Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Comments on MS ranging and network entry in non-transparent RS systems under centralized scheduling**
Date Submitted	**2007-09-09**
Source(s)	Kanchei (Ken) Loa, Yi-Hsueh Tsai, Yung-Ting Lee, Hua-Chiang Yin, Shiann-Tsong Sheu, Youn-Tai Lee, Voice: +886-2-27399616 Fax: +886-2-23782328 loa@iii.org.tw Institute for Information Industry 8F, No. 218, Sec. 2, Dunhua S. Rd., Taipei City 106, Taiwan [add other coauthors here]
Re:	IEEE 802.16j-07/043: "IEEE 802.16 Working Group Working Group Letter Ballot #28"
Abstract	Comments on mechanism that RS locally broadcast RNG-RSP message(s) on the access link
Purpose	Text proposal for 802.16j Draft Document.
Notice	*This document does not represent the agreed views of the IEEE 802.16 Working Group or any of its subgroups*. It represents only the views of the participants listed in the "Source(s)" field above. It is offered as a basis for discussion. It is not binding on the contributor(s), who reserve(s) the right to add, amend or withdraw material contained herein.
Release	The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE's name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE's sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE 802.16.
Patent Policy	The contributor is familiar with the IEEE-SA Patent Policy and Procedures: <http://standards.ieee.org/guides/bylaws/sect6-7.html#6> and <http://standards.ieee.org/guides/opman/sect6.html#6.3>. Further information is located at <http://standards.ieee.org/board/pat/pat-material.html> and <http://standards.ieee.org/board/pat>.

Comments on MS ranging and network entry in non-transparent RS systems under centralized scheduling

Introduction

In P802.16j/D1, the non-transparent RS under centralizing scheduling shall locally broadcast RNG-RSP message(s) on the access link. In order to broadcast RNG-RSP message, first RS must send CDMA BR ranging to request 6-byte uplink bandwidth allocation for sending RS BR header; then the RS must send RS BR header to MR-BS to request downlink bandwidth for the RNG-RSP message). Because of the limitation of T3 timer (60 ms for initial or periodic ranging), the current scheme cannot be used to request BW for the RS with hop-count more than three, therefore, the latency needs to be reduced. In order to shorten latency during the ranging procedure, we suggest that either the MR-BS should pre-schedule proper UL bandwidth in relay link for sending RS BR header to the MR-BS after allocating Ranging channel in the RS access link or the RS should use dedicated ranging code to request BW on its access downlink (for SS) for sending a RNG-RSP message. The advantage of using RS BR header is to handle reporting multiple CDMA code more efficiently. That is, initial, periodic, BR ranging and handover ranging codes receiving in a frame could be handled by one RS BR header message as multiple codes.

In addition, we propose to move subclauses 6.3.9.16.2.1, 6.3.10.3.4.2.1 and 6.3.10.3.4.4.1 to a new subclause (6.3.10.3.7) in 6.3.10.3 "OFDMA-based ranging", which is consistent with how the MS CDMA ranging and OFDMA-based network entry procedure have been described in IEEE 802.16e-2005 (see 6.3.10.3.1 "Contention-based initial ranging and automatic adjustments", 6.3.10.3.2 "Periodic ranging and automatic adjustments" and 6.3.10.3.3 "CDMA HO ranging and automatic adjustment" for detail).
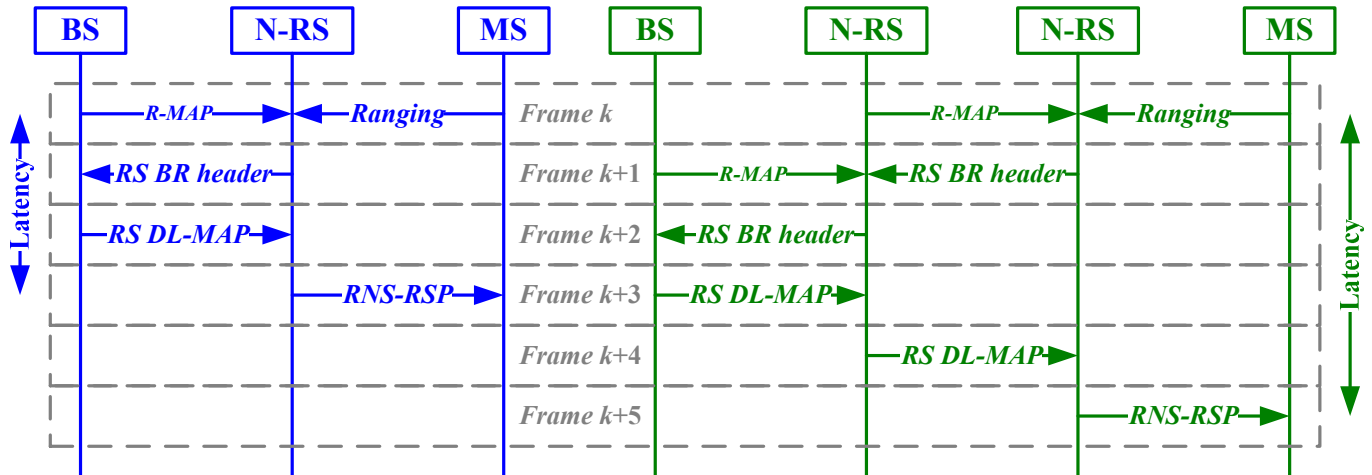
The response latencies for using anonymous ranging code for sending RS BR header (to request bandwidth to send RNG-RSP), using dedicated uplink bandwidth for sending RS BR header, and using dedicated ranging code for sending RNG-RSP are described in Figure 1 and Table 1. In Figure 1a, the minimum latency of CDMA ranging response for 2-hop and 3-hop are 5 and 9 frames (25 and 45 ms for 5-ms frame). Furthermore, the minimum latency with hop-count more than four is lager than 13 frames (65 ms for 5-ms frame) and becomes unacceptable since the T3 timer (60 ms for initial or periodic ranging) at MS side has already been expired. The comparisons of response latency are described in Table 1. In order to resolve this issue, we recommend using Feedback Polling IE or dedicated ranging code to shorten the latency (see Figure 1b and 1c), where the minimum response latency for 2-hop and 3-hop scenario are 3 and 5 frames (i.e., 15 and 25 ms for 5-ms frame), respectively.
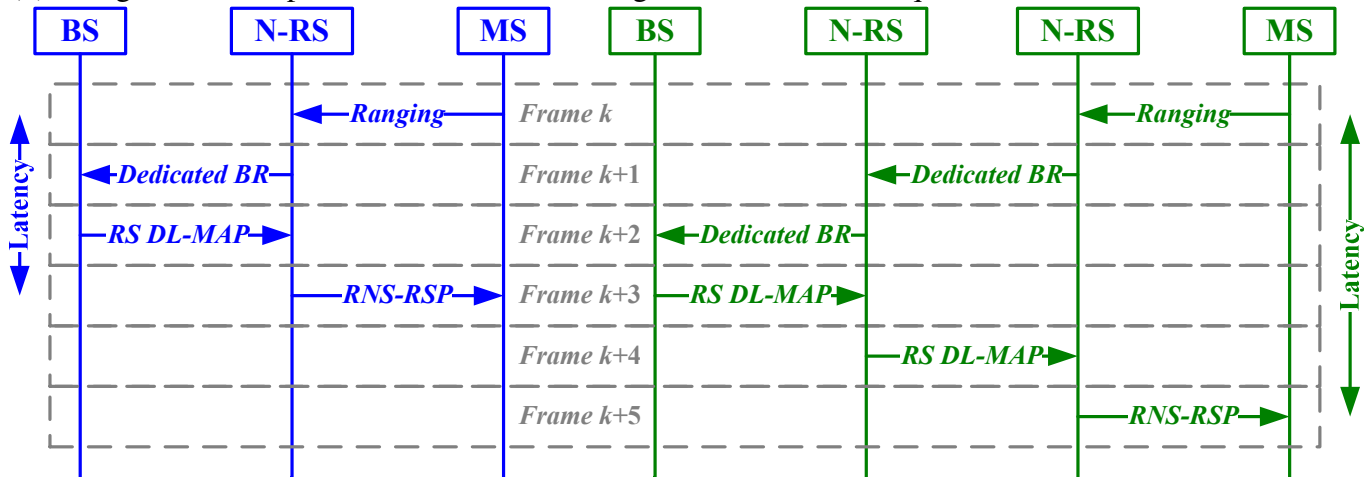
Table 1 Minimum latency for multi-hop systems

Hop count	Latency (5-ms frame)			
	(a)		(b) and (c)	
	frame	ms	frame	ms
2	**5**	**25**	**3**	**15**
3	**9**	**45**	**5**	**25**
4	13	65	**7**	**35**
5	17	85	**9**	**45**
6	21	105	**11**	**55**
7	25	125	13	65
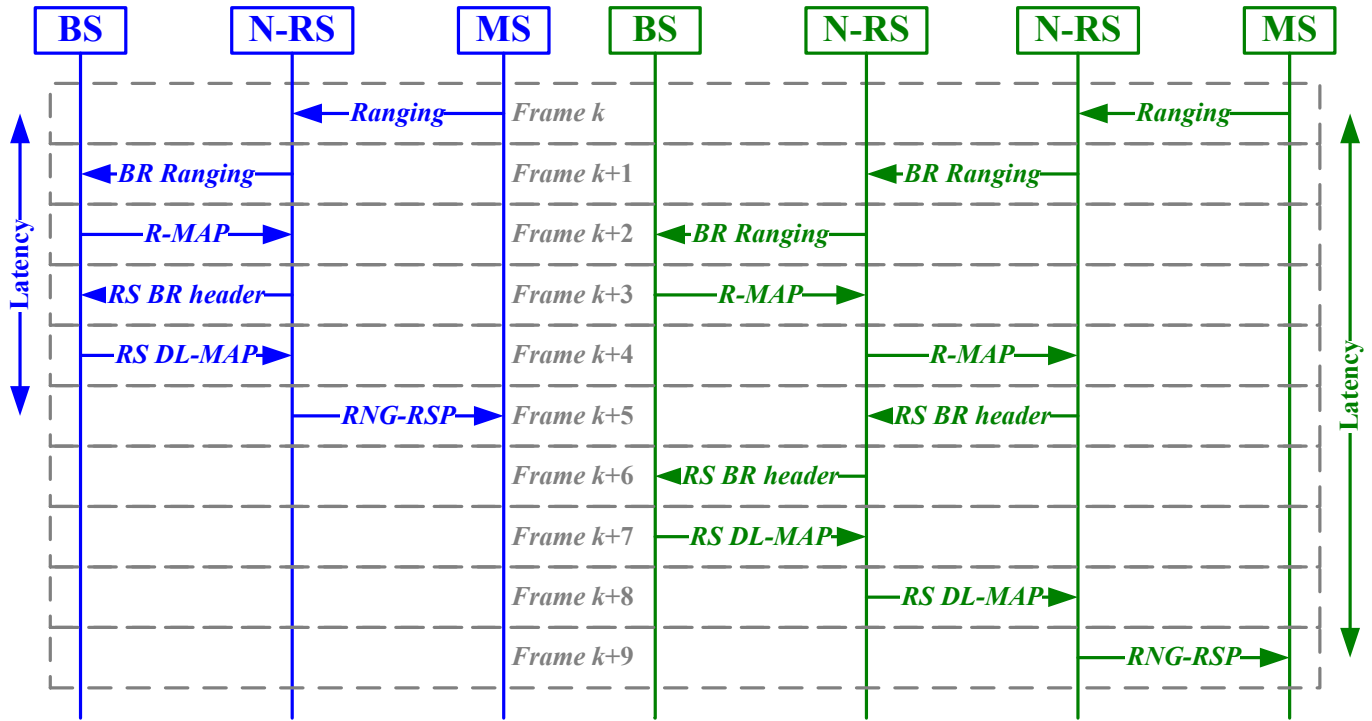
(a) Using anonymous ranging code for sending RS BR header to request bandwidth to send RNG-RSP

(b) Using dedicated uplink bandwidth for sending RS BR header to request bandwidth to send RNG-RSP

(c) Using dedicated ranging code for sending RNG-RSP

Figure 1 Latencies during the ranging procedure for 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.

Text Proposal

[Insert the following subclause 6.3.10.3.7 in line 16 of page 122 as indicated:]

6.3.10.3.7 MS contention-based ranging and automatic adjustments with non-transparent RS under centralized scheduling

[Move all paragraphs of the subclause 6.3.9.16.2.1 in line 33 of page 93 to a new subclause 6.3.10.3.7.1, and modified it as indicated:]

~~6.3.9.16.2.1 Non-transparent RS with Centralized scheduling~~ 6.3.10.3.7.1 MS initial ranging and network entry

In MS initial ranging and network entry procedures in non-transparent RS systems, MS scans for downlink channel and establish synchronization with the non-transparent RS, then obtains transmit parameters from UCD message as described in 6.3.9.1 through 6.3.9.4.

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

When an RS receives ~~a~~ one or multiple CDMA ranging code~~s~~ that requires adjustment of transmission parameters, the RS shall locally ~~send a~~ broadcast RNG_RSP message~~s~~ ~~to the MS~~ with ranging CID on the access link. In order to ~~send~~ broadcast the RNG~~-~~-RSP messages ~~to the MS~~ on the access link, ~~it~~ the RS shall send~~s~~ an RS BR header or the associated dedicated CDMA code to the MR-BS. The MR-BS may pre-schedule proper UL bandwidth in relay link for sending RS BR header to the MR-BS after allocating Ranging channel in the RS access link. Upon receipt of the RS BR header or the dedicated CDMA code at the MR-BS, the MR-BS ~~will~~ shall allocate resources for the transmission of the RNG~~-~~-RSP message~~s~~ and indicate to the RS the resource allocated with ~~RS_RNG_RSP_ALLOC_IE~~ RS_BW-Alloc_IE in the ~~DL~~R-MAP. ~~This procedure shall also be used for the case of periodic ranging and handover ranging. Furthermore, the above procedure shall also be used for the case of periodic ranging where the RS receives the CDMA code resulting in success status.~~

~~When the RS receives multiple codes in a frame resulting in continue status, the RS sends a RS BR header which requests bandwidth to send RNG-RSPs messages for the received codes.~~

[Move Table 199b to the subclause 6.3.10.3.7.1, and modify it as following indicated]

Table ~~199b~~ xxx-a—Ranging and automatic adjustments procedure in ~~MR mode~~ non-transparent mode under centralized scheduling

[Replace "DL BW allocation to send RNG-RSP" by "RS_BW-Alloc_IE in whole Table 199b]

[Move Figure 95e ~ Figure 95i to 6.3.10.3.7.1]

[Delete the following subclause 6.3.9.16.2.1.1 in line 27 of page 98 as indicated:]

~~6.3.9.16.2.1.1 Resource request for ranging~~

~~In order to minimize latency during the ranging procedure with centralized scheduling, a CDMA ranging code may be assigned to an RS for requesting resources for ranging during RS's network entry.~~

~~When the RS determines that it needs to send RNG-RSP, it sends the RS Ranging Code assigned for requesting bandwidth on the access link to transfer RNG-RSP towards MS.~~

[Move all paragraphs of the subclause 6.3.10.3.4.2.1 in line 33 of page 111 to a new subclause 6.3.10.3.7.2, and modified it as indicated:]

~~6.3.10.3.4.2.1 Non-transparent RS with centralized scheduling~~ 6.3.10.3.7.2 MS periodic ranging and automatic adjustments

The periodic ranging process shall begin by sending a periodic-ranging CDMA ranging code on the UL allocation dedicated for that purpose.

When an RS receives ~~the~~ one or multiple CDMA code, the RS shall locally ~~send~~ broadcast RNG-RSP ~~to MS~~ with ranging CID on the access link. In order to ~~send~~ broadcast RNG-RSP messages ~~to MS~~ on the access link, ~~it~~ the RS shall ~~sends~~ an RS BR header or the associated dedicated CDMA code to the MR-BS. The MR-BS may pre-schedule proper UL bandwidth in relay link for sending RS BR header to the MR-BS after allocating Ranging channel in the RS access link. Upon receipt of RS BR header or the dedicated CDMA code at MR-BS, the MR-BS ~~will~~ shall allocate resources for the transmission of RNG-RSP messages and indicate to RS the resource allocated with ~~RS_DL_MAP IE~~ RS_BW-Alloc_IE in ~~DL~~R-MAP.

~~When the RS receives multiple codes in a frame resulting in continue status, the RS sends a RS BR header which requests bandwidth to send RNG-RSPs for the received codes.~~

The message sequence charts in Table ~~201b~~ xxx-b and flow charts in Figures ~~108c~~ xxx-b and ~~108d~~ xxx-c define the periodic ranging and adjustment process that shall be followed by compliant RSs and MR-BSs.

[Move Table 201b to the subclause 6.3.10.3.7.2, and modify it as following indicated]

Table ~~201b~~ xxx-b—Ranging and automatic adjustment procedure in non-transparent ~~RS systems~~ mode under (centralized) scheduling mode

[Replace "DL BW allocation to send RNG-RSP" by "RS_BW-Alloc_IE in whole Table 201b]

[Merge Figure 108c and Figure 108j, and move it to 6.3.10.3.7.2 as following indicated:]

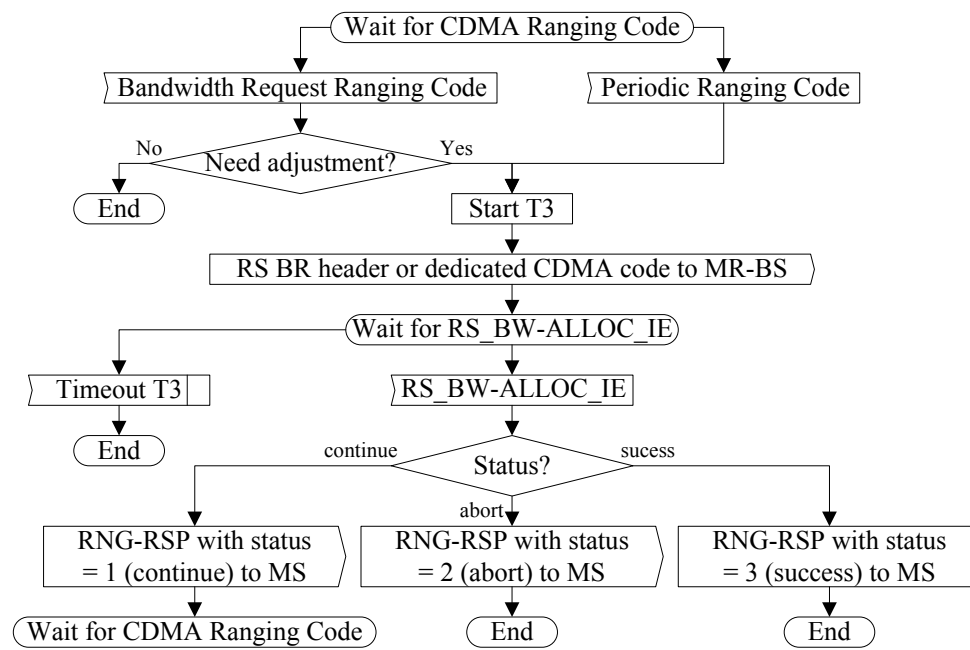Figure xxx-b Handling CDMA ranging code at a non-transparent RS

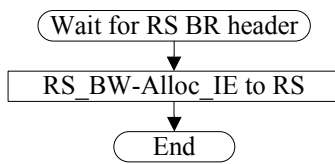*[Merge Figure 108d to 6.3.10.3.7.2, and modified as following indicated:]*

Figure ~~108d~~ xxx-c ~~MS~~ Handling CDMA ~~based periodic~~ ranging code in non-transparent ~~RS systems~~ mode at an MR-BS

[Move all paragraphs of the subclause 6.3.10.3.4.4.1 in line 7 of page 117 to a new subclause 6.3.10.3.7.3, and modified it as indicated:]

~~6.3.10.3.4.4.1 Non *transparent* RS with Centralized Scheduling~~ 6.3.10.3.7.2 MS bandwidth request ranging and unsolicited RNG-RSP

~~The message sequence chart in Tables 201f and 201g and flow charts in Figures 108j and 108k define the unsolicited RNG-RSP process that shall be followed by compliant RSs and MR-BSs.~~

~~The RS should send an unsolicited RNG-RSP as a response to a CDMA-based bandwidth-request from MS, which results in continue status.~~

When an RS receives ~~the~~ one or multiple BR CDMA code that requires corrections, RS shall locally ~~send~~ broadcast RNG-RSP message ~~to MS~~ on the access link. In order to ~~send~~ broadcast RNG-RSP message ~~to MS~~ on the access link, ~~it~~ the RS shall send~~s~~ an RS BR header or the associated dedicated CDMA code to the MR-BS. The MR-BS may pre-schedule proper UL bandwidth in relay link for sending RS BR header to the MR-BS after allocating Ranging channel in the RS access link. Upon receipt of RS BR header or the dedicated CDMA code at MR-BS, the MR-BS ~~will~~ shall allocate resources for the transmission of RNG-RSP message and indicate to RS the resource allocated with ~~RS_DL_MAP-IE~~ RS_BW-Alloc_IE in ~~DL~~R-MAP.

When the RS receives multiple codes in a frame resulting in continue status, the RS sends a RS BR header which requests bandwidth to send RNG-RSPs for the received codes.

The message sequence chart in Tables xxx-c and 201g and flow charts in Figures xxx-b, xxx-c and 108k define the unsolicited RNG-RSP process that shall be followed by compliant RSs and MR-BSs.

[Move Table 201f to the subclause 6.3.10.3.7.3, and modify it as following indicated]

Table ~~201f~~ xxx-c ~~Unsolicited RNG-RSP triggered by BR ranging code~~ Ranging and automatic adjustment procedure in non-transparent ~~RS system~~ mode

[Replace "DL BW allocation to send RNG-RSP" by "RS_BW-Alloc_IE in whole Table 201f]

[Insert the following subclause based on the paragraph in 6.3.10.3.4.5 as following indicated:]

6.3.10.3.7.4 MS handover ranging and automatic adjustments

An RS that supports MS handover ranging shall take a process similar to that defined in the section 6.3.10.3.7.1 with the following modifications.

In CDMA handover ranging process, the random selection is used instead of random back-off and the CDMA handover ranging code is used instead of the initial ranging code. The code is selected from the handover-ranging domain as defined in 8.4.7.3.

Alternatively, if the MR-BS is pre-notified for the upcoming handover MS, it may insert Fast_Ranging_IE into the UL-MAP that it assigns to that non-transparent RS to broadcast on the access link for MS sending an RNG-REQ message.