Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	Comments on Sleep mode supporting the periodic ranging with compressed format of SLP ID fields in MOB_TRF-IND message
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Re:	This is a reply contribution to C80216e-04/330

| Abstract | This document proposes the adaptable periodic ranging interval considering ranging success or fail. If periodic ranging is success, the frame number for next periodic ranging shall be decreased, otherwise it shall be increased. This document is the reply contribution for C80216e-04/07r1(Sleep mode supporting the periodic ranging with compressed format of SLP ID fields in MOB_TRF-IND message). |

| Purpose | Discuss and adapt proposed text |

Comments on Sleep mode supporting the periodic ranging with compressed format of SLP ID fields in MOB_TRF-IND message

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1. Problem Statement

Periodic ranging allows the SS to adjust transmission parameters so that the SS can maintain uplink communications with the BS. If periodic ranging fails, initial ranging is tried and periodic ranging is retried after initial ranging. In the sleep mode, periodic ranging is performed only once for each sleep interval. 'IEEE C80216e-04/330' proposed the Sleep mode supporting the periodic ranging for multiple periodic ranging during long sleep intervals.

Ranging interval for periodic ranging is defined by T27 timer. It is not optimized value for efficient periodic ranging in sleepmode.. If T27 timer is too short, unnecessary periodic ranging is occurred and it increases the system overhead. Whereas the infrequent period ranging is more preferred for high capacity, but it can increase the ranging failure. If T27 timer is too long, possibility of periodic ranging failing may increase, which in turn requires MSS to perform initial ranging. Consequently ranging process takes longer time and more related messages will be created. Ranging interval of periodic ranging is adequately selected by considering both ranging success and message overhead. Optimized ranging interval for periodic ranging is necessary and it can vary according to wireless channel and user mobility. Thus it is preferable for the system performance that optimized ranging interval should be varied by channel environment.

2. Proposed Remedy

We propose that ranging interval is dynamically adjusted on ranging success or failure with maximum and minimum value of interval for MSS in sleep mode. And this value should be reflected on the Frame number of next periodic ranging sent to the MSS by BS in MOB-SLP-SRP or RNG_RSP with ranging status set to 'success'.

2.1 New scheme supporting periodic ranging in sleep mode (proposed in C80216e-330)

When MSS sends MOB_SLP-REQ message to BS in order to enter sleep mode, BS shall send MOB_SLP_RSP including 'Next Periodic Ranging' so that MSS can know when to awaken during sleep interval for performing periodic ranging. Thus, if MSS is still sleeping in that frame whose frame number is the 'Next Periodic Ranging', it shall listen downlink frame and decode the DL-MAP and UL-MAP for periodic ranging

When the periodic ranging operation between MSS and BS comes to an end, BS shall inform MSS of the frame number in which next periodic ranging operation is expected to start. For this situation, BS shall append 'Next Periodic Ranging' as TLV encoding to RNG-RSP message whose ranging status parameter is set to 'success'. In other words, if an MSS receives the last RNG-RSP message that indicates the successful termination of the periodic ranging operation, it shall read the frame number in which next periodic ranging will start. Thus, if MSS is still in sleep interval just after completion of periodic ranging, it may return to sleep mode till the frame as 'Frame Number for Next Periodic Ranging'.

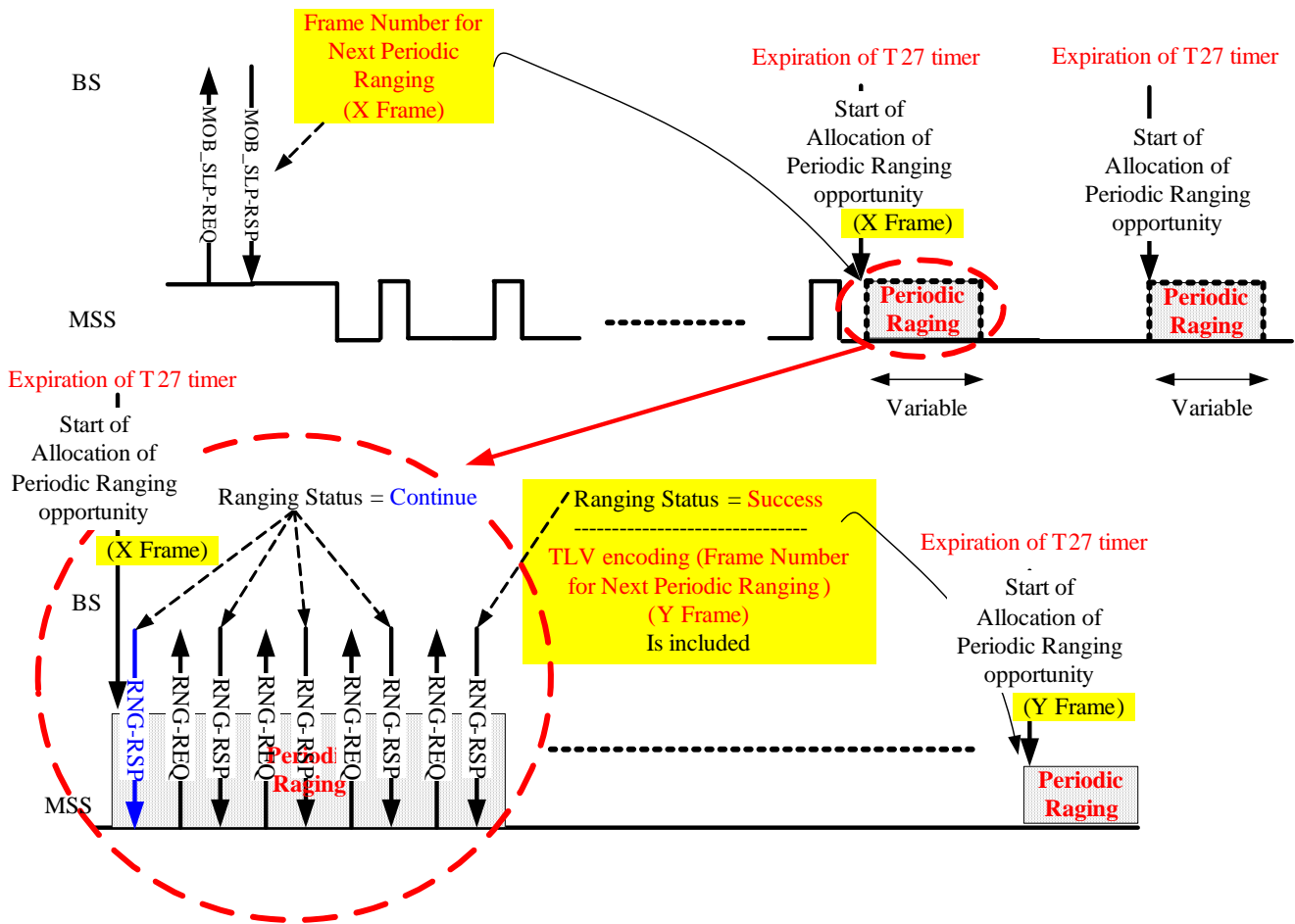Figure 1 depicts the proposed operation of periodic ranging during sleep mode.

Figure 1. The proposed operation of periodic ranging during sleep mode

3.   Proposed Text Changes

[Add the section 6.3.19.4 Periodic Ranging in sleep mode after Page 45, Line 15 as follows]

6.3.19.4 Periodic Ranging in sleep mode

For each MSS at sleep mode, during its listening interval, BS may allocate an UL transmission opportunity for periodic ranging. Alternatively, BS may wake up the MSS using TRF-IND to keep it in active state until assignment of UL transmission opportunity for periodic ranging or let the MSS know when the periodic ranging opportunity occur with 'Next Periodic Ranging' of last successful RNG-RSP.

While BS operates for periodic ranging or negotiation of sleep mode, after RNG-REQ (or MOB_SLP-REQ) reception, BS may send RNG-RSP (or MOB_SLP_RSP) including 'Next Periodic Ranging' so that MSS can know when to perform periodic ranging. Then in the frame specified by 'Next Periodic Ranging', it shall decode all consequent UL-MAP messages waiting for UL unicast transmission opportunity for periodic ranging. When such an opportunity occurs, MSS has to transmit RNG-REQ message to BS and then perform regular procedure of periodic ranging: wait for RNG-RSP etc. Successful periodic ranging procedure does not interrupt Sleep state. In the case periodic ranging procedure fails, MSS has to perform Initial Ranging procedure or handover to another BS.

When the periodic ranging operation between MSS and BS successfully processed, BS may inform MSS of the frame number in which next periodic ranging operation is expected to start. For that, BS shall append 'Next Periodic Ranging' as TLV encoding to RNG-RSP message. BS also may inform MSS of the existence of DL Traffic addressed to MSS. For that, BS shall set the 'Next Periodic Ranging' to zero. If an MSS receives the RNG-RSP message with this indication from BS, then it shall immediately exit the Sleep Mode and resume Normal Operation with the BS.

The length of Periodic Ranging period can be dynamically adjusted on each ranging success or failure by following two methods. One is linear method and the other is exponential method. For linear method, unit of adjustment is fixed to a certain value, such as 10 % of initial period. And on each ranging success or failure, length of period shall be increased or decreased by the specified unit value. In exponential method, period of periodic ranging shall be increased to n times the current period on each successful ranging and decreased to 1/n of the current value. And there shall be a maximum and minimum value for periodic ranging in sleep mode defined.