Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**[Terminal Assisted QoS support]**
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Re:	IEEE 802.16d Terminal assisted QoS support
Abstract	This contribution contains a proposal that helps to support QoS requirement of services by providing each mobile terminal's unique status, such as channel status and internal memory usage status, to the corresponding network.
Purpose	Propose to IEEE 802.16 d or e ad-hoc group
Notice	
Release	
Patent Policy and Procedures	

Terminal assisted QoS

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Introduction

Supporting the QoS is one of the critical requirements of the wireless system. For an obvious example, for a mobile user who can be located near base station (BS) or those who are located in cell boundary, it is impossible to provide a stable broadband service to the users with a guaranteed data rate due to the fact that the signal attenuation of the user is quite different for those two cases. This proposal contains a scheme that helps to support QoS requirement of services by providing each mobile terminal's unique status, such as channel status and internal memory usage status, to the corresponding network.

A terminal checks the downlink channel condition and the availability of its internal memory in order to conclude whether it can accommodate extra bandwidth beyond the assigned data rate by the network. Only if terminal's channel condition is better than the threshold and it's internal memory is sufficiently empty enough to receive more data, it sends a one bit flag in an uplink control message, such as bandwidth request message, in order to request extra bandwidth. Receiving the flag which reflects the request of more bandwidth of the corresponding terminal, BS determines whether there is bandwidth available. If extra bandwidth is available, BS assigns more bandwidth to the corresponding terminal. Receiving extra data from the BS, the terminal stores those data in the internal memory in order to prepare for upcoming channel environment in which the system cannot provide the committed bandwidth due to the harsh channel environment. If extra bandwidth is not available in BS, it simply ignores the request.

With the scheme described above, the terminal can receive extra data from the BS, so that it can prevent potential service disconnection during handover procedure, in which terminal, most likely, experiences a weaker channel condition. Furthermore, the BS can dissipate residual resources during this procedure and make terminal's session complete earlier than its original schedule.

Proposed Mechanism

Figure 1 shows the typical signal qualities of a mobile terminal with respect to the distance from the corresponding BS. As shown in figure 1, the signal quality of a mobile terminal attenuates rapidly when the distance from the corresponding BS is increased. Therefore, a mobile terminal cannot obtain the signal quality required for its application when it is located far from the BS.

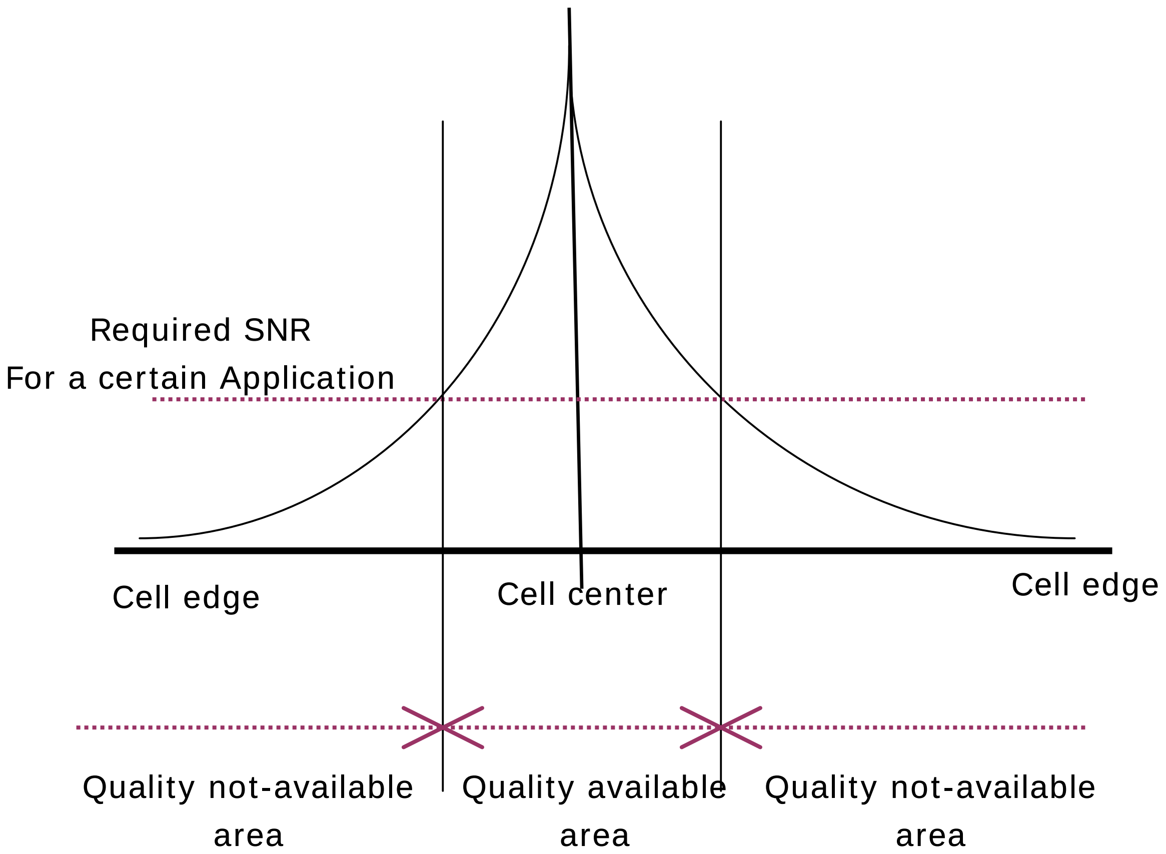

Figure 1: Typical signal qualities of a mobile terminal with respect to the distance from the corresponding BS

A simple scheme that helps to resolve the above problem by providing terminal status to BS in order to prepare an uncertain future channel condition is proposed. The following is the mechanism of operations:

- When a mobile terminal's downlink channel quality is higher than the channel quality threshold and the data occupation in the internal memory of the mobile terminal is less than the internal memory threshold, the mobile terminal sends a flag to the BS to indicate that it can receive more data than originally scheduled or negotiated.
- Receiving the flag from the terminal, the BS scheduler checks whether it has extra resources that can be assigned to the corresponding mobile terminal. If there is an extra resource, then the BS simply assigns more resource to the corresponding terminal. Otherwise, the BS simply ignores the request of the terminal. The BS classifies and maintains the list of terminals

according to the flag received from each terminal. This classification will be valid until a new flag from a terminal arrives.

Proposed Text changes

[Modify the Figure 23 in page 56, IEEE802.16-REVd/D3-2004]

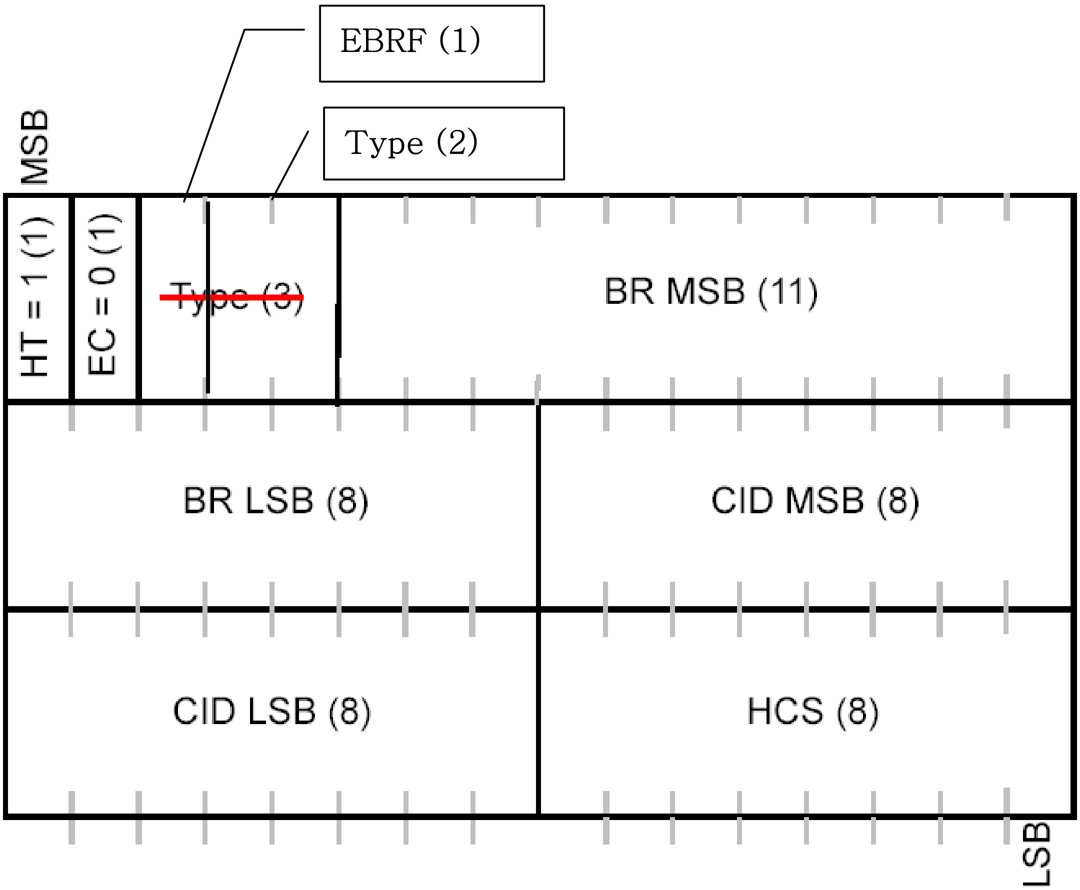

Figure 23—Bandwidth request header format

[Modify the sentences, line 35 – 36 page 56, IEEE802.16-REVd/D3-2004]

To:

The Bandwidth Request shall have the following properties:

a) The length of the header shall always be 6 bytes.
b) The EC field shall be set to 0, indicating no encryption.
c) The CID shall indicate the connection for which uplink bandwidth is requested.
d) The bandwidth Request (BR) filed shall indicate the number of bytes requested.
e) The allowed types bandwidth requests are "00" ~~"000"~~ for incremental and "01" ~~"001"~~ for aggregate
f) The Extra Bandwidth Request Flag (EBRF) is "0" for not requested and "1" for requested

[Modify the Table 7 in page 56, IEEE802.16-REVd/D3-2004]

Table 7 – Bandwidth request header fields

Name	Length (bits)	Description
BR	19	Bandwidth Request The number of bytes of uplink bandwidth requested by the SS. The bandwidth request is for the CID. The request shall not indicate any PHY overhead.
CID	16	Connection identifier
EC	1	Always set to zero
HCS	8	Header Check Sequence Same usage as HCS entry in Table 5
HT	1	Header Type =1
Type	2~~3~~	Indicate the type of bandwidth request header
EBRF	1	Indicate the extra resource request of the terminal