Tentative Minutes of the IEEE P802.11 Working Group

Plenary meeting
West Palm Beach, Fl
November 8-12, 1993

Monday, November 8, 1993, 3:30 PM

The meeting was called to order at 3:45 PM Vic Hayes, chairman IEEE P802.11[1], in the chair. John McKown vice-chairman, Tom Baumgartner secretary (minutes later edited by Carolyn Heide). Nathan Tobol managing document originals and copying, Ed with help from John Rosdahl managing distribution and pigeon hole organization. Tom Phinney handling the attendance list. The agenda document for this meeting is 802.11-93/174.

Objectives:

- Determine MAC foundation protocol (incl. IP release);
- Review multiple PHY rate impact;
- Liaison to 802.10 re compression and encryption;

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[1] The officers of the Working Group are:

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- Continue on MAC/PHY interface;
- Work on DS, FH, Higher Speed FH and IR PHY definition;
- Look at constraints for co-existence of FH and DS in 2.4 GHz band.

1. Opening

1.1 Roll Call: People in the room were invited to introduce themselves.

1.2 Voting rights: Voting tokens were distributed in the attendance book to be picked up by voting members during attendance list circulation. There is a paper describing voting rights and information for new members, IEEE 802.11-92/00, 00.1 and 00.2. In subgroups everyone can vote. There are currently 74 voting members, 77 aspirant members. (chair: see correction in agenda item 9.4 (1))

1.3 Attendance list, Registration: The attendance list was distributed - 75% attendance according to the attendance list is required to qualify for attending the meeting as a whole, so make sure to sign the book. Copies of the attendance list are handed out before the end of each meeting.

1.4 Logistics: Document distribution is done using pigeon holes - you will find your copies and messages in the referenced location in the expanding file folders in the slot *in front of* your name. Breaks will be at 10:00 AM and 2:45 PM, and lunch is approximately 11:45 to 1:00 PM.

1.5 Other announcements

Letter sent to 802.10 chair with 93/181. Chairman will attempt to give an answer this week.

Ballot groups. Must register to be on the list of balloting group for this document. Anyone who is a member of IEEE can get into this group.

IR-PHY finished their business and will not meet Wed night.

2. Approval of the minutes of the previous meeting

2.1 Denver meeting, Document IEEE P802.11-93/117:

Motion #1:	**Approve minutes of Denver meeting.**

Moved by: Wayne Moyers
Seconded by: Bob Buaas

Motion Discussion: none

Approved: 49	Opposed: 0	Abstain: 1	*Motion #1 passes*

2.2 Atlanta meeting, Document IEEE P802.11-93/166:

Motion #2:	**Approve minutes of Denver meeting.**

Moved by: Wayne Moyers
Seconded by: Bob Buaas

Motion Discussion: none

Approved: 43	Opposed: 0	Abstain: 6	*Motion #2 passes*

2.3 Matters arising from the minutes: none.

3. Reports

3.1 Report from the Executive Committee, by Vic Hayes

Pat Thaler changed chair from 802.3 to 802.12

Geoff Thompson acting chair of 802.3

Peter Tarrant new chair for 802.30; which will meet jointly with 802.3 this week. There will be a motion to change the PAR to become part of 802.3 group.

Document order and subscription service. 802.11 is most popular of all groups. It is proposed that Alphagraphics charge more per page. The money will go into 802 general funds not 802.11 directly.

Kerry Lynn offered to look into creating a CD ROM of all documents.

Change that made conformance tests (Abstract Test Suites) part of standard have taken lots of resources and time. Now considered to limit our work to making only PICS pro forma. It has proved difficult to do Abstract Test Suites in form ISO want. Groups have not done them in some instances. Necessary as standard written to think about how parameter will be measured. Current flaws have shown up in Ethernet standard due to not having good conformance tests defined.

There have been problems aired in press about 802. We have been asked to be more complete in our statements about what is happening.

Vancouver meeting has a boat cruise and dinner included in fee; consequently the fees are raised to $225 to cover cost. Question: If you don't go on boat trip will you need to pay extra $25? Answer: Don't know exactly how it will be done.

Discussion:
Dave Bagby urges that the committee spends more time on choosing good hotels.
Paul Eastman: Current contracts call for phone jacks in all hotels. Social is considered to be chance for groups to interact.
Jim Schuessler objects to mandatory extra cost social.
Paul: we must commit now to rent boat; therefore can't be optional.
Straw poll (everybody in room):
   Who wants to have boat cruise? 38
   Who doesn't want to go on boat? 25.
   Don't care? 17

Standards distribution this week :802.3p, 802.3j

4. Registration of contributions to be presented

5. Adoption of Agenda: Document P802.11-93/174

Motion #3:	**To adopt of this agenda.**
Moved by:	Dave Bagby
Seconded by:	Bob Buaas

Motion Discussion: none

Approved: by voice vote the 'ayes' have it   *Motion #3 passes*

6. Unfinished Business:

6.1 Comments on updates to draft Standard P802.11-93/20: this document is the repository for decisions. No comments or objections. The editor has raised questions that need answering within document.

6.2 Intellectual property statement: Vic explained patent policy as usual. IP statement doesn't have to be filed with IEEE as stated in manual.

6.3 How to Liaise with FCC informally: IEEE said that there was no problem meeting directly with FCC to ask questions or if made clear that statements don't represent an IEEE position

7. New Business

Motion #4:   **to postpone the New Business until Thursday .11 plenary session**

Moved by: Dave Bagby
Seconded by: Dave Roberts

Motion Discussion:
Dave B: intent is to make simpler. Several things in list are new and wants to complete old stuff before adding new to list.
Larry van der Jagt: we have nothing to do for next hour.
Move to call question, by Larry van der Jagt, second by Kerry Lynn. (56, 1, 0)

Approved: 6   Opposed: 36   Abstain: 3   *Motion #4 fails*

7.1 Schedule for standard development

After draft standard we have working group ballot. Takes plenary to plenary cycle to get to next draft, then second working group ballot. Then 802 ballot group. Vic asks for an estimate of sub group chairmen as to when can we have a draft sufficiently stable to hold working group ballot?

7.2 Motion regarding paper submission process

Larry Zuckerman withdrew his item at this time.

7.3 Sub megabit turf issue with respect to ISA and IEC

Larry van der Jagt: recalls that we turned down motion to have a data rate at less than 1 Mbit. If we don't change our mind now it will get more difficult to change later.
Tom Phinney: the IEC have started work on a sub 1 megabit standard as a result of our decision to not look at below 1 Mbit.
Peter Chadwick: Realistically there will be equipment operating at sub megabit. We should be considering this.
Kerry Lynn: we should separate the political from technical. To ask for PAR change only means that we want to consider lower rates, not that we will do them. Defeat may have been due to 100 Kbits mentioned in motion, at 800 Kbits might have passed.
Larry Zuckerman: can't overcome laws of nature. Might be necessary to have lower rates to work in environment.
Kamilo Feher: Support previous speakers. On technical grounds there are reasons to look at lower than megabit fallback rates

John McKown: display the following slide:

Lower the Mandatory Data Rate?
Hell No!

We have heard that lowering data rate increases sensitivity and that's self-evidently good. Full stop. This argument has no end short of Voyager. Yes, we can receive signals from beyond Pluto if the rate is low enough. The question is "why?"

Good sensitivity means good performance against thermal noise. The networks of commercial interest are interference-limited, not noise limited. Sensitivity is only of secondary interest. Does anyone claim that S/I requirements are eased at lower data rates?

Network capacity can be shown to be determined by S/I ratio, not S/N. Sensitivity is a false god.

We have seen no quantitative, market-based analysis. When we set a parameter like mandatory data rate, we inevitably penalize some customers and benefit others. Where is the proof that customers who need dense installations at high data rates should be penalized in favor of customers who want huge cells serving sparse device populations?

Chandos Rypinski: Strongly supports John. Reducing the area of coverage will be best way to improve performance; not small changes in data rate. Reason for fast data rate is access delay minimization. Real reason we are in this jam is that a couple of years ago we decided not to ask FCC to change the rules of hopping. Real solution is to open up the bandwidth of 20 db points.
Steve ?: we missed our chance with the FCC. Since there will be lots of equipment operating in the ISM bands, and there is the need to operate indoors and outdoors, we need the greater area.
Jim McDonald: Small change in data rate might not yield enough improvement.
Larry vdJ: When you lower the data rate you do improve S/I, contrary to John McKown's assertion. 20 db limitation has caused move to non-orthogonal signaling set; would like to reduce data rate to get back to an orthogonal signaling set.
Wayne Moyers: If we were to have backed off to some number, what number would be satisfactory to IEC?
Tom P: They have charter from 100 to 1 Mbit. They seem to be ready to go ahead without regard to us to deal with their environmental problems.
Wayne: There are needs for fallback. We should reopen.
Kamilo: The way to proceed is to present a paper that refutes his numbers technically. GFSK standard threw away 4 db unnecessarily.
Dave Bagby: Maybe the PHY group should go away to decide that they can't work within boundary condition, and bring this up again on Thursday. If someone goes home on Thursday they have given up the right to express their opinion.

Motion #5:	**To postpone agenda items 7.3 and higher in the new business section until Thursday.**

Moved by:	Dave Bagby
Seconded by:	Dave Roberts

Motion Discussion:
Paul Eastman: this lets us have time to consider the facts.

Approved: 21   Opposed: 21   Abstain: 6
Tie - the chair settles the tie by voting 'approve'   *Motion #5 passes*

Other agenda items postponed:

7.4 Report on FCC meeting

7.5 Taking a leading role of .11 to PCS activity

8. Adjourn for subgroups

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Tuesday AM, 9 November, 1993
MAC and PHY subgroups

Tuesday PM, 9 November, 1993
MAC subgroup and FH-PHY and DH-PHY ad-hoc groups

Wednesday AM, 10 November, 1993
MAC subgroup and FH-PHY and DH-PHY ad-hoc groups

Wednesday AM, 10 November, 1993
Full Working Group

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The meeting was reconvened at 2 PM, by chairman Vic Hayes, with Carolyn Heide secretary.

9. Opening

9.1 Roll Call: People in the room were invited to introduce themselves.

9.2 Document list update: Last numbered document so far is 224, highest circulated is 222.

9.3 Agenda Adjustments: papers to be presented:

> At architecture: 93/173, 93/204
> At MAC/PHY Interface: none
> At PHY issues: 93/199

9.4 Announcements

(1) membership count -Vic made a mistake in the update of 7 voting members. With the correction for that and the promotion of 20 nearly members to voting members, the situation is as shown between brackets: 74 voting members (111), 33 nearly members (13), 77 aspirant (65)

(2) MAC subgroup ballot results

> ballots handed out and returned 87.
> CODIAC - 8
> DFWMAC - 37
> IBM's mac 7
> WHO - 12

Not ready to decide - 19
Abstain - 4

(3) **another announcement** - presentation for Francois Simon for meeting mailing deadlines continuously and updating the issues log and draft standard so well and reliably.

(4) **Financial Report from Atlanta meeting,** by Frank O'Neill

Expenses		
Welcome reception	393.60	
Meeting room Rental	800.00	
Banquet/Catering (breaks)	3324.74	
Copying (absorbed by LXE)	0.00	
Audio-Visual Equipment	1361.20	
Total Meeting Expenses		5879.54
Collections		
Deposit (previous balance from		
May 1993 meeting)	1834.86	
Meeting fees collected via hotel rooms	3300.00	
Meeting fees Collected cash/checks	298.00	
meeting fees collected local LXE attendees	550.00	
Total Collections		5986.86
Surplus		103.32
Uncollected fees		250.00
Final surplus balance		353.32

Motion #6:	**Approval of financial report from Atlanta meeting.**	
Moved by:	Wayne Moyers	
Seconded by:	Fred Heiman	

Motion Discussion: none

Approved: by voice vote, there were no 'nay's   *Motion #6 passes*

Paul Eastman: if the deadbeats don't pay by after this meeting they loose their voting rights as per the usual procedure?

Vic: yes, but it may have been a misunderstanding rather than deliberate in this case. The hotel may have been mistaken.

Rifaat Dayem: in listening to the role call there seems to be a large west coast contingent. more west coast meetings?

Vic: the next interim is on the west coast, the plenary after that also on the west coast (of Canada).

10. Architecture Issues

Further Definition of the MAC/Ph Interface Primitives, P802.11-93/173, by Larry Van der Jagt

The table and drawing on page two define the names for things that we are bound to use - the ISO reference model names. Tom Phinney adds that in document 131a, page 9 there is a picture of this that might help.

Discussion:

Francois: as a general rule, for a given layer what is at the top of the layer is an SDU, at the bottom is a PDU, and crossing the interface is the IDU. As a packet comes down from n+1 to it changes name as it goes.

Tom P: get a sense from this picture that there is equality between MPDU and IDU. This may not be so - that is not apparent from this picture.

Larry vdJ: the things at the interface should not line up so nicely on this picture. ok.

Tom P: too much work to define a list of managed objects to exchange over the managed object boundary

unidentified: some stuff going down the vertical interface should go sideways to a layer management functions. We have things we want to do that are of a management nature.

Larry vdJ: more of a transmit control nature

unidentified: those that may vary on a PDU basis belong on the vertical interface and a single SAP is fine for that. Those that are more static such as the hop sequence, belong on a layer management interface.

Larry vdJ: a diversity option switching function may be the best way to manage that. (channel option).

Tom P: agrees with both - this is a nomenclature problem. Managed objects have a side interface, protocol control is what you're talking about. A small group should be formed who are knowledgeable and interested to handle this rather than taking the whole groups time.

Francois: there is information that will go through the interface. Then there is information that may go across the same SAP but may not cross the same interface, but the same SAP.

Greg: how does this language pertain to the model within the PHY?

Larry vdJ: can also use the same kind of thing within the PHY. Document 93/172 conceptually describes why there is a media independent sub layer at the PHY. Takes interface control information and extracts it from the rest and imposes it on the convergence layer. Gets a parameter control vector from the MAC and uses it to drive the PMD. It expects to get a simple set of symbols.

Larry vdJ: don't know whether we are supposed to use this now, or go to 802.1, or what.

Vic: expects that 802.1 will have a document that tells us how to use the objects to apply to our work.

Larry vdJ: all discussions of exposed interfaces should be so far down the road they aren't even discussed yet. After everything is sorted out, then deal with someone coming forward saying wouldn't it be nice if we had an exposed interface to do such and such. A desire to conformance testing at the MAC/PHY interface is a total waste of time. Postpone all talk of exposed interface - when we know why we want one it will be obvious where it should be.

Larry vdJ: The intention is that this document is to help decide if we are going to proceed with one SAP or two. Thinks one. If so, we have to modify 94/20 with proposed text.

Tom P: SAPs are placed where entities are bound together. Two SAPs allow binding two different entities to each SAP. They are doorways which on the other side may go to different rooms. As far as OSI goes, you have no choice - you have one because you have two entities joined.

An Improved Reference Model for IEEE 802.11, P802.11-93/204, by Michael Ficsher

Discussion:

Francois Simon: what are the PSAP and DSAP you show?

Mike F: MDPUs and parameters and control information cross the boundary, as per the current model. Intentionally didn't include mapping of functions onto boxes. Believe the moving of the adaptation layer above the MAC/PHY boundary is orthogonal to one or two SAPs.

Bob Crowder: there could be no completion of the MAC until all PHYs were done, with this layer moved to the MAC. That was the original motivation for having the split where it was - looking for a PHY independent MAC.

Mike F: issue is more semantic than anything. Where ever medium adaptation is done there is the likelihood of having to modify media adaptation activities. Full set of interface primitives could allow new PHYs to be defined without changes above the SAPs, in the MAC medium independent and MAC management blocks.

Tom Phinney: these are mostly semantic, and are subtle. Thinks these issues should be referred to a very small group interested in it. The MAC spans both bottom of data link and top of physical layers in the OSI model. The intent was to create a PHY independent solution. Handshake in MAC can be done to support lots of media. In 802.4 is an existing example of the time dependency that you say doesn't exist. The two models you show are the same, but a small group willing to argue such esoteria not bore the whole group so much.

Mike F: not arguing the current model doesn't work, but that greater descriptive complexity is required.

Larry vdJ: at the time the model was generated, discussion was about how to get PHY independence in the MAC. There were presentations by people dealing with the concept of the information control vector passed across the boundary. In order to achieve PHY independence there will be PHY dependent functions stored in the PHY. The approach is let the MAC keep the information it knows, pass across a vector, upload a section of PHY dependent state machines into the MAC from the PHY. The MAC then doesn't have to be concerned about the feature set of the PHY. Also means addition capabilities can be added without changing the MAC.

Mike F: reasonable goal but the location of the state machines needs to identified on the model and the question of whether it is lateral or a vertical component is not clear. Many existing MAC proposals need to be considered in full conjunction with the set of PHYs they need to run over - there is some vertical recognition appropriate.

Larry vdJ: the internal sub layer architecture of the MAC could be re-architected. That's fine but that's not a MAC/PHY issue. The intent of the media independent layer in the PHY was to accept information, separate to data and control, and pass to convergence layer.

Mike F: in certain PHYs the MAC may have to also maintain synchronization of otherwise not synchronized events.

Larry vdJ: the algorithms associated with that are implement by MAC management control. Looks a lot like what is in 802.4 in terms of selecting diversity options.

Vic: is there a small group that would discuss the real architecture? Who would want to do this?

Mike F: involves people from both MAC and PHY.

Vic: Mike Fischer will be the contact point for that group. Interested are Tom Phinney, probably Bob Crowder (but he's not here), Larry van der Jagt perhaps depending on when the group meets.

11. MAC/PHY Interface Issues - none

13. MAC Issues - none

12. PHY Issues

Larry van der Jagt reports that the PHY subgroup opened a single new issue. It discussed what could be done to allow FH PHYs to not interfere with DS PHYs, and issues relating to assessment of whether a channel is occupied or not. The new issue is to examine the feasibility of the PHY determining channel occupied or not, and if it is feasible what are the characteristics of doing it.

Initiation of Effort on 1.9 & 5.2/5.8 GHz PHY's, P802.11-93/199, by Chandos Rypinski

Pre-document introduction: history says that for the last few years it has been difficult to market LANs of less than 10 MegaBits. In 802.9 a small minority said we had to have a higher rate (eventually came out with two PHY rates). One of the purposes today is to make it possible to do higher rate PHYs in this group. Under that background we should consider new PHYs. To this end Chan will offer the motion on page 4 of this document.

Submission Discussion:

Dave Bagby: please clarify 'transfer rate'. Also when you say 'suitable for connection and connectionless' - why are they PHY things?

Chan: transfer rate means modem throughput. Channel schemes and spreading schemes net out to some particular value. Think in terms of a usable throughput. Connection versus connectionless services might be redundant, but it's in the 802.11 functional requirements that they both be supported. The standard requirements says, confusingly, do both but connectionless is optional.

Wayne Moyers: Chan should be commended for taking initiative to get this out in such a timely fashion. We tend to follow the market need, and a technical push here is an opportunity to get out front. But is concerned about lack of resources, and some of the words used. 'Equal in priority' and 'at the same time'. We haven't moved very fast already, and worried about getting resources split. It would be better to complete the work under way first, but would love to see a task force to get at least two PHYs formed (radical difference in frequency and data rates and service types). Would like to see this worked upon quickly and a position in this window of response met.

Phil Belanger: why is it important to specify data rates in those points, why not let the PHY group decide. Suggest dropping the first two clauses in the numbered points. Also feels that the 'further this and further that' statements are not necessary.

Chan: if the choice was to have the motion passed without the clauses, or not passed with them, would prefer to have it passed. But would prefer to do those changes by vote if they are needed. On 16 Mbps, feels strongly on putting a floor on it, could be 16 or 8. Don't want to do more multiple 1 or 2 Mbps systems in that band. The constituency for high rate development is different from that for low rate. If these become recognized as 802.11 tasks, after a few meetings we will find out if there is a constituency - it should have it's shot to see if it attracts a constituency. The numbers are not cast in granite. Looking for a scale factor for the situations.

Phil: didn't think the other subgroups had any limit, but the minimum imposed by the PAR. Why wouldn't the group make that decision themselves?

Motion #7:   **The 802.11 Committee asks its Physical medium Subcommittee to initiate development of new physical mediums of the following description:**

1. Best use of 10 MHz of spectrum (scalable form 2 to 20 MHz) offering a transfer rate of 4 Mbps or higher (scalable from 2-8 Mbps) in the 1.85-2.20 GHz band as allocated by the FCC in the Second report and Order on Docket 90-314 released October 22, 1993; and more particularly the spectrum from 1900-1920 MHz for asynchronous devices including the specified etiquette; and

2. Best use of 40-70 MHz of spectrum offering a transfer rate of 16 Mbps or higher:
a) in the USA Part 15 ISM band at 5.7250-5.8375 GHz, or
b) in the ETSI RES 10 HIPERLAN proposed band near 5.2 GHz; and

further, that the effort on these PHYs be equal in priority to the existing 2.4 GHz PHYs with the possibility of completion at nearly the same time contingent upon adequate support from the membership; and

further, that the PHY selected be suitable for both connectionless and connection-type services either of which may be optionally deleted, and

further that the closed issues which are affected by this motion be revised by the editor's to reflect and then resubmitted to the Committee for approval.

Motion 7 as amended by motions 8 & 9:

The 802.11 Committee asks its Physical medium Subcommittee to initiate development of new physical mediums of the following description:

1. Best use of 10 MHz of spectrum (scalable form 2 to 20 MHz) offering a transfer rate of 4 Mbps or higher (scalable from 2-8 Mbps) in the 1.85-2.20 GHz band as allocated by the FCC in the Second report and Order on Docket 90-314 released October 22, 1993; and more particularly the spectrum from 1900-1920 MHz for asynchronous devices including the specified etiquette; and

2. Best use of spectrum offering a transfer rate of 16 Mbps or higher:
a) in the USA Part 15 ISM band at 5.7250-5.8375 GHz, or
b) in the ETSI RES 10 HIPERLAN proposed band near 5.2 GHz; and

further that the closed issues which are affected by this motion be revised by the editor's to reflect and then resubmitted to the Committee for approval.

Moved by:	Chandos Rypinski
Seconded by:	Wayne Moyers

Motion 7 Discussion:
Dave Bagby: agrees with some stuff just heard - the resource concerns expressed, and agrees with what Phil said about the paragraphs that start with 'further'. But also, on the 1.9 band stuff - those bands have occupants which UTAM is trying to figure out how to move. Many think that is not a simple problem, and that band may not be cleared for a couple of years. Is in favor of this motion in general, but the import of the statement 'equal in weight' is not clear. We should do more homework before figuring out if that band is useful. In general in support of the motion, but makes the following motion.

Motion #8:	To amend motion 7 by deleting the first two paragraphs beginning with 'further'.

Moved by:	Dave Bagby
Seconded by:	Larry van der Jagt

Motion 8 Discussion:

Larry Zuckerman: was at a meeting last January where the chief engineer of the FCC talked about this new band. The incumbent removal problem was talked about, and the gist of the description was it is not going to be easy to solve. Hopes this group would study that first to get an idea of time involved.

Bill Huhn: how about just studying the new band and leaving of the parameters in the numbered paragraphs?

Bill Huhn calls the question, seconded by Larry van der Jagt. (49,0,4)

Approved: 48	Opposed: 4	Abstain: 6	*Motion #8 passes*

Motion 7 Discussion (con't)

Peter Chadwick: is concerned that the chunk of spectrum described in point 2 may overlap with HIPERLAN - concerned by not being interoperable with RES 10.

Chan: it is reasonable to say that we are looking at the best use of 40-70 MHz . Apple petitioned the FCC with those numbers, so they are historic. Maybe with 2 years advance notice we can be prepared to ask for amendments.

Bill H: the detail in motion points 1 and 2 should be withdrawn - these details could be worked out in the groups formed.

Bill Huhn calls the question - no second.

Wim Diestraten: why not state the actual number in the 40-70 area? Isn't the 1.9 band number 20 MHz instead of 10?

Larry: yes but you can't use more than 10 at a time.

Wim: is this worded as the channel or the total?

Chan: I think the wording should be per channel. Some people may think it should be channels and some not. The relationship between bit rate and spectrum - there are philosophies that differ.

Wim: don't understand if this is the total band available, or is this per channel?

Chan: regardless of available bandwidth a certain amount of spectrum should be assumed in use by a system. For example the PCS band 10 MHz is highly occupied and 10 MHz is lightly occupied, that's the rational behind the 10 MHz number. Even though it is a 20 MHz band it will have to be used as a 10 MHz band. Tried to set up the motion to say how much spectrum is used by one system, rather than what's the channel.

Wim: then why is the 5.8 40-70 - in document 93/200 you say 117.5?

Chan: if the group thought 117.5 was better to say that's ok. Hope was to get 2 or 3 channels.

Wim: so why specify it at all?

Chan: trying to set it up as a wide band system. 'Best use' doesn't preclude channelization. If someone wants to use it in pieces that is.

Motion #9:	To amend motion 7 to remove '40-70 MHz from point 2.

Moved by:	Wim Diepstraten
Seconded by:	Wayne Moyers

Motion 9 Discussion:

Dave Bagby calls the question, seconded by Larry van der Jagt (voice vote, the 'ayes' have it)

Approved: 50	Opposed: 1	Abstain: 2	*Motion #9 passes*

Motion 7 Discussion (con't)

Wim Diepstraten calls the question, Bill Huhn seconds (34, 5, 13)

Approved: 18	Opposed: 17	Abstain: 18	*Motion #7 passes*

Submission Discussion (con't)

Wayne: is concerned that a window of opportunity will close in a matter of weeks. There is at least one area of that rule making that has some concern - the level of thresholds. Since we have a standing committee to review FCC filings, they should be empowered to give study to this.

Motion #10:	To empower the standing committee for interface with the FCC to study if and any changes are petition able on the part of 802.11 in the technical requirements of the second R&O issued General Docket 93-14 during the window of comment opportunity. Such actions to be critically reviewed by ExCom and other necessary procedures of IEEE.

Moved by: Wayne Moyers
Seconded by: Bob Crowder

Motion 10 Discussion:

John McKown: this R&O is the FCC's interpretation on the efforts of WINFORUM, which the FCC reflected those for the most part. Every number in this document related is related in ways much more complicated than you can understand. If you change one of those numbers by itself you're not going to realize all the ramifications of it. This body has a lot of weight, and would hate to see it thrown around irresponsibly. Speaks against this motion - it is spontaneous, unthought out and dangerous.

Dave Bagby: is strongly against this motion, for much the same reasons as John. Still has the scars from both WINTECH and WINFORUM. When John he says you won't understand the ramifications of changing any numbers here, he means you would have to be way more than brilliant to do so. Also, beating a dead horse with the FCC could damage the credibility of this group. This group doesn't understand as a whole what's in that R&O - I don't either and I have worked on it for months.

Dave Bagby calls the question, seconded by Bill Huhn (33, 10, 10)

Approved: 3   Opposed: 33   Abstain: 16   *Motion #10 fails*

Submission Discussion (con't)

Dave B: with respect to motion 7, approves of leaving 4 Mbps as a transfer rate in point 1 so there is a target. It is true that the band is 20 MHz wide and you could use all 20, so why the constraint. Let the group study it.

Motion #11:	That the instructions to the new PHY subgroup be modified to ~~remove~~ change item 1 in the adopted instructions to read: "Best use of spectrum offering a transfer rate ..."

Moved by: Dave Bagby
Seconded by: Peter Chadwick

Motion 11 Discussion:

Wayne Moyers: on the basis that the PHY group should be allowed to do the full job, speaks in favor of this motion.

Approved: 42   Opposed: 2   Abstain: 11   *Motion #11 passes*

Larry van der Jagt moves to adjourn. Seconded by everyone.

14. Adjourn for subgroups - 5:05 PM

Thursday AM, 11 November, 1993
MAC and PHY subgroups

Thursday PM, 11 November, 1993
Full Working Group

The meeting was reconvened at 1:10 PM, by chairman Vic Hayes, with Carolyn Heide secretary. John McKown Vice-Chairman and Francois Simon editor.

15. Opening, Roll Call

15.1 Announcements

(1) Lunch and breakfast were included in hotel rate. What do we think?

Jim Shuessler: likes it. It was a real time saver, but it didn't add much overhead to the cost so didn't feel stuck here.
Dave Bagby: it was convenient, but what would the room have bee without it?
Vic: its hard to say because it's negotiated as a package.
Chris Zegelin: the $1.50 was a nuisance for the hot stuff.
Bob: it was a time saver, but it was monotonous. There could have been some day-to-day variety.
Tom Phinney: not against it, but it depends on how accessible other restaurants are. It's nice to get out at lunch if they are convenient. The breakfast is preferable to the usual fruit and pastries.
Don Johnson: breakfast starting at 6:30 instead of 7 would be good.
On the whole, no one objected.

(2) reflector - provided by Bob Egan DEC. only for voting members and aspirant members. Mailing list controlled by chair. Address 'mailer@feenix.lkg.dec.com'. First line must be @80211-list' and only that. You can not reply to the reflector.

(3) FTP Sites: We have two: One provided by Bill Stevens, Apple. Address 'atg.apple.com' (use described in document 93/86); Second provided by Ronald Brockman University of Tente, NL address will be in next mailing.

(4) document 131 will be distributed by Tom Phinney to people not present at this meeting.

15.2 Document list update: List was in pigeon hole, highest number assigned is 224.

15.3 Agenda Adjustments: switch MAC and PHY subgroup reports.

16. Reports from sub and ad-hoc groups

16.1   PHY, by Larry van der Jagt

1) took a vote to adopt NTIA data format for channel information submissions

2) FH ad hoc group elected Peter Chadwick chair

  - worked on preamble/rate switch issues
  - started looking at text
  - note to MAC: we expect to need a length field in absolute time

3) DS as hoc continue resolving sub issues - are basically ready to close parameter list issue and start on text

4) IR ad hoc - looked at modulation and related issues - accepted concrete proposals

5) H.S ad hoc - looked at rate switch and modulation

Open an issues to examine feasibility of doing clear channel assessment (CCA) and examine associate detail (threshold policy etc).

Next meeting:

- work on text;
- closing template subissues;
- CCA discussion;
- review of action on open bands;
- review of H.S. ad hoc group impact on base standard.

Discussion

Tom Baumgartner: did you check on process for getting a delegate to IRDA?

Larry: this is a group formed by HP which charges to be a member, and they are writing a standard. The question is whether we could write them a letter about waiving the fee for a liaison. Will take this up offline with Vic

Tom B: 115.2 Kbits, but they have greater expectations in the future. It is semi point to point - 3 meters, 30 degree field of view.

16.1 MAC, by Dave Bagby

Papers Presented and Discussed:

93/190 DFWMAC proposal (Greg Ennis, Symbol Technologies, Phil Belanger, Xircom and Wim Diepstraten, NCR)

93/191 DFWMAC overview (Greg Ennis, Symbol Technologies, Phil Belanger, Xircom and Wim Diepstraten, NCR)

93/192 Contention free services provided by DFWMAC (Greg Ennis, Symbol Technologies, Phil Belanger, Xircom and Wim Diepstraten, NCR)

93/193 The Timing Synchronization Function for the DFWMAC (Greg Ennis, Symbol Technologies, Phil Belanger, Xircom and Wim Diepstraten, NCR)

93/213 Wireless Hybrid Operation (WHO) MAC Protocol (Jim S, National)

Papers schedule pushed out:

93/195 Performance of Nonpersistent CSMA with Cell Interference and Imperfect Sensing (K.C. Chen, NTHU)

93/208 Complete description of Frame Prioritization in a CSMA/CA MAC Protocol (Rick White, Motorola)

93/214 A measure of performance: W/Kb-Hectare (Tom Baumgartner, Spectrix)

Other papers distributed:

93/131A ISA Cover Letter

93/131B,C ISA services standard.

93/183 Mobile IP as seen by the IETF (Charlie Perkins, IBM)

93/184 Mapping the ISA S50.03 & S50.04 Data Link onto 802.11 MAC Requirements and Terminology (Bob Crowder, Ship Star)

93/196 Theoretical Analysis of Group Randomly Addressed Polling (K.C. Chen, NTHU)

Progress on Announced Agenda Subjects.

- Determine the MAC foundation protocol.
    - Made some progress, but fell short of goal.
    - Majority strength votes drove consolidation.
    - Will plan to achieve final goal in January.

- Foundation Candidate IP exploration.
    - 3 of 4 final proposers filed a submission.
    - 4th claims no IP in proposal.

- Compression and Encryption algorithm Liaison with 802.10 - Tom Phinney summarizes:

We know that in wireless we want to have some kind of encryption. Encryption works because it randomizes the bit stream, approximating white noise, i.e. nothing to read. Compression doesn't work on white noise. So it must be done before encryption. The problem therefore is we cannot do compression at the MAC level, it must be done higher - 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 stateless protocol, they cannot compress across frames, it would have to be done an a SDU basis. If large SDUs are sent, say 4k, you have all the compression your going to get, but with small messages you don't get much effect. Dilemma - works best for each source, but they have no way of identifying the source streams. Every SDU has to be compressed individually. What works with 802.10 - encryption does the same, so looking at them together makes sense - is to look at them that way. You can have the combination algorithms. You can select encryption and compression, compression alone, encryption alone, or neither. They will not standardize encryption, but will provide a method of indicating the algorithm pair.

- Multi phy rate impact exploration.
    - not explicitly addressed, DFW supports

- Issue working.
        No work done.

PRIORITY TASK for this week:

Fulfill September commitment to selecting a protocol (either existing or a derivative of existing proposals), to be the *foundation* used as the basis for future enhancements and refinements, by the end of the November 93 meeting.

MAC efforts since last meeting:
- Collaboration by NCR/Symbol/Xircom: resulted in DFWMAC
- Revision of proposal by National: WHO
- Three proposals superseded:
    WHAT, WMAC -> DFW
    National Compromise -> WHO

Foundation proposals at start of voting:
- CODIAC
- DFW
- Wireless LAN MAC
- WHO

Voting:
- Secret, Written Ballots
- All MAC attendees voting.

- Multiple passes: 5 -> 4 -> 3 -> 2 -> 1
- 5 due to "not ready" category added to ballot
- Low vote dropped each pass

First vote pass results
- 87 voting
- CODIAC: 8
- DFW: 37
- WHO: 12
- Wireless LAN MAC: 7
- Not ready to decide: 19
- Abstain: 4

Second vote pass results
- 72 voting
- CODIAC: 5
- DFW: 31
- WHO: 7
- Not ready to decide: 25
- Abstain: 4

Third vote pass results
- 85 voting
- DFW: 42
- WHO: 3
- Not ready to decide: 33
- Abstain: 7

Fourth vote pass results
- 72 voting
- DFW: 35
- Not ready to decide: 30
- Abstain: 7

Voting history

	V1	V2	V3	V4
Codiac	8	5		
DFW	37	31	42	35
WHO	12	7	3	
W LAN MAC	7			
Not ready	19	25	33	30
Abstain	4	4	7	7
Totals	87	72	85	72

MAC group action:

- To take to the 802.11 plenary session as the MAC recommendation the top 2 protocol proposals.

- Passed 27, 23, 6

- The top two proposals have publicly announced that they will get together and resolve their differences! (sec note: this was announced prior to the third vote)

Motion #12:   **The plenary session directs the MAC group to accept the top 2 protocols as the direction of the sub group.**

Motion 12 as amended by motion 13:

> The plenary session directs the MAC group to accept the top 1 proposal as the direction of the subgroup:
>
> • Accept the DFW MAC as the direction of the 802.11 WG
> • Instruct MAC SG to:
>   1. Proceed to study and enhance this proposal by 51% vote
>   2. Answer & resolve questions relative to its performance

Moved by: the MAC subgroup
Seconded by: Kerry Lynn

Point of order, Ron Bjorklund: concerning vote. A majority vote is acceptable from the MAC group on this?

Paul Eastman: for the recommendation a simple majority is sufficient. For the vote in this session procedural issues require a simple majority, technical issues require 75%. There are two protocol proposals being voted on here - that seems like a technical issue to me.

Tom Phinney: don't recall any procedure discussions on this. It is a technical issue.

Dave Bagby: this is a procedural point - the underlying subject can maybe eliminated. How many people were not in the subgroup this week? (3 voting members). For them a short summary - votes were originally structured so that were proposals or abstentions, but that was modified by the group to include the "not ready to decide" choice. This choice was highly controversial. Some said that it meant what it said. Some said it meant I didn't want to have to vote for something I didn't like. That was the gist of it. The reduction process was intended to get us to one protocol. There were those who felt if you didn't reach 75% on the last vote you didn't succeed. But one way or the other, this was the motion that the group approved to take to the plenary.

Ron: the point of order is that the process needed to have support by 75% of the members, as well as this motion to take this to the plenary. Neither the final vote of the process, nor the vote to bring this recommendation to the plenary got 75%.

Vic: not technical, it is the procedure to bring it to us.

Dave B: believes this motion is that the MAC group gave permission to bring this recommendation to the plenary. We will have to work from this and do further reduction. The spirit is, this is the body which makes decision and this body is being asked to make or not make it.

Pablo Brenner: if adoption of these protocols closes any open issues it is then it is a technical decision.

Vic: the fact is that it came to this group as a procedural issue, and a simple majority is ok.

unidentified: at the last meeting we had a similar proposal on the floor where the number of protocols was narrowed to 5, and that required a 75% vote. This is the same situation.

Ron: this recommendation is based on the previous meetings and rules all of which have required a 75% vote and this should have a 75% support. This should not stand as a recommendation because it doesn't have 75% support from the MAC group. It is not the results of the MAC group without 75% support.

Paul: in the operating rules of 802 the chair has the right to declare anything he wants technical or procedural. It is Vic's decision.

John McKown: assume it is Vic's decision - Vic can accept guidance in making this decision. Surely the issue of precedence should take precedence.

Ed Geiger: 75% of the people have to agree on the standard sometime, you might as well start now. Rather than face only having 50% later.

Ron: (Paul Eastman hands Ron the operating rules, which Ron reads which clearly state that ...) part of the chairman's responsibility is to decide which issues are technical and which are procedural. Are we deciding that the selection of the MAC protocol is a procedural issue?!

Ken Biba: that was a noble point by Ed, but consensus here is hard to establish. Incrementing our way towards it is progress. Making progress is useful, and doesn't require 75% - it requires a plurality or simple majority. Let's move forward.

Tom P: the fiction in the standards world is that chairman writes standard. In history there have been times when the chair has decided things should not follow normal procedure, and the entire subgroup left. The last time this happened the chair found he couldn't do it alone. 75% of that unknown final population will be what is finally required, not these people here today. Thinks this is a technical issue being disguised as procedural, but it is the chair's prerogative to rule on that.

Dave B: is only here giving a report - the group took a vote, told me to come to the plenary and do this. The rule says the chair can decide and he did. How much discussion do we want of this?

Ron: agrees we have a lot more important things to discuss, but we all have to operate under the same rules all the time. We could say that if we had made every decision procedural in the last 2 years, then a majority vote would have made a lot of decisions. If we don't use consistent rules the credibility of decisions suffers.

Larry van der Jagt: we've got 2 problems. (1) What is going to be the MAC standard. (2) How are we going to get to it. This approach pulls some of the options out - limit, limit, limit. Why not try on the basis of just pure votes - how many would accept each one as a foundation protocol and if any one gets 75% you're done, otherwise do it again.

Bob Crowder: suggests changing the motion to "accept the DFWMAC as direction of 802.11 & that the MAC SG: (1) proceed to study & enhance this MAC proposal by 51% vote. (2) answer & resolve questions relative to its performance."

Vic: we are discussing a point of order now. Bob please hold on to that for later.

Dave B: recognizes difficulties of this process, and, yes, there were other things the MAC group could have done. But we did this. So asks for a decision on this motion. If it fails, maybe some other people have suggestions on how to proceed next.

Peter Chadwick: this is procedural. Do you accept the MAC group recommendation or not is the question.

unidentified: clarification - in Sept, 4 or 5 protocols were put up by a 75% vote. What percentage of the vote put the "not ready to decide" choice onto the ballot with them. [Carolyn looks up the vote in the MAC minutes - it was 44,33,3]

The Chair: ruled that it was a procedural decision and that ruling stands. Return to the motion discussion.

Motion 12 Discussion

Dave B: speaks in favor of adopting this recommendation. Hopes that is done by a large margin. In Sept the group made a commitment to come up with one foundation protocol - got a 75% vote on that. If the group wanted to relax that commitment there should have been a 75% vote to undo that. The "not ready to decide" choice allowed 45% to prevent you from accomplishing the goal, rather than having 75% needed to change the goal. This was a violation of that commitment. We have made a lot of progress this week and we don't want to loose it. There is disagreement about how much progress we have made - this seems to depend on whether they like the progress made or not. The MAC group asked me to bring this forward and I did and I'm in favor of it.

Motion #13:   to modify motion 12 to add below the existing text "accept the DFWMAC as direction of 802.11 working group, and instruct the MAC SG to: (1) proceed to study & enhance this MAC proposal by 51% vote. (2) answer & resolve questions relative to its performance". Also to change 2 to 1 in the MAC group's motion.

Moved by:	Bob Crowder
Seconded by:	Paul Eastman

Motion 13 Discussion:

<u>Bob C:</u> despite being strongly and publicly in favor of reservation system is making this motion to advance progress. We are wasting time if we go to January with a proposal that has been withdrawn already.

<u>unidentified:</u> this motion brought forth is not in order. This is a report being asked to be accepted or not, it was voted by the MAC group. It cannot be amended. It was a piece of legislation from the MAC group.

<u>Larry van der Jagt:</u> this motion now belongs to the group and they can do whatever they want with it.

<u>Wayne Moyers:</u> in support of this motion. A 46% constituency were not ready to act upon what was brought in this final vote. This allows that group to work on what caused them not to be ready to choose.

<u>Jim Schuessler:</u> focus on point number 1 - what it is, is a change to the IEEE operating procedure. Speaks against this motion.

<u>Paul Eastman:</u> clearly we can decide something on a less than 75% vote and that gives us direction. When it's time to make a standard we need 75%. To go for a direction is in my opinion a procedural issue.

<u>Tom P:</u> agrees with Paul.

Kerry Lynn calls the question, Paul Struhsaker seconds (42, 8, 5)

Approved: 32	Opposed: 27	Abstain: 3	***Motion #13 passes***

Motion 12 Discussion (con't)

Dave Bagby calls the question, seconded by Paul Eastman (40, 15, 6)

Point of order, unidentified: is the motion as amended technical or procedural?

<u>Vic:</u> technical motion.

Approved: 38	Opposed: 18	Abstain: 6	***Motion #12 fails***

Motion #14:	**The plenary session directs the MAC group to:**

> **• Accept the DFW MAC as the direction of the 802.11 WG**
> **• Instruct MAC SG to:**
>> **1. Proceed to study and enhance this proposal by vote**
>> **2. Answer & resolve questions relative to its performance**

Motion #14 as amended by motion 15:

> **The plenary session directs the MAC group to:**
>
> **• Accept the DFW MAC as the direction of the 802.11 WG**
> **• Instruct MAC SG to:**
>> **1. Proceed to study and enhance this proposal by vote**
>> **2. Answer & resolve questions relative to its performance**
>
> **• When the subgroup has something that can pass by simple majority that it be offered back to the plenary for 75% approval.**

Moved by:	Dave Bagby
Seconded by:	Bob Crowder

Motion 14 Discussion:

Vic limits discussion time to 2 minutes per speaker.

Paul Eastman: recommends that during our discussions we think about our PAR - granted to us by the IEEE standards board, which nothing to do with this group, but does listen to the recommendations of ExCom. This PAR has a limited amount of time, and we're supposed to make progress in that time. If we don't start moving someone else will get our PAR, and there are people who want it. If we don't start moving it will be tough to hang on it.

Kerry Lynn: concerned that we still have not heard the impact of this decision on open issues.

Motion #15:	**to amend motion 14 w.th 3rd bullet 'when the sub group has something that can pass by simple majority that it be offered back to the plenary session for 75 approval'**

Moved by: Kerry Lynn
Seconded by: Dave Bagby

Motion 15 Discussion:
Bob O'Hara, seconded by Mike Fischer calls the question (50, 0, 7)

Approved: 33   Opposed: 8   Abstain: 17   *Motion #15 passes*

Motion 14 Discussion (con't)

Ron Bjorklund: seems that this entire process is an effort to circumvent the concerns that almost 50% of the people in the MAC group had. There are new proposals not reviewed in detail, and proposals that have not been presented in more than 6 months. Efforts to re-present those were discouraged in the effort to move along. The people that voted not ready were saying they want to compare the proposals in more detail. We could wind up with an ill considered standard in the name of progress.

Bob O'Hara: disagrees with Ron. This group doesn't need to be withheld from making a decision that points the MAC group toward making progress. Urges the members of the plenary to take a direction. There is a proposal that has a greater than 50% approval here.

Nathan Tobol: agrees with the motion as far as DFWMAC being a valid direction. The first time the ballot ran we had around 80% of the people ready to decide. As choices disappeared people lost their preparedness. It did come down to a majority, however, and those that were not prepared should provide input on what information it is they need.

Point of personal privilege, Tom Phinney - I changed my vote. I was prepared to decide based on performance results. When my choice disappeared I was not prepared to decide because I had no data on those protocols that were just presented this week. Lack of data was the basis of my 'not ready to decide' vote.

Nathan T: apologizes to anyone offended. No finger pointing was intended, just indicating a trend and a need for information

Greg Ennis: reminds everyone of Sisyphus, who was condemned to push a large bolder to the top of a mountain, yet every time he got near the top it fell back down. It not clear just what crime we as a group committed to get into this similar situation. You've got to take it step by step to make progress. If this is how to get to a final standard, then that is the way we should go.

Dave B: rebuttal to the point about the most recent proposals having more influence. If anything, would consider that those presented this week were at a disadvantage against those that have been heavily advertised for some time. You have to presume people do their homework. Those that are swayed by what they heard last shouldn't bother to come again. How could the older protocols not have had adequate exposure after all this time?

Dave Bagby calls the question, seconded by Larry van der Jagt (49, 6, 6)

Approved: 43   Opposed: 14   Abstain: 4   *Motion #14 passes*

Frederic Bauchot indicates that he counted 15 opposed on that last vote. Vic Hayes replies that two people (Vic and Carolyn Heide) counted the responses and they both counted 14. That count stands as final.

MAC Agenda Subjects and Goals for Jan 94 meeting.

- Complete the determination of MAC foundation protocol based on the actions of the plenary session.
    - Primary goal again.

- Answer Question papers submitted to FIRST mailing.

- Resolve Issues in light of foundation adoption.

- Drafting of text for insertion into draft standard to reflect decisions.

- Multi phy rate impact exploration.

- Papers which schedule prevented this week.

Motion #16:   **To adjourn to announced time in January.**

Moved by: Dave Bagby
Seconded by: Greg Ennis

Motion Discussion: none

Approved: 30   Opposed: 7   Abstain: 7   *Motion #16 passes*

19. Closure - meeting adjourned at approximately 3:30 PM.

First mailing date Nov 18, second Dec 10. Next meeting Jan 10 in San Jose, details to beannounced by mail.

Tentative Meeting Schedule

Date	Month	Year	Place	Type	Location	Host
10-13	Jan	1994	San Jose area	Inter	TBD	WiSE, NSC, or Symbol
07-11	March	1994	Vancouver, BC	Plenary	Hotel Vancouver	
09-12	May	1994	Oshawa, Ontario	Inter	GM of Canada	GM
11-15	July	1994	Orlando, FL	Plenary	Walt Disney Swan	
TBD	Sept	1994	TBD	Inter	TBD	Open
07-11	Nov	1994	Incline Village, NV	Plenary	Hyatt Regency, Lake Tahoe	
TBD	Jan	1995	TBD	Inter		Open
TBD	Mar	1995	TBD	Plenary		
TBD	May	1995	TBD	Inter		Open
TBD	July	1995	TBD	Plenary		
TBD	Sept	1995	TBD	Inter		Open
TBD	Nov	1995	TBD	Plenary		

We received invitations to host a meeting from DEC to Boston area, ICIL to Hong Kong, and LACE.

Appendix 1
Attendance list

Status of membership at end of meeting; vm = voting member, nm = nearly voting member and am is aspirant member.

ACHATZ	Mr. ROBERT	US Dept of Commerce	+1 303 497 3498 rachatz@ntia.its.bldrdoc.gov	vm
BABA	Mr. SATOSHI	NTT	+81 43 211 3325	am
BAGBY	Mr. DAVID	Advanced Micro Devices	+1 408 987 2423 david.bagby@amd.com	vm
BANTZ	Dr. DAVID	IBM Corporation	+1 914 784 6808 bantz@watson.ibm.com	nm
BAUCHOT	Dr. FRÉDÉRIC	IBM France	+33 92 11 55 92 fbauchot@vnet.ibm.com	vm
BAUMGARTNER	Mr. C. THOMAS	Spectrix	+1 708 491 4534	vm
BELANGER	Mr. PHIL	Xircom	+1 415 691 2500 pbelange@xircom.com	vm
BETANCOR	Mr. MANUEL J.	ETSI Telecommunicacion	+34 28 451272 betancor@deimos.ulpgc.es	nm
BIBA	Mr. KEN	Xircom	+1 415 691 2500 kbiba@xircom.com	vm
BJORKLUND	Mr. RON	IBM France	+33 92 11 42 79	nm
BLANEY	Mr. TIM	Apple Computer Inc	+1 408 862 6572 tblaney@applelink.apple.com	vm
BLOMEYER	Mr. PETER	ANDROMEDA GmbH	+49 89 8901480	am
BOER	Mr. JAN	NCR Systems Engineering B.V.	+31 3402 76483 jan.boer@utrecht.ncr.com	vm
BRADBERY	Mr. JACK L.	AMP Inc M.S. 210-020	+1 717 561 6271	vm
BRENNER	Mr. PABLO	LANNAIR	+972 3 6458375 pablo@lannet.com	vm
BRILL	Mr. CHARLES	AMP Inc	+1 717 561 6198	vm
BUAAS	Mr. ROBERT A.	The Buaas Corporation	+1 714 968 0070 buaas@nosc.mil	vm
CHADWICK	Mr. PETER E.	GEC Plessey Semiconductors	+44 793 518080 gecp.peterc@applelink.apple.com	vm
CHAU	Mr. ALAN	IBM Canada LTD	+1 416 448 4963 achau@vnet.ibm.com	vm
CHEN	Dr. KWANG-CHENG	National Tsing Hua University	+886 35 715131 x4054 chenkc@ee.nthu.edu.tw	vm
CRAVEN	Mr. ROBERT A.	NDC Communications Inc	+1 408 428 9108	am
CRIPPS	Mr. PETER K.	Xircom	+1 415 691 2500 pcripps@xircom.com	vm
CROWDER	Mr. ROBERT S.	Ship Star Associates Inc	+1 302 738 7782 0002892306@mcimail.com	vm
DATTA	Ms. SANCHAITA	Dayna Communications	+1 801 269 7251 datta@signus.utah.edu	nm

Appendix 1
Attendance list (continuation)

DAYEM	Dr. RIFAAT A.	Altamont Research	+1 408 736 7107 rdayem@netcom.com	am
DERBYSHIRE	Mr. JIM	Symbionics	+44 223 421025 jhd@symbionics.co.uk	vm
DIEPSTRATEN	Mr. WIM	NCR Systems Engineering B.V.	+31 3402 76482 wim.diepstraten@utrecht.ncr.com	vm
DOO	Mr. WAYCHI	National Semiconductor	+1 408 721 6887 wcd@berlioz.nsc.com	vm
EASTMAN	Dr. PAUL	RF Networks	+1 602 861 3652 p.eastman@compmail.com	vm
EGAN	Mr. ROBERT J.	Digital Equipment Corp	+1 508 486 5746 b_egan@nac.enet.dec.com	nm
ENG	Mr. JOHN W.	Digital Equipment Corp	+1 508 486 7734 eng@nac.enet.dec.com	nm
ENNIS	Mr. GREG		+1 408 356 4775 gennis@aol.com	vm
FEHER	Dr. KAMILO	University of California Davis	+1 916 752 8127	nm
FISCHER	Mr. MICHAEL	Digital Ocean Inc.	+1 210 614 4096	vm
FISHER	Mr. DAVID A.	Pacific Monolithcs Inc.	+1 408 732 8000 x229	vm
FRANCE	Mr. MAURICE		+1 310 373 9515	nm
FULTON	Mr. PAUL R.	Netcore Technology Inc.	+1 214 618 1952	vm
GEIGER	Mr. ED	Apple Computer Inc	+1 408 974 4907 edg@apple.com	vm
GERSHON	Mr. EUGEN	Advanced Micro Devices	+1 408 987 2408 eugen.gershon@amd.com	am
GRANT	Mr. DOUG	Analog Devices	+1 617 937 1481 doug.grant@analog.com	
GRAU	Mr. JUAN	Proxim Inc.	+1 415 960 1630	nm
GROW	Mr. ROBERT M.	XLNT Designs Inc	+1 619 487 9320 bob@xlnt.com	vm
GRUBER	Mr. THOMAS L.	Plexus Research Inc	+1 508 263 6080	
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