MAC Minutes
Tuesday, July 13, 1993

The meeting was called to order by chairman Dave Bagby at 8:45 AM. Carolyn Heide secretary.

One major goal has been accomplished already - called for end of MAC proposals and we got none today. So we can get to evaluating existing protocols maybe even this week.

François Simon: what about the MAC proposed by INRIA in 93/99
Dave B: don't know how to get a discussion of it without an author/presenter here.
François: what if they come next meeting?
Dave B: then they would be considered to have made the deadline because they submitted it this meeting as required.

Distributed Access WMAC Synchronization and Power Management Mechanisms, IEEE P802.11-93/95, by Greg Ennis

93/95a is the presentation overheads.

There are patents that cover some of the material here - can't speak for NCR, that is as far as Symbol is concerned. The IEEE requirements will be meet, patent numbers and names will be supplied.

Wim has made several presentations over the last year introducing the power control concepts. This focuses on details of implementing those.

Refer to 93/70 for protocol details.

Frederic Bauchot: when a station changes power save mode, all other stations must be informed?
Greg: don't anticipate frequent mode changes. Pick type wanted and operate there.
Frederic: does one station become the co-ordinator in ad hoc cases?
Greg: a station is elected co-ordinator and if it leaves another is re-elected. Not much attention has been put into the method of election of co-ordinator in ad hoc yet.

Ron Bjorklund: TIM frame is very short?
Greg: yes, can be in a header of an arbitrary frame coming from AP or in separate frame.

unidentified: how do you determine whether receiving station is to use AP as primary control function. Is all of its traffic to go through that AP.
Greg: if station is acting in power save mode other stations communicate with it through the AP only.
unidentified: if station not in contact with an AP it cannot send to you?
Greg: if it is part of an ad hoc it is in a different network. An ad hoc and an infrastructure cannot communicate with each other. They are two different networks - bridges or routes are used.
Bob Rosenbaum: 2 networks - one infrastructure, one ad hoc and they overlap. They each have timing co-ordinators, how do I know which to listen to?
Greg: a net id is used to identify different networks. A station that participates in one filters on the basis of net id.
Phil Belanger: Wim put forth the idea that a station should be able to be a member of an ad hoc and an infrastructure network simultaneously. Does this conflict with that?
Greg: possibly. But it may be possible for stations to look for 2 net ids.
Ron: based on this method both networks are sync'ed. If they overlap a reasonable amount of traffic could cause loss of synchronization.
Greg: the time identifier frames don't have to come out regularly. If data can get through at all they can get through too. There is a targeted interval which stations use do determine how long

to stay on waiting to receive one. The co-ordinator tries to transmit at regular intervals, but it goes out only when it can.

unidentified: is it fair to say efficiency of power management depends on the load of the network?
Greg: yes that's correct. Analysis shows there is a relationship to load.
Bob R: the receiving station needs to keep receiver on until TIM received?
Greg: there would probably be a time-out mechanism of some kind.
Frederic: TIM follows CSMA rules - does it have higher priority if any kind?
Greg: good idea, using a short inter-frame gap could accomplish that as has been done with the time-bounded service. That's not part of this proposal however.

unidentified: sees 2 functions combined - synchronization of clocks, and notification of packets. These have different timing requirements. The first requires re-synchronization only over long intervals. Whereas awaiting message notification is a rate of service statement. High service rate wants immediate wakeup, lower rate can wait longer time. Could you comment on the degree to which these are de coupled and degree to which they can be de coupled?
Greg: in the MAC frame format we should have a flexible mechanism that allows optional inclusion of elements in frames. Encoding of TIM information is in separate elements. Model is those are include together in a frame, but the MAC frame format allows de coupling. Valid point - they could be sent at different intervals, mind set now has them generated together. Time stamp is a relatively short amount of information, little overhead incurred.
Bob R: new station comes into BSS - how does it figure out where the timing interval is? Hears TIM but how does it know when next is expected?
Greg: the first thing you do is associate with the AP. Information is given to you then.

unidentified: also buffering broadcast?
Greg: no, broadcast not buffered. Stations operating in extreme power save mode may not be able to participate in broadcast. That may be an acceptable trade-off for some. Unless you listen to very DTIM you can't guarantee hearing broadcast.
Bob R: AP is buffering broadcast, and only sending it out after DTIM, but only sending it once. But if message is for a participating station then hold for it.
Bob Crowder: problem with concept that station can loose a function that higher levels expect it to have. How do you let higher levels know? Should degrade performance before we loose functions.
Greg: expects most stations to receive broadcasts.
Carolyn Heide: we must accept that in the wireless medium broadcast is not reliable, a station can be blocked at the moment it's sent, and that's life despite protocol.

unidentified: a lot of stations in PSP mode; messages arrive at AP for many of those stations; they wake up, listen to DTAM and they all generate polls. The receivers in all of those don't know when to turn off - the last one to get service could be one for quite a while.
Greg: TIMs are coming frequently, under normal circumstances there won't be frames buffered for that many stations. You might want to generate some kind of randomization of polls too. AP answers polls immediately, doesn't build a queue of polling stations.
Bob R: could more than one poll get to the AP before it answers the first?
Greg: no. Balancing the IFGs will not allow this to happen.
Tom T: no low level ack for poll?
Greg: ack for poll is the data, which is ack'ed after that. Retires wait for subsequent polls.
unidentified: traffic can accumulate if stations are not listening to all DTIMs (high power save mode).
Greg: not proposing details yet. The more bit can be used to help.

unidentified: to power down you need to know when to no longer expect PSYNC. How is this determined?
Greg: a network constant time.
Frederic: wakeup window size - fixed? Per population?
Greg: fixed for a given ad hoc network. There are management aspects which apply to these ad hoc networks. Maybe a parameter that needs to be agreed on or selected by the elected timing co-ordinator. If no power management required for the ad hoc network, none of this is required.

François Simon: issues addressed are normally pointed out in the paper.
Greg: will go through document and identify issues.

Wireless LAN MAC Protocol, MAC to MAC Interface, IEEE P802.11-93/61,
by Frederic Bauchot

Tom Baumgartner: turning on/off transmitter delimits frame anyway, so energy going away is going to tell you end of frame. Do you see more than one frame in one energy?
Frederic: open picture on that. Thinks that MAC must be smart enough to do alone.
Tom Tsoulogiannis: PHY doesn't guarantee detection of energy going away. So if you detect false start of frame you get overrun. detection of energy isn't good enough for start of frame detect.

Greg Ennis: sniffer node monitoring needs to keep track of all associations to know what local address is assigned to what station?
Frederic: if you want to know station only by MAC local address. It depends what you want to do with your sniffer.

Ken Biba: typical segment size (MSDU segment)?
Frederic: upper bounded by 255 octets. With BER short packets desirable.
Ken: Novell 576 or 1000 octet typical messages would have to segmented into 4 to 8 segments each of which have overhead of control information and ack.
Frederic: yes, but if you sent it as whole with the BER there would be much more retries. Either you have large MPDU with retries, or small with overhead.
Ken: uncomfortable with that small, but understands the problem.

Carolyn Heide: why have SFD, EFD and length too?
David Bantz: one use of length field early is it so can be used for buffer allocation before EFD found, although this is dangerous.
Dave Bagby: EFD and SFD on something about to go to PHY - start and end are PHY business and it should put them on and take them off.
Bob Crowder: this is a PHY job in all of 802.
Tom T: but its part of the MAC frame.

There ensued a lot of discussion about what layer puts on delimiters, without resolution.

Dave B: do you assert that any PHY can do zero insertion?
Frederic: doesn't see why it would be a problem for any PHY.

There ensued a lot of discussion about what is in the PHY and MAC versus bit insert and delimiters, also without resolution.

Ken: regardless of MAC or PHY responsibilities, there is some way of delimiting a frame. SFD and EFD bring the zero insertion overhead. But this is insufficient reliability to recognize start of frame, so PHY will have to put more anyways. So why do we need HDLC delimiters?
Tom T: preamble needed for synchronization, then a delimiter to tell the MAC start of frame.

Ken: for a hopper for example, independently you need stuff for bit synchronization and start of frame synchronization. This flag sequence is not enough for that. So why add more? SFD not requires because PHY preamble does that for you already.
Bob C: delimiters needed to tell MAC this frame has started and this frame has ended. CRC calculation can't be done without it.

Now there was a heated discussion about the value of SFD and EFD. Some assert that the power of the HDLC frame format has been documented and proven. Others say its a waste of time.

Dave B: the worst case where the bit stuffing overhead is going to have a large effect is on slotted overhead because each slot has to allow for worst case stuffing.
Tom T: objects to the hardware implementation implications. Forcing people to design things a certain way, while HDLC is very flexible and allows people design flexibly.
Bob C: PHY setting the start delimiter means the first bit that arrives at MAC is the first bit of the MAC frame and the last is the last, with extremely high reliability.

Performance of GRAP in Multi-Cell Wireless LANs, IEEE P802.11-93/107, by KC Chen

Thinks there are blank spots in evaluation to decide MAC for 802.11. Operation of WLAN will be in multi-cell environment rather than single cell. Performance evaluations have all been based on single cell.

Random access protocols come in two categories: (1) tree algorithms; (2) the ALOHA family. This is ALOHA, slotted ALOHA, and CSMA is an offspring of that family too. All of these have problems:

1) is stability - 80 to 90% is impossible to achieve because access delay gets huge. 1-P Ethernet throughput efficiency is, practically, about 35%. The real, practical, throughput performance is what is important to us here. Evaluation shows degradation in multi-cell environment for any CSMA derivation.

2) CSMA suffers from the hidden terminal problem. This will happen with a non-trivial probability. If even 10% hidden population, performance degrades to 40-50% from the 80-90% theoretical maximum. Then on top of that this theoretical peak performance can't be achieved due to the stability problem.

That's why KC developed a new protocol - CSMA is not good enough.

Access protocol is one issue and frame structure is another issue. They need to be separated.

What we want is not to have to re-register when we move cells. To do this either we monitor everyone all the time (at a rate 20 or 50 mseconds). Another way is to put restrictions on the application.

The idea of GRAP is - say does anyone want to talk, raise your hand if you do. Then I can assign when each gets to talk. RAP also has a problem with stability under load, so that's why GRAP was invented. When I ask anyone to raise their hand, I ask only a small group at a time. The AP doesn't want to know who is under his coverage, just who wants to talk at any given moment.

This paper presents some simulation results of GRAP which were done with custom system written in C. KC doesn't see any problem in releasing the simulation tool if anyone wants it.

An Updated Version of GRAP, IEEE P802.11-93/106, by KC Chen

Adds the reservation system required for TBS support, using the IBM superframe structure of three parts. Use GRAP for the contention of the up-link period.

Currently in the process of simulation of this reservation system, might be available by Sept.

Discussion:

Tom Tsoulogiannis: you mentioned something about 20bd dynamic range - what was the point of that?

KC: the problem of collecting random addresses from devices - separating the addresses submitted by the various stations suffers from the near/far problem, so some power control may be required.

Carolyn Heide: your first presentation (93/107) pretty much convinced me that GRAP was the only protocol submitted so far that is specifically for multi-cell support. But adding this reservation support removes that benefit.

KC: price must be paid for time bounded support. Hopefully no throughput will be lost, but a cell to cell handoff will be required while asynchronous service only doesn't require that.

General

List of Protocols:

- WHAT (Xircom)
- CODIAC (Spectrix)
- IBM.
- GRAP (KC Chen)
- WMAC (NCR/Symbol)
- INRIA
- Slotted Aloha DAMA (Jonathon Cheah)
- (Chandos Rypinski)
- BFP (Bob Crowder)
- BLAMA (Hitachi)
- XIRCOM/IBM Combo (Jim Schuessler)

Couple of ways to divide these. How can we group these for consideration? Maybe a way to start is identify key areas of difference:

- DCF versus PCF
- asynchronous versus isochronous priority of service
- LBT versus non-LBT
- nodes per BSS
- emphasis given to power consumption reduction
- error recovery granularity
- abilities to work with different PHY layers
- support for single channel

Straw poll - how many want to see MAC as soon as possible: (about 1/2 the group).

Straw poll - how many don't care about time frame: (0).

Someone makes the comment that getting a good one is more important than just getting one. Dave summarizes that we want a solution as fast as possible, but want a good one.

There may be a perception that there is complexity imposed by time bounded services. Straw poll - how many would give up TBS to get a MAC done faster: (26). How many would not accept a MAC that didn't support TBS: (11). Also there are some objections to the assumption that TBS support slows development. Originally we decided to consider TBS so that we didn't get ourselves into trouble by ignoring it. Dave personally thinks we shouldn't give up the TBS, but there has been little response to requests for TBS submissions lately.

Bob Crowder: disagrees. There have been as many submissions on security as on TBS yet it has gotten lots of attention.

Jim Schuessler: have spent a lot of time answering the TBS issues. We know the requirements so we're not discussing it a lot.

PCF versus DCF. For the PCF approach there is a natural tendency to say if deterministic then should be able to make it work. But all run into a problem with overlap - we know problems but no good solutions. DCF complaint is performance aspects, but we believe they can work.

Tom Baumgartner: third camp - those who want both. Business applications demand both. PCF needed for performance.
Bob Rosenbaum: DCF proposals have attempted to put in PCF for power levels. It's not quite as black and white as you said.
Greg Ennis: objects to performance remarks in favor of PCF - depends on scenario, which is better.
Ken Biba: echo Greg - worries about efficiency of PCF, for office applications for example. It's clear that bi-modal protocols can be invented. Let the customer decide how to configure it. Consensus of the model to determine performance is the problem - customer choosing which mode to use decides the issue.
Carolyn Heide: CSMA not appropriate for the wireless world due to the problems with stability and hidden nodes. If it was 802.4L would have solved this issue years ago.
Ron Bjorklund: one view of performance could be can you still move the stuff through the air when a lot of other people not co-operating with you are trying to do that at the same time. You have to think that in the future the air waves will be flooded. Performance may be good while the market is low, but it might get worse at it gets more crowded. Would like to see a standard as soon as possible, but keep the future loading in mind. A good standard is the most important goal.
Bob R: we have gone from an objective classification to people arguing for their protocols.

Part of the goal of the discussion is - some flack has been generated from our output versus the time the committee has sat. Trying to get the group thinking about compromises versus schedule. Compromises were brought up last time, as opposed to un-swerving loyalties to various MACs. Some bloody battles are to come, it's almost time to start them. Compromises will get us the most progress. Dave is looking for group direction, rather than trying to lead it by the nose.

Kerry Lynn points out that 802.3 and 802.4 were basically standardization of defacto standards. Do we want 802.11 to follow the same road may be another statement of the question. Dave responds that the PHY group decided to give more weight to things that could be demonstrated rather than just said. If we take that approach we will get what Kerry just said.

Someone suggests forcing of one MAC to various PHYs is slowing progress- some MACs were better for some PHYs than others. Dave views that as one of the constraints that couldn't be undone. If you wanted to undo the PAR, you could probably try to get over that.

Straw poll - how many would make 1 MAC/PHY to get quicker progress? yes: (15), no: (26).

Dave wanted to asked last time of MAC proponents would they be very willing to compromise. Didn't ask then because people weren't empowered to answer. So let's ask now - if we knew up front who would change and who wouldn't it would save a lot of time.

Answers from those present: - C=compromise, N=no compromise

- WHAT (Xircom) - C
- CODIAC (Spectrix) - C (but not if it means solely CSMA operation)
- IBM - don't feel that proposal yet has been explored so that all the advantages can be seen. Prefer not to compromise at this point. Feels some compromise has already occurred in the second update. Our feeling is that it would be premature at this exact moment. But

absolutely we support compromise to reach a standard - we haven't seen the correct technical compromise yet.

- GRAP (KC Chen) - C
- WMAC (NCR/Symbol) - C (Symbol: but not at the sacrifice of low power operation)
- BFP (Bob Crowder) - C (but not at the sacrifice of TBS support, and loss rate support)
- XIRCOM/IBM Combo (Jim Schuessler) - C

The Importance of the tx-rx switching time on the MAC protocol, IEEE P802.11-93/109, & Interleaving Concept, IEEE P802.11-93/110, by Pablo Brenner

unidentified: part of rx/tx switching has to do with synthesizer settling time. In high performance systems that settling time is not going to go down, so the number of bits goes up relatively. This is not a new problem, windowing schemes and things have been adopted to help.
Pablo: with RTS, CTS, DATA, ACK we are definitely not doing windowing schemes. We want local solutions. Last paper seen from PHY group moves this time to even as high as 200 or 300 microseconds.
Tom Tsoulogiannis: deferring ack to after another data may get delayed over and over again if more data frames slip in there.
Pablo: using shortened IFG of the protocol to get the ack out before another data can go. But this is just to give an idea of how it could been done - not a full solution.

If all traffic is going through an AP interleaving breaks down as a solution.

A Review of MAC Requirements & Proposed Decomposition Method for Selecting a WLAN MAC Protocol, IEEE P802.11-93/53, by Bob Crowder

Access control is the first job of the MAC and we should first concentrate on that. This document tries to address requirements/constraints of that task.

Question on the layer diagram on page 5
Frederic Bauchot: thought we had decided we could derive something from 802.10 but insert it into the MAC?
Leon Scaldeferri: that's a logical description, not an implementation.
Bob C: compression needs to done before the data transfer because you need to know how big it is actually going to be when you send it out. Also needs to come off before it leaves the WLAN.
Greg Ennis: where is PHY independence?
Bob C: everything above the DTE/DCE interface is PHY independent.
Greg: what about a FH where you may want to transmit differently depending on where you are in the hop sequence?
Bob C: that's in the access control function, but it's a station dependency not a PHY dependency. Not upset by there being only one mode that is for use with FH, or another with IR. You could join an IR PHY and a DS PHY with just a bridge.
Pablo Brenner: network id filter should be below access control. Otherwise how do you know you're working with right AP?
Bob C: node to AP registration - the AP should know about every node it can hear.

[sec note: document 93/53 was edited as this discussion took place which was before it was circulated. That may make some of the discussions that follow from here rather non-sensible. Sorry.*]*

R2
Dave Bagby: states are pairs of stations?

Bob C: in a DCF you're passing something like a token around in that DCF. If different stations have different views of where that token is bad things happen.
Dave B: that sentence describes a PCF, but you said a DCF?
Bob C: even a PCF could get into a bad situation.
Dave B: so either CF could get put into a bad situation from collisions.
Greg: requirement is protocol deals robustly with situations where stations have differing views of the current state.
Bob C: yes, but minimizing collisions is a good way to get there. If too many states get confused its very bad. A DCF and you're swapping around controller responsibility, if two wind up thinking they're in control you have a lot of trouble.
Phil Belanger: a more useful requirement is the MAC must operate when some stations have a different view of what is happening. Collisions are a result of that. By the very nature of a wireless system different stations will have different views regardless of the CF. It's not perfect connectivity.
Bob C: adds C7 and proposes returning to this issue of collisions.
Don Johnson: if you are reducing efficiency to avoid collisions - where do you hit the break even point?
Phil: disagrees that the result of a collisions is lost data.
Bob C: result is always lost bandwidth, sometimes lost data. Collisions on each retry until retry count expires leads to lost data.

R3
Dave B: close enough to wired LANs that layers above don't care.
Bob C: yes.

R3.1
Phil:: embarked on a useful thing to do (requirement specifications), and then there is this statement which is a comment not a requirement.
Bob C: right, will put it into a comment.

R3.2
Tom T: violates R1?
Bob C: you can change segment size on the fly, and change number of retries on the fly.

R4
Leon: this is a function that the SDE will do for you if you want.
Bob C: but that comes down from way above.
Dave B: there is a function, but where and what is debatable. It's a security issue.

R5
Bob C: "allow" means that there are features in the access control protocol that can be invoked to do this. Whether or not you invoke them is up to you.
Ron: how to judge which is best as a trade off between power consumption and performance?
Bob C: don't think you'll have to make that trade-off. Don't believe someone with power constraints will ever get the performance someone without that constraint will get.
Pablo: what is the difference between CODIAC and IBM in your view?
Bob C: the ability of simple nodes to go from DCF to PCF and receive exactly the same frame.

C2
Pablo: does FCC allow this?
Dave B: FCC has no idea what a CF is, so it would probably say 'huh?'. This is FH pattern synchronization.
Kerry Lynn: multiple co-ordination functions which cannot hear one another?

Bob C: never heard any solution to that problem. I don't have one either.
Dave B: C3 has implications about CFs communicating without saying what that means.
Bob C: management protocol between CFs that let's them share.
Greg: between CFs with different net ids.
Dave B: a lot of people won't want co-ordination between different administrative domains.
Bob C: if constraint is that co-ordination of CFs can't happen anywhere but on the air, OK. Administrations can be made to understand that this information is different from data.
Dave B: if sentence said all part of the same ESS that's OK. But outside of that it's outside of the boundary we have defined.
Bob C: problem is we have shared medium not over BSS, ESS or administration, but over distance.
Greg: not sure there has to be co-ordination to ensure equitable sharing of media.
Bob C: in schemes I have heard they are co-ordinating, but their co-ordination is happening every RTS/CTS exchange.
Dave B: have to assume some communication to solve this. Whether in or out of band may be another discussion, but some communication.

C3.2
Dave B: has there been a requirement for system simplicity, or just station simplicity?
Bob C: just station. The cost is not in the controller but in the stations. If the protocol leaks down into the simple stations their cost will be affected.
unidentified: when you say simple stations being 99% of the volume - the semiconductor manufacturers will not want to manufacture the complex ones.
Bob C: where do you picture silicon?
unidentified: cut it off to optimize the cost of the low stations.
Greg: what if all the stations are simple and there's no one around to form the network?
Bob C: then you have no network. Somebody will bring the complex node that will perform the PCF.
Greg and Dave spend a long time arguing with Bob about eliminate the DCF and whether you can ever count on someone else to bring the box with the PCF in it.

C5
Dave B: time scheduling function and policy about balancing asynchronous versus TBS?
Bob C: require a time schedule function that does that balance.

Bob's summary - we should have an agreed upon set of points that every MAC protocol gets evaluated again. These lists of 35 points that are heavily related to some protocol are just not going to cut it.

Meeting adjourned: 5:23 PM.

Wednesday, July 14, 1993

Meeting called to order at 8:30 AM, by chairman Dave Bagby. Carolyn Heide secretary.

Announcements

Standards pick up for voting members 1-5 PM today.

General

Issues log processing on the agenda for this morning. Break into working groups addressing a section of the issues log and collecting pros and cons.

4. network topics - Pablo Brenner

6. security - Leon Scaldeferri

10. co-ordination, 11. access point - François Simon

12 mac/phy if, 18 data rates, 24 PHY types - Tom Baumgartner

13. network management - cancelled due to no leader

15. services - Jim Schuessler

19. reliability - cancelled due to no leader

Dave B: gives a lecture on the evils of attending to listen without participating. How will we ever get anything done if no one is doing anything.
Bob Crowder: thinks that a procedural mechanism has been created where maintaining that mechanism is more of a labor than creating the standard.
Dave B: have said this was going to be done for quite a while.
Jim: thinks we have enough groups with leaders to do this AM.

Return to Full Group 11:10 AM

Comments from group leaders:

Pablo Brenner: opened new issue about whether station can be member of ad hoc and infrastructure simultaneously. Choices yes, no, maybe. Then decided it's a non-issue - MAC should not be rejected because it doesn't do this.
Dave B: brainstorming to get pros and cons rather than trying to close is maybe a better description of this group work. Capturing the arguments is what is important.
Bob Crowder: co-ordinated use of spectrum between BSS is an issue that got raised in Pablo's group.

Leon Scaldeferri: only one open issue, 6.10 , and Leon presents the pros and cons that will get added to the issues list on an overhead.

François Simon: didn't get to section 11. 10.1 we added alternative (3) both PCF and DCF. 10.2 closed because 10.2A and 10.2B exist already. Rephrased 10.2A and created a new issue. Recommend closing 10.2B. Recommend closing 10.3. Recommend closing 10.4.

Jim Schuessler: recommend closing 2 of 9 issues there, but adding of 3 more. 16.7 close by choosing alternate #1. One of the issues opened appears to be the same as the one opened by François. Recommend closing 16.6. Other issue to open is should we have a net id? There was a lot of discussion about addressing.
Dave B: one way when trying to figure out alternatives is to look at the list of protocols and see how each handles the issue.
Dick Bantz: did you (Jim) mean seamless mobility implemented with no impact on network?
Jim: within a BSS with no impact on user perceptible delays. Perceptible in no layers above the MAC. But as soon as you go beyond the ESS that is beyond the scope of 802.11. Believed definition of ESS could not include a router.
Dave B: between mobile stations and AP the relationship is association and re-association. Does that map to what you (Jim's group) think of as handoff?
Jim: Yes. We can only address within the ESS within this committee, but we can propose to add a hook to the higher layers.
Dave B: we made a firm commitment that we would decide on distribution system services, not on how to implement them.

Rifaat Dayem: what is the issue resolution process?
Dave B: when a group recommends closure it is a sign that a full group discussion could be held soon and probably close the issue. The MAC group takes a vote to take a formal position back to the full 802.11 plenary group to get a vote to close. We have been lucky so far and gotten easy ratification, but discussion back there could get significant too. Has this been a useful exercise, a good way to work [some yea's heard].
Pablo: same kind of discussion could be held over the Internet.
Dave B: would be happy to see that. Heartily encourages that. Votes have to be taken here of course but the more inter-meeting work the better.

Tom Baumgartner: issue 24.11 raised discussion of that fact that so much more stuff is required by the FH PHY than any of the other PHYs. Argued this issue rather than brainstorming. Made progress but didn't have final answer. Then looked at all issues in 18, and all are different ways of looking at the same question. Feel that in a small amount of time all of them could be closed. Discussion of 24.11 covered a lot of 12 issues.
Dave B: a lot of work has been done in this area by MAC group looking top down while PHY group has been doing it bottom up. We need to talk about this one MAC multi-PHY layer interface soon. Sense of positions?
Tom B: (1) non FH people who believe complexities added to MAC by FH is going to make MAC complicated and long to specify. (2) some say MAC has to deal with those like it or not. (3) we should have more than one MAC. Jonathon Cheah's parameterized MAC/PHY interface model or something like it is seen as the only way to accomplish one MAC many PHYs. Relative amounts of intelligence at the interface were discussed but inconclusively. Throwing away the physical header, the rest of the information is not to be interpreted by the MAC. Some things the MAC may just give back to PHY to deal with. Talked about things MAC tells PHY: timing references, state, hop pattern, receiver on/off, data passing in both directions, probably through separate data and management paths.
Jim: in response to non FH people that think there is added complexity for controlling radio at MAC layer - that's why the convergence and media independence layers exist and fall into PHY.
Tom B: sense when you (Jim) presented your division of tasks per layer there wasn't much agreement.
Jim: true, but the point was to bring up discussion of what belongs where. A lot of discussion needs to go on here.
Michael Fischer: 802 definitions of what goes in what layer are involved too.
Bob C: there are 2 views of complexity: (1) got to write much stuff about MAC layer in the standard; (2) if that stuff has to go into silicon rather than just code, it is a different story.
Tom B: suspect time critical things into MAC implementation could cause problems.

Dave B: thinks more progress than full group discussion was made.

Meeting adjourned: 12 noon.

Thursday, July 13, 1993

Meeting called to order at 8:40 AM, by chairman Dave Bagby. Carolyn Heide secretary.

There was a last call for remaining MAC submission, which got only Bob Crowder in response. Then there was a discussion about the closure of acceptance of MAC proposals. If anyone has a completely new MAC proposal, get it circulated (easiest ways is to get to Vic to be mailed out) and the MAC group will then read it before the meeting and vote whether to consider it or not.

General Business

(1) Review report to be made to the Full Working Group

We did.

Dave requests patent holders to bring pro-active statements, not just what is the patent name and number. This is not in the rules or anything, just a friendly thing to do that will make people consider the patented items without fear.

How did everyone feel about working in small groups? General feeling seems to be favorable. Identifying the group topics ahead of time might be helpful so people can scan the log and decide which group to join on a more intelligent basis. Some time left after the group work to process the results is necessary.

Reminder from Dave and François Simon about pointing out issues address in submission is very important. Closed issues are how we get text in the standard. François requests that submission refer to issues address on the first page - he will scan that page and no others to find references.

Pablo Brenner suggests that we are somewhat disconnected from the PHY group. Dave agrees, and adds MAC/PHY interface and layering to next times agenda subjects items. For instance multiple data rate PHYs has great impact on the MAC.

MAC Architecture Proposal - BFP (Best Features of Proposals) MAC Protocol Proposal, IEEE P802.11-93/50, by Bob Crowder

Phil Belanger: example of use of unconfirmed connectionless? Only broadcast or do you see a directed use?
Bob C: only broadcast, multicast anticipated.
Tom Phinney: most uses are multicast, repeated sample sending for instance, where one sample gets lost you don't care.

Greg Ennis: role of the AP in the acknowledged connections?
Bob C: this is between the end users. You are assuming AP and PCF are co-resident, which is likely but not required.
Greg: but set up of the connection involves the PCF. The acks could wind up going through the distribution system.
Dave B: what if the other end of the connection is not an 802.11 thing?
Bob C: it ends up at the portal function. That handles all off wireless LAN traffic.

Greg: in the infrastructure environment where connections between 2 users in different BSSs they go through 2 APs into a common DS. Those APs need to maintain state information on each connection.
Bob C: that could be true, it's not necessarily that hard to do.
Dave Bagby: it is if stations move between BSSs and in/out of range while this is being done.
Bob C: PCFs know about everything going on in their coverage area even where it overlaps with others, and they exchange information by the PCF to PCF protocol.

Carolyn Heide: once you have the token how long do you own the media?
Bob C: up to the slot time.
Carolyn: slot time specified in token?
Bob C: negotiated at connection time.

Dave B: asynchronous service - use priority to compensate for the overhead incurred by a round-robin approach?

Bob C: user priority used to decrease delay to everyone. Schedule has periodic traffic then round-robin sections. In the round-robin you hit higher priority stations more often.

Greg: frame arrives for station during its known sleep time ...
Bob C: sits in the PCF until a time known to both station and PCF.
Greg: PCF doesn't ordinarily buffer frames between two stations?
Bob C: right. Not every PCF has to have this function either.
Greg: power conservation station then has to come awake in the period when there might be data that has been saved for it whether there is or not?
Bob C: yes but this is a very short time and it doesn't have to be on through servicing of other stations.

Phil Belanger: when a station gets re-associated from one AP to another was there an assumption of a single channel PHY? Assumption that all APs could hear all other APs around them - that means all one channel.
Bob C: assumes single channel for everything but PCF to PCF protocol. Little arrows on layer diagram represent the only channel that is not the same.

This conversation continued after the official adjournment of the meeting, and Bob offered to continue is presentation which was cut short by time. However it was decided that this was not information that most people should miss, and he would try to get more time at another meeting.

Meeting adjourned: 10:15 AM.