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Title	A DREG-ACK message for the safe IDLE mode Transition
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Re:	IEEE P802.16e/D5-2004
Abstract	This contribution proposes a new DREG-ACK message which responds to the unsolicited DREG-CMD sent by BS.
Purpose	Discuss and adopt proposed text and DREG-ACK message
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A DREG-ACK message for the safe IDLE mode Transition

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1 Introduction

1.1 Problem statement

In IDLE Mode of the IEEE P802.16e/D5a, BS may transmit the unsolicited DREG-CMD message with action code (0x05) to MSS. But, if MSS in active mode does not receive the DREG-CMD from BS, what happens? On the basis of current IEEE P802.16e/D5a, MSS is still in normal operation and BS deletes all the connection information of the MSS at expiration of Management Resource Holding Timer so that All the messages and traffics except initial RNG-REQ message are discarded due to no existence of connection information of MSS as depicted in figure 1. No synchronization of states between MSS and BS cause a critical problem such as MAC-Initialization of MSS. Why is there not acknowledgement in response to unsolicited idle mode request from BS?

Therefore, we propose a new DREG-ACK message as acknowledgment to the unsolicited DREG-CMD message. Also, we do the parameters such as timer and retries count related to DREG-ACK and DREG-CMD message.
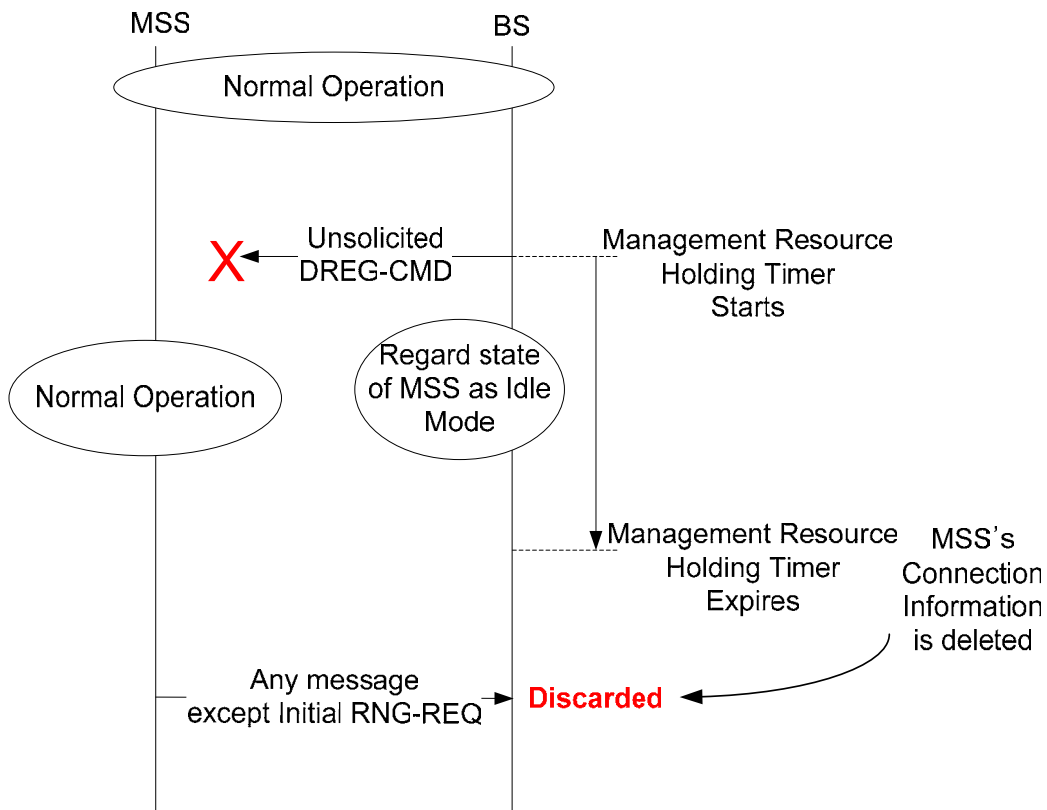

Figure 1 – The Failure of unsolicited DREG-CMD message

1.2 Proposed solution

We propose a new DREG-ACK message which responds to the unsolicited DREG-CMD message sent by BS for MSS's idle mode transition. To guarantee the MSS's successful reception of the unsolicited DREG-CMD message, two parameters are required to BS as follows

- **DREG-ACK response timer**
  In Idle mode, BS shall wait to receive the *DREG-ACK* message after it transmits the unsolicited *DREG-CMD* message within expiry of this timer. If *DREG-ACK* response timer expires, BS shall retransmit the unsolicited *DREG-CMD* message as long as *DREG-CMD Retry Count* has not exhausted.
- **DREG-CMD Retry Count**
  This parameter is incremented whenever BS transmits the unsolicited *DREG-CMD* message to MSS for Idle mode. At expiration of *DREG-ACK* response timer, BS shall retransmit unsolicited *DREG-CMD*. As a result, *DREG-CMD Retry Count* may be incremented till successful reception of *DREG-ACK* message. If *DREG-CMD Retry Count* reaches maximum tolerable value, BS shall stop the procedure that it sends the unsolicited DREG-CMD message to MSS. It means that it regards MSS as alive and decides to follow the action of MSS in future.

Figure 2 depicts the operation of DREG-ACK message and its parameters.

If BS decides to make MSS enter the idle mode, it may send *DREG-CMD* message to MSS in unsolicited manner. At the same time, BS starts *T33* Timer (i.e. *DREG-ACK response timer*) and increment DREG-CMD Retry Count. According to current IEEE P802.16e/D5a, *Management Resource Holding Timer* shall be also started by BS whenever *DREG-CMD* message is sent. If MSS does not receiver unsolicited *DREG-CMD* message from BS, it can't answer to this request of BS. Therefore, *T33* timer expires due to no acknowledgement such as *DREG-ACK*. As a result, BS shall retransmit unsolicited *DREG-CMD* message, reset *Management Resource Holding Timer*, and increment *DREG-CMD Retry Count*. These operations may go on until BS receives the DREG-ACK message from MSS. If *DREG-CMD Retry Count* is exhausted, BS shall does not retransmit *DREG-CMD* message any more. On the contrary, if BS receives *DREG-ACK* message until *DREG-CMD Retry Count* is not exhausted, BS regard MSS as enter idle mode normally and delete the MSS's connection information at expiration of *Management Resource Holding Timer*.
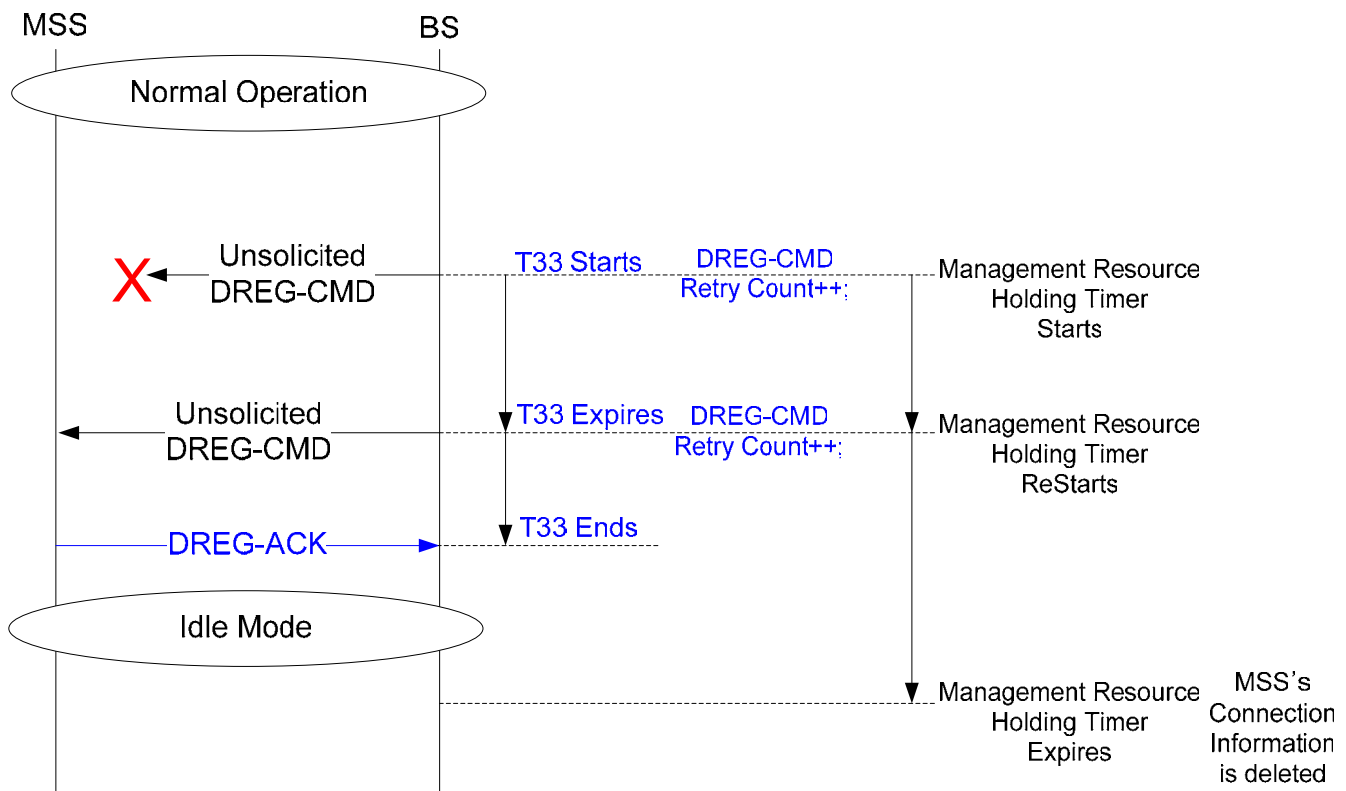

Figure 2 – The Operation of DREG-ACK and DREG-CMD messages

2 Proposed Text

We propose a new DREG-ACK message which informs BS of successful receiving the unsolicited DREG-CMD message sent by BS. We also propose the global parameters related to DREG-ACK and DREG-CMD message.

[Append the following text to the end of the section 6.3.2.3.26 De/Re-register command(DREG-CMD) message in Line 59, Page 43 of IEEE802.16e/D5a document]

In the IDLE Mode operation, the DREG-CMD may be sent to MSS in unsolicited manner. When BS transmits the unsolicited DREG-CMD to MSS, it shall start T33 timer at the same time. If the BS does not receive the DREG-ACK message from MSS in response to the unsolicited DREG-CMD within T33 timer expiry, the BS shall retransmit the DREG-CMD message in unsolicited manner as long as DREG Command Retry Count has not been exhausted. Otherwise, BS shall stop all the IDLE Mode operation that it intends to make MSS .enter idle mode.

[Append the following Message Type to the end of Table 14 in Line 28, Page 27 of IEEE802.16e/D5a document]

Table 14 — MAC Management messages

Type	Message name	Message description	Connection
..	..	..	..
65	PMC_RSP	Power control mode change response message	Basic
66	DREG-ACK	De/Re-register acknowledge message	Basic
6667-255		reserved	

[Add the new section 6.3.2.3.59 as follows after the section 6.3.2.3.58 Power Control mode change response(PMC-RSP) message in Line 13, Page 110 of IEEE802.16e/D5a document]

6.3.2.3.59 De/Re-register Acknowledgement (DREG-ACK) message

The DREG-ACK message shall be transmitted by the MSS on an SS's Basic CID in response to the unsolicited DREG-CMD message sent by BS in order to inform BS of receiving the DREG-CMD clearly. Upon receiving a DREG-CMD, the SS shall enter the idle mode.
The MAC Management Message Type for this message is given in Table 14. The format of the message is shown in Table xx

Table xx — DREG-ACK message format

Syntax	Size	Notes
DREG-ACK_Message_Format() {	..	..
Management Message Type = xx	8 bits	
Action Code from BS	8 bits	
HMAC Tuple	8 bits	(see 11.1.2)

1		

The 'Action code from BS' value is a clone of action code in the unsolicited DREG-CMD sent by BS. The HMAC Tuple shall be the last attribute in the message.

[Add the following text to Table 340a in Line 46, Page 348 of IEEE802.16e/D5a document]

Table 340a—Parameters and Constants

System	Name	Time Reference	Minimum Value	Default Value	Maximum Value
..	..	..	..	..	..
MSS	DREG Request Retry Count	Number of retries on DREG Request Message	3	3	16
BS	DREG Command Retry Count	Number of retries on DREG Command Message	3	3	16
BS	T33	Time the BS waits for DREG-ACK			