Project	**IEEE 802 Executive Committee Study Group on Mobile Broadband Wireless Access** <**http://grouper.ieee.org/groups/802/mbwa**>
Title	**A Proposed Outline**
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Re:	MBWA ECSG Call for Contributions
Abstract	Good System Engineering start with a plan. One way to create a plan for a document is to create an outline as the structure. This proposal presents a start to the outline.
Purpose	Start the process to build the standard
Notice	
Release	
Patent Policy	

Information technology—
Telecommunications and information exchange between systems—
Local and metropolitan area networks—
Specific requirements—
Part XX: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications

1. Overview

1.1 Scope

The scope of this standard is to develop a medium access control (MAC) and physical layer (PHY) specification for wireless connectivity for fixed, portable, and moving stations within a local area.

1.2 Purpose

The purpose of this standard is to provide wireless connectivity to automatic machinery, equipment, or stations that require rapid deployment, which may be portable or hand-held, or which may be mounted on moving vehicles within a local area. This standard also offers regulatory bodies a means of standardizing access to one or more frequency bands for the purpose of local area communication.

Specifically, this standard

- Describes the functions and services required by an IEEE 802.xx compliant device to operate within ad hoc and infrastructure networks as well as the aspects of station mobility (transition) within those networks.
- Defines the MAC procedures to support the asynchronous MAC service data unit (MSDU) delivery services.
- Defines several PHY signaling techniques and interface functions that are controlled by the IEEE 802.xx MAC.
- Permits the operation of an IEEE 802.xx conformant device within a wireless local area network (LAN) that may coexist with multiple overlapping IEEE 802.xx wireless LANs.
- Describes the requirements and procedures to provide privacy of user information being transferred over the wireless medium (WM) and authentication of IEEE 802.xx conformant devices.

2. Normative references

The following standards contain provisions which, through references in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below.

3. Definitions

3.1 access control: The prevention of unauthorized usage of resources.

3.5 authentication: The service used to establish the identity of one station as a member of the set of stations authorized to associate with another station.

3.9 broadcast address: A unique multicast address that specifies all stations.

3.10 channel: An instance of medium use for the purpose of passing protocol data units (PDUs) that may be used simultaneously, in the same volume of space, with other instances of medium use (on other channels) by other instances of the same physical layer (PHY), with an acceptably low frame error ratio due to mutual interference. Some PHYs provide only one channel, whereas others provide multiple channels.

3.12 confidentiality: The property of information that is not made available or disclosed to unauthorized individuals, entities, or processes.

3.16 directed address: *See:* **unicast fram**e.
3.26 Gaussian frequency shift keying (GFSK): A modulation scheme in which the data is first filtered by a Gaussian filter in the baseband and then modulated with a simple frequency modulation.
3.34 mobile station: A type of station that uses network communications while in motion.
3.38 portable station: A type of station that may be moved from location to location, but that only uses network communications while at a fixed location.
3.40 privacy: The service used to prevent the content of messages from being read by other than the intended recipients.
3.42 station (STA): Any device that contains an IEEE 802.xx conformant medium access control (MAC) and physical layer (PHY) interface to the wireless medium (WM).
3.45 time unit (TU): A measurement of time equal to 1024 µs.
3.46 unauthorized disclosure: The process of making information available to unauthorized individuals, entities, or processes.
3.47 unauthorized resource use: Use of a resource not consistent with the defined security policy.
3.48 unicast frame: A frame that is addressed to a single recipient, not a broadcast or multicast frame. *Syn:* directed address.

4. Abbreviations and acronyms

ACK acknowledgment
AID association identifier
AP access point
ATIM announcement traffic indication message
CF contention free
CFP contention-free period
CID connection identifier
CP contention period
CRC cyclic redundancy code
CS carrier sense
CTS clear to send
CW contention window
DA destination address
DBPSK differential binary phase shift keying
DCE data communication equipment
DCF distributed coordination function
DCLA direct current level adjustment
DIFS distributed (coordination function) interframe space
DLL data link layer
Dp desensitization
DQPSK differential quadrature phase shift keying
DS distribution system
DSAP destination service access point
DSM distribution system medium.
DSS distribution system service
DSSS direct sequence spread spectrum
DTIM delivery traffic indication message
ED energy detection
EIFS extended interframe space
EIRP equivalent isotropically radiated power
FC frame control
FCS frame check sequence
FER frame error ratio
FH frequency hopping
FHSS frequency-hopping spread spectrum
FIFO first in first out
GFSK Gaussian frequency shift keying
IBSS independent basic service set

ICV integrity check value
IDU interface data unit
IFS interframe space
Imp intermodulation protection
IR infrared
ISM industrial, scientific, and medical
IV initialization vector
LAN local area network
LLC logical link control
LME layer management entity
LRC long retry count
lsb least significant bit
MAC medium access control
MDF management-defined field
MIB management information base
MLME MAC sublayer management entity
MMPDU MAC management protocol data unit
MPDU MAC protocol data unit
msb most significant bit
MSDU MAC service data unit
N/A not applicable
NAV network allocation vector
PC point coordinator
PCF point coordination function
PDU protocol data unit
PHY physical (layer)
PHY-SAP physical layer service access point
PIFS point (coordination function) interframe space
PLCP physical layer convergence protocol
PLME physical layer management entity
PMD physical medium dependent
PMD-SAP physical medium dependent service access point
PN seudo-noise (code sequence)
PPDU PLCP protocol data unit
Ppm parts per million
PPM pulse position modulation
PRNG pseudo-random number generator.
PS power save (mode)
PSDU PLCP SDU
RA receiver address
RF radio frequency
RSSI received signal strength indication
RTS request to send
RX receive or receiver
SA source address
SAP service access point
SDU service data unit
SFD start frame delimiter
SIFS short interframe space
SLRC station long retry count
SME station management entity
SMT station management
SQ signal quality (PN code correlation strength)
SRC short retry count
SS station service
SSAP source service access point

SSRC station short retry count
STA station
TA transmitter address
TIM traffic indication map
TSF timing synchronization function
TU time unit
TX transmit or transmitter
TXE transmit enable
UCT unconditional transition
WAN wide area network
WDM wireless distribution media
WDS wireless distribution system
WM wireless medium

5. General description

5.1 General description of the architecture

This subclause presents the concepts and terminology used within the ISO/IEC xx document (referred to throughout the text as IEEE 802.xx). Specific terms are defined in Clause 3. Illustrations convey key IEEE 802.xx concepts and the interrelationships of the architectural components. IEEE 802.xx uses an architecture to describe functional components of an IEEE 802.xx LAN. The architectural descriptions are not intended to represent any specific physical implementation of IEEE 802.xx.

5.1.1 How wireless LAN systems are different

Wireless networks have fundamental characteristics that make them significantly different from traditional wired LANs. Some countries impose specific requirements for radio equipment in addition to those specified in this standard.

5.1.1.1 Destination address does not equal destination location

In wired LANs, an address is equivalent to a physical location. This is implicitly assumed in the design of wired LANs. In IEEE 802.xx, the addressable unit is a station (STA). The STA is a message destination, but not (in general) a fixed location.

5.1.1.2 The media impact the design

The physical layers used in IEEE 802.xx are fundamentally different from wired media. Thus IEEE 802.xx PHYs

a) Use a medium that has neither absolute nor readily observable boundaries outside of which stations with conformant PHY transceivers are known to be unable to receive network frames.
b) Are unprotected from outside signals.
c) Communicate over a medium significantly less reliable than wired PHYs.
d) Have dynamic topologies.
e) Lack full connectivity, and therefore the assumption normally made that every STA can hear every other STA is invalid (i.e., STAs may be “hidden” from each other).
f) Have time-varying and asymmetric propagation properties.

Because of limitations on wireless PHY ranges, wireless LANs intended to cover reasonable geographic distances may be built from basic coverage building blocks.

5.1.1.3 The impact of handling mobile stations

One of the requirements of IEEE 802.xx is to handle *mobile* as well as *portable* stations. A *portable* station is one that is moved from location to location, but that is only used while at a fixed location. *Mobile* stations actually access the LAN while in motion.

For technical reasons, it is not sufficient to handle only portable stations. Propagation effects blur the distinction between portable and mobile stations; stationary stations often appear to be mobile due to propagation effects.

Another aspect of mobile stations is that they may often be battery powered. Hence power management is an important consideration. For example, it cannot be presumed that a station’s receiver will always be powered on.

5.1.1.4 Interaction with other IEEE 802 layers

IEEE 802.xx is required to appear to higher layers [logical link control (LLC)] as a current style IEEE 802

LAN. This requires that the IEEE 802.xx network handle station mobility within the MAC sublayer. To meet reliability assumptions (that LLC makes about lower layers), it is necessary for IEEE 802.xx to incorporate functionality that is untraditional for MAC sublayers.

5.2 Components of the IEEE 802.xx architecture

The IEEE 802.xx architecture consists of several components that interact to provide a wireless LAN that supports station mobility transparently to upper layers.

5.2.3 Area concepts

For wireless PHYs, well-defined coverage areas simply do not exist. Propagation characteristics are dynamic and unpredictable. Small changes in position or direction may result in dramatic differences in signal strength. Similar effects occur whether a STA is stationary or mobile (as moving objects may impact station-to-station propagation).

5.2.4 Integration with wired LANs

To integrate the IEEE 802.xx architecture with a traditional wired LAN, a final *logical* architectural component is introduced—a *porta*l.
All data from non-IEEE 802.xx LANs enter the IEEE 802.xx architecture via a portal. The portal provides logical integration between the IEEE 802.xx architecture and existing wired LANs.

5.3 Logical service interfaces

The IEEE 802.xx architecture allows for the possibility that the DS may not be identical to an existing wired LAN. A DS may be created from many different technologies including current IEEE 802 wired LANs. IEEE 802.xx does not constrain the DS to be either data link or network layer based. Nor does IEEE 802.xx constrain a DS to be either centralized or distributed in nature.
IEEE 802.xx explicitly does not specify the details of DS implementations. Instead, IEEE 802.xx specifies *service*s. The services are associated with different components of the architecture. There are two categories of IEEE 802.xx service—the station service (SS) and the distribution system service (DSS). Both categories of service are used by the IEEE 802.xx MAC sublayer.
The complete set of IEEE 802.xx architectural services are as follows:

a) ??

This set of services is divided into two groups: those that are part of every STA, and those that are part of a DS.

5.3.3 Multiple logical address spaces

Just as the IEEE 802.xx architecture allows for the possibility that the WM, DSM, and an integrated wired LAN may all be different physical media, it also allows for the possibility that each of these components may be operating within different address spaces. IEEE 802.xx only uses and specifies the use of the WM address space.
Each IEEE 802.xx PHY operates in a single medium—the WM. The IEEE 802.xx MAC operates in a single
address space. MAC addresses are used on the WM in the IEEE 802.xx architecture. Therefore, it is unnecessary for the standard to explicitly specify that its addresses are "WM addresses." This is assumed throughout this standard.
IEEE 802.xx has chosen to use the IEEE 802 48-bit address space (see 7.1.3.3.1). Thus IEEE 802.xx addresses are compatible with the address space used by the IEEE 802 LAN family.
The IEEE 802.xx choice of address space implies that for many instantiations of the IEEE 802.xx architecture, the wired LAN MAC address space and the IEEE 802.xx MAC address space may be the same. In those situations where a DS that uses MAC level IEEE 802 addressing is appropriate, all three of the logical address spaces used within a system could be identical. While this is a common case, it is not the only combination allowed by the architecture. The IEEE 802.xx architecture allows for all three logical address spaces to be distinct.
A multiple address space example is one in which the DS implementation uses network layer addressing. In this case, the WM address space and the DS address space would be different.
The ability of the architecture to handle multiple logical media and address spaces is key to the ability of IEEE 802.xx to be independent of the DS implementation and to interface cleanly with network layer mobility approaches. The implementation of the DS is unspecified and is beyond the scope of this standard.

5.4 Overview of the services

There are nine services specified by IEEE 802.xx. Six of the services are used to support MSDU delivery between STAs. Three of the services are used to control IEEE 802.xx LAN access and confidentiality.

This subclause presents the services, an overview of how each service is used, and a description of how each service relates to other services and the IEEE 802.xx architecture. The services are presented in an order designed to help build an understanding of the operation of an IEEE 802.xx ESS network. As a result, the SSs and DSSs are intermixed in order (rather than being grouped by category).

Each of the services is supported by one or more MAC frame types. Some of the services are supported by MAC management messages and some by MAC data messages. All of the messages gain access to the WM via the IEEE 802.xx MAC sublayer medium access method specified in Clause 9.

The IEEE 802.xx MAC sublayer uses three types of messages—*dat*a, *managemen*t, and *control* (see Clause 7). The data messages are handled via the MAC data service path.

MAC management messages are used to support the IEEE 802.xx services and are handled via the MAC management service data path.

MAC control messages are used to support the delivery of IEEE 802.xx data and management messages. The examples here assume an ESS network environment. The differences between the ESS and the IBSS network environments are discussed separately in 5.6.

5.4.1 Distribution of messages within a DS

5.4.3.3 Privacy

In a wired LAN, only those stations physically connected to the wire may hear LAN traffic. With a wireless shared medium, this is not the case. Any IEEE 802.xx-compliant STA may hear all like-PHY IEEE 802.xx traffic that is within range. Thus the connection of a single wireless link (without privacy) to an existing wired LAN may seriously degrade the security level of the wired LAN.

To bring the functionality of the wireless LAN up to the level implicit in wired LAN design, IEEE 802.xx provides the ability to encrypt the contents of messages. This functionality is provided by the privacy ser-vice.

Privacy is an SS. IEEE 802.xx specifies an optional privacy algorithm, WEP, that is designed to satisfy the goal of wired LAN “equivalent” privacy. The algorithm is not designed for ultimate security but rather to be “at least as secure as a wire.” See Clause 8 for more details.

IEEE 802.xx uses the WEP mechanism (see Clause 8) to perform the actual encryption of messages. MIB functions are provided to support WEP.

Note that privacy may only be invoked for data frames and some Authentication Management frames. All stations initially start “in the clear” in order to set up the authentication and privacy services.

The default privacy state for all IEEE 802.xx STAs is “in the clear.” If the privacy service is not invoked, all messages shall be sent unencrypted. If this default is not acceptable to one party or the other, data frames shall not be successfully communicated between the LLC entities. Unencrypted data frames received at a station configured for mandatory privacy, as well as encrypted data frames using a key not available at the receiving station, are discarded without an indication to LLC (or without indication to distribution services in the case of “To DS” frames received at an AP). These frames are acknowledged on the WM [if received without frame check sequence (FCS) error] to avoid wasting WM bandwidth on retries.

5.7 Message information contents that support the services

Each service is supported by one or more IEEE 802.xx messages. Information items are given by name; for corresponding values, see Clause 7

5.7.1 Data

For a STA to send data to another STA, it sends a data message, as shown below:

Data messages

— Message type: Data
— Message subtype: Data
— Information items:
    - IEEE source address of message
    - IEEE destination address of message
— Direction of message: From STA to STA

5.8 Reference model

This standard presents the architectural view, emphasizing the separation of the system into two major parts: the MAC of the data link layer and the PHY. These layers are intended to correspond closely to the lowest.

layers of the ISO/IEC basic reference model of Open Systems Interconnection (OSI) (ISO/IEC 7498-1: 1994). The layers and sublayers described in this standard are shown in Figure 11.

Figure 11—Portion of the ISO/IEC basic reference model covered in this standard

6. MAC service definition

6.1 Overview of MAC services

6.1.2 Security services

6.2 Detailed service specification

6.2.1 MAC data services

The IEEE 802.xx MAC supports the following service primitives as defined in ISO/IEC 8802-2: 1998:

7.1 MAC frame formats

Each frame consists of the following basic components:

a) A *MAC header*, which comprises frame control, duration, address, and sequence control information;
b) A variable length *frame body*, which contains information specific to the frame *type*;
c) A *frame check sequence* (FCS), which contains an IEEE 32-bit cyclic redundancy code (CRC).

7.1.1 Conventions

The MAC frames in the MAC sublayer are described as a sequence of fields in specific order. Each figure in Clause 7 depicts the fields/subfields as they appear in the MAC frame and in the order in which they are passed to the physical layer convergence protocol (PLCP), from left to right.

In figures, all bits within fields are numbered, from 0 to k, where the length of the field is $k + 1$ bit. The octet boundaries within a field can be obtained by taking the bit numbers of the field modulo 8. Octets within numeric fields that are longer than a single octet are depicted in increasing order of significance, from lowest numbered bit to highest numbered bit. The octets in fields longer than a single octet are sent to the PLCP in order from the octet containing the lowest numbered bits to the octet containing the highest numbered bits.

Any field containing a CRC is an exception to this convention and is transmitted commencing with the coefficient of the highest-order term. MAC addresses are assigned as ordered sequences of bits. The Individual/Group bit is always transferred first and is bit 0 of the first octet.

Values specified in decimal are coded in natural binary unless otherwise stated. The values in Table 1 are in binary, with the bit assignments shown in the table. Values in other tables are shown in decimal notation. Reserved fields and subfields are set to 0 upon transmission and are ignored upon reception.

7.1.2 General frame format

The MAC frame format comprises a set of fields that occur in a fixed order in all frames. Figure 12 depicts the general MAC frame format. The fields Address 2, Address 3, Sequence Control, Address 4, and Frame Body are only present in certain frame types. Each field is defined in 7.1.3. The format of each of the individual frame types is defined in 7.2.

Figure 12—MAC frame format

7.1.3 Frame fields

7.1.3.5 Frame Body field

The Frame Body is a variable length field that contains information specific to individual frame types and subtypes. The minimum frame body is 0 octets. The maximum length frame body is x.

7.1.3.6 FCS field

The FCS field is a 32-bit field containing a 32-bit CRC. The FCS is calculated over all the fields of the MAC header and the Frame Body field. These are referred to as the *calculation fields*.

The FCS is calculated using the following standard generator polynomial of degree 32:

$G(x) = x^{32} + x^{26} + x^{23} + x^{22} + x^{16} + x^{12} + x^{11} + x^{10} + x^{8} + x^{7} + x^{5} + x^{4} + x^{2} + x + 1$

The FCS is the 1's complement of the sum (modulo 2) of the following:

a) The remainder of $x^k \times (x^{31} + x^{30} + x^{29} + \ldots + x^2 + x + 1)$ divided (modulo 2) by G(x), where k is the number of bits in the calculation fields, and
b) The remainder after multiplication of the contents (treated as a polynomial) of the calculation fields by x^{32} and then division by G(x).

The FCS field is transmitted commencing with the coefficient of the highest-order term.

As a typical implementation, at the transmitter, the initial remainder of the division is preset to all 1's and is then modified by division of the calculation fields by the generator polynomial G(x). The 1's complement of this remainder is transmitted, with the highest-order bit first, as the FCS field.

At the receiver, the initial remainder is preset to all 1's and the serial incoming bits of the calculation fields and FCS, when divided by G(x), results in the absence of transmission errors, in a unique nonzero remainder value. The unique remainder value is the polynomial:

$$x^{31} + x^{30} + x^{26} + x^{25} + x^{24} + x^{18} + x^{15} + x^{14} + x^{12} + x^{11} + x^{10} + x^{8} + x^{6} + x^{5} + x^{4} + x^{3} + x + 1$$

7.2 Format of individual frame types

7.2.1 Control frames

8. Authentication and privacy

8.1 Authentication services

9. MAC sublayer functional description

The MAC functional description is presented in this clause.

9.1.4 Fragmentation/defragmentation overview

9.1.5 MAC data service

The MAC data service shall translate MAC service requests from LLC into input signals utilized by the MAC state machines. The MAC data service shall also translate output signals from the MAC state machines into service indications to LLC. The translations are given in the MAC data service state machine defined in Annex C.

9.4 Fragmentation

9.5 Defragmentation

9.7 Frame exchange sequences

10. Layer management

10.1 Overview of management model

Both MAC and PHY layers conceptually include management entities, called MAC sublayer management and PHY layer management entities (MLME and PLME, respectively). These entities provide the layer management service interfaces through which layer management functions may be invoked.

In order to provide correct MAC operation, a station management entity (SME) shall be present within each STA. The SME is a layer-independent entity that may be viewed as residing in a separate management plane or as residing "off to the side." The exact functions of the SME are not specified in this standard, but in general this entity may be viewed as being responsible for such functions as the gathering of layer-dependent status from the various layer management entities, and similarly setting the value of layer-specific parameters.

SME would typically perform such functions on behalf of general system management entities and would implement standard management protocols. Figure 11 depicts the relationship among management entities.

The various entities within this model interact in various ways. Certain of these interactions are defined explicitly within this standard, via a service access point (SAP) across which defined primitives are exchanged. Other interactions are not defined explicitly within this standard, such as the interfaces between **MAC and MLME and between PLCP and PLME, represented as double arrows within Figure 63. The specific manner in which these MAC and PHY management entities are integrated into the overall MAC and PHY layers is not specified within this standard.**

The management SAPs within this model are the following:

- SME-MLME SAP
- SME-PLME SAP
- MLME-PLME SAP

The latter two SAPs support identical primitives, and in fact may be viewed as a single SAP (called the PLME SAP) that may be used either directly by MLME or by SME. In this fashion, the model reflects what is anticipated to be a common implementation approach in which PLME functions are controlled by the MLME (on behalf of SME). In particular, PHY implementations are not required to have separate interfaces defined other than their interfaces with the MAC and MLME.

10.2 Generic management primitives

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.

Figure 63 depicts these generic primitives.

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

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 indica-tion 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.

Other SAP-specific primitives are identified in 10.3.

10.3 MLME SAP interface

The services provided by the MLME to the SME are specified in this subclause. These services are described in an abstract way and do not imply any particular implementation or exposed interface. MLME SAP primitives are of the general form ACTION.request followed by ACTION.confirm. The SME uses the services provided by the MLME through the MLME SAP.

Example---------

10.3.7.2 Title

10.3.7.2.1 Function

10.3.7.2.2 Semantics of the service primitive

10.3.7.2.3 When generated

10.3.7.2.4 Effect of receipt

---------------- end example

11. MAC sublayer management entity

11.1 Synchronization

All STAs within a single BSS shall be synchronized to a common clock using the mechanisms defined herein.

12. Physical layer (PHY) service specification

12.1 Scope

The PHY services provided to the IEEE 802.xx wireless LAN MAC are described in this clause. Different PHYs are defined as part of the IEEE 802.xx standard.

12.2 PHY functions

The protocol reference model for the IEEE 802.xx architecture is shown in Figure 11. Most PHY definitions contain three functional entities: the PMD function, the physical layer convergence function, and the layer management function.

The PHY service is provided to the MAC entity at the STA through a service access point (SAP), called the PHY-SAP, as shown in Figure 11. A set of primitives might also be defined to describe the interface between the physical layer convergence protocol sublayer and the PMD sublayer, called the PMD-SAP.

12.3 Detailed PHY service specifications

12.3.1 Scope and field of application

The services provided by the PHY to the IEEE 802.xx MAC are specified in this subclause. These services are described in an abstract way and do not imply any particular implementation or exposed interface.

12.3.2 Overview of the service

The PHY function as shown in Figure 11 is separated into two sublayers: the PLCP sublayer and the PMD sublayer. The function of the PLCP sublayer is to provide a mechanism for transferring MPDUs between two or more STAs over the PMD sublayer.

12.3.3 Overview of interactions

13. PHY management

The MIB comprises the managed objects, attributes, actions, and notifications required to manage a station. The definition of these managed objects, attributes, actions, and notifications, as well as their structure, is presented in Annex D.

Annex A

(normative)

Protocol Implementation Conformance Statement (PICS) proforma

A.1 Introduction

The supplier of a protocol implementation that is claimed to conform to ISO/IEC 8802.xx: 1999 shall complete the following PICS proforma.

A completed PICS proforma is the PICS for the implementation in question. The PICS is a statement of which capabilities and options of the protocol have been implemented. The PICS can have a number of uses, including use

a) By the protocol implementor, as a checklist to reduce the risk of failure to conform to the standard through oversight;
b) By the supplier and acquirer, or potential acquirer, of the implementation, as a detailed indication of the capabilities of the implementation, stated relative to the common basis for understanding pro-vided by the standard PICS proforma;
c) By the user, or potential user, of the implementation, as a basis for initially checking the possibility of interworking with another implementation (note that, while interworking can never be guaranteed, failure to interwork can often be predicted from incompatible PICS proformas);
d) By a protocol tester, as the basis for selecting appropriate tests against which to assess the claim for conformance of the implementation.

A.2 Abbreviations and special symbols

A.2.1 Status symbols

M mandatory
O optional
O.<n> optional, but support of at least one of the group of options labeled by the same numeral <n> is required

pred: conditional symbol, including predicate identification

A.2.2 General abbreviations

N/A not applicable
AD address function capability
CF implementation under test (IUT) configuration
FR MAC frame capability
FS frame sequence capability
PC protocol capability
PICS protocol implementation conformance statement.

A.3 Instructions for completing the PICS proforma

A.3.1 General structure of the PICS proforma

The first part of the PICS proforma, Implementation identification and Protocol summary, is to be completed
as indicated with the information necessary to identify fully both the supplier and the implementation.
The main part of the PICS proforma is a fixed questionnaire, divided into subclauses, each containing a number of individual items. Answers to the questionnaire items are to be provided in the rightmost column, either by simply marking an answer to indicate a restricted choice (usually Yes or No) or by entering a value or a set or a range of values. (Note that there are some items where two or more choices from a set of possible answers may apply. All relevant choices are to be marked in these cases.)
Each item is identified by an item reference in the first column. The second column contains the question to be answered. The third column contains the reference or references to the material that specifies the item in the main body of ISO/IEC 8802-xx: 1999. The remaining columns record the status of each item, i.e., whether support is mandatory, optional, or conditional, and provide the space for the answers (see also A.3.4). Marking an item as supported is to be interpreted as a statement that all relevant requirements of the subclauses and normative annexes, cited in the References column for the item, are met by the implementation.
A supplier may also provide, or be required to provide, further information, categorized as either Additional Information or Exception Information. When present, each kind of further information is to be provided in a further subclause of items labeled A<I> or X<I>, respectively, for cross-referencing purposes, where <I> is any unambiguous identification for the item (e.g., simply a numeral). There are no other restrictions on its format or presentation.
The PICS proforma for a station consists of A.4.1 through A.4.4 inclusive, and at least one of A.4.5, A.4.6, or A.4.7 corresponding to the PHY implemented.
A completed PICS proforma, including any Additional Information and Exception Information, is the PICS for the implementation in question.
NOTE—Where an implementation is capable of being configured in more than one way, a single PICS may be able to describe all such configurations. However, the supplier has the choice of providing more than one PICS, each covering some subset of the implementation's capabilities, if this makes for easier and clearer presentation of the information.

A.3.2 Additional information

Items of Additional Information allow a supplier to provide further information intended to assist in the interpretation of the PICS. It is not intended or expected that a large quantity of information will be supplied, and a PICS can be considered complete without any such information. Examples of such Additional Information might be an outline of the ways in which an (single) implementation can be set up to operate in a variety of environments and configurations, or information about aspects of the implementation that are outside the scope of this standard but have a bearing upon the answers to some items.
References to items of Additional Information may be entered next to any answer in the questionnaire, and may be included in items of Exception Information.

A.3.3 Exception information

It may happen occasionally that a supplier will wish to answer an item with mandatory status (after any conditions have been applied) in a way that conflicts with the indicated requirement. No preprinted answer will be found in the Support column for this. Instead, the supplier shall write the missing answer into the Support column, together with an X<I> reference to an item of Exception Information, and shall provide the appropriate rationale in the Exception Information item itself.
An implementation for which an Exception Information item is required in this way does not conform to ISO/IEC 8802-xx: 1999.

NOTE—A possible reason for the situation described above is that a defect in ISO/IEC 8802-xx: 1999 has been reported, a correction for which is expected to change the requirement not met by the implementation.

A.3.4 Conditional status

The PICS proforma contains a number of conditional items. These are items for which both the applicability of the item itself, and its status if it does apply, mandatory or optional, are dependent upon whether or not certain other items are supported.

Where a group of items is subject to the same condition for applicability, a separate preliminary question about the condition appears at the head of the group, with an instruction to skip to a later point in the questionnaire if the Not Applicable (N/A) answer is selected. Otherwise, individual conditional items are indicated by a conditional symbol in the Status column.

A conditional symbol is of the form “<pred>:<S>”, where “<pred>” is a predicate as described below, and “<S>” is one of the status symbols M or O.

If the value of the predicate is true, the conditional item is applicable, and its status is given by S: the support column is to be completed in the usual way. Otherwise, the conditional item is not relevant and the N/A answer is to be marked.

A predicate is one of the following:

a) An item-reference for an item in the PICS proforma: the value of the predicate is true if the item is marked as supported, and is false otherwise.

b) A boolean expression constructed by combining item-references using the boolean operator OR: the value of the predicate is true if one or more of the items is marked as supported, and is false otherwise.

Each item referenced in a predicate, or in a preliminary question for grouped conditional items, is indicated by an asterisk in the Item column.