Project	**IEEE 802.16 Broadband Wireless Access Working Group <**http://ieee802.org/16**>**	
Title	AK validation after MS handover when CIDs are pre-allocated	
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Re:	In response to LB26	
Abstract	This contribution proposed bandwidth efficient AK validation after MS handover to Target-BS when CIDs are pre-allocated to reduce HO interruption time.	
Purpose	Accept the proposed specification changes on IEEE P802.16Rev2/D1.	
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AK validation after MS handover when CIDs are pre-allocated

Introduction

In IEEE 802.16e-2005, different types of Handovers are defined: 1) Hard Handover 2) FBSS and 3) MDHO. Hard Handover is the simplest type of HO where MS disconnects from the serving BS and reconnects at the target BS. MAC Management messages are used to perform the BS switching. This process creates interruption for data transmission. Current specification defines many optimizations in order to reduce the HO interruption time. Even with all the HO optimization features for Hard Handover like

- Complete MS context transfer from Serving BS to Target BS
- Use of association levels for neighbor scanning
- Use of action time and dedicated allocation at the target BS using fast_ranging_IE

TargetBS and MS are still required to exchange RNG-REQ/RSP messages to complete the MS network entry and perform following functions:

- allocate new CIDs (Basic, Primary and Transport CIDs)
- AK validation
- TEK update if TEK is not shared.

Therefore, HO interruption time still could be higher. In WiMAX TWG MAC Study Group, Many contributions were proposed to remove RNG/RSP by pre-allocating CIDs during the handover preparation phase and enable TEK sharing. However, there is no solution agreed upon on how to perform AK validation when MS enters into the T-BS.

This contribution proposes Bandwidth efficient extended sub-Header based scheme where MS upon switching to T-BS transmits CMAC_KEY_Count and CMAC Tuple as content of proposed “Authentication-Code Extended Sub-Header”.

Proposed Solution

Please note that CID pre-allocation during Handover is pre-requisite for this contribution.

T-BSs which are part of the MS handover preparation phase, allocates sufficient bandwidth to MS for sending “Authentication Code Extended Sub-Header and Data. It is up to the T-BS discretion, how much bandwidth is allocated for initial grant. If T-BS determines that there are VoIP or delay critical sessions are running, T-BS may allocate UL bandwidth in order to reduce latency for the delay in-tolerant services.

When MS enters the T-BS and receives the Data-Grant IE on its Basic CID in UL-MAP, MS start AK validation process by sending “authentication Code Extended Sub-Header” with CMAC Tuple calculated on the MS MAC Address and CMAC_KEY_COUNT. Authentication extended Sub-Header contains:

- CMAC_KEY_COUNT
- Bit indicating peer validation status
- CMAC Tuple

Since CIDs are pre-allocated and known between MS and T-BS, New CIDs are used for identification. MS MAC address is not required to be sent.

Authentication Code ESH may be sent along with the Data. MS and BS shall store the received and transmitted

data packets until the peer authentication is complete. Similar AK validation operation is performed by BS on the DL. Figure 1 illustrates the AK validation procedure initiated by the MS after switching to T-BS. Timer T_x is defined to wait for the peer entity to be authenticated. If Timer T_x at MS is expired then MS shall perform contention based ranging and if Timer T_x at BS is expired then BS shall abandon the MS network re-entry.

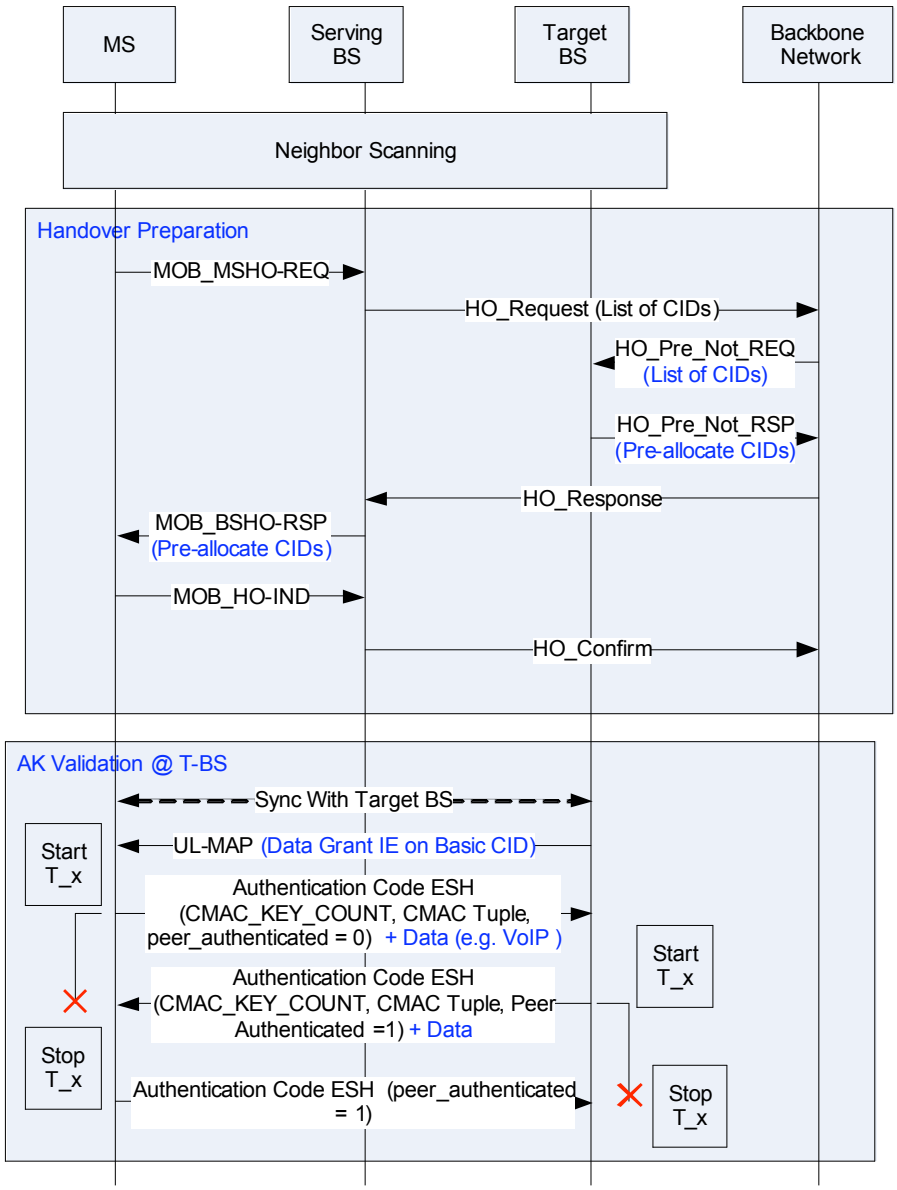

Figure 1: AK Validation after Handover at T-BS

Advantages:

- Reduced Overhead and HO Interruption time.

Spec Changes

[Change the following text on Page 75 line 32 (Table 25) as shown below]

Table 26— Description of extended subheaders types (UL)

Syntax	Name	Extended subheader body size	Description
6	Authentication code extended subheader	variable	See 6.3.2.2.7.9
~~6~~7-127	Reserved	-	-

[Change the following text on Page 75 line 53 (Table 26) as shown below]

Table 26— Description of extended subheaders types (UL)

Syntax	Name	Extended subheader body size	Description
5	Authentication code extended subheader	variable	See 6.3.2.2.7.9
~~6~~5-127	Reserved	-	-

[Insert the following subsection on Page 81 line 26 as shown below]

6.3.2.2.7.9 Authentication Code extended subheader

This sub-header is sent from the MS or BS for AK validation during network re-entry.

Table 26— Description of extended subheaders types (UL)

Name	Extended subheader body size	Description
Peer-Validated	1 bit	0b = Peer is not Validated 1b = Peer is validated
Reserved	7 bits	-
CMAC_KEY_COUNT	32 bits	See Table 201
CMAC Tuple	variable	CMAC Digest is calculated over the MS MAC address and CMAC_KEY_COUNT

[Insert the following para on Page xxx line xxx as shown below]

If all the MS service and operational context information are obtained over the backbone network and CIDs are pre-allocated during MS Handover preparation phase, the target BS may skip all the re-entry management

messages including RNG-REQ and RNG-RSP. T-BSs, which are part of the MS handover preparation phase, allocates sufficient bandwidth to MS for sending “Authentication Code Extended Sub-Header and Data. It is up to the T-BS discretion, how much bandwidth is allocated for initial grant. If T-BS determines that there are VoIP or delay critical sessions may allocate UL bandwidth in order to reduce latency for the delay in-tolerant services.

When MS enters the T-BS and receives the Data-Grant IE on its Basic CID in UL-MAP, MS start AK validation process by sending “authentication Code Extended Sub-Header” with CMAC Tuple calculated on the MS MAC Address and CMAC_KEY_COUNT. Authentication extended Sub-Header contains:

- CMAC_KEY_COUNT
- Bit indicating peer validation status
- CMAC Tuple

Since CIDs are pre-allocated and known between MS and T-BS, New CIDs are used for identification. MS MAC address is not required to be sent.

Authentication Code ESH may be sent along with the Data. Similar AK validation operation is performed by BS on the DL. Figure xxx illustrates the AK validation procedure initiated by the MS after switching to T-BS. Timer T58 is defined to wait for the peer entity to be validated. If Timer T58 at MS is expired then MS shall perform contention based ranging and if Timer T58 at BS is expired then BS shall abandon the MS network re-entry.

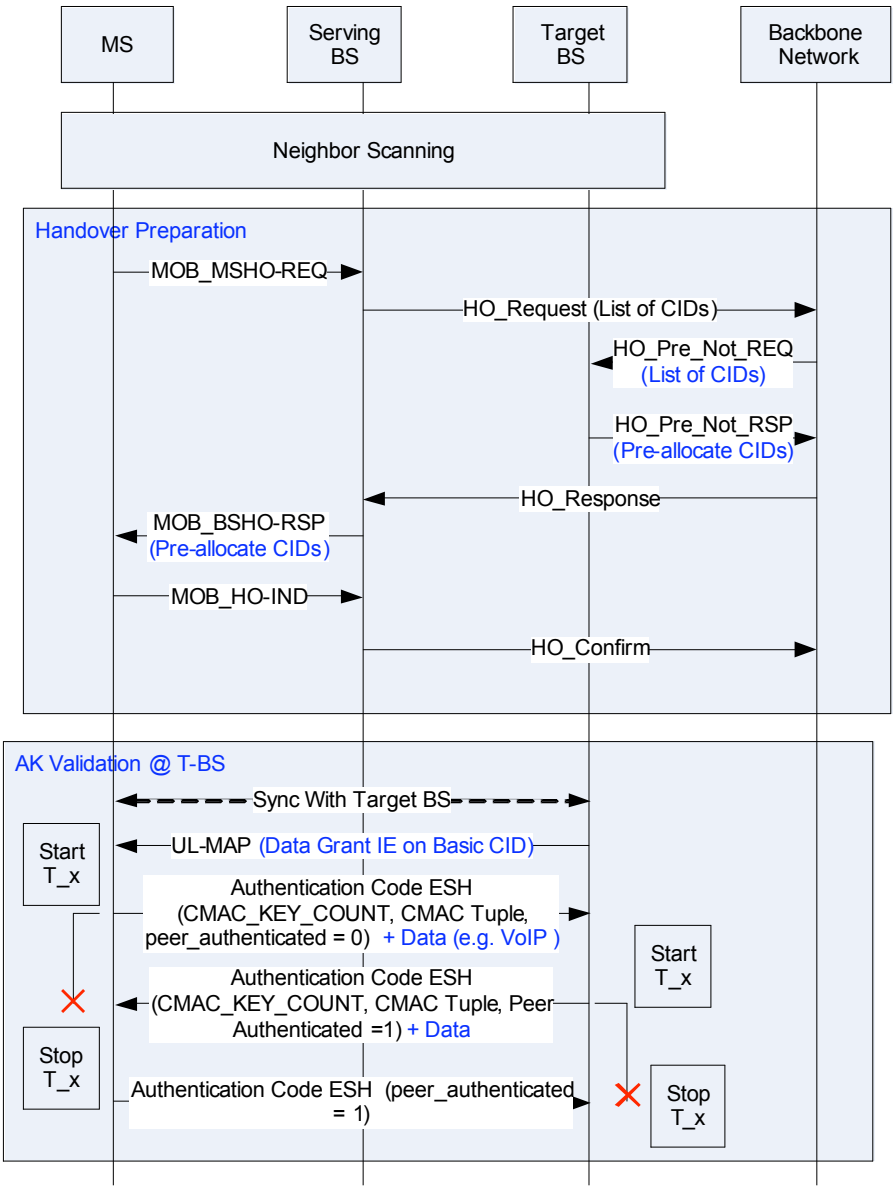

Figure xxx: AK Validation after Handover at T-BS

[Change the table in 11.7.25 as shown below]

		Bit 19: Authtentication code extended subheader Bits ~~19~~20–23: Reserved		

[Insert the following row at the end of table 525

MS, BS	T58	Wait for AK validation after Handover when CIDs are pre-allocated	TBD	TBD	TBD