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Re:	IEEE 802.16j-07/013: "Call for Technical Comments Regarding IEEE Project 802.16j"	
Abstract	This contribution proposes to modify RNG-REG message for MS CDMA Ranging	
Purpose	Text proposal for 802.16j Baseline Document	
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Comment on RNG-REQ message

Introduction

In MR system with transparent RS, the CDMA ranging code sent by MS may be received by the MR-BS and RSs near the MS. In order to decide the most appropriate path to communicate with the code originating MS, each RS successfully decoded the CDMA ranging code should report the ranging code attribute, channel measurement and, and adjustment information to MR-BS. The overhead involving transporting multiple RNG-REQ messages needs to be minimized in order to conserve BW on the relay path.

The overhead of each RNG-REQ message defined in baseline document IEEE 802.16j-06/026r3 is illustrated in Table 1.

Table 1a RNG-REQ message resulting in success/abort

Syntax	Size
Generic MAC header ()	6 bytes
RNG-REQ_Message_Format ()	
Management Message Type = 4	1 byte (8 bits)
MS ranging Indicator	1 byte (8 bits)
TLV Encoded Information	
New MS Indication ID	3 byte (2+1)
Received Ranging Codes (compound TLV)	2 byte
Ranging Status	3 byte (2+1)
Ranging code attributes	6 byte (2+4)
Channel Measurement for MS (transparent RS only)	At least 3 byte (2+1)
CRC-32	4 bytes (32 bits)
Total	29 bytes

Table 1b RNG-REQ message resulting in continue

Syntax	Size
Generic MAC header ()	6 bytes
RNG-REQ_Message_Format ()	
Management Message Type = 4	1 byte (8 bits)
MS ranging Indicator	1 byte (8 bits)
TLV Encoded Information	
New MS Indication ID	3 byte (2+1)
Received Ranging Codes (compound TLV)	2 byte
<i>Timing Adjust</i>	<i>6 byte (2+4)</i>

<i>Power Level Adjust</i>	3 byte (2+1)
<i>Offset Frequency Adjust</i>	6 byte (2+4)
Ranging Status	3 byte (2+1)
Ranging code attributes	6 byte (2+4)
Channel Measurement for MS (transparent RS only)	At least 3 byte (2+1)
CRC-32	4 bytes (32 bits)
Total	32~44 bytes

Remedy

In order to reduce the RNG-REQ message overhead, we propose a modified RNG-REQ message format in Table 3 and message size in Table 4. The comparison of the overhead between original RNG-REQ message and proposed RNG-REQ message is illustrated in Table 5.

Table 3 Description of fields in RNG-REQ message format

Syntax	Size	Notes
RNG_REQ_Message_Format()	-	-
{	-	-
Management Message Type = 4	8 bits	
MS ranging Indicator	1 bit	0: reserved 1: Indicates this message used for MS ranging
If (MS ranging Indicator == 0) {	-	--
<i>Reserved</i>	87 bits	Shall be set to zero
} else {	-	-
Purpose & Status	2 bits	0: relaying RNG-REQ sent from subordinated station 1: received ranging code resulting in continue status 2: received ranging code resulting in abort status 3: received ranging code resulting in success status
If (Purpose & Status == 0) {	-	-
<i>Reserved</i>	5 bits	Shall be zero
} else {		
RCA_OR_CID	1 bit	1: use ranging code attributes 0: use MS basic CID (triggered by upstream traffic)
INC_CM	1 bit	Channel measurement (0 = not present, 1 = present)
INC_TA	1 bit	Timing adjust (0 = not present, 1 = present)
INC_PWA	1 bit	Power level adjust (0 = not present, 1 = present)
INC_OFA	1 bit	Offset frequency adjust (0 = not present, 1 = present)
If(RCA_OR_CID == 1)	-	-
Ranging code attributes	32 bits	Bits 31:22 - Used to indicate the OFDM time symbol reference that was used to transmit the ranging code. Bits 21:16 - Used to indicate the OFDMA subchannel reference that was used to transmit the ranging code. Bits 15:8 - Used to indicate the ranging code index that was sent by the SS.

		Bits 7:0 - The 8 least significant bits of the frame number of the OFDMA frame where the SS sent the ranging code.
} else {	-	-
MS basic CID	16 bits	MS basic CID
}	-	-
If(INC_CM = 1) {	-	-
Channel Measurement	8 bits	The mean CINR as measured on the element pointed to by data measurement type, frame number, and number of frames in the corresponding request. The CINR is quantized as described in 8.3.9.2
}	-	-
If(INC_TA = 1) {	-	-
Timing Adjust	32 bits	Tx timing offset adjustment (signed 32-bit). The amount of time required to adjust SS transmission so the bursts will arrive at the expected time instance at the BS. Units are PHY specific (see 10.3).
}	-	-
If(INC_PWA = 1) {	-	-
Power Level Adjust	8 bits	Tx Power offset adjustment (signed 8-bit, 0.25 dB units) Specifies the relative change in transmission power level that the SS is to make in order that transmissions arrive at the BS at the desired power. When subchannelization is employed, the subscriber shall interpret the power offset adjustment as a required change to the transmitted power density.
}	--	-
If(INC_OFA = 1) {	-	-
Offset Frequency Adjust	32 bits	Tx frequency offset adjustment (signed 32-bit, Hz units) Specifies the relative change in transmission frequency that the SS is to make in order to better match the BS. (This is fine-frequency adjustment within a channel, not reassignment to a different channel.)
}	-	-
}	-	-
}	-	-
TLV Encoded Information	<i>variable</i>	TLV specific (Table364)
}	-	-

Table 4a RNG-REQ message resulting in success/abort

Syntax	Size
Generic MAC header ()	6 bytes
RNG-REQ_Message_Format ()	
Management Message Type = 4	1 byte (8 bits)
MS ranging Indicator (1 bit)	1 byte (8 bits)
Ranging Status (2 bits)	
RCA_OR_CID (1 bit)	
INC_CINR (1 bit)	
INC_TA (1 bit)	
INC_PWA (1 bit)	

INC_OFA (1 bit)	
Ranging code attributes	4 byte
CINR (transparent RS only)	1 byte
CRC-32	4 bytes (32 bits)
Total	17 bytes

Table 4b RNG-REQ message resulting in success

Syntax	Size
Generic MAC header ()	6 bytes
RNG-REQ_Message_Format ()	
Management Message Type = 4	1 byte (8 bits)
MS ranging Indicator (1 bit) Ranging Status (2 bits) RCA_OR_CID (1 bit) INC_CINR (1 bit) INC_TA (1 bit) INC_PWA (1 bit) INC_OFA (1 bit)	1 byte (8 bits)
Ranging code attributes	4 byte
CINR (transparent RS only)	1 byte
<i>Timing Adjust</i>	<i>4 byte</i>
<i>Power Level Adjust</i>	<i>1 byt</i>
<i>Offset Frequency Adjust</i>	<i>4 byte</i>
CRC-32	4 bytes (32 bits)
Total	18~26 bytes

Table 5 Comparison of overhead

	Status = Success	Status = Continue	Status = Abort
Original RNG-REQ message	29 bytes	32~44 bytes	26 bytes
Proposed RNG-REQ message	17 bytes	18~26 bytes	16 bytes

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.

Text Proposal

6.3.2.3.5 Ranging Request (RNG-REQ) message

[Change Table 19 in page 9 as indicated:]

Change 'Reserved' field in Table 19 as indicated:

<i>Reserved</i> MS ranging Indicator	8 bits	Shall be set to zero 0: Reserved 1: Indicates this message used for MS ranging 2-255: Reserved
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Syntax	Size	Notes
RNG_REQ_Message_Format()	-	-
{	-	-
Management Message Type = 4	8 bits	
<u>MS ranging Indicator</u>	<u>1 bit</u>	<u>0: reserved</u> <u>1: Indicates this message used for MS ranging</u>
<u>If (MS ranging Indicator == 0) {</u>	<u>=</u>	<u>=</u>
<i>Reserved</i>	8 7 bits	Shall be set to zero
<u>} else {</u>	<u>=</u>	<u>=</u>
<u>Purpose & Status</u>	<u>2 bits</u>	<u>0: relaying RNG-REQ sent from subordinated station</u> <u>1: received ranging code resulting in continue status</u> <u>2: received ranging code resulting in abort status</u> <u>3: received ranging code resulting in success status</u>
<u>If (Purpose & Status == 0) {</u>	<u>=</u>	<u>=</u>
<i>Reserved</i>	<u>5 bits</u>	Shall be zero
<u>} else {</u>		
<u>RCA_OR_CID</u>	<u>1 bit</u>	<u>1: use ranging code attributes</u> <u>0: use MS basic CID (triggered by upstream traffic)</u>
<u>INC_CM</u>	<u>1 bit</u>	<u>Channel measurement (0 = not present, 1 = present)</u>
<u>INC_TA</u>	<u>1 bit</u>	<u>Timing adjust (0 = not present, 1 = present)</u>
<u>INC_PWA</u>	<u>1 bit</u>	<u>Power level adjust (0 = not present, 1 = present)</u>
<u>INC_OFA</u>	<u>1 bit</u>	<u>Offset frequency adjust (0 = not present, 1 = present)</u>
<u>If(RCA_OR_CID == 1)</u>	<u>=</u>	<u>=</u>
<u>Ranging code attributes</u>	<u>32 bits</u>	<u>Bits 31:22 - Used to indicate the OFDM time symbol reference that was used to transmit the ranging code.</u> <u>Bits 21:16 - Used to indicate the OFDMA subchannel reference that was used to transmit the ranging code.</u> <u>Bits 15:8 - Used to indicate the ranging code index that was sent by the SS.</u> <u>Bits 7:0 - The 8 least significant bits of the frame number of the OFDMA frame where the SS sent the ranging code.</u>
<u>} else {</u>	<u>=</u>	<u>=</u>
<u>MS basic CID</u>	<u>16 bits</u>	<u>MS basic CID</u>
<u>}</u>	<u>=</u>	<u>=</u>
<u>If(INC_CM = 1) {</u>	<u>=</u>	<u>=</u>
<u>Channel Measurement</u>	<u>8 bits</u>	<u>The mean CINR as measured on the element pointed to by data measurement type, frame number, and number of frames in the corresponding request. The CINR is quantized as described in 8.3.9.2</u>
<u>}</u>	<u>=</u>	<u>=</u>
<u>If(INC_TA = 1) {</u>	<u>=</u>	<u>=</u>
<u>Timing Adjust</u>	<u>32 bits</u>	<u>Tx timing offset adjustment (signed 32-bit). The amount of time required to adjust SS transmission so the bursts will arrive</u>

		at the expected time instance at the BS. Units are PHY specific (see 10.3).
}	=	=
<u>If(INC_PWA = 1) {</u>	=	=
<u>Power Level Adjust</u>	8 bits	<u>Tx Power offset adjustment (signed 8-bit, 0.25 dB units)</u> <u>Specifies the relative change in transmission power level that the SS is to make in order that transmissions arrive at the BS at the desired power. When subchannelization is employed, the subscriber shall interpret the power offset adjustment as a required change to the transmitted power density.</u>
}	==	=
<u>If(INC_OFA = 1) {</u>	=	=
<u>Offset Frequency Adjust</u>	32 bits	<u>Tx frequency offset adjustment (signed 32-bit, Hz units)</u> <u>Specifies the relative change in transmission frequency that the SS is to make in order to better match the BS. (This is fine-frequency adjustment within a channel, not reassignment to a different channel.)</u>
}		=
}	=	=
}	=	=
TLV Encoded Information	<i>variable</i>	TLV specific (Table364)
}	-	-