IEEE 802.11
Wireless Access Method and Physical Specification

title: MAC/PHY INTERFACE FROM A DS STANDPOINT

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1. INTRODUCTION

This contribution is a first attempt to define the MAC/PHY interface. The interface lines and functionality are initially based on the Direct Sequence specifications. Item numbers in the text refer to document IEEE P802.11 93/232r1. This contribution is intended as a strawman for the direct sequence group.

2. INTERFACE LINES TO CONVERGENCE LAYER

The transmit and receiver control interface is such that it allows for accurate control of the access function by the MAC. Exposure of these interface lines is optional (DTE/DCE interface)

Description of the control lines in figure 1:

TXE- Transmit Enable (to TX):

Note :This is a RTS kind of signal. To overcome confusion with the MAC RTS/CTS provision it is called here TXE

starts generation of preamble (item 18) :

A: 128 scrambled 'ones'.
B: 16 bits unique word (octal 2717)
C: 8 signalling bits
D: 8 service bits

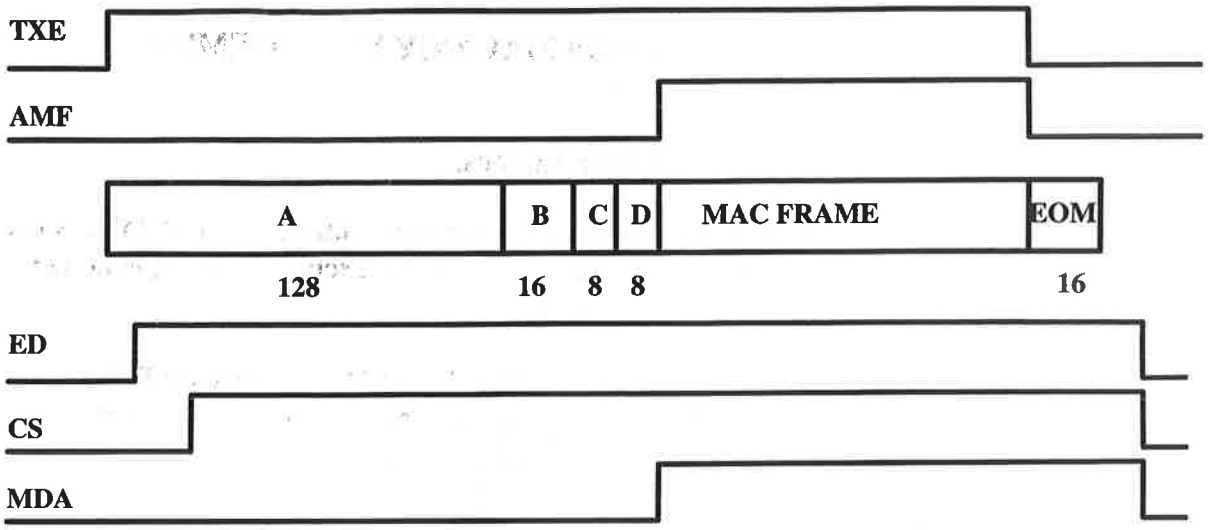

Figure 1 TX and RX control interface.

AMF- Accept MAC Frame (from TX):
Note: This is a CTS kind of signal
Ready to accept MAC frame.

ED - Energy detect (from RX) : Receiver detects energy above threshold (item 20)

CS - Carrier sense (from RX): Receiver detects signal of same (802.11 DS) modulation.

MDA - MAC data available (from RX) : Signals the start of the MAC frame (MPDU) to the MAC (unique word + signalling bits + service bits detected) MDA going down signals the end of the frame. This end of frame indication is inserted during the 4th byte from the end of the MAC frame .

The other interface lines to the convergence layer are:

TX Data (to TX)	- Data is transmitted via this line when CTS is active
RX Data (from RX)	- Data is received via this line when MDA is active
TX clock	- Transmitter clock for transmitter related signals (on bit rate: 1 or 2 MHz)
RX clock	- Receive clock for receiver related signals (1 or 2 MHz).

The timing and the levels of the lines is to be defined.

3. FUNCTIONAL DESCRIPTION OF MAC/PHY MANAGEMENT VARIABLES

3.1. Static information variables/parameters.

This section gives a functional description of the parameters with which the PHY informs the MAC about its capabilities (options). This information is exchanged at initial power up.

PHY-type: To inform the MAC that the PHY is a 802.11 Direct Sequence PHY. While the standard in the future may evolve to higher speeds a version number will be part of this variable.

No_channels: This parameter defines the number of channels (or channel sets) of the (DS) PHY. While the current DS has no options (see item 2b), future standards may require this parameter.

TX_power_levels: This parameter defines the number of Transmitter power levels. The current DS standard defines a maximum of 4 levels (item 4a).

RSS_levels: Defines the number of receiver signal strength levels. (min-max not yet defined)

SQ_levels: Defines the number of receiver signal quality levels. (min-max not yet defined)

Modulation: This parameter defines the modulation capabilities of the PHY. The current options are DQPSK or ODQPSK (other modulation schemes and bitrates may follow in the future).

No_TX_ant: The number of antennas which can be used by the transmitter.

No_RX_ant: The number of receiver antennas.

3.2. Dynamic interface variables

Following is the description of MAC-PHY dynamic variables. Dynamic means that they can change on a per packet basis. They are transmitter or receiver related.

3.2.1. Transmitter control variables

TX_channel: Defines the frequency (channel) on which the packet will be transmitted. (note that in DS the channel will not be changed at every packet; it is possible that the channel is set manually at installation, but the channel

assignment can also be the result of a channel management scheme, controlled by the MAC).(item 2b)

TX_power: Defines the power at which the transmitter will send.(item 5)

TX_mod: Defines the transmitter modulation scheme. In the standard are possible: DBPSK, DQPSK or ODQPSK (item 14).

TX_rate: Transmitter data rate. Currently are defined 1 and 2 Mb/s. In the current standard the rate is covered by the modulation method (item 15 and 14).

TX_ant: Defines the antenna to be used by the transmitter.

3.2.2. Receiver status/control variables

RX_channel(C): Defines the channel on which to receive.(item 2b)

RX_mod(S) : Receiver detected modulation (inclusive data rate); copy of signalling bits in preamble (item 18a)

RX_service(S): 8 service bits in preamble (item 18a)

RX_antenna(S):antenna number at which the frame is received.

RSSI(S) : Receiver signal strength indication: reports the signal strength (at ED).

SQ(S) : Signal quality :reports the signal quality of a packet (at CS).

Silence_level(S): Reports the level of the background 'noise'

Energy_det_thresh (C): Energy detection threshold (item 20a), controlled by carrier (energy) detection algorithm in MAC?
Note: In power control mode (item 5) the threshold is related to the transmitted power (TX-power above). In this case the value may change at every transmit packet.

SQ_threshold(C): Signal quality threshold. This threshold is used to for the decision if a carrier is detected (turn on Carrier Sense)

4. POWER MANAGEMENT CONTROL VARIABLES

A station transceiver can be in three different states:

Transmit:	Transmitter is turned on (controlled by RTS).
Awake:	Receiver is fully powered, capable to receive.
Doze:	Transceiver is not able to transmit or receive and consumes very low power.

The state of the transceiver is the responsibility of the MAC. Normally the transceiver is in receive mode. The PHY will start a transmission on RTS.
For the doze state is a separate control variable:

Doze (C) : If this parameter is active the transceiver will go into the doze state. If it is inactive (Doze off) the receiver will be in receive mode.

5. DIAGNOSTIC CONTROL

5.1. Loop control

If loop tests are to be defined in the standard it must be able to initiate a loop in the PHY. Therefor in the management interface a parameter is defined to set a loop (at DTE/DCE, analog, digital??)

Loop(C) : Set loop 1,2,3.. in transceiver.

5.2. Jabber control

To overcome the situation where a transmitter can grab the medium indefinitely caused by e.g. a hang-up situation the transceiver must detect a transmission longer than a certain period. This jabber function will normally be detected in the PHY. Parameters for this function must be set through the modem management:

Jabber_on(C): This parameter is to turn on or off the Jabber control function

Jabber_period(C): set the length of the of the Jabber control function (e.g. 200ms). If the transmission is longer then this period the transmitter will be turned off.

Jabber_indication(S): Reports the occurrence of the above situation.

WORK TO BE DONE ON MAC/PHY I/F

To complete the work on the MAC/PHY interface the following steps have to be taken:

1. Find the similarities with the Interface descriptions of the Frequency Hop PHY and the Infrared PHY. Bring the I/F on one line. Are there DS specific parameters?.
2. Define for the DTE/DCE interface (when exposed) the timing and the levels of the signals.
3. Define for the other parameters the bit and the (timing of) the actions.