Project	**IEEE 802.16 Broadband Wireless Access Working Group** <http://ieee802.org/16>	
Title	**LBS support in Idle Mode**	
Date Submitted	**2008-01-14**	
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Re:	IEEE 802.16Rev2/D2, Letter Ballot 26a Technical Comments	
Abstract	Proposal to provide support LBS without activating MS from idle mode.	
Purpose	MS shall be activated to receive MOB-SCN-REQ or unsolicited RNG-RSP message. But it is allowed to perform ranging and send RNG-REQ message. The purpose of this contribution is to avoid the idle mode entry/exit state switching while performing LBS, by allowing LBS purpose paging and reporting results in RNG-REQ message.	
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LBS support in Idle Mode

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Explanation

For LBS during idle mode, MSs can not receive MOB-SCN-REQ or unsolicited RNG-RSP messages from BS. As a result, MS in idle mode shall be activated first before performing LBS measurement. This proposal provides LBS methods which make idle MSs performing LBS measurements and at the same time prevent these idle MSs exiting from the idle mode.

We propose BS can indicate LBS by paging the MSs. Here two methods are proposed. One method is that MSs can report measured RTD values through RNG-REQ message. Another method is that MSs can report TDOA parameters through RNG-REQ message.

Proposed Text Changes

6.3.2.3.52 Modify Table152 as following:

Syntax	Size (bit)	Notes
MOB_PAG-ADV_Message_format(){		
Management Message Type = 61	8	
Num_Paging_Group_IDs	8	Number of Paging Group IDs in this message
for (i=0;i< Num_Paging_Group_IDs; i++) {		
Paging Group ID	16	
}		
Num_MACs	8	Number of MS MAC address
for (j=0;j< Num_MACs; j++) {		
MS MAC address hash	24	The hash is obtained by computing a CRC24 on the MS 48-bit MAC address. The polynomial for the calculation is 0x1864CFB
Action Code	2	Paging action instruction to MS 0b00 = No action required 0b01 = Perform ranging to establish location and acknowledge message 0b10 = Enter network 0b11 = LBS measurement
if (Action code = 0b11;) {		
LBS measurement:	2	0b00 = Performing RTD measurement 0b01 = Performing U-TDOA

		measurement 0b10 = Performing D-TDOA measurement 0b11 = Reserved
Reserved	4	
}		
else {		
Reserved	6	
}		
}	8	
Padding	*variable*	Padding bits to ensure octet aligned
TLV Encoding Information	*variable*	TLV-specific
}		

Page 242 Line 1 modify action code description:

0b00 = No action required

0b01 = Perform ranging to establish location and acknowledge message

0b10 = Enter network

0b11 = LBS measurement

LBS measurement

0b00 = Performing RTD measurement
0b01 = Performing U-TDOA measurement
0b10 = Performing D-TDOA measurement
0b11 = Reserved

Page 463 Line 40 modify as following:

0b00 = No action required

0b01 = Perform ranging to establish location and acknowledge message

0b10 = Enter network

0b11 = LBS measurement

LBS measurement

0b00 = Performing RTD measurement
0b01 = Performing U-TDOA measurement
0b10 = Performing D-TDOA measurement
0b11 = Reserved

Page 463 Line 57 modify as following:

After transmitting the Broadcast Paging message with action code 0b01 (Perform Ranging) or 0b10 (Enter Network) or 0b11 (LBS measurement), if the BS does not receive RNG-REQ from the MS paged until the next

MS paging listening interval, the BS shall retransmit the Broadcast Paging message.

Page 463 Line 65 add the LBS paging description as following:

After transmitting the Broadcast Paging message with action code 0b11 (LBS measurement), if LBS measurement value is 0b00 (RTD measurement), BS is waiting for the RNG-REQ from MS, containing the RTD values for a list of scanned BSs. After receiving the MOB-PAG-ADV message, MS detects the MAC-address-hash is matched to its own MAC-address-hash, and the action code is 0b11. MS starts to perform ranging against the scanned BSs. The selection of scanned BSs can be implementation dependent. After getting ranging RTD result, MS sends RNG-REQ with RTD values and the scanned BS IDs to BS. Paging controller ID shall be contained in this RNG-REQ message. The BS can send the result to the identified paging controller.

If LBS measurement value is 0b01 (Performing U-TDOA measurement), MS does ranging to Preferred BS. Meanwhile, MS scans BSs and measures CINR and RSSI of BSs. If MS gets BSID/BS_INDEX, CINR and RSSI of BSs, it will send RNG-REQ message to Preferred BS, this RNG-REQ message contains BSID/BS_INDEX, CINR and RSSI of BSs. Network measures locations of MS in terms of information from RNG-REQ message.

If LBS measurement value is 0b10 (Performing D-TDOA measurement), MS does ranging to Preferred BS. Meanwhile, MS scans Neighbor BSs and calculates RD which is the time difference between DL signals of neighbor BS and Preferred BS, DL signals of Preferred BS is the calculate benchmark. If MS gets RDs of neighbor BSs, it will send RNG-REQ message to BS, this RNG-REQ message contains RDs of neighbor BSs, BSID/BS_INDEX of BSs. Network measures locations of MS in terms of information from RNG-REQ message.

Section 6.3.24.7.1 Page 464 Line 23 modify as following:

In the event that an MS decodes a BS Broadcast Paging message that contains the MS own MS MAC address hash and action code 0b01 (Perform Ranging) or action code 0b11, the MS shall conduct and complete idle mode location update to establish location to the network and acknowledge message decoding.

Section 6.3.2.3.5 Page 89 Line 50 modify as following:

The following TLV parameter shall be included in the RNG-REQ message when the MS is attempting to perform reentry, HO, location update or LBS measurements (RTD measurement, U-TDOA measurement and D-TDOA measurement):

Ranging Purpose Indication

Presence of item in message indicates MS action as follows:

If Bit #0 is set to 1, in combination with serving BS ID, BSID indicates the MS is currently attempting to HO or reentry; or, in combination with Paging Controller ID, the MS is attempting network reentry from idle mode to the BS.

If Bit #1 is set to 1, indicates MS action of idle mode location update process.

If Bit #2 is set to 1, indicates performing RTD measurement.

If Bit #3 is set to 1, indicates performing U-TDOA measurement

If Bit #4 is set to 1, indicates performing D-TDOA measurement

Section 11.5 Table 550 Page 1077 Line 34 modify Ranging Purpose Indication as following:

Name	Type(1 byte)	Length	Value(variable length)	PHY scope
Ranging Purpose Indication	6	1	Bit 0: HO indication (when this bit is set to 1 in combination with other included information elements indicates the MS is currently attempting to HO or network reentry from idle mode to the BS) Bit 1: Location update request (when this bit is set to 1, it indicates MS action of idle mode location update process) Bit 2:RTD measurement (when this bit is set to 1, it indicates MS action of RTD measurement for LBS) Bit 3:U-TDOA measurement (when this bit is set to 1, it indicates MS action of U-TDOA measurement for LBS) Bit 4:D-TDOA measurement (when this bit is set to 1, it indicates MS action of D-TDOA measurement for LBS) Bits 5-7: Reserved	-

Section 6.3.2.3.5 Page 90 Line 1 modify as following:

The Paging Controller ID is a logical network identifier for the serving BS or other network entity retaining MS service and operational information and/or administering paging activity for the MS while in idle mode. If combined with ranging purpose indication Bit #2 set to 1, BS shall get RTD from the RNG-REQ and forward to the Paging Controller. If combined with ranging purpose indication Bit #3 set to 1, BS shall get U-TDOA parameters from the RNG-REQ and forward to the Paging Controller. If combined with ranging purpose indication Bit #4 set to 1, BS shall get D-TDOA parameters from the RNG-REQ and forward to the Paging Controller.

Section 6.3.2.3.5 Page 89 Line 58 add the descriptions as following:

The following TLV parameter shall be included in RNG-REQ message when MS is attempting to perform LBS for RTD measurement:

LBS for RTD measurement Parameters

A list of BS_ID/BS_INDEX and RTD pairs can be contained in this TLV. The number of elements in this list is defined by BS-RTD-number.

The following TLV parameter shall be included in RNG-REQ message when MS is attempting to perform LBS for U-TDOA measurement:

LBS for U-TDOA measurement Parameters

A list of BSID/BS_INDEX, CINR and RSSI pairs can be contained in this TLV. The number of elements in this list is defined by BS-CINR-RSSI-number.

The following TLV parameter shall be included in RNG-REQ message when MS is attempting to perform LBS for D-TDOA measurement:

LBS for D-TDOA measurement Parameters

A list of BSID/ BS_INDEX and RD pairs can be contained in this TLV. The number of elements in this list is defined by BS-RD-number.

Section 11.5 Table 550 Page 1078 Line 36 add three lines as following:

Name	Type(1 byte)	Length	Value(variable length)	PHY scope
LBS for RTD measurement Parameter	22	Variable	A compound TLV for a list of BSID/BS_INDEX and RTD pairs. Result of LBS for RTD measurement.	-
LBS for U-TDOA measurement Parameter	23	Variable	A compound TLV for a list of BSID with CINR and RSSI pairs. Result of LBS for U-TDOA measurement.	-
LBS for D-TDOA measurement Parameter	24	Variable	A compound TLV for a list of BSID/BS_INDEX and RD pairs. Result of LBS for D-TDOA measurement.	-

Section 11.5 inserts two Tables defining the LBS for RTD measurement Parameter TLV as following:

The LBS for RTD measurement Parameters Value field is composed from a number of encapsulated TLV fields as specified in Table 551a

Table 551a– LBS for RTD measurement Parameters

Name	Type(1 byte)	Length	Value(variable length)	PHY scope
N_Recommend_BS_Index	1	1	Number of BS_INDEX	-
N_Recommend_BS_Full	2	1	Number of BS_ID	-
BS-RTD-Pair-List	3	variable	A list of BSID/BS_INDEX and RTD pairs.	-

The BSID-RTD-Pair List TLV Value field is composed from a number of encapsulated TLV fields as specified in Table 551a1

Table 551a1 - BSID-RTD-Pair List TLV

Name	Type(1 byte)	Length	Value(variable length)	PHY scope
BSID	1	48	Identifier of a scanned BS.	-
BS_INDEX	2	8	Index of a scanned BS	-
Round Trip Delay (RTD)	3	8	Round Trip delay of a scanned BS.	-

Notes In one pair the BSID is only used when the MS can not get the BS index from the MOB_NBR-ADV message.

Section 11.5 inserts two Tables defining the LBS for U-TDOA measurement Parameter TLV as following:

The LBS for U-TDOA measurement Parameters Value field is composed from a number of encapsulated TLV fields as specified in Table 551b

Table 551b– LBS for U-TDOA measurement Parameters

Name	Type(1 byte)	Length	Value(variable length)	PHY scope
N_Recommend_BS_Index	1	1	Number of BS_INDEX	-
N_Recommend_BS_Full	2	1	Number of BS_ID	-
BS-CINR-RSSI-Pair-List	3	variable	A list of BSID/BS_INDEX with CINR and RSSI.	-

The BSID-CINR-RSSI-Pair-List TLV Value field is composed from a number of encapsulated TLV fields as specified in Table 551b1

Table 551b1 - BS-CINR-RSSI-Pair ListTLV

Name	Type(1 byte)	Length	Value(variable length)	PHY scope
BSID	1	48	Identifier of a scanned BS.	-
BS_INDEX	2	8	Index of a scanned BS	-
CINR	3	7	Carrier-to-interference-and-noise ratio of a scanned BS	-
RSSI	4	8	Receive signal strength indicator of a scanned BS	-

Notes： In one pair the BSID is only used when the MS can not get the BS index from the MOB_NBR-ADV message.

Section 11.5 inserts two Tables defining the LBS for D-TDOA measurement Parameter TLV as following:

The LBS for D-TDOA measurement Parameters Value field is composed from a number of encapsulated TLV fields as specified in Table 551c

Table 551c– LBS for D-TDOA measurement Parameters

Name	Type(1 byte)	Length	Value(variable length)	PHY scope
N_Recommend_BS_Index	1	1	Number of BS_INDEX	-
N_Recommend_BS_Full	2	1	Number of BS_ID	-
BS-RD-Pair-List	3	variable	A list of BSID/BS_INDEX and RD pairs.	-

The BSID-RD-Pair List TLV Value field is composed from a number of encapsulated TLV fields as specified in Table 551c1

Table 551c1 - BSID-RD-Pair List TLV

Name	Type(1 byte)	Length	Value(variable length)	PHY scope
BSID	1	48	Identifier of a scanned BS.	-
BS_INDEX	2	8	Index of a scanned BS	-
Relative Delay (RD)	3	8	Relative Delay of a scanned neighbor BS and Preferred BS.	-

Notes In one pair the BSID is only used when the MS can not get the BS index from the MOB_NBR-ADV message.

Backward compatibility

Legacy mobile station will ignore this action code 0b11 and reserved bits. New mobile stations will interpret the action code 0b11 and reserved bits as LBS paging. BS shall know the version of the MS, activate legacy MSs before LBS, and page with action code 0b11 and reserved bits for new MSs.