Project	**IEEE 802.16 Broadband Wireless Access Working Group** <http://ieee802.org/16>
Title	**Proposed Network Architecture for Supporting E-MBS in IEEE 802.16m System**
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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 the IEEE 802.16m network architecture from supporting E-MBS point of view.
Purpose	For discussion and approval by TGm
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Proposed Network Architecture for Supporting E-MBS in IEEE 802.16m System

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1. Introduction

In the IEEE 802.16m system requirement document (SRD) [1], it has been agreed that IEEE 802.16m shall support enhanced multicast-broadcast service (E-MBS) in an efficient manner, including achievement of higher spectrum efficiency in multi-cell multicast-broadcast single frequency networks (MBSFN) on both mixed and dedicated frequencies, and minimization of channel reselection interruption time (especially for the broadcast streaming media services). In addition, IEEE 802.16m shall support switching between E-MBS and unicast services even when they are deployed on different frequencies. This contribution proposes a network architecture for E-MBS services in IEEE 802.16m to meet these requirements. Although the detailed design of the network components is outside the scope of TGm task, their functionalities are discussed here as basic assumptions to facilitate the development of the E-MBS services in the 802.16m system.

2. Discussion

In this section, the network architecture for supporting E-MBS services in 802.16m is discussed. Based on the network architecture in the WiMAX Forum NWG [2], the following E-MBS network architecture is proposed.

2.1 Overall Network Architecture

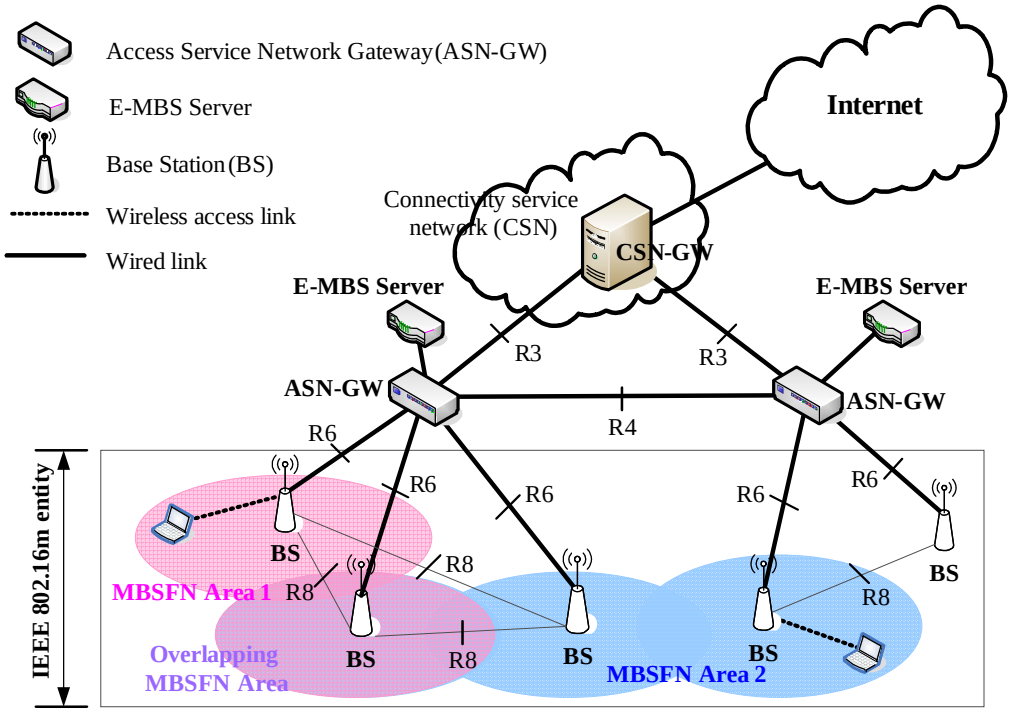

Fig. 1. The Proposed Network Architecture

As depicted in Fig. 1, the overall network architecture consists of connectivity service network (CSN) and access service network (ASN), with R3 interface being responsible for the communication between CSN and ASN networks. In addition, in order to support MBSFN transmission, a logical component called E-MBS server is necessary to coordinate BSs so as to accomplish macro diversity transmission. Besides, it can be seen from Fig. 1 that MBSFN areas can be overlapping (i.e., a BS can involve in more than one MBSFN transmission), and a MBSFN area may traverse an ASN gateway's serving coverage (e.g., MBSFN area 2 in Fig. 1). In this case, one ASN gateway (and E-MBS server) may be designated as the anchor ASN gateway (anchor E-MBS server, accordingly) to centrally control BSs to achieve MBSFN transmission.

For supporting E-MBS transmission, the network control and management system shall provide the following functions:

- E-MBS Authentication and Accounting (AAA)
- E-MBS subscription management
- E-MBS service announcement
- E-MBS session management including session start/update/stop
- Scheduling and radio resource (e.g., time/frequency radio resources) and radio configuration (e.g., MCS) allocation for MBSFN transmission
- Function of content synchronization to coordinate BSs for macro diversity
- Dynamic MBSFN area management
- Payload header compression for E-MBS transmission
- Key management and distribution
- Charging

On the other hand, the IEEE 802.16m network consists of base stations (BSs) and mobile stations (MSs). BSs are under the control of ASN gateway through R6 interfaces. In general, BSs are responsible for radio resource management, mobility management, measurement report configuration for mobility and data scheduling, etc [3].

However, when considering E-MBS transmission, BSs shall further support the following functions:
- Support single-BS access and MBSFN transmission mode
- Support E-MBS transmission via mixed and dedicated carriers
- Transmission mode switching procedure
- Scheduling and resource allocation for single-BS access mode
- Re-keying procedure

In addition to the traditional functions such as measurement report, buffer status report, mobility procedure (including cell selection and cell reselection), etc., 802.16m MSs shall support the following new functions for E-MBS services.
- E-MBS service discovery, subscription and reception
- Support E-MBS reception in sleep and idle modes

3. Conclusions

In this contribution, a network architecture is proposed for IEEE 802.16m system in order to meet the E-MBS requirements, specified in the IEEE 802.16m SRD. Functionalities of each of network components are discussed as basic assumptions to facilitate the development of the E-MBS services in IEEE 802.16m. Thus, it is proposed to capture the network architecture into the IEEE 802.16m system description document (SDD).

References

[1] IEEE 802.16m-07/002r4, “802.16m System Requirements”
[2] WiMAX Forum NWG, “WiMAX Forum Network Architecture,” Release 1.1.2
[3] P802.16Rev2/D1, “Part 16: Air Interface for Broadband Wireless Access Systems”
[4] IEEE C802.16m-07/286r2, “Reference Model and Protocol Architecture for Supporting E-MBS in IEEE 802.16m System”.

Proposed Text

The following text is proposed to be captured in the IEEE 802.16m system description document (SDD).
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4 Overall Network Architecture (informative)

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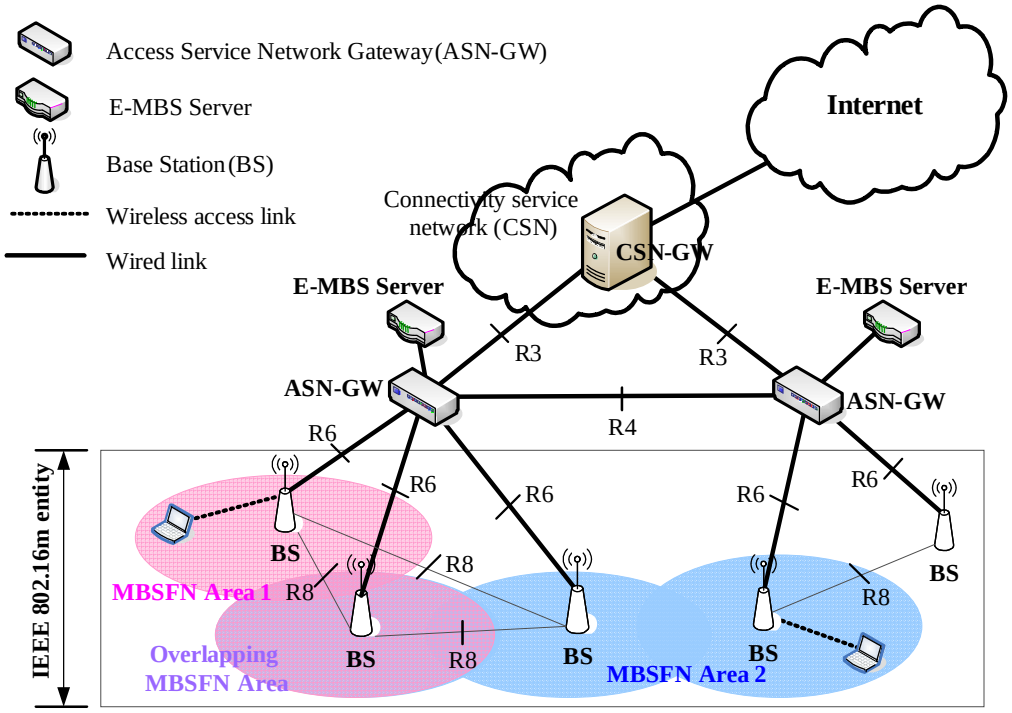

Fig. X. Overall Network Architecture

As depicted in Fig. X, the overall network architecture consists of connectivity service network (CSN) and access service network (ASN), with R3 interface being responsible for the communication between CSN and ASN networks. In addition, in order to support multicast-broadcast single frequency networks (MBSFN) transmission, a logical component called E-MBS server is necessary to coordinate BSs so as to accomplish macro-diversity transmission. Besides, it can be seen from Fig. X that MBSFN areas can be overlapping (i.e., a BS can involve in more than one MBSFN transmission), and a MBSFN area may traverse an ASN gateway's serving coverage (e.g., MBSFN area 2 in Fig. X). Although the detailed design of the network components is outside the scope of TGm task, their functionalities are discussed here as basic assumptions to facilitate the development of the E-MBS services in the 802.16m system.

For supporting E-MBS transmission, the network control and management system shall provide the following functions:

- E-MBS Authentication and Accounting (AAA)
- E-MBS subscription management
- E-MBS service announcement
- E-MBS session management including session start/update/stop
- Scheduling and radio resource (e.g., time/frequency radio resources) and radio configuration (e.g., MCS) allocation for MBSFN transmission
- Function of content synchronization to coordinate BSs for macro diversity
- Dynamic MBSFN area management
- Payload header compression for E-MBS transmission
- Key management and distribution
- Charging

On the other hand, when considering E-MBS transmission, BSs shall further support the following functions:

- Support single-BS access and MBSFN transmission mode

- Support E-MBS transmission via mixed and dedicated carriers
- Transmission mode switching procedure
- Scheduling and resource allocation for single-BS access mode
- Re-keying procedure

In addition, 802.16m MSs shall support the following new functions for E-MBS services.
- E-MBS service discovery, subscription and reception
- Support E-MBS reception in sleep and idle modes

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