Project	**IEEE 802.16 Broadband Wireless Access Working Group** <http://ieee802.org/16>
Title	**Protocol architecture to support multicarrier system**
Date Submitted	**2008-01-16**
Source(s)	Jaehee Cho Yungsoo Kim Jaeweon Cho Mihyun Lee Hokyu Choi Samsung Electronics Co., Ltd. 416 Maetan-3, Suwon, 442-600, Korea Voice: +82-31-279-5596 E-mail: jaehee1.cho@samsung.com
Re:	IEEE 802.16m-07/047, "Call for Contributions on Project 802.16m System Description Document (SDD)". Target topic: "Proposed 802.16m Protocol Architecture and main functionalities per protocol layer".
Abstract	The contribution proposes a generic protocol architecture to support multicarrier system to be included in the 802.16m System Description Document (SDD).
Purpose	To be discussed and adopted by TGm for the 802.16m SDD.
Notice	*This document does not represent the agreed views of the IEEE 802.16 Working Group or any of its subgroups*. It represents only the views of the participants listed in the "Source(s)" field above. It is offered as a basis for discussion. It is not binding on the contributor(s), who reserve(s) the right to add, amend or withdraw material contained herein.
Release	The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE's name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE's sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE 802.16.
Patent Policy	The contributor is familiar with the IEEE-SA Patent Policy and Procedures: <http://standards.ieee.org/guides/bylaws/sect6-7.html#6> and <http://standards.ieee.org/guides/opman/sect6.html#6.3>. Further information is located at <http://standards.ieee.org/board/pat/pat-material.html> and <http://standards.ieee.org/board/pat>.

Protocol architecture to support multicarrier system

Jaehee Cho, Yungsoo Kim, Jaeweon Cho, Mihyun Lee, Hokyu Choi
Samsung Electronics Co., Ltd.

1 Introduction

IEEE 802.16m system requirements mandates or recommend to support multicarrier system and ToC of SDD includes “Support for Multicarrier” as its subclause [1][2]. IEEE 802.16m protocol stack shall be designed to support the multicarrier system. In this contribution, a generic protocol architecture is proposed to support the multicarrier system.

2 Usage models for multicarrier support

2.1 Frequency overlay

Frequency overlay system is defined as system where a BS or MS accesses aggregates of IEEE 802.16m carriers. Figure-a illustrates a frequency overlay system. In the figure, BS transmits aggregates of 16m carriers and MS can access one or more 16m carriers, thus, narrow and wide bandwidth are overlaid.

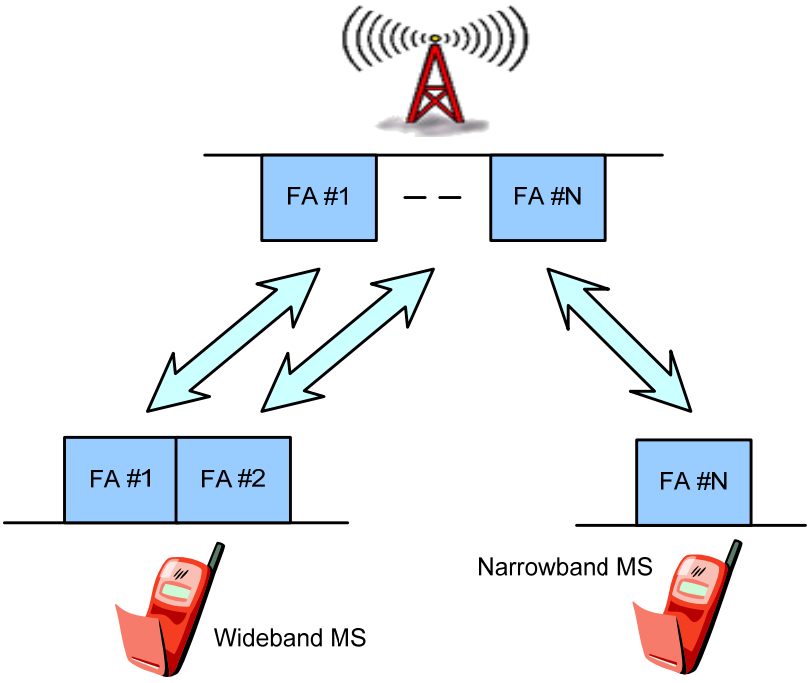

Figure-a: Example of frequency overlay system

The frequency overlay system has the following properties:

1. Wider bandwidth support (Ex. n X 5, 10, 20MHz)
2. More multiplexing gain on the wider bandwidth
3. Flexible load balancing between carriers
4. Support of Roaming of MSs with narrow bandwidth to wider bandwidth BSs

2.2 Unicast and broadcast service

It is mandated for IEEE 802.16m to support E-MBS delivery via a dedicated carrier [1]. Thus, IEEE 802.16m shall be able to support unicast and multicast/broadcast service on different carriers. Figure-b illustrates a broadcast and unicast service. In the figure, BS transmits aggregates of 16m unicast service carriers and 16m multicast/broadcast service carriers. MS can access unicast and/or multicast/broadcast carriers when needed.

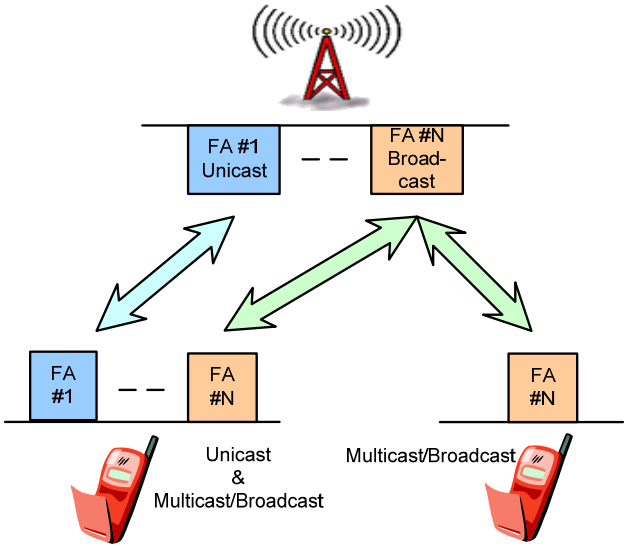

Figure-b: Example of broadcast & Unicast service

2.3 Hybrid Duplex

Hybrid duplex is defined as a system where an MS can access multiple carriers with different duplexing schemes (Ex. TDD, FDD). A possible usage scenario is that DL of FDD is dedicated to a multicast/broadcast service, while TDD and FDD UL carriers are aggregated, and accessed by an MS for unicast service. The FDD UL can be used to enhance the UL performance of the unicast service by, for example, increasing UL coverage and/or reducing UL transmit power of the MS. A guard band or frequency separation between the TDD and FDD carriers must be large enough to prevent interference between the carriers.

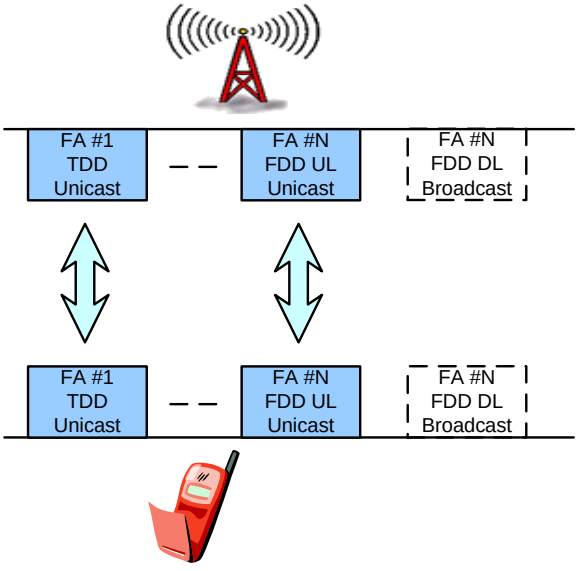

Figure-c: Example of Hybrid duplexing

3 Proposed Protocol architecture

Though the different carriers have different PHY instances, the MAC layer for each PHY share the same functionalities. Instead of parallel MAC layer having same functionality for each carrier, one MAC layer with multiple PHY can provide efficient multicarrier support. For example, there is no reason to define different QoS for carriers aggregated to a MS. More efficient network entry, BW request etc. can be also expected with the proposal. For the dedicated multicast/broadcast carriers, it is reasonable to share the MAC functions defined for the unicast service in 16m. In this sense, unicast and multicast/broadcast PHY can have one MAC layer.

Figure-d illustrates the proposed protocol architecture to support multicarrier system. In the proposed architecture, one MAC layer manages multiples PHYs on different carriers. Multiple PHYs includes dedicated multicast/broadcast carrier, TDD carriers and FDD carriers.

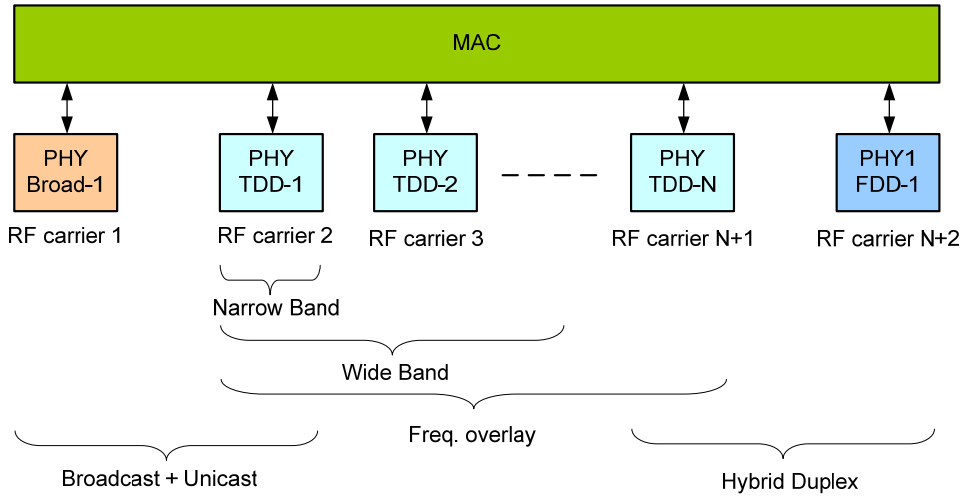

Figure-d: Proposed protocol architecture to support multicarrier system.

4 Proposed Text for SDD

Insert the following text into Air-Interface Protocol Structure subclause (i.e. Chapter 8 in [1]):

---------- Text Start ----------

8.x Protocol architecture for Multicarrier Support

Generic protocol architecture to support multicarrier system is illustrated in Figure Y. A MAC layer protocol manages multiple PHY layer protocols. Each PHY layer protocol operates in different RF carriers in one frequency band or different frequency bands. Each PHY layer provides unicast (TDD or FDD) and/or broadcast service.

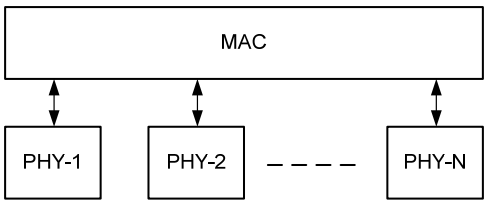

Figure Y. Generic protocol architecture to support multicarrier system

---------- Text End ----------

5 References

[1] IEEE 80216m-07_002r4, “IEEE 802.16m System Requirements.”

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