| | | |
|---|---|---|
| Project | **IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>** | |
| Title | Problems with DBPC Messages and a Solution | |
| Date Submitted | 2005-03-13 | |
| Source(s) | David A Castelow, Gavin Meakes, Eyal Verbin<br><br>Airspan Communications,<br>Cambridge House, Oxford Road,Uxbridge, UK | Voice: +44 1895 467281<br>Fax: +44 1895 467202<br>mailto:dcastelow@airspan.com |
| | Chi-Chen Lee, Tzu-Ming Lin, Yu-Ren Yang, Chia-Feng Kang<br><br>CCL, ITRI, Bldg. 11, 195 Sec. 4, Chung Hsing Rd. Chutung,<br>HsinChu, Taiwan 310, R.O.C. | mailto: jjlee@itri.org.tw |
| | Rainer Ullmann, Donald Stevenson<br><br>Wavesat Inc, 1375 Trans-Canada Highway Suite 300<br>Dorval, Quebec H9P 2W8, Canada | mailto:rullmann@wavesat.com |
| Re: | Document to support comment to Letter Ballot #17 | |
| Abstract | Changes required to prevent DBPC message flooding of 802.16 systems | |
| Purpose | The document is intended for consideration in comment resolution process of LB #17. | |
| Notice | This document has been prepared to assist IEEE 802.16. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein. | |
| Release | The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE's name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE's sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE 802.16. | |
| Patent Policy and Procedures | The contributor is familiar with the IEEE 802.16 Patent Policy and Procedures <http://ieee802.org/16/ipr/patents/policy.html>, including the statement "IEEE standards may include the known use of patent(s), including patent applications, provided the IEEE receives assurance from the patent holder or applicant with respect to patents essential for compliance with both mandatory and optional portions of the standard." Early disclosure to the Working Group of patent information that might be relevant to the standard is essential to reduce the possibility for delays in the development process and increase the likelihood that the draft publication will be approved for publication. Please notify the Chair <mailto:chair@wirelessman.org> as early as possible, in written or electronic form, if patented technology (or technology under patent application) might be incorporated into a draft standard being developed within the IEEE 802.16 Working Group. The Chair will disclose this notification via the IEEE 802.16 web site <http://ieee802.org/16/ipr/patents/notices>. | |

# Problems with DBPC Messages and a Solution

*David A Castelow, Gavin Meakes, Eyal Verbin, Airspan*
*Chi-Chen Lee, Tzu-Ming Lin, Yu-Ren Yang, Chia-Feng Kang, ITRI*
*Rainer Ullmann, Donald Stevenson, Wavesat*

## Introduction

The changes proposed in this document are to solve the problems in the specification and usage of the DBPC-REQ and DBPC-RSP messages as described in IEEE 802.16-2004[1,4].

## *Description of Problem*

The problems of current DBPC-REQ/RSP mechanism are summarized as follows:

1) Problems with DBPC-REQ flooding for broadcast or multicast data

Note that DBPC_REQ must be sent by an SS according to its default assigned DIUC. Default DIUC is the one used by BS to send management messages to the SS. Multicast/Broadcast DIUC shall be smaller or equal to default DIUC. Generally speaking, the problem can be further classified into two categories: broadcast management messages and multicast or broadcast data. For the broadcast management messages, no matter the CID is included in the DL-MAP or not the SS can always check the CID field in the MAC header and if the CID value is *0xFFFF or 0xFFFD* then the SS should not send the DBPC-REQ for requesting the less robust burst profile. However, section 6.3.10.1 does not mention this.
For multicast or broadcast data over transport connection, since there are no dedicated CIDs for multicast or broadcast transport connections, the SSs need not be aware that the connection is a multicast connection (see 6.3.13). Considering that some SSs belonging to same multicast group but operate at different DIUCs, the BS will choose the least robust DIUC to ensure that all SSs belonging to the same broadcast/multicast group can operate correctly. Consequently, the SS that can choose the less robust burst profile will periodically send DBPC-REQ because the SS has no idea about which connection is a multicast connection. Moreover, the DBPC-REQ message is sent by the SS to the BS on the SS's *Basic CID* (see 6.3.2.3.20). Thus, if the SS intends to request to change the DIUC of the *multicast or broadcast transport connection*, the BS will consider that the SS intends to change the DIUC (Default DIUC) for the *unicast* transport connection or the *management* connections and therefore approve the request. However, the SS may still receive the DL data at another DIUC (Multicast/Broadcast DIUC) rather than the requested DIUC (Default DIUC) even if the BS has approved the request.

2) Problems with DBPC-REQ/RNG-REQ flooding

The BS may chooses to ignore the request and enhance the transmission by means of repetition, boosting, etc., which is described in [3].

3) Problem with DBPC-REQ lost

There is no timer to handle the lost of DBPC-REQ or DBPC-RSP. This may occur for the nomadic operation.

4) Problem with DBPC-REQ/RNG-REQ request re-try interval

For some reasons, which are explained in [3], the BS may reject the request from SS to change DL burst profile, the SS should set a timer to try it again later. Additionally, under the multicast data scenario described above, even if the BS has approved the request DIUC the SS still should set a timer to delay the consecutive DBPC-REQs for

avoiding the DBPC-REQ flooding. However, there is no such re-try timer.

5) Problem with how to define that data grant is available (see 6.3.10.1, line 18)

According to [5], it is better to let the SS decide to use DBPC-REQ or RNG-REQ.

6) When asking for change of less robust burst profile the SS should only use DBPC-REQ since initial ranging slot is a scarce resource and should be utilized carefully

Figure 1 summarizes the scenarios of the flooding problem, and the suggested remedies (T28/T29).

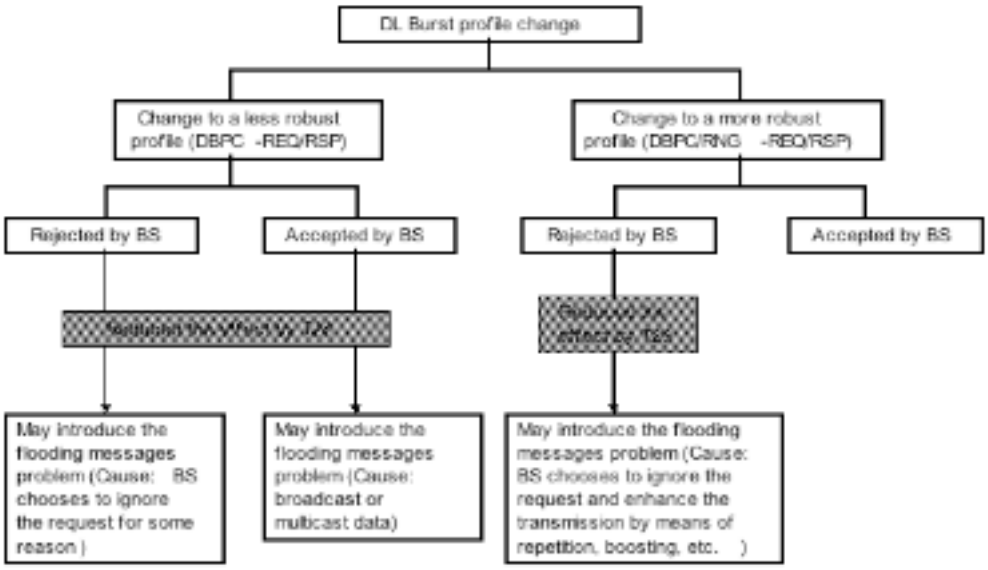


Figure 1

## Text Changes

Text changes are relative to [4].

Page 15, Line 58, insert:

#### 6.3.2.3.20 Downlink Burst Profile Change Request (DBPC-REQ) message

*Change the first paragraph as indicated:*

The DBPC-REQ message is sent by the SS to the BS on the SS's Basic CID to request a change of the least

robust downlink burst profile used by the BS to transport data to the SS.

*Change the second paragraph as indicated:*

The DBPC-REQ message shall be sent at the current operational Data Grant Burst Type for the SS. If the SS detects ~~fading~~ changes of the channel conditions on the downlink, the SS uses this message to request transition to a more appropriate Data Grant Burst Type ~~robust Data Grant Burst Type~~. The message format shall be as shown in Table 48.

Page 27, Line 5:

**6.3.10.1 Downlink burst profile management**

*Change the first paragraph as indicated:*

The downlink burst profile is determined by the BS according to the quality of the signal that is received by each SS or the qualities of the signals that are received by a group of SSs. To reduce the volume of uplink traffic, the SS monitors the CINR and compares the average value against the allowed range of operation. This region is bounded by threshold levels. If the received CINR goes outside of the allowed operating region, the SS requests a change to a new burst profile using one of two methods. In the first method the SS uses an allocated data grant to sent a DBPC-REQ. In the second method the SS uses the initial ranging interval to send a RNG-REQ. The SS determines the optimal method. If the first method is used and the SS has been granted uplink bandwidth (a data grant allocation to the SS's Basic CID), the SS shall send a DBPC-REQ message in that allocation. The BS responds with a DBPC-RSP message. If ~~a grant is not available~~ the second method is used and the SS requires a more robust burst profile on the downlink, the SS shall send a RNG-REQ message in an Initial Ranging interval. With either method, the message is sent using the Basic CID of the SS. For data carried over broadcast CID (0xFFFF) or Fragmentable Broadcast CID (0xFFFD), an SS should not ask for change of DIUC. The coordination of message transmit and receipt relative to actual change of ~~modulation~~ DL burst profile is different depending upon whether an SS is transitioning to a more or less robust burst profile. Figure 79 shows the case where an SS is transitioning to a more robust type. Figure 80 shows transition to a less robust burst profile.
The following changes need to be applied to [1]:
Page 200: Figure 79 needs to indicate action of SS in event of non-detection of DBPC-RSP.
Page 201: Figure 80 needs to indicate action of SS in the event of the BS refusing the DBPC-REQ to move to a less robust modulation. State transition diagrams are needed here, so rather than complicate these diagrams, we introduce a separate figure. This diagram requires timers, so that the BS is not flooded with requests. The diagram (Figure 80a) indicates the actions for the SS, and includes new timers (T28, T29, and T30).
Also DL data may be on DIUC up to m, not at m. This requires a change to Figure 79, too.
RNG-REQ only to be used for transition to more robust cases when no grant is available (see 6.3.10.1).

This requires a change to Figure 80. This leads to the following text changes in [4]:
Page 27, Line 11, insert:

*Change Figure 79 as indicated:*

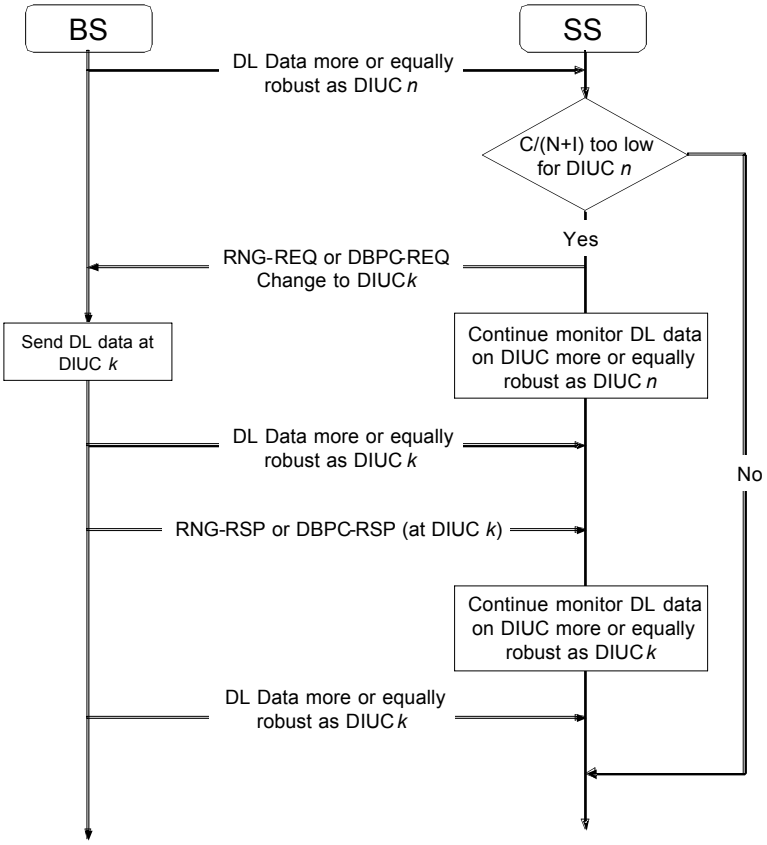


Figure 79—Transition to a more robust operational burst profile

*Change Figure 80 as indicated:*

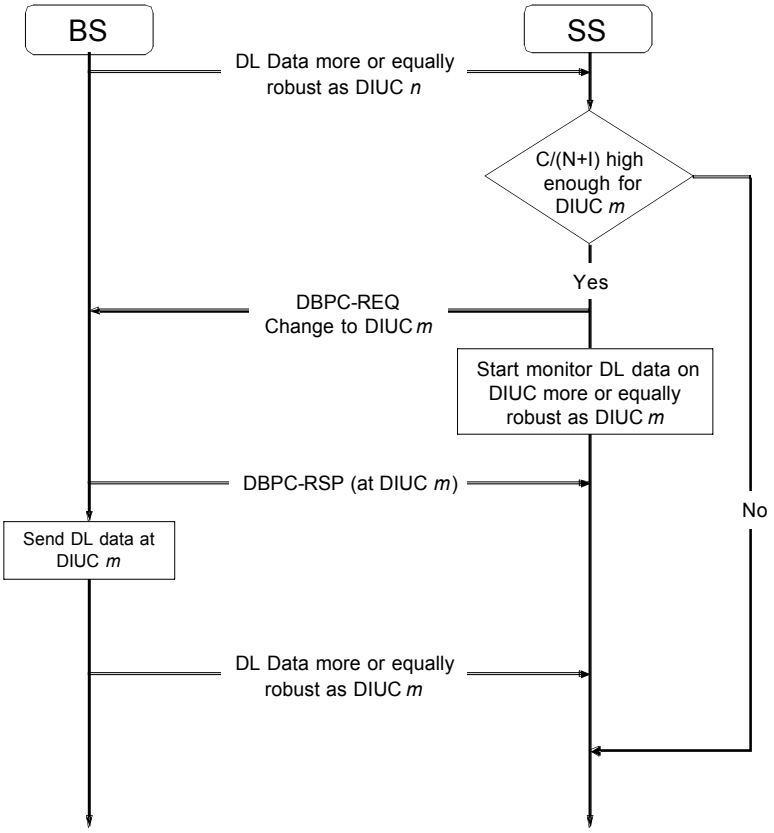


Figure 80—Transition to a less robust operational burst profile

*Insert new Figure 80a (see end of contribution).*

### 10.1 Global values

*In Table 342, Line56, add following entries*:

| System | Name | Time reference | Minimum value | Default value | Maximum value |
|---|---|---|---|---|---|
| SS | T28 | DBPC-REQ re-try timer for requesting less robust burst profile. | 200 ms | 1 s | 1 min |
| SS | T29 | RNG-REQ/DBPC-REQ re-try timer for requesting more robust burst profile after rejecting by the BS. | 200 ms | 1s | 30s |
| SS | T30 | DBPC-RSP reception timeout following the transmission of a DBPC-REQ. | 200 ms | 200 ms | 200 ms |

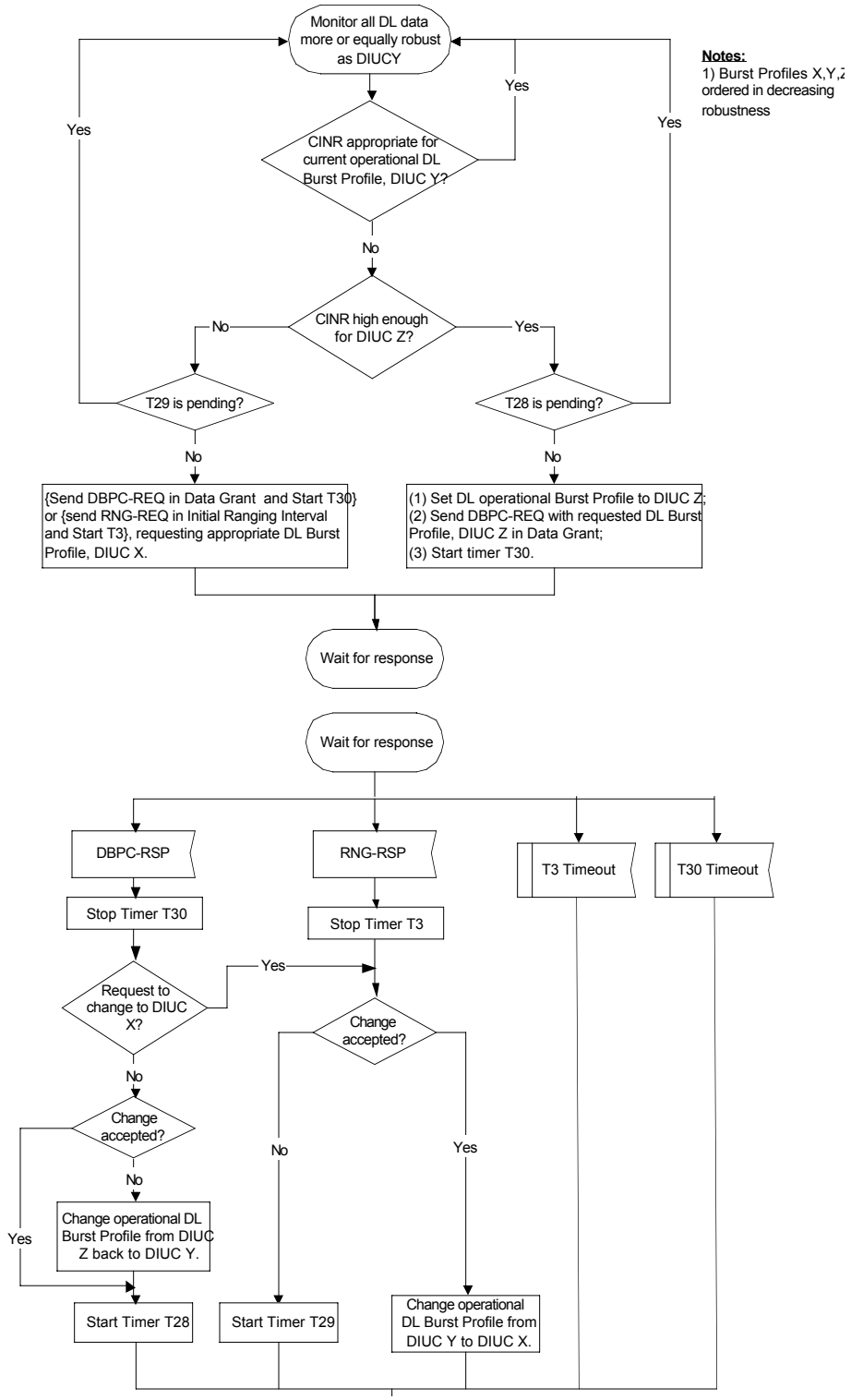


Figure 80a – State transition diagram for downlink burst profile management – SS

## *References*

[1] IEEE, “IEEE Standard for Local and metropolitan area networks Part 16: Air Interface for Fixed Broadband Wireless Access Systems,” IEEE Std 802.16-2004.
[2] Yuval Lomnitz, Comment 084, 802.16maint-04/04r9.
[3] Yuval Lomnitz, Yigal Eliaspur, Dov Andelman , “DL Burst profile selection unsuitable for OFDMA,” IEEE C802.16maint-04/13, 2004-08-19.
[4] Corrigendum to “IEEE Standard for Local and metropolitan area networks Part 16: Air Interface for Fixed Broadband Wireless Access Systems,” IEEE P802.16 -2004/Cor1/D1.
[5] David A Castelow, Gavin Meakes, Eyal Verbin etc., “Problems with DBPC Messages and a Solution”, IEEE C802.16maint-04/49r1