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**
Date Submitted	**2008-01-16**
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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 the IEEE 802.16m System Requirements Document [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 with mobility procedures that are fully compatible with IEEE 802.16g Network Control and Management Services (NCMS). This contribution proposes a network architecture for supporting these IEEE 802.16m Inter-RAT requirements. A new entity “Internetworking Server” and a new interface “Enhanced R4” are added to the 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 negotiations of user mobility controls between different RATs’ mobility management entities. A specific protocol along with a new frame structure will be used for tunneling those negotiations. In the 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 propose a new interface, called enhanced R4, between ASN-GW and other RATs’ mobility management entity for providing the legacy R4 functions over which the corresponding 802.16m messages are sent transparently to other RATs with the 802.21 protocols.

Besides, to support MIIS, an 802.21 information server will be established in the 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 to 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 a 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

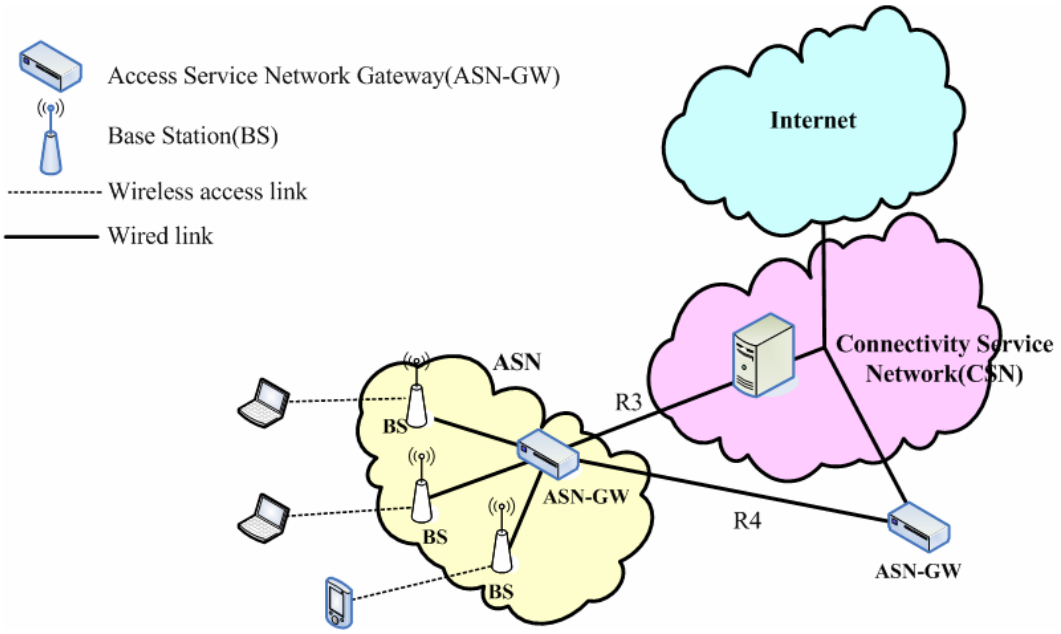

Figure 1. Legacy network architecture

4.2 Inter-Radio Access Technology Network Architecture

In order to support Inter-RAT functions, 802.16m messages need to be sent transparently to other RATs through IP network. Besides, the network should be able to provide sufficient information regarding to neighboring RATs. Figure 2 shows the proposed 802.16m's Inter-RAT network architecture. A new

interface ‘Enhanced R4’, and a new entity ‘Internetworking Server’ are added to the network to facilitate Inter-RAT functions.

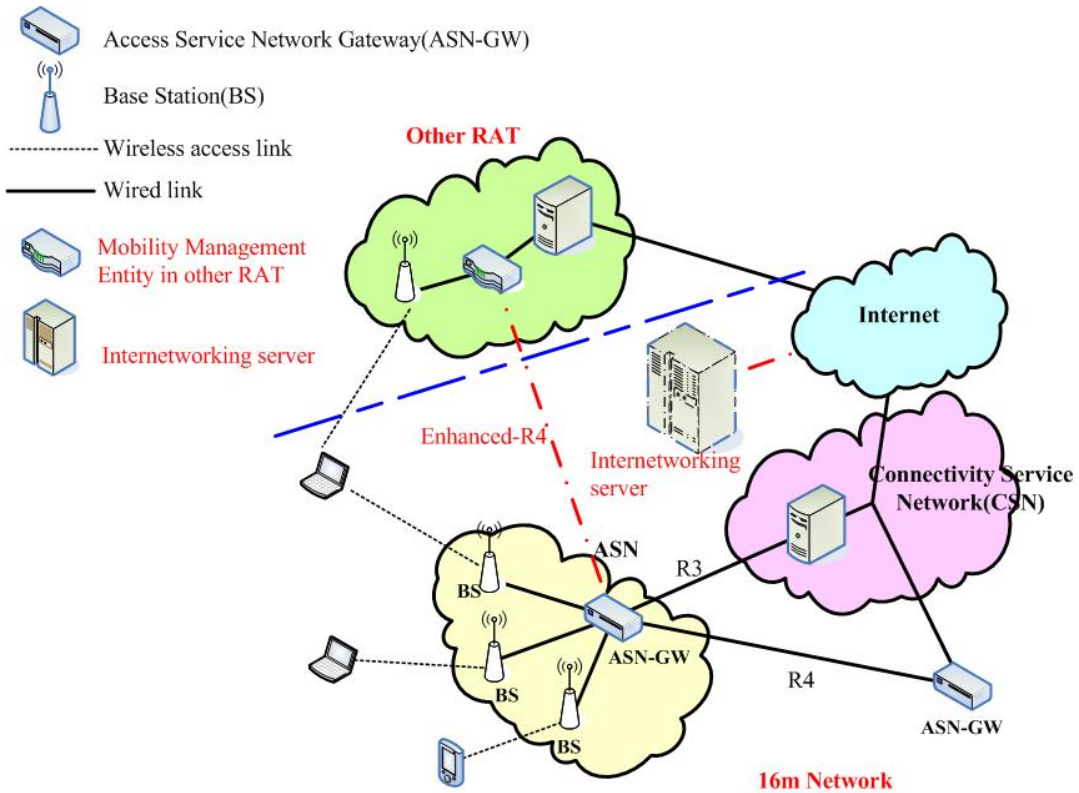

Figure 2. Inter-RAT Network architecture

- Enhanced R4 Interface

Enhanced R4 Interface is used for communications between ASN-GWs and other RATs’ mobility management entities. In addition to R4 functions, Enhanced R4 Interface supports IEEE 802.21 protocols and Media Independent Handover (MIH) functions, which can tunnel management messages from 802.16m to other RATs. The enhancement of IEEE 802.16m protocol architecture model is shown in Figure 3. Detail functions of the new layer is referred to the WiMAX Forum NWG document and IEEE P802.21 specification.

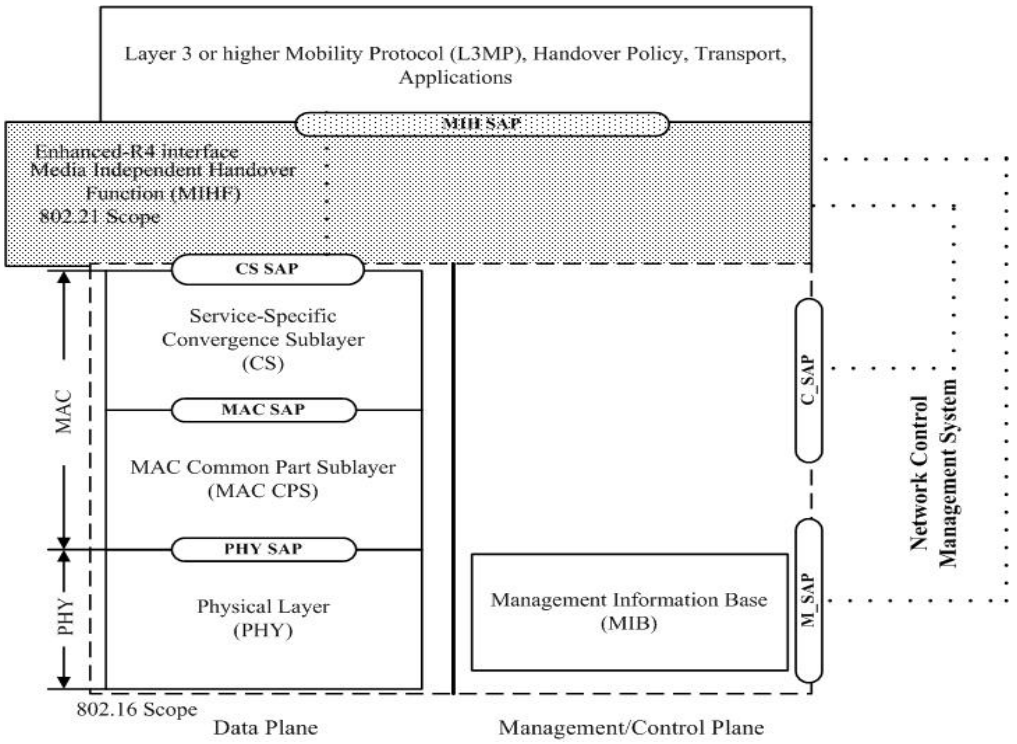

Figure 3. Enhanced 802.16m protocol architecture model

- Internetworking Server

Internetworking Server is to provide a global topology information on available heterogeneous networks for Inter-RAT handover. 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. Therefore, ASN-GW can connect to the server through IP protocol and acquire information for network 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”