Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**	
Title	**Idle Mode Backbone Procedures**	
Date Submitted	**2005-03-11**	
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Re:	Call for Comment on P802.16g Baseline Document	
Abstract	This contribution proposes backbone procedures to support Idle Mode	
Purpose	To be discussed in Legacy Messages Ad-Hoc, IEEE802.16g	
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Idle Mode Backbone Procedures

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Introduction

Idle Mode specified in IEEE802.16e requires backbone communication procedures that are originally covered by three backbone messages – paging-group action message, paging-announce message, and MSS-info-request message – defined in IEEE802.16e/D4.

However, the role or usage scenarios of these messages need to be clarified because Idle Mode has been modified afterwards, e.g. Location Update and several TLV parameters that may be included in DREG-REQ/CMD and RNG-REQ/RSP message. In particular, if Paging Controller is adopted, new usage scenarios need to be defined. In addition, the original MSS-info-request message was not to be used for Idle Mode. Therefore, in this contribution, we define two additional backbone messages – Idle Mode Information Request (Idle-Info-REQ) message and Idle Mode Information Response (Idle-Info-RSP) message. Accordingly, Paging-announce message and MSS-info-request message are slightly modified such that a few action codes in these messages may not be used any more.

References

[1] IEEE802.16e/D6

[2] IEEE802.16g-04/03r1, “Baseline Document – P802.16g Management Plane Procedures and Services”

Proposed Text Change

Remedy 1:

[Add the following text to 14.5.9.2 Paging Management:]

Paging Management is performed using the following three messages: Paging-announce message, Idle Mode Information request (Idle-Info-REQ) message, and Idle Mode Information response (Idle-Info-RSP) message.

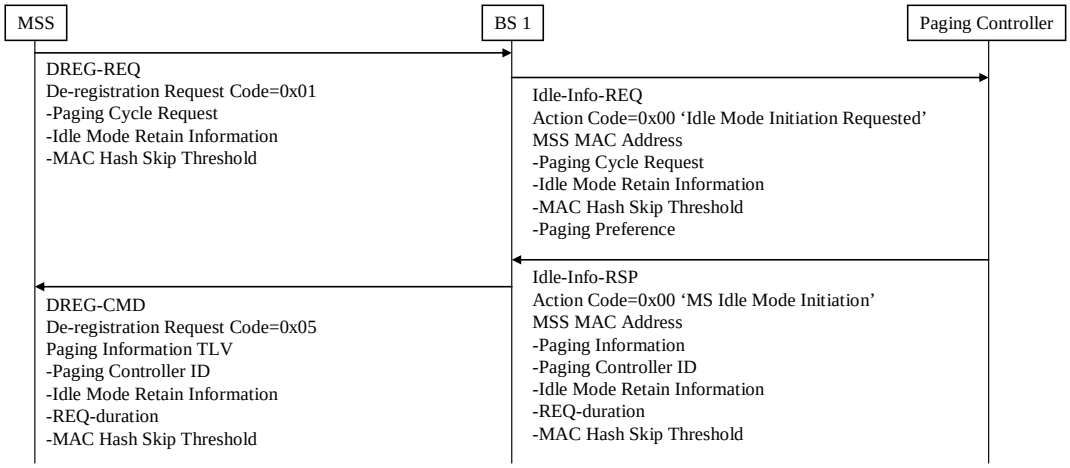

Fig. 1 Idle Mode Initialization

14.5.9.2.1 Paging Procedure

14.5.9.2.1.1 Idle Mode Initialization Backbone Procedures

When serving BS receives a DREG-REQ message with De-registration Code=0x01, 'request for De-Registration from serving BS and initiation of Idle Mode', BS shall transmit to Paging Controller Idle-Info-REQ message with Action Code = 0x00, 'Idle Mode Initiation Requested'. If the DREG-REQ message includes TLV parameters such as Paging Cycle Request, Idle Mode Retain Information, and MAC Hash Skip Threshold, then the BS shall deliver all the parameters to Paging Controller. In addition, BS may include Service Flow management encodings such as Paging Preference TLV in Idle-Info-REQ message.

If Paging Controller approves MS Idle Mode Initialization, then Paging Controller shall respond to serving BS by sending Idle-Info-RSP message with Action Code = 0x00, 'MS Idle Mode Initiation'. In the Idle-Info-RSP message with Action Code = 0x00, Paging Controller shall include Paging Information, Paging Controller ID, and Idle Mode Retain Information, and may include MAC Hash Skip Threshold and REQ-duration. Paging Controller may send the Idle-Info-RSP message to notify other BS of MS Idle Mode Initiation.

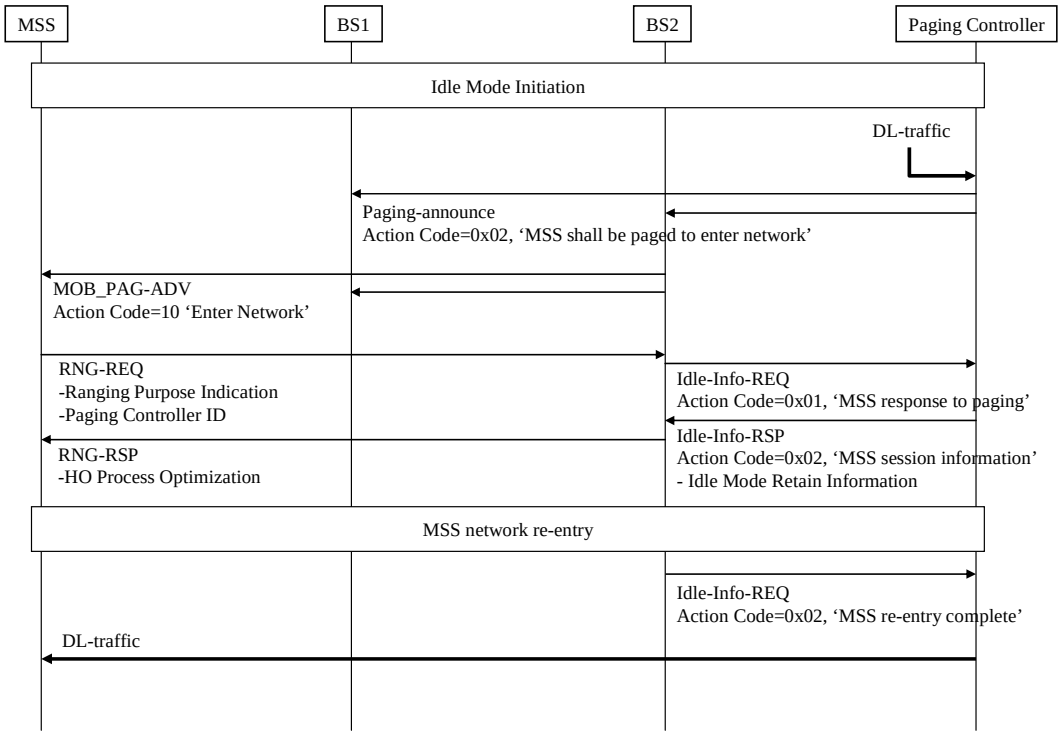

Fig. 2 Paging Procedures for DL traffic

14.5.9.2.1.2 Paging Procedures

If DL traffic to MS in Idle Mode arrives at Paging Controller, then Paging Controller shall transmit Paging-announce message to all BSs belonging to the paging group where the MS is supposed to stay with Action Code= 0x02, 'MS shall be paged to enter network'. BS receiving the Paging-announce message shall broadcast MOB_PAG-ADV message as specified in 6.3.21.7.

If BS receives RNG-REQ message including Ranging Purpose Indication TLV with setting bit #0 to 1 in combination with Paging Controller ID, it shall notify Paging Controller of MS response to paging though Idle-Info-REQ message with Action Code=0x02. Paging Controller may provide a new serving BS with MS service and operational information and Idle Mode Retain Information through Idle-Info-RSP message with Action Code=0x02.

After MS's re-entry, BS shall notify Paging Controller of MS successful re-entry through Idle-Info-REQ message with Action Code=0x02. Paging Controller may notify other BS of MS Idle Mode Termination by transmitting Idle-Info-RSP message with Action Code = 0x01.

Paging Controller may trigger paging by transmitting Paging-announce message with Action Code=0x00, 'No Action Required' for MS that MAC Hash Skip Threshold is applied. BS receiving the Paging-announce message shall broadcast MOB_PAG-ADV message as specified in 6.3.21.7.

Paging Controller may initiate paging to update MS location or verify MS availability in Idle Mode by transmitting Paging-announce message with Action Code=0x01, 'MS shall be paged to perform ranging'. BS receiving the Paging-announce message shall broadcast MOB_PAG-ADV message as specified in 6.3.21.7.

After transmitting Paging-announce message with Action Code=0x01, 'MSS shall be paged to perform ranging', or Action Code=0x02, 'MSS shall be paged to enter network', providing that Paging Controller does not receive Idle-Info-REQ message with Action Code=0x01, 'MS response to paging', Paging Controller shall transmit another Paging-announce message as long as Paging Retry Count has not been decreased to 0. If there is no response from the paged MS till Paging Retry Count is decreased to 0, then Paging Controller shall determine MS unavailability so that it shall delete all Idle Mode retaining information of the MS.

14.5.9.2.1.3 Idle Mode Termination Backbone Procedures

Idle-Info-REQ message with Action Code=0001 may also be used to notify Paging Controller of MS Idle Mode Termination.

Remedy 2:

[Add new clause under 14.5.10.yy Paging-announce message, line 37, pp. 13, IEEE802.16g-04/03r1:]

Table xxx – Paging-announce message format

Field	Size	Notes
Paging-announce message format (){		
~~Message Type = ?~~	~~8 bits~~	
~~Sender BS ID~~	~~48 bits~~	~~Base station unique identifier (same number as that broadcast on the DL-MAP message)~~
~~Recipient BS ID~~	~~48 bits~~	~~Set to 0xffffff to indicate broadcast~~
~~Time Stamp~~	~~32 bits~~	~~Number of milliseconds since midnight GMT (set to 0xffffff to ignore)~~
~~Num MSS~~	~~8 bits~~	~~Number of MSSs to page~~
Global Message Header	152 bits	
For (i=0; i<Num Records; i++) {		
~~MSS~~ MS MAC Address	48 bits	
~~Paging Group ID~~	~~8 bits~~	
~~Paging Cycle~~	~~16 bits~~	
~~Paging Offset~~	~~8 bits~~	
TLV encoded information	variable	
Action Code	~~3 bits~~ 4 bits	~~0=MSS enters Idle Mode~~ ~~1=MSS exits Idle Mode~~ 0x00: No action required ~~2~~0x01~~=:~~ ~~MSS should~~ MS shall be paged to perform ranging ~~to establish location and acknowledgement message~~ ~~3~~0x02~~=:~~ ~~MSS should~~ MS shall be paged to enter network ~~4 7~~0x03 – 0x0f~~=:~~ reserved
reserved	~~5 bits~~ 4 bits	
}		
Security Field	TBD	A means to authenticate this message.
CRC Field	32 bits	IEEE CRC-32

}		

The following parameters may be included in Paging-announce message:

-Paging Information

Remedy 3:

[Add new clause under 14.5.10.yy MSS Information request (MSS-Info-REQ) message, line 37, pp. 13, IEEE802.16g-04/03r1:]

Table xxx – MSS Information request (MSS-Info-REQ) message format

Field	Size	Notes
MSS-info-REQ message format () {		
Global Message Header	152 bits	
For (j=0;j<Num Records; j++) {		
MSS unique identifier	48 bits	
Action ~~flag~~Code	8 bits	0x00 – Request information ~~1 – MSS arrived from Idle Mode~~ ~~2 – MSS has transitioned to another paging group~~ 0x03 – ~~MSS~~ MS request handover 0x01, 0x02, 0x04 – ~~7~~0xff - reserved
}		
Security field	TBD	A means to authenticate this message
}		

Remedy 4:

[Add new clause under 14.5.10.xx Idle Mode Information request (Idle-Info-REQ) message, line 37, pp. 13, IEEE802.16g-04/03r1:]

Table xxx – Idle Mode Information request (Idle-Info-REQ) message format

Field	Size	Notes
Idle-Info-REQ message format (){		
Global Message Header	152 bits	
For (i=0; i<Num Records; i++) {		
MS MAC Address	48 bits	
Action Code	8 bits	0x00: Idle Mode Initiation requested 0x01: MS response to paging 0x02: MS re-entry complete 0x03-0xff: reserved
TLV encoded information	variable	

Num_SFID_Records	8 bits	
For (i=1; i<Num_SFID_Records; i++) {		
SFID	32 bits	
Num_QoS_Records	8 bits	
For (i=1; i<Num_QoS_Records; i++) {		
TLV encoded information	variable	11.13 Service flow management encodings.
}		
}		
}		
Security Field	TBD	A means to authenticate this message.
}		

The following parameters may be included in Idle-Info-REQ message:

- Paging Cycle Request
- Idle Mode Retain Information
- MAC Hash Skip Threshold
- Paging Controller ID

Remedy 5:

[Add new clause under 14.5.10.xx Idle Mode Information request (Idle-Info-RSP) message, line 37, pp. 13, IEEE802.16g-04/03r1:]

Table xxx – Idle Mode Information response (Idle-Info-RSP) message format

Field	Size	Notes
Idle-Info-RSP message format () {		
Global Message Header	152 bits	
For (i=0; i<Num Records; i++) {		
MS MAC Address	48 bits	
Action Code	8 bits	0x00: MS Idle Mode Initiation 0x01: MS Idle Mode Termination 0x02: MS session information 0x03: MS may retransmit DREG-REQ after REQ-duration 0x04: MS shall not retransmit DREG-REQ and message and shall wait DREG-CMD message 0x05-0xFF: reserved
TLV encoded information	variable	
For (i=1; i<Num_SFID_Records; i++) {		
SFID	32 bits	
Num_QoS_Records	8 bits	
For (i=1; i<Num_QoS_Records; i++) {		

TLV encoded information	variable	11.13 Service flow management encodings.
}		
}		
}		
Security Field	TBD	A means to authenticate this message.
}		

The following parameters may be included in Idle-Info-RSP message:

-Paging Information

-Paging Controller ID

-Idle Mode Retain Information

-REQ-duration

-MAC Hash Skip Threshold