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Re:	This is a response to Call for Technical Proposals regarding IEEE Project P802.16j.
Abstract	The document contains technical proposals to handle with drops during MRS or MS handover in IEEE P802.16j network.
Purpose	The document is submitted for review by 802.16 Working Group members.
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Drops during MRS/MS handover

1 Introduction

In IEEE 802.16e, a drop is defined as the situation where an MS has stopped communication with its serving BS before the normal handover sequence. Due to the introduction of relay station in the network, the technique to deal with drops during MS handover defined in IEEE 802.16e should be modified to satisfy RS network, especially the mobile relay station (MRS) condition. In addition, procedures should be defined to handle drop during MRS handover.

~~Generally, MRS is installed on the vehicle to provide stable access link to part of MS holding in this mobile carrier. In MRS operation scenario, we consider that both MRS and MSs can receive the signal from current serving BS directly for they are confined in the same vehicle and the distance between BS and MRS is approximately equal to that between BS and MSs, so the main function of MRS is not to increase the system coverage but enhance the system capacity. Based on such assumption, there exist two kinds of MS on the same vehicle:~~

~~1 MS communicate with BS without MRS;~~

~~2 MS communicate with BS through MRS.~~

~~According to above explanation, two sorts of drops may occur: MS which connects with BS directly drops; MRS drops and then triggers its attached MSs drop consequently.~~ This contribution proposes modifications ~~a method~~ to ~~deal~~ handle ~~with~~ drops during non-transparent MRS and~~or~~ MS handover ~~on the same vehicle~~ for MR network. ~~We will focus on both cases and the former case will be solved different from the available method in IEEE 802.16e.~~

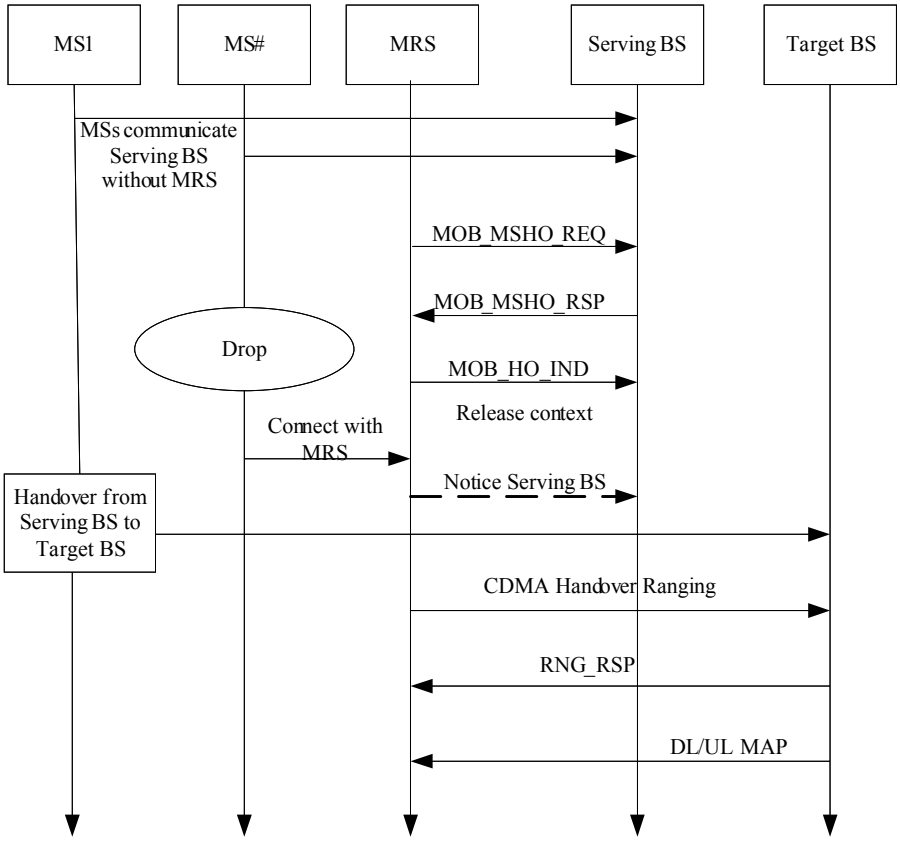
2 proposed solution

As discussed above, ~~when the vehicle on which the MRS and MSs are mounted moves from one BS to another, the following two sorts of drops are possible during handover~~this contribution describes methods to handle the following types of drop in MR network:

1 MS ~~which connects with BS directly drops~~ drop during handover;
2 MRS drop~~s and then triggers its attached MSs drop~~ during handover.

~~In former case~~For MS drop during handover, MS should~~could~~ perform the ~~similar~~same ~~-~~procedure~~s about drops during handover~~ as defined in IEEE802.15-2005 section 6.3.22.2.6. In addition, if MS is attempting to handover to a RS when a drop occurred, the MR-BS controlling the target RS should inform the target RS of the handover failure and remove any MS context from the target RS. ~~However, the available method is likely to bring annoying time delay because of resuming communication failure and network reentry procedure. Therefore, we propose a method for MS drops to decrease unnecessary delay and to keep the continuity of the calling signal. We assumed that MRS has the ability of transmitting its own control information such as Preamble/FCH/MAP, so the MS which connect with BS directly can monitor MRS' downlink information and perform parameter negotiation and synchronization in advance. Upon MS drops arising, it can communicate with MRS immediately and then the MRS reports corresponding MS information to its serving station.~~

~~The following figure illustrates the proposed method for MS drops.~~



~~Figure 1: MS drops which connects with BS directly~~

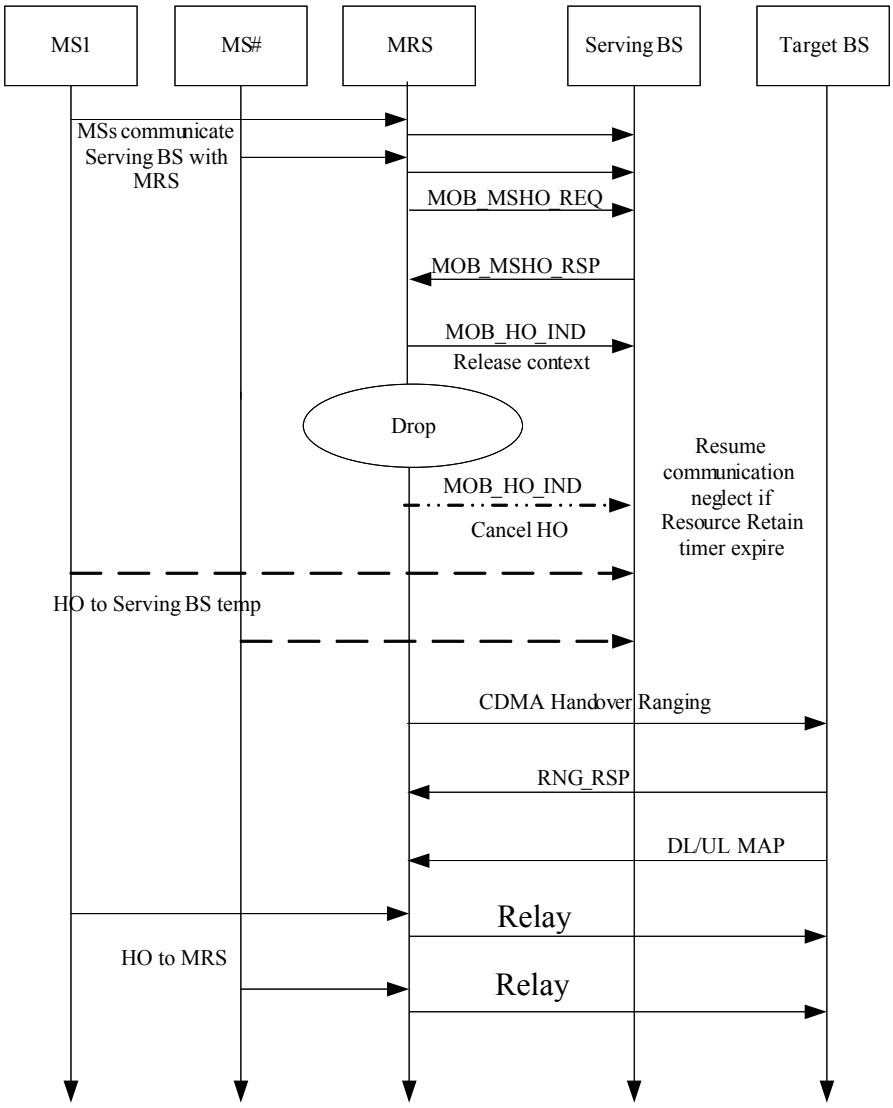
~~In latter case, MRS can detect its drop by its failure to demodulate the downlink, and~~

~~the attached MSs can detect its drops for they cannot receive correct downlink information from its current MRS. As MS which connect with BS directly, the attached MSs can also receive control information from serving BS.~~

If a drop is detected during MRS handover, the MRS should follow similar procedure as defined for MS in IEEE802.16-2005. However, to minimize impact to the attached MSs, the MRS should always attempt to re-enter the old serving BS first by cancelling HO. This allows fast recovery of MSs' services when drop occurs during ~~MBS~~MRS handover. For ~~MBS~~MRS handover without preamble change, returning to the serving BS enables the MSs to be continuously served by the MRS without interruption. For MRS handover with preamble change, all MSs attached to the MRS will be directed to start handover procedure by MR-BS. In many scenarios, the target station where MS hands over to should be the same MRS with a changed preamble. Hence, a drop of MRS could cause a drop in MS handover as well. If MRS re-enters serving BS by cancelling the HO, the MSs can also perform the HO cancellation procedure by re-entering the MRS as defined in IEEE802.16-2005. ~~If MRS detects its drop before sending the MAC message MOB_HO_IND, MRS may try to resume communication with current serving station by sending the MAC message MOB_HO_IND with HO_type=0b01(or 0b10) to cancel(or reject) handover. If MRS detects its drop after sending the MAC message MOB_HO_IND with HO_type=0b00 (resource release), and serving BS does not receive the successful network attachment at target station over backbone, MRS may transmit new MOB_HO_IND with HO_type=0b01 (or 0b10) to cancel (or reject) handover. The old MOB_HO_IND message will be neglected if the new MOB_HO_IND message is received by serving BS before resource-retain-time timer expiration. On the contrary, the new MOB_HO_IND message will be neglected if it is received after resource-retain-time timer expiration. Under such circumstance, MRS still performs handover ranging with its preferred target BS in terms of normal handover operation. During MRS drops interval, the attached MSs connect to current serving BS temporarily.~~

~~When serving BS detects a drop, it shall react as if a MOB_HO_IND message has been received with HO_IND_type=0b00, which is similar to IEEE 802.16e. The following procedure may adopt the scheme for the latter case.~~

~~The following figure illustrates the proposed method for MRS drops.~~



~~Figure 2: MRS drops then triggers its attached MSs drop~~

~~Target BS may send RNG_RSP with 'ranging status'=continue and time, power, frequency adjustment information when MRS is unable to perform handover ranging with its target BS successfully. If MRS cannot establish correct connection with its target BS during network reentry, MRS shall attempt to resume communication with serving BS, and search for appropriate target BS at the same time through cell reselection.~~

3 Proposed Text Change

[Insert following text at end of section 6.3.22.2.6]

6.3.22.2.6 MS Drops during handover

In MR network, if MS detects a drop when performing network re-entry at the target

station, the MS shall perform the same procedure as defined for non-MR network. If the target BS is informed of MS attachment to a different RS or different BS from what is originally targeted dure to the drop, the target BS may send MS_INFO-DEL message to make the original target RS discard MS context information. Upon receiving the MS_INFO-DEL message, the RS shall transmit MS_DEL-ACK or ACK header as an acknowledgement and remove the MS context information

[Insert new subclause 6.3.22.4.4xx after section 6.3.22.4.3]

6.3.22.4.xx MS Drops during handover

In MMR network, a MRS moves along with its attached MSs. All MS in the same vehicle may consist of two parts: MSs which connect with BS directly and MSs which connect with BS through MRS.

MSs which connect with BS directly can detect a drop using the method defined in 6.3.22.2.6. MRS has the ability of transmitting its own control information such as Preamble/FCH/MAP. Those MS can monitor MRS' downlink information and perform parameter negotiation and synchronization in advance. Upon MS drops arising, it can communicate with MRS immediately and then the MRS reports corresponding MS information to its serving station.

6.3.22.4.4xx MRS Drops during handover

MRS can detect its drop by its failure demodulate the downlink, and the attached MSs can detect its drops for they cannot receive correct downlink information from its current MRS. As MS which connect with BS directly, the attached MSs can also receive control information from serving BS.

When MRS detects its drop before sending the MAC message MOB_HO_IND, MRS may try to resume communication with current serving station by sending the MAC message MOB_HO_IND with HO_type=0b01(or 0b10) to cancel(or reject) handover.

If MRS detects its drop after sending the MAC message MOB_HO_IND with HO_type=0b00 (resource release)during network re-entry at target BS, and serving BS does not receive the successful network attachment at target station over backbone, MRS may shall attempt resume communication with the serving BS by transmitting new MOB_HO_IND with HO_type=0b01 (or 0b10) to cancel (or reject) handover if the resource_retain_time timer has not expired. If the resource_retain_time timer has expired, the MRS may attempt network re-entry with its preferred target BS as through Cell Reselection. If the MRS fails network re-entry with its preferred Target BS, the MRS shall perform initial entry procedure.

When performing network entry, MRS shall perform CDMA ranging with Target BS using codes from HO codes domain.

Upon Target BS sending RNG-RSP with 'ranging status' = success, Target BS shall provide CDMA_ALLOC_IE with appropriate UL allocation for RNG-REQ from MRS. MRS shall send RNG-REQ with MAC address and HMAC/CMAC. Target BS may now identify that HO attempt by MRS was not coordinated with Serving BS and

may request all relevant MRS context and attached MSs' context from Serving BS. Using this info Target BS shall now send RNG-RSP with 'HO process optimization' bitmap and network re-entry may continue as in the typical, non-drop case.

~~The old MOB_HO_IND message will be neglected if the new MOB_HO_IND message is received by serving BS before resource-retain-time timer expiration. On the contrary, the new MOB_HO_IND message will be neglected if it is received after resource-retain-time timer expiration. Under such circumstance, MRS still performs handover ranging with its preferred target BS in term of normal handover operation. During MRS drops interval, the attached MSs connect to current serving BS temporary.~~

When serving BS detects a drop, it shall react as if a MOB_HO_IND message has been received with HO_IND_type=0b00~~, which is similar to IEEE 802.16e. The following procedure may adopt the scheme for the latter case.~~

~~Target BS may send RNG_RSP with 'ranging status'=continue and time, power, frequency adjustment information when MRS is unable to perform handover ranging with its target BS successfully. If MRS cannot establish correct connection with its target BS during network reentry, MRS shall attempt to resume communication with serving BS, and search for appropriate target BS at the same time through cell reselection.~~

Reference

[1] Mobile RS Handover. IEEE C802.16j-07/122r4. Sungkyung Kim, Sungcheol Chang, Chulsik Yoon, Sunggeun Jin. ETRI.

[2] Handover of Mobile Relay Station. IEEE C802.16j-07/147r3. Kaibin Zhang, Gang Shen, Jimin Liu, Shan Jin. Alcatel-Lucent, Rearch &Innovation.