Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Proposal on changes in the 802.16 MAC Reference Model and PHY Service definition**
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Source(s)	**Naftali Chayat, Vladimir Yanover** **BreezeCOM Ltd.** **Atidim Technology Park, Bldg. 1** **P.O. Box 13139, Tel-Aviv 61131, Israel** **Naftalic@breezecom.co.il** **Vladimiry@breezecom.co.il** **Tel.: +972-36457834** **Fax: +972-36456290**
Re:	Proposal on changes in the 802.16 MAC Reference Model and PHY Service definition
Abstract	Changes proposed in the MAC part of the 802.16.1 Air Interface document. The goal of the changes is to define an abstract MAC-PHY interface for further accommodation of another PHY options. Main issues are - Change the Reference Model - Define the set of service primitives for MAC-PHY communication and the corresponding sets of PHY parameters and PHY-dependent MAC parameters
Purpose	The document is presented to Editorial Group as a subject for discussion on the structural change in the Air Interface Document
Notice	
Release	
Patent Policy and Procedures	

Proposal on changes in the 802.16 MAC Reference Model and PHY Service definition

Vladimir Yanover, Naftali Chayat
BreezeCOM

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1. References

[1] Air Interface for Fixed Broadband Wireless Access Systems, IEEE 802.16.1-00/01r4, September 2000
[2] International Standard ISO/IEC 8802-11: 1999(E) ANSI/IEEE Std 802.11, 1999 Edition. Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications

2. Goal of the Document

To propose the basics of generic definition of MAC-PHY interface suitable for the TG1 PHY, HUMAN (802.11a/HIPERLAN2 — like PHY) and for future TG3 PHY, potentially different from TG1 PHY.

Some parts of the document are suggested to be included into the 802.16.1 MAC document (marked in the text).

Authors comments appear in this document as <<< COMMENT >>>.

3. Definitions

To define communication between the layers in the abstract form, we need some additional terms and definitions.

<<< To be inserted into 1.2 >>>>
The following terms/definitions proposed:

- "**PHY PDU**" (PPDU) means an interval of continuous transmission, at the given carrier frequency, by either BS or SS bounded by intervals where the mentioned station does not transmit
- "**Downlink PPDU**" (DL PPDU) means a PPDU transmitted by BS
- "**Uplink PPDU**" (UL PPDU) means a PPDU transmitted by SS
- "**Frame Control Header**" (FCH) means information broadcasted by BS that specifies the PHY and/or MAC parameters (e.g. destination) for the current PPDU and optionally of the immediately following PPDUs
- "**Frame**" means a time interval that includes a set of PPDUs transmitted with exactly one Frame Control Header transmitted by BS
- "**Burst Profile**" means set of PHY parameters values (such as modulation type) that may be used in the transmission of either BS or SS. <<< Possibly covered by Burst Type >>>
- "**Burst**" or **PHY Burst** means a continuous part of PPDU transmitted with a set of PHY parameters representing one of the valid burst profiles. The way of the bursts are separated within the PPDU, is PHY specific. [E.g. in OFDM they are separated by mid-ambles]. The burst is a minimal possible data unit to be received by a station
- **Transmit Opportunity** or **Transmission Opportunity** (TO) means a time interval allocated for a station for transmission of its PPDU or to a group of SSs for the contention based transmission of their PPDU(s)

4. Proposed Changes in the Structure of 802.16.1 MAC Document

The following changes are proposed

- Change the Reference Model by adding PHY Layer Management Entity (and possibly MAC Layer Management Entity)
- Add to the MAC part of the document a new clause (PHY Services) that define abstract MAC-PHY interface
- Add to the MAC part of the document a new clause describing in the generic terms the PHY Convergence Layer
- Replace throughout the MAC part of the document all the things related to MAC-PHY interaction with invocation of the corresponding primitives
- Remove all the PHY dependent issues to the corresponding PHY clauses including
    - Exact definition of the PHY related parameters (PHY MIB)
    - Implementation of the MAC-PHY primitives
- Add to each PHY clause a definition of the PHY Convergence Layer procedure specific for this PHY. This will incorporate TC layer functionality

Few comments on the PHY Convergence Layer function. This function adapts the capabilities of the physical medium dependent (PMD) subsystem to the PHY service. It is supported by the Transmission Convergence procedure, which defines a method of mapping the MAC sublayer protocol data units (MPDUs) into a framing format suitable for sending and receiving user data and management information between BS and SS using the associated PMD system.

A PMD subsystem function is defined as the function that defines the characteristics of, and method of transmitting and receiving data through, a wireless medium (WM) between BS and SS.

Thus the Physical Layer will be comprised of two sublayers: the PHY Convergence sublayer (PCS) and the PMD sublayer. The function of the PCS sublayer is to provide a mechanism for transferring MAC Protocol Data Units (MPDU) between BS and SS over the PMD sublayer.

5. Generic PPDU Structure

This is an informative topic explaining terms and giving examples. Some part of it may be transformed into a subclause of the MAC description.

There are two types of the Generic PPDU Structure: for the Burst Mode and Continuous Mode.

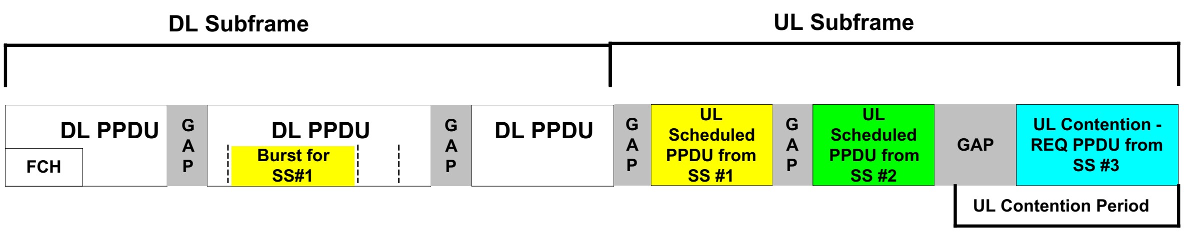
5.1. Burst Mode

The PHY PDU (PPDU) is a building block of the framing structure so that in the each channel the frame interval contains PPDUs transmitted by BS and/or different SSs.

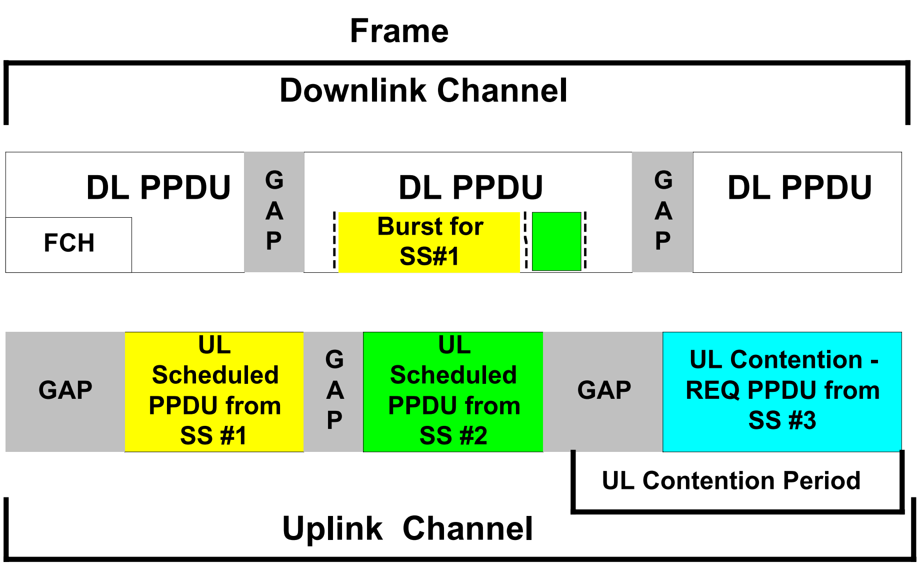
The following picture figures the TDD frame structure. It generalizes the pictures from the document IEEE 802161c-00/12 Replacement Figures Mentioned in TG1 Comments by Ken Stanwood.

5.1.1. DL and UL subframes

The frame interval consists of DL and UL subframes. Note the Frame Control Header (FCH) embedded into the first burst.



The following picture figures the FDD frame structure



5.1.2. PHY PDU Structure

The following structure of the PHY PDU (PPDU) is assumed. It is visible to PHY but not to MAC.

PPDU						
Preamble	**PHY Header**	**1st PHY Burst**	**Mid-amble**	**2nd PHY Burst**		**Nth PHY Burst**
Different types of the preambles may be used	*Optional*	*Contains both user and control data*	*Optional*	*Contains both user and control data*	*Optional*	*Contains both user and control data*

Figure 1. PPDU Structure

In the above picture **Preamble** is a PHY specific waveform that may differ dependently on the PPDU type.

Optional **PHY Header** specifies the PHY parameters (like modulation type) of the immediately following PHY Burst. At the above picture it is attached to the first burst only that is a possible example of usage.

Alternatively, the PHY parameters may be implicitly specified by the corresponding MAC messages, see below.

5.1.3. Transmission Convergence Sublayer Units and MAC Messages

The PHY burst consists of Transmission Convergence (TC) units of the fixed length except possibly the last one in the burst. Format of TC unit is PHY specific. From the MAC point of view, the burst consists of MAC messages. Some of the messages may carry MAC control information and/or PHY control information.

<table>
<tr><th colspan="12">PHY Burst</th></tr>
<tr><td colspan="2">TC Unit</td><td colspan="2">TC Unit</td><td colspan="2">TC Unit</td><td colspan="2">TC Unit</td><td colspan="2"></td><td colspan="2">TC Unit</td></tr>
<tr><td colspan="3">MAC Message</td><td colspan="3">MAC Message</td><td colspan="3">MAC Message</td><td colspan="3">MAC Message</td></tr>
</table>

5.2. Continuous Mode

TBD

<<<The following topic is proposed for insertion in the document as Heading 1 topic. It is similar to the clause 12 of [2]>>>

6. Reference Model

6.1. 802.16.1. and 802.11 Reference Models

The following picture figures the existing 802.16.1 Reference Model from [1], 1.15.

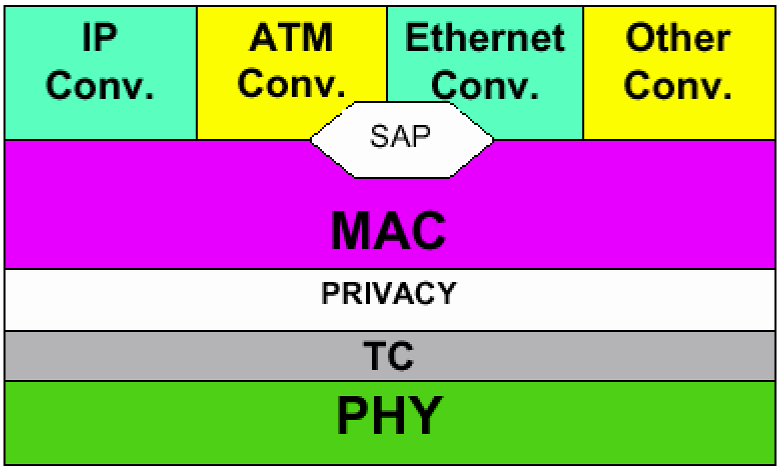
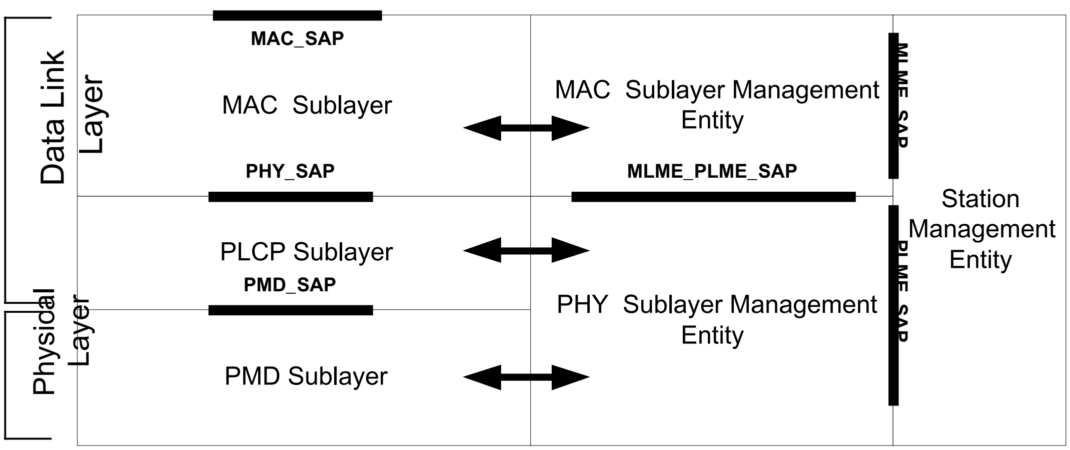


Figure 5—802.16.1 protocol layering, showing service access point.

The following picture figures the existing 802.11 Reference Model from [2], 5.8.



6.2. Proposed Reference Model

<<< A new text of 1.14 ???? >>>

As mentioned earlier in this document, 802.16.1 conforms to the 802 system model. Some specifics (see IEEE Standards for Local and Metropolitan Area Networks: Overview and Architecture (IEEE Std 802-1990) [IEEE802]) are:

The 802.16.1 MAC supports the 48-bit IEEE address format. An 802.16.1 system supports MAC multicast in the downstream direction only, not upstream.

The protocols support 802.1 bridging services and protocols, including support of virtual LAN tag and priority ID.

The protocols support encapsulation of 802.2 (LLC) by the MAC protocol.

Conform to the 802 conventions and structures for interface primitives: logical structures that are passed between protocol layers to invoke processes and transact data.

<<< Address the 802 system management guidelines (see section Management). >>>

Provide a MAC service interface that complies with 802 conventions.

The following model is proposed. This model contains the following layers and sublayers

- **Link Layer**
  - **Convergence Sublayer** responsible for encapsulation of the upper layers PDUs into the native 802.16.1 MAC/PHY PDUs and mapping upper layer s addresses and upper layer CoS/QoS parameters into 802.16.1 addresses and QoS parameters
  - **MAC Sublayer** responsible for the proper sharing of the wireless medium and for the reliability of the wireless transactions
  - **Privacy Sublayer** responsible for TBD
- **Physical Layer**
  - **PHY Convergence Sublayer**, which adapts the capabilities of the physical medium dependent (PMD) system to the PHY service provided to MAC sublayer. This function includes a method of encapsulation of the IEEE 802.16 MAC sublayer protocol data units (MPDUs) into a framing format suitable for sending and receiving data between BS and SS using the associated PMD function. This includes TC encapsulation and possibly PHY specific encapsulation.
  - **PMD Sublayer**, whose function defines the characteristics of, and method of transmitting and receiving data through, a wireless medium (WM) between BS and SS.

<<< Arrows mean non-specified by the standard transfer of control information e.g. setting and reading of the values of certain MIB variables. There is also MLME in this picture, but it is out of scope of this document and needs separated consideration. Without MLME, PLME_SAP appears as an interface SAP between the MAC and PLME. >>>

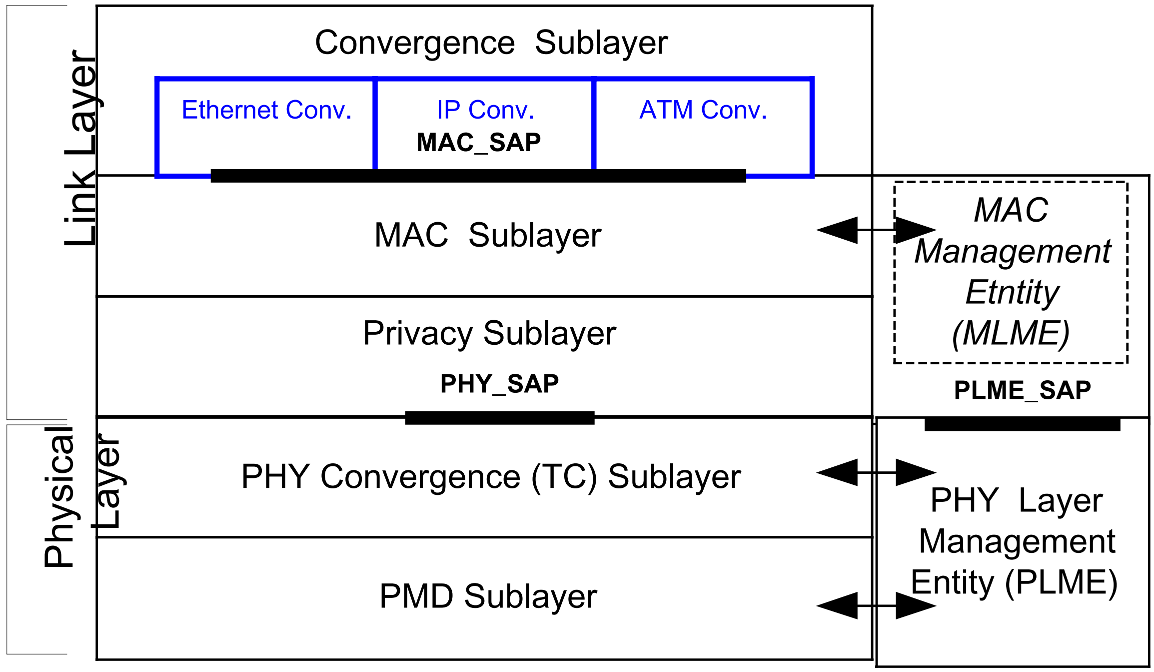


Figure 2. Proposed Reference Model

<<< end of the 1.14. >>>

7. Layer Management

<<< This is suggested to be inserted in the document as Heading 1 topic. The text was taken from [2]. It refers to both MAC and PHY management. For the PHY, the mentioned SAP should be PLME-SAP. The MLME-SAP invocation is out of scope of this document>>>>

The management information specific to each layer is represented as a management information base (MIB) for that layer. The MAC and PHY layer management entities are viewed as containing the MIB for that layer. The generic model of MIB-related management primitives exchanged across the management SAPs is to allow the SAP user-entity to either GET the value of a MIB attribute, or to SET the value of a MIB attribute. The invocation of a SET.request primitive may require that the layer entity perform certain defined actions.

The GET and SET primitives are represented as REQUESTs with associated CONFIRM primitives. These primitives are prefixed by PLME <<<or MLME depending upon whether the MAC or PHY layer management>>>
SAP is involved. In the following, XX denotes PLME <<< or MLME >>>

XX-GET.request (MIBattribute)

Requests the value of the given MIBattribute.

XX-GET.confirm (status, MIBattribute, MIBattributevalue)

Returns the appropriate MIB attribute value if status = success, otherwise returns an error indication in the Status field. Possible error status values include invalid MIB attribute and attempt to get write-only MIB attribute.

XX-SET.request (MIBattribute, MIBattributevalue)

Requests that the indicated MIB attribute be set to the given value. If this MIBattribute implies a specific action, then this requests that the action be performed.

XX-SET.confirm (status, MIBattribute)

If status = success, this confirms that the indicated MIB attribute was set to the requested value, otherwise it returns an error condition in status field. If this MIBattribute implies a specific action, then this confirms that the action was performed. Possible error status values include invalid MIB attribute and attempt to set read-only MIB attribute.

Additionally, there are certain requests (with associated confirms) that may be invoked across a given SAP that do not involve the setting or getting of a specific MIB attribute. One of these is supported by each SAP, as follows:

XX-RESET.request: where XX is MLME or PLME as appropriate
XX-RESET.confirm

This service is used to initialize the management entities, the MIBs, and the datapath entities. It may include a list of attributes for items to be initialized to non-default values. The corresponding **.confirm** indicates success or failure of the request.

7.1. MAC Management

<<<TBD, it may be decided that this issue already covered in [1] >>>

7.2. PHY Management

7.2.1. PHY Management Entity

7.2.1.1. General

The PHY Management Entity contains

- A set of PHY parameters, *PHY MIB*. These parameters are the PHY constants and variables, for example, constant array of possible transmission rates and variable assigned to the current value of transmission power. SET and GET generic primitives are applicable.
- (At BS) a table of discovered PHY capabilities per SS
- State Machine(s) needed for implementation of PHY management functions like generation of Ranging Response at BS

7.2.1.2. PHY MIB

The set of PHY parameters is specified separately for each PHY option in the clause covering that PHY. See PHY Clause Template for examples..

7.2.1.3. Parameters’ Vectors

Several service primitives use parameter vectors. Such a vector is a list of PHY parameters. The list itself may vary depending on the PHY type. For example, some PHYs may have Preamble Pattern parameter while others have no similar parameter. Even if parameters with the same name are present in the lists of two different PHYs, it is still possible that the sets of their possible values differ.

A subset of the whole parameters set may be arranged into a vector. Such a vector may be transferred between PHY and MAC as a parameter of certain primitive. There are the following vectors. Note that PPDU_xxx primitives refer only to the PHY parameters related to the whole PPDU, not to the specific PHY bursts.

- PHY_PARAMVECTOR — the vector that contains all the PHY-dependent MAC parameters, like the duration of mini-slot

- UCD_VECTOR — set of the PHY parameters transferred in UCD message (e.g. central frequency)
- DCD_VECTOR — set of the PHY parameters transferred in DCD message
- CH_PARAMVECTOR — set of the PHY parameters related to all the channels in use
- PPDU_TXVECTOR — set of PHY parameters related to the transmit of the whole PPDU (like Tx Power and preamble s specification)

BURST_TXVECTOR — this is the vector of pairs
{Burst Profile ID, Length}
Where
Burst Profile ID — same as or similar to DIUC/UIUC
Length — length (bytes) of the data block to be transmitted with the modulation type etc. given by the Burst Profile ID

- TXVECTOR

This is a concatenation of PPDU_TXVECTOR and several BURST_TXVECTORs

- PPDU_RXVECTOR — set of PHY parameters related to the receive of the whole PPDU
- BURST_RXVECTOR — it is a vector of pairs

{Burst Profile ID, Length}
Where
Burst Profile ID — same as or similar to DIUC/UIUC
Length — expected length (bytes) of the data block with the modulation type etc. given by the Burst Profile ID

- RXVECTOR — it is a concatenation of PPDU_RXVECTOR and several BURST_RXVECTORs

PPDU_RXSTATUS — set of PHY parameters (like RSSI) measured during the reception of a PPDU

- BURST_RXSTATUS — set of PHY parameters measured during the reception of a burst
- RNGREQ_VEC — set of PHY parameters used in the ranging request message
- RNGRSP_VEC — set of PHY parameters used in the ranging response message

Each PHY clause has to contain definitions of all the above vectors in the following format

- List of the parameters
- (For each parameter) Set of possible values

7.2.2. PLME SAP interface

<<< The list of primitives used for communication across PLME SAP>>>
The following picture explains the terms used in this clause

7.2.2.1. Primitives for Sublayer-to-Sublayer Communication

Primitive s type	request	confirm	indication
Direction	MAC => PHY	PHY =>MAC	PHY => MAC
Comment	Initiates some PHY action	Appears as a response for request primitive	Triggered by a PHY event

7.2.2.1.1. PLME-CHARACTERISTICS.request

7.2.2.1.1.1. Function

This primitive is a request by the PLME to provide the PHY operational characteristics.

7.2.2.1.1.2. Semantics of the service primitive

PLME-CHARACTERISTICS.request

7.2.2.1.1.3. When generated

This primitive is generated by the PLME, at initialization time, to request the PHY entity to provide its operational characteristics.

7.2.2.1.1.4. Effect of receipt

The effect of receipt of this primitive by the PHY entity will be to generate a PLME-CHARACTERISTICS.confirm primitive that conveys its operational characteristics.

7.2.2.1.2. PLME-CHARACTERISTICS.confirm

7.2.2.1.2.1. Function

This primitive provides the PHY operational parameters.

7.2.2.1.2.2. Semantics of the service primitive

The primitive provides the following parameters:
PLME-CHARACTERISTICS.confirm(PHY_PARAMVECTOR)

7.2.2.1.2.3. When generated

This primitive will be issued by the PHY entity in response to a PLME-CHARACTERISTICS.request.

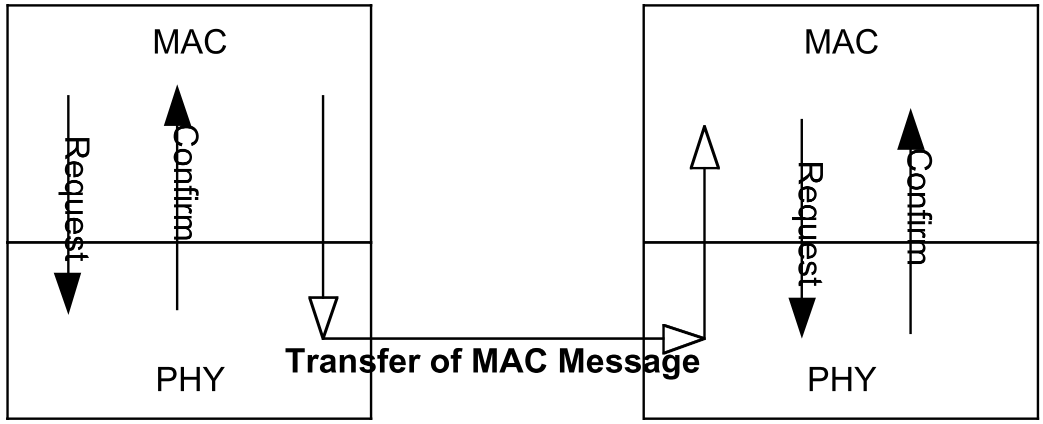
7.2.2.1.2.4. Effect of receipt

The receipt of this primitive provides the operational characteristics of the PHY entity.

7.2.2.2. Peer-to-Peer Communication Related to PHY Management

This subclause describes the way of PHY related communication between PHY entities at BS and SS.

The following picture reflects the communication paradigm.



See also the scheme of Ranging procedure as an example.

Certain MAC messages may carry PHY related information, such as DCD, UCD, UL-MAP, REG-REQ (in the part of SS capabilities). These messages are to be received by MAC and then translated into the PHY service primitives.

Always it is MAC who initiates communication. I applies to the local PHY with request primitive to get a vector of the TLV tuples with encoding of the relevant parameters.

At the MAC sublayer, the tuples are picked up and inserted into the message of the corresponding type.

At the peer side, the message comes to the MAC sublayer, which should recognize its type. Then MAC has to translate the message into the vector of TLV tuples.

Then these tuples are passed, as a parameter of certain service primitive, to PHY.

So MAC does not perform any interpretation of the PHY related messages and thus the MAC description does not have to mention any of the PHY dependent parameters.

The following primitives follow this paradigm. Note the difference between the PLME-BS-xx and PLME-SS-xx primitives.

7.2.2.2.1. PLME-BS-DCD

7.2.2.2.1.1. PLME-BS-DCD.request

7.2.2.2.1.2. PLME-BS-DCD.confirm

7.2.2.2.2. PLME-SS-DCD

7.2.2.2.2.1. PLME-SS-DCD.request

7.2.2.2.2.2. PLME-SS-DCD.confirm

7.2.2.2.3. PLME-BS-UCD

7.2.2.2.3.1. PLME-BS-UCD.request

7.2.2.2.3.2. PLME-BS-UCD.confirm

7.2.2.2.4. PLME-SS-UCD

7.2.2.2.4.1. PLME-SS-UCD.request

7.2.2.2.4.2. PLME-SS-UCD.confirm

7.2.2.2.5. PLME-BS-RNG

7.2.2.2.5.1. PLME-BS-RNG.request

7.2.2.2.5.2. PLME-BS-RNG.confirm

7.2.2.2.6. PLME-SS-RNG

7.2.2.2.6.1. PLME-SS-RNG.request

7.2.2.2.6.2. PLME-SS-RNG.confirm

8. Physical layer (PHY) service specification

<<< Describes PHY functions NOT RELATED to the layer management >>>

8.1. PHY functions

The protocol reference model for the IEEE 802.16 architecture is shown in Figure XX. Most PHY definitions contain three functional entities: the PMD function, the PHY Convergence function, and the layer management function.

The PHY service is provided to the MAC entity at the STA through a service access point, called the PHY-SAP, as shown in Figure . A set of PLME-XX primitives is defined to describe the communication across PHY-SAP.

8.2. PHY service specifications

8.2.1. Scope and field of application

The services provided by the PHY to the IEEE 802.11 MAC are specified in this subclause. These services are described in an abstract way and do not imply any particular implementation or exposed interface.

8.2.2. Overview of the service

The PHY function as shown in Figure XXX is separated into two sublayers: the PHY Convergence sublayer and the PMD sublayer.

The functions of the PHY Convergence sublayer are

- Provide a mechanism for transferring MPDUs between BS and SS(s) over the PMD sublayer
- At Tx, translate PHY related information provided by MAC, into requests addressed to the specific PMD sublayer
- At Rx, translate PHY related information provided by PMD sublayer, into primitives addressed to MAC

8.2.3. Overview of interactions

The primitives associated with communication between the IEEE 802.11 MAC sublayer and the IEEE 802.11 PHY fall into two basic categories:
a) Service primitives that support MAC peer-to-peer interactions;
b) Service primitives that have local significance and support sublayer-to-sublayer interactions

8.2.4. PHY-SAP detailed service specification

PHY Parameters are transferred between MAC and PHY using certain primitives.

8.2.4.1. PHY -TXSTART.request

Function.

This primitive is a request by the MAC to the local PHY entity to start <<<immediately>>> the transmission of a PPDU. It specifies all the PHY parameters for the PPDU as a whole and for each burst.

Semantics.

PHY -TXSTART.request (TXVECTOR)

When Generated.

This primitive is generated by MAC to start the transmission of the PPDU

Effect of Receipt

PHY starts the transmission of the PPDU

8.2.4.2. PHY-TXSTART.confirm

Function.

This primitive issued by the PHY to the local MAC entity to confirm the start of the transmission. The PHY will issue this primitive in response to every PHY-TXSTART.request primitive issued by the MAC layer.

Semantics.

PHY -TXSTART.confirm

When Generated.

This primitive is generated by PHY immediately after the start of the transmission

Effect of Receipt

<<< >>>

8.2.4.3. PHY-TXEND.indication

Function.

This primitive will be issued by the PHY to the MAC entity whenever the PHY has received a PHY-TXEND.request immediately after transmitting the end of the last bit of the last data octet

Semantics.

PHY-TXEND.indication

When Generated.

Effect of Receipt

8.2.4.4. PHY -RXSTART.request

Function.

This primitive is a request by the MAC to the local PHY entity to start the reception of PPDU It specifies all the PHY parameters for the PPDU as a whole and for each burst.

Semantics.

PHY -RXSTART.request (RXVECTOR)

When Generated.

Effect of Receipt

8.2.4.5. PHY -RXSTART.confirm

Function.

This primitive is a request by the PHY to the local MAC entity immediately after the reception of PHY-RXSTART.request.

Semantics.

PHY -RXSTART.confirm

When Generated.

Effect of Receipt

8.2.4.6. PHY -RXCONT.request

Function.

This primitive is a request by the MAC to the local PHY entity to continue the reception of PPDU after the completion of the last burst specified by the previous PHY-RXSTART or PHY-RXCONT primitive. It specifies all the PHY parameters for the PPDU as a whole and for each burst.

Semantics.

PHY -RXCONT.request (RXVECTOR)

When Generated.

Effect of Receipt

8.2.4.7. PHY -RXCONT.confirm

Function.

This primitive is a request by the PHY to the local MAC entity immediately after the reception of PHY -RXCONT.request.

Semantics.

PHY -RXCONT.confirm

When Generated.

Effect of Receipt

8.2.4.8. PHY-DATA.request

Function.

PHY-DATA.request primitive is generated by the MAC sublayer to transfer an octet of data to the PHY. This primitive can only be issued following a transmit initialization response (PHY-TXPARAM.confirm) from the PHY layer.

Semantics.

PHY-DATA.request (DATA, MAC_HEADER_START_FLAG)

The parameters:

- DATA

A single octet of user data

- MAC_HEADER_START_FLAG

The MAC_HEADER_START_FLAG is set to 1 if the given octet is the first octet of a MAC Header and to 0 otherwise. This flag is used by the TC layer.

When Generated.

Effect of Receipt

8.2.4.9. PHY-RXDATA.request

Function.

PHY-RXDATA.request primitive is generated by the MAC sublayer to acknowledge the arrival an octet of data to the MAC. It means that MAC is ready to receive the next octet.

Semantics.

PHY-RXDATA.request

When Generated.

Effect of Receipt

8.2.4.10. PHY-DATA.confirm

Function.

PHY-DATA.confirm primitive will be generated immediately after the PHY-DATA.request meaning that the data octet is received by PHY.

8.2.4.11. PHY-DATA.indication

Function.

The PHY-DATA.indication is generated by a receiving PHY entity to transfer the received octet of data to the local MAC entity

Semantics.

PHY-DATA.indication (DATA, MAC_HEADER_START_FLAG)
The parameters:

- DATA

A single octet of user data

- MAC_HEADER_START_FLAG

The MAC_HEADER_START_FLAG is set to 1 if the given octet is pointed by the TC as the first octet of a MAC Header and to 0 otherwise.

When Generated.

Effect of Receipt

8.2.4.12. PHY-RXEND.indication

Function.

This primitive will be issued by the PHY to the MAC entity after the last octet of the last burst of the PPDU has been transferred to MAC

Semantics.

PHY-RXEND.indication (PPDU_RXSTATUS)
When Generated.

Effect of Receipt

9. Examples

9.1. Ranging Procedure Example

<<<This is an informative part, not normative.>>>

The following sequence of primitives will appear to provide the ranging procedure.

Issued by	*Action or Primitive, parameters*	*Addressed to*
MLME at SS	PLME -RNG.request	PLME
PLME at SS	PLME -RNG.confirm	MLME
PLME at SS	PLME -RNG.indicate(RNGREQPARAM)	MLME
MAC at SS	[Prepares and sends the RNG-REQ message using the tuples from RNGEQPARAM]	
MAC at BS	Receives the RNG-REQ message	
MAC at BS	PLME-RNG.request (RNGREQPARAM) Where the parameter vector RNGREQPARAM consists of the tuples arrived in the RNG-REQ message	PLME
PLME at BS	PLME-RNG.confirm(RNGRSPPARAM)	MAC at BS
MAC at BS	[Prepares and sends the RNG-RSP message using the tuples from RNGRSPPARAM]	
MAC at SS	Receives the RNG-RSP message	
MAC at SS	PLME-RNG.confirm(RNGRSPPARAM) Where the parameter vector RNGRSPPARAM consists of the tuples arrived in the RNG-RSP message	PLME
PLME at SS	Processes the RNGRSPPARAM set of parameters	

9.2. Scheduling

<<<TBD>>>

9.3. Tx Sequence Example

<<<This is an informative part, not normative.>>>

The following sequence of primitives will appear to provide transmission of a frame composed of several PHY bursts with different sets of PHY parameters.

Issued by	*Primitive, parameters*
MAC	PHY -RXSTART.request (RXVECTOR)
PHY	PHY-TXSTART.confirm

[N times the following pair, N = total number number of octets, j = 1 .. N]

MAC	PHY-DATA.request (DATA$_j$, MAC_HEADER_START_FLAG$_j$)
PHY	PHY-DATA.confirm
PHY	PHY-TXEND.indication

9.4. Rx Sequence Example #1

The following sequence of primitives will appear to provide reception of a frame composed of the series of PHY bursts with different sets of PHY parameters (like bit rate). This set of parameters for each burst assumes to be known from the previous MAP message. This information is arranged into the RXVECTOR. The total amount of data in all the bursts is N octets

Issued by	***Primitive, parameters***
MAC	PHY -RXSTART.request (RXVECTOR)
PHY	PHY-RXSTART.confirm

[PHY starts receiving data and transfers the data to MAC. The following line should be repeated N times]

PHY	PHY-DATA.indication
PHY	PHY-RXEND.indication

9.5. Rx Sequence Example #2

The following sequence of primitives will appear to provide reception of a frame composed of PHY Header and series of PHY bursts with different sets of PHY parameters (like bit rate). The PHY Header contains information on the PHY parameters of the first burst while this burst contains PHY information on the next bursts. The whole PPDU contains total N octets.

In this case the $RXVECTOR_1$ contains information on the presence of PHY Header, only while $RXVECTOR_2$ contains the PHY parameters for all the bursts except the first one.

Issued by	***Primitive, parameters***
MAC	PHY -RXSTART.request ($RXVECTOR_1$)
PHY	PHY-RXSTART.confirm

[PHY receives the PHY header and starts to receive the first burst]
[PHY transfers the data to MAC up to the end of the DL-MAP repeating the following two lines should N1 times]

PHY	PHY-DATA.indication
MAC	PHY-RXDATA.request

[MAC issues the RXCONT.request primitive to configure PHY for the following bursts, starting from the second]

MAC	PHY-RXCONT.request ($RXVECTOR_2$)
PHY	PHY-RXCONT.confirm

[PHY continues to transfer the data to MAC repeating the following two lines N_2 times]

PHY	PHY-DATA.indication
MAC	PHY-RXDATA.request

[PHY transfers the data of the second burst to MAC repeating the following two lines N_3 times]

PHY	PHY-DATA.indication
MAC	PHY-RXDATA.request
.	
PHY	PHY-RXEND.indication