MAC/PHY Joint Meeting Minutes
Wednesday, July , 1993

The meeting was called to order by Vic Hayes at 1:10 PM. Carolyn Heide secretary.

(1) Announcements

Standards distribution for voting members 1 - 5 PM

Meetings tonight: 5 PM until 8:30 PM higher speed FH PHY ad hoc group, 8:30 PM PHY DS group.

(2) Presentation of Submissions

The Importance of Power Management Provisions in the MAC, P802.11-93\94,
by Wim Diepstraten, presented by Don Johnson

Purpose of this submission is to set up a framework for understanding importance of power management in wireless MAC

Discussion: none

The Need for a Flexible Standard, P802.11-93\108, by David Bantz

Form of presentation - try to convince you that there is a need for a degree of flexibility in the system design, MAC and PHY that may be wider than you have thought. That may cause concern about added complexity to development and implementability that need not be true.

There are other service providers already existing that provide a wide flexibility of services and we don't want to loose to out to them.

Has been involved over last 6 months in a strategy determining effort at IBM in the wireless area. The knowledge gained of paging system was very interesting - there power conservation is the most important thing. Some of the techniques employed there are remarkably similar to those in the previous presentation.

Discussion:
Peter Chadwick: TDMA is having difficulty in Europe with EMC. Some EMC immunity is a standard requirement. There is a move to bane DECT and GSM in Norway. To what extent do you think a TDMA is going to give us more problems than a non-TDMA?
Dick: this come completely out of left field to me - why is TDMA worse for EMC?
Peter: 100% pulse modulation AM, gets into low level circuitry of low level amplifiers and gets rectified. Happens to telephones and answering machines. Nice edges in your logic lines.
Dick: repeated use of medium is not expected in CSMA.
Peter: equipment getting interfered with is badly designed is the problem.
Dick: we cannot avoid TDMA - digital cellular, packet radio. Let them be the snowplow for us and push that bad equipment out of the way. The other answer, confronted also when considering the issue of health and safety - limit the amount of transmit power, use directional antennae. Have a chance to control affective radio power with directed antenna. Sorry if the answer is not satisfactory.
Peter: this is an area to bear in mind because there are no immunity requirements in the USA.
Tom Baumgartner: if the periodicity is the problem, versus randomness of CSMA, the proposed MAC protocols have all added periodicity to their CSMAs to accomplish TBS, so there is no difference anymore.

Dick: prefer not to view this as adding a vice to a vice-less systems, but as evidence of convergence.
Dave Bagby: just saw a presentation that said TDMA is good, and I understood it, but - what aspect of the presentation addressed something that needed to have the joint group to hear that opinion?
Dick: wanted everyone to hear that the need for flexibility is good. There was a straw poll in the MAC group yesterday on the need for isochronous support, and a substantial number thought no. Important to get out notion that people want to use wireless systems for lots of things, maybe most importantly TBS.
Dave B: I can understand looking for the biggest audience when making a sales pitch.
Dick: intention was not to make a sales pitch. Trying to say don't worry about need for multiple services - there is proof that it can be done and needs to be done.

An RF Data Transport Protocol - The RF Adaptation Sublayer and RF Physical Layer Specifications for Slow Hopping Spread Spectrum, P802.11-93\104, by Ed Geiger

Last few years Apple has been involved in securing unused spectrum for WLAN use. Have concluded that interference is something to worry about. not just from our own type of LAN, but other LANs not using our protocol, but from other things in the same band too.

Decided to develop a data transfer protocol that would help operation in the presence of interference.

Discussion:
Tom Tsoulogiannis: assuming fixed packet length? No - then how do you break up really short packet?
Ed: don't. Each burst has whole packet, no fragmentation.
Tom T: what if your carrier sense says carrier free when it's not.
Ed: you transmit. You've got to get 3 bursts through OK to thinks it's OK.
Tom Phinney: can fragments of messages from different LANs get mixed accidentally?
Ed: probability of confusing pieces is extremely low. The fragments would all have to have the same length.
Tom P: there is a high probability of all fragments being maximum length, so length won't tell you. There is some probability that you could reconstruct good packet from fragments from different sources.
Ed: CRC(32 bit) error would be created - the MAC will reject it after it has been reconstructed. But thinks it won't get through - the total segment length is repeated in each fragment header as well as the fragment length, so they will probably be different there.
Tom T: not if they are sending maximum length MAC packets.
Ed: it is conceivable, but the MAC will reject it because of the CRC.
Larry van der Jagt: situation in which MAC can offer a packet to PHY for transmission and PHY can nak the delivery of that packet (because it sensed the carrier was busy). What do people think about that - that hasn't been done before.
Ed: just a primitive back to MAC saying I couldn't do it, and it can say try again.
Bob Crowder: this is done in Ethernet.
Larry: in no 802 LAN can the PHY reject a packet from the MAC.
Tom P: but it can provide a busy/not busy to the MAC. Let's not get hung up on the partitioning offered. Look at the technology, not at what labels you put on the layer functions.
Pablo Brenner: what is the performance penalty?
Ed: a little under 50% on a long packet. Preamble size is a function of radio not protocol.
Tom T: how long on hop - dwell time on channel to transmit.
Ed: it is the time to send packet, so it depends on packet length. Same on each of first 3 channels, bit shorter on last 2 due to shorter preamble. Last 2 shorter because if you're in sync already.
Greg Ennis: what is the time on each channel?

Ed: 80 microseconds to change, 16 microseconds diversity selection, clock recovery 16 microseconds - about 153.6 total. When hopping you are not on one channel or another, so not all of the 80 counts. 5000 hops per second.
Jim Schuessler: don't see negative or positive ack?
Ed: that is the responsibility of the MAC layer.
Jim: trade off overhead of error correction against time for re-transmission. At what error rate of channel do you break even? You get a higher overhead with better error rate.
Ed: 10^{-3} can be tolerated. Think of this scheme as a life insurance policy. We played with adaptable techniques and it gets complicated. There's lots of room for adaptation here.
Tom P: this contribution offers many things. There is an obvious fall back if really great media or single channel - drop the two error correction channels. But has a chance to handle the growing market of larger populations.
Ed: saw 80% packet loss running on top of a microwave oven.
Pablo: 1 Mbit data rate, 50-60% overhead - you have 400 kbit/s affect rate.
Ed: don't think any protocol will give you 1 Mbit out of 1 Mbit.
unidentified: each sender using different PHY frequency and there is some synchronization?
Ed: WLANs in the same space don't have to be synchronized. If both hop in the same pattern for a while they recognize the same protocol and don't keep each others data.
Bob C: proposing a different PHY layer?
Ed: this is a PHY layer proposal in my view of modelling.
Bob C: doesn't replace something that wants to meet a Mbit throughput - you say I'll take less rate to always get through.
Ed: goal to make WLAN that runs at LocalTalk speed, and we got that and more.
Dave B: ideas are intriguing - pointed out there are trade-offs to be made, and we have to choose camps - either feel there is too much overhead, or that's OK as long as I can get it through. Assumed multi-channels and that is a problem for us - we have a requirement for single channel PHY operation. But if it takes multi-channels to get the BER required, is that the more important requirement? What about doing this in code space - not enough isolation to have essentially separate channels?
Tom P: DS - if loss rate low enough, just do first 3. If code division multiple of 5 might not be enough.
Ed: if any one of 5 bursts gets through and you find the first fragment to be OK, there is the header id field that you could use to tell someone is trying to talk, get the SA and DA, and maybe do something with them.
Tom T: what do you see as the role of the MAC sending packets to this?
Ed: not a MAC person, had not intended to solve MAC problems.
Tom T: this protocol is doing all the MAC functions so ...
Ed: when transport protocol says can't send it back to the MAC, MAC has to decide what to do. MAC sends hop group selection to PHY. Is trying to provide a layer that tries to do a damn good job getting that data across the media. This also works with both DCF and PCF MACs.
Jim: could you map these functions into the model we have - the 802.11 model in the draft standard?
Ed: haven't seen that model. Our approach to layer modelling is in section 2. The Hopping Protocol in the convergence layer of the PHY, the adaptation layer in the MAC. Have to do some slicing and dicing, and that may be different for each PHY.
Dave B: can you give a feel for how you settled on 5 channels.
Ed: 3 ways seen: segment to 2 and transmit on 3, or 3 of 5 or 4 of 7. 2 of 3 worried us - not enough margin for interference. 4 of 7, the overhead gets too bad. The trade-off of reliability to overhead seemed right.
Tom P: this gives you a 3 of 4 fallback if you want - the algorithm would just think the 5th was missing.

(3) Issues from PHY subgroup, by Larry van der Jagt

PHY group heard this previous presentation yesterday and recommended that the entire group heard it because it approaches a complete solution. Tack it below a MAC and see how a radio LAN might do everything it has to do to move data. We have been grappling with what function goes where. Think that if we get these complete solutions that have a MAC and a PHY we can then take the whole thing and cut it up to put the pieces in layers as we see them. Suggestion to make it a must that proposals show how they work with the other pieces - say how a PHY proposal works with one of the proposed MACs, says how proposed MAC works with a PHY.

unidentified: you say showing how a PHY proposal works with one of the MACs. Are you against submitting a whole proposal with new MAC?
Dave Bagby: yes, because this meeting was the end of accepting new MACs - whether they came with a PHY is irrelevant.
Kerry Lynn: but there is a caveat of a certain number of members voting to accept a new MAC, then it's OK.
François Simon: decision to which Dave refers was not formal.
Dave B: it was ratified by the full working group at the last meeting.
[sec note: ratification was not sought at the full working group for that decision. It was reported to the full working group at the May 1993 meeting as a motion taken and passed at the MAC subgroup.*]*

Alert to MAC group of a big issue to come eventually - receive to transmit turn around time, will it be on the order of 5 microseconds or on the order of 200 microseconds.

Warning that tomorrow the PHY group will bring a proposal to close issue 24.10 to the plenary. Content is all 802.11 FH PHYs that are operating in the 2.4 GHz band shall implement GFSK modulation with BT on the Gaussian filter of .5, and a deviation of a minimum 168 kHz at 1 Mbit. That higher speed modulations are adopted for further study and technologies for switch between basic data rate and higher rates are also for further study. The concept is that if we have a "meet me" channel there is a lot of flexibility to go to other places later, but the lowest common denominator is required first to go anywhere.

Dave Bagby is alarmed at the concept of a system with different APs at different speeds.

(4) Issues from MAC subgroup: none

(5) New Business: none

Meeting adjourned: 3:45 PM