

MAC Minutes

Tuesday, November 9, 1993

The meeting was called to order by chairman Dave Bagby at 8:30 AM. Carolyn Heide secretary. Minutes from the last meeting didn't get circulated yet, but the results were in the 802.11 minutes summarized.

Agenda Planning

Last meeting the objectives listed for this meeting were:

- select a MAC foundation protocol - the fundamental task that we are going to accomplish this week. We are committed to do this this week.
- Liaison with 802.10
- multi-rate PHY exploration

Foundation protocol - looking for a core on which to build other work. The thing you build other stuff on. Perfection is not the yardstick -not looking for the final solution, rather for something that forms a good basis to do other work. It is going to change and evolve. Why do this? Because the MAC group would not take decisions on some issues in the log, so we decided the thing to do was to pick a starting point for work.

Future submissions become "here is problem I find in the foundation and here is what should be done about it". All contributions should be positive.

At the Sept meeting the 5 proposals chosen as the initial subset were (in alphabetical order): CODIAC (Spectrix), IBM, National Semiconductor Hybrid, WHAT(XIRCOM), and WMAC(NCR).

Chandos Rypinski: will there be a ratification of that list of 5 at this meeting?

Dave B: it was ratified in the 802.11 plenary in Sept. with a more than 75% vote.

On this meeting's agenda contributions addressing this agenda items come first. Others come as time permits. Any not submitted yet are on a first come first serve basis after that.

Papers on agenda items as of right now: 93/181 (by Leon, but he's not here), 190, 191, 192, 193 (all DFWMAC), 213 (National Semiconductor MAC)

Papers on non-agenda items: 183, 208, 214.

Papers submitted but not put on the agenda for this week - papers on proposals not selected. 131a,b,c 184, 196 . People have been told that if the group wants to expand the list of things to look at a 75% vote could do that, and Dave would try to find agenda time. (Dave pauses, but nothing is heard.)

Tentative agenda - Tuesday, MAC foundation proposals papers and discussion. Wednesday AM, foundation proposal decision. Wednesday PM 802.11 meeting for MAC/PHY issues. Thursday AM, time permitting, papers; 802.10 liaison, multiple PHY rate impact exploration, and plenary session report preview. Thursday PM is 802.11 plenary.

Foundation protocol voting will be done by secret written ballot. Everybody in the MAC group meeting votes

Kerry Lynn: why not voting members only?

Dave B: in this group everyone votes - those are the rules. In the plenary only the voting members ratify the decision.

Kerry: what good is having a secret ballot here, when it's not secret in the plenary?

Dave B: we can do secret there too.

Francois Simon: are you sure?

Dave B: Vic didn't think it was a problem.

Tom Phinney: there have been instances in 802 history when it has been secret before.

Carolyn Heide: would like to encourage people here who have not been here before, or have not heard anything about some of the protocols to do the honorable thing and abstain.

Tom P: a written ballot inhibits multiple votes. Maybe we should let people vote for any of the protocols they think are acceptable as a foundation.

Dave B: we can't build a house out of two foundations.

DFWMAC, IEEE P802.11-93/191, by Greg Ennis

Carolyn Heide: for clarification before we start - is this intended to place the WHAT and WMAC protocols, or is this a sixth protocol.

Dave B: we don't know yet. Will be looking for input from the group at voting time.

Greg: from our point of view it is an integration of the two, replaces them and adds some new strengths.

Presentation Questions:

Slide 5

Wayne Moyers: can A1 be a relay to AP A?

Greg: no. The BSS's can overlap, as will happen. From a connectivity standpoint they are independent.

Kerry Lynn: can there more than one BSS ID active at a single station?

Greg: the group decided in September that the standard will neither mandate nor prohibit that. We have the same approach.

Ron Bjorklund: picture on slide 5 shows PCFs overlapping ...

Greg: they must be isolated by channel or space. This is a limitation of PCFs - all PCFs not just this protocol.

Nathan Silberman: what do you mean by isolation? Two different networks are not isolated because they are different networks?

Greg: isolation means not operating on the same frequency channel at the same time in the same space.

Phil Belanger: there is nothing about the PCF here that is any different from any PCF proposed before as far as PCF/PCF overlap. However this PCF does allow the overlap of DCFs, and of PCF/DCF.

KC Chen: is there included any specification of the distribution system?

Greg: no.

Slide 7

Carolyn: can you participate in the PCF without associating with the AP? If two stations want to communicate with each other, not with the AP, and they are in the presence of it's PCF, do they have to communicate using an overlapping DCF?

Greg: yes.

Slide 10

Pablo Brenner: longer waiting period for retry gives lower priority to those who have waited longer, not higher?

Greg: the exponential backoff algorithm gives retries higher priority.

KC: are there any numerical facts about how long stations have to wait? This is a text book situation of CSMA deferral.

Greg: Wim has some analysis. This is CSMA deferral, there is nothing different here.

Slide 12

My Le: how do you calculate the 'duration'. In a mixed rate environment each station could calculate the duration differently?

Phil: in a mixed rate situation the CTS/RTS could go at the common rate.

Greg: the duration is specified in time. There are various PHY level parameters that the MAC must know.

My: parameter of whether to use RTS/CTS is set by whom?

Greg: anticipate that in the infrastructure case the AP passes to some configuration information to the station on association.

Slide 14

The last bullet should say 'maximum' frame size, not 'minimum'.

Kerry: have any simulations been done adjusting the use of RTS/CTS as a function of network load?

Greg: no, but that's a good idea.

Slide 16,

Says short IFS is used 'for' ACKS, RTS, CTS. It is in fact used 'between' the RTS/CTS, not 'for' the RTS. It is used 'for' the ACK.

Slide 18

unidentified: slide 18 refers to ACK of multicast?

Greg: if a station sends a multicast/broadcast frame, the AP is the single recipient of that frame and it can generate the ACK.

Nathan S: AP is always involved in multicast?

Greg: it must be to get that multicast onto the DS.

My: obviously the AP is needed to get onto the DS, but questions if the AP is needed for broadcasting within the BSS.

Greg: how does a station know? There is a concept of a broadcast BSS ID which might allow to do what you seem to want - this subject doesn't distinguish this proposal from any other.

Slide 19

KC: what the reference for the synchronization timing?

Greg: if infrastructure case, the AP. This is synchronization within the BSS - each station knows which BSS it is associated with.

Slide 24

Kerry: does the boundary between the contention and contention free periods move around?

Greg: yes.

Kerry: so the rate at which contention free traffic can be offered is a function of superframe time?

Greg: that can vary according to application and configuration.

Ron: the inability to handle overlap with the PCF - isn't that unrealistic given the future environment? There will be areas of coverage that will overlap.

Greg: this is true for all PCFs, not just this one.

Ron: for all CSMA-based PCFs. Disagrees that all PCFs have this problem.

Greg: all PCFs must be isolated by space or channelization.

Carolyn: you have a contention free period and a contention period in each superframe, and asynchronous traffic can go in the contention free period. Having both period allows nicely for overlap of PCFs and DCFs. Is there any reason for keeping the contention period in the PCF except to facilitate this overlap?

Greg: envisions management traffic going through the contention period. There is overhead in the PCF that can be avoided by using the contention period. Stations can participate in both if desired.

Kerry: why is TBS only available in an infrastructure scenario.

Greg: it is only available with a PCF.

Kerry: can't you have a PCF without an infrastructure?

Greg: you can't have a PCF without an AP.

Nathan S: couldn't coordination between the APs of overlapping PCF BSSs be used to facilitate the overlap?

Greg: that could be used to get over the generic overlapping PCF problem, but it is not considered here.

My: you keep referring to the contention free area as token passing - it's polling isn't it?

Greg: polling is the best implementation of token passing in this case.

My: why have the contention period of the superframe if contention free period is available?

Greg: it is at least needed for the management traffic required for joining the PCF.

My: why allow asynchronous traffic in the contention free period, if the contention period is available?

Greg: handling heavy load is one example why an asynchronous station might use the contention free area.

Ron: has there been any performance analysis done on this protocol?

Greg: stations get different levels of performance depending on the amount of power they want to conserve. The higher power conservation modes sleep for longer, and they miss announcements which adds latency.

Ron: don't all stations have to agree on how much power to conserve? Otherwise they would be awake at different times.

Greg: in adhoc situation some station coordination is required.

Slide 28

Pablo: how do you prevent misordering of frames when buffering at the AP?

Greg: probably have the AP note the SA of a broadcast and make sure that broadcasts from the particular source are ordered properly.

Pablo: unicast too. If a broadcast is buffered because someone is asleep, then you can't transmit anything until he gets it.

Greg: missing broadcasts is a penalty of severe sleep modes.

Dave B: shuts down this discussion of evaluation and improvements - concentrate on trying to understand the proposal.

Ron: if it's not appropriate to evaluate this protocol now, at what point will it be appropriate?

Dave B: at end of presentation we usually have those discussions.

Ron: as long as that time period will be made available.

Dave B: don't see how it can be avoided with this group of people.

Slide 29

unidentified: what if a station goes to sleep and wakes up associated with a different AP?

Greg: associating with a different AP involves a management function, it can't change without the station's participation. The power management is unique to a BSS, so you are going to modify your power management timing to correlate with a new BSS when you associate.

unidentified: but the AP has been buffering messages for that station.

Greg: that is part of the general handoff between APs on the DS, and needs to be covered by any MAC.

unidentified: it is part of the complexity of trying to implement this protocol as a standard. Has any work been done on a state machine to make such evaluations available?

Greg: some thought, nothing now.

unidentified: there are a lot of functions to be handled by a station here.

Greg: there is a lot of stuff here, but we have a lot of requirements.

unidentified: in deciding which MAC to vote for, the complexity of this state machine is important. The other MACs will say they meet these complexities too.

Slide 34

Nathan S: how will performance vary with types of PHY?

Greg: there are different bit rate and fading considerations; to the performance of the scanning mechanism the number of channels is important - we looked into that. But more work needs to be done on that.

unidentified: are fragmentation and reassembly supported?

Greg: not addressed. The committee as a whole needs to address that. This MAC could easily handle that. We are not proposing one or the other.

unidentified: is frequency reuse considered?

Greg: using transmit power control can increase frequency reuse. Transmitting at the lowest possible power increases power conservation efficiency greatly too.

**DFWMAC Basic Access Method & Contention Free Service Support, IEEE P802.11-93/192,
by Wim Diepstraten**

Questions during Presentation:

Side 4

My Le: are the inter frame space's rate dependent?

Wim: they are PHY dependent.

Fred Heiman: slot time is parameter negotiated between MAC and PHY?

Wim: don't know that you would call it negotiation, but it is a PHY dependent number.

Fred: different PHYs have different slot times?

Wim: possible between different types of PHYs, but for given a PHY - a FH or DS - that will be fixed for the whole installation.

Simulation results slide not in handouts.

My: efficiency of about 50% with best scenario for CSMA/CA (no hidden stations or interference)?

Wim: given the distribution of packet sizes shown here.

My: 100% long packets?

Wim: about 85%.

Rifaat Dayem: what is the mix of TBS and asynchronous traffic?

Wim: this is pure asynchronous CSMA/CA. The exponential backoff on retry and the extra CA characteristics give the improved performance over plain CSMA.

Phil: simulation shows that the channel stays stable under high load.

Another picture from document, but not in the handouts

unidentified: how is the beginning of DIFS known?

Wim: detection of the end delimiter.

unidentified: you have to within range of the transmitting station?

Wim: you listen to CS, or look at the NAV.

Nathan S: how do you determine when the medium is available?

Wim: that is a function of hardware CS coming from the PHY, or of the NAV that is maintained in the MAC when RTS/CTS is used.

Nathan S: interference could postpone the backoff indefinitely.

Wim: depends on how CS is built. Techniques can be used to improve the CS mechanism.

Greg: RTS/CTS becomes more important if a PHY has a weaker CS mechanism.

Jim Schuessler: if there was a PHY with a weak CS function you can use RTS/CTS as alternative. But you can't 'or' them together - unless you see a clear carrier you can't send RTS.

Phil: in a system where you don't have CS that you can rely on, you can use something else.

unidentified: high load performance?

Wim: high load, higher probability of having collisions, collisions are not eliminated just reduced. The exponential increases in backoff will reduce the relative load.

unidentified: are you sure the mechanism is stable?

Wim: yes, as far as analyzed. Didn't test with 100,000 stations yet.

unidentified: but what about with interference?

Wim: did simulations with microwave interference, and there was still performance left. Any system will have to deal with these issues.

Slide 5

Kerry: contention windows size?

Wim: contention window increases for a particular station when it retries.

Kerry: backoff decrements in number of slot times?

Wim: there are advantages to keeping slot synchronization.

My: CSMA RTS/CTS difference is about 8% according to your information. Assume all short frames, and call it 10%. Question is why not make RTS/CTS a requirement at the loss of only 10% efficiency?

Wim: any station must understand RTS/CTS. Its use is optional but all stations must know how to do it. So if you want to sacrifice the efficiency you can.

Mike Fischer: not all stations can hear the ACK and so they could collide with it?

Wim: yes. There is a probability.

unidentified: could also happen between the RTS and CTS.

Phil: that's exactly why you do it, so that the RTS/CTS are destroyed not the data. Total throughput is saved.

Slide 7

Fred: how can you have superframe stretching and still guarantee TBS?

Wim: stretching is limited to the size of a maximum length asynchronous frame.

Kerry: what is the superframe length?

Wim: that is determined by the kind of TBS service you want.

Chandos Rypinski: superframe is approximately constant length in octets or microseconds?

Wim: based on microseconds.

Chan: double the rate you don't half the length?

Wim: recommends different lengths for different rates.

Slide 9

unidentified: contention free period held off as long as the medium is busy?

Wim: yes. Under normal circumstances this will be a maximum of the maximum frame size.

Slide 11

Fred: is the setup of how you get to be put on the polling list for the contention free service in this proposal?

Wim: no. It gets done in the contention period by exchange of a request and control management information.

unidentified: what about a station that hears the AP but not all of the time?

Wim: that may introduce problems.

unidentified: no ACK on downward TBS frames?

Wim: in general the contention free service has an 'ACK previous frame' field in the header.

Ron: multi-media traffic may have multiple sources of information all going to a single user - voice, data etc.

Wim: from a given station you could setup multiple connections and get multiple polls.

Ron: part of the concern is to make sure that voice 1 and data 1 all stay together. How do you keep those synchronized if some are contention and some contention free?

Wim: also requires that once a packet has been delayed beyond a particular repetition rate it is discarded. The time relationship in the whole chain is not changed - the relationship that was

there when the data entered the MAC is not lost. There are no mechanisms here that will disrupt the synchronization.

Slide 13

Rifaat: is there a maximum on the TBS portion of the superframe?

Wim: should be such that at least one maximum size asynchronous frame can fit in the contention area of the superframe.

Slide 19

Document 190 has an old approach to calculating performance of TBS. Slide 19 has a more up to date version. This is actually a capacity table, not a performance table.

KC: parameters for table on slide 19?

Wim: high load simulations as shown previously, and in many other simulation submissions.

General Questions

Rifaat: a station that implements only DCF, can it coexist with a PCF?

Wim: yes.

unidentified: how is this protocol specifically suited to wireless LANs?

Wim: efficient way of sharing the medium without a large control overhead. Deals with interference that is expected there - the higher loss rate. Mobility addressed by the power management facilities.

unidentified: any idea of how it will perform in 10^{-3} bit error rate environment?

Wim: don't believe in picking fixed bit rate assumptions. The idea in wireless is either you have good connection or none at all. Errors are bursty and there is a certain probability of success rather than a bit error rate.

unidentified: this seems to be dependent on Rx/Tx turn around quite a lot. That plus CS time.

Phil: the protocol is not dependent on those times, but the better they are the better the performance is.

Wireless Hybrid Operation - WHO, IEEE P802.11-93/213, by Jim Schuessler

Jim feels the best way to present this protocol is by using the DFWMAC as a comparison. He points out that overlap between adhoc and PCF of the DFWMAC is not as seamless as they stated. An adhoc station that cannot hear the AP can interfere with the stations in the infrastructure BSS.

Questions during Presentation:

Slide 4

Dave Bagby: since you say that the overlap can only be handled by multiple channels - what do we do about the single channel requirement in the PAR?

Jim: suggests that the overlap functions only be supported by systems with multiple channels. WE can do overlap. We can do single channel. Not simultaneously however.

Dave B: do you assume that you always have more channels than things that overlap?

Greg Ennis: using the support of a DS in the infrastructure case could avoid this.

Wim Diepstraten: WHO cannot support infrastructure networks on a single channel?

Jim: it can as long as they are isolated.

Carolyn Heide: or coordinated through the DSS.

Jim: yes.

Slide 6

My Le: what about the turn around time for the AP to calculate the information in the UH?

Jim: yes, a very fast algorithm is here required.

unidentified: fairness of access in a heavily loaded system?

Jim: this is perfectly fair because the AP is the only one that has all the information to perform fairness of access control.

Slide 9

Wayne Moyers: overhead seems that it may be significant.

Jim: in a clear channel it is significant. In a messy channel this is more efficient.

Greg: don't understand why this is more robust in the presence of a bad medium the DFWMAC.

Jim: no deferral to noise. TBS delay jitter is less and reliability greater.

Bob Crowder: this is a lot less complex than DFWMAC.

Jim: there are two simple modes - adhoc or infrastructure.

Wayne: there is a power management function?

Jim: you could use the one from the DFWMAC.

Phil: DFWMAC is not reliant on a good channel. We tried to accommodate a range of PHYs as well as a range of channel quality.

Jim: understood that in the DFWMAC even the RTS/CTS deferred to CS. That relies on a better channel. CS is a fundamental requirement of the DFWMAC as I read it today.

Chris Zegelin: you don't use CS in the non-contention period - does this implementation have no CS use at all?

Jim: no. Must have CS for the contention period.

Chris: so the hardware must have CS. What is the recovery mechanism for failed packets?

Jim: there is a section on slipping of the MPDU in the non-contention area. See the paper.

General

What should we do as a group about the WHAT and WMAC turning into the DFWMAC, and the National Semiconductor presentation turning into the WHO. Anyone object to adding them as separate protocols?

Bill Huhn: seems that the people that voted last meeting were voting on the MACs on the table at that time. Now we have two more and we should add them to the list.

Carolyn: we closed new MAC submissions months ago, we can't go around adding new ones now. The proposers of the WHAT and the WMAC suggested themselves that this one substitutes for their two. And Jim has stated that he has just enhanced the WHO and named it. The list of protocol should now just be 4 - CODIAC, IBM, DFWMAC, and WHO.

A straw poll shows that far more people favor having those four protocols on the ballot - that is what will be done. The four proposers are asked to do homework for tomorrow. Each will be given 5 minutes to present (1) abilities your proposal has that others don't, and (2) major flaws in the others.

Carolyn Heide: would like to see a straw poll of how many people in the room have never heard a presentation on or read a description of any of the protocols not presented today.

Dave B: no. We have to assume people are responsible and would not be expressing an un-informed opinion in this process. The protocols not presented today have been around for a long time, people have information on them and have had time to study them. If you do not have all the information to make this decision then you must do the honorable thing and abstain.

Meeting adjourned: approximately 6 PM

Wednesday, November 10, 1993

Meeting called to order at 8:00 AM, by chairman Dave Babgy. Carolyn Heide secretary.

Synchronization & Scanning in DFWMAC, IEEE P802.11-93/193, by Phil Belanger

Questions during Presentation:

Slide 4

unidentified: mechanism to prevent getting 2 beacons if a partially hidden station sends a beacon too?

Phil: none, but no problem is caused by that. In an adhoc network everybody hears everybody else is the general assumption.

Wim Diepstraten: beacons are generated by different stations. A station can miss a few beacons without creating a problem, and there is no harm in receiving multiple beacons.

Slide 11

Nathan Silberman: active scanning goes to each frequency and sends a probe. If you get a response then that's your frequency?

Phil: if you get a response you learn something. You could chose another channel too. This is how you find the network initially. Section 4 of document 93/190 has an example.

unidentified: is there a mechanism to distinguish a frequency from its image frequency?

Phil: no MAC mechanism to deal with it - it sounds like a PHY issue to me.

Slide 17

Dave Bantz: if corrections to timer get smaller over time, confidence in the timer increases?

Phil: didn't define algorithms to do these things?

Wim: condition to go to synchronized state is when there is all clocks are within a certain boundary. When no major deviations are heard you can go into synchronized state knowing you are correct.

unidentified: isn't synchronization is a PHY issue, used for multi-frequency control?

Phil: this synchronization is required for the MAC too. If it's required for the PHY too that's fine. There might be other things that the PHY needs to do about it, but this takes care of the synchronization requirement in the MAC.

Wayne Moyers: is it possible to enter the network and then pull off all existing nodes and loose the previous synchronization?

Phil: that's why there is the sync flag and the weight. You start by scanning with sync flag of 0, so if anything is there you will find it. Two stations may start independently (and you wind up with clusters), but you can't drag other stations off other networks - you assert sync 1, but you have low weight.

Wayne: have you simulated that convergence?

Phil: yes, it happens quickly.

Bob Crowder: thought we were trying to pick a foundation protocol but what we are hearing is extensive detail on one protocol.

Dave B: yes presentation of details is being heard, and yes we are trying to pick a foundation. Where we are in that process was laid out at the beginning of the meeting. We are completing the presentation of the compromise protocol now. Later we move on to the selection of the foundation protocol. We are asking questions during the presentation now. Apologizes to the group for shouting, but sometimes the only way Dave feels he can get through to Bob is to shout.

Bob C: objects to the personal attack, and his treatment in this group He cant get papers circulated, and can't even get copies of the material distributed.

Dave B: you are on the list to get copies when more are available, like everyone else who was late getting a slot.

Bob C: is complaining about the personal attack he got in response to his question.

unidentified: what is the practical timing for a scanning station?

Phil: there is an example in the paper of a worst case - active scanning when nothing is there. If passive used instead the operation could take as long as 20 seconds.

unidentified: strict performance requirement on responding to management frames. Is there a problem of response time versus power saving modes?

Phil: there are provisions for nodes that are in power management mode to remain active for periods of time to respond. That response does have to be fairly quick. The system wouldn't break if there was activity between the probe and the response, but the timing wouldn't be as nice.

unidentified: could you summarize why this is better than the original WHAT protocol, which had timing information in every frame

Phil: more efficient, and flexible. Faster if you enable active scanning. WHAT did passive scanning only.

Dave Bantz: setting of timer when beacon received depends on predicted delay between beacon receive and setting timer.

Phil: doesn't agree. You can save the timer value when the start delimiter is received then verify the frame at your leisure. Then you come back and manage the timer. You record your timer when receive, then later compare the two values - the delta is all that is important.

General DFWMAC and WHO Question Period

Promised earlier in the meeting that there would be a time for general questions about the new protocols rather than specific presentation questions. So ...

Tom Baumgartner: DFWMAC - Greg said in light traffic the overhead of the PCF is not desirable for asynchronous traffic. But later he said that contention free mode is a performance booster in a heavily load situation. Resolution?

Greg Ennis: basic difference between PCF and DCF as far as transmitted frames by stations is that the PCF has no a priori knowledge of when a station has something to transmit. In a DCF the station knows when wants to transmit, so it doesn't have to wait for a go ahead from a third party. So in a lightly loaded situation a DCF has lower latency. In a heavily loaded situation there are advantages to PCF mechanisms that deal with heavily loaded traffic. Async traffic may be able to take advantage of a PCF in those situations. The performance boost is that in a PCF version of the DFWMAC the superframe has the contention period relegated to the remaining part of the superframe. If async traffic is able to be serviced early it has additional opportunities for transmission.

Chris Zegelin: WHO - what happens when a station roves into BSS in FH?

Jim Schuessler: previously outlined the scanning mechanism where the station is aware of the BSS and AP in the area. WHO maximizes the time available for scanning, as opposed to the DFWMAC. When you move a boundary you simply switch channels. Any answer more detailed is outside the scope of what we are asked to decide today.

Chris: how do you acquire a hop sequence?

Jim: that is outside the scope of the access method - same as any other frequency hopper.

Chris: don't believe you can use an active scanning method with this protocol. So you have to use a passive scanning method which is slower.

Jim: sees no difference in the protocols in this area, except that you have more time to scan in the WHO protocol. You can't scan off channel in a contention area because you might miss a frame. The non-contention area is free - you know exactly when you have time to go scanning from the information in the UH. In the DFWMAC it's randomized - on the average you have 50% of the time to scan.

Bob Crowder: for all four proposers - how do all these protocols meet the requirements of the WINFORUM etiquette, with respect to the tight backoff timing requirements?

Paul Eastman: before any answer is specified - we are picking a base structure. What Bob brings up seems to be a detail, what the backoff interval the is. There is a backoff mechanism. These things can be worked out and varied after the foundation has been accepted.

Dave Bagby: heard Bob's question as "have you thought about how you meet the PCS requirement" which is a valid question.

Greg (DFWMAC): agrees with Paul. But as far as PCS goes, the basic etiquette is LBT. Easier for a protocol which uses LBT as its basis to operate in that etiquette than one that is based on a PCF. DFWMAC is closer as a start.

Jim (WHO): there are two sub-bands in the PCS - the isochronous requires a sub-band. Those that don't use CS can operate in that band.

Frederic Bauchot (IBM WMAC): our response is exactly the same as Jim's. We specifically issued a paper addressing that in the past..

Carolyn Heide (CODIAC): ditto. There is nothing we can add to Jim and Frederic.

Nathan Tobol: three protocols said they were only applicable to one band. DFWMAC - are you limited only to the other band or applicable to both?

Wim: DFWMAC can go in either band.

Jim: hasn't kept close tabs on PCS, but thinks operating only the isochronous band is ok.

Carolyn: doesn't see why CODIAC and WHO have to operate only in one band. The DCF can operate in one band and the PCF in the other. It is an excellent method of providing BSS isolation.

David Bantz: has a problem with CS as the basic foundation. More than 20% of the time there will be collisions. Don't understand how CS will work in this wireless system. Even with two users close together and a third far away but close enough to interfere with them, the CS becomes a problem.

Chris Zegelin: there are sufficiently good carrier detection methods that don't get destroyed by any trash in the band. If you look at actual data patterns and use sufficiently good techniques you can really understand where the interference is coming from and can distinguish those things. It is not expensive to do this.

David: the DFWMAC has said 23 microseconds are enough to do CS. This is not enough. Interference from microwaves isn't covered by this, and what about multi-channel interference?

Wim Diepstraten: depends on threshold applied - whether you are sensitive to noise and interference. There could be even 20% overlap in the channels. What happens when you're not polite and just talk is much worse - you can improve on that with CS.

Greg: the overlap situation is worse with PCFs.

Dave B: there are two different views of the world here that will not coalesce. Let's not waste time on it.

Bob C: this is an important point. There have been proposals made about PCFs with coordination between them, without the need for CS and with no collisions.

Phil Belanger: the 23 microsecond number is a real example - from a practical example.

Wayne Moyers: hears the need/no need for CS discussion. Also feels the need for a clear statement from each on whether we can meet the WINFORUM etiquette and meet the FCC rules.

Greg (DFWMAC): have already responded that we meet it all.

Jim (WHO): any contention system will work in the async band and I described one that does. As Carolyn pointed out we may use the PCF in one band and the DCF in the other. There is nothing that states that all modes of all protocols must work in all bands of the universe. We are trying to find a base foundation here.

Frederic (IBM WMAC): has already responded and written a paper on this

Carolyn (CODIAC): ditto again.

My Le: all four will say about anything you ask "we can do that if we work on it". The point about whether CS will work was excellent. We are looking for a foundation here. They can't give you yes/no answer on every detail right now.

Nathan Silberman: the issue at essence of this is the wireless environment. Would like to hear from each how they address the unique problems - interference, minimum number of overlapping networks, acquisition of network and what happens after acquisition. Specifically, does you protocol handle (1) interference from know sources; (2) operation with geographically overlapping networks.

Greg (DFWMAC): geographically overlapping is the major issue discussed that clearly distinguishes between PCF and DCF, because of the problems with overlapping PCF. DFWMAC clearly addresses this because of its ability to work in DCF mode even in infrastructures. As for handling interference, there is MAC level ACK, and there is no one special frame from the PCF that if it gets destroyed the entire superframe is lost.

Jim (WHO): yes and yes. If questions like this are being asked now perhaps it indicates there's not enough information to make the decision. Overlap - the DCF can handle overlap, multi-channel support is required for the PCF to overlap. WHO is more robust than DFWMAC because of transmission through interference rather than deferring to it because of CS.

David Bantz (IBM WMAC): the WMAC is very robust because you don't allow people to transmit until you know it will not be destructive. It doesn't rely on CS, doesn't rely on detection of high noise. It supplies synchronization of nodes through the most reliable mechanism - a PCF. The issue of overlapping PCFs is a red herring. You can have independent network overlapping if you want them to overlap - the right solution is PHY level isolation.

Carolyn (CODIAC): once again there's little left for me to do except to echo David and Jim. The problems of the wireless environment are specifically addressed by the CODIAC protocol. There is no use of CS at all because it is inappropriate for the wireless medium. It is totally non-interference limited because it transmits through interference rather than deferring to it. It has a DCF mode which can be used in adhoc or infrastructure, and can overlap seamlessly. The right solution to the overlap problem for PCFs is PHY level isolation.

General - liaison with 802.10

Kerry Lynn reports that the 802.10 basically said we have no business doing compression at the MAC layer, and they didn't feel they needed to accommodate us. Then there was some discussion that within their algorithm space could specify that a node is issuing both compress and encryption. This information would be passed separately from the key exchange.

Tom Phinney adds that the net result is that they will put some words into the key manage document to accommodate the exchange of both privacy algorithms and compression algorithms. Compression has to be done above encryption. They will allow for combined algorithms, so there will be indication of the data being (1) encrypted and compressed, (2) encrypted only, (3) compressed only, or (4) neither.

General - determine foundation protocol

We will use an iterative process as follows:

- time limited discussion.
 - no filibusters.
- vote for one foundation proposal.
- If one proposal acquires $\geq 75\%$ of vote, that is our recommendation to 802.11, else drop proposal with the least votes.
- in case of low vote tie, we'll immediately do a tie breaking vote for the tied proposals.
- Iterate again until done.

Discussion

Kerry Lynn: the recommendation from this committee on the winning protocol gets passed up to the plenary. If we can't get 75% of voting members to agree then we're not ready to decide yet?

Dave B: if the plenary doesn't have 75% approval they send us back to do it again.

Motion #1: To add one item to vote list "not ready to decide".

Moved by: Bob Grow

Seconded by:

Motion #1 ruled out of order

Dave B: rules the motion out of order - we have decided that we are making the decision this meeting. That vote choice allows that decision to not happen. We decided that by a 75% vote at the plenary and it needs the equivalent vote to undo that decision.

Motion #2: To appeal the decision of the chair in ruling motion 1 out of order.

Moved by: Bob Grow

Seconded by: David King

Paul Eastman: we need to get going on a standard, or we have nothing to show for 6 years of work. Without a foundation we are building on sand and every wave changes the shape. We are going to watch a market place go by. There is enough commonalty here that we ought to be able to pick one.

Dave B: defers question to Vic - how do we proceed here?

Vic Hayes: heard and appeal for the chairman's decision - but you didn't recognize it so you can ignore it if you want.

Dave B: didn't know if you could appeal a motion that didn't happen, since it had no second.

Bob Grow: the goal is to get more information from the people trying to decide. Is concerned about issues like performance and behavior in noise. Is willing to stay with the four protocols, only wants more information. Two of them had never been heard of until this week.

Dave B: displays the following overhead:

A plea for rational behavior...

- A foundation used to build the rest of the structure - it is not the final structure.
- Proposal perfection is not an appropriate yardstick.
- None of the proposals are currently without any flaws.
- The MAC foundation will evolve and be refined.
- Simply vote for that proposal which you think is the best foundation proposal.
- This is our 20th meeting, 40 months, almost 3.3 years, we need forward progress!

The motion for appeal is recognized by the chair.

Motion 2 Discussion:

Nathan Tobol: has been around the standards making process for a long time and has seen other committees get into this state. No decision is always worse than making a decision. This method was used in the fiber optics group and its a very workable method to get a "standard equally disagreeable to all concerned". If we don't get down to something we might as well disband. None of us will get all of the things we want.

Bob O'Hara: desires the group to make progress, knows the need to make a decision. But it is harder to unmake an ill considered decision. This will force us to know the real opinions of the people. Lumping together the people who don't know and those that don't care is wrong.

David King: we are asking a fundamental question about the fundamental. The choice of the core structure is critical. Do we have a core that is PCF with added DCF on top of it, or vice versa. As an active wireless systems marketing company we are anxious for a standard. An outcome of 2 proposals at opposite extremes is a good goal. We have experience in real systems of both kinds, and are not convinced that CSMA is the right way to go. The attempt by the chair

to relegate this to a 50% vote, which is what this process does, is bad. We need to set limits, yes, but there isn't enough data on the protocols proposed yet.

Bob O'Hara calls the question. Jim Schuessler seconds (81,0,3)

Support the ruling: 29 Against the ruling: 36 Abstain: 11

Motion #2 passes

Motion #1: To add one item to vote list "not ready to decide".

Moved by: Bob Grow

Seconded by: Ron Bjorklund

Point of clarification, Paul Eastman - to all ballots or just last? The answer is ALL.

Motion 1 Discussion:

Kerry Lynn: speaks in approval of the motion.

Kerry Lynn calls the question. Paul Eastman seconds (50, 2, 10)

Approved: 44

Opposed: 33

Abstain: 3

Motion #1 passes

Bob C: if the highest vote on the first ballot is "not ready" do we stop the balloting?

Dave B: no, the lowest drops off.

Motion #3: that if "not ready" is the highest vote on any ballot we don't take the rest of the votes.

Moved by: Bob Crowder

Seconded by: KC Chen

Motion 3 Discussion:

unidentified: clarify highest?

Bob C: means numerically highest.

Bob O'Hara: urges people to vote against this. This is asking us to make a decision on a small majority. Thinks that not making the decision is the wrong thing to do. The proposals are not so different that we can't make a start out of any of them.

Dave Bagby: asks for wording change from Bob Crowder - there was a judgment in Sept on the narrowing of proposals and the desire for commitment. The 75% vote on that makes that conform to the valid operating group rules. Could we modify to 75%?

Bob C: no. Would modify to 50%.

Jon Rosdahl: confused now about whether to speak or just go home. Sees great minds working on a system that perpetrates a filibuster by not deciding. My father told me that when you go into the outhouse you just come out, you don't stay there for a long time. Rules and procedures are designed to allow everyone to speak and move ahead. When used properly they work very well. Let's move ahead - a 75% decision here has to be taken to the full working group anyways. Having a not ready to decide is fine but it should have equal weight with the other choices.

Jon Rosdahl calls the question. Kerry Lynn seconds (78,0,1)

Approved: 4

Opposed: a lot

Abstain: 4

Motion #3 fails

Dave Bagby displays the following slides:

IEEE rules (std dev 4.1)

Organizational representation to Working Groups or to the Standards Subcommittee or both is encouraged. However, except for those individuals for whom a specific letter nominating them as

organizational representatives has been received by the IEEE Standards Board, individuals on Working Groups or Balloting Groups do not represent their organizations, but rather themselves. in this context they should work and ballot as concerned professionals in the field, not as representatives of a particular organization.

Tom Phinney: adds, if you do not feel that you can ethically comply with this then abstain. You are here as an individual not a company.

Nathan Tobol: if there is a company group present, typically you have one member of the company vote the company line, the rest vote with their conscience.

IEEE rules (std dev 4.2)

It is the responsibility of the Standards Subcommittee Chairperson, jointly with the Working Group Chairperson, to ensure that Balloting Groups and Working Groups are not unduly influenced by members belonging to a particular organization.

I have been informed:

- We may use a secret written ballot - ballots to be handled by non-voters.
- Ignore the space on the ballots which require your name and company.

Undue influence impact:

- Votes will be checked (after the fact for time reasons) for indications of undue organizational influence and/or domination by an organization.
- If the 802.11 Chairperson determines this situation exists, he may treat that organizations' vote as one.
 - (Project 802 operating rules).

Vote calculation:

- We are looking for 75% of those votes cast for foundation proposals. Abstentions do not impact the % calculation.
- Example: for a yes/no question, a vote of 15, 5, 347 passes the 75% rule.
- If wish to abstain, just write "abstain" on the ballot.

A plea for rational behavior...

- A foundation used to build the rest of the structure - it is not the final structure.
- Proposal perfection is not an appropriate yardstick.
- None of the proposals are currently without any flaws.
- The MAC foundation will evolve and be refined.
- Simply vote for that proposal which you think is the best foundation proposal.
- This is our 20th meeting, 40 months, almost 3.3 years, we need forward progress!

Vote 1 (4 -> 3 proposals):

Vote 1 discussion:

- Everyone is assumed to be familiar with the CODIAC and IBM proposals - they have been extensively discussed in previous meetings and the papers are widely distributed.
- Everyone who attended the MAC meeting this week has seen the DFWMAC and WHO proposal presentations and the papers have been available for reading.
- Available discussion time is limited by our schedule.
- Homework exercise from last night should present major points in a concise fashion to the group.

For each proposal, the authors will present the 5 minute presentation they prepared.

- Please - No interruptions from the audience.
- Time limit will be strictly enforced.
- Presentation order to be determined by picking number from 1-100, closest # goes first, farthest last.
- After the presentations, the authors will have 15 minutes to prepare a 5 minute response to the previous presentations.
- For each proposal the authors will give their response.
- We will then proceed to take the first vote.

Nathan Tobol: would like to suggest that while this 20 minute operation is done, Vic places a call to IEEE standards office and gets a ruling on the appropriate-ness of this.

Paul Eastman: because this is not binding, and has to go to the full plenary for approval ...

Nathan T: doesn't hurt to place a phone call.

Dave Bagby: heard the request, will forward it, but will not ask them to do it now. By the time we get to the plenary - they can have it clarified before then.

Kerry Lynn: asks whether the vote at the plenary is secret or not?

Vic: at the plenary it will not be secret.

Wayne Moyers: asks if the rules are being complied with that each of these bodies of knowledge have been covered by a patent statement.

Dave B: to the best of my knowledge all have filed intellectual property statements. Asks for statements from the parties concerned.

Tom Baumgartner, Spectrix: distributed in writing last meeting, Vic said it needed signing and a signed copy has been given to Vic. Vic agrees he has that.

Greg Ennis, Symbol: all three companies, Symbol, NCR and XIRCOM have provided statements.

Jim Schuessler, National Semiconductor: has not submitted a paper saying anything in regards to the WHO protocol, but to Jim's knowledge nothing in his protocol uses any of National Semiconductor's intellectual property.

David King: asks for a point of clarification - is it the intent of 'process for completing' to eliminate down to one protocol or stop at two, should none ever receive 75% support.

Dave B: down to one.

The four proposers select random numbers to decide the presentation order. The resulting orders is: CODIAC, DFWMAC, IBM WMAC, WHO for 7 minute presentations.

[Sec note - my apologies to the presenter if the formatting of your presentation is not accurate. I had the rtf files with the exact text (although I did make spelling corrections), but I didn't have the formatting. I took my best shot, and I hope nothing suffered in the outcome.]

CODIAC, Presentation by Carolyn Heide

CODIAC

- ALL communications are contention free in the PCF
- NO carrier sense in PCF
- SIMPLE stations - always use 4-step transactions, PCF or DCF
- EXCELLENT power conservation
- NON-INTERFERING adhoc/infrastructure overlap
- LARGE POPULATION
HIGH TRAFFIC - support inherent for these
TBS
- OVERHEAD of unused reservation slots is less than overhead induced by collisions and carrier sense mechanisms
- STABLE performance

Summary

Wireless environment =
high noise +
hidden stations +
near/far problem

CSMA in Wireless
is like
a fish on LAND

DFWMAC flaws

- CSMA normal async stations mode
- contention for every async transmission
- overhead in collisions and "blank" air time
- Complex, too many options
- Inadequate support of large populations and high traffic

IBM Protocol flaws

- Contention for every async transaction
- Wasted unused reserved data slots
- No DCF, results in clumsy ad-hoc support
- Poor large population support for single channel systems

WHO flaws

- CSMA normal async station mode
- contention for every async transaction
- Overhead in collisions
- Inadequate support of large populations and high traffic

DFWMAC, presentation by Phil Belanger, Wim Diepstraten, Greg Ennis

Overview

DFWMAC proposal addresses all of the major requirements for an 802.11 MAC.

Other proposals do not cover major aspects of the MAC protocol that should be part of the foundation.

DFWMAC is the result of an extensive collaborative effort.

- an integration of two major proposals
 - improvement over WMAC and WHAT
- three competing companies
- based on extensive WLAN experience, but doesn't describe a commercial implementation

Problems with a PCF Foundation

Will not support necessary PHY environments.

- Won't support infrastructure with a single channel PHY.
- No asynchronous PCS support.
 - not compatible with required etiquette
- Problems supporting overlapping BSS with imperfect isolation.
 - dense hopper environment
 - fewer hops eg. Japan

PCFs are vulnerable to interference.

- lost control frames can affect entire BSS

Poor support for bursty traffic.

- higher latency
- longer response times

Additional Problems with WHO

Inefficient use of the medium.

- unused reserved bandwidth is wasted
- dead time at end of fixed superframe
- half of a reserved slot is wasted on average
- can't reclaim slots reserved for terminated TBS connections without introducing jitter

Complex implementation.

- two separate access methods needed for Asynchronous traffic
- increases station complexity

Addressing problems???

Additional problems with IBM

HDLC framing.

- Hamming distance, addressing....

Limited number of nodes per BSS.

Ad hoc networks require a master node.

Complex implementation.

- two separate access methods needed for Asynchronous traffic
- increases station complexity????
- difficult to evaluate based on available information
- WHO problems may apply as well

Additional problems with CODIAC

Reservation slots required for every station in BSS.

- slots are "owned" by a station
- big overhead if short superframes
- ... or extremely long superframe

CODIAC PCF is similar to DFWMAC PCF.

- both based on polling
- DFWMAC is more efficient.
- data, polls and acks are piggybacked

Complex implementation.

- two separate access methods needed for Asynchronous traffic
- increases station complexity

TBS support unclear.

DFWMAC is the best!

IBM WMAC, Presentation by David Bantz

IBM PROPOSAL STRENGTHS

- * The only proposal that included, from the very beginning, all of the features which had to be added to other proposals

IBM Native Features

- + Hybrid Scheme --> Reservation & Contention
- + Time-bounded Services Support
- + Infrastructure & Ad Hoc Network Support
- + Simple Power Saving Scheme
- + Adaptive Traffic Support
- + Simple Synchronization Scheme
- + Less Demanding of PHY
- * Low Risk Implementation
- * Easy Accommodation of:
 - + Security
 - + Management
 - + Control
- * Performance Efficiency:
 - + Under Heavy Loading
 - + In Congested Band
- * No Hidden Terminal Exposure
- * Anticipates Future Enhancements
 - + Multimedia
 - + Multiple Bit Rates
 - + Mobility

OTHER PROPOSAL FLAWS

- * High Dependency on Carrier Sensing
- * Power Saving Complexity
- * High Overhead Due to MPDU Complexity
- * Vulnerable to Hidden Terminals
 - + Relies on Omnidirectional Antennas
 - + Shadowing
 - + Range
- * Very Demanding on PHY
- * Synchronization is Vulnerable to CSMA Characteristics

WHO, Presentation by Jim Schuessler**Features**

- Maximize reliability. No dependence on CS function.
 - > Excessive deferral in noisy channel environment for protocols that DO rely on CS.
 - > Difficult to set "proper" CS level for each transaction for protocols that DO rely on CS.

**Carrier Sense
Features**

- Minimize Time-Bounded Delay Variance (jitter)

Features

- Guaranteed free time to scan for alternate BSS.
 - > Time frequently is full Non-Contention area

Features

- Power Consumption is Minimized in STA for Infrastructure Networks
 - > (Graph available on next page.)

Power Consumption using PCF
Features

- Lower Complexity to Implement Full Set of Features
 - > WHO Based on Absolute Time
 - > Minimal set of OPTIONS

What are we asked to decide?

- We will decide WHO is best...

What are we asked to decide?

- An A.C.C.E.S.S M.E.T.H.O.D
 - > Many of the "features" of other protocols are orthogonal to this issue.

Who Rules? W.H.O.

- Maximize reliability. No dependence on CS function.
- Minimize Time-Bounded Delay Variance (jitter)
- Roaming Scan Time is Maximized
- Power Consumption is Minimized in STA
- Lower Complexity to Implement Full Set of Features

The ballots passed around will have spaces for name and company. Ignore these, this is an anonymous ballot. The choice "not ready to decide" is not on the ballot, so if that's your selection write it on. If you are abstaining, check the abstain box.

Now each proposer is allowed a 2 minute rebuttal, same order as previously.

CODIAC, Presentation by Tom Baumgartner

- It is true that in a perfect channel we have higher latency, but we think it's a good tradeoff versus not working well in bad channel.

- Long superframes not a problem in time-bounded; we can send more than one frame in one superframe for a connection.
- DFWMAC asserted that their PCF most efficient. Most people would say that reservation based polling is more efficient than polling.
- DFWMAC says they have one access method for all. If it is only one access method then it is so complex as to appear to be many.
- simplification in our statement that IBM must contend every time they tx. They also can make reservation for a fixed time slot which goes unused if there is not data.
- IBM doesn't have fairness in contention when using the method of contention for every transmission every time because of near/far.
- DFWMAC said that other MACs are missing descriptions of how to solve every problem. Admire the amount of effort they put into their protocol and lots of their work will be used whatever foundation we use. However, we don't think we had all the answers especially for radio and we thought we were preparing a foundation as has been said repeatedly.
- There is no operational experience to back any assertions by anyone. Dave King from Proxim statement about the problems of CSMA is the most validated by actual field experience.

DFWMAC, Presentation by Greg Ennis

Support of all of the necessary PHY environments.

- DSSS, FHSS, IR
- PCS
- mixed bit rate support

DCF foundation enables overlapping operation.

- no overlap limitations

Optional PCF available.

- for appropriate configurations
- appropriate given 802.11 PAR.

Power management in all configurations.

Simple implementation.

- stations use a single access method for all services

Why is DFWMAC PCF better?

Medium efficient

- unused time bounded bandwidth is automatically made available to asynchronous service
- not based on fixed slots

Flexible

- constant rate or variable rate TBS
- contention free Asynchronous

More robust

- interference during CF burst only affects a single transfer to a single STA
- no BSS wide control information to lose

Summary

DFWMAC is the best foundation for future work!

DFWMAC is Scalable and Flexible.

DFWMAC supports all PHYs, all environments.

It has a better PCF than the PCF centric proposals.

IBM WMAC, Presentation by David Bantz

CODIAC about IBM

- Contention in C interval
 - > Support for Contention provides the greatest flexibility for all types of data
- Ad Hoc support
 - > Fully supported

DFWMAC about IBM

- Do not cover major requirements
 - > All major customer requirements are supported
- Overlapping PCF support
 - > Phy isolation + IBM Protocol provides the greatest performance and capacity of any proposal
- Unused slots when connections terminated
 - > Not true ... variable boundaries prevent unused bandwidth
- HDLC
 - > Complies with Hamming Distance of 4, as required by 802.11
- Limited number of nodes per BSS
 - > Channel provides limitation, not protocol design
- PCF function is less efficient
 - > CSMA in PCF is much less efficient than IBM approach

WHO, Presentation by Jim Schuessler

- most indictments against WHO have been addressed by others previously.
- garbage collection in the non-contention area. Assertions have been made that if a station drops out, a certain number of slots have been allocated to it, so when the call goes away so you have no traffic for that time. The options available are to waste bandwidth or introduce jitter into the superframe time. We introduce jitter. This happens at call setup and tear down only - which is not seen as a large problem. After all, what is the frequency of a telephone call?
- the DFWMAC can have this jitter every superframe because of deferral due to the superframe stretching. There is more delay variance in the DFWMAC than in WHO.

Statements from the floor, one minute slots:

Tom Phinney: last night re-read all the proposals. They weren't all the same thickness, but they all had a lot of content. Having been through this before in standards development, knows there is a lot of utility in starting simple and adding complexities. All of the proposals have good and bad. All could be merged successfully. Personally prefers CODIAC because it solves the problems required while retaining simplicity, and it doesn't rely on CS.

Wayne Moyers: is frustrated - a lot of work has been done and will be done by this collective body in creating the composite, and hates to see intellect property maintained by any one company or company cluster. There is a lack of real sound simulation results - the proof of the pudding. We are being forced to a decision without proof. Wants to move forward, but needs more data.

Bob Crowder: foundation is a basic access method, neither most complete nor most complex, but what will really work. The real issue is CS based or deterministic. Implementation simplicity is also important, and extra features have been appearing rapidly lately.

Chan: several concerns. (1) any use of negative logic, absence of condition - in a radio system you can't depend on the absence of a condition, is what experience says. (2) lack of carpet condition where you have to have a continuous coverage. (3) access delay, the minute you design contention free area to have transmission access time too long there's a lot of things you can't do.

David King: would prefer to vote on basic foundation not on a company protocol - basic issues such as CSMA, or centralized and distributed. I have feelings about these things. Specific protocol is a more difficult thing to vote on without performance data.

Rifaat Dayem: progress here is made through contribution. When voting think about the effort put into the proposals and the willingness of people to put in more work.

Dave Bagby: the best technical detail is secondary to the best foundation. All of these proposals have flaws. Simulation and details will come on the one we choose. Joint efforts are important to recognize. Is personally concerned about PCF. All proposers admit multi-channel is required for overlapping PCF, but single channel support is required by the PAR. A foundation that doesn't satisfy one of the requirements of the PAR is a problem. Believes there is a good foundation the DFWMAC.

KC Chen: The only problem is the CSMA. KC displays graphs of performance of CSMA in hidden terminal situations. Believes CSMA is not appropriate for the wireless environment.

Ballots are being handled by Vic Hayes and Paul Eastman who are not voting.

The second vote is not going to wind up happening today, the afternoon has an 802.11 plenary meeting. The process will resume tomorrow, the results of vote 1 will be displayed in the plenary.

Meeting adjourned: 12:50 PM

Thursday, November 11, 1993

Meeting called to order at 8:15 AM, by chairman Dave Babgy. Carolyn Heide secretary.

General, foundation protocol selection (con't)

First ballot Results, Ballots handed out and returned 87.

CODIAC	8
DFWMAC	37
IBM WMAC	7
WHO	12
Not ready to decide	19
Abstain	4

Discussion before vote 2, protocol comments only, 2 minutes each

Bob Crowder: concerned that people who have not heard the older proposals are voting.

Motion #4: That only voting members be allowed to vote in the next rounds.

Moved by: Bob Crowder
Seconded by: Frederic Bauchot

Motion #4 ruled out of order

Dave Bagby: rules the motion out of order because the discussion was explicitly for comments on the proposals.

Bob C: would like to know does Dave's company have a business agreement with one of the proposers?

Dave B: have been accused of something personal, we should discuss this off line.

Point of order, Bob Crowder - would like to officially protest the ruling on a point of order. Would like to appeal the ruling of the chair.

Dave B: defers to Vic on the rules here.

Point of order, Kerry Lynn - Bob did make a motion when he had the floor. His motion should stand.

Dave B: explicitly laid out the rules of recognizing people for the purpose of discussing the proposals, on that basis of that ruled the motion out of order.

Paul Eastman: in this meeting, which is a sub group, everyone who attends has a vote is the rule. It wouldn't be binding anyways, because it has to go to the full working group for ratification vote. This is a group which is not necessarily the whole working group.

Bob C: feels the one vote per company would be more appropriate, and less embarrassing for some people who may be putting themselves into a bad situation.

Vic: what are your grounds for requesting an appeal on a point of order Bob?

Bob C: point of order is (1) voted in secret ballot which allows block voting without detection. (2) believes people here are not fully aware of all the MACs because two haven't been presented for a long time. The rule broken is block voting going on without detection.

Vic: our rules say at the working group level, yes. But at MAC and PHY subgroup everyone votes.

Bob C: no rule says vote cannot be limited to one vote per company. Thinks there are companies here which might be putting themselves in a bad situation. Trying to provide a way to use the rules to avoid this situation.

Dave B: what specifically are you accusing me of?

Bob C: your employer has an agreement with one of the proposers which places you, as a relatively new employee of that company, in a position which may makes it difficult for you to be objective about block voting. The secret ballot makes it easy to allow that to go undetected.

Vic: has discussed with Don Lochery how many makes for block voting, he said nearly 50% of the group. We don't see that here.

Dave B: must speak to the personal accusations being made here. Bob has said that since I have been only 5-6 months with my current employer, AMD, they are telling me what to do and I'm not being impartial. I absolutely disagree, so you will have to decide for yourselves. But look at the record. My personal opinions have been well expressed, and there is a consistent pattern to my approach through time. Through the life of 802.11 I have had 3 employers - Toshiba, SUN and now AMD. My opinions have varied very little other than through education on some issues. That speaks loudly that I'm not operating under the orders of my current employer. As to AMD and other companies - AMD liked the original WHAT proposal and that has been publicly stated - that is no secret. I have stated to people I don't care what the foundation is - have even stated that the Mickey Mouse theme song would be ok with me as long as we move forward. It is well known that I favor a CSMA approach, and don't approve of determination time-slotted protocols which I don't believe will work. I have stated that although I don't agree with the IBM approach I would take that as a foundation so we can get any result and move forward. We have been at this for over 3.5 years and where are we? We have educated people, had a lot of turn over and made little progress. How to measure progress - our draft standard for 3 years work is very thin. The editor is frustrated because at every meeting we ask for comments and no one does because no read it - although maybe no one has comments, but I doubt it, since what he writes in it is that he didn't understand what the decision was and no one comments on that. I am opposed to Bob's statement because it is absolutely not true. If people don't believe me - at the plenary a motion to get another chair is perfectly reasonable. Otherwise I will continue to the best of my ability.

Motion #5: To appeal the decision of the chair in ruling motion 4 out of order.

Moved by: Bob Crowder
Seconded by: Ron Bjorklund

Motion Discussion:

Kerry Lynn: would like Vic to determine whether it was within Dave's authority to suspend normal rule. If so Dave was correct in what he did.

Dave B: understood that to make motions you have to be recognized and have the floor, and I only recognized people for a very explicit purpose.

Larry van der Jagt: supports Dave in the path that he's going down. Please remember that the final decision is not going to happen now, just the starting point. Dave has set up a way to make progress, so lets make progress.

Ron Bjorklund: more concerned about the rules than the nature of the motion. Is concerned about the chair being able to direct all aspects of discussion that way. I have a problem with that, that's why I seconded the appeal.

Phil Belanger: could we ease that concern by identifying a place for that other discussion in the agenda?

Dave B: reasons this way - it is my understanding that within Robert's Rules the form of a discussion is set by the chair. When we get into free form discussions emotions go up a lot. We get into one on one arguments, and side conversations break off, and things go very slowly. We are very late in our agenda, and comments from people said that the focused discussions and the short time limits would help there, as they helped earlier. Since we have a commitment made in Sept, and my job is to get is through that, then my job is to get us through this procedure before noon.

Phil: and you are to be commended for that. If the opportunity for other discussion had been identified it might have helped. You defined a time for discussion on one topic, and someone rose to discuss another - if there was a time when he knew he could raise his topic it might ease is concern.

Dave B: don't believe starting down the path of a topic then changing direction is appropriate.

Ron: that says that the chair has the ability to direct all topics and all discussions in the group. When a motion is on the floor the group should be able to vote on it one way or another.

Vic: Kerry thought that the chairman had suspended the rules, which takes a 2/3 majority vote to do. But not accepting any motion but the order of the day is valid. If we are on an agenda item and another subject motion comes up the chair may rule that out of order.

Bob C: believes the motion is directly related to the process we are in - to suspend it until after the agenda item would have made it irrelevant.

Vic: Dave ruled it out of order, you appealed, now we ask assembly if ruling is correct.

Bob Grow calls the question, Ron Bjorklund seconds (57, 0, 3)

Approved: 12 Opposed: 31 Abstain: 20 **Motion #5 fails**

Motion #4 ruled out of order - the ruling stands

Dave asks for a straw poll on how many people like 45 minutes, 2 minutes per speaker, how many would like a more free style discussion. Many more would prefer the former.

Discussion before vote 2, protocol comments only, 2 minutes each (con't)

Tom Baumgartner: is not being paid by either group, in fact still thinks that CODIAC is the best protocol. However, feels that there is a red herring being directed by WHO against DFWMAC. The jitter problem pointed out - if one second of data is compressed into a packet that's then sent to the destination it only matters that it arrives some time within the one second period. Because the previous second's data is being expanded during that period of time.

Jim Schuessler: what Tom has brought up is the very simplest TBS case. You don't even need a TBS to do that kind of service. It is a one way audio service. We want to do two way video conferencing where absolute delay is critical. The jitter is absorbed in the buffering at each end - the more jitter you have to accommodate the more the cost and complication rises. Minimizing jitter reduces absolute path delay for 2 way TBS.

Chandos Rypinski: what matters is the transfer delay as a sum of uncertain time. At receiving end there will be a FIFO. If the data arrives in time for the FIFO to get it that's enough. Worse case access delay is more important than jitter. The absolute transfer delay has a bound, but in the actual execution there is a great deal to be desired in both for the CSMA protocol.

Mike Fischer: has observed in thinking about the set of protocols, that the degree of commonality of general functional features exceeds the differences. All use a superframe. All have some degree of RTS/CTS, all have MAC level ACK. But as a framework, one has more flexibility to be adapted with features from the others, greater simplicity. With a parametric degree of reliance on CS all the way down to zero. The DFWMAC is the most flexible.

Kerry Lynn: in favor of the "not ready to decide" choice. Reasons - at the last meeting we set a goal to select from a list of five. Three are no longer on there, and there are two new ones. Is not trying to be obstructionist, but the new proposals need more review. Some votes for not ready have to do with uncertainty about what is the process from here out. Perhaps the chair should say what happens if say DFWMAC is selected - does it go into the draft standard, or what?

Bob Egan: echoes Mike. Jim made same points other day where he applauded good things in the DFWMAC and said there are more commonalities than differences. Opposes Kerry - a "not ready to decide" choice cannot be the outcome here, and when it's in order would like to make a motion to that effect.

Tom B: problem with the DFWMAC. When they talk about power saving and TBS and handling high load and high population, they switch to PCF to get the best handling of these features. Yet they talk about their superior support of overlap by the DCF.

Paul Eastman: to Kerry - "not ready to decide" is not a good solution. Most people doing that are hoping to halt the process so they can get something else in here. We have gone long and far enough to have an idea of the types of things we want. We use the proposal selected as an outline, only an outline. We can add and change and do anything to that outline. A stake in the ground is essential here.

Dave B: to Kerry - 802 operates that a technical ruling takes a 75% vote. Whatever you pick for a foundation, you need 75% to add each thing to the standard. No differences between any of the proposals are short circuited by that.

Nathan Silberman: is confused. There were 4 protocols last time. This time we have two new ones without sufficient information to make a judgment. To choose a sound foundation takes good information. Most of us don't have enough information on the two new ones. If we keep adding new ones all the time how can we make this decision?

Dave B: is against the "not ready to decide" choice. It is an interesting class which contains people with many different motives. The minority of the people there are actually not ready, though there are some who are legitimate. If you are first time, then you should abstain, not choose "not ready". There is another group in this class - expect to see the "not ready" vote count grow as candidates drop off. These are pouters and obstructionists. We can stay in a deadlock that way. We have some new proposals, and I have some sympathy there. But we need to make a decision.

Phil Belanger: to Tom B about the PCF and DCF switching. Power management works in all modes, it is independent of the PCF that controls access to the media. In the infrastructure mode the TIMs come from the PCF, but the role of the PCF is to control the access method. The DCF/PCF is relevant with respect to infrastructure, independent from the there is a power conservation which works in all modes. And by the way, a vote for "not ready to decide" is ridiculous.

Kerry: speaks again for the "not ready to decide" category. There have been comments that it doesn't matter what we pick, just as long as we pick. Disagrees. A 75% vote will be required to

undo any feature of the DFWMAC - this is the whole house, not just the foundation! If the decision is between TDMA and CSMA I would be ready to vote. If it was between DCF and PCF I would be ready to vote. But I don't feel that I know enough about the DFWMAC, if a 75% vote is required to undo anything about the MAC. Is not taking fault with them for going to this length, but its too much to take in in this short an amount of time

Carolyn Heide: has heard a lot of statements about making any selection is ok as a foundation because the protocols are all so much alike. But CSMA and not CSMA are not alike, they are radically and very importantly different. And CSMA is the wrong choice for the wireless environment.

Dave B: we need to make a decision, yes. But if you're new and haven't read all about the protocols to go ahead and vote is wrong - you should abstain. If you were ready to decide once, to switch to not ready when one proposal drops off is obstructionist - switch or abstain.

Jim: to Nathan S - disagrees that this is shifting sand. If it, then it's in a very small sand box. Some decision needs to be reached today. We are in a competitive operating mode now and performance data presented in this mode is bound to be biased. We need to have a foundation protocol where we are all working together to make the one protocol that is best is the best approach.

Mike F: agrees with Jim. To Kerry - text goes into the standard by closing issues, and unless we close many issues we couldn't get the text of any of the protocols into the standard, as I understand the procedure.

Wim: to Tom B - argued that when things get tough the DCF people go PCF anyway. Don't think that that is the basis of the flexibility of the DFWMAC. We came up with a set of functions that provided flexibility for the people who would like to implement PCF too. A foundation that allows for sufficient flexibility, and doesn't block any application. Working in PCF and PCF and having this flexibility is the strength of the DFWMAC.

Dave B: has concerns about any PCF. The PAR calls for single channel PHY support and we have to have adequate coverage. No one can answer how a PCF works in overlap. Although I support the DFWMAC, personally I would like to take away the PCF. Or change the PAR to overcome this conflict.

unidentified: is worried about reliability. So far it has been expressed in delivering packets when everything works well. We have not had enough time discussing how we work in a poor environment. How the failure mechanisms are affected by bad media. The interaction between power management and roaming - not a lot of time talking about how those interactions occur. Power management and roving and very important functions to be provided in this MAC.

David Bantz: the throughput using virtual channel sensing is less than 50% at 1 meg, and less the 30% at 10. So the physical channel sensing is very important to the DFWMAC. This leaves me undecided - must vote "not ready to decide".

Chan: has a basic objection to CSMA and distributed logic MACs - they don't work in a large scale systems. It will be very embarrassing to have 802.11 approval attached to systems that don't work in high density situations. It is not true that no proposal has been presented that addresses the overlap situation (but since I am out of the running I won't dwell on that). To the DFWMAC supporters - think about how you feel about having success in the 802.11 group and lack of success in the field. In a large convention center, for instance, phenomenon beyond imagining will occur. We must have a protocol designed for always having interference. There will be more lost channel time from false lock out, then from the hidden station problem - lost capacity from couldn't transmit due to carrier sense.

Bob E: agrees with the comment about needing a stake in the ground. When you get down to it if the names and emotions could be removed - we are asking TDMA or CSMA. There are superframe structure differences. People seem to believe that the power management in one is good enough to go into any of them. Look for which one provides the opportunity for greatest flexibility, the DFWMAC does that. The PCF issues - no one has solved that problem. Let's put that stake in the ground.

KC Chen: the DFWMAC throughput cannot get beyond 25-35%. Understand we must move quickly, and select not on perfection but acceptability to all. But the decision must be based on numbers, not religion. Also we have seen intellectual property statements from all companies in the DFWMAC but not from each company specifically about this MAC. The foundation we pick we may never have a chance to change at all. Without the numbers we can't decide.

Paul: we are deciding a recommendation for the working group. A broad outline, not binding anybody to anything. Voting members will vote on. Then it we can pick at it, and vote line by line on its contents. We are saying "working group, this is the outline that looks best to us". If we can't even say that after all this time, then why don't we just quit and go home.

Wayne Moyers: supports the comments before - the adversarial nature of what's happening is due to perceived market gain. We need to settle on the best set of features. Applaud combined efforts of companies, more of that should have happened. All should share in the rights obtained, not one company against another. There is a important issue of do we all own rights in the intellectual property of what we do here. Wish that others would take up take this concern.

Second ballot Results, Ballots handed out and returned 72.

CODIAC	5
DFWMAC	31
WHO	7
Not ready to decide	25
Abstain	4

Discussion before vote 3, protocol comments only, 2 minutes each

Fred Heiman: the issue of a single channel PHY and whether PCF works with multiple cells - in Japan the ISM band is 26 mbits wide. They don't often have lots of channels available. Multiple channels is not always a good thing to rely on to get out of trouble.

Greg Ennis: have discussed TBS with Jim lots of times, he helped us a lot with the DFWMAC development. One of the main issues that the WHO protocol raised about the DFWMAC was the deferral of the superframe with regards to asynchronous traffic. Would like to include within the provisions of the DFWMAC the ability to support more deterministic behavior regarding superframe deferral to async traffic. As we continue to move towards a standard there will be a lot more discussion, and we look forward to more discussion with Jim and National Semiconductor. Also I continue to believe that the DFWMAC provides the best foundation here.

Jim: it has been pointed out that there are more similarities than differences between these protocols. With this change Greg mentions one of those things coalesces. The DFWMAC is a more general case, and a variable time bound could be parameterized to be fix that problem. The overriding concern here is a single decision from this committee. "Not ready to decide" is a weak argument and is not the right choice. In the interest of progress, with the outcome of the last vote, I recommend that whoever voted for WHO should vote now for the DFWMAC.

Mike Fischer: was going to say those things too, to point out the cost of not moving ahead. Urge no further votes for "not ready to decide".

Tom Phinney: observations - seems like this procedure has had people shift "not ready to decide" from loosing proposals. Points out to Fred that IR has the single channel problem, not just Japan. A question - if we adopt this and it requires 75% to unadopt it, does the proposal meet all of the closed issues that exist?

Greg: to the best of my knowledge (Jim says yes too.)

Kerry Lynn: does accepting this proposal close open issues?

Vic Hayes: no, have to go manually through the issues and consciously close each of them.

Dave Bagby: note that what is happening is the total voting population went down, and the votes for "not ready to decide" went up. That is very disappointing.

Bob Egan: applauds Jim for his statement, it was the right thing to do for the industry and for 802.11. Has concerns about the DFWMAC, but this will be a stake in the ground and that's very

important. Voting "not ready to decide" is absolutely inappropriate. The foundation needs to be made consistent and reliable. Would like to make a motion to remove "not ready to decide" from the ballot.

Dave B: don't, because I would rule it out of order.

Chandos Rypinski: since the outcome of the process has become apparent, thoughts should be given as to how to work what is proposed into something that works. Those companies that may wish to soon claim 802.11 endorsements will be on very shaky ground with this proposal. A great deal will have to happen to this foundation simply just to make it work. Urges those that have prevailed not to be overcome with the glory of the moment.

Dave B: we have a draft standard and things go into it when issues are solved and that procedure stands. This group voted on a motion from the floor to adopt a foundation, and we are doing it.

Tom Baumgartner: as much as I don't like a lot of things that have gone on in this process this week, I do not intend to change my professional ethics - this time I will abstain because there is no longer anything I can support on the ballot. I am not "not ready to decide". I just wish I had been better in convincing the group away from the wrong choice.

Ron Bjorklund: the vote "not ready to decide" is not a vote to not to make a standard. It is a does not reflect a blockage attempt. It says we want a standard but we want the right choice, and we don't understand the things that have come up so recently that we have had so little exposure to. The choice of the wrong standard can impact the wireless industry for years to come. To make the decision based on 2 days exposure is irresponsible.

Jim: adds to his previous statement - because we're endorsing the DFWMAC doesn't mean that multimedia service support or TBS have been abandoned. We will continue to work with the entire committee to make sure that these get fixed in the DFWMAC. A bad standard is not in anyone's interest. We need to be working together in a constructive manner.

Dave Mansour: "not ready to decide" is a fair vote if you believe the proposed protocol is not good enough. If you believe it is not a foundation, don't vote for it. The claims that in single channel only CS will work are invalid, experience says so. There are other ways and I have a high level of confidence in saying that.

Kerry: we don't have a full understanding of how the issues list will be affected by this choice, and on that basis I can't choose. If your intention is to abstain from this point on you might as well take an early list.

Dave Roberts: voting abstain is better than voting "not ready" - if you don't like the choices at least let the committee make a decision. If you knew enough to choose one before, then you know enough to make a decision now. The decision of this committee is the right decision of the committee by default, and that has to be respected.

Ken Biba: attended the first meeting 3.5 years ago. The issues on the table in terms of designing the system have not changed. We discussed PCF and DCF before we knew what they were. We have been unable to fundamentally resolve those issues, they are still on the table. The only way to move is to have a common base to explore in depth as a committee. This is a set of ideas put together as a whole and it has been offered to the committee to go beat the living crap out of it. The key issue is to be able to have a common area of discourse. Vote for something or abstain.

Dan Lewis: the requirement is to 75%, then go back to the working group for 75% of the voting members. Even if one wins here, the battle is still to get 75% of the voting members. Urges not deciding one here, but taking 2 protocols to the working group and letting their vote decide.

Ron: voting "not ready to decide" means we don't have enough information to decide. This is not the same as abstaining. This is a critical choice because of the rules - whatever we choose it takes 75% to undo it. It is more critical than it is being presented as. Change and modification of any kind has been difficult here. Technical decisions should be based on proper technical information, and that has not been done. To abstain means that you don't care, or don't care from one to another.

Wayne Moyers: applaud Jim's willingness to make a concession. Now we have 4 companies involved. Do we have intellectual property rights to the proposed protocol now? Hears that Jim has reached an accommodation with the DFWMAC because they made a change, so he had an

impact. We all have intellectual property rights to this. Asks that this team throws open the property right to all. We all must own whatever we choose. Accommodation on intellectual property required.

Jim: agrees with the concept behind Wayne's words, but statements have been made by all companies involved.

Discussion of 802.10 Liaison (during count of ballots for vote 3)

Tom P: we know in wireless environment want to have some kind of encryption. Encryption works because randomizing the bit stream, creates an output approximating white noise, nothing to read. Compression doesn't work on white noise. So it must be done before encryption. The problem is we cannot do compression, it must be done higher than the MAC - either by 802.10 or someone else. Compression works best on streams from a single source and therefore is best done at the application layer where each stream can be compressed using statistics compiled from that stream. 802.10 pointed out that they have a stateless protocol, they cannot compress across frames, it would have to be done an SDU basic. If large SDUs sent, say 4k, you have all the compress you're going to get, but with small messages you don't get much efficiency. Dilemma - works best for each source, but they have no way of identifying source. Every SDU would have to be compressed individually. What works with 802.10 - encryption does the same, so looking at them together makes sense. 802.10 is looking at them that way - you have the combination algorithms. They will not standardize encryption, but will provide an method of indicating the encryption/compression pair in use.

Francois Simon: 802.10 is kind of inside the MAC.

Tom P: between the LLC and the MACs, above us.

Francois: hopes that compression is still an optional feature, because many applications do it much higher and we don't want to compress something that is already compressed.

Tom P: yes, it must be optional.

Kerry Lynn: 802.10 initial response was compression only makes sense at higher layers. Belongs in 802.2. We pointed out the special needs of wireless MAC. The effect of this decision allows us to talk technically now this political decision has been made. If they hadn't done this we would have been stuck, we can talk now.

Tom P: disagrees. Who has jurisdiction, who does the work are different cases. We will have to do the work, who has the jurisdiction is unclear. They don't see this as their charter, which is security.

Mike Fischer: 802.10 may claim to be stateless, but clearly with respect to keys they are not. They though compression might belong in 802.2 - should we talk to them?

Tom P: personally, 802.2 is not the way to get the problem solved before the end of the millennium

Wayne Moyers: don't you need the application to be known in order to correctly compress?

Tom P: no, it can be done at the MAC level, but not after encryption.

Francois: did 802.10 specify a registration process for the different algorithms?

Tom P: said they would address it in an annex. Belongs in key management according to them. They agreed to address the subject.

Third ballot Results, Ballots returned 74.

DFWMAC	31
WHO	3
Not ready to decide	33
Abstain	7

Discussion before vote 4, 1 minutes each

David Bantz: data being presented to make this decision is lacking. If we filled it in - had more time to study the various proposals. I don't even have the DFWMAC paper yet. Performance -

we have rough capacity calculation under perfect condition, but no real performance data. Empirical data is needed, information on the interlock with the PHY is needed.

Bob Crowder: dichotomy. We are being asked to decide a foundation, but ruling that 75% technical vote is needed to change it once decided. This is not compatible. Also agrees with Wayne that the issue of intellectual property in certain companies is critical. But lets move forward and try to get as much progress as we can out of this meeting.

Dan Lewis: this is parliamentary procedure that gets us nowhere. Makes a motion we take the top two protocols back to 802.11 and argue them out there. Then come back here with a foundation. [No second]

Frank O'Neill: the major issue is the CSMA issue. The DFWMAC features are fairly malleable. But in terms of CSMA I don't see how that can be an attribute that could be changed about it. For my opinion on this I have relied on our own experience in delivering in radio LAN systems, often large population, high density. We have done CSMA and non-CSMA, and experience says CSMA does not work in many cases. This forces me to vote "not ready to decide" because the other choice is unacceptable.

Chris Zegelin: we should be swayed by the accommodation to change. Symbol went and started working on a protocol. They got together with NCR and both changed. Then they did same with XIRCOM. Getting together to make something that works - we must have a product that comes out of this committee that works well. If you are worried about change, look at what Jim has just done.

Dave Bagby: agrees with Bob Crowder (believe it or not). We have started the process, and must finish it. If this is inconsistent with trying to get a 75% vote out of the protocol, lets back up and ask for ratification for each vote. Keep backing up vote b vote until the committee will give us a 75% ratification. Let's capture as much progress as we can make.

Chandos Rypinski: in wondering how to get out of this problem I have thought under what conditions I might support the DFWMAC. The MAC breaks into 2 groups: DCF and PCF. Without a PCF that has knowledge of the overlap the overlap is not cellular. We should let the DCF people do their own thing, but don't let them squeeze out the PCF people.

Ron Bjorklund: there is not enough information available for anyone who wants to decide responsibly. The absence of a decision today is not necessarily negative. What do we have to show for 3 years - more than 11 proposals, cut down to 5, and the compromised down to 4. That is progress. A "not ready to decide" outcome allows that progress to continue.

Jim: the 75% change thing is apparently scary. Once a foundation is picked the whole committee is working toward a goal and getting out a standard. I have been in groups that have made it past this point, and has found that 100% becomes a common outcome of votes.

Nathan Tobol: agrees with Bob C. A lot of people are worried about the 75% required for changes, so we need to something different. Maybe we should vote that what we are voting for is the overall philosophy, but the details can be modified by a 50% vote. Could make a motion about that if people like it.

Mike Fischer: there are 78 open issues that would have to be closed to incorporate everything from this protocol into the standard, so there are plenty more opportunities to make decisions without needing Nathan's suggested motion.

Ron Mahany: has been in this industry that has been growing rapidly for 3 years, and thanks this committee for the lack of progress. Has experience and can attest that these distributed types of architectures do work - some kind of active sensing does work in high performance applications. Is confident that they work.

Bob Egan: we could have continued operating as we have in the 3 past years. We could have picked a PCF and voted on that, but that didn't happen and probably won't happen in the near term. A great number of people would like to have a foundation protocol, but it seems some of the concern of the "not ready" people is what will the process be to move forward from here.

Dave B: Jim - what was the committee that had 100% vote a lot of the time? I'd like to go join it.

Ken Biba: believes the question of what we do to go forward has been resolved. We have to have a vote on each issue (as Mike said, there are at least 78). This whole issue about 75% is bogus perhaps, we have the mechanism, we all know it.

Fourth ballot Results, Ballots handed out and returned 72

DFWMAC	35
Not ready to decide	30
Abstain	7

Dave suggests that to capture as much progress as possible, we ask the plenary "The plenary session directs the MAC group to accept the top 2 protocols as the direction of the sub group". Asks would someone please make that motion.

Paul Eastman: not going to make that motion, going to make another one. Sees we have decided to agree not to decide. Moving back in the votes as Dave proposes is not progress. Let's get a small group together that could get 1,2 or 3 issues - big issues, such as CSMA or not, superframe or not. No more than 5 issues, and vote on those.

Motion #6: take a proposal to vote on a few salient features as incorporated in the requirements

Moved by: Paul Eastman
Seconded by: Bill Huhn

Motion Discussion:

Dave Bagby: against this, believes it has failed in the past and will fail again. Maybe this process this week failed too - but the reason we voted to take this approach and set a deadline for this week is that we refused to vote on those things alone before. This goes back to square one and that's the wrong thing to do. The decision here is tough because of new stuff this week. But we have a record of what happened here, and we should take as much progress as we can back to the plenary. Thinks his way is more appropriate.

Ron Bjorklund: proposes that to move forward, the results indicate that more information is needed. Let's go and seek that information. Progress has been made over many months, 11 protocols down to 4. Everyone that voted for "not ready" would feel more comfortable to make a choice if the information needed was available. This is simpler now there are only 4 proposals, let's investigate them. Compare feature per feature and do the process again. Authors of all proposals represented can provide specified information, set a time frame of maybe the next plenary to do this again.

Paul: heard from the "not ready to decide" people that they kind of like things but can't give cart blanche over the whole thing. If we can't decide that some basic features are what we want to stick with - if we can't decide on even one let's just go home.

Fred Heiman: people gave the salient features of the 4 proposals. The votes clearly indicated that the favor of 1 or 2 over others. Heard that people want more time to study the two new ones. Going back to square one makes no sense. We debated the major issues before. If more information is required that is fair and that ought to be done next session. Pick apart what is unacceptable in the top one or two. Going back all the way is more political than sensible.

Dave B: personal opinion - which he believes to be factual. If I was the first person dropped out I would say let's go all the way back. Surely it is more fair to work backwards from the last vote. Have heard people say we have made progress, even though we haven't - the people saying that are the same people that voted against narrowing from 11 to 5. My personal conclusion, maybe wrong, is there is a serious desire not to make progress. Have urged people to try to compromise, and thinks there are people who didn't make that effort.

Bill Huhn: strongly commends the people who collaborated. We seem to be getting closer, but people may be more comfortable with making the choices that Paul has suggested.

Nathan Tobol: don't support Paul. We are dealing with proposals where issues are intertwined, because we didn't make progress trying to work on them separated. Give the people who voted "not ready" the benefit of doubt and assume they were honestly not ready. Ask them for a list of the information they are missing to be able to make the decision. Make sure all that information is present at the next meeting. That resolves the real "not ready".

Mike Fischer: supports what Dave said. Other attempts to close issues in isolation didn't work. We need a list of the missing information and some basis of what the criteria we are trying to access, or we will be looking at a bunch of numbers that can't be compared. In the next 15 minutes can't do that

Dan Lewis: agrees that issues are incorporated in the proposals on the table. Thinks we should limit the list to those top two protocols.

Dave Roberts calls the question, Bob O'Hara seconds (a lot, 5)

Approved: no 'ayes' Opposed: a lot of 'nays'

Motion #6 fails

Kerry Lynn: in favor of preserving as much of this week's work as we can. If the result does not get ratified, we are back to a list of 2 - we do this exercise again?

Dave B: the goal has not changed, it just has not been achieved this week if that happens.

Jon Rosdahl: clarification - what are we trying to do?

Dave B: to say to the working group that we want to do such and such. Please ratify with 75% of the voting members or better.

Motion #7: ask for ratification of vote 4 by 75% - if not, try again in Jan with results of vote 3.

Moved by: Kerry Lynn

Seconded by: Bob Egan

Motion Discussion:

Ron Bjorklund: you are trying to take something to the plenary and end up with a decision when the group said there's not enough information to make the decision. A fair and accurate discussion is the thing that needs doing rather than making a decision.

Jon Rosdahl: at a loss as to what the subgroup is taking to the full body, there was no 75% in support of any proposal. The results of vote 4 take no recommendation to the working group. What are we asking them to ratify? It's time to move out of the outhouse. Whether lack of information or disregard of information presented is not issue. the people who presented the 4 proposals need to take a moment and get together in a room. There is a lot of commonality.

Phil Belanger: Kerry - the motion's intent is if final vote not ratified, the MAC group works on the vote 3 proposals. What is the mechanism for iterating further than that?

Kerry: my understanding from vote 4 is that DFWMAC is the foundation. Trying to preserve as much of the vote as possible. If they want 2 proposals, vote 3 will get 75%. The final decision will have to go into January.

Ron: what is the recommendation of this committee?

Dave B: we said we would get to one, the process we followed forces to one because the low one drops off. That leaves one after the last vote, so the result of the fourth vote is DFWMAC. They will get the whole history presented to them at the plenary.

Point of order, Ron Bjorklund: recommendations from this committee are supposed to have 75% approval and the DFWMAC doesn't.

Paul Eastman: clarification of voting rules - any technical issue can be voted on as a simple majority in the subgroups and can be carried forward. It can also be reversed by that.

Dave B: speaks against the motion. If vote 4 doesn't get ratified, it takes us back to Jan. and would rather step backwards quickly rather than wait until Jan.

Dave Bagby calls the question, Mike Fischer seconds (no nays)

Approved: a few 'ayes'

Opposed: lots of 'nays' *Motion #7 fails*

Fred Heiman: let's not make any more motions so we can proceed. NCR came to us and it took us many months to come together. We approached other proposers. We have to make a decision. Lot's of people tried to compromise and some refused, if you stuck to your guns you lost. If you voted "not ready" then go away and study. There has been a lot of work and a lot of effort to compromise. Lets abort the obstructionists and move forward.

Motion #8: **The plenary session directs the MAC group to accept the top 2 protocols as the direction of the sub group.**

Moved by: Dan Lewis
Seconded by: Greg Ennis

Motion Discussion: none

Approved: 27 Opposed: 23 Abstain: 7 *Motion #8 passes*

Anyone who voted not ready, get requests for the information you feel you are missing into the next mailing.

Motion #9: **To adjourn.**

Moved by: Bill Huhn
Seconded by: Roger Samdahl

Approved: everyone *Motion #9 passes*

Meeting adjourned: around noon.

