

**Accommodating a Range of Intelligence in the Physical Layer  
A MAC/PHY Interface Issue**

Jim Schuessler  
National Semiconductor Corporation  
408-721-6802  
jim@berlios.nsc.com

**Assumptions:**

- There will be one MAC (I hope)
- There will be multiple PHYs.
- There will be separate documents for the MAC, each PHY, the Management Functions and perhaps other interfaces/functions (ref. John Cory and Nathan Silberman: doc. 92/56)
- PHYs will address different speed/power/cost trade-offs.
- P802.11 must accommodate these trade-offs (or become/remain irrelevant in mkt.)

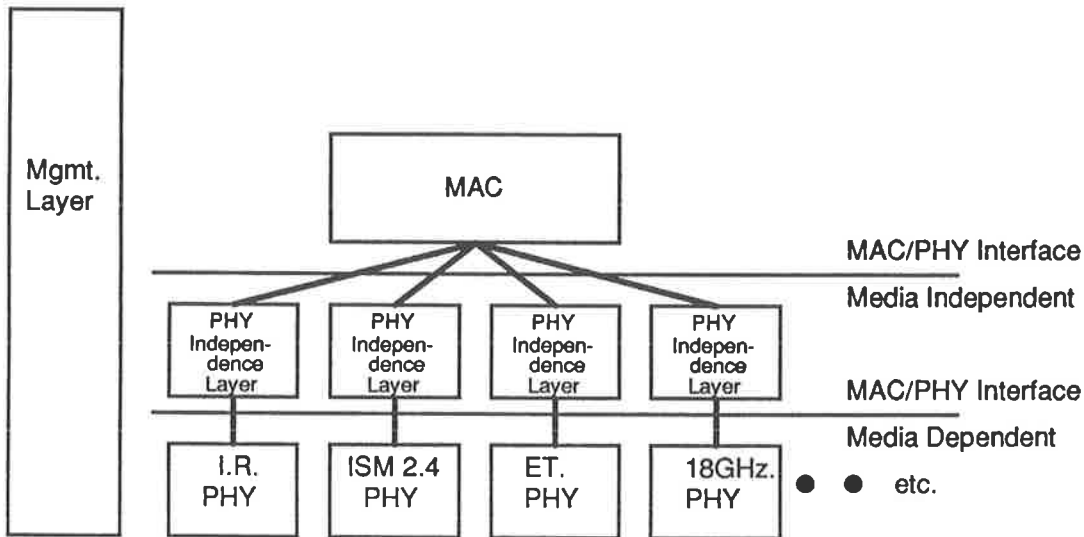
**Goal:**

- A single MAC/PHY interface which does not preclude proper **market driven** decisions about the MAC or the PHY, whatever type it may be.

Some take a top down, logical (as opposed to physical) approach to the MAC/PHY interface question. This results in a "services" oriented interface with SAPs and logical functions to be supported. Others take a bottoms up, physical approach to the MAC/PHY interface question. They know this approach has resulted in the lowest cost, most efficient interface in the past, at the penalty of reuse and "orthogonality". (elegance?) I contend we can and must accommodate both approaches.

**A Structure for the Solution:**

(Idea of a media dependent and media independent MAC/PHY interface was proposed by Bob Crowder in email dated 6/20/92. Is this what you mean Bob?)



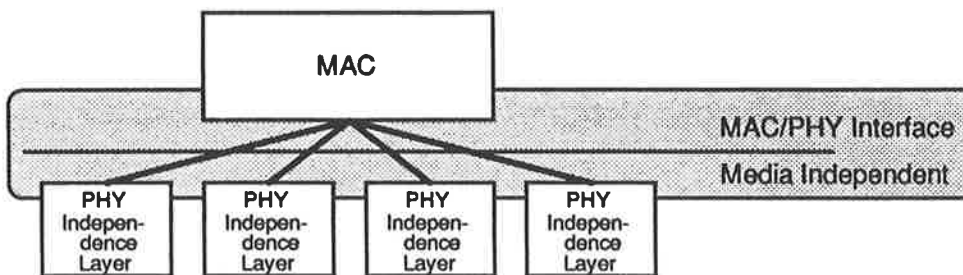
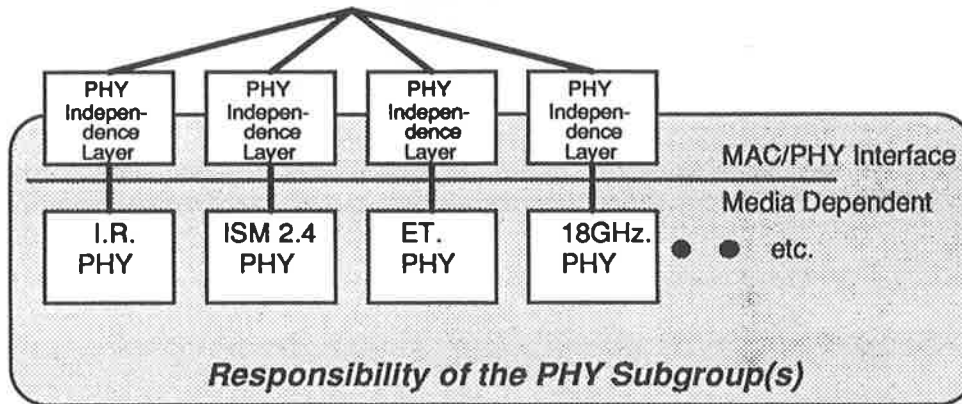
**Media Independent MAC/PHY Interface:**

This is the "classic" MAC/PHY interface. It is defined in terms of logical functions, services, data and messages. It is important in terms of what the MAC can expect from the PHY, especially with respect to data integrity and security. It answers the question, "What services does the MAC/PHY interface support?"

**Media Dependent MAC/PHY Interface:**

This is the efficient or expedient MAC/PHY interface. It is defined in terms of signals and lines expressing exact hardware functionality and no more. It answers the question, "How can I make the lowest cost (dirt cheap.), most efficient MAC/PHY interface?"

**Who's Responsibility?:**



**Responsibility of MAC and PHY Subgroups**

**Problems with this approach:**

1. Limitations imposed at the Media Dependent interface may make implementation of functions required at the Media Independent interface impossible. Is this surmountable?
2. More work. (Yes, but worth it.)

**The Dave Bagby Questions: (email 6/19/92)**

1. Is the MAC/PHY interface the place where MAC/PHY independence is achieved? Answer: NO for Media Dependent interface, YES for Media Independent interface.
2. What level of intelligence should exist on either side of the MAC/PHY interface? Answer: As little as possible given the agreed trade-offs of a specific PHY. Contention may still arise if (when?) members cannot target a specific PHY to a well defined market segment. At least with this approach, we have some freedom to address our competing market requirements, and still produce a single viable standard, albeit with multiple parts. I would hope we could avoid, for instance, multiple ISM 2.4GHz. PHYs., or multiple IR PHYs.

Appendix

Appendix

Appendix to 92/85 page 1/2.

Return-Path: <sun!Eng.Sun.COM!David.Bagby@nsc.nsc.com>  
Date: Fri, 19 Jun 92 14:31:07 PDT  
To: ieee\_802.11@Eng.Sun.COM  
Subject: Topics for next 802.11 meeting

Hi all,

One of the primary topics to be handled at the July meeting is:  
What is the MAC/PHY interface?

Both the MAC and the PHY groups will be working on this question. both in joint and seperate sessions. I want to take a moment to list what I believe are the major issues which we need to take a stand on at the next meeting.

MAC/PHY interface issue 1:

Given: One MAC will support multiple PHYs (a PAR derived requirement).

This tells me that there has to be some place where there is a MAC/PHY independent interface. A fundamental issue is:

Is the MAC/PHY interface the place where MAC/PHY independence is achieved?

MAC/PHY interface issue 2:

What level of intellegence should exist on either side of the MAC/PHY interface?

In the past I have heard two pretty different approaches:

- a) The PHY is dumb, it has a lot of variables that the MAC can set (like which antenna to use) and the MAC makes all the decisions.
- b) The PHY is smart, the MAC simply hands the PHY data and says "send it, let me know what happens".

If we can adopt a position on just these two issues at the July meeting, we will have made significant progress. In particular, enough progress to enable the MAC and PHY groups to continue doing parallel work.

Let's hear from all you 802.11 people in net land - what are your opinions on these two issues? What other major issues do you see that shape the MAC/PHY interface?

Dave

---

Return-Path: <sun!mcimail.com!0002892306@nsc.nsc.com>  
Date: Sat, 20 Jun 92 19:59 GMT  
To: 80211 Reflector <ieee\_802.11@Eng.Sun.COM>  
Subject: MAC\_PHY Interface

Comments on MAC <-> PHY Interface - Answer to D.Bagby, Fri.-June 19 Issue 1

I agree that a 2I level interface spec. is reqd. if we allow any significant diversity between PHYs.

I think that there will be significant differences between proposed PHYs - eg. IR & ISM & 18Ghz

Thus I think we need two interfaces:

- 1.A Media Independent MAC-PHY interface
- 2.A Media Dependent Interface for each PHY

Appendix to 92/85 page 2/2.

The IEC SC65C & ISA SP50 draft Fieldbus standard supports 4 Wire media and will support a low speed Radio & a Fiber Optic PHY and also may support addn. PHYs. The PHY spec is being processed as a DIS. It has the architecture on from ISA to distribute copies of the relevant document (ISA SP50 236P) and give a short overview of the Interface Architecture in July. Unfortunately, I do not have the time to prepare a complete tutorial before our meeting.

Issue 2

Many of the requirements discussed in IEEE 802.11 are for both a smart MAC & a smart PHY:. Some of the ones that come readily to mind are:

Need for low power & small size

Need for adaptability to a wide variety of "radio/IR" and regulatory environments

introduces different phenomena to be coped with

makes it difficult to find general characterizations for similar phenomena

a Smarter PHY is better able to cope with both of the above

Need for adaptability to several Distribution Architectures

Support of multiple, quite different PHYs and thus resolution of a variety of problems/concerns at either MAC or PHY -

BUT there is only one MAC so it can not have lots of PHY specific functions

I think Dave's characterizations of the Smart PHY & the Dumb PHY are a bit extreme, and so I believe we have a lot of work to do in deciding on an appropriate division of intelligence.

