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Re:	This contribution is response to call for technical proposal (IEEE 802.16j-06/027)	
Abstract	This contribution proposes combined A&F and D&F relaying.	
Purpose	For discussion and approval of inclusion of the proposed text into the P802.16j baseline document.	
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Direct Relaying Zone in Transparent RS system

Introduction

There are three relaying method as follows,

- A&F (Amplify and Forward)
- M&F (Modulation and Forward)
- D&F (Decode and Forward)

Since A&F method is relaying data from sender to receiver in time domain (i.e. without FFT, demodulation and FEC decoding), RS can relay data with minimum delay by using A&F method. However Burst Profile for A&F relaying may be dominated by the radio link that has the worst condition between relay link and access link.

M&F method is relaying data without decoding and re-encoding. RS which receives data from sender demodulates and modulates it, and relays regenerated data to receiver. Though some gaps are needed for RS to demodulate and modulate, RS can relay data within one frame by using M&F method.

Decode and forward is the most robust, hence higher modulation schemes can be used, because the Burst Profile on relay link and the Burst Profile on access link can be set individually. However it takes time to decode and re-encode data at RS, RS takes a few frames to relay data from sender to receiver.

This contribution proposes the direct relaying zone on which RS relays data from sender to receiver within one frame by using ~~A&F method~~ or M&F method. Since RS does not decode data on this zone, MR-BS should notify the zone information to RS and control the transmission on this zone.

Direct Relaying Zone

In Figure 1, two direct relaying zones are defined in each subframe. First direct relaying zone in DL subframe is the zone where RS should receive data from MR-BS, and second direct relaying zone in DL subframe is the zone where RS should forward signal or data to MS under RS. The direct relaying zone in UL subframe is also similar.

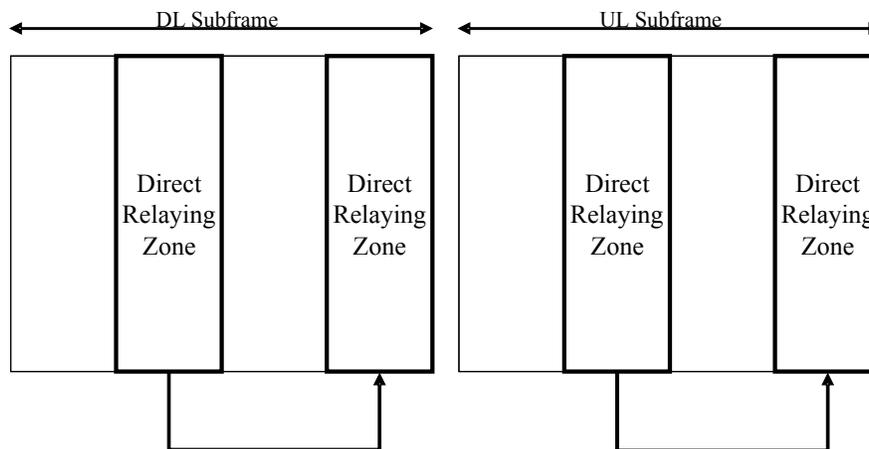


Figure 1 Direct Relaying Zone

RS receives data from sender on the direct relaying zone in receiving area, and forwards it to receiver on the direct relaying zone in sending area by using ~~A&F method~~ or M&F method.

IE for Direct Relaying Zone

MR-BS decides the direct relaying zone and relaying method on this zone which is A&F method or M&F method, and notifies this information about the zone to RS by DL/UL MAP including a value of frame offset. RS starts to relay at frame defined by this value. The value of frame offset is defined considering of the decoding delay of DL/UL MAP at RS. And the other parameters that MR-BS notifies RS about the direct relaying zone are the following and Figure 2 shows the relation these parameters and the frame.

a) Symbol offset for direct relaying zone

The OFDMA symbol offset in which direct relaying zone starts

b) No. OFDMA symbols for RS receiving

The number of OFDMA symbols which RS should receive for direct relaying

c) No. OFDMA symbols of gap

The number of OFDMA symbols between the receiving area and the forwarding area

d) No. OFDMA symbols for RS relaying

The number of OFDMA symbols by which RS should relay signal without decoding and re-encoding

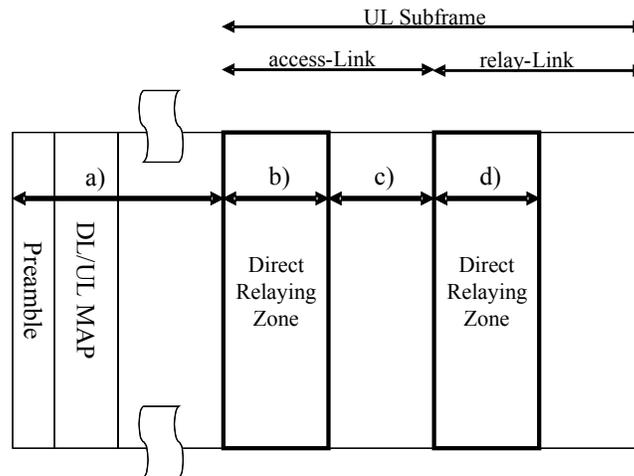


Figure 2 IE of Direct Relaying Zone

RS which receives these parameters relays signal from sender to receiver without decoding and re-encoding on the zone indicated by these parameters.

Specific text changes

[Change Table 277c as indicated.]

Table 277c—Extended-2 DIUC code assignment for DIUC=14

Extended-2 DIUC (hexadecimal)	Usage
00	MBS_MAP_IE
01	HO_Anchor_Active_DL_MAP_IE
02	HO_Active_Anchor_DL_MAP_IE
03	HO_CID_Translation_MAP_IE
04	MIMO_in_another_BS_IE
05	Macro-MIMO_DL_Basic_IE
06	Skip_IE
07	HARQ DL MAP IE
08	HARQ ACK IE
09	Enhanced DL MAP IE
0A	Closed-loop MIMO DL Enhanced IE
0B	RS-RNG_RSP_ALLOC_IE
0BC	Direct Relaying DL Zone IE
0B-0D	<i>Reserved</i>
0E	AAS_SDMA_DL_IE
0F	<i>Reserved</i>

Insert a new subclause 8.4.5.3.28

[8.4.5.3.28 Direct Relaying DL Zone IE format](#)

[This IE is sent by MS-BS to RS to notify the zone of downlink for relaying within one frame without decoding and re-encoding. If this IE indicates A&F method for relaying, RS should relay signal from MR-BS without FFT, demodulation and FEC decoding on the zone indicated by this IE. If this IE indicates M&F method for relaying, RS should relay signal from MR-BS with FFT, demodulation, modulation and IFFT.](#)

[Table 286za - Direct Relaying DL Zone IE](#)

Syntax	Size	Notes
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<u>Direct Relaying DL Zone IE() {</u>		
<u>Extended-2 UIUC=</u>	<u>4 bits</u>	<u>0x0B</u>
<u>Length</u>	<u>8 bits</u>	
<u>Relaying Method Type</u>	<u>1 bit</u>	<u>0: A&FD&F, 1: M&F</u>
<u>Symbol offset for RS receiving</u>	<u>6 bits</u>	
<u>No. OFDMA symbols for RS receiving</u>	<u>4 bits</u>	
<u>No. OFDMA symbols of gap</u>	<u>4 bits</u>	
<u>No. OFDMA symbols for RS relaying</u>	<u>4 bits</u>	
<u>Frame offset</u>	<u>2 bits</u>	

Relaying Method Type

Indicates the relaying method which is ~~A&F~~ D&F or M&F

Symbol offset for direct relaying zone

The OFDMA symbol offset in which direct relaying zone starts

No. OFDMA symbols for RS receiving

The number of OFDMA symbols which RS should receive for relaying without decoding and encoding

No. OFDMA symbols of gap

The number of OFDMA symbols between the receiving area and the forwarding area

No. OFDMA symbols for RS relaying

The number of OFDMA symbols by which RS should relay signal without decoding and encoding

Frame offset

Frame offset from the current frame. RS starts relaying indicated by this IE at frame defined this value.

[Change Table 290a as indicated.]

Table 290a—Extended UIUC Code Assignment for UIUC=15

Extended UIUC (hexadecimal)	Usage
00	Power_control_IE
01	Mini-subchannel_allocation_IE
02	AAS_UL_IE
03	CQICH_Alloc_IE
04	UL Zone IE
05	PHYMOD_UL_IE
06	MIMO_UL_Basic_IE
07	UL-MAP_Fast_Tracking_IE
08	UL_PUSC_Burst_Allocation_in_Other_Segment_IE
09	Fast_Ranging_IE
0A	UL Allocation Start IE

0B...0F	Reserved Direct Relaying Zone UL IE
0C ... 0F	Reserved

Insert a new subclause 8.4.5.4.29

[8.4.5.4.29 Direct Relaying Zone UL IE format](#)

~~This IE is sent by MS-BS to RS to notify the zone of uplink for relaying within one frame. If this IE indicates A&F method for relaying, RS should relay signal from MR-BS without FFT, demodulation and FEC decoding on the zone indicated by this IE. If this IE indicates M&F method for relaying, RS should relay signal from MR-BS with FFT, demodulation, modulation and IFFT.~~

[Table 302w - Direct Relaying UL Zone IE](#)

Syntax	Size	Notes
Direct Relaying UL Zone IE() {		
Extended UIUC=	4 bits	0x0B
Length	8 bits	
Relaying Method Type	1 bit	0: A&F/D&F, 1: M&F
Symbol offset for direct relaying zone	6 bits	
No. OFDMA symbols for RS receiving	4 bits	
No. OFDMA symbols of gap	4 bits	
No. OFDMA symbols for RS relaying	4 bits	
Frame offset	2 bits	

[Relaying Method Type](#)

[Indicates the relaying method which is A&F/D&F or M&F](#)

[Symbol offset for direct relaying zone](#)

[The OFDMA symbol offset in which direct relaying zone starts](#)

[No. OFDMA symbols for RS receiving](#)

[The number of OFDMA symbols which RS should receive for relaying without decoding and encoding](#)

[No. OFDMA symbols of gap](#)

[The number of OFDMA symbols between the receiving area and the forwarding area](#)

[No. OFDMA symbols for RS forwarding](#)

[The number of OFDMA symbols by which RS should forward signal without decoding and encoding](#)

[Frame offset](#)

[Frame offset from the current frame. RS starts relaying indicated by this IE at frame defined this value.](#)

References

- C802 16j-06_127, "A Proposal for combined A&F and D&F relaying"
- C802 16j-06_250, "Hybrid Relay Structure with a Single Frame"

