IEEE P802.11
Wireless LANs

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| Resolutions for “backoff” and “obsolete” Comments on D2.0 |
| Date: 2019-04 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Graham SMITH | SR Technology | Sunrise, FL, USA. | 916 799 9563 | gsmith@srtrl.com |

Abstract

This submission proposes resolutions for CIDs 2300, 2642, 2640, 2491, 2483, 2402, 2388, 2345, 2262, 2139

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.

REV 4 CID 2640 withdrawn as Mark R has resolved in another document

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| CID | Commenter | Clause  | Page  | Line | Comment | Proposed |
| 2300 | Mark H | 10.3.2.3.1 | 1696 | 44 | With the change to use "backoff count", there is no "backoff time" anymore, except for the logical concept (which should have very limited mention). | Change "Select backoff time and decrement" to "Selection backoff count and decrement".  Same thing at P1729.35.  Change the heading of 10.3.3 to "Random backoff count". At P1730.43, change "backoff time" to "backoff count".  Same thing at P2247.38. |

Yes, these were simply missed last time round. The first two refernces are to figures and the other two somehow missed in the original global search.

Search for other instances of “backoff time”?

Mark R provided 3, but 2 were already in Mark H’s comment. The one missing is

*10.3.1 The basic medium access protocol is a DCF that allows for automatic medium sharing between compatible PHYs through the use of CSMA/CA and a random backoff time following a busy medium condition.*

Proposed Resolution

REVISED

At 1693.15 (10.3.1) change “random backoff time” to random backoff count”.

In Figure 10-6

1696.38 delete “Backoff Time” and the arrows

1696.45 change “Select backoff time” to “Select backoff count”

In Figure 10-17

1729.35 change “Select backoff time” to “Select backoff count”

At P1730.43, change "backoff time" to "backoff count".

At P2247.38 change "backoff time" to "backoff count".

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| CID | Commenter | Clause  | Page  | Line | Comment | Proposed |
| 2642 | Mark Rison | 10.26.7 |  |  | HT-delayed BA is obsolete and should be deleted.  This was rejected in CID 1377 because "the Task Group discussed removing the feature, and deteremined no change at this time" but this is not responsive to the comment | Delete the referenced subclause |

Even though the Proposed Change is clear enough, you can’t just delete a subclause without fixing all the other references to the feature, hence probably this is “Submission Required”.

Reach out to Menzo.

 “Amongst the reasons as I recall were potential use of delayed BA ​for unidirectional links and for devices which can not meet the SIFS response requirement”

Ask for volunteer to make a submission?

Need the reasons why the comment was rejected originally.

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| CID | Commenter | Clause  | Page  | Line | Comment | Proposed |
| 2640 | Mark Rison | 10.3.4.3 |  |  | 10.3.4.3 (Backoff procedure for DCF) says (paragraph 5) [context:backoff suspended when medium busy]: "The medium shall be determined tobe idle for the duration of a DIFS --->\*or EIFS\*<---- as appropriate... before the backoff procedure is allowed to resume".This conflicts with a reading of the lettered paragraphs in 10.22.2.4,which determine the corresponding rules for EDCA.  Note in particularthat the only mention of EIFS is in b), which is therefore crucial.  The prologue to the lettered items says "EDCAFoperations shall be performed at slot boundaries, defined as follows onthe primary channel, for each EDCAF:".  b) Following EIFS - DIFS + AIFSN[AC] x 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 (11ah)non-S1G frame reception that has resulted in FCS error, or  (11ah)of a frame reception that has resulted in PHY-RXEND.indication  (RXERROR) primitive where the value of RXERROR is not NoError.Note in particular that EIFS here is applied only for busy medium thatwas the result of the error itself.So it seems that when there is later busy medium, and hence thebackoff is suspended in the sense of 10.3.4.3, the catch-all item e) forwhat to do following busy medium applies.  This makes no mention ofusing EIFS, so the medium only has to be clear for the standard formulainvolving AIFS at this point.FWIW, the EDCA version probably makes more sense.  The point of EIFS isto clear out a single possible bad frame from consideration.  Repeateduse of EIFS after that has happened doesn't seem useful.[This was rejected in CID 1347, in a way that suggest the point was missed.  Will present this time!] | Delete " or EIFS" in " The backoff counter is next decremented after the medium has been determined to beidle for the duration of a DIFS or EIFS, as appropriate" in 10.4.3.4 |

Note, reference is to DCF rules in 10.3.4.3 P1730.20

  Also, the Obtaining an EDCA TXOP is in 10.24.2.4. P1799.1

I refer to my work on CID 1347 in document 18/0655r0

Commentor is using D0.1 text (but a D1.0 reference?):

D0.1 1429.25

If the medium is determined to be busy at any time during a backoff slot, then the backoff procedure is suspended; that is, the backoff timer shall not decrement for that slot. The medium shall be determined to be idle for the duration of a DIFS or EIFS, as appropriate (see 10.3.2.3 (IFS)), before the backoff procedure is allowed to resume. Transmission shall commence when the backoff timer reaches 0.

This was changed as a result of CID 189 to make it clear what “suspended” means and now reads:

10.3.4.3 **Backoff procedure for DCF**

1608.20

“If the medium is determined to be busy at any time during a backoff slot, then the backoff counter shall not be decremented for that slot. The backoff counter is next decremented after the medium has been determined to be idle for the duration of a DIFS or EIFS, as appropriate (see 10.3.2.3 (IFS)), plus aSlotTime.(#189)

(#189)Transmission shall commence when the backoff counter equals 0.”

**The commenter is asking to delete “or EIFS” in this para.**

The EDCA TXOP rules are in 10.24.2.2 and read as follows:

EDCAF operations shall be performed at slot boundaries, defined as follows on the primary channel, for each

EDCAF:

a) Following AIFSN[AC] × aSlotTime – aRxTxTurnaroundTime of idle medium after SIFS (not

necessarily idle medium during the SIFS) after the last busy medium on the antenna that was the

result of a reception of a frame with a correct FCS (11ah)or of an S1G frame. Note that upon

reception of an S1G frame, an S1G STA updates its RID counter based on information obtained

from the RXVECTOR as described in 10.3.2.5 (Setting and resetting the RID(11ah)) and this update

does not depend on the outcome of the FCS check.

**b) 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 (11ah)non-S1G frame reception that has resulted in FCS error, or (11ah)of a frame**

**reception that has resulted in PHY-RXEND.indication (RXERROR) primitive where the value of**

**RXERROR is not NoError.**

c) When any other EDCAF at this STA transmitted a frame requiring acknowledgment, the earlier of

1) The end of the AckTimeout interval timed from the PHY-TXEND.confirm primitive, followed

by AIFSN[AC] × aSlotTime + aSIFSTime – aRxTxTurnaroundTime of idle medium, and

2) The end of the first AIFSN[AC] × aSlotTime – aRxTxTurnaroundTime of idle medium after

SIFS (not necessarily medium idle during the SIFS, the start of the SIFS implied by the length

in the PHY header of the previous frame) when a PHY-RXEND.indication primitive occurs as

specified in 10.3.2.10 (Acknowledgment procedure).

d) Following AIFSN[AC] × aSlotTime – aRxTxTurnaroundTime of idle medium after SIFS (not

necessarily medium idle during the SIFS) 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 nonzero, and, if dot11MCCAActivated is true, the

expiration of the RAV timer if nonzero.

e) Following AIFSN[AC] × aSlotTime + aSIFSTime – aRxTxTurnaroundTime of idle medium after

the last indicated busy medium as indicated by the CS mechanism that is not covered by a) to d).

f) Following aSlotTime of idle medium, which occurs immediately after any of these conditions, a) to

f), is met for the EDCAF.

**My assumption is that the EDCA procedure should be basically the same as DCF but where DIFS is replaced by AIFSN x slottime.**

DISCUSSION

So a) corresponds to the DCF condition of “the medium has been determined to be idle for the duration of a DIFS ….plus aSlotTime.”

Second let’s remind ourselves what EIFS is:

**10.3.2.3.7 EIFS**

A DCF shall use EIFS before transmission, when it determines that the medium is idle following reception of a frame for which the PHY-RXEND.indication primitive contained an error or a frame for which the FCS value was not correct. Similarly, a STA’s EDCA mechanism under HCF shall use the EIFS–DIFS+AIFS[AC] interval.

So b) corresponds to the DCF condition of “the medium shall be determined to be idle for the duration of a …EIFS ….plus aSlotTime.”

EDCA then adds more conditions, all using the AIFSN x Slottime + SIFS:

c) The STA itself transmits from a different EDCAF, requiring an ACK. No need for EIFS here.

d) The STA itself transmits from a different EDCAF, not requiring an ACK. No need for EIFS here.

e) Is “catch all” but I have to admit I have no idea what condition it may mean in practice.

So what is the commenter saying?

*“Note in particular that EIFS here”, i.e. condition b)” is applied only for busy medium that was the result of the error itself.”*

Correct, the packet did not check out, the received packet **resulted in FCS error** so the NAV is suspect, so EIFS applies and this corresponds exactly with DCF.

*“So it seems that when there is later busy medium, and hence the backoff is suspended in the sense of 10.3.4.3 “Backoff procedure for DCF,” the catch-all item e) for what to do following busy medium applies.*

**I don’t agree with this. I read the rules as applying to each and every backoff slot. So if the medium goes busy, in any backoff slot, one of a), b), c) or d) would apply**.

* FCS did check (use a), AIFSN x Slottime
* FCS did not check (use b), EIFS
* another packet transmitted by the same STA requiring an ACK (use c),
* another packet transmitted by the same STA not requiring an ACK (use d)
* a random burst of energy, no indication of NAV ??? Use e)? One could argue that this should be EIFS, but the framers of the rules chose not to
* F0 is strange because it refers to itself, but previous efforts to change it have fallen on deaf ears.

*This makes no mention of using EIFS, so the medium only has to be clear for the standard formula involving AIFS at this point.
FWIW, the EDCA version probably makes more sense. The point of EIFS is to clear out a single possible bad frame from consideration. Repeated use of EIFS after that has happened doesn't seem useful*

**Each backoff slot is independent. If medium goes busy during a backoff slot, the backoff timer stops. If the NAV is interpreted correctly, i.e. the interfering packet is correctly received, then the STA waits as per a), c) or d). If the packet was in error, then the STA waits as per b).**

**Then the timer starts again. If the medium goes busy again, either in the same backoff slot or a different one, the same conditions apply. If a “bad” packet caused an EIFS wait, then after the wait that packet is out of there, but true if another ‘bad’ packet came in, then the STA must wait EIFS again.**

MAYBE the commentor is concerned that if, in any one timeslot, EIFS was used, then because the rule says **“**EDCAF operations shall be performed at slot boundaries”, this is interpreted as EIFS must be used until that timeslot has completed? This may be countered by “after the last busy medium on the antenna” which I interpret as even though it is the same slot, it is the last received packet.

Now we look at the commenter’s Proposal

*Delete " or EIFS" in " The backoff counter is next decremented after the medium has been determined to be idle for the duration of a DIFS or EIFS, as appropriate" in 10.4.3.4*

If we did this, then we would have EIFS for EDCA, and not for DCF. This, I feel, would not be acceptable as basically DCF and EDCA should be basically the same. We could delete EIFS in DCF AND delete b) in EDCA and then e) would apply if the FCS failed. Personally I would be OK with that except some will say it is a major change that would disadvantage legacy devices.

I await the presentation so as to see the point I missed.

In the meantime, I suggest two possiblilites:

RESOLUTION

Either

1. REVISED (Get rid of EIFS all together)

At 1730.23 Delete “or EIFS’”

At 1797.48 delete bullet b).

Renumber c) to f) as b) to e).

In new e) change “a) to f)” to “a) to e)”

OR

1. REJECT (My preferred option)

EDCA and DCF backoff procedures should be basically the same. Removing EIFS condition only from DCF would be a major difference to EDCA. EIFS is required to account for packets detected where the NAV information is not reliable.

THIS CID HAS BEEN RESOLVED BY MARK R IN A SEPARATE DOCUMENT. THEREFORE WITHDRAWN FROM THIS DOCUMENT.

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| CID | Commenter | Clause  | Page  | Line | Comment | Proposed |
| 2491 | Mark Rison | 10.3.1 | 1694 | 23 | (Cf. CID 1358)  It is not clear that this NOTE still makes sense, now that the rules have moved to 10.3.5 | Delete the NOTE at the referenced location |

“The use of the RTS/CTS mechanism under control of dot11RTSThreshold is described in 10.3.5

(Individually addressed MPDU transfer procedure).

NOTE—**A STA configured not to initiate the RTS/CTS mechanism** updates its virtual CS mechanism with the duration information contained in a received RTS or CTS frame, and responds to an RTS frame addressed to it with a CTS frame if permitted by medium access rules.”

Discussion:

“A STA configured not to initiate the RTS/CTS mechanism”, what exactly does this mean? In this clause we have all the possible uses of RTS/CTS and this note comes after the clause referring to dot11RTSTreshold which, as we see in 10.3.5., is mandatory. So does the note refer to not setting the dot11RTSThreshold? Also, if a STA receives an RTS or CTS then is should obey the NAV and it should respond if addressed. This is defined behavior and should not need a note.

Just for reference here is 10.3.5

“A STA using the DCF shall use an RTS/CTS preceding a frame exchange including an individually

addressed data or management frame when the length of the PSDU is greater than the length threshold

indicated by dot11RTSThreshold. A STA may also use an RTS/CTS exchange for individually addressed

frames when it is necessary to distribute the NAV or when it is necessary to establish protection (see 10.28

(Protection mechanisms)). A STA may also use an RTS/CTS exchange for other purposes.

If dot11RTSThreshold is 0, an RTS/CTS exchange shall precede all frame exchanges including an

individually addressed data or management frame.

When an RTS/CTS exchange is used, the PPDU containing the PSDU shall be transmitted starting one SIFS

after the end of the CTS frame.

NOTE—No regard is given to the busy or idle status of the medium when transmitting this PSDU.

When an RTS/CTS exchange is not used, the PSDU shall be transmitted following the success of the basic

access procedure. With or without the use of the RTS/CTS exchange procedure, the STA that is the destination

of a Data frame shall follow the acknowledgment procedure.”

RESOLUTION

ACCEPT

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| CID | Commenter | Clause  | Page  | Line | Comment | Proposed |
| 2483 | Mark Rison | 10.3.5 | 1734 | 50 | "If dot11RTSThreshold is 0, an RTS/CTS exchange shall precede all frame exchanges including anindividually addressed data or management frame." -- this is covered by the previous para's "A STA using the DCF shall use an RTS/CTS preceding a frame exchange including an individually addressed data or management frame when the length of the PSDU is greater than the length threshold indicated by dot11RTSThreshold." (except for the "using the DCF", which should either be deleted or replaced with "using the DCF or EDCA") | Delete "A STA using the DCF shall use an RTS/CTS preceding a frame exchange including an individually addressed data or management frame when the length of the PSDU is greater than the length threshold indicated by dot11RTSThreshold."  In the previous para delete "using the DCF" |

Here is 10.3.5

“A STA using the DCF shall use an RTS/CTS preceding a frame exchange including an individually

addressed data or management frame when the length of the PSDU is greater than the length threshold

indicated by dot11RTSThreshold. A STA may also use an RTS/CTS exchange for individually addressed

frames when it is necessary to distribute the NAV or when it is necessary to establish protection (see 10.28

(Protection mechanisms)). A STA may also use an RTS/CTS exchange for other purposes.

If dot11RTSThreshold is 0, an RTS/CTS exchange shall precede all frame exchanges including an

individually addressed data or management frame.

When an RTS/CTS exchange is used, the PPDU containing the PSDU shall be transmitted starting one SIFS

after the end of the CTS frame.

NOTE—No regard is given to the busy or idle status of the medium when transmitting this PSDU.

When an RTS/CTS exchange is not used, the PSDU shall be transmitted following the success of the basic

access procedure. With or without the use of the RTS/CTS exchange procedure, the STA that is the destination

of a Data frame shall follow the acknowledgment procedure.”

Not sure if I read this right. If we delete the first sentence it includes “using the DCF”. Looks as though the proposed contradicts the Comment.

RESOLUTION

Revised

At 1734.43 Delete “using the DCF”

At 1734.50 change to a NOTE and edit as shown.

“NOTE: If dot11RTSThreshold is 0, an RTS/CTS exchange precedes all frame exchanges including an

individually addressed data or management frame.”

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| CID | Commenter | Clause  | Page  | Line | Comment | Proposed |
| 2402 | Mark Rison | 9.4.2.92 | 1237 | 8 | Per 18/1371r0 Advertisement protocol ID 1 does not have a well-defined format so needs to be deprecated (probably also ID 2 has the same problem) | In Table 9-237---Advertisement protocol ID definitions at the end of the leftmost cell for values 1 and 2 append "(deprecated)" |

Reached out to Stephen McCann:

The two Advertisement Protocols in question (ID 1 and ID 2) are defined by IEEE 802.21-2017. These protocol IDs allow the 802.21 “MIS Information Service” to operate over IEEE 802.11 GAS frames in a similar way that 802.11 ANQP operates over 802.11 GAS frames.…and well that’s it.

IEEE 802.21 does not really define how the MIS Information Service works or operates, but I think that’s a fault of 802.21 and not 802.11.

Therefore I think accepting Mark’s proposed change may be the correct thing to do technically, but I would not want to be involved in the ensuing political fallout.  I think I’d would propose a resolution of:

“Revised: Since these Advertisements Protocols are defined, and therefore still exist, within IEEE 802.21-2017, they should not be deprecated. A liaison or request should be sent to the IEEE 802.21 WG asking for assistance and clarification with these Advertisement Protocols formats.”

I think this is “reject” not “revised”. Others may wish to liaise with 802.21 but even so it is still “reject”.

RESOLUTION

Rejected

These Advertisements Protocols are defined, and therefore still exist within IEEE 802.21-2017 - they should not be deprecated. A liaison or request could be sent to the IEEE 802.21 WG asking for assistance and clarification with these Advertisement Protocols format if one wished to pursue deprecation.

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| CID | Commenter | Clause  | Page  | Line | Comment | Proposed |
| 2388 | Mark Rison | 10.3.3 | 1727 | 26 | There are still a few references to a backoff time being decremented | In Figures 10-6 and 10-17 change "Select backoff time" to "Select backoff count" |

Yep. Also covered in CID 2300

RESOLUTION

Accept

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| CID | Commenter | Clause  | Page  | Line | Comment | Proposed |
| 2345 | Mark Rison | 9.4.2.147 | 1306 | 50 | There is no behaviour associated with the setting of the A/C Power subfield, so this subfield is useless | Change "A/C Power" to "Reserved" in Figure 9-585 and delete "The A/C Power subfield indicates whether the STA is power constrained or not. It is set to 1 if the STA is not power constrained, i.e., supplied by external power, including PoE, wall plug, etc.; otherwise, it is set to 0." below |

“The A/C Power subfield indicates whether the STA is **power constrained** or not. It is set to 1 if the STA is not power constrained, i.e., supplied by external power, including PoE, wall plug, etc.; otherwise, it is set to 0.”

This has history CID 1569

Original - STA is capable of obtaining A/C Power

Proposals - STA is capable of obtaining A/C Power

- STA is capable of using AC Power

- STA is using AC Power

Ended up with - STA is **power constrained** or not

Discussions first time round,

7.7.4.3 Question on the POE as a possible issue. Need definition of the power that is being described. Maybe we should include an example of what the power usage is being needed here. 7.7.4.4 There may be a bigger issue of capability vs is currently having power currently supplied.7.7.4.5 This is a bit in a capability field, so is the value set to one if capable, or is it that the device is using the power. The bit is only useful if it is telling if the device is on AC power or not. If it is a capability, then it is not very useful.7.7.4.6 Discussion on if this is a capability or not.7.7.4.7 Original text: **“The A/C Power subfield indicates whether the STA is capable of obtaining A/C Power. It is set to 1 if the STA is capable of being supplied by AC Power, otherwise it is set to 0.”**

7.7.4.8 Proposed Alternative Change 1):

“The A/C Power subfield indicates whether the STA is using AC Power. It is set to 1 if the STA is supplied by AC Power, including PoE, wall plug, etc.; otherwise it is set to 0.”

7.7.4.9 Proposed Alternative Change 2):

“The A/C Power subfield indicates whether the STA is capable of **using** AC Power. It is set to 1 if the STA is capable of being supplied by AC Power, including PoE, wall plug, etc.; otherwise it is set to 0.”

7.7.4.10 Straw Poll: 7.7.4.10.1 Choice option 1 or Option 2)7.7.4.10.2 Results: 4 – 4

7.7.4.11 Need to check with DMG experts to determine what the intent of this bit when defined.7.7.4.12 ACTION ITEM #5: Mark HAMILTON to check with DMG experts on the intent of the A/C Power subfield definition.

SOooo

I would hesitate to take it out as it does indicate mobility. We could argue forever on the wording.

RESOLUTION

Reject

This is a bit in a capability field that presumeably is deemed useful by somebody. It does convey information.

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| CID | Commenter | Clause  | Page  | Line | Comment | Proposed |
| 2388 | Mark Hamilton | 9.2.4.1.8 | 781 | 5 | "PC" and "CF-Pollable" is still in body text. | Delete the paragraph.  (Check with an HCCA expert that this is not needed for HCCA operation, or can be modified to match current terminology for HCCA.) |

Looked Ok to me but also reached out to Menzo

Menzo’s response:

“Yes, looks okay to delete, because it seems solely related to PCF.

What is your opinion on these:

**10.6.5.4 Rate selection for polling frames**

A Data frame of a subtype that includes **CF-Poll** that does not also include CF-Ack (M53)shall be transmitted at a rate selected as follows:

a) If an initial exchange has already established protection and the Duration/ID field in the frame establishing protection covers the entire TXOP, the rate or MCS is selected according to the rules in 10.6.5.7 (Rate selection for other individually addressed Data and Management frames).

b) Otherwise, the Data frame shall be transmitted at a rate or MCS as defined in 10.6.5.3 (Rate selection for other group addressed Data and Management frames), treating the frame as though it has a group address in the Address 1 field, solely for the purpose of determining the appropriate rate or MCS.

**11.4.5 TS setup by resource request during a fast BSS transition**

A QoS STA may transmit a TSPEC as part of a RIC-Request in a resource request message. The SME in the hybrid coordinator (HC) decides whether to accept the TSPEC as specified, or refuse the TSPEC, or not accept but suggest an alternative TSPEC. It then generates a RIC-Response, according to the procedures given in 13.11 (Resource request procedures).

Each TS established by this resource request is placed in the accepted state. This state is an intermediate state between inactive and active. In the accepted state, the inactivity and suspension timers shall not be started for the TS. For a TS based on hybrid coordination function (HCF) controlled channel access (HCCA), the HC shall not generate **CF-Poll** for the TS.”

I agree. Propose to

Delete 10.6.5.4

At p2223.12 delete “For a TS based on hybrid coordination function (HCF) controlled channel access (HCCA), the HC shall not generate **CF-Poll** for the TS.”

RESOLUTION

ACCEPT

**Also**

Delete 10.6.5.4

At 2223.12 (11.4.5) delete “For a TS based on hybrid coordination function (HCF) controlled channel access (HCCA), the HC shall not generate **CF-Poll** for the TS.”

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| CID | Commenter | Clause  | Page  | Line | Comment | Proposed |
| 2139 | Graham Smith | 9.3.1.2 | 818 | 5 | "For all RTS frames sent by non-QoS STAs, the duration value is the time, in microseconds, required to transmit the pending Data or Management frame, plus one CTS frame, plus one Ack frame, plus three SIFSs."  In the CTS description the case for a 'no-ACK' is covered so we should also include this in the RTS section. | Insert at P818L7 "At a non-QoS STA, if the pending Data or Management frame does not require immediate acknowledgment the duration value is the time, in microseconds, required to transmit the pending Data or Management frame, plus two SIFS." |

Need to edit the first part as it refers to “all” RTS frames, and now we have an exception.

RESOLUTION

REVISED

At 818.5 Change

“For all RTS frames sent by non-QoS STAs, the duration value is the time, in microseconds, required to transmit the pending Data or Management frame, plus one CTS frame, plus one Ack frame, plus three SIFSs.”

To

“For RTS frames sent by non-QoS STAs, if the pending Data or Management frame requires immediate acknowledgment, the duration value is the time, in microseconds, required to transmit the pending Data or Management frame, plus one CTS frame, plus one Ack frame, plus three SIFSs. At a non-QoS STA, if the pending Data or Management frame does not require immediate acknowledgment the duration value is the time, in microseconds, required to transmit the pending Data or Management frame, plus two SIFs."