Project	**IEEE 802.16 Broadband Wireless Access Working Group** <http://ieee802.org/16>
Title	**Proposed Network Architecture for IEEE 802.16m Inter-Radio Access Technology Functions**
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Re:	IEEE 802.16m-07/047 - Call for Contributions on Project 802.16m System Description Document (SDD), shoot for "Proposed IEEE 802.16m Reference Model and potential System Architectures" topic.
Abstract	This contribution proposes network architecture for IEEE 802.16m Inter-Radio Access Technology Functions. Two new entities are suggested to add into legacy architecture to support Inter-Radio Access Technology Functions.
Purpose	For discussion and approval by TGm
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Proposed Network Architecture for IEEE 802.16m Inter-Radio Access Technology Functions

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1. Introduction

As mentioned in IEEE 802.16m System Requirements [1], 802.16m shall support handover and internetworking functionalities with other radio access technologies (RATs). In addition, 802.16m should support IEEE 802.21 [2] Media Independent Handover (MIH) Services, and its mobile procedures should be fully compatible with IEEE 802.16g Network Control and Management Services (NCMS). Accordingly, this contribution proposes network architecture for supporting these IEEE 802.16m Inter-RAT requirements. A new entity “Internetworking Server” and a new interface “Enhanced R4” are added into legacy network architecture to facilitate 802.16m Inter-RAT functions.

2. New Entities for Inter-RAT Functions

In order to support Inter-RAT functions, IEEE 802.21 provides three services: Media Independent Event Services (MIES), Media Independent Command Services (MICS), and Media Independent Information Services (MIIS). These services provide the negotiations of user mobility controls between different RATs’ mobility management entities and a specific protocol with regarding frame structure will be used for tunneling those negotiations. According to legacy 802.16 network architecture [3], ASN-GW provides Handover functions and a R4 interface is used for coordinating UE mobility between ASNs. As a result, we suggest a new interface between ASN-GW and other RATs’ mobility management entity such as MME in LTE system is needed for providing legacy R4 interface’s functions and sent corresponding 802.16m messages transparently to other RATs by 802.21 protocols.

Besides, to support MIIS, an 802.21 information server will be established in network-side to supply global network topology information for performing network topology advertisement during Inter-RAT HO.

3. Proposed Text

The following text is proposed to be added into section 4 in the IEEE 802.16m System Description Document (SDD) [4].

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[Insert the following texts into section 4 in SDD]

4. Overall Network Architecture

4.1 Legacy Network Architecture

Figure 1 illustrates the legacy network architecture of IEEE 802.16. It comprises of three major functional aggregations: Mobile Station (MS), Access Service Network (ASN) and Connectivity Service Network (CSN). The ASN includes Base Station and ASN Gateway (ASN-GW). It renders controls for UE mobility. The CSN comprises network elements such as, user databases, AAA proxy/servers and MIP HA. R3 interface consists of a set of control plane protocols between the ASN and CSN to support AAA policy enforcement and mobility management capabilities. This also encompasses the bearer plane methods to transfer data between ASN and CSN. R4 interface consists of set of Control and Bearer plane protocols that coordinate UE mobility between ASNs. R4 interface encompasses the following functionality relating to mobility management:

- Handover Control and Anchoring: This function controls overall handover decision making and signaling procedures related to handover.
- Context Transfer: This function helps with the transfer of any state information between network elements.
- Bearer Path Setup: This function manages data path setup and procedures for data packet transmission between functional entities

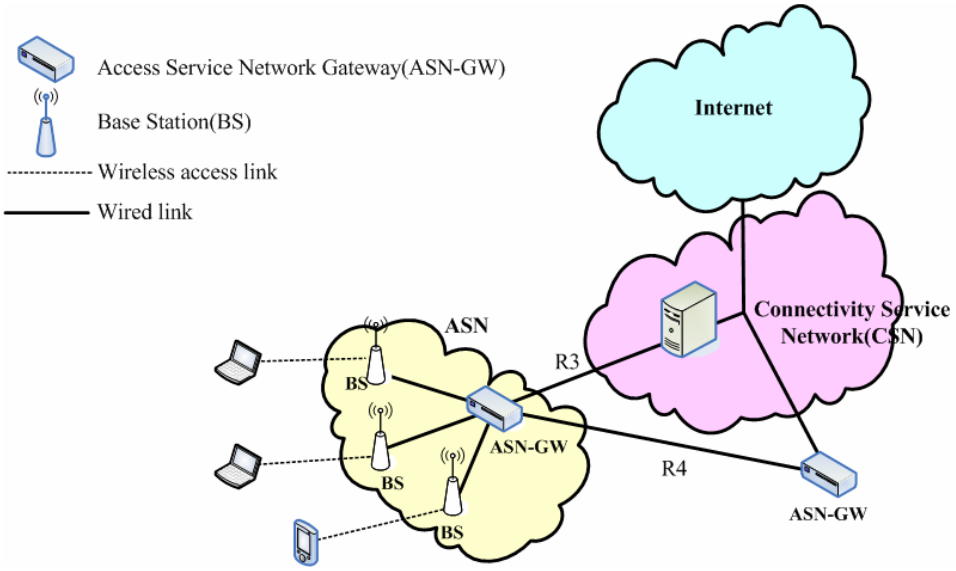

Figure 1. Legacy network architecture

4.2 Inter-Radio Access Technologies Network Architecture

In order to support Inter-RAT functions, 802.16m messages need to be sent transparently to other RATs through IP network. Besides, network should be able to provide sufficient information of neighboring RATs. Figure 2 shows proposed 802.16m's Inter-RAT network architecture. A new interface 'Enhanced R4 Interface' and a new entity 'Internetworking Server' are added to facilitate Inter-RAT functions.

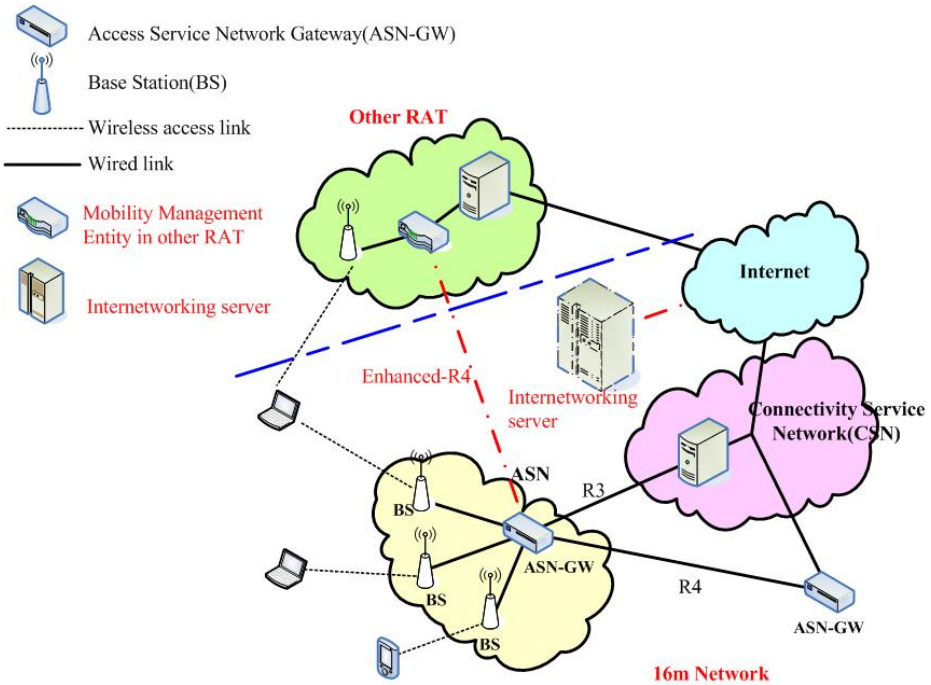

Figure 2. Inter-RAT Network architecture

- Enhanced R4 Interface

Enhanced R4 Interface is used for communication between ASN-GWs and other RATs' mobility management entities. In addition to R4 interface functions, Enhanced R4 Interface supports IEEE 802.21 protocol and Media Independent Handover (MIH) functions, which can tunnel associated management messages from 802.16m network to other RATs. Corresponding enhancements in IEEE 802.16m protocol architecture model are shown in Figure 3. Details of new layers can be referred to WiMAX Forum NWG document and IEEE P802.21 specification.

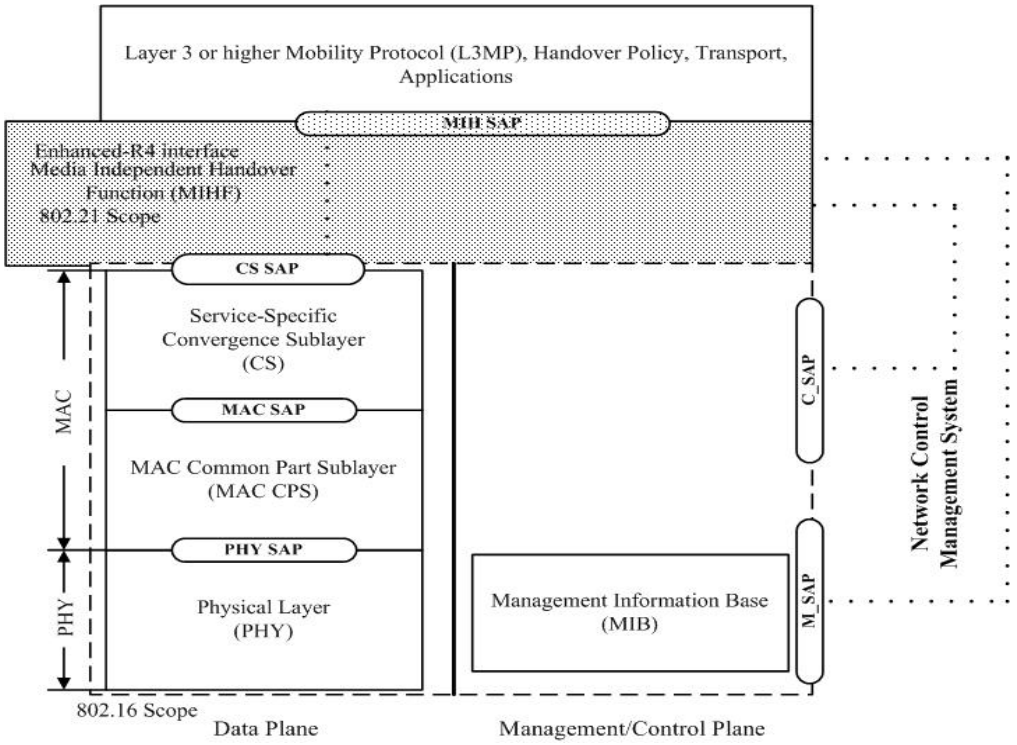

Figure 3. Enhanced 802.16m protocol architecture model

- Internetworking Server

Internetworking Server is to provide a global topology view of available heterogeneous networks for Inter-RAT Handover between 802.16m and other RATs. It is a media-independent network entity. An operator which deploys several radio access technologies would be expected to establish and maintain its own Internetworking Server for providing network topology information. And then ASN-GW can connect to the server through IP protocol and acquire information for facilitating advertisement. The internetworking information includes:

- List of available networks
  - NAP ID, NSP ID, BSID, etc.
- Link layer information
  - MAC version, center carrier frequency, cell bandwidth, frame duration, etc.
- List of support services
  - available DL/UL resources, available services, QoS mapping, etc.

Besides, MS may be able to perform automatic neighbor discovery to report neighboring RAT information and help update the network topology.

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References

[1] IEEE 802.16m-07/002r4, “IEEE 802.16m System Requirements”

[2] P802.21 D06, “Draft Standard for Local and Metropolitan Area Networks: Media Independent Handover Services”

[3] WiMAX Forum NWG Release 1.1.2

[4] C802.16m-07/320r1, “Draft Table of Content for the IEEE 802.16m System Description Document”