IEEE P802.11 Wireless LANs

Title: **Minutes to IEEE P802.11 WLAN High Data Rate FH-PHY Group
Ad-Hoc Group Meeting**
San Jose, Ca
Dates: 10th Jan 1994

Minutes by: Jonathan Edney
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Session 1: 10th Jan 1994

Chairman: **Wayne Moyers,** WiSE Communications
Secretary: Jonathan Edney, Symbionics

1) Motion to ratify minutes, Doc 93/231

Moved by Kamilo Feher, 2nd Nathan Silberman

Motion Carried 10:0:6

2) Presentations

94/8 Juan Grau, Proxim

Last year Proxim presented 1.6Mbps 4FSK scheme at the same meeting where GFSK was adopted

Now Proxim propose to present the 4FSK scheme updated for 2Mbps for adoption as higher data rate standard

Proxim is not fully finished with data to present and will present a full proposal at the next meeting.

Question: Quoted Eb/Nr performance is 22.5db. But how much tolerance is there on this figure?

Ans: The figure was obtain using simulation, not real measurement.

Qu: So what is the realistic figure for an actual radio?

Ans: It depends on cost, 24-25db is easily attainable.

Qu (Kamilo): Will you propose π/4DQPSK for this committee?

Ans: No. It adds too much to implementation cost. Also the high rate should provide significant performance improvement [Grau's proposal is for 2MBps] for marginal cost increase.

Qu: What is the change in Eb/nr for 1.6 -> 2Mbps

Ans: Can't tell specifically

Qu (Kamilo): Why did you not study or why did you reject linear amplifier designs?

Ans: We rejected linear amplifiers several years ago - wanted to have a system which is not phase sensitive due to the demands of frequency hopping.

94/03 Kamilo Feher, UC Davis

Main proposal of this presentation is to go for a more robust system to increase throughput and reduce delay. - robustness is more important than raw bit rate.

The proposal is to go for a 1.4Mbps OQPSK, non-linear amplifier.

Even though the data rate is only 1.4Mbps, this can give higher throughput than the system with data rates of 1.5 or 2mbps because the error rate an be lower. In fact under certain noise conditions this scheme can have 30 - 100 times better throughput.

Various examples of data were shown to support the claim of increased robustness.

Q - There is an assumption here that people would design installations to accept error rates of 10^{-2}. But in practice this would not be the case.

A - yes no one would design the system this way but this could be base error rate and error correction is put on top. In practice you can not get 10^{-5} BER in a practical system. If you design for 10^{-5} BER some areas will be 10^{-2}.

Q- Is 1.4Mbps the optimum for robustness? If not what is?

A - Don't know but 1.4Mbps non linear is better than 1.5. 1.2Mbps might be better - it is not known at this time.

Feher made three recommendations:

1) Adopt revision of the charter of the committee to lower the acceptable data rate defined as "high" to 1.4Mbps

2) Adopt 1.4Mbps PHY as the HS-FH group standard

3) Adopt OQPSK and compatible non linear modem / radio

Chairman pointed out that it was agreed that all modulation schemes should be presented at this meeting and that no other submissions had been received.

Jon Edney mentioned that Jerry Loraine of Symbionics intended to present pi/4DQPSK but was unable to do so due to illness. Request was made to allow inclusion of this as valid submission.

This was presented as motion: "For the case of pi/4DQPSK modulation scheme, the group will allow submission of proposal at next meeting"

Proposed : J.Edney, Symbionics Seconded : J. Renfro, Raytheon

Amendment: N. Silberman: "Submission should be included in first mailing so that it can be studied before next meeting". This amendment was agreed.

Voting: Motion passes: 16:0:11

Tim Blaney, Apple raised an objection to having mandatory support for the low data rate for devices which can support high data rate. His proposal is that the high data rate FH PHY should be separate - i.e. that high data rate devices need not provide low data rate support. His objections to dual rate are:

- ❏ Radios operating at 1.0Mbps will have difficulty detecting radios operating at 1.6 Mbps
- ❏ overall performance gain [may not be good considering the extra] complexity in a mixed data rate system

❑   Eliminate dealing with the "gear shift" at the higher PHY layer. Need to push it down to the PMD layer to help streamline the standard adoption process.

Motion presented by Tim Blaney, AppleSeconded by Kamilo Feher, UC Davis

"To adopt separate Physical Media Dependent (PMD) Layers for the frequency hopping PHY (FH-PHY). There will be a baseline PMD (FH-PMD), established at 1.0Mbps GFSK, and a higher speed PMD (FH-HS-PMD) with speed as yet to be decided. The FH-PHY may operate at either the lower baseline data rate of 10Mbps or at the higher data rate, where both PMD's will be considered to be 802.11 compliant."

Discussion:

J. Grau, Proxim: It is too premature to assume that we can't come up with an efficient scheme. Proxim has current gearshift scheme working. They plan to present this in March.

J. Socci, Nat Semi: This motion disagrees with the Denver decision -> "all units shall be capable of operating with GFSK".

N. Silberman : This needs more information and scientific analysis.

W. Moyers (chairman), WiSE: this issue should be submitted to the next meeting with more analysis. However, the proposed modulation schemes should assume that the current dual mode is in effect.

C. Feher, UC Davis: There are many examples where dual rate works fine. Also high speed modulation schemes are much more resilient to interference - it is not just a bit rate issue.

T. Blaney, Apple: Main concern is complexity and trying to get the standard implemented faster

Motion to table the motion indefinitely by Dean Kawaguchi, second Nathan Silberman

Motion passed: 29:0:4

Chairman proposed motion to adjourn: accepted

Session 2: 12 Jan 1994, 18:30

W. Moyers (Chairman), WiSE: We want to mandate that the primary and main charter does not change - the baseline is GFSK and we will look for means to gearshift speed with ability to receive GFSK and go to higher data rate that will give us good performance.

The chair ruled that group will stay with the premise to gearshift up even though Apple is proposing to present alternative. There has to be a way to demod GFSK while in High speed mode. There will be a flag in the preamble to identify higher speed operation therefore the preamble will also be at lower speed. After preamble system can transition to high speed for duration of pay load.

Kamilo : This means you must have a dual mode receiver.

Wayne: right.

Wayne's premise: this allows us to use the bulk of, if not all, the parameters for baseline frequency hopper PHY? Is it possible?

Nathan: We should take the existing document and modify for High speed - not write new document.

Kamilo: In direct sequence there is a precedence for this already.

Wayne: Let's make absolute agenda item for March meeting to study and propose what changes are necessary to baseline template: 93/R210

Ed,Apple: May need an additional preamble to accomplish this - it is could be a big change.

Nathan: Yes it could be more than a line or two but the intent is to stick as close as possible to this document.

Wayne - this is a guiding principle. Line by line doc 210 should match high speed template.

Ed: I really think this must be two different documents. Vendors don't want to have to read irrelevant parts of a standard - it should be a separate document

General agreement.

Wayne: What other guiding principles should we establish?

Kamilo: Schedule

Wayne: We already have a schedule.

Kamilo: but this should be objective not a must.

Ed: I thought that there would be a presentation of performance information for modulation schemes tonight.

Wayne: This should be presented at next meeting

Juan: Main thing is that the same format should be used for comparisons

Ed: No what I want is comparison of gearshift performance versus dual high speed PHY (separate high speed PHY). What is the loss in performance by having to keep the 1Mbps compatibility mode?

Juan: I can give rough number but each proposal should be calibrated. For doubling of speed you can get 60% improvement in actual throughput. It depends on the MAC implementation.

Nathan: We don't have enough information about the MAC yet to determine this.

Ed: What counts is the perceived speed measured by user for such issue as file transfer.

Wayne: Let's wait until March meeting before discussing this issue.

Chris: In MAC Meeting, Apple described a simulator which models MAC and some real data will come out of that. This looks like the MAC eats up 40% of throughput.

Ed: This means you get only get 16% increase in throughput for 50% increase in bit rate!

This is disputed by several people.

Kamilo - it depends on signal to noise ratio.

Jon - but isn't this issue really about comparing gearshift performance to straight high speed performance?

Ed: Basically If you can go at 1.6Mbps, why not go at this all the time.

Wayne - This is outside charter of the group - discuss in March meeting

Kamilo - Wants agreement that comparison of performance will be done on equal terms. If we only get 16% increase it is not worth it but I can show that performance overall is much increased when you take into account real noise environment. Therefore we should fix good comparison chart to reflect real performance comparison.

Juan: but it depends a lot on the model of the room you use

Kamilo - yes but this is real environment this is what really counts

Juan - yes but you cannot make a standard environment model - it is too complex and subject to local conditions.

Kamilo - but we should try to get a benchmark model

Wayne - We have existing document (number unknown) Criteria for Selection, 92/210

Chris - more important to compare BER sensitivity at different speeds

Ed- note that bit error in preamble can have major effect on the rest of the payload - error protection in payload would help.

Wayne (Chair) reviewed other agenda items:

Selection of submissions postponed to March Meeting

Vote on PHY preamble format for switching declaration -> next meeting

Review action on other frequency bands -> deleted as out of order.

Wayne - What are issue that should be reported to full PHY meeting? Nothing can get in the standard if it is not in the issues book.

Nathan - One issue is definition of CCA (clear channel assignment)

Nathan - maybe we can simplify the PHY by reducing intelligence in PHY

Wayne : How will be extract clock if we're not in GSFK mode?

Wayne: Assert that it is desirable that single rate receiver should be able to detect a high rate transmission during the payload.

Jim Renfro : Too hard to do.

Wayne: well we should study this issue.

Nathan - but it only matters if you wake up in the middle of a payload - probability is low.

Chris - but this will be common when in power saving mode where radio will be turning on and off all the time.

Nathan - wake up is slow - you can wait one packet length

Chris - this adds significantly to power consumption.

Juan: (New Issue) Modulation Proposals should cover: RSSI, Clock recovery & Preamble protection.

Kamilo : (New Issue) I want to modify charter to lower definition of high speed as 1.5Mbps. Need more practical definition.

Kamilo present motion: "To revise the wording in the charter of the high speed frequency hopping committee that the minimum rate should be 1.4Mbps instead of 1.5Mbps".

Second: Jim Bertelas

Vote: 7:3:5 - Motion carried.

Kamilo wants to reconfirm that no new candidates can be introduced after this meeting.

Wayne - This is already agreed.

Kamilo Moves: "This committee confirms previous agreement that there will be no new proposals"

Wayne - rules out of order.

Nathan Silberman proposed list of issues to be considered:

1. Impact of proposed modulation on CCA included in the list of criteria

2. Issue for DOC 64a, PHY group

- ❑ What is CCA?
- ❑ Functional partition between MAC & PHY

3. Impact of Proposed modulation on "Gear Shift" mechanism.

Wayne: Want to take vote on adding issue (2) to Doc 64a (to PHY group)

Tim: There is existing issue in Doc 64a about CCA

Nathan : yes its issue 25.8, but there is still not definition of CCA.

Tim: Maybe you should question wording of existing issue rather than adding new issue.

Wayne: Do we all support following up on this issue?

Tim: I think existing issue implies that definition must be made.

Chris: In MAC it is a binary issue - channel is clear or not. However, it has major effect of channel performance at PHY layer. How you implement CCA is a PHY issue.

Nathan: But there is no definition of "clear" is it "no energy" or "no signal" etc.

Tim: Best way to change issue is to make submission which cover the area of ambiguity.

Tim: I don't think that a binary decision in MAC will be enough based on today's meeting.

Wayne: Nathan will make list of points to be brought to the fore in this issue.

Therefore new issue will not be raised.

Wayne: recommend to postpone item 5. (review Draft specification for Higher Data Rate FH - DOC 93/210 rl and vote on it)

Wayne - item 6 is already covered

Wayne - item 7: Agenda for next meeting

Kamilo - would like to change scheduling of High speed meeting. Attendance in second evening meeting is always lower.

Nathan: would like to allocate joint meeting with FH PHY during regular time.

Tim: Will re-table issue of separate High Speed PHY or downshift at next meeting.

Wayne (Chair) presented revised schedule of group:

- Draft Std. vote - slipped to March
- Report and approval at full PHY subgroup - slipped to May
- Complete HDR-FH draft for 802.11 draft std editors - July 94
- New PHY 1st Draft Full working group meeting - Nov.

Wayne motion: "To accept dates as above"

Motion passes: 11:0:3

Wayne motion: Adjourn - accepted.