Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status

This document is a copy of my original (Sponsor Ballot) comments, with the latest 802.11 resolution position as of today (Sunday, January 19, 1997). I have added an additional column indicating my position relative to the current situation, as of Tuesday, Jan 27. As a simple shortcut:

- A double check mark (✓✓) indicates complete agreement with the commitee's resolution. These comments are considered resolved
- A single check mark (✓) indicates tentative resolution. These comments are resolved in principle, but I would like to see the specific changes made to the draft before signing off on them.
- A mark of ✖ indicates that I do not consider this comment resolved at this time.

I have included appropriate notes indicating my position on each comment. Changes made since the last revision (both the committee response and my comments) are indicated in boldface, and precede earlier text (left for historical record). The current status of comment acceptance is the first one indicated (i.e., the check-mark or "X" at the top of the comment is my current position). For more information, feel free to contact me at: Networks and Communications, 21885 Bear Creek Way, Los Gatos, CA 95030. (408) 395-5700 voice, (408) 395-1966 (fax), seifert@netcom.com (Email).

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
1.2, 5.1.1.4, 5.2, 5.4.2.1, etc.	R S	T	Y	The fact that high-layer applications may desire the ability to move within or among wireless LANs does NOT imply the requirement, as stated in 5.1.1.4, that this mobility must be provided within the MAC sublayer. In fact, 802.11 does not currently provide this mobility service (see discussion of DS and ESS below). Mobility is best relegated to higher-layer protocols (such as Network). 802.11 should provide the appropriate service interfaces (e.g., allowing a MAC client or management entity to determine the current associations of an AP) that allow higher-layer protocols to implement mobility, but not to attempt to implement it within the MAC. There is no need to "reinvent" the entire ISO protocol stack within the MAC, just because it's wireless.	Eliminate mobility as a requirement of, and function provided by 802.11. Include a paragraph in the Scope section identifying mobility as a higher-layer function that can be provided among 802.11 LANs.	**Request is respectfully declined. We believe the commenter misunderstood the architecture. As data flows from higher layers into the top of the MAC, this data must be delivered as a Stations moves. Hence, mobility is inherently a primary aspect of the functionality provided by 802.11. Note that it is the mobile STA that decides when to reassociate. While layers higher than layer 2 may well be involved in the implementation of mobility as provided by the MAC (via invocation of a DS service), mobility is not a service which can be removed from the 802.11 MAC layer. primary purpose of 802.11 is to provide the mobility services requested - this is what the functions of association, reassociation etc accomplish.** Request is respectfully declined.	✖ **The comment stands. The fact that mobility is needed by applications does not make it a MAC functional requirement. Especially since the DS is unspecified in 802.11, mobility is very much a higher-layer protocol (or application) concern, not MAC. Mobility within the MAC that spans internetworks violates ISO layering principles as well, as it is the Network Layer that is responsible for packet delivery across internetworks, and not the MAC/Data Link.** **The fact that a station (rather than the network) makes the reassociation decision also does not make this a MAC concern. It should be a higher-layer entity within the station performing this function.** **Mobility is a service which *can* easily be removed from 802.11, and should be. The primary purpose of 802.11 is NOT mobility services, it is wireless MAC. By definition, a MAC is a single Data Link, not an internetwork.** The written response to this comment does not provide any rationale for its rejection, and it was not discussed during the conference call. It is still an

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
10.1	R S	t	Y	Since the operation of the MAC depends on MAC Management being present, and MAC Management requires a SM entity, the statement that "a SM entity is assumed to exist" should be replaced by a "shall" requirement.	Add a requirement that a SM entity be present, either here or in Clause 11.	Declined - it may be splitting hairs but - 802.11 can not require that an SM entity exist, as the SM entity is outside the scope of 802,11. However, 802.11 does assume that some entity invokes our interface to let the MAC know what to do, we hope it is a station mgt entity, but we can't "require it". Neither can we require that we be asked to do anything else…	✖ **This is not what was agreed to in our telephone conference. I fail to see why 802.11 cannot require that a Station Management entity exist, and that it have certain required functionality. This is true in many other LAN standards, including 802.5 and FDDI. Since you require an entity to perform certain operations, (or the MAC doesn't work), you should make Station Management implementation a conformance requirement.** ✓ Per our telephone conference, it was agreed that a Station Management entity is indeed required. SM will be made mandatory, and all references to optional SM functionality will be eliminated.
11.1.2.1	R S	t	Y	The note states that Beacons may be delayed. In fact, since CSMA delay is unbounded (especially without fixing the Capture Effect!) Beacons may not be sent at all.	The standard needs to deal with the possibility that frames, including Beacons and ATIMs, etc. may be delayed indefinitely. The standard must specify the behavior of the STAs under these conditions.	No change made. The behavior in the cases cited is specified. The group does think that any further specification is necessary w/o further specific examples of problems of which the group is not currently aware of.	✓ The state machines must show the behavior of the MAC for an indefinitely-delayed Beacon. (This should not require any change to the State Machine; it should already be there.)
11.2.1.1	R S	T	Y	The draft states that "Some circuitry, such as timers, may still be active.".	The standard must state, explicitly, exactly which functions of the MAC and MAC Management must remain active during doze state for proper operation.	Corrected. Superfluous sentence cited was deleted.	✓✓

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
11.2.2.1	R S	T	Y	The mechanism specified for operation of power-save mode in an IBSS does not appear to ensure correct operation, since the time for successful transmission of a ATIM (using CSMA/CA) is unbounded. Worse than this, the use of power-save effectively forces all traffic into the ATIM window (until the devices actually come out of doze state). This further reduces the available bandwidth and increases contention during the window, increasing the probability that the ATIMs will not be delivered. This appears to fail in the worst-case of all stations dozing under heavy load. There is no assurance that any station will ever be able to transmit ATIMs (much less data frames) under worst-case conditions.	Eliminate the use of power-save mode in ad-hoc networks.	**I am sorry we overlooked this during the conference call. Please look at the file SEC8.pdf. May be this is an item for review during the Recirc ballot?** Declined. The group went thru a list of all concerns that have been brought to / thought of by the group. Each was examined and in several cases language was added and/or clarified in the draft. The group now believes that there is no problem with power save mode in ad-hoc networks.	✓ **Proposal accepted. This will be reviewed during Recirculation.** ✖ This is still an open issue. We did not discuss it during our telephone conference.
11.2.2.4	R S	t	Y	There are two conflicting statements in the first paragraph. The first sentence requires ("shall") STAs to buffer MSDUs for stations known to be in power-save mode. Yet the second sentence says that that knowledge is outside the scope of the standard. How can you have a conformance requirement that is outside the scope of the standard?	Eliminate the use if power-save mode in ad-hoc networks.	Suggested change declined. Pwr mgt in ad-hoc reviewed. Specific language cited corrected.	✓✓
3	R S	e		Definition of "Mobile Station"	Insert a <CR> before the definition.	Done	✓✓

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
3	R S	e	Y	In the definition of "Ad-hoc network", the word "comprised" should be "composed". This is a global editorial change (numerous other places). "The whole comprises its parts"; "The parts compose the whole". The expression "is comprised of" is never correct.	Change all instances of "is comprised of" (or similar) to "is composed of".	Done	✓✓
5.2.1.1	R S	e		The title of this section is "STA to AP Association is Dynamic", yet the section does not discuss APs at all.	Change the title to reflect the actual content of the section.	Corrected - changed AP in title to BSS.	✓✓
5.2.3	R S	e	Y	The text discusses "red blocks" in Figure 4, which is printed in black/white. I don't believe that IEEE will be publishing this document in color.	Eliminate Figure 4 and the associated references, as it is rather useless in black/white. Alternatively, print the standard in color (and distribute the drafts in that form as well).	New text refers to "dark box" which should show in black and white print	✓✓
5.2.3, 5.2.4.1, etc.	R S	E	Y	The use of rhetorical questions, such as in the paragraph just before Figure 5 is inappropriate in an IEEE standard. (global issue)	Eliminate this and all such rhetorical questions.	**Action Taken: Accept Change sentence to: "Consider figure 5 in which station 6 could belong to BSS 2 or BSS 3." Other rhetorical question eliminated by resolution to comment 9.** Request declined. The group feels that the 802.11 document must do more than simply write up the final results of the group's work. In particular, it is useful to set the context of the architecture within which 802.11 exists - to this end the text referred to is helpful to other readers/reviewers.	✓✓ **Response accepted.** I disagree with the position of the group on this, but accept your decision on the matter.

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
5.2.4.1	R S	E	Y	The statement, "Bridges were originally designed to provide range extension between like-type MAC layers." is false. Bridges were first designed to provide traffic segmentation between LANs, regardless of MAC type. Refer to the 802.1D introduction. In the next paragraph, there is a reference to "bridge-like devices", with no definition of what these are. IEEE 802 only defines bridges, not "bridge-like devices".	Eliminate these statements.	**Action Taken: Accepted. Replace section 5.2.4.1 as follows: "The 802.11 architecture contains more than one distinct logical medium., the DSM and the WM..Bridges provide repeater functionality, traffic segmentation, and integration of different MAC subnetworks. Repeater functionally extends the range of the LAN beyond the limits imposed by the PHY. In 802.11, the ESS architecture (APs and the Distribution System) provides traffic segmentation and range extension.. Logical connections between 802.11 and other LANs are via the Portal.. Portals connect between the DSM and the LAN medium that is to be integrated."** Partially accepted. The reference to "bridge-like devices" remains as 802.11 recognizes that 802.11 links will operate in environments that are not restricted to 802 specified components.	✖ **Response is inadequate. The committe says that they accepted the response when in fact they did not. The comment requested a definition of a "bridge-like device".** **As to the actual response, subnetworks are not defined in IEEE 802; there is no such concept, and therefore bridges do not provide for integration of different MAC subnetworks, as stated. Second, the statement that the ESS architecture provides traffic segmentation and renge extension is false. An architecture does not provide anything, it is simply a framework for implementations, which provide various functions**. I am willing to accept the group's response IF a definition of a "bridge-like device" is added to the definitions.

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
5.3	R S	E	Y	The statement, "The generality allows 802.11 to satisfy the diverse interests ..." is a clear statement that "We couldn't agree on how to standardize this, so we left it up in the air." While this may be true, it: (1) indicates the importance of the previous comment on a lack of DS and ESS requirements, and (2) looks like dirty laundry hanging out to dry.	Eliminate the statement.	The statement was deleted (though not for the reasons asserted by the reviewer).	✓✓

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
5.3, 5.4.2.2, etc.	R S	T	Y	There is no specification provided for the DS; neither a specific implementation nor a set of service interfaces and invariants that ensure proper MAC operation across the ESS. Since 802.11 depends on the DS to provide mobility and ESS coverage, it is clear that this standard currently does not provide sufficient information to build an interoperable, conformant ESS. Without conformance requirements, DS's and ESS's become proprietary entities. In addition, the inclusion of an "unspecified" DS makes the delay as seen at the LLC service interface unbounded and uncontrolled. LAN MAC clients expect a low delay; the inclusion of an arbitrary internetwork (including possible WAN links) invalidates any assumptions about delay that are typically made by LAN clients. IEEE 802.1G allows WAN links for Remote Bridges, but it puts an upper bound on their number and delay, and makes this information available to a management entity.	Eliminate the concept of DS and ESS from the standard at this time, and note that this is "under study" or "work-in-progress". When specifications are available that allow interoperable, conformant implementations to be built, revise the standard to include these new specifications. Eliminate all discussion of mobility as an 802.11-provided service.	**Request is respectfully declined. We believe the commenter misunderstood the architecture. As data flows from higher layers into the top of the MAC, this data must be delivered as a Stations moves. Hence, mobility is inherently a primary aspect of the functionality provided by 802.11. Note that it is the mobile STA that decides when to reassociate. While layers higher than layer 2 may well be involved in the implementation of mobility as provided by the MAC (via invocation of a DS service), mobility is not a service which can be removed from the 802.11 MAC layer. primary purpose of 802.11 is to provide the mobility services requested** - this is what the functions of association, reassociation etc accomplish. Declined. 802.11 has gone to a lot of effort to handle the problems unique to mobile stations using a WM. In order to do this it had to explain the architectural context within which the 802.11 MAC and PHYs operate. This information is crucial to understanding 802.11. Also refer to resolution of comment 3 in this clause. The 802.11 draft does what is required and appropriate for a MAC layer, i.e., media access to the Wireless Media. DS internals are outside the scope of 802 (not just 802.11). The reviewer is asked to consider that the draft is a MAC/PHY standard	✖ **No change in position.** I agree with the statement that "the draft is a MAC/PHY standard and not a complete reference to everything required…". I also agree that the purpose of 802.11 is (and should be) to specify only "what is required and appropriate for a MAC layer, i.e., media access to the Wireless Media". This is PRECISELY why we should eliminate discussion of the DS and ESS, because it falls outside the scope of 802.11.

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
5.3.1, 5.3.2	**R S**	e			Change "The Station Services subset is:", to "The Station Services are:". Similar for Distribution Services.	Done	✓✓
5.3.3	**R S**	T	Y	The last paragraph of this section implies that an IP internetwork may be used as the DS for an 802.11 ESS. This places a Network Layer entity as a "service provider" to a MAC entity, in contradiction with both the letter and spirit of ISO 7498.	Either: (1) Eliminate the discussion of IP internetworks appearing "below" the 802.11 MAC, or (2) Eliminate the DS and ESS concepts from 802.11 entirely.	**Action Taken: Partially accepted. Delete parenthetical phrase about IETF, it is superfluous. Add the following sentence at the end of section 5.3.3 for clarification: "The specification of the distribution system is unspecified and beyond the scope of this standard."** Declined. One of 802.11's primary purposes is to handle mobility within the constraints imposed by existing LAN systems - hence the DS and ESS concepts in 802.11. It is not required that a DS be entirely layer 2 entities. Neither is it required that DSs NOT be layer 2. There exist implementations of the 802.11 architectural concepts of DS which are not restricted to layer 2. An example would be the coupling of 802.11 to a DS based on the IETF mobile IP specification. 802.11 chooses not to ignore the existence of non-802 LAN components.	✓✓ **Response accepted.** ✓ Per our telephone conference, option (1) has been taken. The draft eliminates all discussion of IP internetworks appearing "below" the 802.11 MAC (as part of a DS).
5.4, 9.5, etc.	**R S**	e		A forward reference is labeled as "xx.xx". (global issue)	Fix all such unresolved references.	Done	✓✓

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
5.4.1.2	R S	T	Y	There is no specification of the functions or even service requirements of the Integration Service. Without any specification, there is no way to ensure correctness, conformance, or interoperability of any Integration Service implementation. Without these three elements, the service is meaningless and useless.	Specify (at a minimum) sufficient detail of the requirements of an Integration Service implementation to ensure correctness, conformance, and interoperability, or alternatively, eliminate the Integration Service from 802.11.	No change needed. The details of the integration service are dependent on the implementation of a specific DS. As the service in question is an interface to the DS, it is not appropriate for 802.11 to attempt to specify it. It is appropriate for 802.11 to mention the functionality as part of setting the architectural context for 802.11 operation.	✓ Per our telephone conference, a note will be inserted stating the purpose of the IS, the fact that it is completely optional, and that it is outside the scope of the standard.
5.4.3.1	R S	E	Y	It is not true that, in a wired LAN, access conveys authority, as stated. Authority is dealt with as mandated by the security needs of the organization administering the wired LAN.	Eliminate this statement.	**Action taken: Accept.. Change text as follows: "In wired LANs physical security can be used to prevent unauthorized access. This is impractical in wireless LANs since they have a medium without precise bounds**. Declined. 802.11 disagrees. In a typical wired LAN, physical access to a physical connection point does provide the ability to make the connection. The 802.11 authentication mechanisms provide a substitute for the physical security characteristics of wire which 802.11 does not inherently have due to the use of wireless PHYs.	✓✓ **Response accepted.** ✖ I agree that "In a typical wired LAN, physical access to a physical connection point does provide the ability to make the connection." This is NOT the same as saying that physical access implies the AUTHORITY to make the connection. The statement is 802.11 is false. If the group does not want to eliminate the statement, I suggest changing the word "authority" to "ability". There is no real difference between authorization in a wired or wireless LAN, even though the ability to access the LAN is possible without a wired connection, when using 802.11.

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
5.4.3.1, 5.7.6	R S	T	Y	Since 802.11 does not mandate the use of any particular Authentication scheme, there is no way to ensure conformance or interoperability. This is a requirement of any standard.	Specify the Authentication scheme sufficiently to provide for conformance and interoperability, or eliminate Authentication from 802.11.	**Action taken: Declined. 802.11 specifies 2 authentication schemes in clause 8.** Declined. The comment is incorrect. While 802.11 does not specify a **single** specific authentication scheme, it does specify 2 authentication schemes and could be extended to others. The ones specified are sufficiently detailed to ensure conformance and interoperability.	✖ **This was not the agreement from our telephone conference. The standard must mandate some interoperability for Authentication. A second method may be optional, but it cannot allow conformant, non-interoperable implementations, which would be the case of one station exclusively used Authentication method A, and another exclusively used Method B.** ✓ The specification will require all devices to implement one Authentication scheme. The second one is optional, in addition to (as opposed to "instead of") the first.
5.4.3.2	R S	e		The act of Deauthentication causes an IMPLICIT Disassociation, not an EXPLICIT one.	Change the wording as indicated.	Changed.	✓✓
5.4.3.3	R S	E	Y	The term "adapter" in the second paragraph is undefined.	Define "adapter", or change wording to eliminate the term.	Changed.	✓✓

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
5.4.3.3, 8.1.2, 8.2.1	R S	T	Y	802.11 defines a WEP algorithm for privacy. There is already an established 802 standard for secure data exchange (802.10/SILS). There is no need to define new standards where we have existing ones. In addition, a privacy algorithm that requires a known key must specify a means for key distribution, or it is not usable in an interoperable manner. There is already a standard for key distribution in 802.10, which should be used by 802.11.	Eliminate the WEP algorithm and use 802.10 for secure data exchange, along with the 802.10 key distribution mechanisms.	**Action Taken: Declined. The purpose of 802.10 and the purpose of 802.11 WEP are not the same. WEP's purpose is to compensate for the physical attributes of wired media which wireless media do not have. WEP is applied only to the 802.11 link and provides a substitute for missing "closed physical nature of wire". The group believes that it is not commercially acceptable to require a full 802.10 implementation for every 802.11 implementation. The subject of key distribution and the use of keys are separate subjects. Many security systems assume a separate conceptual communication channel over which key values have been provided. 802.11 will inter-operate with out having to provide the details of key management as part of the MAC layer.** Declined. The purposes of 802.10 and the 802.11 WEP are not the same. WEPs purpose is to compensate for the physical attributes of wired media which wireless media do not have. The group feels that this is a requirement for commercial success and that it is not commercially acceptable to require a full 802.10 implementation for every 802.11 implementation. WEP is applied only to the 802.11 link and provides a substitute for missing "closed physical nature of	✓ Per our telephone conference, I agree to drop the objection.

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
5.5	R S	T	Y	The statement that an AP shall always be in State 3 seems incongruous. How does it get to State 3? With what does it get Authenticated and Associated? What is the initialization procedure? In what state is the AP while being initialized? If an AP is always assumed to be Authenticated and Associated, then there is no protection against "rogue" APs, as there is for "rogue" STAs.	The AP states should be defined in a state machine formulation, with State 3 being invoked after proper initialization and authentication (if necessary).	Has been corrected, see clause 5 resolution on comment number 36	✓✓
5.5, etc.	R S	T	Y	There are many places in this clause (and others) where what are essentially MAC and MAC management specifications are buried in the service descriptions. These have associated "shall" statements, which require PICS entries. (For example, on p. 24, bottom: "If STA A receives a class 2 frame . . .") All conformance requirements should be in the same section (MAC and/or MAC management) and not strewn through service descriptions and other clauses. All "shall" statements shall be grouped and easy to find and recognize (sic!).	Put all conformance requirement statements in the clause appropriate to that requirement. There should be no "conformance" requirements in a clause on service specifications, since these are not required to be exposed interfaces.	**Action taken: Decline. The working group adopted the current structure of the document and feels that it does not preclude the generation of an accurate and meaningful PICS .** No action taken: The reviewer apparently would like the document to have a different structure. However, the group was unable to determine from the comment supplied, what structure would satisfy the reviewer. Therefore the request is declined.	✖ **This is not what was agreed to in our telephone conference. The PICS must not only be "meaningful", it must conform the the requirements of an International Standard! Conformance requirements in Service Specifications are not acceptable.** ✓ Per our telephone conference, all conformance requirements (shalls) shall be removed from the Service Specifications. MAC functionality will be moved from this clause to the MAC clause.

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
5.6	R S	E	Y	In Fig 10, it is not obvious that a STA *may* be an 802.1D bridge, or a router. Both of these devices appears as regular STAs to 802.11.	Add a note to Figure 10: One or more STAs may be providing 802.1D bridging or Network Layer routing functionality, even in an IBSS.	**Action taken: Declined. These comments are superfluous. While the stations in the diagram may NOT be APs, there is no restriction on the functions above the MAC layer that may be running on the machines that embody the stations**. Declined. Please refer to the definition of Station in clause 3. A Station is not defined as the physical box within which there may be components in addition to an 802.11 implementation. Specifically, the Station in figure 10 are ONLY Stations, there are no Bridges or routers possible in an IBSS as neither bridges or routers can be a member of the IBSS. If an 802.11 Station happens to be contained within a physical box, which does further processing on data acquired via the 802.11 Station, what that processing is is not relevant - this hypothetical box may be doing something similar to a bridge, or it may be doing word processing.	✖ **The comment stands. (We have a "disconnect" here. My only request was to *clarify* the figure by indicating that there could be a bridge among those devices. This is definitely a true statement, as 802.11 does not place any restrictions on the nature of the devices. I fail to understand the reason why the requested note is objectionable.)** The response is inconsistent. First it says that there are no bridges or routers possible in an IBSS, then it states that a station may be performing bridge functions (or functions similar to a bridge, which is ambiguous). Clearly, since 802.11 cannot specify the higher-layer functions performed in a device, then it is possible to build 802.1D bridges or Network Layer routers with 802.11 interfaces. My original comment stands.

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
5.6	R S	t	Y	There is no need to require a device in an IBSS to be able to associate.	Eliminate the requirement.	**Action taken: Accept. No change required. There is no requirement that ALL class 1 and class 2 frames be used by a station in an IBSS**. No change needed. Clause 5.6 does not contain any reference to association, hence it already reads as the reviewer desired.	✓ **Tentatively accepted. The reviewer will check the Recirculation to make sure that not only is a station not required to USE all classes of frames, but is also not required to IMPLEMENT those classes. That is, it must be possible to build an IBSS-only device that does not implement any functionality not needed in that application.** The reviewer will check the latest draft to make sure that this requirement does not exist.
5.7	R S	e		The meaning of "minimally present" in the first paragraph is unclear.	Reword.	Sentence removed.	✓✓
5.7.7	R S	e		A station may be authenticated with an AP *or* another STA (in an IBSS).	Change wording to reflect.	**Accept: change 2 nd information item to: "IEEE address of the STA with which the Stations currently authenticated." remove parenthetical clause** Incorrect. Authentication is always between two 802.11 Stations. APs and STAs are not XOR. An AP is defined to contain a STA. Please refer to Clause 3 definitions.	✓✓ **Response accepted.** ✖ I agree that Authentication is always between two 802.11 STAs. However the text of the draft says "IEEE Address of the AP". This is what needs to be changes.

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
6	R S	T	Y	Ordering of MSDUs: ISO 15802 (the successor document to ISO 10039) has been changed (in part due to my own actions taken on behalf of 802.11) so that the ordering invariant is no longer between MAC entities, but between DA/SA pairs. There is a subtle difference, since a single MAC entity will handle multiple DAs (in the case of multicast frames). The bottom line is that there is no longer a requirement to maintain the relative ordering of MAC frames between multicasts and unicasts. (Isn't this what you wanted me to do?) Ordering must still be maintained within a unicast stream, or a multicast stream (for a given multicast DA), but not between the streams. This greatly simplifies your design.	Eliminate the "strictly ordered" class of service, all discussions of ordering, and all references the "strictly ordered" class.	**Added optional in clause 6.1.3** Even though the ISO document has been updated, we recognize that the implementations in the world will take time (possibly forever) to change to match the new ISO spec. Therefore, 802.11 chooses to keep this facility as it does not harm and if not required in any given installation, it does not have to be invoked.	✓✓ **Response accepted.** ✓ The draft must show that support for the strictly-ordered class is completely optional.
6.1.2, etc.	R S	E	Y	The text discusses sublayers within the MAC (e.g., WEP), that are not present in Figure 11.	Update Figure 11 to reflect the sublayering in 802.11.	ACCEPTED - incorrect use of word "sib-layer" corrected.	✓✓

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
6.1.3	R S	T	Y	This section states that the DS may reorder MSDUs (even within a unicast stream). This is unacceptable at the MAC service interface, and is a prime example of why (1) The DS, if allowed, must have its requirements specified, and (2) IP is unsuitable as a DS mechanism for an IEEE 802 MAC. This section essentially violates ISO 15802/10039, as it states that 802.11 does not guarantee even the unicast ordering invariant at the MAC service interface of a conformant implementation. If you are providing a IEEE MAC-layer service, you must specify whatever is necessary to provide such a service at the LLC interface. This section allows an 802.11 conformant interface that violates IEEE 802 Functional Requirements.	Either specify the DS in sufficient detail to ensure correctness, conformance, and interoperability, or eliminate the DS concept and all references to it in 802.11.	**Added sentence in 6.1.3: However, in order for the MAC to operate properly, the DS must meet the requirements of ISO 15802.** ACCEPTED - corrected - 802.11 now specifies that as DS shall meet the requirement for ordering of 15802.	✓ **A note should be added: "Most Layer 3 internetworks (e.g., those using the IP suite of protocols) do not meet this requirement."** ✓
6.2.1.1	R S	e		The discussion of transmission rates and the switching algorithm is out-of-place in the clause on LLC service interface.	Eliminate this paragraph.	Accepted - paragraph deleted.	✓✓
6.2.1.3	R S	e		The last paragraph is duplicated.	Eliminate one copy (take your pick!)	Done	✓✓

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
7.1.3.3. 3, 7.2.2, etc.	R S	T	Y	These clauses contain redundant "shall" statements. A "shall" requirement should only be stated once. This occurs in many other places within the standard; this is just one example.	Eliminate all redundant "shalls".	**Proposal to Rich: accept for the time being and review during recirculation** Declined - the group does not think that the two sections cited are internally redundant..	✓ **Proposal accepted**. ✓ You missed my point. I didn't mean that each of these clauses contain internally redundant "shalls"; I meant that the shalls in 7.1.3.3.3 are redundant with those in 7.2.2. Nevertheless, per our telephone conference, we have agreed to eliminate any such "obvious" redundant shalls, and to check that the remaining ones are consistent.
7.2.1, 9.1.1, etc.	R S	T	Y	The use of explicit RTS/CTS for LAN access control appears to be protected by one or more patents issued to Apple Computer. Has Apple agreed to abide by IEEE requirements for standardizing patented technology?	Either (1) Obtain the necessary letter from Apple ensuring patent licences on IEEE terms, or (2) Eliminate the use of RTS/CTS as an access control method from the standard, or (3) Obtain an opinion from IEEE counsel on the applicability (or lack) of the Apple patents.	Thanks for bringing this to our attention. Apple submitted the required statement. PatCom approved the statement	✓✓
7.2.2	R S	T	Y	There are numerous "shall" statements in this section on Frame Formats, e.g. "Data+DF-Ack, Data+CF-Ack+CF-Poll, CF-Poll, and CF-Ack+CF-Poll shall only be sent by a Point Coordinator". This is not a requirement of the *Frame Format*, but a requirement of the MAC entity. There should be no "shall" statements in the section on Frame Formats.	Move all conformance requirements ("shall" statements) from the Frame Format clause to the MAC or MAC Management clauses, or eliminate if redundant.	Accepted - text moved to clause 9.2 and 9.3	✓

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
7.3.2	**R S**	**E**		The subclauses discussing each element type should be in the same order as the element IDs in Table 18, for readability and reference ease.	Re-order the subclauses as indicated.	**Action taken: Accept: Done** Editor's job/decision? Vic	✓✓ **Response accepted.** ✖ No resolution offered.
8.2.2	**R S**	**T**	**Y**	The WEP does not ensure international usability. This may be acceptable in an IEEE (US-only) standard, but is unacceptable for ISO (and may be unacceptable per IEEE policy as well, even if not in violation of any export laws).	Either: (1) Eliminate the use of WEP from 802.11, or (2) Specify a WEP algorithm that is acceptable for international use, or (3) Place a note in the standard indicating that the sections on WEP do not apply to the ISO version of the document (should this standard proceed to ISO, anything disallowing internationalization will have to be dropped). In any case, check with the IEEE standards board regarding policy on standardization of technologies that cannot be exported from the US.	Change declined: The WEP has been carefully selected to be subject of receiving export licenses. The IEEE rules regarding use of IP in WEP were carefully followed. The Author of the comment asserts that WEP is not acceptable for international use, but does not explain why this is asserted. 802.11 disagrees with the assertion and believes to the best of it's knowledge that WEP is acceptable internationally.	✓✓ Resolution is accepted.

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
9	R S	T	Y	802.11 specifies an extremely complex MAC in English prose. This is a deviation from all other 802 standards, and unacceptable for a number of reasons: (1) This standard must be implemented by people unfamiliar with many of the slang terms used by the writers and left undefined, e.g., "transmit again immediately" (How soon is immediately?), or "shall be implemented on top of the DCF" (What does this mean for conformance?), or "shall wake-up" (undefined slang). (2) This standard must be implementable by non-native English speakers. Having the normative requirements in English prose makes this virtually impossible. (3) English prose (or any human language, for that matter) is ambiguous. There is not a 1:1 correspondence between *words* and *meaning*; the same words can mean different things depending on the listener's background. (This is a major reason why we have wars and courts of law; if language were unambiguous, we would have no arguments over the meaning of what was said!) (4) In particular, the 802.11 MAC is extremely complex, perhaps the most complex MAC yet devised within 802. No other 802 MAC standard allows the use of prose for normative specification.	(1) Make the English prose description of the MAC (and MAC Management) *informative*, rather than normative. Remove all "shall" statements from the descriptions. (2) Provide a normative, formalized presentation of the MAC (and MAC Management). This formalization can use state-machine notation, Pascal, C, Verilog or other code, or any method that is truly unambiguous.	802.11 decided to make a normative formal description using SDL, an ITU-T standardized language (Rec. Z100 series). Vic	✖ **If the text is also normative, the comment stands. It is not acceptable to have two, potentially conflicting, normative specifications of the same behavior.** Per our telephone conference, the draft now contains TWO normative specifications of the same behavior, with no indication of which one prevails in the event of a conflict. We also agreed that the probability of conflict between these specifications is extremely high. This leaves 802.11 in a precarious state. For all of the reasons stated in the original comment, I believe that it is imperative that an International Standard specify complex behaviors in a single, unambiguous manner. If there are errors in the normative specification (which can reasonably be expected in a MAC this complex), they can be fixed through the normal maintenance process (that's what it is for!). EVERY 802 MAC (and some other 802 standards, such as bridging) is specified in a normative formalization, with informative (not normative) text description. The reasons for this procedure are those stated in the comment. The 802.11 MAC is the most complex conceived by 802,

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
9.1.1	R S	e	Y	The use of the term "contiguous frame sequences" is incorrect. Contiguous refers to adjacency in space. *Continuous* is the correct term for adjacency in time.	Use "continuous" in place of contiguous.	Done	✓✓
9.1.4, 9.2.6	R S	t	Y	Because of the lack of fragmentation and the lack of acknowledgments, the Quality of Service provided by 802.11 on multicast frames is less than for unicast frames. This is unique to 802.11 among 802 MACs. This should be made explicitly clear in the LLC service specification.	Add a note to the LLC service specification clause indicating the lower QoS afforded multicast transmissions relative to unicast.	**Sentence added at 6.1.1 asynch dats services: . Due to the characteristics of the WM, broadcast and multicast MSDUs may experience a lower quality of service, compared to that of unicast MSDUs**. Accepted - some additional text added.	✓✓ **Response accepted.** ✓
9.2.4	R S	t		The use of "real" numbers is unnecessary (and difficult in some implementations). It is better to specify the Random function as providing a random *integer* in the range aCWmin through aCWmax slots.	Change as indicated.	Accepted.	✓✓

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
9.2.4	**R S**	t	Y	It is critical not only that the distribution of random numbers be uniform, but also that they be statistically independent among STAs. Otherwise, you can get identical streams of "perfectly random" (low autocorrelation) numbers in each STA, yet still "collide" on every transmission.	Add a note indicating the need for statistical independence among the random number streams among STAs.	**New definition: Random() = Pseudo random integer drawn from a uniform distribution over the interval [0,CW], where CW is an integer within the range of values of the MIB attributes aCWmin and aCWmax, aCWmin <= CW <= aCWmax. It is important that designers recognize the need for statistical independence among the random number streams among stations**. True - but declined - 802.11 is a layer two specification and there is no way to specify interrelationships of randomness between multiple 802.11 instantiations in different physical stations.	✓✓ **Response accepted.** ✓ Per our telephone conference, you have agreed to add a note indicating the need for statistical independence, with no conformance requirement.

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
9.2.4	**R S**	**T**	**Y**	The backoff algorithm specified allows the value of CW to be different in different STAs, depending on their relative success/failure on previous transmission attempts. This is precisely analogous to the similar "bug" in 802.3/CSMA-CD, which causes the well-known "Capture Effect". The capture effect significantly reduces short-term fairness, and can cause significant performance degradation for certain high-layer protocols (e.g., NFS). Capture effect is well-documented in: Molle, Mart L., *A New Binary Logarithmic Arbitration Method for Ethernet*, Computer Systems Research Institute, University of Toronto, Technical Report CSRI-298, available by anonymous ftp: cs.toronto.edu/reports/csri/298. 802.3 has a Task Force working on enhancements to the backoff algorithm, chaired by Dr. Molle. The new algorithm is commonly referred to as BLAM. BLAM eliminates the capture effect (and related problems) through simple means, which are directly applicable to 802.11. Capture is especially important in 802.11, since, with its relatively low data rate, the probability of a single device being able to saturate the network is quite high.	Change the backoff algorithm to a BLAM-like algorithm, to eliminate capture effect.	Declined. After discussion and examination of the 802.11 backoff alg, it was decided that the capture effects is minimized in 802.11 because of the use of 1) a larger initial contention window than 802.3 and 2) the lack of count down during activity, and 3) a STA always performs a backoff after a successful transmission. These three items are thought to sufficiently minimize the capture effect such that it is not a significant issue for 802.11.	✓✓ Resolution accepted.

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
9.2.5.3	R S	t	Y	The first sentence of the last paragraph implies that there must be an AP to use power-save mode.	Either reword or eliminate this statement to change the inference, or eliminate the use of power-save mode for ad-hoc LANs. (Note: A state-machine or other formalization of the MAC would eliminate this and many other inconsistencies.)	accepted - wording clarified.	✓✓
9.4	R S	E	T	The terms "size" and "length" are both used in this section with no implication that they mean the same thing. This is a good example of the ambiguity and sloppiness of English prose to specify algorithms. Also note that each takes a "shall": "The size of a fragment MPDU shall be an equal..." and "... its content and length shall remain fixed ...". Thus there are two separate conformance requirements on two separate entities (size and length).	Change terminology to be consistent. Use a formalization to specify the MAC to avoid having language ambiguities affect conformance and interoperability.	Done	✓✓
9.5	R S	E	Y	Since the standard only requires the ability to reassemble 3 MSDUs simultaneously, a note is needed that the simultaneous presence of >3 fragmented MSDUs may result in excessive frame discards.	Add note as indicated.	**Changed para in 6.5: All stations shall support the concurrent reception of fragments of at least three MSDUs or MMPDUs. Note that a station receiving more than three fragmented MSDUs or MMPDUs concurrently may experience a significant increase in the number of frames discarded**. Done	✓✓ **Response accepted.** ✓

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
9.8	R S	E	Y	In the second paragraph, it is implied that MSDUs from different LLC sources (different LSAPs) might be reordered by the MAC. This is not true, as having different LSAPs does not change the MAC address, and ordering is based on address, not LSAP.	Delete the statement: "This latter restriction . . . "	Done	✓✓
general	R S	E	Y	There are no line numbers from which to reference comments.	Include line numbers in all future drafts, including recirculation ballots.	Next version will contain line numbers	✓✓

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status
various	R S	T	Y	Use of "shall" and PICS: The use of the word "shall" is critically important in IEEE standards. A "shall" mandates a conformance requirement. Therefore, the word should be used SPARINGLY, in precisely those clauses that absolutely require conformance for interoperability or correctness. In addition, EACH AND EVERY "shall" must have an associated entry in the PICS proforma. This has not been done in this standard. The PICS refers generally to sections that contain many shall statements. This in incorrect. There should be a 1:1 correspondence between the number of "shalls" in the document and the number of conformance requirements in the PICS.. Rather than have a lot of "shalls", it is common practice to have a complete detailed description of some desired behavior, either in prose or a formal language/state-machine, then have *ONE* statement, such as: "The MAC shall implement the requirements of the Transmit State Machine as specified in clause x.x.". This allows one PICS entry for a complex entity.	Eliminate and restructure the use of the term "shall" as indicated, or correct the PICS such that there is a 1:1 correspondence between "shalls" and PICS requirements entries.	**Comment respectfully declined. It is accepted that there are places in the draft where rather than have a prose description covered by a single 'shall' the text uses 'shall' statements for each of the elements that make up the required function. This is a style issue that does not change the specified functionality. The editing burden of changing the style of the draft at this stage is quite frankly too great to accept this comment at this late stage.** Comment respectfully declined. The group does not know how the reviewer would change the draft: remove all "shalls" and simply say "it shall operate as specified in clauses 1 thru 14"? How many shalls are too many? The author is requested to inform 802.11 which Shalls he views as superfluous.	✖ **The response is not accepted. This is NOT a style issue. You simply cannot have conformance requirements in a Service Specification. Service Specifications are *abstractions*, and do not indicate observable behaviors. There is no reasonable means of having conformance requirements on an unobservable abstraction.** **The attitude preented that, "It is too late to fix things, even if they are wrong" seems inappropriate in an International Standard.** ✓ Per our telephone conference, you have agreed to remove "shalls" (conformance requirements) from the clauses on Service Specifications and Frame Formats, and other places if obvious. Redundant shalls shall (sic) be checked for consistency. In addition, it is a requirement (of IEEE/ISO standards) that there be a 1:1 correspondence between the word "shall" and entries in the PICS proforma. It is NOT permissible to have a single PICS entry cover a number of shalls. Specifically, it is not possible to have a single PICS entry cover a sub-clause containing multiple shall statements.

Section number	id co de	Ee Tt	N O	Comment/Rationale	Recommended change	802.11 Proposed Disposition	Resolution Status