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Title	Fixes for Lost of MOB_HO-IND (Cancel) Messages	
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Source(s)	Chi-Chen Lee, I-Kang Fu MediaTek Inc. No. 1, Dusing Rd. 1 Science-Based Industrial Park, Hsinchu, Taiwan 300	chichen.lee@mediatek.com IK.Fu@mediatek.com
Re:	IEEE 802.16 Letter Ballot Recirculation #26b, on P802.16Rev2/D3, as announced in IEEE 802.16-08/006.	
Abstract	In IEEE 802.16 Rev2/D3, there is no definition on MS's/BS's behavior when the message MOB_HO-IND message with the HO Cancel commend is lost. This contribution explains the potential problems and proposes a resolution to resolve this confusion.	
Purpose	Accept the proposed text modification to IEEE 802.16 Rev2	
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Fixes for Lost of MOB_HO-IND (Cancel) Messages

Chi-Chen Lee, I-Kang Fu
MediaTek Inc.

1 Problem Statement

There is no ACK from BS when MS tries to cancel HO by sending MOB_HO-IND message. Thus, if the MOB_HO-IND with HO_IND_type=0b01 (cancel) is lost, the MS and serving BS will at asynchronous state since MS intends to stay on serving BS after HO cancel; and further, there is no way for the MS to know whether the MOB_HO-IND message is lost. The problematic scenarios are described in Figure 1 to Figure 7.

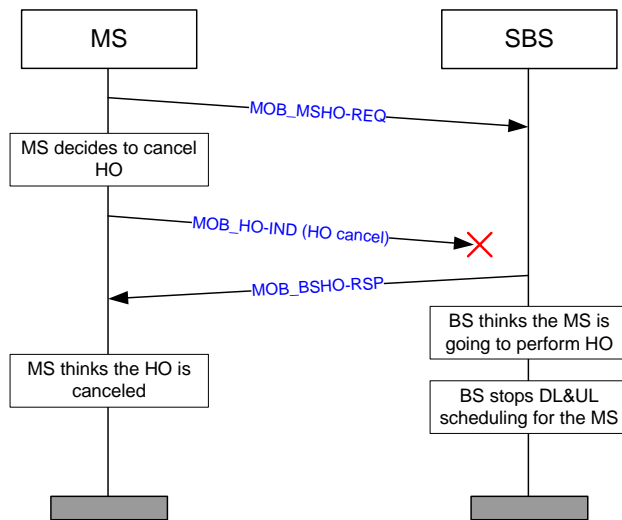


Figure 1 – Lost of MOB_HO-IND (cancel) message after MOB_MSHO-REQ before MOB_BSHO-RSP message

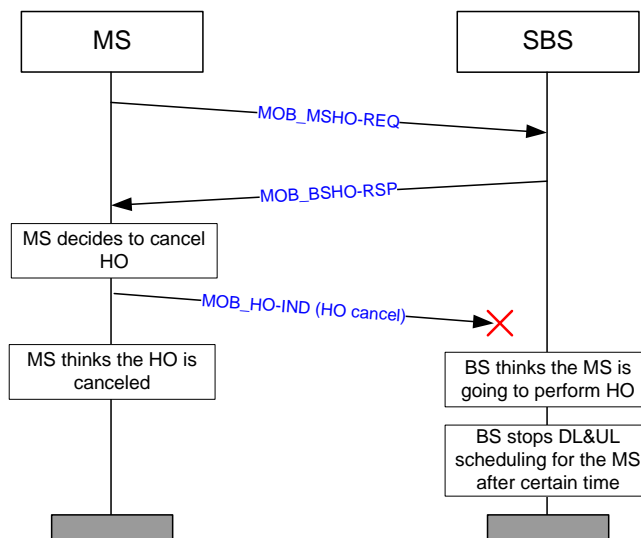


Figure 2 – Lost of MOB_HO-IND (cancel) message after MOB_BSHO-RSP message

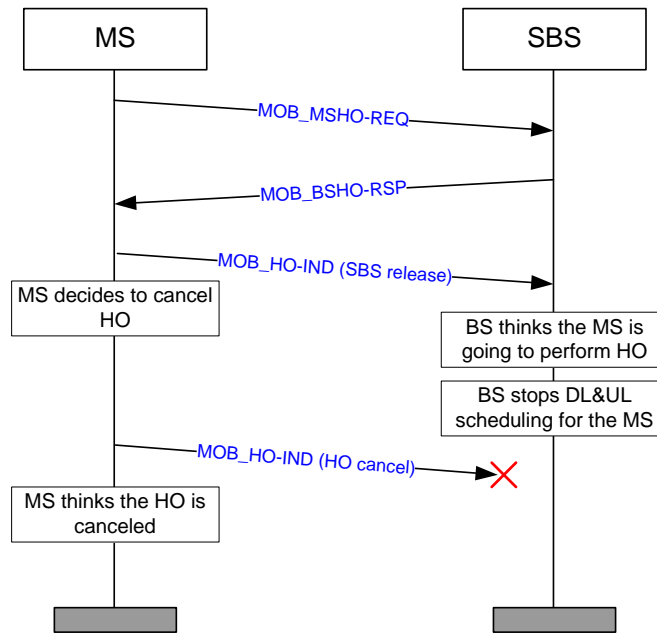


Figure 3 – Lost of MOB_HO-IND (cancel) message after MOB_HO-IND (release) message during MS initiated HO

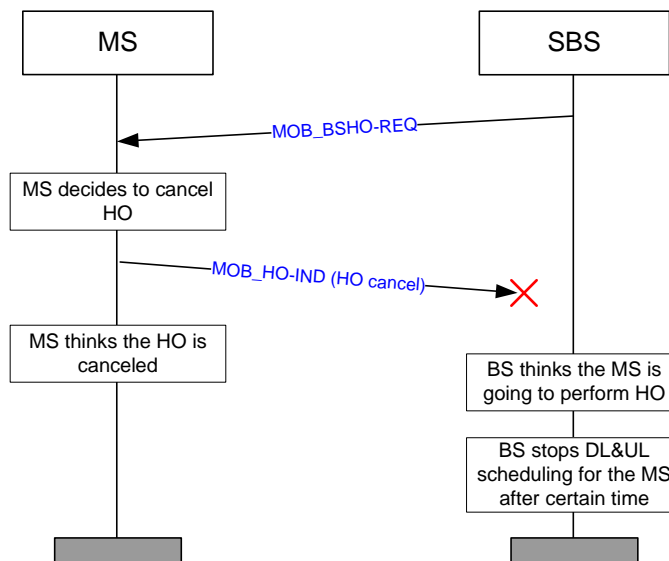


Figure 4 – Lost of MOB_HO-IND (cancel) message after MOB_BSHO-RSP message

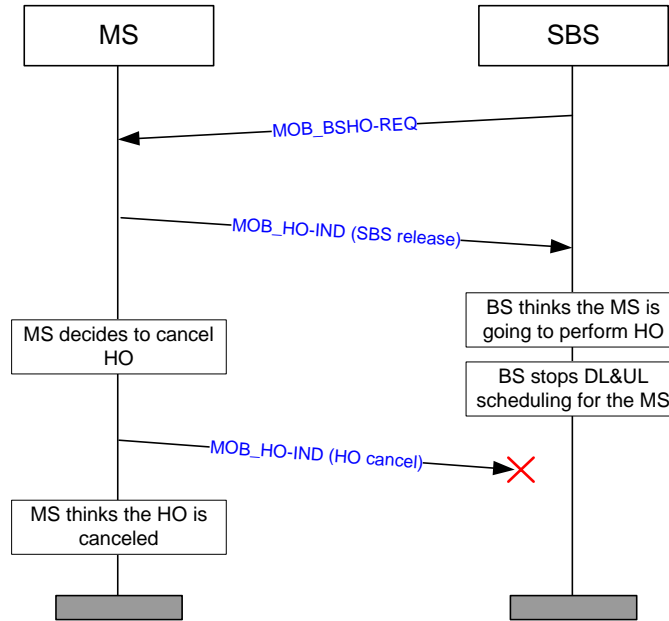


Figure 5 –Lost of MOB_HO-IND (cancel) message after MOB_HO-IND (release) message during BS initiated HO

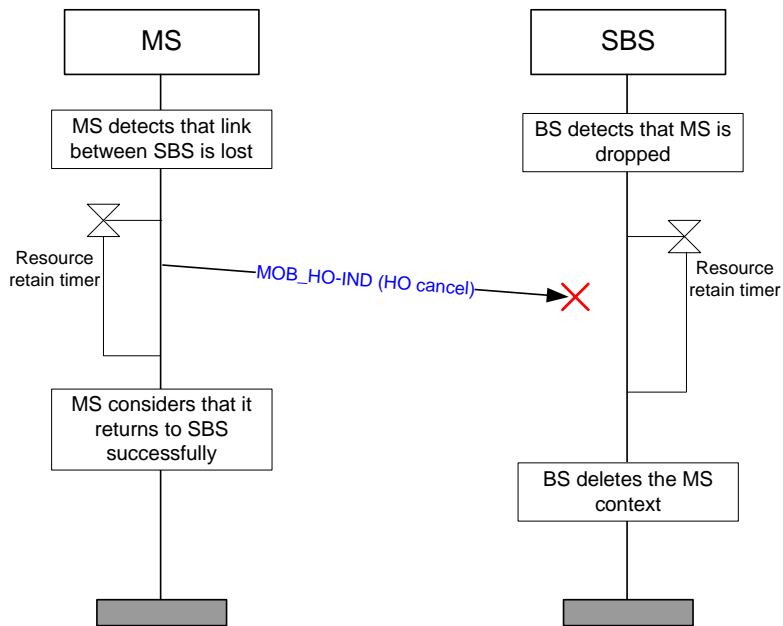


Figure 6 – Lost of MOB_HO-IND (cancel) message when MS detects drop

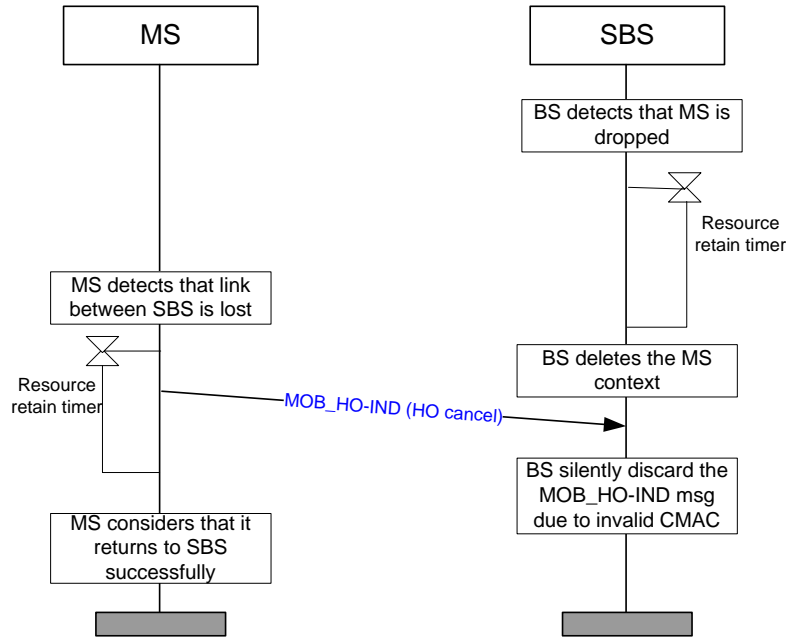


Figure 7 –MOB_HO-IND (cancel) message is received but when MS context was deleted at serving BS

Figure 7 points out the issue that drop detection at BS and MS may be different and even the MOB_HO-IND message is received correctly at serving BS it still may be discard due to the MS context no longer exists. In this case, the MS has no idea that SBS has deleted its context and may continue requesting bandwidth.

Figure 8 shows the potential security issue if the MOB_HO-IND (cancel) message is lost. If the serving BS that received MOB_HO-IND (release) message from the MS before but accept bandwidth request from the MS that should perform handover, it creates a security hole that a malicious MS can cancel HO operation on behave of any MS. However, if the serving BS ignores the bandwidth request, the MS will be blocked until it detects the asynchronous situation.

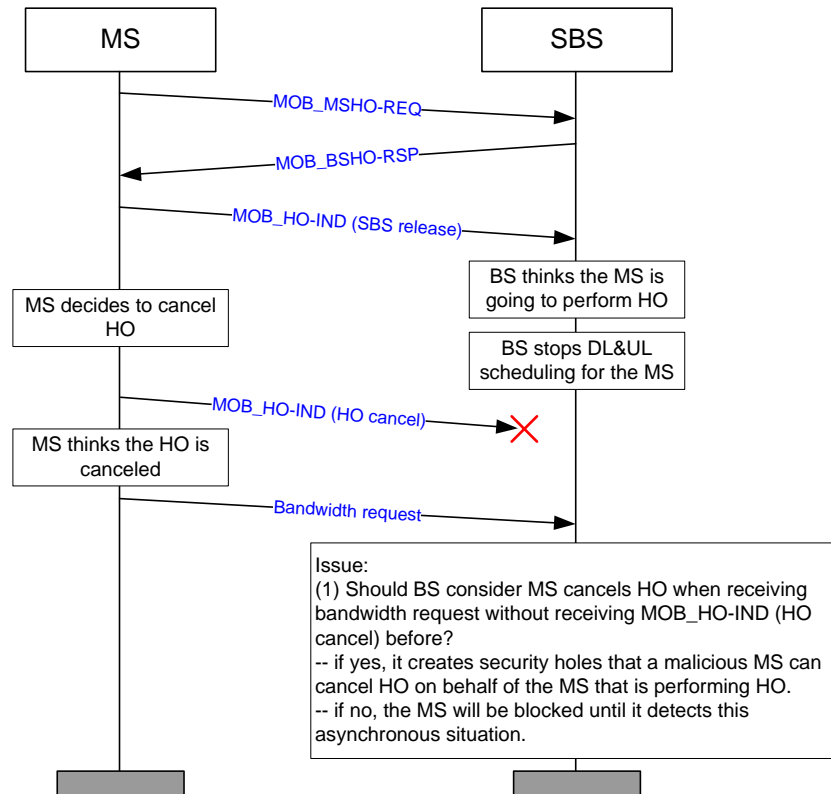


Figure 8 – Lost of MOB_HO-IND (cancel) message when MS detects drop

2 Suggested Remedy

There are two remedies, remedy one is to **define a method to detect the lost MOB_HO-IND (cancel) message** and remedy two is to **clarify how should MS and BS behave after lost of MOB_HO-IND (cancel) message**.

The suggested remedy one is illustrated in Figure 8. An MS shall start T42 after sending MOB_HO-IND (cancel) message and wait for RNG-RSP message with Success status without any other TLV encoding, e.g. PHY adjustment, except CMAC as the acknowledgement of reception of MOB_HO-IND message from serving BS. The BS receives MOB_HO-IND (cancel) message with valid CMAC should send RNG-RSP message with Success status without any other TLV encoding except CMAC to the MS. If the MS does not receive the RNG-RSP message before the expiration of T42, it should consider the MOB_HO-IND (cancel) message is lost.

The suggested remedy two as described in Figure 10 is once the MS detects that MOB_HO-IND (cancel) message is lost, it should behave as it detects drop and take action that described in section 6.3.22.2.6 *Drops during HO*. If the MS decides to return serving BS and the resource retain timer is not expired, it should perform network reentry with serving BS.

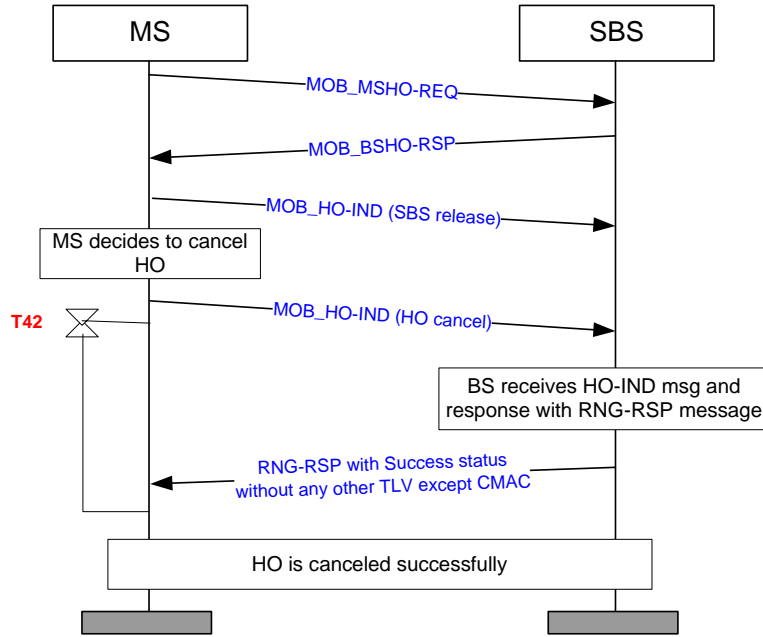


Figure 9 – [Remedy 1] Detection of lost of MOB_HO-IND (cancel) message

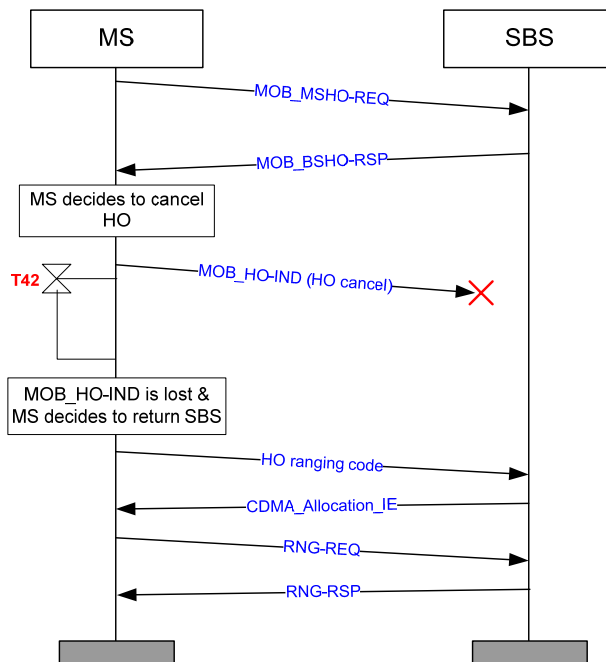


Figure 10 –[Remedy 2] Network reentry after lost of MOB_HO-IND (cancel) message

3 Suggested Changes in Rev2/D3

-----Start of the Text-----

[InRev2/D3, line 27 on page 434, section 6.3.22.2.3, insert the following text]

MS shall start T42 immediately after sending the MOB_HO-IND message (HO_IND_type = 0b01). If T42 is expired and MS does not receive RNG-RSP message with Success status without any other TLV encoding except CMAC, it shall consider the MOB_HO-IND message is lost and reacts as if it detects drop during HO (6.3.22.2.6). In this case, if MS decides to return to serving BS, it should perform network reentry with serving BS as described in section 6.3.22.2.6. The BS shall send RNG-RSP message with Success status without any other TLV encoding except CMAC when it receives a MOB_HO-IND message with valid CMAC.

[InRev2/D3, line 42 on page 435, section 6.3.22.2.6, modify the text as follows]

When the MS has detected a drop during network reentry with a target BS, it may attempt network reentry with its preferred target BS as through Cell Reselection (see 6.3.22.2.1), ~~and~~ may include resuming communication with the serving BS by sending MOB_HO-IND message with HO_IND_type = 0b01 (HO cancel), and may perform network reentry with serving BS if it detects (see 6.3.22.2.3) that MOB_HO-IND message with HO_IND_type = 0b01 is lost.

[InRev2/D3, line 45 on page 435, section 6.3.22.2.6, modify the text as follows]

MS shall perform CDMA ranging with target BS or serving BS if MOB_HO-IND message (HO_IND_type = 0b01) is lost using codes from HO codes domain.

[InRev2/D3, line 55 on page 435, section 6.3.22.2.6, modify the text as follows]

If MS attempts network reentry with the serving BS, the MS shall transmit RNG-REQ with all required TLVs as if performing HO to the serving BS. The serving BS may now identify that HO attempt by MS was dropped before by learning that Serving BS ID in RNG-RSP message is identical to its BS ID. The serving BS shall now send RNG-RSP message with HO process optimization TLV and network reentry may continue as in typical nondrop case.

[InRev2/D3, on page 1031, section 10.1, modify the following entry in Table 524]

System	Name	Time reference	Minimum value	Default value	Maximum value
MS	T42	MOB_HO-IND timeout when sent with HO_IND_type = 0b10 <u>or 0b01.</u>	-	<u>150 ms for HO_IND_type = 0b01.</u>	-

-----End of the Text-----