Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**	
Title	**Sleep Mode – Proposal to solve IOT issues**	
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Re:	IEEE Std 802.16-2004/Cor2/D1	
Abstract	The document contains suggestions on solving IOT issues in sleep-mode	
Purpose	Adoption of proposed changes into Std. 802.16-2004/Cor2/D1	
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Proposal to solve sleep-mode IOT issues

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Problem definition:
1. Sleep-mode and scanning: Currently, according to maint83r4-a, during sleep-mode an MS cannot request scanning prior to deactivating the PSC related to its basic CID. However, there are no restrictions regarding MS in scanning requesting sleep-mode.

2. Unsolicited transmission of MOB_SLP-RSP for definition and re-definition: the initial intention of the sleep-mode authors in the standard was that both BS and MS are capable of defining PSCs. However, Cor2-D1 has certain restriction (Section 6.3.2.3.45): "The BS may send the unsolicited MOB_SLP-RSP message for the purpose of activation or deactivation only.". This capability, unsolicited transmission of MOB_SLP-RSP for definition purposes, is an essential capability for the proper operation of both the MS and the BS. Although, the common approach is that only the MS is in charge of the battery life and this only the MS is entitled to initiate PSC definition, I do think that the BS has a key role in enhancing the MS's power save. Moreover, the BS, and only the BS, can define, or redefine, a PSC to support the MS's QoS requirements in the most optimal way. For example, the MS requests a certain PSC with listen window of 10 frames and sleep window of 10 frames, the BS approves the scheme. After a while the BS detects that the MS's QoS can be supported in a listen window of 5 frames, meaning 50% more power-save, and it re-defines the PSC. Currently, there is no alternative to the optimal solution of BS's intervention in definition of PSC.

Proposed solution:
1. Sleep mode shall no be activated during scanning. To activate sleep-mode, scanning shall be deactivated.

2. Return the capability to the BS (BS vendors may decide on not supporting this capability).

Suggested remedy:

In Cor2_D1, modify the following paragraph in Section 6.3.21.1:
MS in sleep mode may request BS to allocate scan duration by sending MOB_SCN-REQ in case trigger action for sending MOB_SCN-REQ message is enabled by Enabled-Action-Triggered TLV. In this case, MS shall deactivate the PSC associated to basic CID before sending MOB_SCN-REQ, and the BS shall regard the MS as deactivating the PSC associated to basic CID after reception of the MOB_SCN-REQ message.

MS in scanning shall not request the activation of PSC associated with its Basic CID, prior to deactivating the scanning procedure. BS shall not activate the PSC associated with the Basic CID with regard to a MS in scanning.

In Cor2_D1, modify first paragraph in Section 6.3.2.3.45:
The MOB_SLP-RSP message shall be sent from BS to an MS on the MS's basic CID in response to an MOB_SLP-REQ message, or in an unsolicited manner for the purposes of definition, activation and deactivation. ~~The BS may sent the unsolicited MOB_SLP-RSP message for the purpose of activation or deactivation only.~~ The BS may either reconfigure sleep mode parameters in MOB_SLP-RSP by using the same Power Saving Class ID, or may define a new sleep class by

using a new Power Saving Class ID. When defining a new sleep class: the Definition bit shall be set, and the message shall contain the definition of a new Power Saving Class together with an assigned Power_Saving_Class_ID that shall be unique per MS if unicast traffic connections are included and unique per cell if only multicast connections are included.

In Cor2_D1, modify the Sleep_Approved definition in Section 6.3.2.3.45:

For a MOB_SLP-RSP message transmitted in an unsolicited manner, the BS shall set 'Sleep approved' = 1 ~~and 'Definition' = 0 for each Power Saving Class~~.