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Title	MMR Protocol Stack and Definition of RS Types	
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Re:	A response to a Call for Technical Proposal, http://www.ieee802.org/16/relay/docs/80216j-07_007r2.pdf	
Abstract	In order to support 802.16e MAC PDU forwarding by RSs on the relay link, MMR protocol stack is proposed to enable different types of relay forwarding operation.	

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Purpose	To incorporate the proposed text into the P802.16j Baseline Document (IEEE 802.16j-06/026r2)
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MMR Protocol Stack and Types of Relay Stations

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Introduction

To efficiently support 802.16e MAC PDU forwarding by RSs and end-to-end operation between MR-BS and MS, an MMR data protocol stacks are proposed as shown in Figure 1 and Figure 2. Figure 1 shows the protocol for MS traffic relaying where the MS connection and privacy managements are on end-to-end basis (between MMRBS and MS). Figure 2 shows the other protocol for MS traffic relaying where the MS connection and privacy management are managed by the RS and the RS connection and privacy management are controlled by MR-BS. The R-MAC layer provides an extendable framework for various relay related functions, such as QoS control, routing control and etc.

For purely physical layer relaying, the protocol is the same as current 802.16d/e protocol stack.

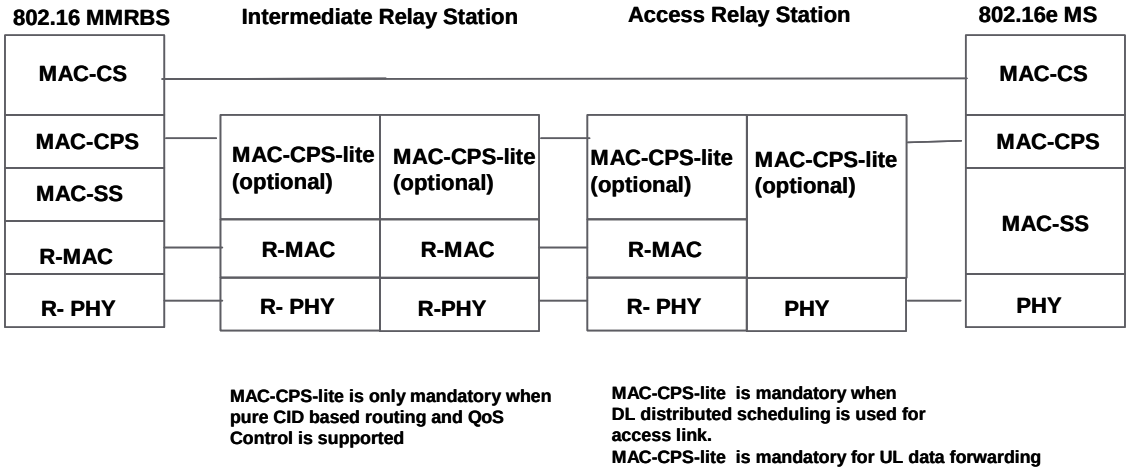

Figure 1 MMR data protocol stack for simple RS (MS traffic relaying)

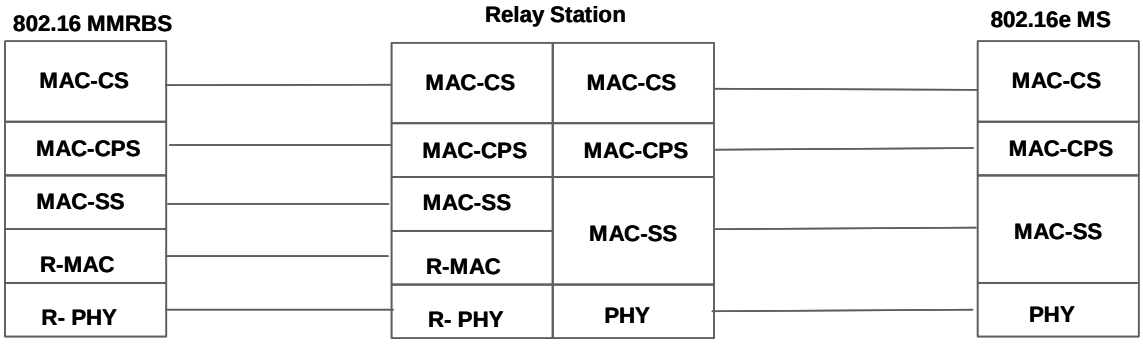

Figure 2 MMR data protocol for micro-BS RS (MS traffic relaying)

The design principles of the R-MAC layer proposal should:

- Enable extendibility of functionality
- Minimize overhead

Protocol stack shown in Figure 2 can be used for mobile RS usage scenario, see contribution C80216j-06_235 [1].

Based on the functions a relay station implements, relay stations can be categorized into 4 types. The following table shows the functions of each type of relay station implements and corresponding operations.
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		Type 1 R-link: R-PHY Access link: PHY	**Type 2** R-link: R-PHY, R-MAC Access link: PHY, MAC-CPS	**Type 3** R-link: R-PHY, R-MAC, MAC-CPS Access link: PHY, MAC-CPS	**Type 4** R-link: R-PHY,R-MAC, MAC-SS, MAC-CPS, MAC-CS Access link: PHY, MAC-SS, MAC-CPS, MAC-CS
RS properties	RS naming (RSID)	Yes	Yes	Yes	Yes
	Basic CID/Primary CID	Yes	Yes	Yes	Yes
	Secondary CID	No	No	No	Yes
	Transport CID	No	Yes (for connection originated relaying) No (for packet originated relaying)	Yes (for connection originated relaying) No (for packet originated relaying)No	Yes
	RS <-> MMRBS security	No	Yes	Yes	Yes
	Trans/non-trans	Transparent	Transparent/non-transparent	Transparent/non-transparent	Non-transparent
MS connection and security and	MS connection management	No (MS end-to-	No (MS end-to-end	No (MS end-to-end	Yes (MS

service flow management		end connection with MMRBS)	connection with MMRBS)	connection with MMRBS)	connection with serving RS)
	MS security management	No (MS end-to-end security established with BS)	No (MS end-to-end security established with BS)	No (MS end-to-end security established with BS)	Yes (MS security established with serving RS)
	MS service flow management	No	No	No	Yes
R-link functions (MS data/message and other RS control message forwarding)	Route control	No	Yes (e.g., destination RS based, T-CID based based, etc) No (e.g., source routing)	Yes (MS CID based)	Yes (any routing methods)
	QoS control-forwarding scheduling	No	Yes if supported	Yes if supported	Yes if supported
Access-link functions	Preamble/MAP transmission (IDCell)	No Or optionally it may transmit the same preamble as the MR-BS.	Yes	Yes	Yes
	MS control message/control header process	No (i.e., transparent)	Yes (for non-authenticated MS control management message, RS	Yes (for non-authenticated MS control management message, RS may	Yes (for all MS control messages and control

			may process) No (for authenticated MS control message, RS only forwards)	process) No (for authenticated MS control message, RS only forwards)	header, RS can process)
	MS traffic scheduling (DL/UL)	No (centralized scheduling)	Optional (centalized or distributed scheduling)	Optional (centalized/distributed scheduling	Yes (distributed scheduling)
	UL traffic forwarding QoS control	No	Yes if supported	Yes if supported	Yes if supported
	MS MAC state management	No	No	No	Yes

Proposed text change

[Insert new subclause 6.1.1.1 MMR Protocol]

6.1.1.1 MMR Protocol

The R-MAC sub-layer is introduced to 802.16d/e protocol for efficient 802.16e MAC PDU relaying/forwarding and control functions. This sub-layer is applicable to the links between MMR-BS and RSs and between RSs. The resulting data protocol stacks are shown in Figure XX and Figure XXX. Figure XX shows the protocol for MS traffic relaying where the MS connection and privacy managements are on end-to-end basis (between MMRBS and MS). Figure XXX shows the other protocol for MS traffic relaying where the MS connection and privacy management are managed by the RS and the RS connection and privacy management are controlled by MMRBS.

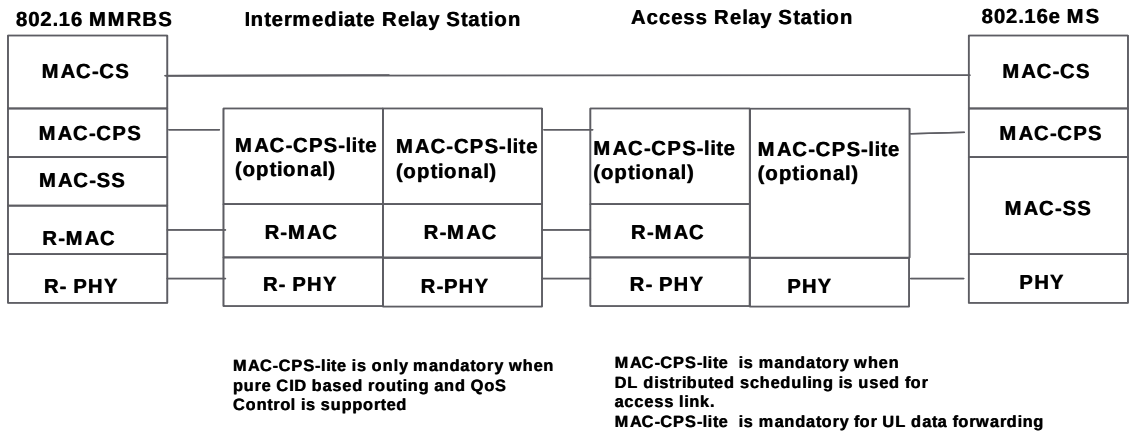

Figure XX. MMR Data Protocol for simple RS (MS traffic relaying).

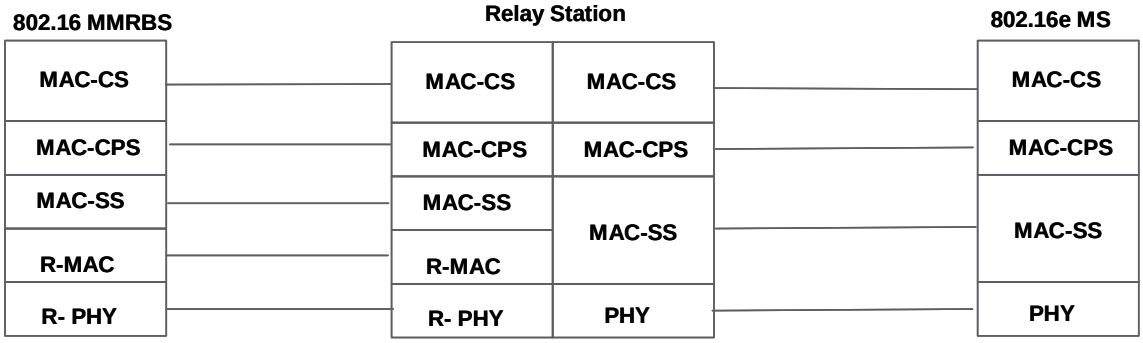

Figure XXX. MMR Data Protocol for micro-BS RS (MS traffic relaying)

The R-MAC provides the concatenation of forwarded 802.16d/e MAC PDU and control functions, such as scheduling, routing, flow control and etc.

The R-PHY layer provides definition of physical layer design, such as, sub-channelization, modulation and code set and etc, for links between MMR-BS and RS and between RSs.

A relay station can optionally implement R-MAC sub-layer, or 802.16e MAC CPS function and MAC CS function.

If a relay station only implements R-PHY layer on R-link and 16e PHY on access link, this relay station is defined as a type 1 relay station; If a relay station implements R-PHY and R-MAC layers on R-link, this relay station is defined as type 2 relay station; If a relay station implements R-PHY, R-MAC and MAC-CPS layers on R-link, this relay station is defined

as type 3 relay station; If a relay station implements R-PHY, R-MAC, MAC-SS, MAC-CPS and MAC-CS layers on R-lonk, this relay station is defined as type 4 relay station.

The transport connection(s) of a MS can be established between MMR-BS and MS (end-to-end connection) or established between its serving station (MMR-BS or relay station) and the MS.

For type 1 relay stations, management connections may be established and no any transport connection is established between MMR-BS and this relay station.

For types 2 and 3 relay station, management connections are established for control purpose between MMR-BS and the relay station. One or multiple transport connection may be established for relaying purpose.

For type 4 relay station, management connections are established and transport connection(s) are established for relaying MSs's traffic.

The following table XXX shows the functions of each type of relay station implements and corresponding operations of each type of relay station.

Table xxx. Relay station types and functions implemented.

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		Type 1 R-link: R-PHY Access link: PHY	**Type 2** R-link: R-PHY, R-MAC Access link: PHY, MAC-CPS	**Type 3** R-link: R-PHY, R-MAC, MAC-CPS Access link: PHY, MAC-CPS	**Type 4** R-link: R-PHY,R-MAC, MAC-SS, MAC-CPS, MAC-CS Access link: PHY, MAC-SS, MAC-CPS, MAC-CS
RS properties	RS naming (RSID)	Yes	Yes	Yes	Yes
	Basic CID/Primary CID	Yes	Yes	Yes	Yes
	Secondary CID	No	No	No	Yes
	Transport CID	No	Yes (for connection originated relaying) No (for packet originated relaying)	Yes (for connection originated relaying) No (for packet originated relaying)No	Yes
	RS <-> MMRBS security	No	Yes	Yes	Yes
	Trans/non-trans	Transparent	Transparent/non-transparent	Transparent/non-transparent	Non-transparent

MS connection and security and service flow management	MS connection management	No (MS end-to-end connection with MMRBS)	No (MS end-to-end connection with MMRBS)	No (MS end-to-end connection with MMRBS)	Yes (MS connection with serving RS)
	MS security management	No (MS end-to-end security established with BS)	No (MS end-to-end security established with BS)	No (MS end-to-end security established with BS)	Yes (MS security established with serving RS)
	MS service flow management	No	No	No	Yes
R-link functions (MS data/message and other RS control message forwarding)	Route control	No	Yes (e.g., destination RS based, T-CID based based, etc) No (e.g., source routing)	Yes (MS CID based)	Yes (any routing methods)
	QoS control-forwarding scheduling	No	Yes if supported	Yes if supported	Yes if supported
Access-link functions	Preamble/MAP transmission (IDCell)	No Or optionally it may transmit the same preamble as the MR-BS.	Yes	Yes	Yes
	MS control message/control	No (i.e., transparent)	Yes (for non-authenticated	Yes (for non-authenticated MS	Yes (for all MS

	header process		MS control management message, RS may process) No (for authenticated MS control message, RS only forwards)	control management message, RS may process) No (for authenticated MS control message, RS only forwards)	control messages and control header, RS can process)
	MS traffic scheduling (DL/UL)	No (centralized scheduling)	Optional (centalized or distributed scheduling)	Optional (centalized/distributed scheduling	Yes (distributed scheduling)
	UL traffic forwarding QoS control	No	Yes if supported	Yes if supported	Yes if supported
	MS MAC state management	No	No	No	Yes

[1] “Moving RS operation”, Hang Zhang, G.Q. Wang ,Peiying Zhu, Wen Tong, David Steer, Gamini Senarath, Derek Yu, Mark Naden, C80216j-06_235.