IEEE P802.11

Wireless Access Method and Physical Layer Specification

Section 7. thru 7.1.4 Response to Draft D1 Letter Ballot Processed at March 1995 Meeting

Bob O'Hara

Advanced Micro Devices
One AMD Place
Sunnyvale, CA 94088

Abstract: This paper presents the Section 7. thru 7.1.4 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 7 of P802.11/D1, as shown in the companion document P802.11-95/54.

Section 7 "Easy" comments:
This document contains only those comments upon which some action was taken. Comments on which no action was taken **are not in this document**.

7.1	C. Heide	t	throughout the section - define NID, and add it to the frame formats in section 4	acronym undefined

Adopted. NID is an obsolete concept and will be replaced with correct, up to date terms.

7.1.1.1	Bob O'Hara	T	MACMGT_Beacon_Interval must be defined	Management is insufficiently specified.

Adopted. This is the same as aBeacon_Period in the MIB. The name of aBeacon_period will be changed to aBeacon_Interval. Change 7.4.4.1.18 to indicate "nominal" transmission times.

7.1.1.1	C. Thomas Baumgartner	t	Need to define what happens when there are 2 AP's in a BSS.	I haven't seen anywhere that there can't be 2 AP's in a BSS. In that case there will be conflicting synchronization information.
7.1.2.3	C. Thomas Baumgartner	t	Need to define what happens when there are 2 AP's in a BSS.	I haven't seen anywhere that there can't be 2 AP's in a BSS. In that case there will be conflicting synchronization information.

Adopted. It is implicit that there is only one AP per BSS because the BSSID is the MAC address of the AP. This should be dealt with explicitly in section 2.

7.1.1.1	Rick White	T	Terminology used for time stamps must be consistent between this section and the frame format section.	

This is an editorial comment.

7.1.1.1	Rick White	T	Terminology used for beacon intervals must be consistent between this section and the MIB section.	

Resolved in previous comments.

7.1.1.2	Tim Phipps	T	The Timing Synchronization Function in an ad hoc network is implemented via a distributed algorithm that is performed by all of the members of the BSS. All stations in the BSS shall transmit Beacons according to an algorithm to be specified below. Stations receiving a Beacon from another station in the same BSS shall adjust their Synchronization Timers towards the Beacon's time-stamp value in a manner to be specified below. Timing synchronization shall be maintained in an ad hoc network by adjusting a synchronised timing reference to be the average of itself and any time stamp received from another station within the same ad hoc network. NOTE: The timers for all synchronised stations in a BSS will typically converge to the same value over a short period of time. **It is permitted that a station within an ad-hoc BSS may scan for a better BSS within the same ESS. Within an ad-hoc network, all beacons and probe-responses carry an extended TSF time element. A station receiving such a frame from another BSS with the same ESS ID will compare the extended TSF time with its own extended TSF time. If the extended TSF time of the received frame is later than its own extended TSF time, it will adopt the BSS-ID, hop parameters and extended TSF time contained in that received frame.**	Paper 94/281, motion 24 forces us to adopt the changes proposed in paper 94/240. This permits BSSs started separately, with the same ESS ID to merge. They will eventually adopt the BSS ID of the first station to start with the common ESS ID. Note, this "adopt if older" applies only in the case of determining a better BSS, not in maintaining synchronisation within a BSS, in which case the simpler "average" algorithm is used.

Adopted.

7.1.2	A. Bolea	T		
7.1.2	Bob O'Hara	T	Clause XXX mudt be defined	Clause XXX is not specified.
7.1.2	Geiger	T	Fix Clause XXX	Management is insufficiently specified.
7.1.2	Greg Ennis	T	Remove last sentence	This definition is missing
7.1.2	Rick White	T	What is Clause XXX? This must be defined.	missing a single beacon should not cause the station to take any special action
7.1.2	Renfro	T		Not defined.
				Clause XXX needs to be specified.

Adopted. Delete last sentence of 7.1.2.

7.1.2	Greg Ennis	T	Add the following: "A station sending a beacon shall set the value of the beacon's timestamp so that it equals the value of the station's TSF timer at the time that the first MAC bit of the beacon is transmitted into the airwaves."	First bit of MAC frame is the reference point for timestamp, and transmitter must compensate for delays through the local PHY components.

Adopted with the following change: replace "into the airwaves" with "to the PHY."

7.1.2	McDonald	t	Clause xxx need to be defined How long is MACMGT_Beacon relative to a dwell period of a frequency hopper? Should we have one beacon per dwell?	Can not judge this section without clause xxx

7.1.2.1	Rick White	T	The relationship between dwells and beacons must be defined for frequency hopping PHYs.	For a frequency hopping systems the beacons should probably be sent as the first frame in a new dwell period.

Not Adopted. The standard specifies no fixed relationship between dwell time and beacon interval. Any relationship is implementation dependent.

7.1.2.1	A. Bolea	T		The beacon needs to be delayed from the TBTT(beacon strobes) by an amount large enough to allow waking station oscillators to settle out. The maximum settling time should be specified in this standard. If we don't do this an AP could transmit beacons and all waking stations would miss them!
7.1.2.1	Renfro	T		TBTT should be delayed from beacon strobe by an amount of time equal to the maximum timing error + maximum wakeup time. This ensures that all stations have time to wakeup and settle to within specified receive performance before the beacon is transmitted. From an implementation perspective, it is easier to keep beacon, hop and wakeup strobes aligned in time and delay TBTT from the strobe. It is also necessary that all PHYs specify a maximum wakeup time.

Not adopted. This is putting implementation specific material in the standard. If it takes you fifteen minutes to get out of bed after the alarm goes off, set the alarm fifteen minutes early.

7.1.2.1	Geiger	T	Time Stamp appear to only be sent in Beacons. Is this the best way.	Why not send Time Stamp elements in data frames and other management frames. Then only send Beacons when there is no activity for long periods of time on the medium

Do not adopt. Beacons go out for many reasons other than timer sync. Recommended solution adds unacceptable overhead to other frames.

7.1.2.1	McDonald	t	We need a high inertia timing system	In this system it sounds like the timing is set frame by frame. If so, this is not high inertia and there will be problems if the channel is lost for a short period of time causing some beacons to be lost

Do not adopt. The system has sufficient inertia in the absence of beacons (limited by oscillator accuracy).

7.1.2.1	McDonald	t	Beacons, if transmitted should be transmitted only at steady rate	A steady pace of beacon transmission is required for good battery saving or power management.

Beacons are transmitted at a steady rate. Accepted.

7.1.2.1	Rick White	T	Beacons must be transmitted without sensing the medium.	There is no reason that any other station in the BSS should be transmitting. Note: Superframe stretching must be removed. If Beacons are not transmitted at fixed times, this will lead to problems with synchronization and power management. With frequency hopping systems, beacons are very important in order to maintain hopping synchronization. It the beacons are not generated at fixed times, this will lead to problems with hop synchronization and wasted bandwidth.

Do not adopt. Beacons may be sent after deferral without affecting synchronization because of the included timestamp. This will cause only minimal pain to power managed stations.

7.1.2.1	Tim Phipps	T	The access point shall define the timing for the entire BSS by transmitting Beacons according to the MACMGT_Beacon_Interval parameter within the AP. This defines a series of Target Beacon Transmission Times (TBTTs) exactly MACMGT_Beacon_Interval time units apart, **time zero is defined to be a TBTT**. At each TBTT, the AP shall schedule a Beacon as the next frame for transmission. If the medium is sensed to be unavailable, the AP shall delay the actual transmission of a Beacon according to the CSMA medium access rules specified in Section 5. NOTE: Though the transmission of a Beacon may be delayed because of CSMA deferrals, subsequent Beacons will be scheduled at the nominal beacon interval. This is shown in Figure 7-1	Stations must know when to expect a beacon. The most practical way to know when a beacon will occur is to make the TBTT a function of the TSF timer and the beacon interval, with a fixed (zero) offset.
7.1.2.2	C. Heide	t	define how STAs get their beacon intervals in sync.	the length of a beacon interval is a management parameter, but how do all STAs get to have their beacon interval starting at the same time?

Adopted. An algorithm is defined below that defines synchronization of beacon intervals.

7.1.2.2	Bob O'Hara	T	Replace the algorithm described with "1) save the timestamp from the most recently received Beacon, 2) calculate a random delay, 3) wait for the period of the random delay, 4) if no Beacon has arrived during the delay period, send one, go to step 1, otherwise 5) go to step 2"	Current algorithm is overly complex and requires a cancellation mechanism needed by no other MAC service requester.

Adopted, but needs specific language to accurately describe the process details.

7.1.2.2	C. Heide	t	remove ad hoc beacon generation	this mechanism encourages STAs to all try to transmit as close as possible to the same time. This is a bad thing to do in a CSMA based network, particularly a wireless one.

Not adopted. Other changes adopted, fix this anyway.

7.1.2.2	Geiger	T	Section 6.2 contains no information on Awake periods of stations that are operating in a low power mode	This needs to be resolved.
7.1.2.2	McDonald	t	Complete section 6.2	Cannot complete judgment of 7.1.2.2 without 6.2

Editorial mistake. Proper reference is to 7.2.

7.1.2.2	McDonald	t	If one unit in the ad hoc BSS became the effective AP for at least the purpose of sync, then the issue of sync stability would become simpler. For the reason stated to the right, I fear that the ad hoc sync system may not be stable.	If one would assume that this process is stable, then one would conclude that all units would reach the point where they would be transmitting their beacons at the same time. If this happened, then there would be "15 in the fog" and no unit would receive a beacon and therefore the sync system is unstable.

Not adopted. The timer synchronization algorithm described below provides the needed stability. Randomization of beacon transmission addresses this problem.

Not adopted

7.1.2.2	Renfro	T		In a very busy network, will the awake period be stretched if beacon transmission is delayed too long? Need to specify.

Not adopted. This decision is implementation dependent as to how long a station wants to wait for beacons. The trade-off between power consumption and data transfer reliability should be a manufacturers decision.

7.1.2.2	Rick White	T	In an ad hoc network, a beacon master must be elected. An algorithm to elect a beacon master must be generated.	This is extremely important in a frequency hopping system in order to maintain hopping synchronization. Again, the beacons must be sent at fixed intervals.

Not adopted. This assumes that averyone in an ad hoc network can hear the beacon master.

7.1.2.2	Tim Phipps	T	Beacon generation in an ad hoc network is distributed. All members of the BSS participate in Beacon generation. Each station shall maintain its own TSF timer which is used for MACMGT_Beacon_Interval timing. **This defines a series of Target Beacon Transmission Times (TBTTs) exactly MACMGT_Beacon_Interval time units apart, time zero is defined to be a TBTT. At each TBTT** the station shall schedule a Beacon transmission to occur after a random delay. If a Beacon is received from another station during this delay period, the transmission is cancelled.	Stations must know when to expect a beacon. The most practical way to know when a beacon will occur is to make the TBTT a function of the TSF timer and the beacon interval, with a fixed (zero) offset.

Adopted.

7.1.2.3	Greg Ennis	T	remove entire section	Beacon content should be covered in Section 4 and should not be repeated here
7.1.2.3	Tim Phipps	T	Remove this section.	The contents of a beacon are defined elsewhere. The detail in this section is obsolete and wrong.
7.1.2.3	Tim Phipps	T	Delete this section	The contents of this section are no longer accurate. Even, if they were accurate they would be duplicated elsewhere in the standard.

Adopted, Replace section with definition of addressing for beacon frames in section 4.

7.1.2.3	bdobyns	T	<last paragraph> NID not defined anywhere else. (should have been in Section 4) Section 6.2 has nothing to do with this, delete reference.	Maybe you want BSSID instead?
7.1.2.3	C. Thomas Baumgartner	t	Need to define what happens when there are 2 AP's in a BSS.	I haven't seen anywhere that there can't be 2 AP's in a BSS. In that case there will be conflicting synchronization information.
7.1.2.3	C. Thomas Baumgartner	t	Need definitin of NID. I assume that it is Network ID that has been referred to earlier. Don't know what that is or where it is specified.	Network ID field not specified in section 4 frame formats
7.1.2.3	Geiger	T	The description of the Timestamp field is inconsistent with the description of the Short TSF and Long TSF fields described in the element definitions	Change this to be consistent
7.1.2.3	Renfro	T		Delete reference to sync flag. Refer to previous section for definition of beacon frame.
7.1.2.3	Tom T.	T	Change 'Timestamp' to 'Short Time Stamp'. Change NID to ESS ID. "certain circumstances" - These other circumstances must be defined here or referenced to where they are defined.	There is no element defined that is simply 'Timestamp'. NID is not a defined element.

Not adopted, because section was deleted.

7.1.2.4	A. Bolea	T		Change references to "free-running" timer. The algorithm for updating the station timer is missing. We agreed to have it be the average between the local station time and the time in the beacon.

Adopt "free-running" deletions. Algorithm addressed in other comments.

7.1.2.4	Greg Ennis	T	replace "Start Frame Delimiter (SFD) is transmitted" with "first bit of the MAC frame is transmitted by the transmitting antenna".	Two issues here: 1) there is no SFD at the beginning of the MAC frame, and 2) the transmitting station should compensate for the delays through its local PHY components when placing the timestamp in the frame.

Adopted. replace "by the transmitting antenna" with "to the PHY".

7.1.2.4	Greg Ennis	T	after "algorithm:" add the following text: "The received timestamp value isadjusted by adding an amount equal to the receiving station's delay through its local PHY components plus the time since the first MAC bit was received at the MAC/PHY interface. In the case of an infrastructure BSS, the station's TSF timer is then set to the adjusted value of the timestamp. In the case of an ad hoc BSS, the station's TSF timer is set to the average of t its current value and the adjusted value of the timestamp.	Algorithm needs to be specified.
7.1.2.4	Bob O'Hara	T	Define the algorithm for TSF timer update.	Not defined
7.1.2.4	C. Heide	t	add the algorithm referred to here	missing text
7.1.2.4	C. Thomas Baumgartner	t	Need algorithm	Can't implement compliant MAC without algorithm
7.1.2.4	David Bagby	T	sync algorithm must be defined for both infrastructure and ad hoc[DB1]	See imbeded comments and annotations
7.1.2.4	bdobyns	T	Specify Beacon update algorithm. Algorithm should permit error tolerance such that it is possible to achieve MACMGT_Sync_State = Synchronized	
7.1.2.4	McDonald	t	Define and make tight resolution . Note that there are analog delays involved	Resolution is a major issue in that it adds to the SIFS and DIDF and Contention Window periods. The amount that it adds is a function of the system design but should be enough to allow min to max variation.
7.1.2.4	Rick White	T	The algorithm for updating the TSF timer must be defined.	Not defined.

Adopted.

7.1.2.4	Renfro	T		Value of beacon should be time at which first symbol of MAC frame (i.e., Frame Control Field) is transmitted over the air. I believe reference to SFD is incorrect. Also, need to add algorithm for updating TSF timer.
7.1.2.4	Rick White	T	For a frequency hopping PHY, the Start Frame delimiter is not the byte before the first byte of the MAC header. The timestamp value in the beacon should be the time at which the first byte in the MAC header is transmitted.	

Adopted as a result of other comments.

7.1.2.4	Tim Phipps	T	**Delete the following:** Upon receiving a Beacon BSS with a valid CRC and BSS-ID, a Station shall update its TSF timer according to the following algorithm:	The necessary algorithms are described in sections 7.1.1.1 and 7.1.1.2.

Not adopted. Sections referred to contain only general information. Specific definition is gfiven here.

7.1.3	Bob O'Hara	T	Define MACMGT_Scan_Mode in the MIB	not defined
7.1.3	Rick White	T	Most define MACMGT_Scan_State and MACMGT_Scan_Mode in the MIB.	Not defined.

Adopted only definition of scan mode. Replace "MACMGT_" with "a" and create MIB text.

7.1.3	C. Thomas Baumgartner	t	This section must justify why Probes are required since there are regular beacons that a scanning station could hear.	I assume that a probe will spead up the scan. Has this been simulated so we can see if the complexity is justified by enough performance improvement?

Not adopted. Justification is not required in a standard, only definition. However, Probes will, on average give a benefit of 1/2 Beacon Interval per channel scanned.

7.1.3	McDonald	t	Complete sections as indicated by the editor's note	

Adopted. Algorithms are in 7.1.2.4.

7.1.3.1	Bob O'Hara	T	Define MACMGT_Passive_Scan_Duration in the MIB	not defined

Adopted. Change "MACMGT_" to "a". Should be returned in an associate response.

7.1.3.1	Renfro	T		As defined, passive scanning will work well for DS network. For FH network, a station acquiring using passive scanning will stay on only a single (or very few) of the frequency channels.

No change required (editorial comment, in nature).

7.1.3.1	Rick White	T	Must define what "the correct BSS-ID" means.	Not defined.

Adopted (BSS should be ESS), text: "the ESSID matching that for which the search is being conducted."

7.1.3.2	A. Bolea	T		Correct all references to NID.
7.1.3.2	bdobyns	T	NID not defined (should have been in Section 4)	Maybe you want BSSID instead?
7.1.3.2	Renfro	T		Is there still a NID? For infrastructure nets, use broadcast BSS ID, for Ad Hoc nets, use specific BSS ID.
7.1.3.2	Rick White	T	NID is no longer used. This section must be rewritten.	
7.1.3.2	Tim Phipps	T	*Remove:* "Source NID .. Probe".	There is no NID. The probe response carries the BSS-ID.

Adopted. NID is out of date, will be replaced.

7.1.3.2	Bob O'Hara	T	Insert "If a station's MACMGT_Scan_Mode variable is ACTIVE," before the start of the first sentence	A station should not be continuously sending Probes.

Adopted.

7.1.3.2	Greg Ennis	T	Replace the entire section with "Active scanning involves the generation of Probe frames and the subsequent processing of received Probe Response Frames. The details of the active scanning procedures are described in Sections 7.1.3.3, 7.1.3.4, and 7.1.3.5."	Current section does not say what active scanning is and describes Probe format (which should be covered solely in Section 4).

Adopted.

7.1.3.2	C. Thomas Baumgartner	t	Change 1st sentence so make sense. What is a NID and where does the ESSID come from? 4.2.3.8 says that Probe Reqest will include supported rates--nothing about NID and ESS ID.	Maybe just my lack of knowledge but don't understand this sentence at all. Seems to be in conflict with 4.2.3.8
7.1.3.2	C. Thomas Baumgartner	t	4.2.3.9 defines contents of Probe Response and they don't match with this paragraph.	Seems in conflict with 4.2.3.9
7.1.3.2	Renfro	T		Is there still a NID? For infrastructure nets, use broadcast BSS ID, for Ad Hoc nets, use specific BSS ID.
7.1.3.2	Rick White	T	NID is no longer used. This section must be rewritten.	
7.1.3.2	Tim Phipps	T	*Remove:* "Source NID .. Probe".	There is no NID. The probe response carries the BSS-ID.
7.1.3.2	Tom T.	T E	Change 'Timestamp' to 'Short Time Stamp', in list of elements. Change 'Source NID' to ESS ID. Delete description of Source NID. remove word 'are' in second sentence.	There is no element defined that is simply 'Timestamp'. NID is not a defined element. ESS ID is defined elsewhere.

Adopted as a result of adopting Greg's comment.

7.1.3.2	C. Heide	t	add some justification for active scanning - what are the PHY parameters that add together to give some idea of how long it might take to acquire synchronization using passive scanning?	with the possibility of active scanning not working due to hidden nodes (i.e. if the AP is conversation with a node hidden from the scanner it cannot respond to the probe) making it possible that active scanning could take a long time, justification is need for how much fast it might be to use active scanning vs passive scanning.

Not adopted. A standard is a document for definition, not justification. This discussion of passive scanning belongs in the Informative annex..

7.1.3.3	Bob O'Hara	T	Define a mechanism to ensure one station is awake to respond to Probes.	no mechanism is defined to implement the required functionality
7.1.3.3	C. Thomas Baumgartner	t	Add "In an infrastructure network the AP's are always awake."	Since we say how this is taken care of in ad-hoc should say how taken care of in infrastructure case
7.1.3.3	Geiger	T	There must always be a station awake to respond to a probe. Where is this discussed for ad hoc networks	This process is not defined in the Standard, in other words, what station has the honor of this function or is it distributed?

Adopted. Change the final sentence of the section to read: "The station that sent the most recent beacon shall remain awake and shall be the only station to respond to Probes until a beacon frame is received. If the station is an access point, it shall always respond to probes."

7.1.3.3.	Fischerma:Sending a Probe Response	T	Last paragraph of this section: In a network there shall be at least one node that is awake at any given time to respond to probes unless all nodes in the network are battery-powered, in which case, there may be periods of time during which no node is awake to respond to probes. Therefore, probes should be sent at frequent intervals for a period of TBS seconds before abondoning the scanning procedure. In an ad hoc network, probe responses shall be sent by the station that sent the last beacon.	The burden of remaining powered up and draining valuable battery resource should be placed onto the station desiring to enter the network, since this is more power efficient and except for the rare case of roaming through a field of battery-only powered BSS's, the scanning procedure will still produce a quick response, since newtorks with some non-battery powered nodes are still required to remain powered up at all times, and these will represent the overwhelming majority of BSS's through which mobile users will roam.

Not adopted due to adoption of alternative.

7.1.3.3	Bob O'Hara	T	Revise the mechanism for Probe Responses so that a random delay is introduced in the management state machine and not on the MAC state machine.	This is the only requester of MAC services that requires backoff to be performed prior to initial transmission. Changin the mechanism for submitting Probe Responses for transmission will remove unnecessary complexity from the MAC.

Adopted. Replace first paragraph and list with: "Stations receiving probes shall respond with a probe response only if the ESSID is the broadcast ESSID or if the ESSID matches the specific ESSID of the station. Probe responses shall be sent as directed messages to the address of the station that generated the probe. The probe response shall be sent using normal frame transmission rules. An access point shall respond to all probes. In an ad hoc network, the station that generated the last beacon shall repond to a probe."

7.1.3.4 - 7.1.3.5	C. Heide	t	remove section 7.1.3.4; change title of 7.1.3.5 to "Scanning for an Existing Network"	there should be no difference between scanning for an ad hoc and scanning for an infrastucture network. In both cases more than one station can respond to probes. In either case the second probe response should be sent if the BSS of the second sender differs from the BSS in the first response, and not sent if it doesn't.

This is a technical comment, not editorial. Adopted. Delete " ad hoc" in header and first sentence of 7.1.3.5. Replace the algorithm with:
"For each channel to be scanned:

a) wait until CCA indicates the medium is clear
b) Send Probe with Broadcast Destination, ESSID, and broadcast BSSID
c) Start Probe_Timer_1
d) If CCA indicates activity prior to expiration of Probe_Timer_1
   then start Probe_Timer_2
   Else If CCA indicates no activity before the expiration of Probe_Timer_1
      then Clear NAV, Scan next channel.
e) When Probe_Timer_2 expires, process all received Probe Responses.
f) Clear NAV and Scan next channel. "

Delete the figure.
Replace text following the figure with:
"Probe_Timer_1 shall be of sufficient duration to detect the presence of a probe response transmission. This period shall be greater than the sum of the TBD."
"Probe_Timer_2 shall be of sufficient duration to receive all potential probe responses, including retransmissions."

7.1.3.4	Bob O'Hara	T	Eliminate step c) and the conditional start of step d)	

Not adopted.

7.1.3.4	Bob O'Hara	T	Define timer(s) used in Probe process	not defined

Adopted.

7.1.3.4	Bob O'Hara	T	Eliminate step c) and the conditional start of step d)	Reduces the complexity of scanning at a minimal cost in time lost. Relying on energy sensing will result in a large proportion of false positives in the current bands.

Not adopted.

7.1.3.4	Bob O'Hara	T	Define timer(s) used in Probe process	not defined

Adopted.

7.1.3.4	C. Thomas Baumgartner	t	T2 missing from Figure 7-3 Change Figure 7-3 to "G3=DIFS"	Can't tell without drawing what T2 timer does. I believe that drawing show G3 as DIFS

Adopted.

7.1.3.4	Lewis	T	Define the selection mechanism a STA uses to select the AP when multiple Probe responses are received.	

Not adopted. The mechanism requested does not affect interoperability and may safely be left to the implementor.

7.1.3.4	Mahany	T	Revise Algorithm. DS and FH PHY's do not produce indication of energy.	
7.1.3.4	Marvin Sojka	T	In action d, "receive energy" should be replace with "clear channel assestment becomes false".	
7.1.3.4	Renfro	T		Need to define T2 timer and show in figure 7-3.
7.1.3.4	Rick White	T	The scanning algorithm defined must be more specific as far as frequency hopping PHYs are concerned.	Its possible that a STA may never find an AP depending how it scans the channels. The scanning algorithm defined must be more specific as far as frequency hopping PHYs are concerned. Its possible that a STA may never find an AP depending how it scans the channels.

Adopted.

7.1.3.4	Rick White	T	The timer values must be defined in the MIB.	Not defined.

Adopted.

7.1.3.4	Tim Phipps	T	*Remove:* "Specific ESSID".	Probes do not carry ESSID, only probe responses.

Not adopted. ESSID is required in Probes. Probe description in section 4 must be adjusted.

7.1.3.4 - 7.1.3.5	C. Heide	t	remove section 7.1.3.4; change title of 7.1.3.5 to "Scanning for an Existing Network"	there should be no difference between scanning for an ad hoc and scanning for an infrastucture network. In both cases more than one station can respond to probes. In either case the second probe response should be sent if the BSS of the second sender differs from the BSS in the first response, and not sent if it doesn't.

Adopted.

7.1.3.5	A. Bolea	T		Correct all references to NID.

Adopted.

7.1.3.5	bdobyns	T	<last paragraph> NID not defined (should have been in Section 4)	

Adopted.

7.1.3.5	Bob O'Hara	T	Use same process as 7.1.3.4 (revised)	same reasons

Adopted.

7.1.3.5	C. Heide	t	figure 7-4 change to "G3 = SIFS"	probe responses should not have a low priority in an ad hoc network

Not adopted. SIFS is used only in interlocked frame exchanges.

7.1.3.5	C. Thomas Baumgartner	t	change 1st sentence to "An new station attempting to join an existing ad hoc network using active scanning would use the following procedure:"	The sentence currently says that a new station MUST use active scanning

Adopted.

7.1.3.5	C. Thomas Baumgartner	t	T2 missing from Figure 7-3	Can't tell without drawing what T2 timer does.

Adopted.

7.1.3.5	C. Thomas Baumgartner	t	What is a NID?	Uses term not defined.

Adopted.

7.1.3.5	Marvin Sojka	T	in action d, "receive energy" should be replace with "clear channel assestment becomes false".	

Adopted.

7.1.3.5	Renfro	T		No need to retransmit probe response message if T1 has expired. If probing station successfully received probe response but ack failed, probing station has necessary information. If probing station did not receive probe response, it will go to another channel after T1. Also, delete reference to NID.

Not adopted. Mechanism specified for leaving a channel when scanning uses T2, not T1.

7.1.3.5	Rick White	T	The scanning algorithm defined must be more specific as far as frequency hopping PHYs are concerned.	It's possible that a STA may never find an ad hoc network depending how it scans the channels.

Adopted.

7.1.3.5	Rick White	T	The timer values must be defined in the MIB.	Not defined.

Adopted.

7.1.3.5	Tim Phipps	T	*Remove:* "Specific ESSID". *Replace:* "Specific BSSID" *with* "Broadcast BSSID". *Remove the para:* "Whenever a responding ... and NID".	Probes do not carry ESSID. The BSSID is not known in advance, so probes must always be sent to the broadcast BSSID. Section 7.1.3.3 : "In a network ... last beacon" ensures that there will be at least one, but usually only one station which responds to probes. The scanning process is robust with respect to receiving multiple probe responses. There is therefore no need to define the cancellation process. Furthermore, cancellation as described carries significant implementation costs.

Reject the portion regarding ESSID, adopt the remainder.

7.1.3.6	C. Heide	t	explain how a newly sync'ed STA knows when an "expected" Beacon interval is to begin.	the probe response contains the length of the beacon interval, but how does the STA know when the next one is supposed to start?

Adopted. Text to be provided in sections on power management.

7.1.3.6	bdobyns	T	What is the duration of the various timers T5, T3? These values should be in MAC MIB	
7.1.3.6	Bob O'Hara	T	Define timer(s) used in Probe process	not defined
7.1.3.6	C. Thomas Baumgartner	t	Where are these times T1, T2, T3, (presumably) T4, T5 defined?	Need specific times for compliance
7.1.3.6	C. Thomas Baumgartner	t	If stating a new network how can there be a specific BSS ID?	I don't understand

7.1.3.6	C. Thomas Baumgartner	t	Reference to JoinNet is not specific enough to understand	I don't understand the reference to process describe above.
7.1.3.6	Geiger	T	There are several timers described in this section, T1, T2, T3, and T5. The time these timers are monitoring are not specified.	Specify Times by providing MIB variables.
7.1.3.6	Geiger	T	What is the JoinNet and StartNet functions.	I haven't seen this described anywhere yet. Is JoinNet another word for Association?
7.1.3.6	Lewis	T	Define T5 time	
7.1.3.6	Mahany	T	Role of T5 is not clear. It is not defined in the figure. Define Value	Not sufficient for implementation without this info.
7.1.3.6	Renfro	T		Not necessary to define T3. As currently stated, if a station starts an Ad Hoc network and nobody joins, it will be the only station transmitting beacons and will, therefore, stay on forever..... Also, delete reference to 'synced'

Change the title to "Initializing or synchronizing with a BSS"
replace algorithm with the following:
An access point shall select a BSSID, select channel synchronization information, select a beacon interval initialize its TSF timer and begin transmitting beacons.

Stations which are not access points shall:
a) Scan for the presence of an existing BSS with a specific ESSID
b) If a BSS with the specific ESSID is found, adopt the BSSID, channel synchronization information, TSF timer value of the BSS.
Else if the ESSID designates an ad hoc network, select an ad hoc BSSID, select channel synchronization, select a beacon interval, initialize and start the TSF timer, and begin transmitting beacons.
Else indicate failure to find a network matching the ESSID.

The definition of ESSID must be modified to include an indication of ad hoc vs infrastructure.

7.1.3.6	Rick White	T	The timer values must be defined in the MIB.	Not defined.

Adopted.

7.1.4	Bob O'Hara	T	Define MACMGT_Weight in MIB	not defined
7.1.4	Bob O'Hara	T	Define AdjustTimer	not defined
7.1.4	Bob O'Hara	T	Define or delete Coalesce operation	not defined
7.1.4	C. Thomas Baumgartner	t	Add definition of AdjustTimer algorithm and Coalesce operation.	This section describes operations that are basic to MAC. Can't have interoperability or conformance unless these items are completely defined
7.1.4	Gegier	T	Stations shall always adopt the timer...	In this text, I have seen the Long Time Stamp, the Short Time Stamp, the timer in the Probe or Beacon and the use of just time stamp. This is very confusing because I believe these are all the one in the same variable. If not, then some explanation is missing in the standard of how each of these is used

7.1.4	Geiger	T	Coalesce Function not defined. AdjustTimer algorithm not defined. Suitable number not define	Define these functions
7.1.4	Miceli	T	need specification of the timer adjustment algorithm	incomplete
7.1.4	Renfro	T		Procedure for Ad Hoc networks is wrong. Update to reflect recent agreements.
7.1.4	C. Thomas Baumgartner	t	Add definition of AdjustTimer algorithm and Coalesce operation.	This section describes operations that are basic to MAC. Can't have interoperability or conformance unless these items are completely defined

Adopted. Replace section with:

7.1.4 Adjusting Station Timers and Coalescing

In the infrastructure network, Stations shall always adopt the timer in a Beacon or Probe Response coming from the AP in their BSS.

In an ad hoc network, a station shall always adopt the information in the contents of a beacon or probe response frame when those frames contain a matching ESSID and the value of the time stamp is greater than the station's TSF timer. A station may return to its previous BSS, if any, and transmit a beacon with the newly adopted information.

7.1.4	Gegier	T	Stations shall always adopt the timer...	In this text, I have seen the Long Time Stamp, the Short Time Stamp, the timer in the Probe or Beacon and the use of just time stamp. This is very confusing because I believe these are all the one in the same variable. If not, then some explanation is missing in the standard of how each of these is used

Adopted. Changes shall be made in section four to change all references to time stamps to be the long time stamp.