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Source(s)	Jungje Son, Jaeweon Cho, Panyuh Joo, Younsun Kim, Beomsik Bae, Yong Chang Samsung Electronics 416, Maetan-3dong, Youngtong-gu, Suwon-si, Gyeonggi-do, Korea Min-Sung Kim, Yongjoo Tcha, Yong-Bum Kim, Seong-Choon Lee KT 17 Woomyeon-dong, Seocho-gu, Seoul, 137-792, Korea	jungje.son@samsung.com jaeweon.cho@samsung.com panyuh@samsung.com younsun@samsung.com bsbae@samsung.com yongchang@samsung.com Voice: +82-31-279-5098 Fax:+82-31-279-5130 cyberk@kt.or.kr Voice : +82-2-526-6109 Fax : +82-2-526-5200
Re:	This contribution is for reply of IEEEP802.16e/D4 recirculation.	
Abstract	This contribution proposes the physical enhancement feature for robust multimedia broadcasting service.	
Purpose	Discussion and Adoption in IEEE 802.16e	
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Enhancement Feature for Robust Multimedia Broadcasting

Jungje Son, Jaeweon Cho, Panyuh Joo, Younsun Kim, Beomsik Bae, Yong Chang
Samsung Electronics

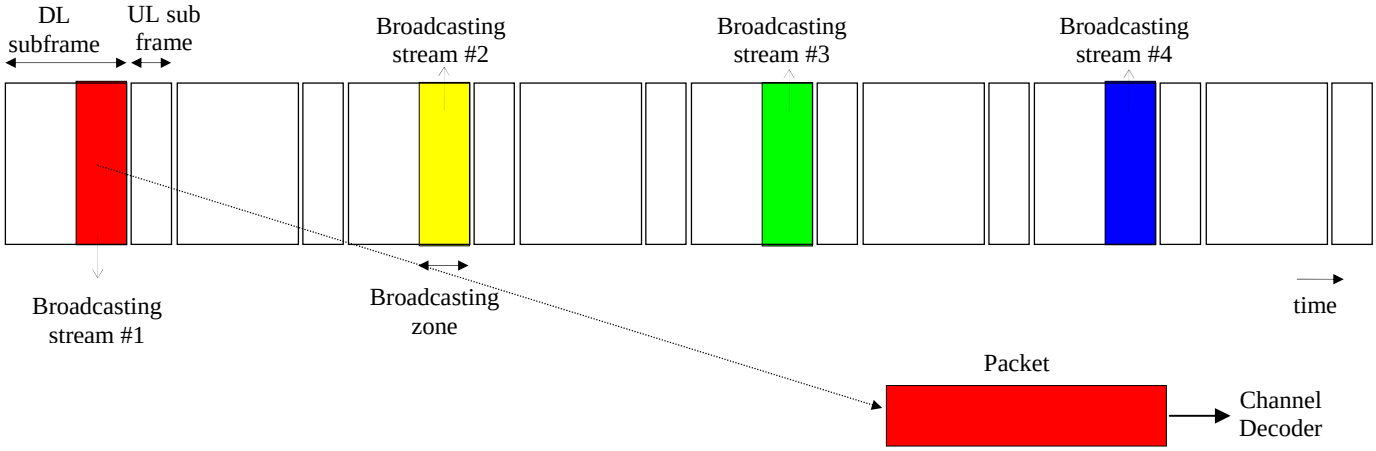
Min-Sung Kim, Yongjoo Tcha, Yong-Bum Kim, Seong-Choon Lee
KT

Introduction

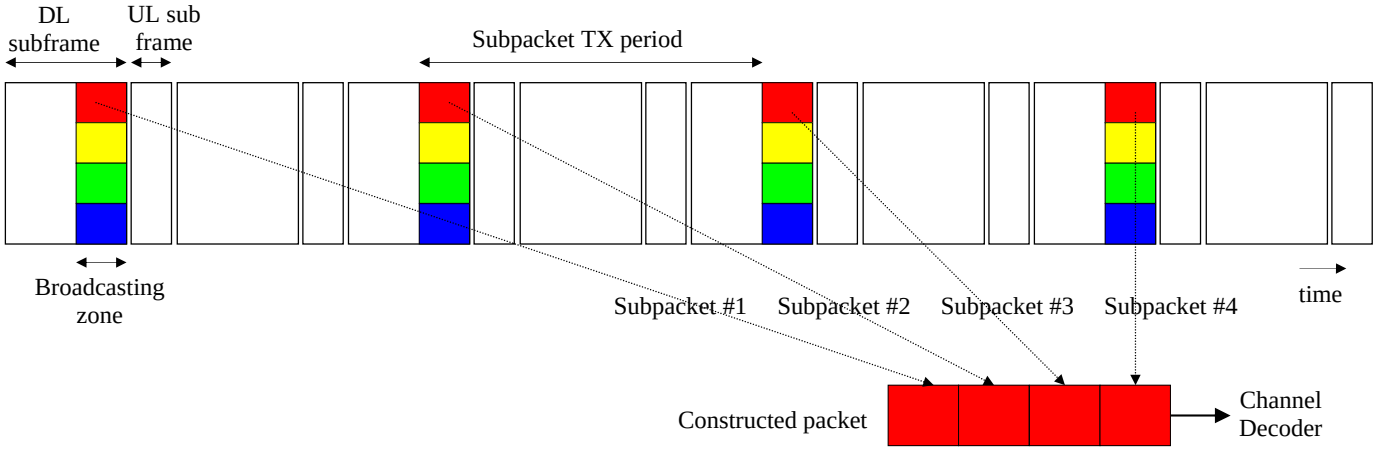
This contribution proposes the BS transmission scheme of multimedia broadcasting traffic to exploit time diversity. When BS transmits traffic of multimedia broadcasting service (MBS) in the manner based on current IEEE802.16 draft, the packets are encoded and sent out frame by frame. These packets occupy only short time in air, so they are very susceptible to the channel fading. Furthermore, since it should be broadcasted to multiple MSS, the user-based control schemes such as downlink power control can not be employed to overcome fading. In this contribution, we propose the enhanced transmission scheme of the MBS traffic, with which the transmission period occupied by MBS packet can be lengthened by over coherent time of fading channel, so as to achieve time diversity gain.

Proposed Mechanism

In the proposed scheme, the encoded packet is divided into multiple subpackets and each subpacket is transmitted in different frame so as to go through different fading channel. MS collects and concatenates these subpackets, and then the constructed packet is decoded at the channel decoder. Figure 1 depicts the proposed multi-subpacket transmission scheme. The example shown in this figure is for the case where the packet is divided into 4 subpackets and the transmission period of subpacket is 2 frames.



(a) Conventional Transmission



(b) Multi-subpacket transmission

Figure 1. The multi-subpacket transmission scheme

We present the performance of the proposed scheme in figure 2. Simulation environment is the following:

- 1 Path Rayleigh fading: mobile speed = 10km/h, center frequency = 2.35GHz
- Channel bandwidth: 10MHz
- FFT size: 1024, Cyclic prefix length: 128 samples
- Ideal channel estimation
- Encoder packet size: 384 bit
- Convolutional code: R=1/2
- QPSK
- Number of subpackets per packet: 4, Each subpacket is conveyed by 2 subchannels
- Frame length: 5ms
- Subpack transmission period (P): 5ms (1 frame), 10ms (2 frame), 20ms (4 frame)

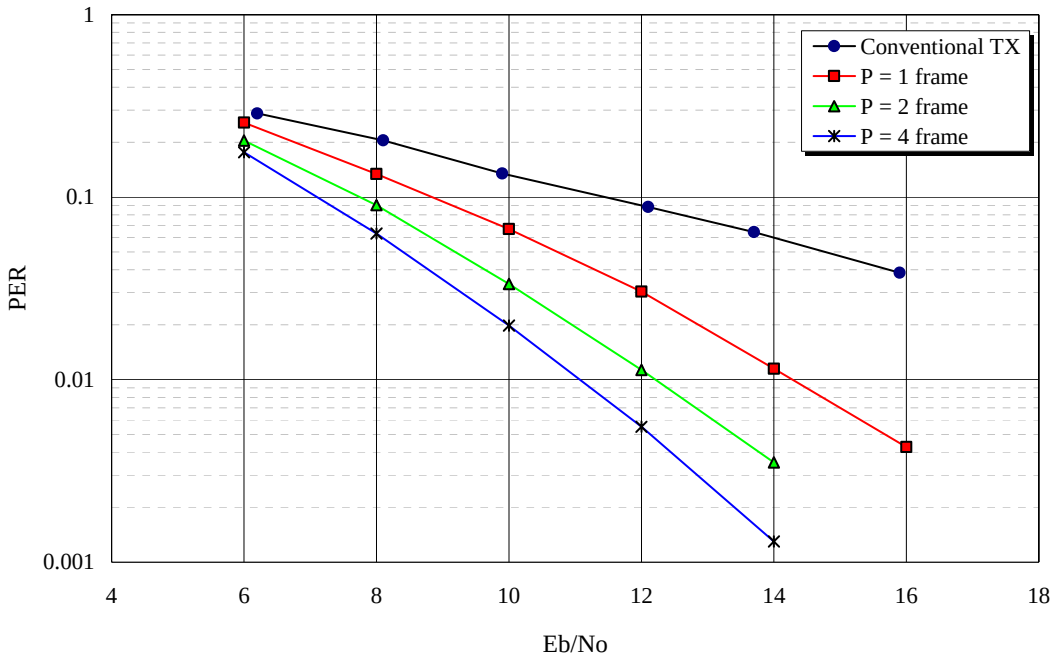


Figure 2. Performance of the multi-subpacket transmission scheme.

In figure 2, we can see that PER (packet error rate) is significantly decreased by employing the proposed scheme, and the decreases in PER becomes larger as the subpacket transmission period (P) increases. It is noted that such performance gain has been achieved through exploiting time diversity.

We provide Compact DL-MAP IE supporting the proposed multi-subpacket transmission scheme; This MAP IE is for H-ARQ enabled MS. Noted that the proposed scheme agrees well with MBS for H-ARQ enabled MS, because the multi-subpacket transmission can be easily implemented by employing H-ARQ transmission with turning off feedback from MS.

Proposed Text Changes

[Remedy 2 : Insert followings at end of section 6.3.2.3.43.6.6]

Table 99a - DL-MAP subtypes

DL-MAP Subtype	Description
0	TimeDiversity_MBS_DL-MAP_IE
1 ~ 31	Reserved

6.3.2.3.43.6.6.1 TimeDiversity_MBS_DL-MAP_IE

The TimeDiversity_MBS_DL-MAP_IE format is presented in Table ??. This message defines the access information for the multimedia broadcasting service burst of H-ARQ enabled MSS. The multimedia broadcasting service burst indicated by the TimeDiversity_MBS_DL-MAP_IE is encoded at the same way of H-ARQ. But it does not need the acknowledgement from MSS. The multimedia broadcasting service zone in downlink subframe should be defined with a common IDcell.

Table ??. TimeDiversity_MBS_DL-MAP_IE

Syntax	Size	Notes
TimeDiversity_MBS_DL-MAP_IE{		
For(i=0;i<N_CID;i++){		N_CID can be calculated by Length field in Compact_DL-MAP IE format for extension
CID	16 bits	CID of each Broadcasting Service
Subchannel Offset	12 bits	
N_{EP} code	4 bits	
N_{SCH} code	4 bits	
AI_SN	1 bits	ARQ ID seq. No
SPID	2 bits	Subpacket ID
ACID	4 bits	ARQ Channel ID
reserved	5 bits	
}		
}		

Subchannel Offset

Subchannel Offset is the starting position of each subpacket notified by the TimeDiversity_MBS_DL-MAP_IE.

N_{EP} code, N_{SCH} code

The combination of N_{EP} code and N_{SCH} code indicates the number of allocated subchannels and scheme of coding and modulation for the DL burst

AI_SN

Defines ARQ Identifier Sequence Number. This is toggled between ‘0’ and ‘1’ on successfully transmitting each encoder packet with the same ARQ channel.

SPID

Defines SubPacket ID, which is used to identify the four subpackets generated from an encoder packet.

ACID

Defines ARQ Channel ID for TimeDiversity MBS packet. Each TimeDiversity MBS connection can have multiple ARQ channels, each of which may have an encoder packet transaction pending.