# IEEE P802.11

## Wireless Access Method and Physical Layer Specification

# Section 5.2.6.6 thru 5.2.9 Response to Draft D1 Letter Ballot Processed at March 1995 Meeting

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**Abstract:** This paper presents the Section 5.2.6.6 thru 5.2.9 Response to Draft D1 Letter Ballot processed at March 1995 meeting.

**Action:** Adopt the changes in this paper to replace the relevent portions of Section 5 of P802.11/D1, as shown in the companion document P802.11-95/59.

| SECT | AUTH | TYP | REQUIRED CHANGE | COMMENTS | RESPONSE |
|---|---|---|---|---|---|
| 5.2.6.6 | A. Bolea | E | | In Figures 5-11& 5-12, the "RTS" needs to be blocked off. | |
| 5.2.6.6 | Bob O'Hara | E | Add box around opening RTS in figure 5-11 | | |
| 5.2.6.6 | Bob O'Hara | E | replace "Frame" with "Fragment" in the last sentence before figure 5-12 | | |
| 5.2.6.6 | Bob O'Hara | E | Add box around opening RTS in figure 5-12 | | |
| 5.2.6.6 | C. Heide | e | figure 5-11 and 5-12 are missing boxes around RTS frames | | |
| 5.2.6.6 | C. Thomas Baumgartner | e | Put x through or shade differently the NAV(ACK 1) in Figure 5-12.<br>Figure 5-12 missing a box around RTS | since the discussion says there was no ACK 1 to create that NAV update. Typo. | |
| 5.2.6.6 | Jim Panian | E | Specify that each fragment is transmitted after waiting SIFS. | The draft states that "the source station will transmit all fragments of the MSDU without releasing the channel as long as<br>there is enough time left in the dwell time". Does this mean that there is no SIFS between fragments? | |
| 5.2.6.6 | Jim Panian | E | Change the last sentence of the second paragraph to read "Each fragment and ACK acts as a virtual RTS and CTS for the next fragment to come." | The text is ambiguous regarding the applicability of the duration field for fragments and ACKs. | |
| 5.2.6.6 | Jim Panian | E | Remove the NAV (ACK 1) from "Other" from the figure "RTS/CTS with Transmitter Priority w/ missed ACK." | The figure is incorrect in showing the NAV being set by ACK 1 when ACK 1 is never sent. | |
| 5.2.6.6 | Jim Panian | E | Place RTS in the two figures. | RTS is not within a "box" of the following two figures:<br>· RTS/CTS with Fragmented MSDU<br>· RTS/CTS with Transmitter Priority | |
| 5.2.6.6 | Rick White | E | This section should be moved to be after Section 5.2.7 | The basic RTS/CTS function should be introduced before addressing RTS/CTS for fragmentation. | |
| 5.2.6.6 | Tom T. | E | Figure 5-11 errors:<br><br>Correct the NAV bar for fragment 1 to start from the end of Fragment 1, not from the end of ACK1. Same for NAV bar of Fragment 2. | | |
| 5.2.6.6 | Okada | E<br>Approve | Clarification.<br>Does NAV have a count-down timer which is defined by PHYs? | | |

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| 5.2.6.6 | A. Bolea | T | | The way the duration field is defined in fragments, a station will need to hold on to the duartion value until the ACK is complete before using it as the NAV. I recommend that we redefine the duration in each fragment so that it corresponds to the time from the end of that fragment to the ACK for the following fragment. This makes the RTS and Fragment NAV processing identical. That is, any time a valid message( RTS,CTS, ACK or Fragment) is received, a station sets the NAV to the duration value. CTS and ACK processing is also identical because the duration field is calculated as the duration field from the proceeding RTS or Fragment minus a fixed offset. Figure 5-11 needs to be updated to reflect this. | ACCEPT<br><br>Fix picture per Wim and Barry. Thereby making Bolea happy. |
| 5.2.6.6 | A. Bolea | T | | In last two sentences, it is stated that a station which has not received an ACK should wait until NAV has expired before attempting re-transmission. I recommend that the station be allowed to re-transmit after a DIFS plus random backoff as it would do normally for any re-transmissions. Figure 5-12 needs to be updated to reflect this. | ACCEPT<br><br>Fix picture per Wim and Barry. Thereby making Bolea happy. |
| 5.2.6.6 | Joe Kubler | T | strike sentence "The source station must wait until the NAV (Fragment 1) expires before attempting... | While this adds a little to fairness of access, it wastes a potentially large amount of bandwidth | REJECT<br><br>Violates rules of CSMA/CA protocol as presented in std. |
| 5.2.6.6 | Renfro | T | | Define duration field to be the time from end of current frame till end of next anticipated ack in all cases. This makes processing consistent whether the duration information is in a RTS, CTS, Data or ACK frame. | ACCEPTED<br><br>However, definition belongs in section 4.1.2.2 |
| 5.2.6.6 | Renfro | T | | Transmitting stations should not maintain NAV. When ACK is not received, transmitting station should try to reaccess the channel beginning after anticipated ACK would have been received. This is the same time that stations getting NAV information from the CTS will begin to access the channel. | ACCEPT WITH MODIFICATIONS<br><br>Used Fischerman text to correct last paragraph in section |
| 5.2.6.6 | Rick White | T | Must define how a STA makes a decision to use RTS/CTS for a fragmented MSDU. I assume that if the fragment size is greater than RTS_Threshold, RTS/CTS is used. | Not defined. | ACCEPTED<br><br>Accept Rick's Assumption, craft and add words to standard. |
| 5.2.6.6 | Rick White | T | The duration field in the Data and ACK frames shall be used to update the NAV even if the transmission did not start with an RTS/CTS exchange. | This is especially useful for a multi-fragement MSDU that does not use RTS/CTS. | ACCEPTED<br><br>No change necessary. |
| 5.2.6.6 | Rick White | T | If RTS/CTS is used for the initial transmission of a fragmented MSDU, RTS/CTS will be used for retransmission of any fragments of the MSDU. | | ACCEPTED<br><br>Craft and add words to standard. |

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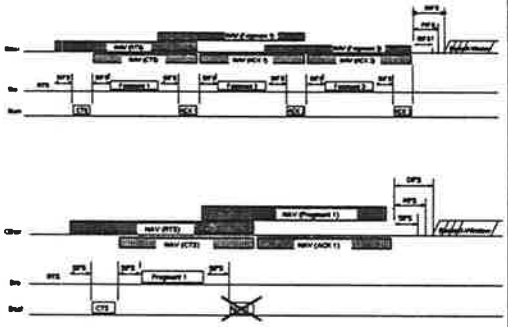
| 5.2.6.6 | Tim Phipps | T | Figure 5-11.  | The NAV should always be updated at the end of a received packet. | ACCEPTED WITH CHANGES<br><br>Backoff occurs after lost ACK, not after NAV (frag1) |
| 5.2.6.6 | Wim Diepstraten | T | The figures and description in this section should be updated to reflect the general definition of the "Duration" field when it is used in a Data and Ack frame.<br>The Duration field in a Data frame should specify the time from the end of the data frame until the end of the Ack of the subsequent fragment (RTS function).<br>The Duration field in a Ack frame should specify the time from the end of the Ack frame until the end of the subsequent Ack frame (CTS function). | This definition is similar to the Duration definition for an RTS and CTS frame.<br>The same CTS_Timeout mechanism could be used to reset the NAV when a subsequent fragment is not immediately send as result of a Ack failure. | ACCEPTED<br><br>definition in 4.1.2.2 needs update and pictures are updated per previous comments. |
| 5.2.6.6 and 5.5 | Iwen Yao | T Approve | | It is not clear that whether RTS/CTS is required if the same MSDU has to recontent for the medium for any reason. e.g. If the dwell time expired before all the fragments are sent. Please clarify. It seems reasonable to explicitly require the use of RTS/CTS in this situation if it is used to set up the transmission of the MSDU. | ACCEPTED<br><br>Have clarified in response to previous comments. |
| 5.2.6.6. | Mahany | E | For improved clarity in second paragraph, may wish to insert sentence: "Fragment 2 and ACK 2 will update NAV to indicate busy until end of ACK 3. ", prior to last two sentences. | Readabilty | |
| 5.2.6.6. | Fischerma:RTS/CTS usage with Fragmentation | T | First paragraph of section:<br>The following is a description of using RTS/CTS for a fragmented MSDU. The RTS/CTS frames define the duration of the first frame and acknowledgment. The duration field in the data frame specifies the total duration of the subsequent ACK frame, the next frament and the next ACK frame and the duration field in the acknowledgment frames specifies the total duration of the next fragment and acknowledgment. This is illustrated in Figure 5-11. | NAV should be updated at end of frame received to avoid hidden node problem. Current description tries to avoid hidden node problem by relying on storing duration field from DATA frame until NAV timeout, and then reloading NAV at that point. This method is unacceptable, since it is inconsistent with RTS/CTS NAV update scheme. | ACCEPTED<br><br>already addressed in changes for previous comments. |

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| 5.2.6.6. | Fischer ma:RTS/CTS usage with Fragmentation | T | Text and diagrams should be updated to convey the following directive:<br><br>NAV counter shall be updated with new duration field information at the end of the successfully received frame from which the duration field was parsed.<br><br>[This implies that duration field information for DATA and ACK frames of MSDU fragments must be different - DATA duration must include this ACK, next DATA, next ACK, ACK duration field should include next DATA, next ACK.] | It is unclear from the text and the diagrams when the NAV should be updated. Should the update for DATA frame duration field inforamtion occur at the end of the DATA frame, or at the end of he ACK frame, or at the end of the curent NAV count, assuming that the ACK frame is not received first?<br>I vote for: update NAV at end of frame that contains duration and is successfully received, since this is consistent with current description of NAV updates for RTS and CTS frames. | ACCEPTED<br><br>already addressed in changes for previous comments. |
| 5.2.6.6. | Fischer ma:RTS/CTS usage with fragmentation | T | Last paragraph of section:<br>The source station must wait until the ACK timeout before attempting to contend for the channel after not receiving the acknowledgement. | Note that D1 wording implies that source station maintains a NAV according to its own transmissions! NAV update policy elsewhere in D1 makes no mention of NAV updates in response to own transmissions. Also, it is not clear that even if NAV was updated during say, ACK frame of fragmented MSDU exchange at the DATA frame sender, that the DATA frame sender would somehow be allowed to ignore the NAV information in order to send the next DATA fragment. Therefore, wording should reflect accepted transmitter behavior by obeying ACK timeout in order to determine when to begin contending for channel again. | ACCEPTED<br><br>Given text replaces last paragraph. |
| 5.2.7 | A. Bolea | E | Last sentence "frame and an SIFS gap period. No regard shall be give " should be "frame and a SIFS gap period. No regard shall be given" | | |
| 5.2.7 | Bob O'Hara | E | Change last sentence of third paragraph to: "The value zero shall be used to indicate that all MPDUs shall be delivered with the use of RTS and CTS." | Clarity | |
| 5.2.7 | Bob O'Hara | E | delete "gap" and replace "give" with "given" in last paragraph | | |
| 5.2.7 | C. Heide | e | third paragraph refers to "LME" which is undefined | | |
| 5.2.7 | Joe Kubler | E | last sentence "shall be give to" should read "shall be given to " | | |
| 5.2.7 | Renfro | E | | Add 'LME' to list of acronyms. | |
| 5.2.7 | Bob O'Hara | T | Clarify or delete paragraph four. | It is ambiguous | ACCEPT |
| 5.2.7 | C. Heide | t | remove fourth paragraph | a STA's RTS_Threshold has no control over incoming frames - the sending STA's RTS_Threshold controls whether it uses RTS/CTS or not, and is it does the receiving STA must adhere to that regardless of its own RTS_Threshold. Therefore this parameter does not control direction. | ACCEPT |
| 5.2.7 | C. Heide | t | last paragraph - carrier sensing should be done before any access to the medium. | hidden stations, stations with varying coverage distances and unsymetrical rx/tx distances will cause many instances of STAs accessing the medium when they shouldn't. Collisions can be minimized by carrier sense before any transmit. | DEFER<br><br>under duress.<br><br>vote 3-3-0 |

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| 5.2.7 | C. Thomas Baumgartner | t | change 1st sentence of 2nd paragraph to "STA shall use an RTS/CTS exchange for directed frames according to the state of attribute (NEED NAME OF THIS ATTRIBUTE) with values of never and when the length of MPDU is greater than the length threshold indicated by the RTS_Threshold attribute." | 5.2 says use of RTS/CTS can be set to always, never, or when MPDU greater than threshold. RTS_Threshold value can't take care of never state so an RTS/CTS attribute is required. Personally, I'm not sure that never should be allowed because of the implications for operation in overlapping BSA's | ACCEPTED<br><br>Add text to stanadard, paragraph 2<br>never is RTS_Threshold = 0<br>always is RTS_Threshold > MPDU_Max |
| 5.2.7 | C. Thomas Baumgartner | t | Need discussion of affect on overlapping BSA in same channel of not sensing medium before CTS | MUST have simulation of this affect to know if this is good design. | DEFER<br><br>with great heat and light.<br><br>vote 2-1-2 |
| 5.2.7, 3rd paragraph | Fischer, Mike. | T | Add sentence at end ÒThe value 2304 shall be used to indicate that no MPDU shall be delivered with the use of RTS/CTDS.Ó | completeness | ACCEPTED<br><br>used different text above in Baumgartner comment. |
| 5.2.7.1 | Renfro | E | | Combine with 5.2.7. Inappropriate to have only a single subheading.<br><br>Add reference to figure 5-13 in text. | |
| 5.2.7.1 | David Bagby | T | **Figure 5-13: Directed Data/ACK MPDU** | See imbeded comments and annotations | ACCEPTED<br><br>editor's comment deleted. |
| 5.2.7.1 | Joe Kubler | T | data should set duration to protect the ack | in a busy network, the number of missed acks could get quite large without this. it really adds no cost to bandwidth since (as fig 5-13 shows) other stations should defer until after a DIFS following the ack. This would still allow the use of short directed frames even in BSAs that are using RTS/CTS in an efficient manner | ACCEPTED<br><br>This is the intent of standard. No change necessary - comittee cannot make sense out of comment. |
| 5.2.7.1 | Rick White | T | Figure 5-13 should be modified to show that the data frame is transmitted at some point during the contention window, not after DIFS. | STA must select a window in the contention window after DIFS. | DEFER<br><br>very ugly debate to ensue. |
| 5.2.8 | Bob O'Hara | E | replace "STA's" with "STAs" | Proper usage. | |
| 5.2.8 | Bob O'Hara | E | replace "on" with "for" in the last paragraph | Proper usage. | |
| 5.2.8 | Tom T. | E/T | How does a STA decide whether to send a broadcast STA to STA or through the AP?<br><br>What does the AP do with a broadcast frame it hears from a STA to STA transmission? | | DEFER<br><br>Big battle to come. |
| 5.2.8 | A. Bolea | T | | Broadcast/multicast messages should not be fragmented since we don't all receiving stations trying to ACK the fragments.<br>In Infrastructure networks, the broadcast message from the STA to AP should go up the AP as a directed message( it could be fragmented!). The AP would then transmit this entire broacast message without fragmentation. | REJECTED<br><br>PHY will reject frames larger than Fragment threshold. |

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| 5.2.8 | bdobyns | T | Change<br>"There is no MAC level recovery ... except for those frames sent via an AP."<br>to<br>"... those frames sent *to* an AP" | frames from an AP cannot be recovered if lost. | ACCEPTED WITH CHANGE<br><br>"... those frames sent with the To_DS bit set" |
| 5.2.8 | Bob O'Hara | T | Clarify paragraph three. | It is ambiguous | ACCEPTED<br><br>replace paragraph 3 with "Multicast MSDU shall be propogated throughout the ESS" |
| 5.2.8 | C. Heide | t | broadcasts and multicasts coming from a STA should be sent without RTS/CTS and ACK. It should be the responsibility of the AP to retransmit them onto the DS.<br>OR<br>STA should send all broadcasts to the AP only if there is one. The AP must then retransmit them within the BSS and onto the DS if the BSS is part of an ESS. | this section proposes that a STA must transmit all broadcasts and multicasts twice - once to the STAs in its BSS and once to the AP so that the AP can distribute them throughout the ESS. This is an unreasonable request of a STA. A STA should not have to know if there is an ESS, or if there is a portal somewhere through which its broadcast must be sent to wired STAs - it should just transmit a broadcast when it needs to do so. | WITHDRAWN BY COMMENTATOR |
| 5.2.8 | John Hayes | T | TBD | Broadcast and Multicast frames may be fragmented. | ACCEPTED WITH CHANGE<br><br>TBD is replaced with better prose. |
| 5.2.8 | Renfro | T | | Second paragraph is only true if To DS bit is set. While it is probably a good idea, we have done nothing to preclude individual stations from sending broadcast/multicast messages to everyone. We have also not precluded STA to STA communications without using the AP in an infrastructure network. | ACCEPTED<br><br>change "to ap" to "with To_DS bit set" |
| 5.2.9 | A. Bolea | E | ToAP needs to be changed to ToDS | | |
| 5.2.9 | Fischer, Mike. | E | Change ÒToAPÓ to ÒToDSÓ | correctness | |
| 5.2.9 | Geiger | E | Can't find Ack_timeout in MIB table | Helps to define it | |
| 5.2.9 | Greg Smith | E | references 'ToAP' bit should be 'To DS' bit | | |
| 5.2.9 | Renfro | E | Change 'To AP' to 'To DS' | | |
| 5.2.9 | Tim Phipps | E | *Replace:* "ToAP" *with* "ToDS". | This has equivalent functionality for the purpose of this section.<br>The "ToAP" bit has been removed. | |
| 5.2.9 | Bob O'Hara | T | add "without receiving an ACK frame" after "time" in the second paragraph | It is unclear what the purpose of the timeout is. | ACCEPTED |
| 5.2.9 | C. Heide | t | the medium should be sensed before ACKs are transmitted. | Not sensing the medium could cause a collision which destroys the ACK, causing a retransmission which would have resulted anyway had the medium be sensed - no difference. However not sensing the medium causes the other transmission to be corrupted also, which would not have happened. | DEFER<br><br>Humongus Big Enormous Debate To Come. |
| 5.2.9 | C. Thomas Baumgartner | t | Need discussion of affect on overlapping BSA in same channel of not sensing medium before ACK | MUST have simulation of this affect to know if this is good design. | WITHDRAWN<br><br>desire to avoid grief. |

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| 5.2.9 | David Bagby | T | The Source STA shall wait an Ack_timeout amount of time before concluding that the MPDU failed.<br><br>This policy induces some probability that a pending frame in a neighboring BSA (using the same channel) | See imbeded comments and annotations | ACCEPT<br><br>hiddent text deleted. |