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Title	<b>A Proposal for Transmission of FCH, MAP, R-FCH, R-MAP in Non-transparent Relay System with Centralized Scheduling</b>	
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Re:	IEEE802.16j-07/019:” Call for Technical Comments Regarding IEEE Project 802.16j”	
Abstract	This contribution proposes a mechanism for MR-BS to transmit the scheduling information, including FCH, MAP, R-FCH, R-MAP, to non-transparent RS with centralized scheduling.	
Purpose	The text proposal in this contribution is accepted by TG16j.	
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# A Proposal for Transmission of FCH, MAP, R-FCH, R-MAP in Non-transparent Relay System with Centralized Scheduling

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## Introduction

This contribution proposes a mechanism used for MR-BS and RS to transmit the scheduling information including FCH, MAP, R-FCH and R-MAP in non-transparent relay system with centralized scheduling.

## Details

As we all know, regarding non-transparent RS with centralized scheduling, MR-BS has to determine the scheduling and allocation of RS downlink subframe and uplink subframe. It means MR-BS shall determine the transmission parameters and allocation for DL/UL access zone and relay zone of RS frame. The transmission parameters and allocation information include FCH, DL/UL MAP for access zone, and R-FCH, R-MAP and for relay zone, wherein access zone and relay zone belong to the frame of RS. When non-transparent RS with centralized scheduling receives these transmission parameters and allocation information, RS shall transmit FCH, DL/UL MAP in DL access zone, and also transmit R-FCH, R-MAP in DL relay zone as required by MR-BS.

For non-transparent relay system with centralized scheduling, MR-BS has to determine the scheduling and allocation of all the relay links and access link for RSs in the relay path. MR-BS shall transmit the scheduling information of all the RSs in DL relay zone of MR-BS frame. After the first RS receives these scheduling information, the first RS shall transmit FCH, DL/UL MAP in DL access zone, and also transmit R-FCH, R-MAP in DL relay zone as required by MR-BS. And the first RS shall also forward the scheduling information for other RSs in the relay path in DL relay zone as indicated by MR-BS. Other intermediate RSs shall do the same operation as the first RS. And the access RS only broadcast FCH, DL/UL MAP in DL access zone as indicated by the received scheduling information from superordinate RS or MR-BS.

In current 16j baseline, there is no a complete mechanism to describe how MR-BS transmit these scheduling information for non-transparent RS with centralized scheduling in MR-BS DL relay zone.

To resolve the above mentioned problem, we propose a new RS Scheduling MAP message in which all the information, including FCH, DL/UL MAP for access zone and R-FCH, R-MAP for relay zone, should be included for individual non-transparent RS with centralized scheduling. This RS Scheduling MAP message shall be generated by MR-BS and be sent in DL relay zone. Non-transparent RS with centralized scheduling shall recompose and broadcast FCH, DL/UL MAP in DL access zone, and broadcast R-FCH, R-MAP in DL relay zone according to the received RS Scheduling MAP message. And RS also needs to forward RS Scheduling MAP message for other non-transparent RSs with centralized scheduling in the relay path as required by MR-BS.

In addition, because MR-BS has to do the scheduling for non-transparent RS with centralized scheduling for each frame, if every time RS Scheduling MAP message contains all the scheduling information and configuration information, it will cause very large overhead. So we also propose to include only changed configuration information in RS Scheduling MAP message and periodically broadcast all the configuration information.

## Proposed Text Change

[Add the following text in the current baseline.]

### 6.3.2.3.91 RS Scheduling MAP (RS-SCH-MAP) message

This message shall be generated by MR-BS for non-transparent RS when centralized scheduling is used. This message contains allocation information for RS and shall be sent once per frame over RS' basic connection. After the reception of RS Scheduling MAP message, RS shall compose FCH, DL/UL MAP, R-FCH, R-MAP based on its RS Scheduling MAP message and other related configuration messages. RS shall transmit FCH, DL/UL/MAP in RS DL access zone, and transmit R-FCH, R-MAP in RS DL relay zone.

Table 183ag – RS Scheduling MAP message format

<u>Syntax</u>	<u>Size</u>	<u>Notes</u>
<u>RS Scheduling MAP Message Format</u> {		
<u>Management Message Type = 98</u>	<u>8 bits</u>	
<u>DL Frame Prefix Change Indication</u>	<u>1 bit</u>	<u>DL Frame Prefix is used for RS access zone.</u> <u>0: All the parameters of DL Frame Prefix remain same with the latest Configuration.</u> <u>1: The parameters of DL Frame Prefix are updated.</u>
<u>If (DL Frame Prefix Change Indication = 1 )</u> <u>{</u>		
<u>Used Subchannel Bitmap in Access Zone</u>	<u>6 bits</u>	<u>Bit#0: Subchannel Group 0</u> <u>Bit#1: Subchannel Group 1</u> <u>Bit#2: Subchannel Group 2</u> <u>Bit#3: Subchannel Group 3</u> <u>Bit#4: Subchannel Group 4</u> <u>Bit#5: Subchannel Group 5</u>
<u>Repetition Coding Indication</u>	<u>2 bits</u>	<u>0b00: No repetition coding on DL-MAP</u> <u>0b01: Repetition coding of 2 used on DL-MAP</u> <u>0b10: Repetition coding of 4 used on DL-MAP</u> <u>0b11: Repetition coding of 6 used on DL-MAP</u>
<u>Coding Indication</u>	<u>3 bits</u>	<u>0b000: CC encoding used on DL-MAP</u> <u>0b001: BTC encoding used on DL-MAP</u> <u>0b010: CTC encoding used on DL-MAP</u> <u>0b011: ZT CC encoding used on DL-MAP</u> <u>0b100: CC encoding with optional interleaver</u> <u>0b101: LDPC encoding used on DL-MAP</u> <u>0b110 to 0b111 –Reserved</u>

<u>↓</u>		
<u>Compressed MAP Used</u>	<u>1 bit</u>	<u>Indicates if Compressed map format shall be used by RS</u> <u>0b00: Regular MAP format</u> <u>0b01: Compressed MAP format</u>
<u>DCD Count</u>	<u>8 bits</u>	
<u>No. OFDMA Symbols</u>	<u>8 bits</u>	<u>Number of OFDMA symbols in the DL subframe including all AAS/permutation zone.</u>
<u>N_DL_MAP_IE</u>	<u>7 bits</u>	
<u>For (i=1; i&lt;=N_DL_MAP_IE; i++) {</u>		
<u>  <u>DL_MAP_IE ()</u></u>	<u>variable</u>	<u>These DL-MAP IEs indicate the allocation of RS DL access zone.</u>
<u>  </u>	<u>e</u>	
<u>}</u>		
<u>UCD Count</u>	<u>8 bits</u>	
<u>N_UL_MAP_IE</u>	<u>7bits</u>	
<u>For (i=1; i&lt;=N_UL_MAP_IE; i++) {</u>		
<u>  <u>UL_MP_IE ()</u></u>	<u>variable</u>	<u>These UL-MAP IEs indicate the allocation of RS UL access zone.</u>
<u>  </u>	<u>e</u>	
<u>}</u>		
<u>Relay Zone Scheduling Parameters Present</u>	<u>1 bit</u>	<u>0: No relay zone, only used for access RS.</u> <u>1: The scheduling parameters for RS relay zone are included.</u>
<u>If (Relay Zone Scheduling Parameters Present = 1) {</u>		
<u>  <u>R_Zone_Prefix Change Indication</u></u>	<u>1 bit</u>	<u>R_Zone_Prefix is used for RS relay zone.</u> <u>0: All the parameters in R_Zone_Prefix remain same with the latest configuration.</u> <u>1: The Parameters in R_Zone_Prefix are updated.</u>
<u>  </u>		
<u>If (R_Zone_Prefix Change Indication = 1) {</u>		
<u>  <u>R_Zone_Location</u></u>	<u>7 bits</u>	<u>The field indicates the DL relay zone position referenced to the beginning of next frame in unit of 1 OFDM symbol.</u>
<u>  </u>		
<u>  <u>Used Subchannel Indication</u></u>	<u>1 bits</u>	<u>0: The subchannels used in relay zone are same with the subchannel used in access zone in the same frame.</u> <u>1: The subchannels used in between relay zone and access zone are different in the same frame.</u>

<u>If (Used Subchannel Indication = 1) {</u>		
<u>Used Subchannel Bitmap in Relay Zone</u>	<u>6 bits</u>	<u>Bit#0: Subchannel Group 0</u> <u>Bit#1: Subchannel Group 1</u> <u>Bit#2: Subchannel Group 2</u> <u>Bit#3: Subchannel Group 3</u> <u>Bit#4: Subchannel Group 4</u> <u>Bit#5: Subchannel Group 5</u>
<u>}_</u>		
<u>FEC Code Type and Modulation Type Change Indication</u>	<u>1 bit</u>	<u>0: FEC code and modulation type is same with the latest configuration.</u> <u>1: FEC code and modulation type is updated..</u>
<u>If (FEC Code Type and Modulation Type Change Indication = 1) {</u>		
<u>FEC Code Type and Modulation Type</u>	<u>5 bits</u>	<u>0b0000 = QPSK (CTC) 1/2</u> <u>0b0001 = QPSK (CTC) 3/4</u> <u>0b0010 = 16-QAM (CTC) 1/2</u> <u>0b0011 = 16-QAM (CTC) 3/4</u> <u>0b0100 = 64-QAM (CTC) 1/2</u> <u>0b0101 = 64-QAM (CTC) 2/3</u> <u>0b0111 = 64-QAM (CTC) 3/4</u> <u>0b1000 = 64-QAM (CTC) 5/6</u> <u>0b1001-0b1111 reserved</u>
<u>}_</u>		
<u>Repetition Coding Indication</u>	<u>1 bit</u>	<u>0: No repetition coding on R-MAP</u> <u>1: Repetition coding of 2 used on R-MAP</u>
<u>}_</u>		
<u>N_R_DL_MAP_IE</u>	<u>7 bits</u>	<u>Number of DL_MAP_IE</u>
<u>For (i=1; i&lt;=N_R_DL_MAP_IE, i++) {</u>		
<u>DL_MAP_IE ()</u>	<u>variable</u>	<u>These DL-MAP IEs indicate the allocation of RS DL relay zone.</u>
<u>}_</u>		
<u>N_R_UL_MAP_IE</u>	<u>7 bits</u>	<u>Number of UL_MAP_IE</u>
<u>For (i=1; i&lt;=N_R_UL_MAP_IE, i++) {</u>		
<u>UL_MAP_IE ()</u>	<u>variable</u>	<u>These UL-MAP IEs indicate the allocation of RS UL relay zone.</u>
<u>}_</u>		
<u>}_</u>		

<u>If ! (Byte Boundary) {</u>		
<u>  Padding Nibble</u>	<u>5 bits</u>	<u>Padding to reach byte boundary.</u>
<u>}</u>		
<u>}</u>		

[Change section 6.3.28 Message and data relaying as follows.]

#### 6.3.28.1 RS broadcast message relaying

Non-transparent RS with distributed scheduling shall broadcast FCH, DL/UL-MAP in RS DL access zone, and R-FCH and R-MAP in RS DL relay zone.

When centralized scheduling is used, MR-BS shall determine the bandwidth allocations for all links within its cell and shall generate RS Scheduling MAP (RS-SCH-MAP) message for each non-transparent RS. BS shall transmit RS-SCH-MAP to RS over RS basic connection once per frame. When RS receives RS-SCH-MAP, RS shall compose FCH, DL/UL MAP, R-FCH and R-MAP based information in RS-SCH-MAP and broadcast FCH, DL/UL MAP, R-FCH and R-MAP in RS DL access zone and RS DL relay zone, respectively.

A non-transparent RS shall also broadcast DCD ~~and~~ UCD, ~~DL-MAP and UL-MAP~~ messages in the DL access zone, which may be generated by the MR-BS and be sent in the relay zone. The MR-BS should send DCD and UCD messages with RS primary CID, ~~and DL-MAP and UL-MAP messages with RS basic CID to the RS.~~

Upon receiving the DCD/UCD message with RS primary CID, the RS shall broadcast the DCD/UCD message with fragmentable broadcast CID.

~~Upon receiving the DL-MAP/UL-MAP message with RS basic CID, the RS shall broadcast the DL-MAP/UL-MAP message with broadcast CID.~~

## Reference

[1] IEEE 802.16j-06/026r4 P802.16j baseline document