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Re:	IEEE 802.16j-07/013:“Call for Technical Comments regarding IEEE Project P802.16j”
Abstract	This contribution proposes MAP IEs in transparent RS systems
Purpose	Text proposal for 802.16j Baseline Document
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MAP IEs in Transparent RS Systems

Problem Statement

An MR system requires new MAP IEs and control messages for RS operation. It is imperative to enable RS data forwarding with minimum overheads. This contribution proposes two new MAP IEs to enable a burst-based data forwarding scheme that incurs very low signaling overheads and processing complexity at RS in comparison with MPDU-based data forwarding schemes based on existing MAP IEs defined in the baseline working document IEEE 802.16j-06/26r3. This burst-based data forwarding scheme supports unicast, multicast, and broadcast data forwarding at RS that is also compatible with the existing MPDU-based data forwarding scheme.

In a transparent RS system, the same MAP IEs sent from MR-BS are decoded by the transparent RSs and MSs simultaneously. From the legacy MAP IEs, the transparent RSs and MSs have been able to obtain the information of downstream burst receptions and upstream burst transmissions. As a result, burst-based data forwarding can be easily achieved by providing the transparent RSs linkages of downstream burst transmissions and upstream burst receptions via new MAP IEs within the same MAPs.

In the 16j baseline document, there is no efficient approach to handle the data forwarding for MS/RS moving among access stations with same preamble/FCH/MAP. The proposed burst-based data forwarding scheme achieves efficient MS/RS movement among access stations with same preamble/FCH/MAP by reducing signaling overhead to zero.

Finally, the proposed MAP IEs are required for frame-by-frame operation. Therefore, they cannot be put into the RS configuration messages sent by MR-BS to RSs.

Introduction

In order to elaborate the proposed burst-based data forwarding scheme, a DL-MAP IE with "DL_Burst_Transmit_IE" is first defined in Table 1 for an RS to transmit data to its subordinated stations. Moreover, an UL-MAP IE with "UL_Burst_Receive_IE" is defined in Tables 2 for an RS to receive data from its subordinated stations. Examples of using the proposed MAP IE in DL-MAP and UL-MAP for data relaying with transparent RSs are given in Tables 3, 4, and 5. Examples of 4-hop data relaying is also given in Figures 1 & 2 to illustrate the proposed burst-based data forwarding scheme. Finally, in order to facilitate the incorporation of this proposal into IEEE 802.16j standard, specific changes to the baseline working document IEEE 802.16j-06/026r3 are listed below.

Table 1 DL-MAP IE with "DL_Burst_Transmit_IE"

Syntax	Size	Notes
DL-MAP_IE(RS, Nr)	variable	RS is assign to relay Nr IE

{		
DIUC	4 bits	15 (Extended DIUC dependent IE)
DL_Burst_Transmit_IE() {		
Extended UIUC	4 bits	DL_Burst_Transmit_IE = **0x0C**
Length	4 bits	Length = 2+2Nr
RCID	8 bits	Reduced RS basic CID;
Nr	8 bits	Number of IEs following current IE for RS transmitting to subordinated stations
for (n = 0; n < Nr; n++) {	-	-
Relay burst length	16 bits	Relay burst length (in unit of byte)
}		
}		

Table 2 UL-MAP IE with "UL_Burst_Receive_IE"

Syntax	Size	Notes
UL-MAP_IE(RS, Nr)	36 bits	
{		
CID	16 bits	RS basic CID
UIUC	4 bits	15 (Extended UIUC dependent IE)
UL_Burst_Receive_IE () {		
Extended UIUC	4 bits	UL_Burst_Receive_IE = **0x0C**
Length	4 bits	Length = 1
Nr	8 bits	Number of UL-MAP IE following current IE for RS to receive from subordinated stations
}		
}		

Table 3: Format of DL-MAP

Syntax	Size	Notes
DL-MAP_Message_Format() {		
Management Message Type = 3	8 bits	
PHY Synchronization Field	variable	
DCD Count	8 bits	
Base Station ID	48bits	
Begin PHY Specific Section {		
if (WirelessMAN-OFDMA) {		
No. OFDMA symbols	8 bits	Number of OFDMA symbols in the DL subframe including all AAS/permutation zone.
}		
for (n = 0; n < N; n++) {	-	For each DL-MAP element 1 to N.
DL-MAP_IE()	Variable	**(Table 5a as an example)**
}		
}		

Table 4 Format of UL-MAP

Syntax	Size	Notes
UL-MAP_Message_Format() {		

Management Message Type = 3	8 bits	
Reserved	8 bits	Shall be set to zero.
UCD Count	8 bits	
Allocation Start Time	32 bits	
Begin PHY Specific Section {		
if (WirelessMAN-OFDMA) {		
No. OFDMA symbols	8 bits	Number of OFDMA symbols in the UL subframe
}		
for (n = 0; n < N; n++) {	-	For each UL-MAP element 1 to N.
UL-MAP_IE()	Variable	**(Table 5b as an example)**
}		
}		

Table 5a: Example of proposed DL-MAP IEs

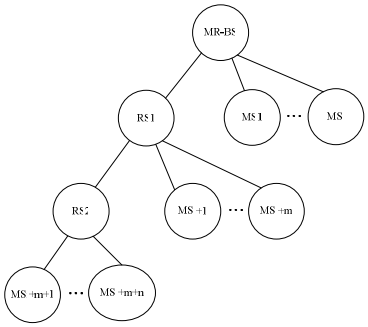
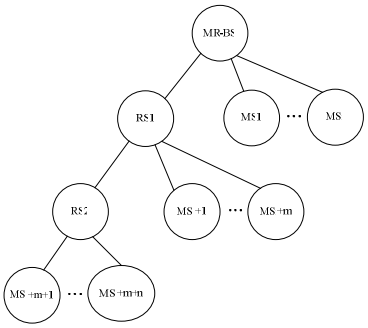
MR Network Topology	Zone	MAP-IEs used to describe the zone(s)	Notes
	DL Access Zone (BS:Tx, MS :Rx, RS1:Rx, RS2:Rx)	DL-MAP_IE$_1$()	MAP IEs for MS receiving from MR-BS
		⋮	
		DL-MAP_IE$_i$()	
		DL-MAP_IE$_{i+1}$ ()	Data burst for RS1 itself (with RS1 basic CID)
		DL-MAP_IE$_{i+2}$()	Data burst for RS1 relaying (with RS1 primary CID)
		STC_Zone_IE	Indicate zone switch
	1st DL Trans-parent Zone (RS1:Tx, MS:Rx, RS2:Rx)	DL-MAP_IE with DL_Burst_Transmit_IE (RS1, Nr = m)	RS1 is assigned to transmit the following m legacy DL-MAP IEs
		DL-MAP_IE$_{j-1}$()	MAP IEs for MS receiving from RS1
		⋮	
		DL-MAP_IE$_{j+m}$()	
		DL-MAP_IE$_{j+m+1}$()	Data burst for RS2 itself (with RS2 basic CID)
		DL-MAP_IE$_{j+m+2}$()	Data burst for RS2 relaying (with RS2 primary CID)
		STC_Zone_IE	Indicate zone switch
	2nd DL Transp arent Zone (RS2:Tx, MS: Rx)	DL-MAP_IE with DL_Burst_Transmit_IE (RS2, Nr = n)	RS2 is assigned to transmit the following n legacy DL-MAP IEs
		DL-MAP_IE$_{k-1}$()	MAP IEs for MS receiving from RS2
		⋮	
		DL-MAP_IE$_{k+n}$ ()	

Table 5b: Example of proposed UL-MAP IEs

MR Network Topology	Zone	MAP-IEs used to describe the zone(s)	Notes
	UL Access Zone (MS:Tx, RS1:Rx, RS2:Rx)	UL-MAP_IE$_1$()	MAP IEs for MS transmitting to MR-BS
		⋮	
		UL-MAP_IE$_i$()	
		UL-MAP_IE with UL Burst Receive IE (RS1, *m*)	RS1 is assigned to receive following *m* IEs
		UL-MAP_IE$_{j-1}$()	MAP IEs for MS transmitting to RS1
		⋮	
		UL-MAP_IE$_{j+m}$()	
		UL-MAP_IE$_j$ with UL Burst Receive IE (RS2, *n*)	RS2 is assigned to receive following *n* IEs
		UL-MAP_IE$_{k-1}$()	MAP IEs for MS transmitting to RS2
		⋮	
		UL-MAP_IE$_{k+n}$ ()	
		UL_Zone_IE()	Indicate zone switch
	1st UL Relay Zone (RS1:Rx, RS2:Tx)	UL-MAP_IE with UL Burst Receive IE (RS1, *1*)	RS1 is assigned to receive following IE
		UL-MAP_IE()	MAP IE for RS2 transmitting to RS1
		UL_Zone_IE()	Indicate zone switch
	2nd UL Relay Zone (RS1:Tx BS :Rx)	UL-MAP_IE()	MAP IE for RS1 transmitting to MR-BS

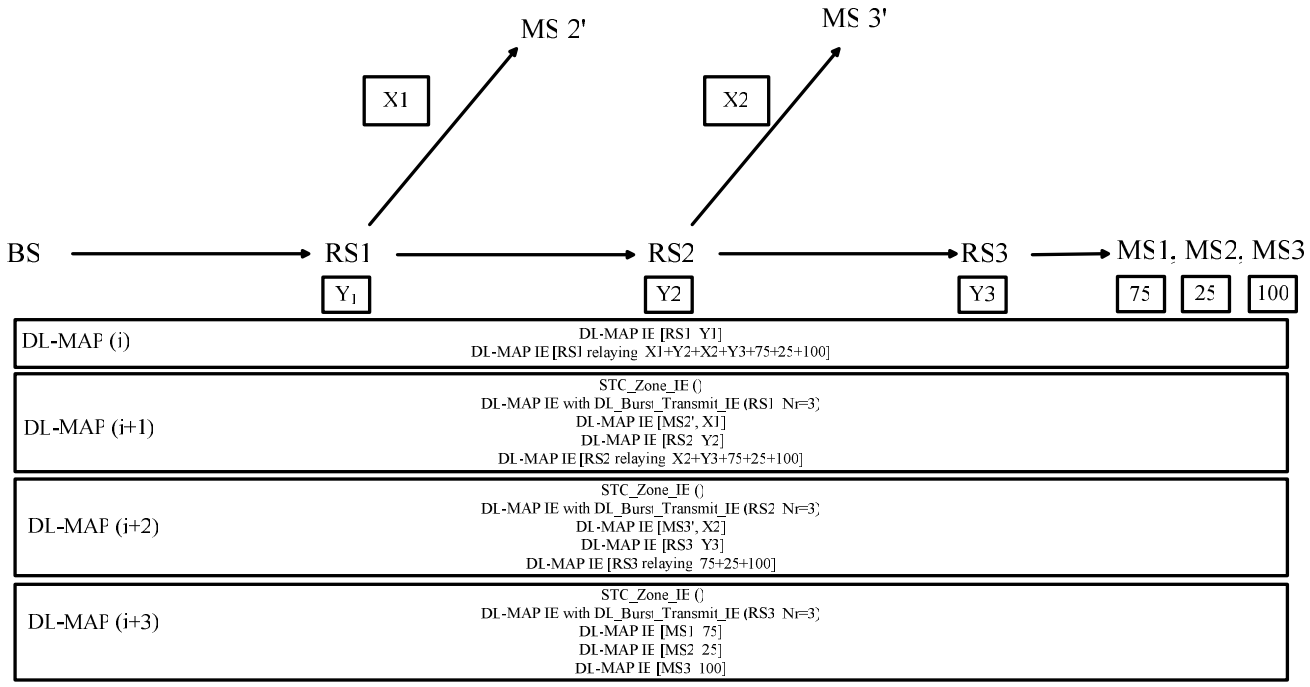


Figure 1a Example of proposed MAP-based scheme for unicast data relaying (one hop in one frame)

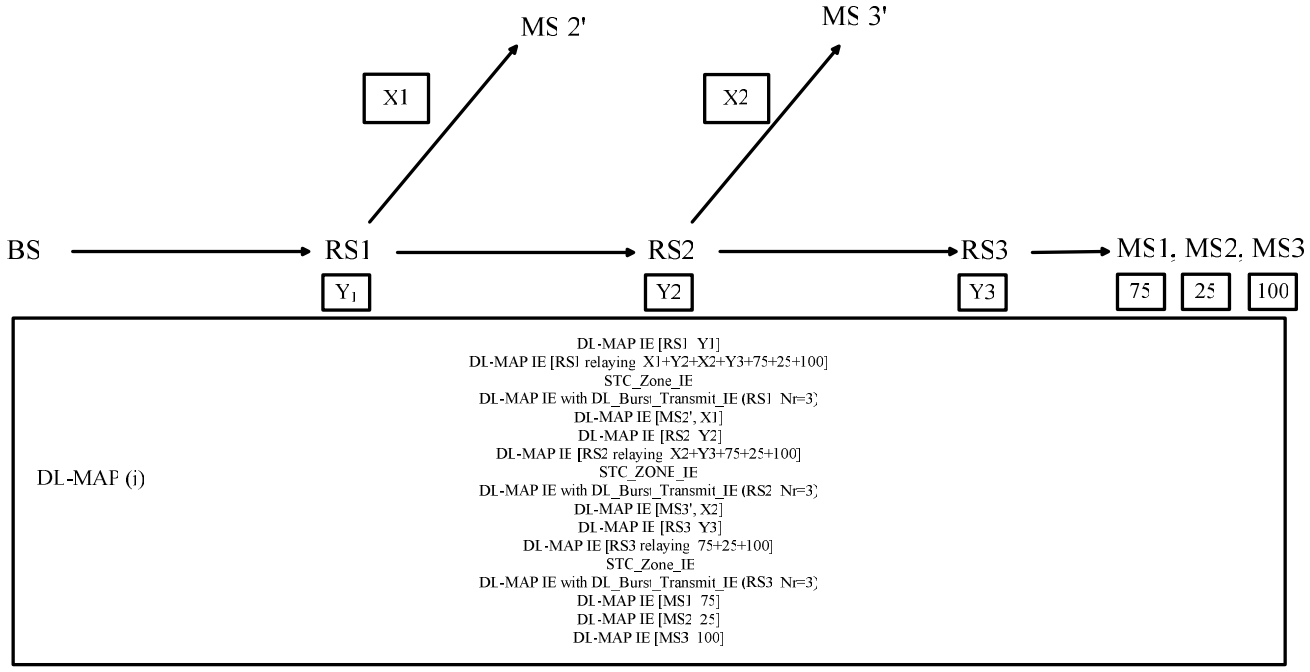


Figure 1b Example of proposed MAP-based scheme for unicast data relaying (all hops in one frame)

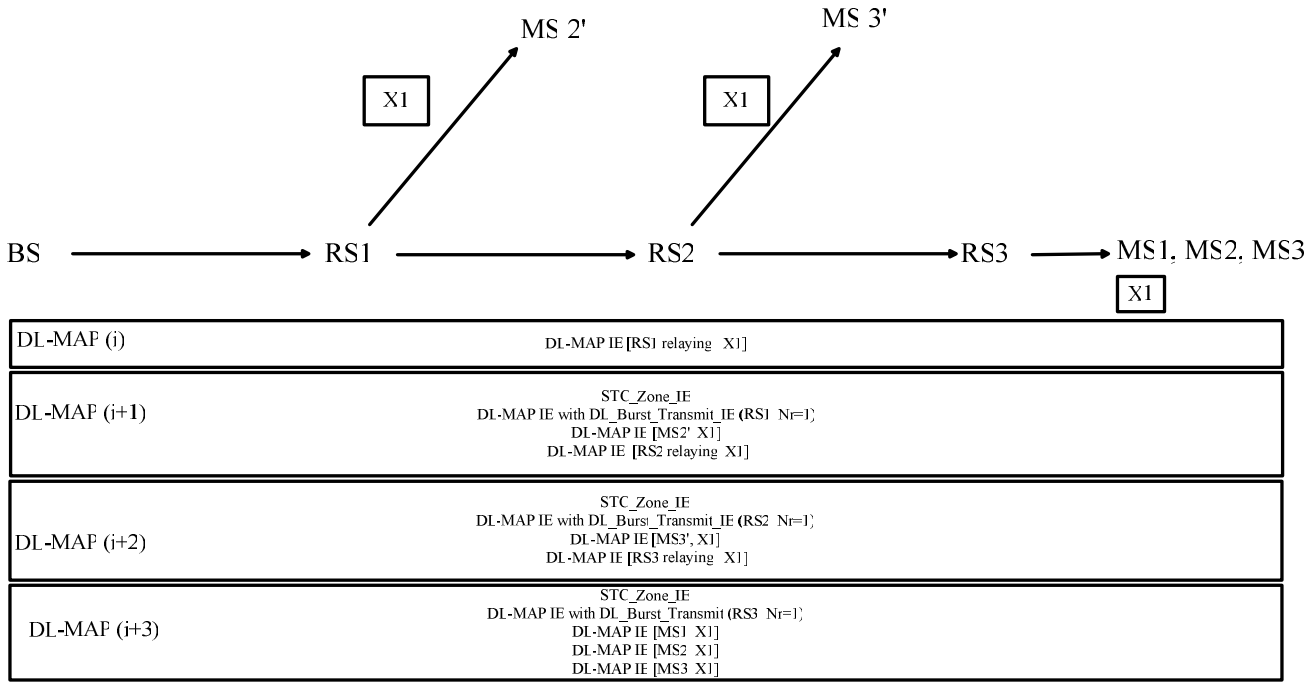


Figure 2a Example of proposed MAP-based scheme for multicast data relaying (one hop in one frame)

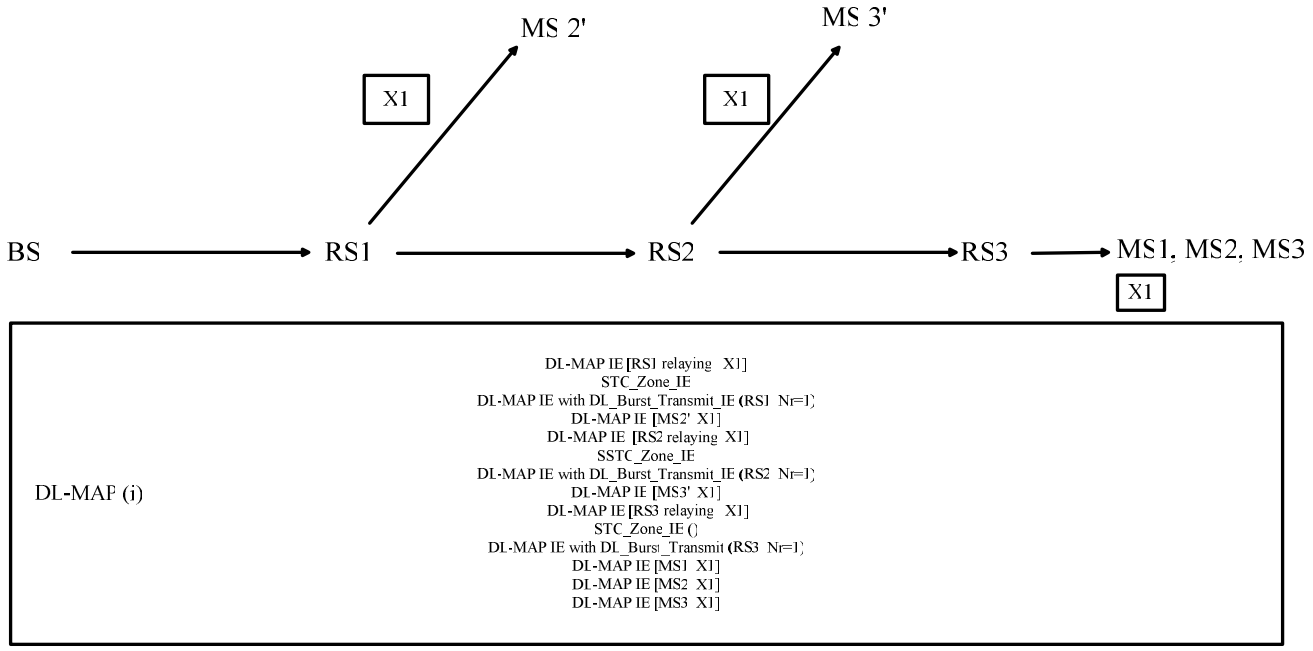


Figure 2b Example of proposed MAP-based scheme for multicast data relaying (all hops in one frame)

Text Proposal

6.3.3.8.2 Transmission using station CID

[Change the following text as indicated]

The construction of MPDUs is the same as without relay. There are two schemes for RS to forward received data. One is the MPDU-based forwarding and the other is burst-based forwarding.

In MPDU-based forwarding scheme, ~~T~~the forwarding of MPDUs by each RS is performed based on the CID of MPDUs. An RS is informed apriori about the next hop station during SF setup for a station CID. The inclusion of CID in DL-MAP is optional as it is without relay.

Optionally, under centralized scheduling, forwarding of MPDUs by each RS is performed based on burst described in MAP IEs, namely burst-based forwarding. The burst-based forwarding rules are encoded in the MAPs sent by MR-BS. Data bursts that are scheduled to be relayed by burst-based forwarding mechanism and destining to stations other than the receiving RS are described by MAP IEs with RS primary management CID. If burst-based forwarding is used, DL_Burst_Transmit_IE and UL_Burst_Receive_IE defined in 8.4.5.3.29, and 8.4.5.4.29, respectively, shall be used, where DL_Burst_Transmit_IE is used to describe DL data relaying information and UL_Burst_Receive_IE is used to describe UL data relaying information.

8.4.5.3.2 DL-MAP extended IE format

8.4.5.3.2.1 DL-MAP extended IE format

[Change Table 277a as follows:]

Table 277a—Extended DIUC Code Assignment for DIUC=15

Extended DIUC	(hexadecimal) Usage
00	Channel_Measurement_IE
01	STC_Zone_IE
02	AAS_DL_IE
03	Data_location_in_another_BS_IE
04	CID_Switch_IE
05	MIMO_DL_Basic_IE
06	MIMO_DL_Enhanced_IE
07	HARQ_Map_Pointer_IE
08	PHYMOD_DL_IE
09-0A	Reserved
0B	DL PUSC Burst Allocation in Other Segment
0C	DL_Burst_Transmit_IE
~~0C~~0D-0E	Reserved
0F	UL_interference_and_noise_level_IE

[Insert the following new subclause]

8.4.5.3.3.29 DL Burst Transmit IE format

Table xxx — DL Burst Transmit IE format

Syntax	Size	Note
DL_Burst_Transmit_IE() {	variable	
Extended UIUC	4 bits	DL_Burst_Transmit_IE = 0x0C

Length	4 bits	Length = 2+2Nr
RCID	8 bits	Reduced RS basic CID
Nr	8 bits	Number of bursts forwarding by RS
for (n = 0; n < Nr; n++) {	-	-
Relay burst length	16 bits	Relay burst length (in unit of byte)
}		
}		

8.4.5.4 UL-MAP IE format

8.4.5.4.4.1 UL-MAP extended IE format

[Change Table 290a as indicated:]

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

E-UIUC	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	RS_CDMA_Ranging_IE (defined in C80216j-07/271)
0C	UL_Burst _Receive_IE
~~0B~~ 0D… 0F	Reserved

[Insert the following new subclause]

8.4.5.4.29 UL_Burst _Receive_IE format

Table xxx — UL_Burst_Receive_IE format

Syntax	Size	Note
UL_Burst_Receive_IE () {	16 bits	
Extended UIUC	4 bits	UL_Burst_Receive_IE = 0x0C
Length	4 bits	Length = 1
Nr	8 bits	Number of UL-MAP IE following current IE for RS to receive from subordinated station(s)
}		