IEEE 802.11
Physical Layer Group

Meeting Minutes (Leiden, NL)

Date: **May 12, 1992**

Substitute Chair (for Larry Van Der Jagt): Bruce Tuch

Start of meeting 8:45 am

Nathan Silberman started presenting contribution IEEE 802.11/92-54, Frequency Hopping Spread Spectrum PHY.

After the first page of Introduction, Requirements and Frequency Hopping questions started:

John McKown: How will data rate and modem rate be related? There is an inverse relation between spreading vs data rate.

Bruce Tuch: Spreading is done for interference and multipath tolerance.

Nathan Silberman: Spreading in this presentation also is used to share bandwidth.

John McKown: For the European Wireless LAN (HiperLAN) 100 MHz and 5.2 GHz - coordination rather than incoordination. If Spread Spectrum for multipath and interference protection then less at high data rates will be possible.

CHAIR asked for Nathan to continue presenting paper.

Nathan Silberman finished going through the Specifications of the Frequency Hopping System.

Bob Buaas: I think the BER of 10 E-7 should be at least 10 E-7.

Bruce Tuch: This error rate assumes gaussian noise but the system will not be noise limited.

Bob Buaas: We should add TX power out, Sleep Mode control to the MAC interface.

John McKown: Power levels in standards (Europe) will go down; for example the Altair system at 15 Mbps uses 10 mW ERP.

Bruce Tuch: At the Mac/Phy interface we should specify the outage probability (due to multipath) for a hop. What is the hop interval you specified Nathan?

David Leeson: FCC will reject < 100 ms hop time.

Nathan Silberman: Smarts can be put into the MAC to improve outage...

David Leeson: At maximum range a 20-30% retry rate could be possible

Bruce Tuch: I suggest that we create a MAC/PHY interface specification.

Bob Buaas: Channel center frequencies tolerances need to be specified for physical systems.

AFTERNOON BREAK END OF Nathan Silvermans Presentation and discussion.

Afternoon Start 2:00 pm

John McKown gave a on written presentation concerning "Channel Modeling drawn from Altair":

Reflection is a special case of scatter. Shadows get harder as frequencies go up
Conceptual: Treat the indoor radio model as optical (ray). Imagine a light match at night in a glass walled office. You see a lot of matches. Now replace match (omni directional antenna) with flashlight (directional) and view through a tube. See individual flash light.

Most indoor channels have separate "peaks" above a diffused background for the impulse response. Indoor surfaces tend to be smooth and big (mirrors). In this environment echoes are deterministic in nature (not a "flickering channel"). Also the delay spread parameter alone is not a sufficient performance parameters, some modulations disrespect rms delay spread.
It is important to model the channel correctly, including the time-variant nature, for the environment one works in.

Presentation Ended.

John McKown: I can submit a good channel model/simulator and will start at next meeting.

David Leeson: Transverse equalizer would also work if it knew channel characteristics.

Johns McKown: IEEE Network Mag of several months ago is has a article describing Altair, ray-tracing and the licensing.

David Leeson: the Channel is deterministic, though some statistical variables it is learnable.

Bruce Tuch: The channel coherence time is important..Channel model from Telecom/NCR will be submitted.

John McKown: Altair has 6 antennas in TX and 6 antennas in RX. The probe at 42 Hz for best antennna (channel) by using eyepattern assessment.

David Leeson: MAC will adapt to PHY, not vice versa.

Break till Tomorrow for MAC/PHY interface brain storm

Meeting Started 14:15 5/13/92

Objectives:

PHY-MAC Interface "Frame Work"

-Define Next Contributions and Issues
-Contribution list for next meeting

Bruce Tuch: Data flows between MAC and PHY what else?

John McKown: Where is relay handled? It would be nicer for the PHY to do that?

Nathan Silberman: Are you asking for routing?

John McKown: Should a table/data base be in the PHY for this purpose?

Bruce Tuch: What about staying consistent with ISO?

John McKown: Should the PHY group have an opinion on the Table/data base? Also what is the commitment of the group to have Isochronous Services (VOICE)??

Bruce Tuch: We are supporting time bounded packet delivery service. Where is packet relay and the Network Management Protocol. has not yet been fixed.

John McKown: Anything that can be automatic should be done (smart node).

Nathan Silberman: Ask MAC for transmission attempt, give your packet and I'll take care of it THAT'S ALL.
Three classes where presented by Nathan:
1   Related to data
2   Control to the PHY
3   Management Information (Two Way)
            Network MGMT

            Status of the packet
            Signal Quality/required for Network MGMT

[Bruce Tuch Starts writing down signals which have been mentioned]

Interface Signal	Class
Signal Quality	Data
Jabber control	Control
RX signal power	Mgmt Info
TX signal power	Mgmt Info

What else?

Nathan Silberman volunteered to make a PHY/MAC interface foil and started on it. The following discussion ensued:

John Christensen: What about doppler shift?

John McKown: Table update..does the MAC care about it?

Bruce Tuch: MAC provides the defined services to the MAC...this must be set first.

John McKown: Data transfer rate- where is it defined?

Nathan put up the foil (See Attachment 1).

John C: What about security?

Nathan Silberman: It is a PHY issue.
Bruce Tuch agreed.

Gary J: He thought it was not a PHY issue.

John McKown: NCR submitted security document to RES 10.
                    Encryption = Security

Nathan Silberman: Encryption should be handled at a different level.

John McKown: General comment...Felt that a small group of individuals in this 802.11 group have a lot of power.

Bruce Tuch: It is an open group..do you have a problem?

John McKown: No, just an observation...
Where are acknowledgements handled?

Bruce Tuch: I think in the MAC. (Chair gave a short review of 802 stack..MAC LLC)...802.11 can define the PHY MAC Interface with Ack if they decide it is needed.
John McKown: Where is the address table?

Bruce Tuch: This is a MAC function (use MAC field address information).

Gary J: In general the PHY = real time focus while the MAC = State Machine/table bases.

Bruce Tuch: When roaming what does the PHY need to know?

Bob Buaas: Handover co-ordination should NOT be in the PHY.

John McKown: Should do everything that you can on the PHY.

Bob Buaas: Use the term "handoff" in stead of roaming.
This was agreed to by the group

Bruce: Handoff between "orthogonal" access points is necessary.

Buaas: We must limit the responsibility of the PHY to have/lost signal.

John McKown: MAC must have a contingency plan "headed for an edge" or such.

Bruce: We should now try to get the issues for the MAC/PHY interface.

Richard Parker: I will write a list of issues on a overhead.

K.C. Chen: Some overhead for the MAC will be needed that is not trial for handoff.

Bruce: I don't know if we must deliver "seamless" handoff.

K.C.Chen: Transition time is not a trial time

Don Johnson: Requirements group is the proper people to decided on seamless issue.

Buaas: *Motion-* **We open an issues list and use the mechanism adopted by the MAC group to process the issues.**

2nd: Nathan

y	n	a
16	0	1

Passed

R. Parker foil shown and discussed. (See attachment 2)

[Data Agility discussed]

Nathan: The PHYs should negotiate the data rate (one option) or MAC intervention also (another option). ISSUE

John McKown: MAC is only interested in "class of service". If these are determined by the PHY maybe PHY should negotiate with the MAC. May have to do this in a medium dependent way.

Bruce: Difficult to negotiate on a packet basis.

John: In this case you also maintain "time bounded" services. Shouldn't we negotiate for this service?

Buaas: "Push info up"

[Which Antenna now discussed]

Bruce: I think this is an internal PHY parameter.

John McKown: Diversity signal should be on the interface.

Nathan: Must make decision in PHY during preamble-need quick decision.

Buaas: Should be pushed up to MAC. Have seen it done both ways keep this and ISSUE. MAC with two complete receivers at its disposal?

R Parker: Also MAC may know what other end expects.

[Timing/Equalization and historical information]

John McKown: Know velocity of mobile for example.

Parker: Who send/receiving to whom.

John McKown: Conceptual difficulty...one MAC with several PHY's. MAC shouldn't have to recognize the many PHY types.

K.C. Chen: 10 ms is about the timing range for history information.

Nathan: PHY configuration?

McKown: "PHY Status Word" delivering PHY type.

[Chair puts up Issue procedure foil, see attachment 3)

[ISSUE Distribution and Access Points]

1.   Same Channel/AP   Solve "reach problem"
2.   Different Channels/AP   Solve "Capacity problem"
3.   Both
4.   Multiple Channels/AP

McKown: The coverage areas are full of holes. Item #4, multiple channels, is the same as diversity.

Buaas: I disagree with that.

K.C. Chen: Don't use them "together"

McKown: Guess we don't mean the same thing (diversity not equal to multiple channels/AP)

Nathan: What is seamless? This is an ISSUE.

[ISSUE Diversity]

McKown: Independent source of structured frame, redundantly received.

John Eng: Is it unique to the PHY, if so keep it at the PHY.

Other issues where listed:

[Power Control]
[Definition of Seamless]
[Security]
[PHY ID]
[Network Mgm]
[Packet trial #] is this information needed by the PHY?

[See attachment 4 for Issue foil]

Bruce: Asks if we need another PHY meeting tomorrow or should a joint
(Chair)   MAC/PHY meeting be more effective?

K.C. Chen: I agree with a joint meeting.

Conclusion: Put off decision until morning (talk with MAC).
[A joint meeting was decided upon the next day].

CONTRIBUTION LIST for NEXT MEETING

1.	Microwave Channel	McKown
2.	MAC/PHY Interface	Bruce
3.	Direct Sequence	Buaas
4.	Selection Criteria	
	for F Hopping Pattern	(K.S. Natarajan)
5.	DS vs slow Freq Hopping	
	Comparison	K.C.Chen

Motion Bruce:
Don't meet Monday July 6 as PHY group:
Second Don Johnson

Y	N	A
5	0	8

Motion **passed**
NO PHY Meeting Monday July 6 at Plenary meeting.

Meeting Closed

MAC /PHY INTERFACE

SIGNALING CLASSES

   1. DATA

   2. CONTROL

   3. MANAGEMENT INFO

DATA:
- TX DATA
- RX DATA
- DATA CLOCKS
- DATA SIGNAL VALID

CONTROL
- FREQ. CONTROL (WHERE APPLICABLE)
- POWER CONTROL
- JABBER CTL
- SLEEP MODE
- CHANNEL CONTROL
- TX/RX

NeT MGMT INFO
- CHNL. AVAILABLE
- SGNL. QUALITY
- RX POWER LVL
- SYNTH LOCK
- FAULT

Attachment 2

Phy MAC Interface "framework"
- objective Define next Contributio
- Topology framework
- Contribution list next meeting

① Are we considering time - slotted systems ?
     ⑭ Synchronize MAC and PHY for slotted
         transmission
     ⑮ MAC tells PHY to adjust slot start
     ⑯ PHY Tells MAC where slot started
② Are we considering Data Rate Agility ?
     Initial Data Rate (Modulation)
     Final   "   "   "
③ WHICH ANTENNA
④ Channel Sense / Information
⑤ Timing/Equalization historical info
⑥ Reception report   SNR BER ._..
⑦ Phy Configuration

Issues

① ESS AP AP
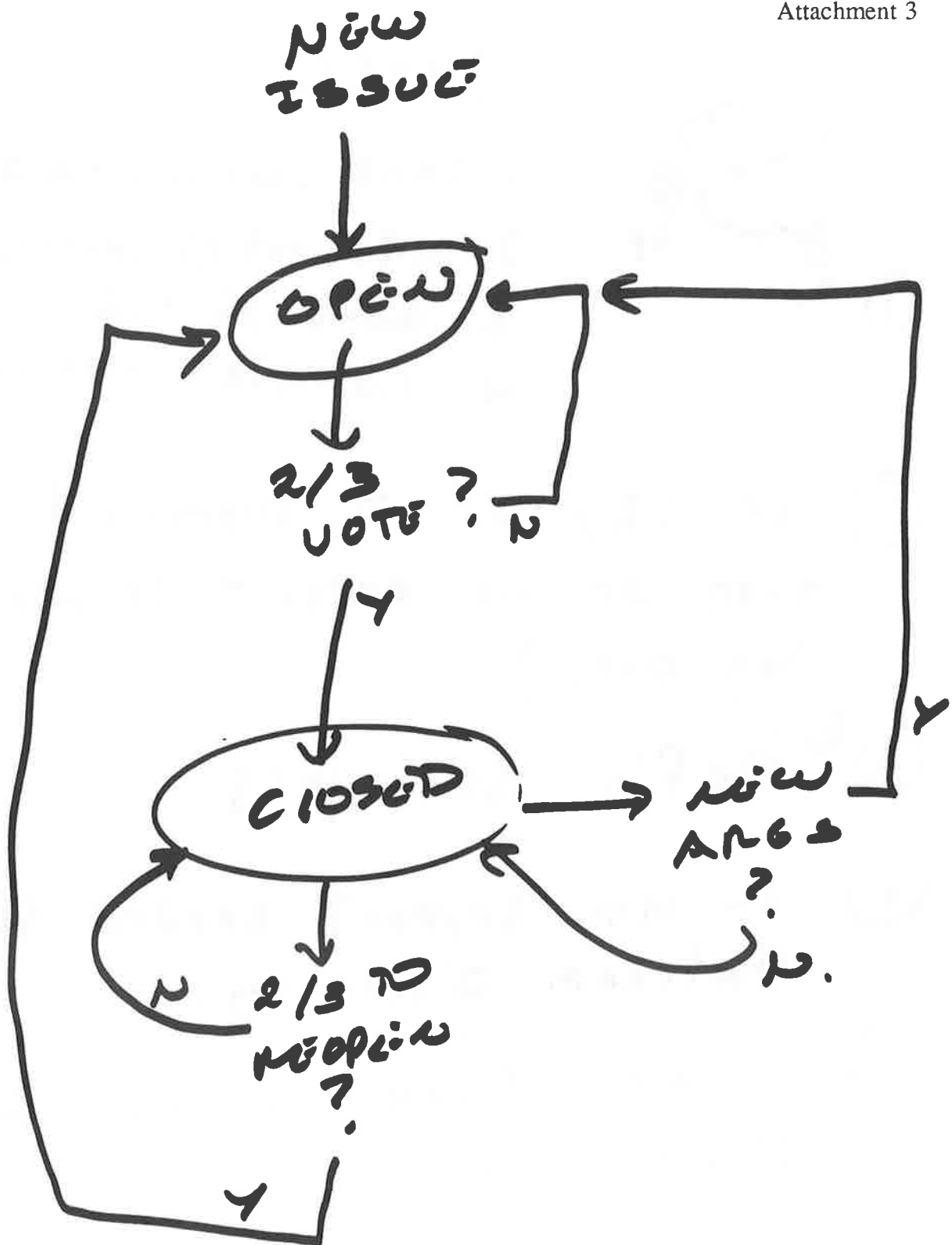
1. Same channel / AP
2. Different channel / AP
3. Both of 1&2
4. Multiple channels / AP

② If 1.2 / 1.3 / 1.4 supported then do we support seamless ✱ handover?

③ Define seamless

④ Is MAC support needed for Antenna Diversity.

⑤ Is MAC support needed for power control.

⑥ Does the phy perform or support the security function.

⑦ Do we supply a phy
Type to the MAC ?

⑧ Is MAC/phy exchange needed
to Supply Network MGM
Information ?

⑨ Does the MAC supply a
packet trial number to
the phy ?

⑩ Is DATA Rate Agility
only a phy matter ?

⑪ what are the environments
including station speed.