IEEE P802.11
Wireless LANs

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| D1.0 Comments Resolutions on Backoff Procedure |
| Date: 2011-11-04 |
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This document provides resolution for the following backoff procedure related comments to 11ac spec draft D1.0: 3406, 3407, 3421, 3746, 3752, 3793, and 2097. All CIDs are for MAC ad hoc.

**CID 3793**

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| 3793 | 9.19.2.5 | 84.00 | This section is missing backoff procedures for secondary ACs. For example, how should a secondary AC adjust its CW and backoff timer when 1) its last PPDU has been sucessfully transmitted, 2) its transmission has failed, and 3) it is able to avoid an internal collision by MU-MIMI transmission. | Add defined backoff procedures for secondary ACs. | **Agree in principle**See doc # 11-11/1472 for detailed resolution |

**Discussion:**

This comment covers 3 of the 5 events that will trigger a backoff procedure as listed below.

b) The final PPDU transmission by the TXOP holder initiated during the TXOP for that AC was successful and the TXNAV timer has expired.

c) The expected immediate response to the initial frame of a TXOP of that AC is not received.

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.

The discussion here only addresses backoff procedure triggered by event b). Event d) will be addressed later when related comments are discussed. The commenter withdrew the comment on event c) so no resolution is provided.

For event b):

According to the TXOP sharing rules, each PPDU must contain at least one primary AC A-MPDU. If the PPDU contains one or more secondary AC frames and the transmission was successful, we believe the secondary ACs should not be requested to reset their CWs to CWmin[AC] just because they have shared the MU TXOP for downlink transmission.

**Proposed Resolution**

TGac Editor, please change the existing text (TGac D1.2, P102L16-17) as below.

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, and the AC is the primary AC in a MU transmission or the only AC in a SU transmission, the value of CW[AC] shall be reset to CWmin[AC]. If the backoff procedure is invoked because of reason b) above and the AC is a secondary AC in a MU transmission, neither the value of CW[AC] nor the backoff timer shall be changed (CID 3793).

**CID 3406, 3421, 3407, 3752**

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| 3406 | 9.19.2.5 | 84.42 | According to the current backoff rule, a backoff procedure shall be invoked when an internal collision between ACs occurs. However, if those ACs share TXOP, it could be not reasonable to make the secondary AC backoff with increasing CW. Different backoff rule for TXOP sharing may be preferred. | Define a different backoff rule for internal collisions with TXOP sharing. | **Agree in principle**See doc # 11-11/1472 for detailed resolution |
| 3421 | 9.19.2.5 | 84.42 | According to the current backoff rule, a backoff procedure shall be invoked when an internal collision between ACs occurs. However, if those ACs share TXOP, it could be not reasonable to make the secondary AC backoff with increasing CW. Different backoff rule for TXOP sharing may be preferred. | Define a different backoff rule for internal collisions with TXOP sharing. | **Duplicate of CID 3406** |
| 3407 | 9.19.2.6 | 85.34 | If an internal collision occurs but the secondary AC was successfully serviced through TXOP sharing, retry counters need not increase. | Clarify the behavior for retry counters with internal collisions under TXOP sharing. | **Agree in principle**See doc # 11-11/1472 for detailed resolution |
| 3752 | 9.19.2.5 | 84.00 | There is no description on the case that one AC's transmission attempt collides internally with another EDCAF of an AC that has higher priority but it gains the TXOP sharing by the AC has higher priority. The state machine is not complete. | Add some description and make the state machine complete accordingly. Refer to contribution 11-11-xxxx-xx-00ac-resolution-to-comments-xxx for a suggested change. | **Agree in principle**See doc # 11-11/1472 for detailed resolution |

**CID 3746**

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| 3746 | 9.19.2.5 | 84.11 | One of the backoff condition is "c) The expected immediate response to the initial frame of a TXOP of that AC no received". This rule only consider initialize the TXOP by a SU frame. When initializing a TXOP by a MU frame, one more rule is need to clearify the backoff. | Refer to contribution "Backoff for MU-MIMO TXOP". | **Withdrawn**Comment withdrawn by the commenter. |

**Discussion:**

The discussion here addresses backoff procedure triggered by event d); the internal collision case(CID 3406, 3421, 3407 and 3752).

According to current TGac draft, when there is an internal collision of at least two ACs, the contention window CW of the AC that has lower priority doubles.

With MU TXOP transmission, it is expected that in many cases internal collision can be resolved by transmitting frames of two or more ACs simultaneously. Therefore, if the internal collision cannot be resolved by TXOP sharing, the lower priority AC shall invoke exponential backoff just like in the current spec; and if the internal collision can be resolved by TXOP sharing, we believe it is better for the lower priority AC (now also the secondary AC) to keep its contention window unchanged until the time when the expected response to its initial frame is received (successful case), or the timer expires without receiving any response (failure case). When the transmission result is known, a secondary AC shall invoked backoff procedures according to the different results.

• If the result was successful, a secondary AC follows procedure of event b) for secondary AC. This means the secondary AC will use its current CW and pick up a random timer within this CW (it has counted down to zero).

• If the result is unsuccessful, a secondary AC invokes exponential backoff.

**Proposed resolution:**

TGac Editor: Pls make the following changes in subclause 9.19.2.5:

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

1. A frame with that AC is requested to be transmitted, the medium is busy on the primary channel as indicated by either physical or virtual CS, and the backoff timer has a value of zero for that AC.
2. The final PPDU transmission by the TXOP holder initiated during the TXOP for that AC was successful and the TXNAV timer has expired.
3. The expected immediate response to the initial frame of a TXOP of that AC is not received
4. 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, and the EDCAF of the lower priority AC is not sharing the TXOP with the winning AC through TXOP sharing mode. (CID 3406, 3421, 3407 and 3752)

In event d) above, if an internal collision can be resolved by one or more secondary ACs sharing the MU TXOP for downlink transmission, the one or more secondary ACs shall keep their CW[AC]s and backoff timer values unchanged before transmitting in a MU TXOP. In addition, at the end of the transmissions, depending on the transmission results, a secondary AC shall invoke different backoff procedures defined for either event b) or event c).

TGac Editor: Pls make the following changes in subclause 9.19.2.6 (Revmb D10.0):

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For internal collisions occurring with the EDCA access method, the appropriate retry counters of the colliding ACs that did not transmit in a MU TXOP (short retry counter for MSDU, A-MSDU, or MMPDU and QSRC[AC] or long retry counter for MSDU, AMSDU, or MMPDU and QLRC[AC]) are incremented (CID 3406, 3421, 3407 and 3752). For transmissions that use Block Ack, the rules in 9.21.3 (Data and acknowledgment transfer using immediate Block Ack policy and delayed Block Ack policy) also apply. STAs shall retry failed transmissions until the transmission is successful or until the relevant retry limit is reached.

**CID 2097**

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| 2097 | 9.19.2.5 | 84.22 | P802.11aa modifies this clause and this change has been lost in 11ac draft. | Update clause's referenced text to take account of REVmb + prior amendments | **Agree in principle**See doc # 11-11/1472 for detailed resolution |

**Discussion:**

Neither TGac draft spec D1.0 (the version used for LB# 178) nor the draft spec D1.2 (the latest version) reflects changes made by IEEE P802.11aa/D6.0 in this sub-clause. By checking the two specs, draft spec/D1.2 and P802.11aa/D6.0, it is found that the only paragraph both TGac and TGaa made changes to is the second paragraph.

**Proposed resolution:**

TGac Editor: Pls incorporate the changes made by IEEE P802.11aa/D6.0 in subclause 9.19.2.5 into TGac draft spec.