IEEE P802.11
Wireless LANs

Tentative minutes of TGa meeings in May 1999

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Monday 14:10 2/5/99

Naftali Chayat chairs the meeting, Tal Kaitz volunteered to take minutes.

Overview of comments related to preamble.
Discussion on C. Webster/ Andren comment on length of preamble

Chair shows agenda for afternoon:
- submission
- Liaison letters
- Comments processing
- Output to liaison
- Regulatory issues

Approved

Submission lists: 104-request to BRAN to sponsor .11 to ETSI
107- Proposal for Annex E (Tal K)
123- HP2 BRAN decision list. (Jamshid K)
115- Proposal for improved long symbol phase (Masahiro)

Jamshid to give an overview later (input statement)
No inputs from MMAC.

Comments addressing the preamble
Websetr's comment
1. No clear transition between short and long seq. Remedy: delimiter pattern
2. Preamble too short to implement diversity.

Comments by C. Andren addressing item 2.

Comment from BRAN
Replace short sequence with the one BRAN use: better P2AP and lower dynamic range.
Sign inversion of last seq. to be implemented.

Comment by Masahiro :
Phase transition between short and long may cause degradation in timing. Remedy: rotate long sequence by 3/4pi.

Masahiro gives an presentation on "Proposal for improved long symbol phase". doc 99/115
Comments by Tal + Bob W: applies only to specific solution.
Jamshid: Try to find a better more general solution.
Naftali: Not enough energy in 16 points. Co design short and long sequences.
C Andren : Use a unique pattern to detect short-long transition.

Jamshid presents: Hiperlan decision list (doc 112)
BRAN decided on preamble similar to IEEE MMAC.
Harmonization regarding several parameters.
Scrambling of pilot scramblers (maybe same pattern as IEEE)

Preamble structure
Interleaving: block interleaving
Pulse shaping vs. modulation: accuracy + mask (same as method IEEE, but perhaps different masks ?)

Preamble structure
Overview of HP2 MAC.
BCH preamble 10+1 long. length 16uS.
Uplink and random access 2 types (short and long -similar to IEEE))

Ad-hoc meeting to discuss preamble issues in parrallel with TGb.

Tuesday morning

- Chair presents doc 99/124 which summarizes yesterday informal discussion.
  4 types of comments were discussed:
  1. Short seq. section too short for diversity.
  2. No clear transition between long and short sequences.
  3. Correlator side lobe.
  4. Better sequence available: BRAN B seq

- In doc 99/124 Naftali presents a timeline for diversity/agc/aqcuistion process. Basic points
  for Eb/no=6 dB SNR=14dB (@ 16sqmples):
  1.6 uS used for coarse timing and comparison

Two scenarios
1. Detection of short-long done by correlating for long subsequence template. processing can continue after transition
2. delay/multiply detection. We need last 1.6 us of short sequenceand antenna should be settled before that.

For case 1: Presentation and discussion.
Naftali conclusion: For gain settling <0.8 us diversity is possible (but ambitious)
C. Andren: 0.8 uS is highly ambitious. 8 uS is more likely.
For case 2: Presentation and discussion
Performed under BRAN assumptions. (gain control).
Overall time (w.o. calculation) require 8uS.

Naftali's conclusion: The present structure is more adequate for diversity and is the only one that converges in 8 uS.
J. Kowalski: We need to know the prob of detection (not specified in standard)
C. Andren: Minimize overhead by not extending preamble is important. But design is very ambitious. Is liaison with other bodies so important ?
Naftali: Liaison is important but not critical. We should be carful in inserting changes. Discussion shows that it is possible. This is a proof of existence and we should not induce changes.
C. Andren: Because of scanning we loose 1 antenna. Also there is delay in SAW filter. Until he sees an implementation of such equipment he will remain skeptical.
D. Kawaguchi: Is there any data to estimate gain from diversity?

Chair: We should make 2 decision: Should we invert last seq? Should we lengthen signal?

Peter E: About inverting: Are there any other suggestions from BRAN or any further discussion?

Jamshid: 2nd issue is more important. If it is decided that 8u is not enough it should be increased. After that we should decide on inversion.
Naftali: first decide on inversion. Because it would influence detection method.

Motion 1
C. Andren: Move to invert last symbol of preamble. 2nd by Al P.

Motion 2 by peter E (John Kowalski): To table this issue to Wednesday afternoon so we can consider it more. second by Tal K.

Debate on motion to postpone:

Peter E: Not enough information before making a decision (regrading motion 1)
Naftali: what kind of information is needed? Speaks against postponing.
John K.: We can't get better information by Wed.
C Andren: Lets compare situation to TGb. We need also equalization.
Naftali: Done by long section.
David S: Motion 1 can be discussed now.
John K: Timeline gets worst if you invert. Question is whether it is long enough. But I'd like to see that.
Naftali: We have enough info regarding that.

Motion # 2 to postpone 0-7-9 -> fail.

Motion #1. 2-5-13 ->fails.

Naftali: Now we should discuss length
John Kowalski: We should also postpone. We need information on that affects detection and error prob.
B Ward: Is there data that was brought before?

Naftali: bringing data should take couple of weeks. Maybe
Peter E/ Bob Ward

- **Motion #3** Table decision on length Until May 26.

B Ward: What action should we take on 26 May?
Naftali: We should bring data by that time
Harry W: We need someone to do the work
Naftali: We have already at least one.

9/4/2 -> passes.

- Naftali: Proposal by BRAN to change training sequence by BRAN. It was presented by R. Bohenke from Sony. It has some better properties.

- Naftali: This is also a good point to increase power of preamble. Because power of preamble is about 13/12 lower and because of low p2ap we can increase preamble power

- **Motion #4**: Tal K./Yuha: To change the sequence according to BRAN comment #22 in

Tal K: Is the B sequence is a decision in BRAN?
Jamshid K Yes.
Naftali: I speak in favour
Vote 9/0/10 -> motion passes.

- About power of preamble:

Jamshid: Maybe postpone decision
John K: Postpone to MAY.

- Masahiro's proposal:

Naftali: We shall reconsider in lieu of motion 3.

- Interleaver issue:

Naftali: Take a look at comment 14 and draft 4.3 and replacement text.

LUNCH

Tuesday 13:00

Chair presents a text for correcting the interleaver in draft 5.0. This is text for as appears in the comment file.

David S: Need more time to look into suggested Correction.
Naftali: This is a correction to DRAFT 4.0
Bob O: We'll have time to look at it during ballot process

Bob W: Is the first step as in draft 3.0?
John K: This is the text that relates to Annex E

- **Motion #5**: Bob O/Hitoshi move to incorporate the inter. description text, as provided in suggested resolution comment, into the standard. 14/0/3 -> pass.

Comments by David S + Kazuhiro:
Rate field to be moved to front.

- **Motion # 6:** Change the order of the bits in the SIGNAL field into R1-R4 and then the reserved bit, and the length lsb/msb.= parity, tail. Kazu/Jan B 11/0/5.

Naftali: Also the diagram should be flipped left to right for direction of time.
Bob W: I want to see clear definition of LSB and MSB.

Comment by Bob O: The PHY is not aware of CRC32 and it should not be mentioned. (comment 10)

No objection to remove relevant text => comment accepted

- Comment by Bob O: regrading table 80: too much information. Not needed here. This is the only place that connects coding + modulation to rate.

Naftali+Jan: look at table 79
Bob O: The only normative info in table 80 is the R1-R4. Normative info should appear only once.
Peter E: Add R1-4 info to table 79.
Bob O: either have 2 col. in 80 or add R1-4 to 79.

Naftali: Defer to editor and discuss later after viewing changed text.

- Comment by Bob W: definition of number of symbols in equation 11 17.3.5.3 (non integer results add floor or ceiling function)

Naftali presents new text which includes ceil() function.
Editor will change text.

- Comment 34 by Vic Hayes: Octal notation by conv. encoder

Naftali: octal notation is common in conv. code literature and proposes to keep as is. Also a table is there to explain.
Vic agrees to withdraw

- Comment by Bob O: Why only 1 regulatory domain?

Naftali: Only 1 regulatory domain open to us. We had a text that speculated on other domains but it was deleted after a comment by Juha.
Bob O: So this is a US standard
Naftali: For the time being, regretfully, yes.

- Relevant comment by Mike Trompower:
- Comment by Bob O about TXVECTOR in table 76. Naftali proposes text change
- Comment by Bob O: about TXVECTOR in table 77: There are 4 fields but only 2 (RATE and LENGTH) have explanation.
  Editor should add description

- Annex E comment by Vic on behalf of Tal K.

Bob W (also comment in file) window function in Annex E is informative.
Naftali: Would it suffice to add a note saying 'informative only'.

Motion #7: Bob W / Kazu To incorporate the text of doc 99/107, with the changes arising from the changes in the standard draft as an Annex to 802.11a.

Bob W: The puncturing is ¾. Should we include an example of rate 2/3 and 64QAM.
Naftali: Example is an example. It cannot cover all cases.
11-0-5 passes.

Wednesday 4/5/99 8:45

Naftali: Go through updated draft Hitoshi prepared that incorporates changes due to comments.

Discussed corrections
Intro: mandatory rates at intro
TXvector correction
Txvector SERVICE
17.2.3.3
17.2.3.4
figure 107
17.3.2.1

17.3.4 Signal Field: The word training should be deleted.

17.3.5.6 Interleaving:
Bob W + Dean K: We need figures to make interleaver absolutely clear.

17.3.12
Move line 31-32 to after line 13. Remove sentence: "The intended duration…"
Successful -> receivable (line 30)

OF3
Bob O: Withdraw comment

Discussion on the need to include diagram for the interleaver section
Chair shows Dean's doc 99/75
=>Take it offline.

- Bob W: Conv encoder on 17.3.5.5 It is not clear which goes first A or B.

Remedy: Split the sentence on line 42 to: "…figure 116. The bit denoted as A shall be output of the encoder before the bit denoted as B"

- Comment by J. Fischer:

Naftali: Possible interpretation of comment: "Add channel dependent backoff " to the standard. But this should be left to the implementor.

Comment by Anil K.

Wednesday afternoon

Naftali discusses parameter for analyzing the feasibility of diversity in TGa. This is for discussion to be held on May 26. The purpose is to determine length of preamble.

Naftali presents a document (preamble consideration) which describes the H/W model used for the simulation: Switch, filter (17MHz @ 3dB delay 0.5us), variable gain amplifier (idealized), amplitude modulation, delay (0.3us for pipeline delay, VGA delay), base band processor.

Naftali: Discusses A/D resolution. If A/D resolution is not limited there is no penalty for too low gain. Suggests 7 bit.

Carl A: Not sure about block diagram. What's the role of the limiter? For AGC we need high drive for cases of saturation.

Naftali: We need to limit ourselves to simple model.

Carl A: Problem is complex and difficult. We need probably IF measurements (RSSI) for rapid convergence.

Naftali: After defining framework teams should perform simulation under following scenarios:
Channel [AWGN , flat fading, 25 50 100 150]
Preamble length 8,12,16 usec.
External supplied or estimated timing.

Data will be supplied with genie-aided diversity, signal selected and no diversity

Naftali: How should we decide? Initially we did not consider diversity.

Carl F: We should allow the option for implementing diversity.

Naftali: We should set the target rate.

Al P: Diversity is important from market perspective

Carl F: 24Mb/s case is easier. But the fall back 6Mb/s is the hardest. We may loose fall back.

Naftali: Increasing preamble length will effect all frames. Insuring diversity for 6Mb/s conditions is wrong.

Peter E. ETSI case is even more difficult because of lower bitrate.

Naftali: ETSI case is different. The point how much should we loose in the limit SNR case before degrading throughput in all cases.

Bob W: We should decide on detection (acquisition) prob per case so as not over design the system.

Naftali: This is included in PER parameter and in how it measured.

Bob W. The test procedure should be included in standard. The definition is ambiguous.

Discussion on how to define the test.

Jamshid: How did we got here anyway, this is another debate.

John K: Do we really need all those delay spreads. We need to decide if diversity is possible for optimal AGC for sensitivity in standard.

David S: This can be calculated no need for simulations.

Naftali: Let's limit to one scenario: 6Mb/s, flat fading, independent fading. PER vs. Eb/No

Peter E: I want to see in it 24Mbs. Maybe null one antenna.

Naftali: Let's compare AWGN in one antenna and null in other. This will test decision process

Jamshid: But that way we bring in account specific algorithms.

Straw Poll: Who thinks that with the data we have now we can use 8us? -> About 2/2

Jamshid: ETSI decided to lengthen the preamble for sake of harmonization. We should look at it more carefully.

Bob W: From decision this week we deduced that inverting last is no good. We need same discussion for length of preamble.

Chair: We shall reconvene at 9pm to further discuss these issues.

- More issues: illustrative figures for interleaver.

Naftali+Hitoshi presents comment resolution.

Several comments are resolved online.

- Comment on inversion of last short sequence.
- Mark W. comment on length of preamble.
- Comment by BRAN: to invert last short sequence. Asking BRAN not invert last sequence. This will go into Liaison letter as well.
- Comment by BRAN: Short training sequence -> accepted as suggested.
- Masahiro Comment: About changing phase of long section. Did Masahiro check with new seq?

Masahiro: New sequence will not give good correlation output even with rotation of 2pi/8* n. Naftali: We have no new data so we can close this issue for now.
Masahiro presents results on correlation.
Naftali from results it seems no benefit is achieved by phase rotation so suggest to maintain current phase relation. Further discussion on this scheduled to tomorrow.

Chair asks if objection to continue until 6 PM. No objection -> Adjourn at 6pm.

- Normative vs. Informative comment 28 by Bob O: 5 shall added.
- Comment #29 bob O delete R1-4 form table. accepted
- # 32 Bob W ceiling function added
- # 33 Vic H editorial – accepted
- # 34 Vic H octal representation of generators – rejected
- # 35 Vic H. Interleaver issue: accepted
- #37 D.K figures pertaining to interleaver to be resolved
- #66 KO RvN Interleaver -accepted
- #40 VH interleaver –accepted
- #41 Mike Tromp: regulatory domain. -> Not accepted. If any desire to see immediately what is the band for which the PHY is applicable it should be done in the subband capabilities. Is there doubt about that response?
- # 67 J Fischer: About specifying backoff. Chair prompts for a polite response. The suggested remedy calls for a method to meet regulatory specification. This should not be done in the standard but left to the implementor.

Naftali: did we address correctly? Suggestion for other wording -> none.

- #44 S. O'Hara – belongs to TGb not to TGa.
- #64 V. Zelenty:
- #48 V Hayes D4.0b –accepted
- #68 Anil S: wrong reference. Naftali: This is correction in mother standard.
- #49 Does CF7 refers to DS or OFDM. to be checked off line.

Adjourning at 6. We still have some to process/display. We shall continue on preamble length at 9pm. Also discuss Masahiro phase rotations.

Meeting Adjourned. Meeting tomorrow after TGb.

Thursday Morning

Chair discusses result of last night informal meeting
About preamble: Decided not to go to simulation campaign. A time line which showed convergence of antenna diversity in today's technology. Future technology will enable cheaper lower power implementation of diversity. More relaxed implementations today can be made w/o diversity. For these we decided to not to increase preamble and not to start a simulation campaign.

Chair reads proposed response: To reject the comments by Carl A. and Mark W.

We need to take a formal action about our decision to table the relevant question until May 26.

Motion #8: Hitoshi/Kazu: To reopen motion 3 "To table the short sequence preamble issue Until may 26, by which time data should be provided to support the decision. The criteria for comparing the alternative shall be set by the end of the May meeting"
12-06- passes

Motion #9:kazuhiro / Hitoshi:
To resolve the comments #18 by Mark Webster and #20 by Carl Andren regarding short training sequence duration as
"The primary goal of reliable operation with one antenna is met by the 8 microsec short training sequence. We have outlined a timeline (see doc 99/124) which shows that with an ambitious (by today's technology) implementation it is possible to implement antenna selection diversity with an 8 microsec preamble. This opinion was supported by an implementation experience of a similar system and simulation results presented for relevant scenarios. In addition, having a single antenna reception does not preclude implementing antenna diversity switching on a higher layer (not on a per packet basis). Given this data and the reluctance to impose a throughput penalty on all implementations, we decided not to change the duration of the short training sequence from 8 microsec."

13-1-5 passes

Chair discusses Dean K comment about diagram for interleaver. Suggested solution: The interleaver is outlined in Annex G. We need to add reference in text regarding Annex (Actually in other places in standard).

- Chair discusses comments #24 by Masahiro: Phase of long symbol. The response: We changed the short sequence. We saw that with the new sequence, no phase rotation had a low correlation peak. Also this criteria (absence of peak) for low SNR is not good. For that reason reject.

Masahiro: Propose another sequence with same peak to average as BRAN sequence but better corr. Masahiro presents correlation figures. Draft 5.1 sequence has high correlation peak in location of missing peak. New sequence has lower correlation in
Talk: this was obtained by cyclically shifting B16 by 4 and rotate by pi/2.
Naftali: This is actually BPSK. It same symbols as long seq.

Jamshid: This applies to one specific algorithm.
Jamshid: You raised other sidelobe.

Tal K: There is also advantage of low peak near main peak
.
Jamshid: I'm not sure there is no harm because it affects correlation and F.A. probabilities. Also you rejected another solution for short to long transition. Have to check with BRAN members.

Dean K: All acquisition issues are inter- related.

Tal K: There should be little harm because the seq. was merely shifted and rotated.

Jamshid: We should not decide now.

Dean K: What to we get if we invert last solution

Naftali: I propose you submit it to consideration of BRAN. Then it can be submitted during next ballot.

Jamshid: Our next meeting is in two weeks. I hope we can get input by that time.

Naftali: first you get formal request by IEEE: One about inversion one about this.

Continuing with comments
- Comment by John Deane about section 17.2.2 page 9/45: Null bits-> reserved bits. Already corrected

- Comment by John Deane: Boxes Mapping S/P and demapping P/S should indicate also interleaving/deinterleaving function. Suggest: Replace text in box to interleaving and mapping. No objection.
- Comment by John Deana clause 17.3.11 pp 37/9: Not a clear sentence. Delete sentence. no objection.
- Comment pp 42/ 4 flow diagram. Cause for CS/CCA not given. Also distinguish between.
- Comment by John Deana: Describe preamble processing. Response: The intention of each part is mentioned but it is not the purpose of the standard to specify implementaion. -> rejected. No objection.
- Comment by John Deane 17.5.5.2 : Mechanism to transfer of SIGNAL after CCA/BUSY.. : Not clear what reviewer meant.
-

- Comment by John Deana pp. 15/1 Does this mean it is an implementation issue…". Availability of RSSI is internal issue of implementation, which does not come into effect until PLCP requests for it.

Announcements before adjourning -> no

Adjourning at 12:00.

Reconvene at 15:30. At 1pm informal meeting discussing flow-diagrams related comments.

Thursday afternoon

Last TGa meeting this week.

Report on processing comments by informal meeting.
Does anyone objects or sees any harm? -> no

We have a comment resolution file distributed doc 112. The left section should look at pages 1-20. The right section should look at pages 1-40.

Motion # 10 Peter E/ Bob O
To approve resolutions given in doc 99/112r1 and to empower the comment resolution teleconference planned for 28 May 1999 to resolve any additional TGa comments.
11/0/1 – pass

Motion 11: Hitoshi/Bob Ward
To submit the draft 802.11a to sponsor re-circulation ballot after incorporating the comment resolutions in doc: 99/112r1 and any changes decided upon by the comment resolution teleconference planned for May 28,1999. This is subject to approval by the participants of the teleconference WG members. There is no quorum required. The comment resolution teleconference shall only resolve any additional comments from balloter's that have not submitted their votes.

13-0-1 passes

Peter E: There is need to protect against comment that will be submitted before GMT 12:00 tomorrow and have been responded to this week.

Naftali: If anyone who voted no, and changed his vote to yes in response to remedies taken this week, please resubmit with a yes vote.

Liaison letter to BRAN doc 99/104:

Naftali reads letter asks group to submit to ETSI via BRAN

Vic H Who can be at the Sophia –Antipolis BRAN meeting and support.

Juha: Are we asking BRAN to adopt IEEE802.11 standard as wireless Ethernet standard?

Naftali: We are asking BRAN to sponsor our request within ETSI.

Jamshid: The most important issue is that ETSI has its own wireless Ethernet standard and there are announcements of Hiperlan 1 products so there's a problem.

Naftali: Within BRAN: Will it be support because of similarity which is higher than with respect to Hiperlan 1?

Motion #12 Peter E/Tomoki
To forward document 99/104 liaison letter to BRAN.
12/0/1 passes.

Liaison statement to BRAN and MMAC doc 99/105:
An update on status of 802.11a 5 GHz OFDM PHY layer.

Jamshid: Jan Kruys is currently chair of ETSI Project BRAN

Statement include of list of changes:

- Increase of preamble to 10 repetitions upon MMAC request
- Short training subcarrier phases. Proposal by BRAN. Accepted by IEEE. IEEE did not accept the proposal of inverting last symbol
- Coupling RF and sampling clocks – BRAN proposal
- Scrambled pilots – following a comment by MMAC
- Additional interleaver permutation.
- Rotated the BPSK symbols to be aligned with the 'I' axis
- 802.11 related parameters: SIFS, Slot time, and order of bits within header.

Thanking BRAN/MMAC for cooperation and encouraging further comments
Status of ballot and intended sponsor ballot.

Cross-Comitee IP issues:
We are not aware of any IP related to specific changes.
We shall contact 802.11 members and all bodies that declared IP and ask to reassure fair play also to BRAN/MMAC. Ask BRAN/MMAC do same.

VicH: Asked Jim Carlo about this and he came back with a letter saying: 'Vic you've got over board. We're not to handle IP issue, which are related to other bodies'.

Jamshid: I don't think its necessary to send letters but I don't know how to solve it. But we need to assure that IP owner would be non-discrimantory, etc., also to ETSI and MMAC impelementors and vice versa.

Vic H: I should consult Mary (IEEE IP manager)

Peter E/ English problems with letter.

Naftali: suggest: "We shall look into finding a long term solution of IP issues relating to IEEE standard"

VicH: Even that is doubtful

Jamshid: Few sentences in liaison statement won't solve the problem.

The modified doc is 105r1

Motion #13 Peter E/Masahiro
To send liaison document 105r1 to BRAN and to MMAC.

Hitoshi: When will the letter be sent with draft 5.3

Naftali: Should we send a temporary now or the final in a couple of days?

Naftali: We shall try to finalize a draft today and provide

Jam: We need interleaving and pilot scrambling. If it's in then it's enough.

Motion #13 -amended Peter E/Masahiro
To send liaison document 105r1 to BRAN and to MMAC with a change stating that D5.2 is attached and 5.3 will be provided soon.
11/0/1 –passes

Any other issues?

Adjourning at 18:00.