Project	**IEEE 802.16 Broadband Wireless Access Working Group <*http://ieee802.org/16*>**
Title	The configuration of MAPs and IEs for ~~comparatively dynamic super frame in~~ multi-hop relay network
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Re:	IEEE802.16j-06/034: "Call for Technical Proposals regarding IEEEP802.16j"
Abstract	This contribution proposes a comparatively dynamic super frame structure to support flexible payload ratio between access and relay links.
Purpose	To propose configuration of MAP and IEs for comparatively dynamic super frame structure to support flexible payload ratio between access and relay links without very high overhead.
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A Proposal of the configuration of MAP and IEs for Multi-hop Relay Network

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Introduction

Super frame structure configuration summarized in the baseline consists of fixed access zone and relay zone. Actually, the variant payload ratio between access and relay links requires a more flexible super frame structure to improve the resource efficiency. To solve this problem without very high overhead, we propose a comparatively dynamic super frame structure where the relay zone position can be reset and maintained for a duration according to some factors such as the network topology or the traffic payload ratio between access and relay links. BS and RSs control the relay zone position of super frame throughby management messages. Moreover, to avoid interference to management messages in relay zone, simultaneous switch from access zone to relay zone among BS and RSs is considered. Since the last hop RSs connect without subordinate RSs, all resource could be allocated to MSs to support access link transmission.

Proposal

The proposed super frame structures of BS, intermediate RSs and the last hop RS are illustrated in Fig. 1. Since transmission of management messages in each hop requires time delay including transmission delay, processing delay and queuing delay, etc, in order to have all BS and RSs switch to relay zone at the same time, BS needs to send the following frames' relay zone position in advance. BS is able to be aware the maximum delay that management messages takes to transmit between BS and the last hop RS.

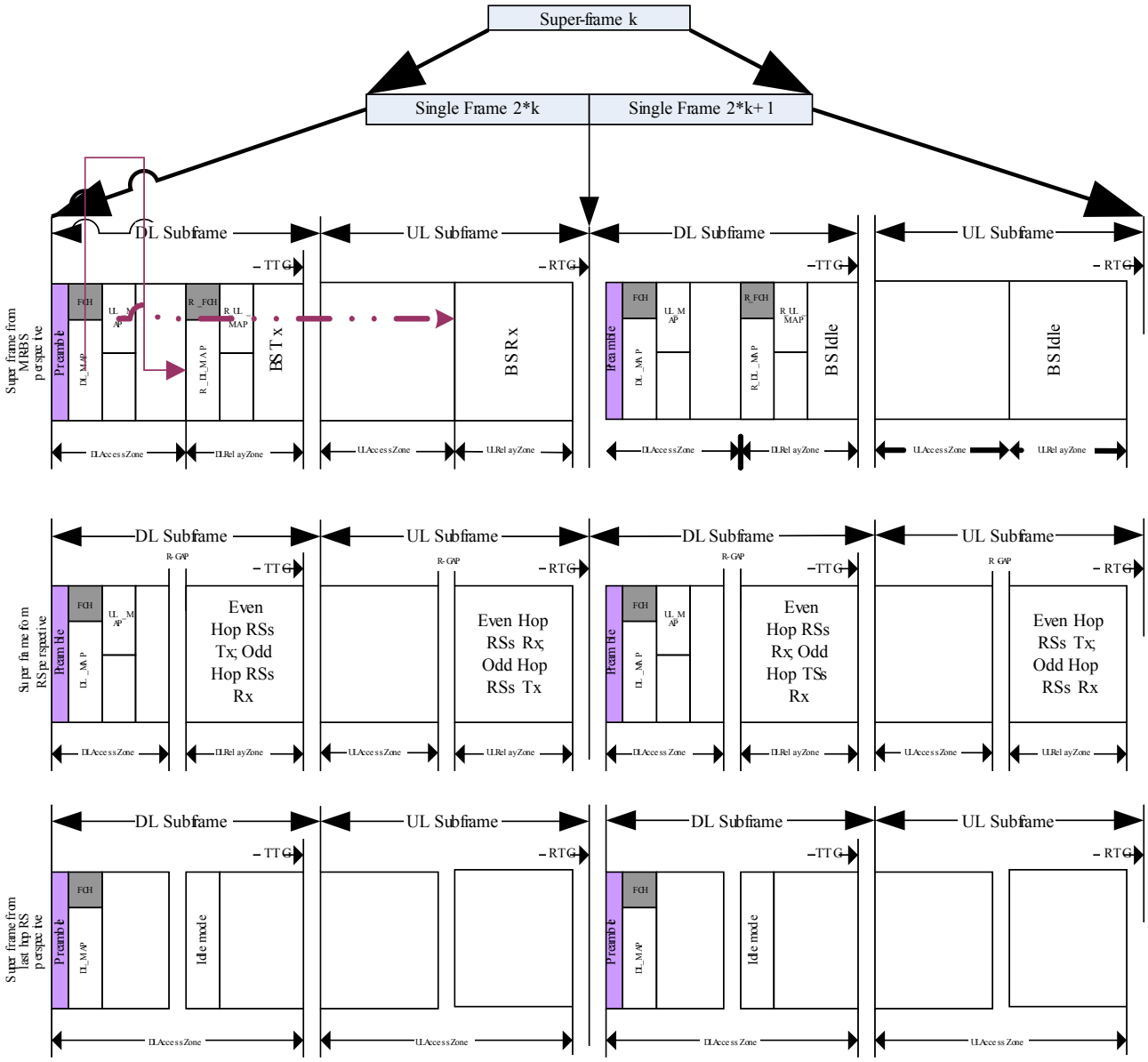

Fig. 1 Dynamic Super Frame Structure.

In this proposal, two single frames are contained in the super frame where the first one is defined as odd frame and the second one as even frame. BS sends out the following super frames' related relay zone change information in current odd frame. The required time duration in advance should be larger than the maximum delay and be integral times of super frame length. The position could be the relay zone start time in units of OFDMA symbol.

Once BS determines to change the relay zone position, it denotes RSs to get ready to change by R-DL-MAP. BS also indicates RSs the time point to change and the newly updated relay zone position. The time point to

change could be depicted as the super frame number using “absolute time” or “relative time”.

Because RSs utilize the management messages in access zone to process network entry, BS needs to denote the relay zone position of current frame in access zone. And MSs also should be indicated where the access zone margin is.

The last hop RS only connects with MSs in downlink, therefore, all resource could be allocated to access link transmission to improve efficiency. And the part assigned to management messages in relay zone is set as idle mode in order to avoid interference with other RSs’ management messages.

This super frame structure proposed here considers the fact that the traffic payload ratio between access and relay links is variant. It solves the resource inefficiency problem caused by fixed super frame structure without too high overhead. This method further improves the efficiency by allocating all resource to access zone in the last hop RSs, and the synchronous zone switch avoids the interference to management message in relay zone.

Specified Text Changes

According to the proposed text in IEEE 802.16j-06/026r~~2~~3, we propose the following changes.

Since MSs need to be aware the access zone margin without adding new MAPs, some definitions of IEEE 802.16-2004 are adjusted.

[Change the definition of “No. OFDMA Symbols in Table 275 “OFDMA DL-MAP_IE format” of IEEE802.16-2004]

No. OFDMA Symbols

The number of OFDMA symbols that are used (fully or partially) to carry the Access Zone Downlink PHY bursts.

[Change the definition of “No. OFDMA Symbols in Table 287 “OFDMA UL-MAP_IE format” of IEEE802.16-2004]

No. OFDMA Symbols

The number of OFDMA symbols that are used to carry the Access Zone Uplink PHY bursts.

[Insert a new section 8.4.5.3.28]

8.4.5.3.28 MR DL Relay Zone Location IE

In the DL-MAP, BS and RS shall transmit DIUC=15 with MR_DL_Relay_Zone_Location_IE() to indicate the

downlink relay zone position of current frame. This IE is addressed dedicatedly to RS.

Table xxx DL-MAP IE message format

Syntax	Size	Notes
MR_DL_Relay_Zone_Location_IE() {		
Extended DIUC	4bits	0x09
Length	4bits	
OFDMA symbol offset	32 bits	Indicating the start of DL Relay Zone in the current frame, counting from the frame preamble and starting from 0.
No. OFDMA Symbols	8bits	The number of OFDMA symbols in the DL Relay Zone.
}		

OFDMA symbol offest

An indicator regarding the DL Relay Zone Position in the current downlink frame.

No. OFDMA Symbols

The number of OFDMA symbols in the DL Relay Zone.

8.4.5.4.29 MR UL Relay Zone Location IE

In the UL-MAP, BS and RS shall transmit UIUC=15 with MR_UL_Relay_Zone_Location_IE() to indicate the uplink relay zone position of current frame. This IE is addressed dedicatedly to RS.

Table xxx +1 UL-MAP IE message format

Syntax	Size	Notes
MR_UL_Relay_Zone_Location_IE() {		
Extended UIUC	4bits	0x09
Length	4bits	
OFDMA symbol offset	32 bits	Indicating the start of UL Relay Zone

		in the current frame, counting from the uplink start time and starting from 0.
No. OFDMA Symbols	8bits	The number of OFDMA symbols in the UL Relay Zone.
}		

OFDMA symbol offest

An indicator regarding the UL Relay Zone Position in the current uplink frame.

No. OFDMA Symbols

The number of OFDMA symbols in the UL Relay Zone.

[add new section 8.4.5.9 Relay Map message fields and IEs]

8.4.5.9 Relay Map message field and IEs.

In DL relay zone, BS and RS shall transmit R-DL-MAP and R-UL-MAP message. Especially, the access RS will not transmit R-DL-MAP and R-UL-MAP message in DL relay zone.

8.4.5.9.1 R-DL-MAP IE format

8.4.5.9.1.1R-DL_Updated_Relay_Zone_Location IE

BS transmits R-DL_Updated_Relay_Zone_Location_IE in downlink relay zone to indicate RSs to get ready to change the relay zone position and the exact time when the change happens. The newly updated relay zone position should be also denoted. RSs receive this IE and restore the information about the position change of downlink relay zone for the following frames. According to the received information, RSs transmit the location change information of downlink relay zone to their subordinate RSs.

Table xxx +2 R-DL_Updated_Relay_Zone_Location IE format

Syntax	Size	Notes
R-DL_Updated_Relay_Zone_Location_IE format (){		
DIUC	4bits	

Length	4bits	
R-RZ Position Change Count	32bits	Incremented by one(modulo 256) by the BS whenever the relay zone position is determined to change.
R-Time To Change	4bits	Indicating the exact time to change which could be expressed by absolute time or relative time.
R-OFDMA symbol offset	8bits	Indicating the newly updated relay zone position, counting from the frame preamble and starting from 0. .
}		

R-RZ Position Change Count

When BS determines to change relay zone position, it is incremented by one(modulo 256) to have RSs get ready to change relay zone position.

R-Time To Change

An indicator denoting the exact time to change which could be expressed by absolute time or relative time.

R-OFDMA symbol offset

An indicator denoting the newly updated relay zone position, counting from the frame preamble and starting from 0.

8.4.5.9.2 R-UL-MAP IE format

8.4.5.9.2.1 R-UL_Updated_Relay_Zone_Location_IE

BS transmits R-UL_Updated_Relay_Zone_Location_IE in R-UL_MAP message to indicate the newly updated uplink relay zone position. RSs receive this IE and restore the information about the location change of uplink relay zone for the following frames. According to the received information, RSs adjust the location of UL relay zone in the following frames and transmit the location change information of uplink relay zone to their subordinate RSs.

Table xxx+3_R-UL_Updated_Relay_Zone_Location_IE format

Syntax	Size	Notes
R-UL_Relay_Zone_Location_Change_IE Format(){		
UIUC	4bits	
Length	4bits	
R-OFDMA symbol offset	8bits	Indicating the newly updated relay zone position, counting from the uplink start time.
}		
}		

R-OFDMA symbol offset

Indicating the newly updated relay zone position, counting from the uplink start time.

[Insert a new paragraph in the end of 8.4.4.7.2.2]

To improve the efficiency, the last access RS on the relay path is set idle mode in the bursts allocated to R_Preamble, R_FCH, R_MAPs of the DL relay zone and UL relay zone.

Reference:

[1] IEEE C802.16j-06/026r2, “P802.16j Baseline Document”

[2] IEEE C802.16j-07_276, “A proposal of the configuration of MAPs and IEs for multi-hop relay network”