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| Re: | IEEE 802.16 NetMan Task Group Call for Contributions for Table of Contents and Network Reference Models |
| Abstract | A simplified Network Reference Model is proposed for the IEEE 802.16g specification along with a management architecture model. |
| Purpose | This document proposes a Network Reference Model for the IEEE 802.16g specification |
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# Proposal for Network Reference Model

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## Introduction

This contribution proposes a network reference model for the IEEE 802.16g specification. In the last IEEE 802.16 interim session #33 in Seoul we had proposed the scope and architectural considerations for this project in contribution IEEE C802.16g-04/07 [1]. This contribution derives the proposed based on that work and other contributions [2][3][4][5][6]. The text for the introduction is derived from the PAR[7].

## Concept

This contribution proposes a generic Network Reference Model that abstracts specific implementation variations of the 802.16 network to enable capturing the key management and control functionality that are needed for the efficient operation of the air interface. Any structural considerations of the various entities in the network other than the 802.16 BS and SS/MSS are to be considered outside the scope of the 802.16g specification. Procedures that enable management and control interactions between the MAC and PHY layers of the 802.16 devices and such network entities however are in scope. An abstracted network reference model is presented to clearly depict the interfaces that are assumed to be in scope of the specification.

## Proposed Text

Adopt the following text into the initial working document.

## 1 Introduction

### *1.1 Scope*

This document provides enhancements to the MAC and PHY management entities of IEEE Standard 802.16-2004, as amended by P802.16e, to create standardized procedures and interfaces for the management of conformant 802.16 devices.

### *1.2 Purpose*

The purpose of this project is to specify (for conformant 802.16 equipment) PHY/MAC/CS layer primitives to enable interoperable and efficient management of network resources and efficient handover procedures and to standardize management plane behavior in 802.16 fixed and mobile devices.

# 2 Overview

The 802.16 devices within the purview of this specification can include 802.16-2004 subscriber stations (SS) or 802.16e mobile subscriber stations (MSS) or base stations (BS). As the 802.16 devices may be part of a larger network and therefore would require interfacing with entities for management and control purposes, this document assumes a Network Control and Management System (NCMS) abstraction that interfaces with the base stations. The NCMS abstraction allows the PHY/MAC/CS layers specified in 802.16 to be independent of the network architecture, the transport network, and the protocols used at the backend and therefore allows greater flexibility on the network side. Any necessary inter-BS coordination is handled through the NCMS. This specification will only describe procedures for management and control interactions between the MAC/PHY/CS layers of the 802.16 devices and the NCMS. The details of the various entities that form the Network Control and Management System are outside the purview of this specification. An abstracted network reference model is presented to clearly depict the interfaces that are assumed to be in scope of the specification.

## *2.1 Network Reference Model*

Figure 1 describes a network reference model along with the interfaces that are within the scope of this specification. Multiple SS or MSS maybe attached to a BS. The SS communicate to the BS over the U interface using a Primary Management Connection or a Secondary Management Connection. MSS typically only utilize the Primary Management Connection over the U interface for management and related control functions.

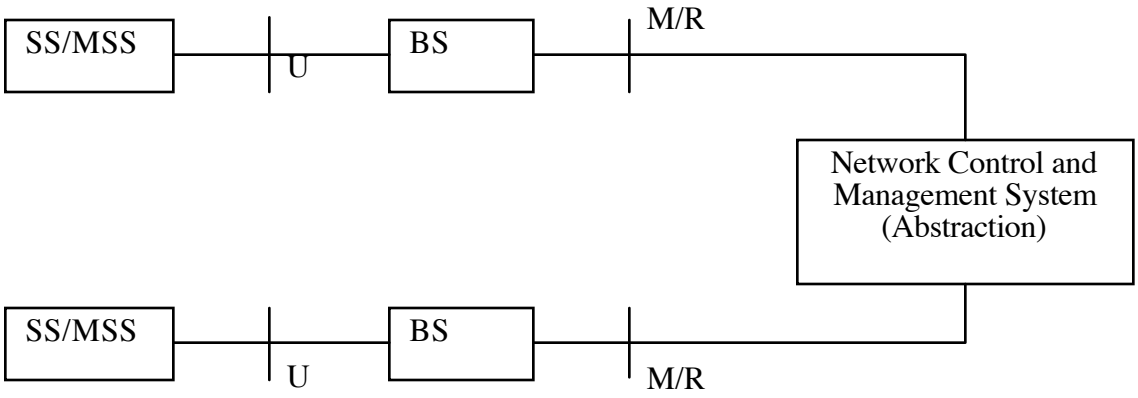


Figure 1: Basic Network Reference Model (Informational)

### 2.1.1 Network Control and Management System (NCMS)

This abstraction is detailed in figure 2 to show the different entities that make up such a Network Control and Management System. The exact functionality of these entities and their services is outside the scope of this specification but shown here for illustration purposes and to better enable the description of the management and control procedures.

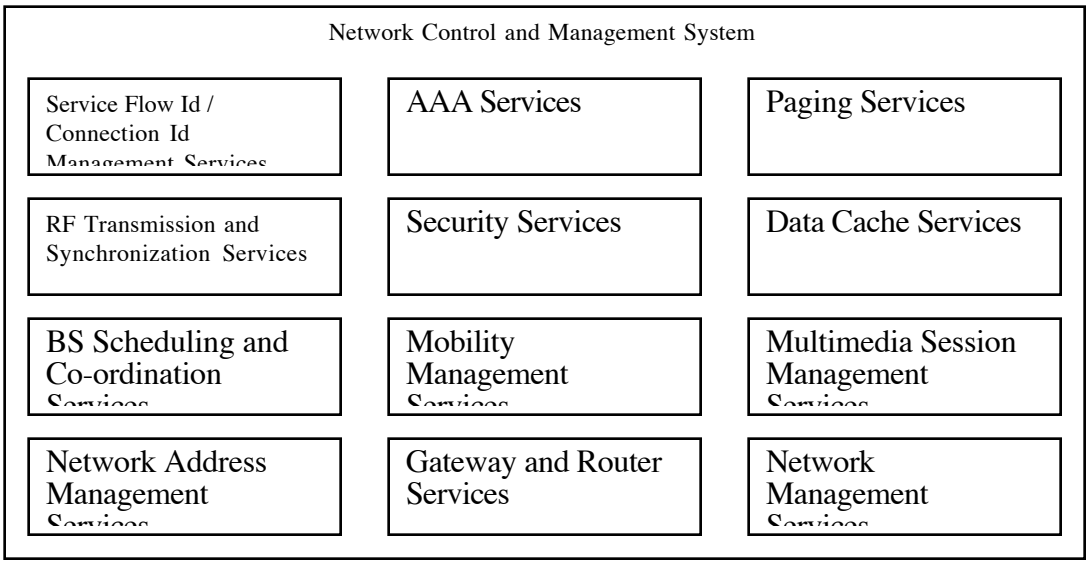


Figure 2: Illustration of the Network Control and Management System (Informational)

### 2.1.2 SS/MSS and BS Interface

This U interface may be implemented using either a primary management connection or a secondary management connection

### 2.1.3 BS and NCMS Interface

This interface is logically decomposed in to two parts: the M interface used for Management procedures alone and the R interface used for Control plane procedures that to support handovers, security context management, radio resource management, and low power operations (such as Idle mode and paging functions). Protocol procedures on both M and R interfaces are described in a transport independent manner.

The M interface may include messages for procedures related to:
- System configuration
- Monitoring Statistics
- Notifications/Triggers

The R interface may include the messaging required for procedures related to:

- Handovers (e.g. notification of HO request from MSS, etc.)
- Idle mode mobility management (e.g. Mobile entering idle mode)
- Subscriber and session management (e.g. Mobile requesting session setup)
- Radio resource management, etc.

The interactions over the R interface can be bi-directional and not necessarily master-slave with the NCMS acting as master. The interaction may be of a request-response nature, in which a request from one side triggers a procedure on the other side in order to generate the response.

### 2.1.4 Management Architecture Model

Figure 3 shows how the different sub layers are organized for the PHY, MAC and the CS and Management and Control functions. It is assumed that when the secondary management connection is used the CS sub layer is used as the conduit for messages over the air interface for managing the SS and the BS. Use of the secondary

management connection for the U interface may enable network-level management protocols that need a direct communication between NCMS and SS/MSS transparently over the 802.16 MAC/PHY.

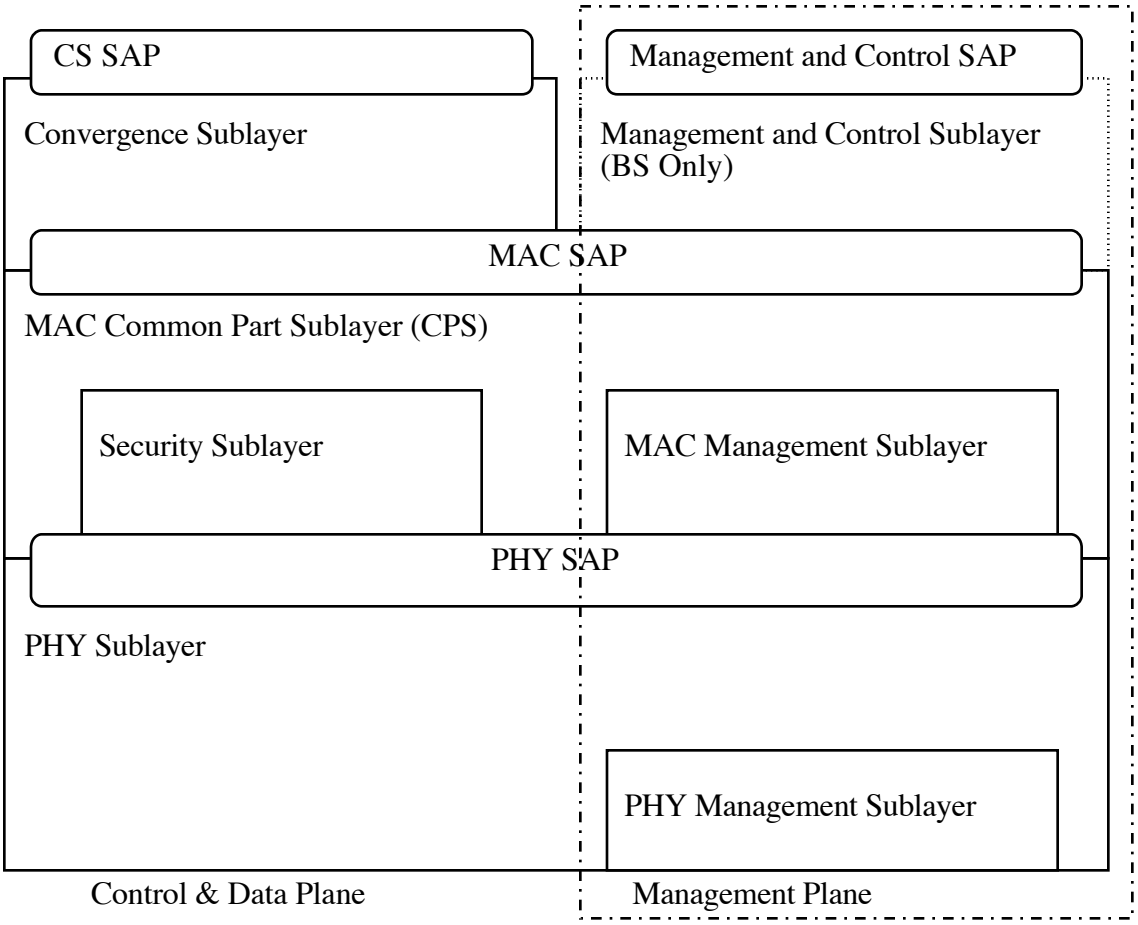


Figure 3: Basic Management Architecture Model (Informational)

However when the primary management connection is used, the MAC SAP is extended to include management related messages that need to go over the air interface. This therefore allows reduced management complexity. However on the BS, a specific Management and Control sub layer above the MAC SAP enables additional upper layer functions to be implemented to enable optimal functioning of a multi-base station 802.16 network. The M and R interfaces expose this sub layer using messages that are described as part of the Management and Control SAP which in turn describe the procedures between the BS and the NCMS.

# 3 References

[1] IEEE C802.16g-04/07, 802.16g Scope and Architectural Considerations (Jose Puthenkulam, Prakash Iyer, 04/08/29)

[2] IEEE C802.16g-04/06, Operation Support System Interface Specification for 802.16 fixed Wireless Systems (Radu Selea, Bogdan Moldoveanu, 04/08/26)

[3] IEEE C802.16g-04/05, The type of MIB and process of management by EMS (Chi-Man Lee, Ki-Jun Lee, Dong-Cheol Lee, 04/08/20)

[4] IEEE C802.16g-04/04, The issues related with Roaming (Ki-Jun Lee, Dong-Cheol Lee, Chi-Man Lee, 04/08/20)

[5] IEEE C802.16g-04/02, The scope of IEEE 802.16g (Min-Sung Kim, Yongjoo Tcha, Seong-Choon Lee, 04/08/17)

[6] IEEE C802.16g-04/01, 802.16 Accounting based on IEEE 802.1X Accounting (Dongkie Lee, DongIl Moon, DongRyul Lee, JongKuk Ahn, KangIl Koh, Sihun Ryu, Sungho Ha, 04/08/17)

[7] IEEE 80216-04_35r4, 802.16g PAR, August 12, 2004