Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**	
Title	Signaling Support for R-amble Configuration	
Date Submitted	**2007-03-05**	
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Re:	A response to a Call for Technical Proposal,http://wirelessman.org/relay/docs/80216j-07-007r2.pdf	
Abstract	In this contribution, we propose a signaling scheme for the location of the R-amble introduced in C-802.16j-2006/241r1.	
Purpose	To incorporate the proposed text into the P802.16j Baseline Document (IEEE 802.16j-06/026r2)	
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Signaling Support for R-amble Configuration

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1. Introduction

In [1], we introduce a R-amble to be transmitted periodically for the purposes of

- Downlink synchronization (Nortel [1] , Fujitsu [2]): RS(s) transmitting their own preambles will not be able to receive the 802.16d/e preamble for synchronization
- Enabling the RS(s) and BS(s) to monitor the RS(s) and BS(s) in their coverage areas (Nortel [1], Fujitsu [2]).

This contribution introduces the signaling scheme to configure the location of the R-amble.

2. R-amble Configuration

It is agreed that [R-amble location contribution], for proper monitoring and synchronization, a potential R-amble shall have a (i) *network-wide fixed* and (ii) *configurable location*, that shall appear (iii) *within the downlink subframe*.

In 802.16d/e, a preamble is transmitted at the beginning of each frame. One of the functions of this preamble is to facilitate the frame-synchronization at the MSs. One can define a fixed location within a 802.16d/e frame by providing an offset (in terms of the number of OFDM symbols, slots, or physical slots (PSs), etc. from this frame-start preamble. This offset can be configured as desired to change the R-amble location. The R-amble shall be transmitted periodically, and its period (in terms of number of frames) shall be configurable as well to maintain its function efficiently.

The R-amble may also be used for monitoring purposes. The phase of this R-amble shall be different from the that of the R-amble to prevent any collision. The period of the R-amble for monitoring may or may not be the same as that for the R-amble for synchronization. Furthermore, whether a RS will take part in a synchronization and/or monitoring process shall be configurable.

It is necessary to provide RSs with the following parameters:

- **period of the R-amble**: It may not be necessary to transmit R-amble at every frame. Depending on the situation it may not even be necessary to transmit an R-amble. The knowledge about the presence of an R-amble and its period shall be informed to the RSs. RS may need two different period values for the R-amble: one for synchronization, the other for monitoring process.

- **symbol offset**: The fixed offset with respect to the frame-start preamble shall be informed to the RSs.

In general, the whole network has the same R-amble periods across the whole network. On the other hand, sometimes individual RSs may have different preferences regarding this synchronization/monitoring process. To that end, we need one broadcast signaling to transmit common parameters across the whole network, and a unicast signaling to configure individual RSs. The configuration of the R-amble may be performed during network entry, initialization, and during normal operation. New parameters in the RS_CD (RS Configuration Description) Message [06/242r1,06-243r1] are introduced for this purpose.

A method for the designing PN sequences for R-ambles is proposed in [R-amble_design].

3. Proposed Text Change

Insert the following subclause:

++++++++++++++++ *start text* ++
8.4.4.8.1.1 R-amble location and transmission period

"The R-amble location shall be network-wide synchronized across all RS(s) and MRBS(s), shall be configurable, and shall be within the DL subframe. The R-amble may be transmitted periodically by the MR-BS(s), while a RS(s) may transmit or receive the R-amble during the R-amble symbol time. The R-amble may be employed for two purposes: (i) synchronization, and (ii) monitoring. Both the periods associated with these two functions and their presence shall be configurable. The frame number, *i*, at which an R-amble may appear shall obey Equation XXX:

$$\mathrm{mod}(i, N) = c, \qquad i = 0,1,\ldots,2^{24} - 1 \quad \text{(Equation xxx)}$$

where N may be the R_amble_Synch_Cycle or R_amble_Monitor_Cycle defined in 6.3.2.3.63, and c is an implementation specific offset parameter that shall be selected such that the R-amble for monitoring and R-amble for Synchronziaton processes do not collide with each other. R_amble_Monitor_Cycle shall be an integer (greater than 1) multiple of R_amble_Synch_Cycle.

The R-amble shall occupy one OFDM symbol located at a fixed offset from the frame start preamble (plus any R-TTG or T-TTG involved) and the value of this offset shall be configurable. 1 TTG before and 1 TTG after the R-amble location shall be present. If the optional Common_Sync preamble of the 802.16e is being transmitted, the R-amble shall not be transmitted. The modulation for the R-amble is the same as that used by the 802.16d/e preamble. Section 8.4.4.x describes the method to generate the PN sequences to be used in the R-amble symbol."

[Add new section 6.3.2.3.63 in page 172. Note that the same message is also proposed in C802.16-07-243r2]

6.3.2.3.Y MR-BS configuration description message

This message is transmitted by a MMR-BS for the purpose of RS configuration. A MMR-BS can use this message to set operation parameters for a RS. MMR-BS can transmit this message as a response.

Syntax	Size	Notes
RS_CD_ format {		
_Management message type = 68	8 bits	
_Configured_para_type	8 bits	b0 = 1: R-amble for synch_is_present b1 = 1: R-amble for monitoring is present b2– b7: reserved
_If (b0 of Configured_para_type = 1 or b1 of		

Configured_para_type = 1_) {		
R-amble_Symbol_Offset	5 bits	R-amble offset in terms of number of OFDM symbols
}		
If (b0 of Configured_para_type = 1) {		
R-amble_Synch_Cycle	8 bits	R-amble period for synhronization in terms of number of frames
}		
If (b1 of Configured_para_type = 1) {		
R-amble_Monitor_Cycle	8 bits	R-amble period for monitoring in terms of number of frames
}		

Configuration_para_type

The first bit is used as R-amble indicator to indicate the preamble_index field appearance in this message. The second bit is used for indicating the presence or absence of R-amble configuration parameters.

R-amble_Symbol_Offset

This field is used to indicate the R-amble offset counting from the frame-start preamble (preamble is the 0^{th} OFDM symbol).

R-amble_Synch_Cycle

This field is used to indicate the synchronization R-amble period if present.

R-amble_Monitor_Cycle

This field is used to indicate the monitoring R-amble period if present.

6.3.2.3.X MMR-BS configuration response message

This message is transmitted by a MMR-BS for the purpose of RS configuration. A MMR-BS can use this message to set individual operation parameters for a RS. MMR-BS can transmit this message as a response to RS_Config-REQ or as a unsolicited message.

Syntax	Size	Notes
RS_Config-RSP format {		
Management message type = 68	8 bits	
Configured_para_type	8 bits	b0 = 1: preamble configuration is included; b1 = 1: R-amble for synch_is_present b2 = 1: R-amble for monitoring is present b3– b7: reserved
If (b0 of Configured_para_type == 1) {	8 bits	
Preamble_index }	7 bits	Preamble index
}		
If (b1 of Configured_para_type = 1) {		
R-amble_Synch_Cycle	8 bits	R-amble period for synhronziation in terms of number of frames
}		
If (b2 of Configured_para_type = 1) {		
R-amble_Monitor_Cycle	8 bits	R-amble period for monitoring in terms of number of frames
Monitor_Allocation_Start_Time	8 bits	The time to start monitoring cycle in terms of number of frames starting from the current frame
Monitor_Allocation_Duration	8 bits	The time to stop monitoring cycle in terms of number of frames starting from Monitor_Allocation_Start_Time
}		

Configuration_para_type

The first bit is used as preamble index indicator to indicate the preamble_index field appearance in this message

Preamble_index

This field is used to indicate the preamble index assigned by MMRBS

Monitor_Allocation_Start_Time

The time to start monitoring cycle in terms of number of frames starting from the current frame

Monitor_Allocation_Duration

The time to stop monitoring cycle in terms of number of frames starting from Monitor_Allocation_Start_Time

++++++++++++++++ *end text* ++

References

[1] Hang Zhang, et al., IEEE C802.16j-06/240 ” RS DL Synchronization and Radio Environment Measurement - Introduction of RS-Preamble”, available at http://www.ieee802.org/16/relay/contrib/C80216j-06_240.pdf

[2] Hang Zhang, et al., IEEE C802.16j-07/242r1

[3] Hang Zhang, et al., IEEE C802.16j-07/243r2

[4] Mike Hart, et al., IEEE C802.16j-06/144, “Relay midamble”, available at http://www.ieee802.org/16/relay/contrib/C80216j-06_144.pdf

[5] New harmonized contribution

[6] Design method