Project	**IEEE 802.16 Broadband Wireless Access Working Group** <http://ieee802.org/16>
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Re:	IEEE 802.16m-07/040 ("Call for Contributions on Project 802.16m System Description Document (SDD)")
Abstract	This document describes a proposal for the 802.16m SDD protocol architecture model and also provides an overview of 802.16m functional architecture.
Purpose	To be discussed and adopted by the TGm for the 802.16m SDD.
Notice	
Release	
Patent Policy	

Proposed 802.16m SDD Protocol/Functional Architecture

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1 Introduction

This document describes a proposal for the 802.16m SDD protocol architecture model and also provides an overview of 802.16m functional architecture.

2 Proposed 802.16m Protocol Architecture

The proposed 802.16m protocol architecture model is illustrated in Figure 1.

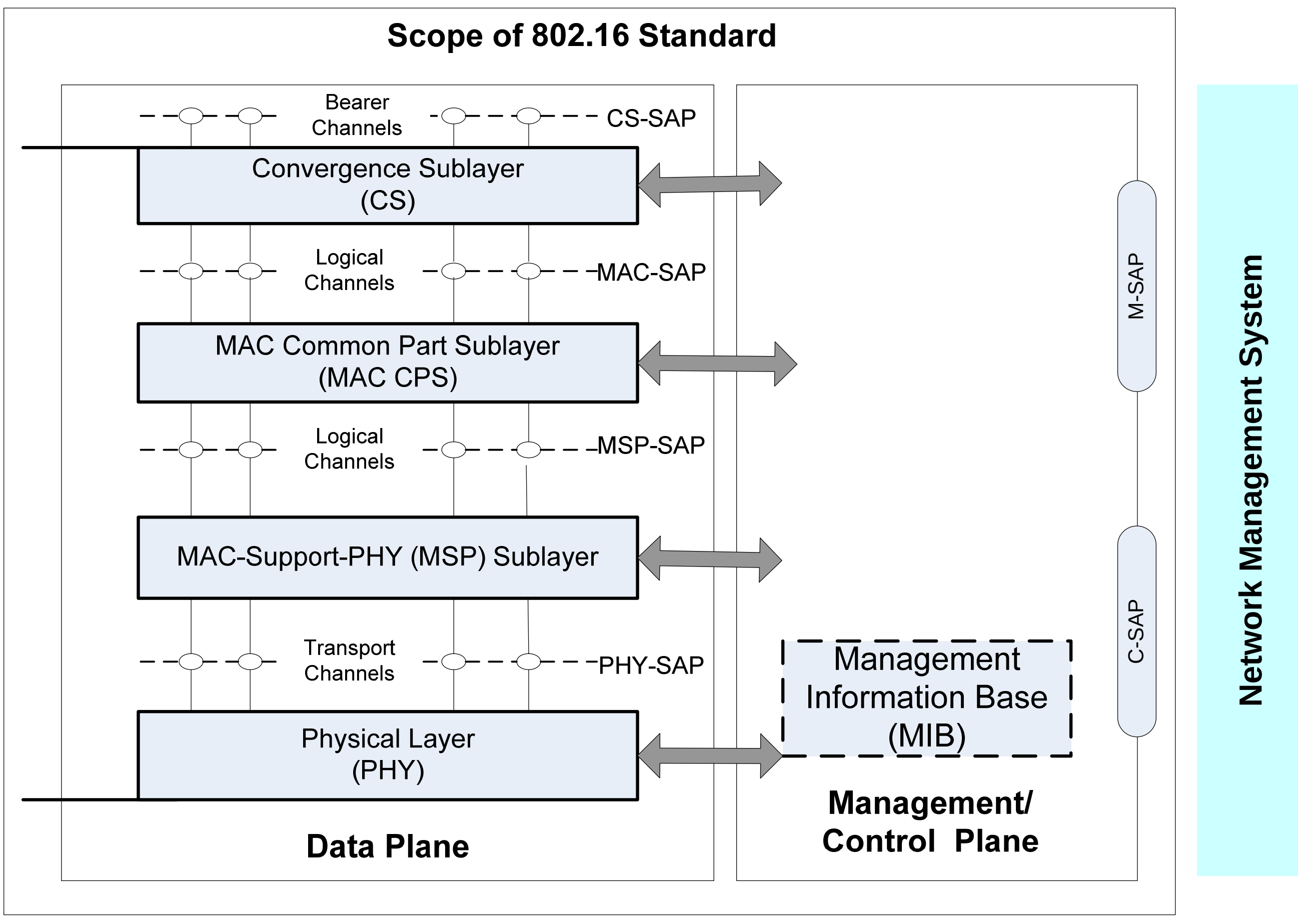

Figure 1. IEEE Std. 802.16m Protocol Architecture Model

The differences between this proposed 802.16m protocol architecture model and the existing 802.16 protocol architecture model are:

1) A new sublayer, named as “MAC support PHY (MSP) Sublayer”, is inserted between PHY and MAC Common Part Sublayer. This new layer encompasses the air-link management MAC functions.

2) The “Security Sublayer” box is removed, as we don’t think security is a separate sublayer; we view the security function as a functional module and believe that it is best placed in the Convergence Sublayer;

3) The sublayer name “Service Specific Convergence sub-layer” is changed to “Convergence Sublayer”, as we believe it is more appropriate to represent the functionality of this sublayer.

4) A Bearer Channel concept is introduced to represent the input flow into the MAC. There can be multiple distinct flows into the CS.

5) A Logical Channel construct is shown in the architecture diagram to illustrate the fact that logical connections are MAC constructs and are not know to the PHY. There are two types of logical channels: control logical channels and traffic logical channels.

6) Transport channels are known by both MAC and PHY; examples of a transport channels are DL broadcast control channel, DL Data Channel, DL Multicast channel, UL control channel

3 Overview of 802.16m Functional Architecture

The section provides an overview of the proposed 802.16m functional architecture, i.e., the function modules of each layer or sublayers in Figure 1.

[Note: missing from this SDD function architecture proposal are Registration and Authentication protocols.]

3.1 Convergence Sublayer

The Figure 2 shows the functional modules in the Convergence Sublayer.

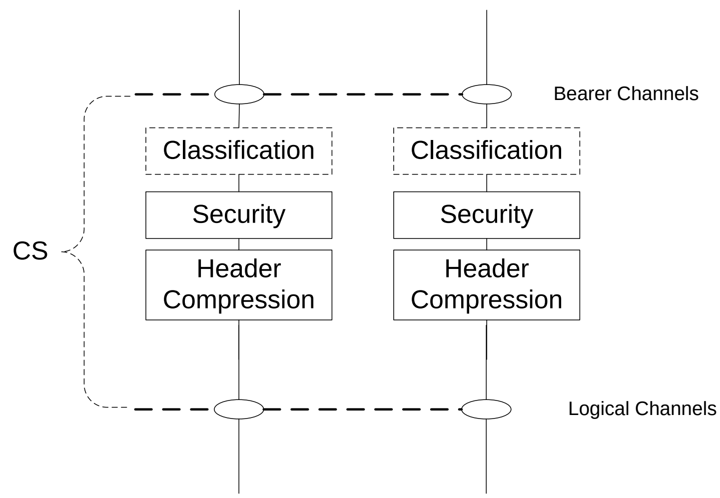

Figure 2. Functional Modules of 802.16m Convergence Sublayer

Functional components of the Convergence Sublayer include:

- Classification: Classification is defined as the process of mapping bearer channels to logical channels. Classification is shown with a dashed-line box to indicate that classification may be also be done outside the CS if there is one to one mapping between bearer channels and logical channels.

- Security: We proposed to elevate the security function to the CS since it is better done at the SDU level.

The security functional entity includes all the necessary protocol elements to support key exchange between the MS and the Base Station.

- Header Compression: This can reuse some or all of the header compression capabilities in legacy 802.16. However, we would like to see only one header compression technique supported by the standard. We recommend ROHC.

3.2 MAC Common Part Sublayer

The Figure 3 shows the function modules in the MAC Common Part sublayer.

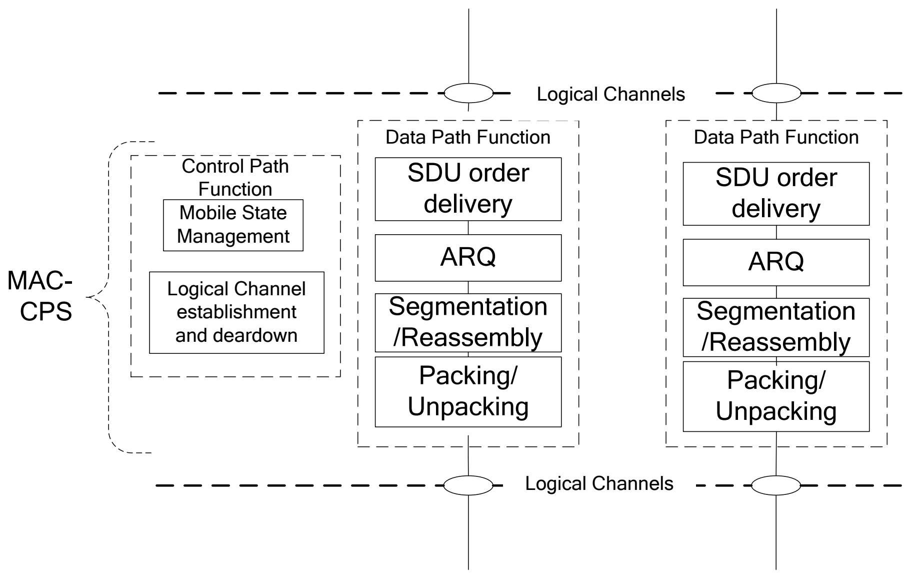

Figure 3. Functional Modules of 802.16m MAC Common Part Sublayer

Functional components of the MAC Common Part Sublayer include:

- ARQ
- Segmentation and Reassembly
- Packing and Unpacking
- Logical channel establishment and teardown
- Ordering delivery of SDU to upper layer
- Mobile Station state management and associated protocols -- Active, Idle, Sleep, HO, etc.
- Note: there is no CRC in the MAC as it relies on the error detection function in the PHY.

3.3 MAC-Support-PHY Sublayer

The Figure 4 shows the functional modules in the MAC-Support-PHY (MSP) Sublayer.

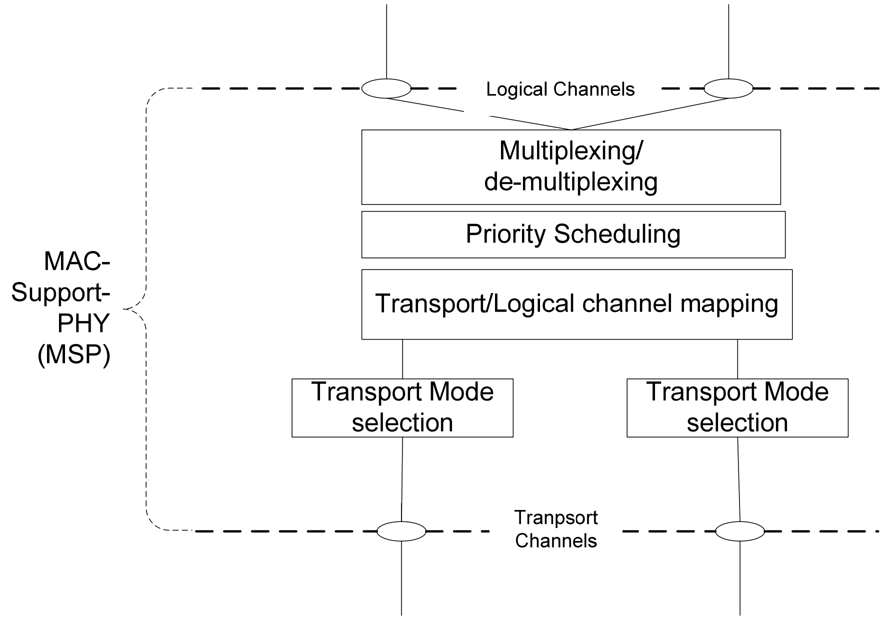

Figure 4. Functional Modules of 802.16m MAC-Support-PHY (MSP) Sublayer

Functional components of the MAC-Support-PHY Sublayer include:

- Mapping between transport and logical channels
- Multiplexing and de-multiplexing
- Scheduling and priority handling of different logical channels
- Transport channel mode selection e.g. MCS, HARQ mode, MIMO, beam forming, etc.
- Padding

3.4 PHY Layer

Figure 5 shows a modular view of the PHY layer.

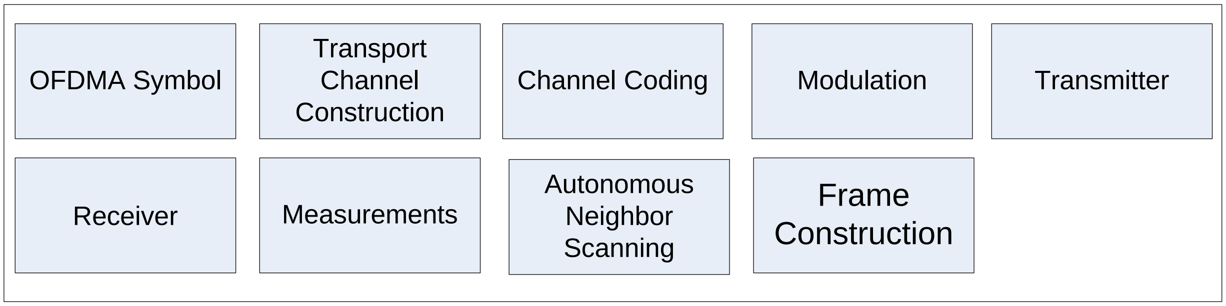

Figure 5. Modules of 802.16m PHY Layer

3.4.1 Frame Construction

A frame is constructed from a sequence of OFDMA symbols. There are slightly different versions for TDD and FDD duplexing.

3.4.2 OFDMA Symbol

Detailed descriptions for the OFDMA symbol structure and parameters shall be provided.

3.4.3 Transport Channel Construction

A transport channel is a specific physical configuration (modulation and coding set) and allocation of subcarriers used to transport information. Everything is conveyed on a transport channel. The preamble is conveyed on the preamble transport channel. A map is conveyed on a map transport channel. Control info is conveyed on a control transport channel, and data on a data transport channel. The preamble channel has a fixed position at the start of the frame; the positions of data channels vary.

3.4.3.1 Some PHY Transport Channels

DL Transport channels supported by the Physical layer include:

- Preamble channel (PrCH)
- Fixed Broadcast control channel (FCH)
  - Must be 'heard' by all MS in the cell coverage area
  - Has predefined PHY transport characteristics
- Broadcast control channel (BCH)
  - Must be 'heard' in the entire cell coverage area; (Compressed and normal MAP)
- Multicast control channel (McCH)
  - Required to be 'heard' by a group of users with similar channel decoding capabilities. (e.g. sub-maps)
- DL Data channel (DLDCH)– supports most if not all PHY layer transport modes: HARQ, dynamic MCS, MIMO, etc.
- DL broadcast Data Channel (DLBDCH)
- DL Multicast Data Channel – (DLMcDCH) used for MBS type services

UL Transport channels supported by the Physical layer include:

- UL Unicast Data Channel (ULUDCH)
- Contention access channel – Ranging, traffic indication
- Dedicated UL control channel – CQI, traffic indication
- HARQ ACK/MACK channel

3.4.4 Channel Coding

The basic coding elements include CC, CTC, RS, HARQ, and STC. Methods of randomization and interleaving specific to each encoding are considered part of the encoding process and are described in their respective sections.

3.4.5 Modulation

The modulation types include BPSK, QPSK, QAM-16, and QAM-64.

3.4.6 Transmitter

Specifications on the transmitter include specifications for power control, zone boosting, spectral flatness, spectral mask, signal quality, timing accuracy, frequency accuracy, and symbol clock accuracy.

3.4.7 Receiver

Specifications on the receiver include sensitivity, time tracking accuracy, maximum input, cochannel rejections, and adjacent channel rejection.

3.4.8 Measurements

The PHY must perform measurements including CQI, RSSI, CINR, and possibly ACC (advanced channel characterization).

3.4.9 Autonomous Neighbor Scanning

The PHY must support autonomously collecting information on neighboring cells.