which did not require an –acknowledgment and after the expiration of the TXNAV timer if non-zero, and, for a mesh STA that has dot11MCCAActivated true, the expiration of the TXMCCAOP timer if non-zero.

At 1329.30, make changes as shown

“…the duration of transmission of that frame plus any expected acknowledgment for that frame is less than either the remaining TXNAV or, for a mesh STA that has dot11MCCAActivated true, TXMCCAOP timer value, then the TXOP holder may commence transmission of that frame a SIFS (or RIFS, if the conditions defined in 9.3.2.3.2 (RIFS) are met) after the completion of the immediately preceding frame exchange sequence, subject to the TXOP limit restriction as described in Figure 9.22.2.8 (TXOP limits). A STA shall not commence the transmission of an RTS with a bandwidth signaling TA until at least PIFS time after the immediately preceding frame exchange sequence. An HT STA that is a TXOP holder may transmit multiple MPDUs of the same AC within an A-MPDU as long as the duration of transmission of the A-MPDU plus any expected BlockAck frame response is less than either the remaining TXNAV or, for a mesh STA that has dot11MCCAActivated true, TXMCCAOP timer value.

At 1329.49, make changes as shown

 “…provided that the duration of that transmission plus the duration of any expected acknowledgment and applicable IFS is less than either the remaining TXNAV or, for a mesh STA that has dot11MCCAActivated true, TXMCCAOP timer value. At the expiry of the TXNAV and, for a mesh STA that has dot11MCCAActivated true, the TXMCCAOP timer, if the channel access function has not regained access to the medium, then the EDCAF shall invoke the backoff procedure that is described in 9.22.2.10 (Retransmit procedures). Transmission failure is defined in 9.22.2.10 (Retransmit procedures).”

At 1329.56 delete

“All other channel access functions at the STA shall treat the medium as busy until the expiry of the TXNAV timer.”