Project	**IEEE 802.16 Broadband Wireless Access Working Group <**http://ieee802.org/16**>**
Title	**Comments on MS initial ranging in non-transparent RS systems**
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Re:	IEEE 802.16j-07/043: "IEEE 802.16 Working Group Working Group Letter Ballot #28"
Abstract	This contribution proposes to use "MR-Code-REP header" instead of "RNG-REQ message with MS ranging indicator equal to 1" to request CDMA-Allocation_IE for MS.
Purpose	Text proposal for 802.16j Draft Document.
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Comments on MS initial ranging in non-transparent RS systems

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Introduction

In P802.16j/D1, MR_Code-REP header is used to request MR-BS to allocate BW via CDMA-Allocation_IE for MS sending BR header after RS receiving CDMA BR ranging code, whereas RNG-REQ message is used to request MR-BS to allocate BW via CDMA-Allocation_IE for MS sending RNG-REQ message after RS receiving CDMA initial and handover ranging codes. However, because of the limitation of T3 timer (60 ms for initial or periodic ranging), the current scheme that utilizes RNG-REQ message cannot be used to request CDMA-Allocation_IE for non-transparent RS with hop-count more than two. Therefore, the latency of MS requesting CDMA-Allocation_IE needs to be reduced. In addition, by comparing the response latency and message/header size, using MR_Code-REP header is a better scheme, which also handles reporting multiple CDMA code more efficiently. Hence, we propose to use "MR_Code-REP header" instead of "RNG-REQ message" for requesting CDMA-Allocation_IE for MS.

The message size and response latency of using MR_Code-REP header and RNG-REQ message are described in Table 1 and Figure 1, respectively. The minimum latencies of 2-hop and 3-hop scenarios using RNG-REQ message are 7 and 13 frames (35 ms and 65 ms for 5-ms frame), respectively. Hence the latency using RNG-REQ message in 3-hop scenario becomes unacceptable since the T3 timer (60 ms for initial or periodic ranging) at MS side has already been expired. The minimum latencies of 2-hop and 3-hop scenarios using MR_Code-REP header are 5 and 9 frames (25 ms and 35 ms for 5-ms frame), respectively.

In summary, the response latency and message size for using MR_Code-REP header are less than response latency and message size for using RNG-REQ message. The comparison of response latency of using MR_Code-REP header and RNG-REQ message are described in Table 2

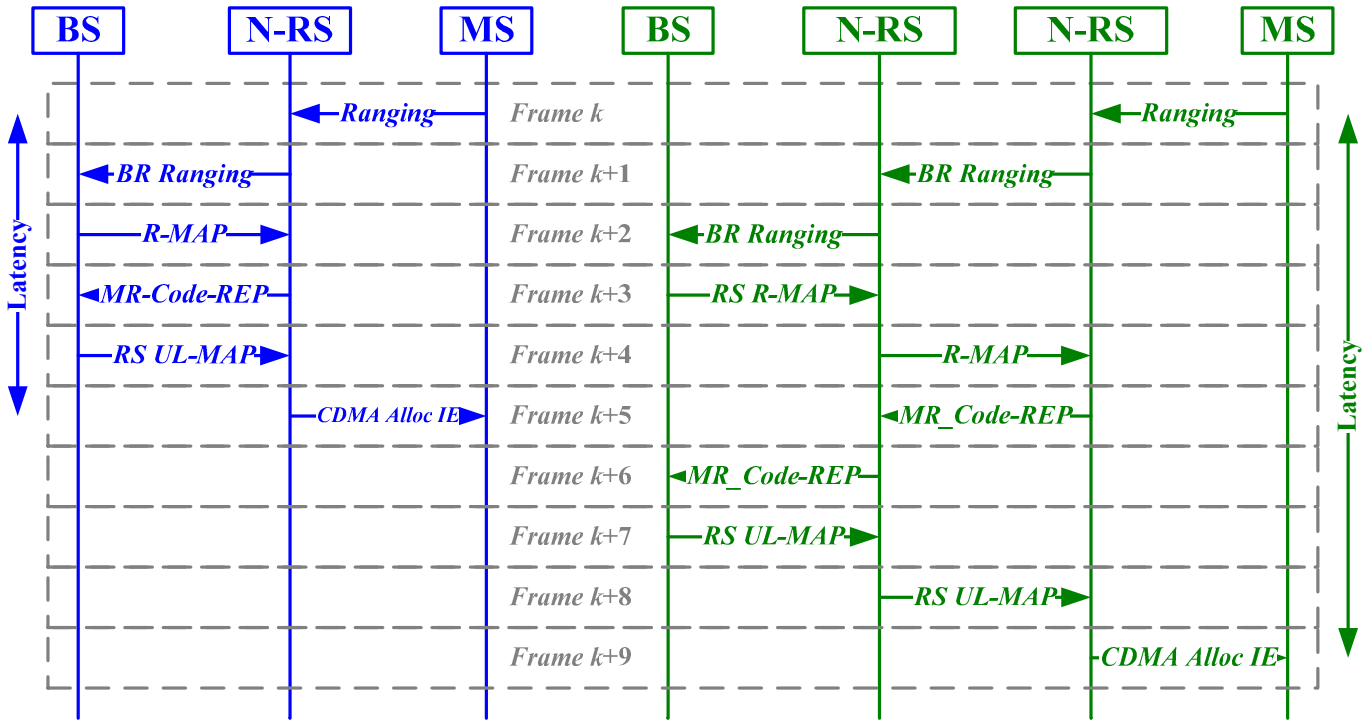
Table 1 Message sizes for RNG-REQ message and MR_Code-REP header

Size \ Message		RNG-REQ (bytes)	MR-Code-REP (bytes)
Generic MAC header		6	6
Message body	Fix part	2	0
	Variable part	14×*Nr*	0
CRC		4	0
Total		12+14×*Nr*	6

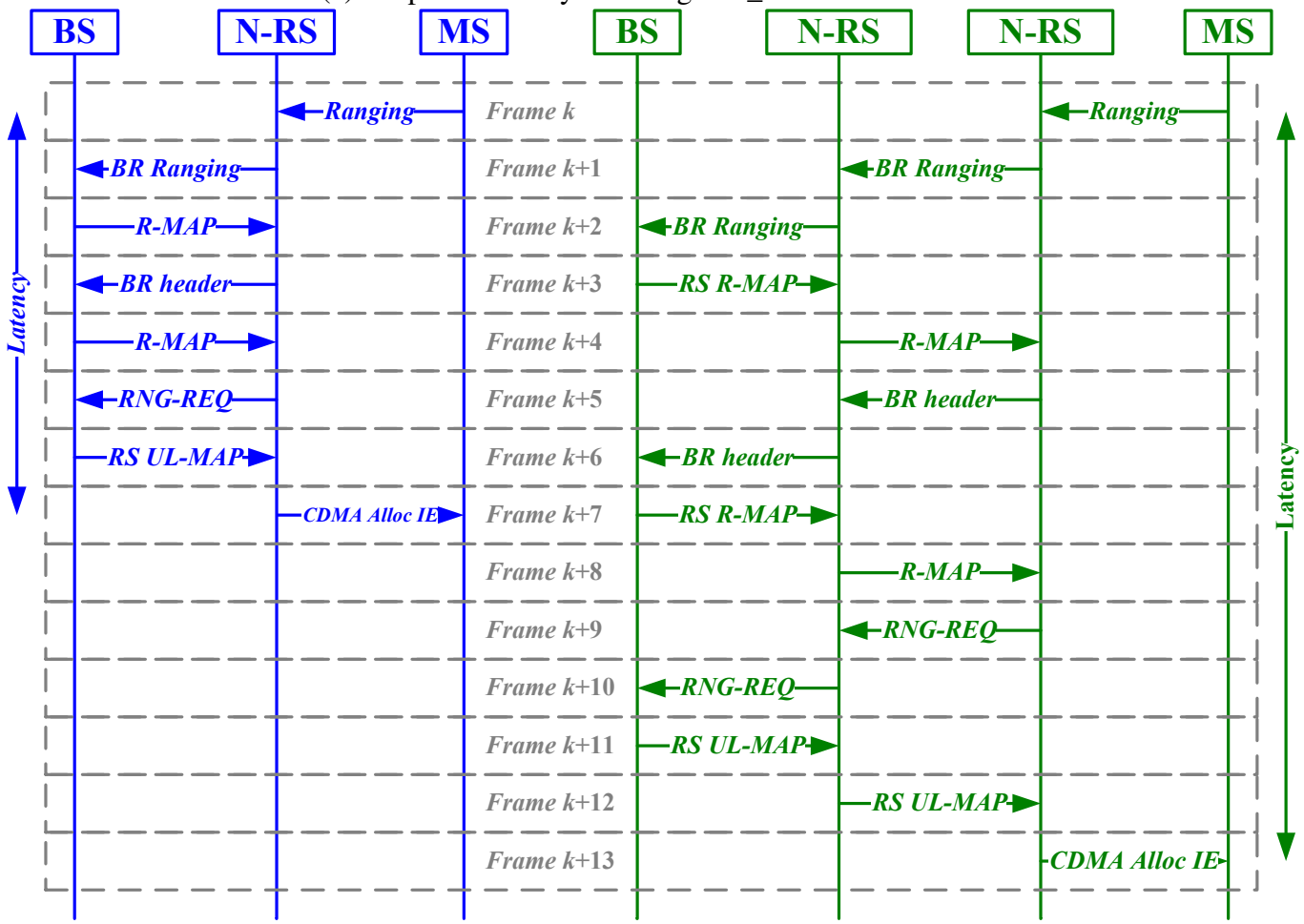
Nr: *Number of CDMA ranging code in a RNG-REQ message or an MR_Code-REP header*

Table 2 Minimum latency for multi-hop systems

Hop count	*Latency (5-ms frame)*			
	RNG-REQ		*MR-Code-REP*	
	frame	*ms*	*frame*	*ms*
2	**7**	**35**	**5**	**25**
3	13	65	**9**	**45**
4	19	95	13	65



(a) Response latency for using MR_Code-REP header



(b) Response latency for using RNG-REQ message

Figure 1 Response latencies of 2-hop and 3-hop scenarios

In order to facilitate the incorporation of this proposal into IEEE 802.16j standard, specific changes to the draft standard P802.16j/D1 are listed below.

Specification Changes

6.3.2.1.2.2.2.5 MR_Code-REP header

[Change the following table in line 24 of page 15 as indicated]

Table xxx Description of fields in MR_Code-REP header

Name	Length	Description
HT	1 bit	= 1
EC	1 bit	= 1
Type	1 bit	= 1
Extended Type	3 bits	= 5
Frame Number Index	4 bits	LSBs of relevant frame number
Number of Received IR CDMA Codes	4 bits	Number of CDMA initial ranging code that requires no correction
Number of Received HR CDMA Codes	4 bits	Number of CDMA handover ranging code that requires no correction
Number of Received BR CDMA Codes	6 bits	Number of CDMA bandwidth request ranging code
~~Reserved~~	~~12 bits~~	
Basic CID	16 bits	RS basic CID
HCS	8 bits	Header Check Sequence (same usage as HCS entry in Table 5).

6.3.9.16.2.1 Non-transparent RS with Centralized scheduling

[Change the following subclause in line 55 of page 93 as indicated]

Once a RS receives the ~~CDMA~~ initial ranging code that requires no adjustment, it transmits an ~~RNG-REQ~~ MR_Code-REP header with the RS basic CID to the MR-BS, containing ~~ranging code attributes~~ number of CDMA initial ranging code that requires no correction. ~~In addition, the value of MS ranging indicator of the RNG-REQ is set to 1. When the RS successfully receives multiple codes in a frame, the RS sends a RNG-REQ message which contains information of multiple received codes.~~

When the MR-BS receives the ~~RNG-REQ with MS ranging indicator equal to 1~~ MR_Code-REP header, it may send an RS_BW-Alloc IE with Type equal to 1 to RS for broadcasting RNG-RSP message containing abort status ~~and the value of MS ranging indicator equal to 1 to the RS~~ according to its policy. ~~RNG-RSP contain downlink frequency override~~ Otherwise, ~~instead of sending RNG-RSP with success status,~~ the MR-BS shall provide ~~BW~~ bandwidth allocation for the MS by ~~sending a RS-UL-MAP to the RS including a~~ inserting CDMA_Allocation-IE with certain fields zeroed out into the UL-MAP that it assigns to that RS to broadcast on the access link (see 6.3.6.7.2.1 for detail). Sending an RS_BW-Alloc IE with Type equal to 1 to RS for broadcasting RNG-RSP message with status "Success" is optional.

~~After receiving the RNG-RSP, which the value of MS ranging indicator is equal to 1, the RS sets the value of MS ranging indicator to zero and then relays the message with the initial ranging CID.~~ Upon receiving RS_BW-Alloc_IE, the RS shall broadcast RNG-RSP message with ranging CID, which contains status success or abort. If the INC_DFO is 1, the RNG-RSP message shall also contain downlink frequency override given by MR-BS.

Upon receiving a message UL-MAP containing CDMA_Allocation_IE with zeroed out fields, the RS shall fill in the corresponding ranging code and transmit region information into the appropriate fields of the CDMA Allocation IE and then broadcast this updated UL-MAP on the access link.

[Change the following Table 199b in page 84 as indicated]

Table 199b—Ranging and automatic adjustments procedure in ~~MR~~ non-transparent mode

[Replace "RNG-REQ" by "MR-Code-REP header" in line 23 ~ 27 of page 95 (Table 199b)]

[Merge figure 95e and figure 95f as following indicated:]

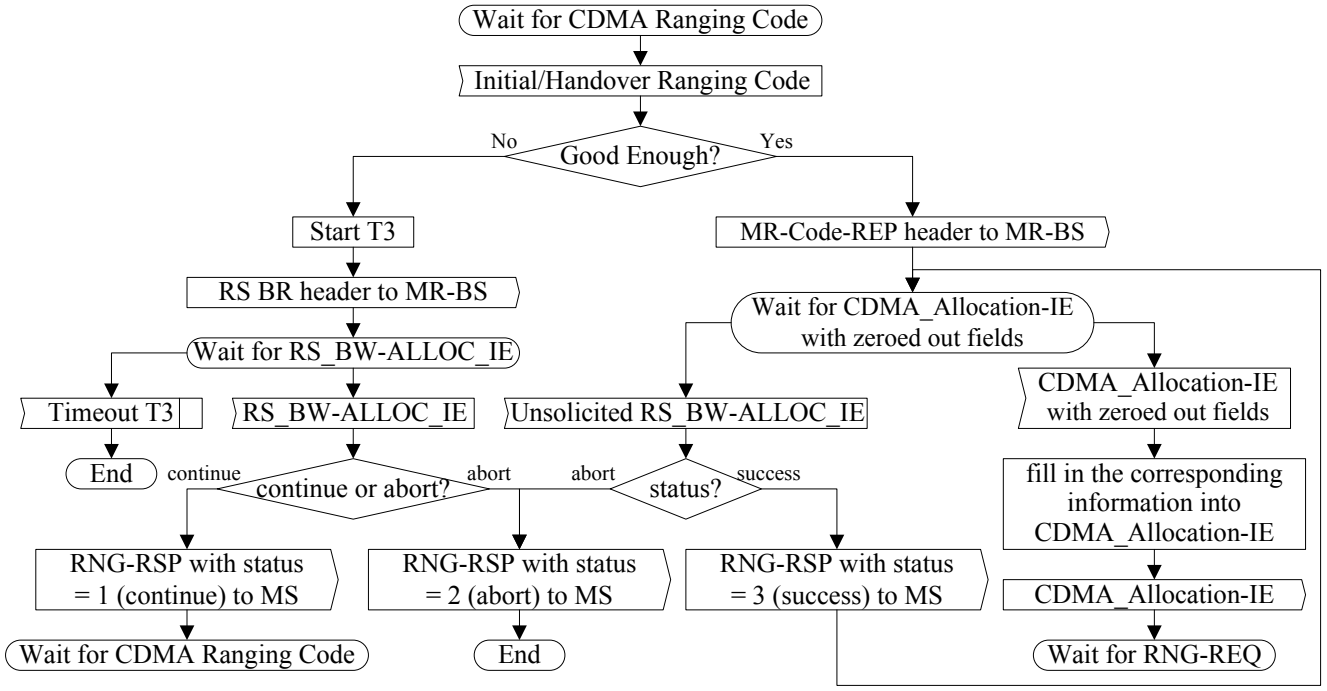


Figure 95e—Handling CDMA initial ranging code at a non-transparent RS

[Replace figure 95g as following indicated:]

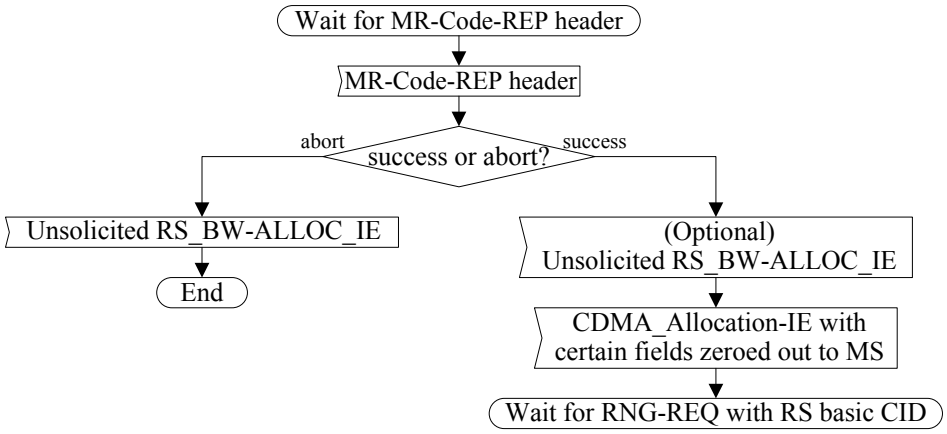


Figure 95g Handling ~~RNG-REQ~~ MR_Code-REP in non-transparent mode at MR-BS ~~(Part 1)~~

[Change the title of figure 95i as following indicated:]

Figure 95i—Handling RNG-REQ in non-transparent mode at an MR-BS ~~(Part 2)~~

8.4.5.9.3 RS Bandwidth Allocation IE (RS_BW-ALLOC_IE)

Table xxx—RS_BW-ALLOC_IE format

Name	Length	Description
RS_BW-ALLOC_IE {	-	-
Type	5 bits	0x01
Length	4 bits	variable
RCID_IE()	4,8,12,16 bits	RS basic CID in RCID_IE format (see 8.4.5.3.20.1)

Type	1 bit	0b0: Response for RS BR header 0b1: For RS broadcasting RNG-RSP
If (Type == 0x0) {	-	-
TID	4 bits	Transaction ID
} else if (Type == 0x1) {		
Frame Number Index	4 bits	LSBs of relevant frame number
Number of successes	5 bits	Number of RNG-RSP message with status “Success”
Number of aborts	5 bits	Number of RNG-RSP message with status “Abort”
INC_DFO	1 bit	Include downlink frequency override (0b0: no, 0b1: yes)
}		
DL-MAP IE index	8 bits	RS shall transmit message on the burst described by the k-th DL-MAP IE within the DL-MAP message broadcasted by the RS, where *k* is the DL-MAP IE index
}	-	-