IEEE P802.11

Wireless Access Method and Physical Layer Specification

Responses to Remaining Letter Ballot Comments on Section 5 (now 6) Draft D1 Processed at July, 1995 Meeting

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Abstract: This paper presents the responses to the remaining letter ballot comments from section 5 of the Draft D1 Letter Ballot (which corresponds to section 6 of D1.2). These responses were processed at the July, 1995 meeting of IEEE P802.11.

Action: Adopt the changes recommended in this set of comment responses to replace the relevent portions of Section 6 of P802.11/D1.2, as shown in the companion document P802.11-95/174. In cases where the recommendations resulting from these comment responses affect sections other than 6, the recommended text changes are identified in a separate section of other references in document P802.11-95/174

5.2 **#U1**	C. Heide	t	10th paragraph, support of multiple rates should be removed.	multiple rate support breaks (1) the virtual carrier sense mechanism when data transactions do not use RTS/CTS, which is optional; (2) the power management mechanism (section 7.2); and (3) the synchronization (section 7.1) mechanisms. All of these mechanisms are based on STAs interpreting information they hear in other STA's frames, which cannot be accomplished if STAs are communicating at multiple rates.	NOT ACCEPTED. The limited quantitative information available from submissions on multirate and comments and discussions since then are inadequate to reach a clear technical decision. There are potentially valid analyses that show a net gain in performance due to the multirate mechanism (doc 94/119). There are also potentially valid concerns that subsequent changes to power management, time synchronization, and MAC functions which rely upon virtual carrier sense may be sufficiently compromised that a lower or negative performance gain may occur. In the absence of a clear basis to recommend a major functionality change, overriding multiple votes of the working group, these comments are not accepted. Reviewers of subsequent drafts are encouraged to perform additional analysis or simulation to support future decisions regarding these issues.
	5.2 **#U2**	Geiger	T	Remove the usage of RTS/CTS in the standard	Apple Computer supplied the committee with a statement which indicated that the RTS/CTS reservation mechanism may infringe upon a specific patent. Apple has never submitted any licensing statement regarding the use of any of their patented technology which might appear in the Standard.	NOT ACCEPTED It is believed that the cited Apple patent does not apply to the RTS/CTS function of the proposed 802.11 MAC, for reasons discussed in document 95/109. NOTE THAT DOCUMENT 95/109 IS A TECHNICAL OPINION, NOT A LEGAL OPINION. The sub-group working on resolving these letter ballot comments recommends that the chair of 802.11 forward information on this issue as appropriate at IEEE standards activities to begin the process of resolving this issue in a manner suitable for IEEE intellectual property policy.
5.2.1 8.x **#U3**	Belan ger	E	"Physical Carrier Sense Mechanism see section 8..." should be deleted or Section 8 should describe more explicitly how CCA information is passed to the MAC. Section 8 should explicitly state that the START OF ACTIVITY indication and END-OF-ACTIVITY indications are used for CCA	Section 8 does not define how Carrier Sense information is conveyed to the MAC.	ACCEPTED It is believed that the updates to the PHY service primitives and substantial changes and additions to PHY CCA definitions resolve this comment according to the 2nd alternative.

5.2.4 **#U4**	David Bagby	T	It should be noticed that the different IFSs are independent of the station bitrate, and are fixed per each PHY ~~(even in multi-rate capable PHYs)~~[DB1], IFS times shall be specified in units of bit time. This is the most natural for the mac to deal with and avoids conversion problems with odd time granularities.[DB2]	See imbeded comments and annotations	ACCEPTED The current definition is in terms of the symbol time (microseconds), which is equal to the bit time at the lowest data rates of the various PHYs, and is the most appropriate unit to both MAC and PHY. The current definition achieves the purpose of defining the IFS times independent of bit rate.
11 -5.5 **#U5** **(point #2)**	David Bagby	T	**1. Fragmentation** ***POINT #1 combine this section with sec 5.1.5 so frag info all in one place[DB3] ***POINT #2 After due consideration, and recognizing that stations are explicitly not required to attempt to fit fragments to remaining dewell times fir FH PHYs, and considering that the increase in band width utilization involved is very slight, I conclude that the complexity of attempting to match fragment size to remaining dwell time does not justify the effort involved. Even as an option, I don't believe we should retain this feature as the draft is already the most complex MAC ever defined. This is an area were we should increase the odds of interoperability and simplicity over functionality. Therefore, I vote against sponsor ballot until this feature is removed. If this modification is adopted, I shall volunteer to edit sections 1.1.4 and 5.5 to make the needed wording changes. I have not provided exact text here as word does not allow recursive annotations and that change would obscure other comments I have made in the same sections.[DB4]	See embedded comments and annotations	POINT #1 (processed in March) REJECT - 5.1.4 has mostly moved to section 7, what remains is a brief overview of the concept, which is consistent with the format of the document. POINT #2 **NOT ACCEPTED** The limited quantitative information available from submissions on fragmentation and comments and discussions since then are inadequate to reach a clear technical decision. There are potentially valid qualitative arguements favoring hop sequence optimization. There are also potentially valid qualitative arguements that the practical benefits of such optimization are close to nil.. In the absence of a clear basis to recommend a major functionality change, overriding votes of the working group, these comments are not accepted. Reviewers of subsequent drafts are encouraged to perform additional analysis or simulation to support future decisions regarding these issues. POINT #3 and #4 (processed in March) ACCEPT POINT #5 (processed in March) ACCEPT with replace "accounts" with "allows" **NOTE: There are continuations to this comment that have not been copied into this document. For the full text see the original D1 letter ballot comment documents (95/018xx).**

11 -5.5 **#U6**	David Bagby	T	***POINT #3 The MAC ~~may~~will fragment and reassemble MSDUs. The fragmentation and reassembly mechanisms allows for fragments to be retransmitted.	See embedded comments and annotations	NOT ACCEPTED To allow a MAC to not fragment in cases where the MSDU length exceeds the maximum that the PHY MIB indicates can be handled could lead to non–interoperable, but allegedly conformant implementations.
20 -5.5, paragraph 4 through paragraph 9 **#U7**	Fischer, Mike.	T M A J O R I S S U E	I recommend that this whole discussion of fragment size variation for dwell boundary optimization be eliminated, and replaced with something to the effect that ÒFragmentation shall only be applied when the MPDU required to hold the entire MPDU exceeds aFragment_Threshold. When fragmentation is applied, each fragment shall have a payload length of aFragment_Payload octets, except the final fragment, which may have a shorter payload.Ó	The fundamental reason that fragmentation was added to the MAC was because certain PHYs were unable to deliver maximum length MSDUs in a single PhPDU. This can be overcome using fixed size fragments. The concept of dwell optimization is unnecessarily complex, only beneficial to the FHSS PHY, if at all, and complicates buffer management at the receiving station. The complexity penalizes all MAC implementations whether or not they can attach an FHSS PHY. The benefits are dubious, because if the fragmentation decision must be made based on the amount of time expected to be left after the Ack to the previous fragment, in order to build a MAC header and TXVECTOR for the correct length fragment, but if deferral is needed due to a CCA event, or retransmission of the previous fragment proves necessary, the time calculation is invalid. Finally, with a maximum MPDU size of 400 octets, the FHSS PHY whether operating at 1Mbps or 2Mbps, stands to gain, best case, less than 80Kbps of aggregate raw data transfer, assuming perfect dwell optimization, no extra deferrals, no failures to acknowledge, perfect hop synchronization, etc.	NOT ACCEPTED See comment U5. This comment has additional constraints beyond elimination to removal of the hop dwell optimization. These additional constraints appear to have further advantages for receiver simplicity, however, these benefit have also not been quantified nor analyzed for several series of MAC updates.
6 - 5.5 **#U8**	Bob O'Hara	T	delete paragraph eleven	Unnecessary complexity to squeeze, on average, half a frame into each hop period.	NOT ACCEPTED See comment U5

23 -5.6 #U9	bdobyns	T	An implementation whose PHY MIB parameter aMPDU_Minimum is greater than 2304 plus MAC Header may choose to not implement fragmentation on either transmit or receive.		NOT ACCEPTED. This is fundamentally wrong since it would lead to non–interoperable implementations. While operating with such a MIB setting the MAC is not required to fragment, but to allow the MAC to not implement fragmentation means it will be unable to handle a fragmented frame if one is sent by another station. (NOTE: Stations are allowed to fragment even if the MSDU is shorter than the maximum.)

5.2.4 and 5.2.6 **#U10**	D. Johnson	T	**5.2.4 PCF- IFS (PIFS)** This PCF priority level shall be used only by the PCF to send any of the Contention Free Period (CFP) frames. The PCF shall be allowed to transmit after it detects the medium free for the period PIFS (PCF Interframe Space), at the start of and during a CF-Burst. Alternatively, in cases where regulations require the point coordinator STA to contend for access, the contention window for the PCF begins after the PIFS time. **Figure 5-8: Backoff Procedure** The wording around the lower right arrow will need to be changed to conform to the revision. **5.2.6.2Backoff Procedure** The backoff procedure shall be followed whenever a STA desires to transfer an MPDU and finds the medium busy. The backoff procedure consists of selecting a backoff time from the equation in Section 5.2.5 Random Backoff Time. ~~The Backoff Timer shall decrement only when the medium is free. The Backoff Timer shall be frozen while the medium is sensed busy.~~ Decrementing the Backoff Timer shall begin~~resume~~ whenever a medium free period longer than DIFS is detected. Transmission shall commence whenever the Backoff Timer reaches zero providing the medium is free for a period of DIFS or longer prior to when the timer reaches zero. **Figure 5-8: Backoff Procedure** This illustration will need to be changed to conform to the revised wording. A station that has just transmitted a frame and has another frame ready to transmit (queued), shall perform the backoff procedure. This requirement is intended to produce a level of fairness of access amongst STA to the medium. The effect of this procedure is that when multiple stations are deferring and go into random backoff, then the station selecting the lowest delay through the random function will ~~gain access to the medium. Another effect of this approach is that stations that lost contention~~ will defer again until after the next DIFS	Allows an IEEE STA with the DCF to operate with the spectrum etiquette pf Part 15.321 and thereby operate in the UPCS asynchronous sub-band. Although the currently specified back-off procedure favors STAs which have been in back-off longest, it cannot be implemented on the basis of power detection. An etiquette cannot determine when a retransmission is needed. Further, typical user information transfers normally consist of multiple frames, thus the delay to the user is more dependent on the average delay each frame experiences. This average delay will be no longer with the proposed change. It retains the definition of the PIFS for those cases where PCF operation is permitted. This is one of the reasons for the no vote.	ACCEPTED AS TO DESIRED OUTCOME, ALTHOUGH WITH A DIFFERENT MECHANISM THAN SUGGESTED IN THE COMMENT NOTE: "ACCEPTANCE" here means acceptence of the objective, not compliance with FCC 15.321, because there are no current PHYs which operate in a band governed by FCC 15.321. Both D1.1 and D1.2 include provisions for the contention free period to span multiple medium occupancy instances. While the proximate need for this change to the PCF was the spanning of multiple dwell periods when operating with an FH PHY, the same mechanism will work to permit a contention free period to span multiple periods of medium occupancy when operating under the UPCS etiquette if such a PHY were ever to be defined.

5.2.5 #U11	bdoby ns	T	Where are numerical values for CW_{min} and CW_{max} specified? They're MAC MIB parameters, but can they vary from one implementation to another?	what fun!	Already accommodated in D1.2 changes.
3 -5.5 #U12	bdobyns	T	An implementation whose PHY MIB parameter aMPDU_Minimum is greater than 2304 plus MAC Header may choose to not implement fragmentation on either transmit or receive.		NOT ACCEPTED. This is fundamentally wrong since it would lead to non-interoperable implementations. While operating with such a MIB setting the MAC is not required to fragment, but to allow the MAC to not implement fragmentation means it will be unable to handle a fragmented frame if one is sent by another station. (NOTE: Stations are allowed to fragment even if the MSDU is shorter than the maximum.)
5.7 #U13	bdobyns	T	change (two places) "transmitted on STATION_BASIC_RATE" to "transmitted at one of aBSS_Basic_Rate_Set"		ACCEPTED. aBSS_Basic_Rate_Set is a PHY MIB parameter, while STATION_BASIC_RATE is not.
5.7 #U14	bdobyns	T	This section should specify and clarify the use of the defined variables in the PHY MIB section 9.1.1.2 agPhyRate_Grp: aSupported_Rx_Rates, aSupported_Tx_Rates, aBSS_Basic_Rate_Set, aStation_Basic_Rate, aExtended_Rate_Set, aPLCP_Rate, aPreferred_Tx_Rate, aPreferred_Rx_Rate		There are substantial clarifications in D1.2 and even more have been recommended from the July meeting — if there is still clarification needed we will need another question so understand what is still unspecified. The IR PHY is asymmetric - it may receive at rates which it cannot transmit on.
5.7 #U15	Bob O'Hara	T	Delete this section		NOT ACCEPTED — SAME COMMENT AS #U5 Multirate support incurs complexity not commensurate with the theoretical gain in throughput.
5.7 #U16	C. Heide	t	remove this section.		NOT ACCEPTED — SAME COMMENT AS WITH #U5 (1) there is a great deal of information which STAs are required to interpret in every frame (not just control frames) to make this protocol work. This is broken by multirate support.
5.7 #U17	C. Thomas Baumgartner	t	Someone with better understanding of protocol than I should be asked to determine if this section has listed all the frame types that contain data that every other station needs to hear.		Already handled — CF-End has been reclassified as a control frame and all control frames are sent at the basic rate. What about the End_CF frame? I'm sure that is a frame type not listed here that must be sent at basic rate. There are probably others.

5.7 #U18 **THIS COMMENT HAS CONTINUED PARTS WHICH HAVE NOT BEEN COPIED INTO THIS DOCUMENT, REFER TO THE ORIGINAL D1 LETTER BALLOT COMMENT SUMMARIES 95/18nnn**	David Bagby	T	~~**2. Multirate Support**~~ Please refer to my comments annotated as "one band = one phy" for background to this comment. The same leadership problem which has resulted in that situation also resulted in the mis-guided desire for multiple rate support. The unpleasant history (as this reviewer understands it) is: The subject of multiple rate support first arose within the DS PHY sub-sub-group. Members from companies participating could not decide whether to support 1mbs or 2mbs for a data rate. Instead of resolving this difference they decided to simply say that they would do both. From a market standpoint this is foolish as the market is conditioned to desire the highest rate possible (all other factors being held constant). In the mean time the members interested in FH PHYs could also not decide on a basic data rate. This resulted in a splintering of the FH gang into two sub-sub-groups which have generally been called the FH group and the hi-speed FH group. Again, the rates involved are 1mbs and 2mbs respectively. This creted a situation where there were people interested in 2 different phys each at 2 different rates all in the same band. While this interest is ok for investigating differences between the proposals, it never should have been encouraged to continue and result in multiple conflicting phy proposals within the draft.	NOT ACCEPTED — SAME COMMENT AS #U5 See imbeded comments and annotations

5.7 **#U19**	Dean Kawaguchi	T	Multirate Support The following set of rules must be followed by all the stations to ensure coexistence and interoperability on MultiRate Capable PHYs. ~~All Control Frames (RTS, CTS and ACK) are transmitted on the STATION_BASIC_RATE (which as specified before belongs to the ESS_BASIC_RATE) so they will be understood by all the stations in the ESS.~~ ~~All Multicast and Broadcast Frames are transmitted on the STATION_BASIC_RATE, regardless of their type.~~ ~~Unicast Data and/or Management Frames are sent on any available transmit rate. The algorithm for selecting this rate is implementation dependent and is beyond the scope of this standard.~~ Management Frames are sent at the ESS_BASIC_RATE to enable stations to determine its compatibility and associate or decline association. All other frames are sent at the BSS_RATE. A BSS associated with a particular AP will have a BSS_RATE defined by a management entity. A station attempting to enter the BSS must determine if it is capable of communicating at the BSS_RATE before associating.	NOT ACCEPTED. The objective is desirable if multi–rate remains in the standard. However, the specific changes listed here will not work, and there appears to be an inadeqate understanding of MAC mechanisms (e.g. the NAV updates cover a time which includes IFS and acknowledgement in the case that the frame is of a type which gets acknowledged, whereas the frame type is unknown when the PLCP header is received so the length obtained from the PLCP header is generally not the correct value to update the NAV.) Although implementations need not be defined, the standard should include the mechanisms to allow all multi-rate compliant devices to determine when it can switch to higher rates. The current text does not provide any general algorithm nor the mechanisms to enable it to do so. The one dynamic switching method proposed had a patent infringement issue which the committee chose not to tackle. In light of these problems, the only alternative that can be sufficiently defined for a standard is the non-dynamic, management-defined method of one rate per BSS. The text defines the basic method with mechanisms for roaming and CSMA protocol with non-multiple rate units. Note: Both FH and DS PHYs send preamble and PLCP header at the basic rate of 1 Mbps, even on 2 Mbps packets. Thus, all stations are capable of hearing the preamble and PLCP header which contains the length of the packet, i.e., a ÒPHY NAV.Ó
5.7 **#U20**	Fischer, Mike.	T	last paragraph, change Òany available transmit rateÓ to Òany rate available at both the TA and RA stations. If RA capabilities are undetermined, the transmit rate shall be the STATION_BASIC_RATE.Ó	Already covered (with different words) in D1.2 completeness

5.7 #U21	Geiger	T	Unicast Data and/or Management Frames are sent on any available transmit rate.	NOT ACCEPTED (to the extent that this is not fully accommodated in D1.2 changes) — there is not an apparent reason to add the complexity of segregating management frames as to which ones have information that all stations need to process and ones which could be allowed at a higher rate. Management Frames must be sendable at the Basic Rate but can optionally be sent at any bit rate. How could you associate with a LAN or set up connections with Basic rate only nodes. I believe that the algorithm used to set the rate can be buried in upper layer management. Unfortunately, I also believe that for purpose of managing the polling list and QoS of the PCF, the bit rate in the CF must be predefined at the time when setting up a connection or the maximum channel usage set at the basic rate and the nodes can optionally send at the higher rate. This must be used by the connection management entity
5.7 #U22	Jeff Rackowitz	T	Eliminate this section.	NOT ACCEPTED — SEE #U5. I don't believe that 802.11 should support packets at variable rates in a given BSS. 802.11 radios should be set to a given rate in a particular BSS.
5.7 #U23	N. Silberman	T	Re:Multirate Support: Allow support for homogenous high data rate Networks in places where feasible.	NOT ACCEPTED. To do this as a fundamental MAC mechanism would lead to non–interoperable but allegedly compliant implementations. Current standard supports only low data rate networks or mixed "speed" networks. In places where high data rate only is feasible, high speed networks will have to slow down the header part lowering the network throughput accordingly. "Mixed Mode" shall be requested only in places where 1 and 2 Mbps stations exist or are expected to communicate.

5.2 deferred from March, moved here due to subject #U24	C. Heide	t	10th paragraph, support of multiple rates should be removed.	multiple rate support breaks (1) the virtual carrier sense mechanism when data transactions do not use RTS/CTS, which is optional; (2) the power management mechanism (section 7.2); and (3) the synchronization (section 7.1) mechanisms. All of these mechanisms are based on STAs interpreting information they hear in other STA's frames, which cannot be accomplished if STAs are communicating at multiple rates.	NOT ACCEPTED — SEE #U5.