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Title	**Proposed 802.16m SDD Protocol/Functional Architecture**	
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Re:	Call for Contributions on Project 802.16m System Description Document for the Levi, Finaland F2F meeting. Specifically on "Protocol Architecture and Main Functionality per Protocol Layer"	
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.	
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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 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.

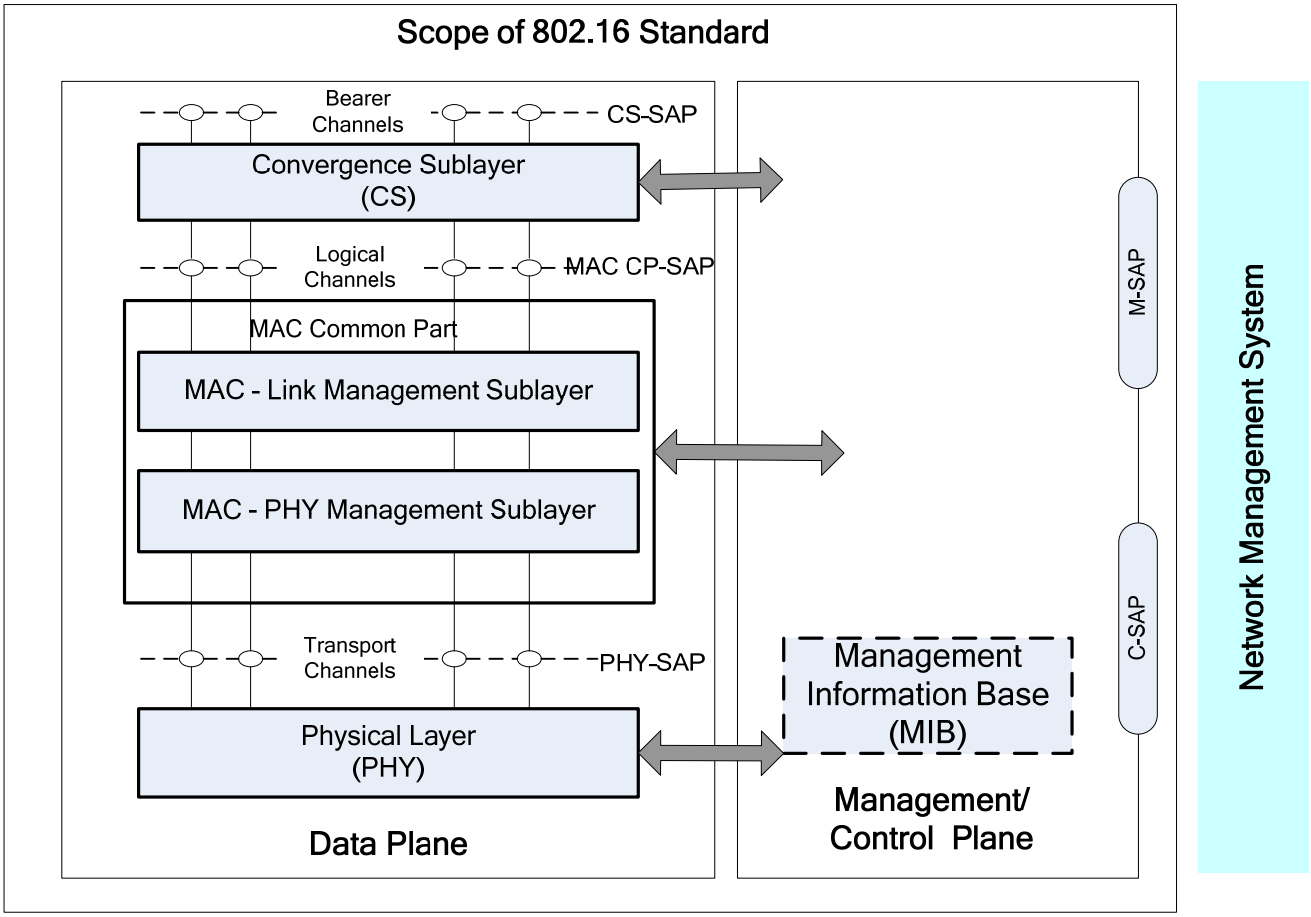

Figure 1. IEEE Std. 802.16m Protocol Architecture Model

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

1) The MAC Common Part layer is functionally divided into two sublayers

   - MAC - Link Management Sublayer which encompasses MAC ARQ, segmentation and reassembly, connection establishment procedures, etc.

- MAC – PHY Management Sublayer which encompasses the air-link management MAC functions, e.g. Ranging and link adaptation, and MAC PDU construction

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 at the Convergence Sublayer;

3) The sublayer name “Service Specific Convergence sub-layer” is changed to “Convergence Sublayer”, as we believe it more appropriately represents the functionality of this sublayer; we believe that one generic sublayer can provide the services required by multiple services and therefore, there is no need to have a convergence layer for each service type.

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, etc.

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.

3.1 Convergence Sublayer

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

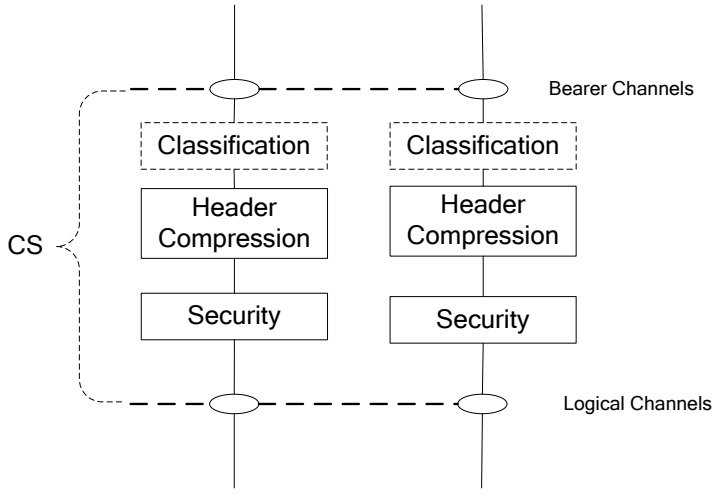

Figure 2. Functional Modules of 802.16m Convergence Sublayer

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 also be done outside the CS if there is one-to-one mapping between bearer channels and logical channels. In addition, we view the details of the classification process as being outside the scope of the air interface standard since there is no impact on interoperability and it is an area that should be left to vendors' differentiation.

- 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-Link Management Sublayer

The Figure 3 shows the function modules of the MAC-Link Management Sublayer within the MAC Common Part sublayer.

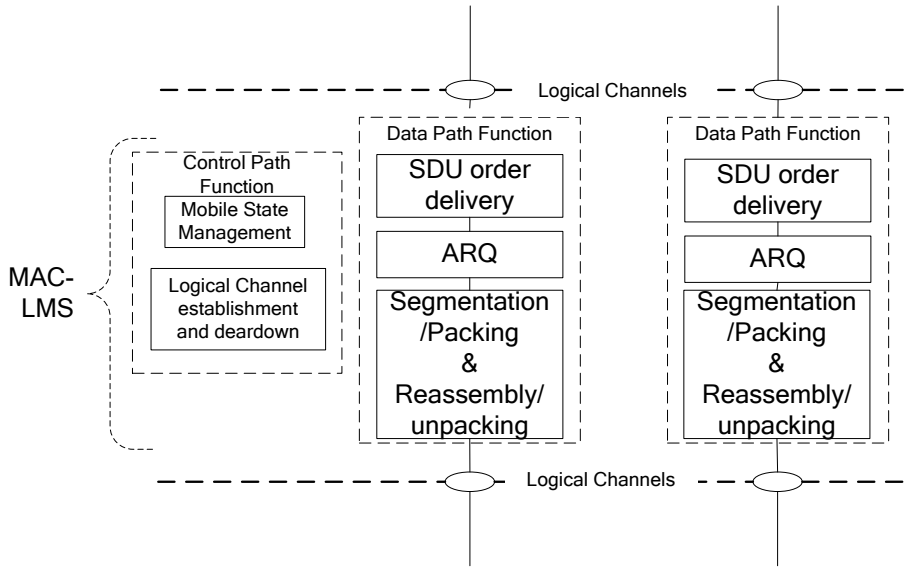

Figure 3. Functional Modules of 802.16m MAC-Link Management Sublayer

Functional components of the MAC Common Part Sublayer include:

- ARQ – MAC layer retransmission mechanism

- Segmentation/Packing and Reassembly/Unpacking. We should combine the segmentation and packing (concatenation) into one functional entity; similarly, the reassembly and unpacking should also be combined.

- Logical channel establishment and teardown (e.g. DSx)

- Ordered delivery of SDU to upper layer
- Mobile Station state management and associated protocols -- Active, Idle, Sleep, HO, etc.

3.3 MAC- PHY Management Sublayer

The Figure 4 shows the functional modules in the MAC- PHY Management Sublayer.

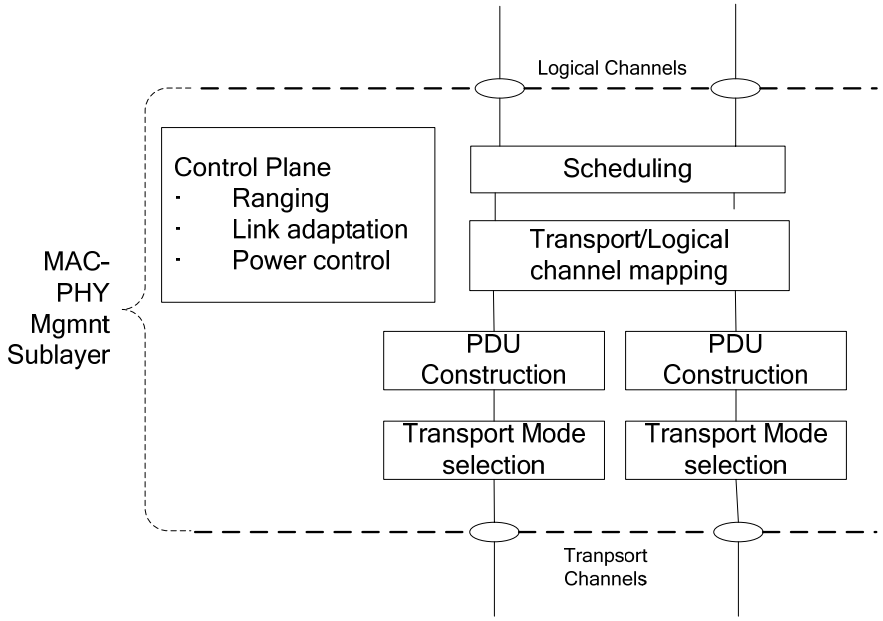

Figure 4. Functional Modules of 802.16m MAC-Support-PHY (MSP) Sublayer

Functional components of the MAC-PHY Management Sublayer include:

- Scheduling and priority handling of different logical channels
- Mapping between transport and logical channels; note that several logical channel can be carried over a single transport channel and therefore, this functional entity also includes logical channels multiplexing function.
- PDU Construction – limited to adding MAC header and CRC
- Transport channel mode selection e.g. MCS, HARQ mode, MIMO, beam forming, etc.
- Padding to align with the specific PHY mode transmission units.

3.3.1 Transport channels

The MAC views the PHY via transport channels. Each transport channel has a known data transfer attributes, e.g. data rate, E\error rate, retransmission capabilities, etc. The MAC uses this knowledge to map logical

channels to transport channels.

Multiplexing of multiple transport channels over the same physical layer channel should be allowed.

DL transport channels

- DL Data channel
  - Carries DL MS information
- Paging channel
  - Support MS power saving modes
  - Required to be 'heard' in the entire cell coverage area
- MBS channel
  - Carries multicast and broadcast information
  - Supports single frequency network mode

UL transport channels

- UL Data channel
  - Carries MS UL information

3.4 PHY Layer

A Physical channel is a specific physical configuration (modulation and coding set) and allocation of physical slots (subcarriers and symbols) used to transport information. Some channels have fixed (known a priori) physical layer attribute while other physical channels have variable physical layer attributes.

DL channels supported by the Physical layer include:

- Preamble channel (PrCH)
  - Must be heard by all MS in the call coverage area
  - Fixed location in time and frequency; attributes are known a priori.
- Fixed Broadcast control channel (e.g. FCH)
  - Must be 'heard' by all MS in the cell coverage area
  - Has predefined PHY transport characteristics
  - Informs the MS about the PHY attributes on the Common DL MAP control channel
- Broadcast DL Control channel
  - Must be 'heard' by all MS in the cell coverage area
  - Informs the MS about the system parameters (e.g. DCD, UCD)
- Common DL MAP control channel
  - Must be 'heard' in the entire cell coverage area
  - Does not support retransmission requests
  - Informs the MS about Sub DL MAP control channels
  - Contains information about DL Data channel resource allocations
  - Contains information about UL Data channel resource allocations (uplink grants)
- Sub DL MAP control channel
  - Required to be 'heard' by a group of users with similar channel decoding capabilities.
  - Does not support retransmission requests
  - Contains information about DL Data channel resource allocations
  - Contains information about UL Data channel resource allocations (uplink grants)
- Unicast DL MAP control channel
  - Must be 'heard' by one MS and thus can be sent at the most efficient PHY mode.

    - May support retransmission requests (e.g. HARQ)
    - Informs the MS about DL Data Channel resource allocations
    - Informs the MS about UL Data Channel resource allocation (uplink grants)
- DL Data Channel
    - Carries transport channels in the DL
- UL Data Channel
    - Carries transport channel in the UL
- DL Multicast Data Channel
    - Carries MBS type services

UL channels supported by the Physical layer include:

- UL Random Access channel
    - A contention bases access used for ranging and possibly for traffic indication.
    - Carries the random access PN sequence
- Dedicated UL control channel
    - May need to have multiple Dedicated UL control channels, each a with different data rate capabilities
    - Carries DL CQI
- UL HARQ ACK/NACK channel
    - Carries the ACK/NACK indication in response to DL transmission
- UL Unicast Data Channel
    - Carries MS transport channel information