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Re:	Call for inputs for commentary of p802.16e/D1
Abstract	This contribution describes Enhanced Handover Mechanism for supporting Active BS Set in IEEE P802.16e/D1-2004.
Purpose	Discuss and Adopt enhanced feature of p802.16e/D1
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Idle hand over & Location Update in 802.16e.

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1. Problem Statements

The concept of idle mode has been proposed in order to provide efficient power consumption (see C802.16e-04/27r1). During idle-mode, the performance optimized handover operation should be provided. In addition to whenever doing handover, its related operation such as location update should be also provided in line with handover in idle-mode

In this contribution, we propose the simplified handover and location update procedures in idle mode. While a MSS in idle mode handover, the handover process is simply completed by that the MSS receives new configuration messages from the new Serving-BS without normal re-entry procedure. In addition, the MSS may register the location information if needed. Comparing to handovers taken place in awake or sleep mode, the MSS and BS does not require exchanging handover related MAC control messages. The BS is able to efficiently allocate CIDs because assigned CIDs, what is assigned by old Serving-BS, to the MSS can be reused immediately as soon as the BS and MSS enter the idle mode in the case of that the CID number is available in the new Serving-BS.

2. Overview of Proposed Solutions

The MSS in idle mode shall periodically scan the BS with the strongest signal on the corresponding frequency. An idle handover occurs when an MSS in idle mode moves from the coverage area of the current serving BS to the coverage area of another BS.

2.1. Handover operation in idle mode

Handover in idle mode is similar to existing handover concepts, but in this mode the MSS updates only parameters broadcast by MOB_NBR-ADV and UCD/DCD message and location information when the packet zone changed so that the additional overhead such as network re-entry can be reduced and provide light handover.

- The MSS shall update the neighbor set whenever it detects that the configuration change count of **MOB_NBR-ADV** message has been changed.
- After performing the idle handover, the MSS shall discard all unnecessary messages received in the broadcast CID of the old serving BS.
- The MSS shall start Normal Operation of idle mode with a new serving BS and perform the Location Registration if needed.
- If a new serving BS doses not support idle mode, the MSS shall perform the network re-entry and initialization procedures in order to transit to Awake mode.
- Through the idle handover, the MSS does achieve only the location update, not network initialization and its related all of operation.
- If the location update failed, the MSS may achieve the network initialization, retry of the location update or scan the neighbor BS according to the BS's command through MOB_LU-RSP MAC message

2.2. Location update in idle mode

During the idle handover, the MSS shall perform location registration operation if the registration condition is met. Through the Location Registration, the MSS notifies the BS of its location, the paging parameters and other characteristics. The MSS informs the BS of its location so that the BS can efficiently page the MSS when the BS has a message destined to the MSS.

To provide the location registration process, we propose two location registration schemes as followings.

- Zone-based registration

The MSS performs location registration either whenever it receives a paging message from the BS to perform the zone-based registration or when the packet zone is changed. The zone identifier, PZONE_ID, is transmitted on the **MOB_NBR-ADV** message.

- Timer-based registration

The MSS periodically performs location registration whenever a predefined timer expires using **MOB_LU-REQ** message. The timer-based registration can be enabled or disabled by the BS.

On both the zone-based registration and the timer-based registration, the MSS shall inform the BS of its previous packet zone ID using a PREV_PZONE_ID of the **MOB_LU-REQ** message and the BS shall transmit the **MOB_LU-RSP** message in response to the MOB_LU-REQ message. If both the zone-based registration and the timer-based registration are enabled together, the MSS shall perform the zone-based registration

2.3. The changes for proposed Idle-handoff

- 6.4.18.3 and subclauses have been created to address idle handover and location update operaion
- MOB_LU-REQ MAC management message
  - Registered Location update request
  - Required parameters for idle mode
  - From the MSS
- MOB_LU-RSP MAC management message
  - Mode change approval or reject
  - Negotiated parameters for idle mode
  - From the BS

3. Proposed Changes in Document

[Add following section on line 27 page 43]

6.4.18.3 Idle handover in idle mode

An idle handover is a handover in which the MSS moves to another BS from the serving BS. During idle mode, the MSS shall periodically scan the cell with the strongest signal and shall update the neighbor set information whenever it detects that the configuration change count of the **MOB_NBR-ADV** message has been changed. An MSS may perform an idle handover if such an action is necessary with respect to its PHY signal quality. While performing the idle handover, the MSS shall monitor all frames at least once in order to receive **UCD, DCD,** and **MOB_NBR-ADV** messages on the broadcast CID transmitted by the target BS and update handover related parameters in these messages. After receiving all these messages, the MSS shall resume the operation in idle mode and, if needed, the MSS performs the Location Registration using MOB_LU-REQ/RSP messages exchanging with BS.

The Figure shows the overview of performing the idle handover from BS1 to BS2.

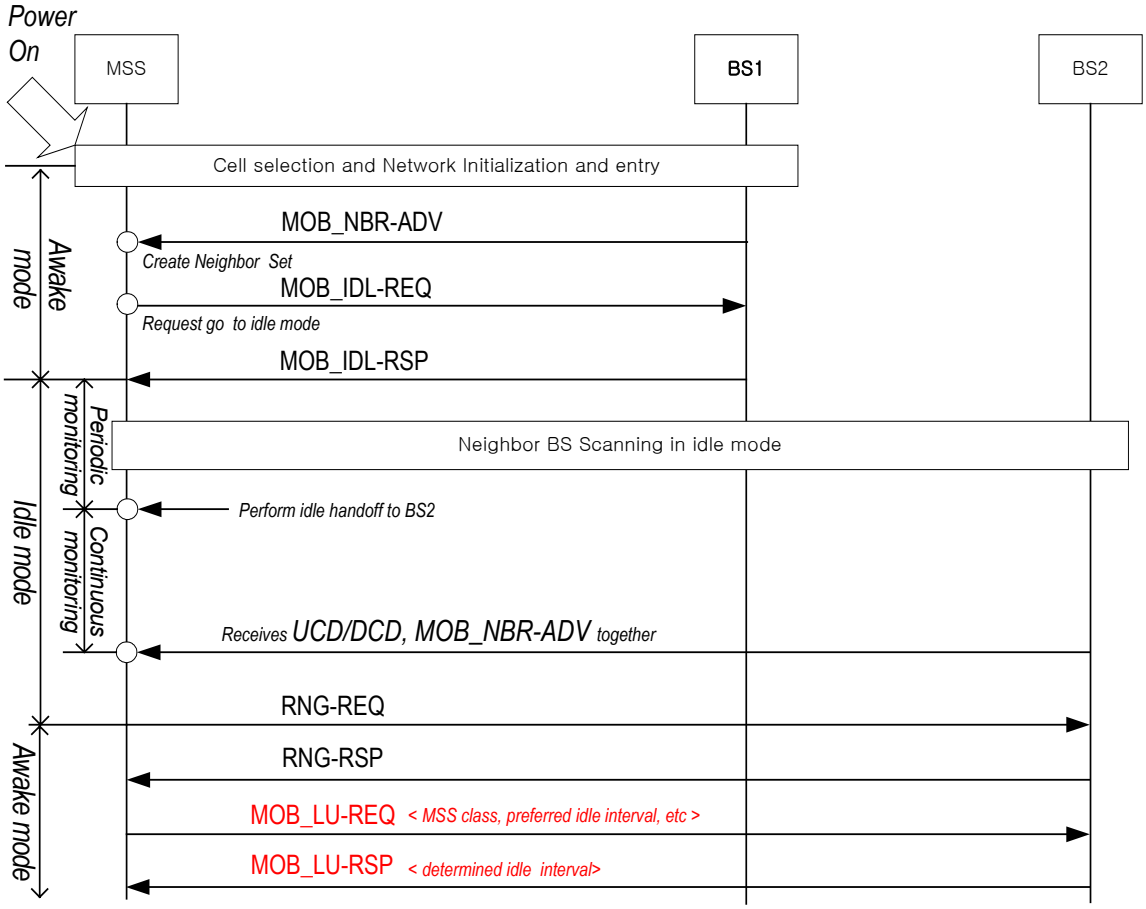

Figure XX. Idle Handover Procedure

If the BS doses not support idle mode, the MSS shall perform the network re-entry and initialization procedures to transit its mode to Awake mode. During idle handover for a specified timer, ***guard timer***, transmitted by the BS using MOB_NBR-ADV message, the MSS is prohibited performing successive idle handover. After a successful idle handover, the timer is reset.

6.4.18.3.1 Location registration procedure in idle mode

During idle handover, the MSS may perform the location update. Before transmitting MOB_LU-REQ message for location update MSS shall start Initial Ranging procedure with the serving BS in order to obtain Basic CID. After achieving successful location update, the serving BS may release Basic CID allocated to the MSS and the MSS return to idle mode. If the location update failed, the MSS shall act according to the After_REQ_Action in MOB_LU-RSP message. Through the location registration, the MSS notifies the BS of its location information and its related parameters. The BS can efficiently page the MSS when the BS has a message to transmit to the MSS based on the location information transmitted by the MSS.

6.4.18.3.1.1 Zone-based registration

The MSS perform the zone-based registration either when it receives a paging message from the BS to perform the zone-based registration or when the packet zone is changed. Each packet zone has its own zone identifier, PZONE_ID that is broadcasted in the **MOB_NBR-ADV** message. Geographically, a packet zone can consists of one or more cells.

6.4.18.3.1.2 Timer-based registration

Upon entering idle mode, the BS can enable or disable the MSS to register the location when a specified timer expires. The BS shall inform the MSS of timer-based registration capability using the TB_REGI_REQUIRED field of the **MOB_IDL-RSP** message. The MSS shall restart this timer when re-entering idle mode if the timer-based registration is enabled. The timer-based registration causes the MSS to register at regular intervals based on TB_REGI_INT-ERVAL. If both the zone-based registration and the timer-based registration are enabled together, the MSS shall perform the zone-based registration. The MSS shall compute the timer expiration count as followings.

$$TB\_REGI\_INTEVAL = 2^{i} \times T$$

(where *i* is REST_INTERVAL_INDEX and T is the TB_REGI_INDEX.)

The TB_REGI_INTERVAL is an integral multiple of the REST_INTERVAL and so the MSS can increment the timer-based registration counter every specified multiple of REST_INTERVAL frames. The counter is reset when the timer is restarted.

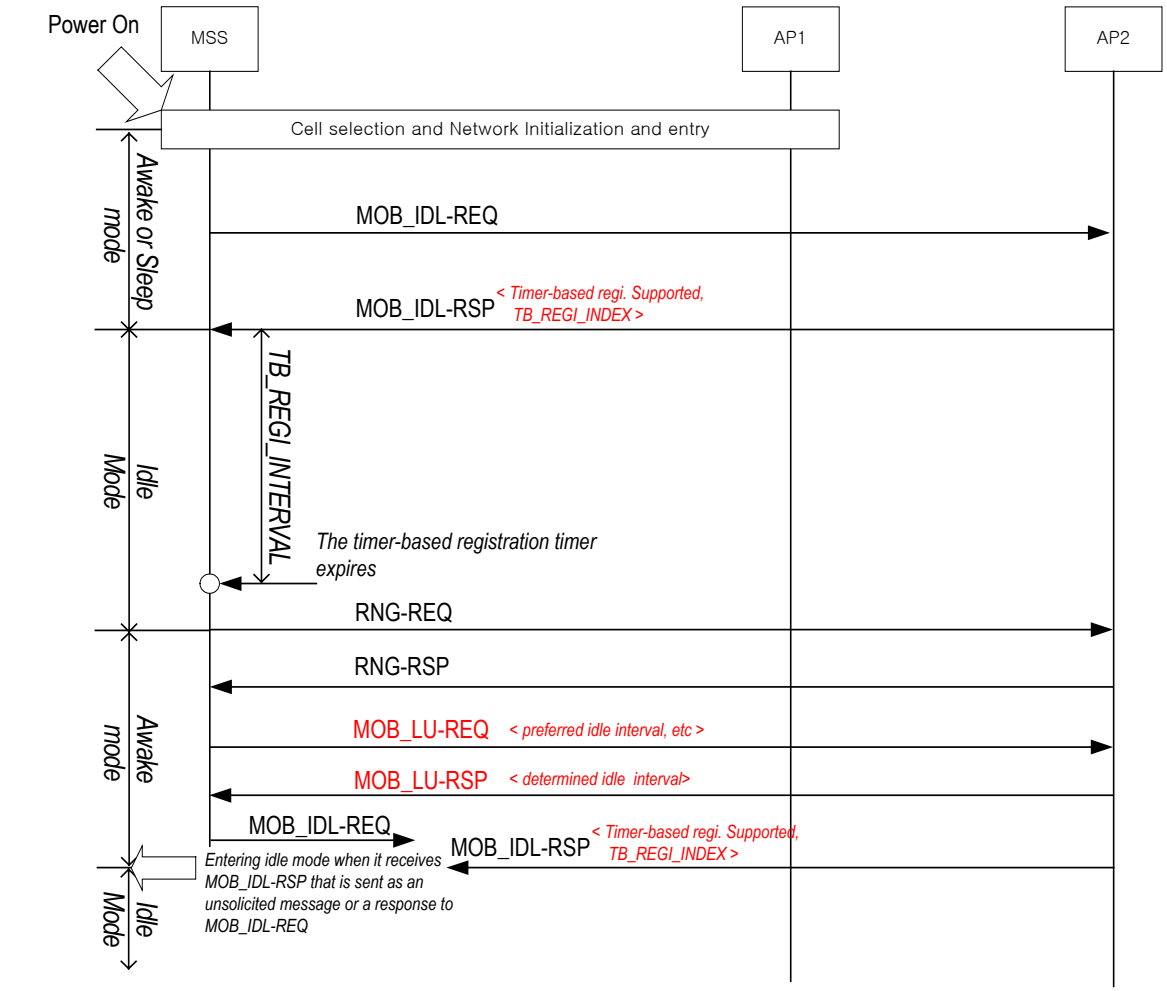

Figure XX. Timer Based Location Update Procedure

[Add messages on Table 14a page 18]

6.4.2.3 MAC Management Messages

Table 14b. MAC Management Messages

Type	Message Name	Message Description	Connection
TBD	MOB_LU-REQ	Location update request message	Primary
TBD	MOB_LU-RSP	Location update response message	Primary
38, 57-255		Reserved	

[Add the following section on page 31]

6.4.2.3.57 Location Update Request (MOB_LU-REQ) Message

MSS supporting idle-mode uses the **MOB_LU-REQ** message to request permission from the BS to update its location. The **MOB_LU-RSP** message is sent from the MSS to the BS on the MSS's primary CID.

Table XX.MOB_LU-REQ Message Format

Syntax	Size	Notes
MOB_LU-REQ_Message_Format() {		
Management message type = ??	8 bits	
REST_INTERVAL_INDEX	4 bits	
PREV_PZONE_ID		
}		

Parameters shall be as follows:

REST_INTERVAL_INDEX

Start value for the rest interval index (measured in frame)

PREV_PZONE_ID

Packet zone ID of a previous serving cell

6.4.2.3.58 Location Update Response (MOB_LU-RSP) Message

The MOB_LU-RSP message shall be sent from BS to a MSS on the MSS's primary CID in response to an MOB_LU-REQ message. After successful Location update, the MSS shall enter idle-mode using the parameters in the message.

Table XX. LR-RSP Message Format

Syntax	Size	Notes
MOB_LU-RSP_Message_Format() {		
Management message type = ??	8 bits	
LU approved	1bits	0 : Location update failed 1 : Location update succeed
If(LU approved == 0){		
After-REQ-action	2 bit	0: The MSS may retransmit the MOB_LU-REQ after the time

		duration (REQ-duration) given by the BS in this message 1: The MSS shall operate for re-initialization at this BS. 2: The MSS shall move to other BS for handover and location update.
REQ-duration	4 bits	Time duration for case where After-REQ-action value is 000.
Reserved	1 bits	
} else{		
REST_INTERVAL_INDEX	4 bits	
TB_REGI_REQUIRED	1 bits	Timer-base registration required 0 : non-required 1 : required
if(TB_REGI_REQUIRED)		
{		
TB_REGI_INDEX	8bits	0 : reserved 1~255
}		
Reserved	2 bits	
}		
}		

Parameters shall be as follows:

LU approved

The activation indication of the MSS when the MSS receives this message from the BS.

After-REQ-action

On MSS request to update its location rejected by the BS, indicate recourse action.

REQ-duration

Waiting value for the MOB_LU-REQ message re-transmission (measured in frames)

REST_INTERVAL_INDEX

Start value for the rest interval index (measured in frames)