Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**S/N cued scheduling support in the downlink for IEEE 802.16d MAC**
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Re:	Sponsor Ballot Review of IEEE P802.16-REVd/D4-2004
Abstract	Adding support for S/N cued scheduling in the downlink
Purpose	Adoption
Notice	
Release	
Patent Policy and Procedures	

S/N cued scheduling in the downlink

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Introduction

Supporting the QoS is one of the critical requirements of the wireless system that is designed to use licensed band spectrum. Especially in BWA systems, targeting to accommodate broadband services having multiple QoS classes, stable provisioning of bearer according to committed QoS agreement is the most important parameter that can decide the fortune of the BWA business.
However, harsh wireless environment makes it hard for system designer to build the system that can guarantee stable QoS provision, because the air interface quality changes as a function of time (typically Doppler rate would be several Hz even for fixed SS). This proposal contains a scheme that enables the DL scheduler to take advantage of varying C/N conditions, such that resources may be allocated to SS based (among other considerations) on their temporary link quality.

Currently in IEEE 802.16d MAC there is no explicit connection between BW allocation in the downlink and SS C/N, and no consideration of other factors that may limit of SS ability to take advantage of temporary advantageous link conditions, like limited memory resources. In order to devise a solution to this problem we can take as an example the process of allocating BW for a SS in the uplink. In such a case, the BS typically knows the link quality (being the receiver), but does not know the amount of BW required by the SS. This knowledge will typically be provided to the BS by using a BW request header. When allocating BW in the downlink, on the other hand, the BS knows the amount of BW required (being the transmitter), but does not know the SS link quality (this metric is reported but not in a manner that is associated with sceduling). The BS also does not know whether the SS is capable of receiving all the data (because of possible lack of memory. Resources).

A simple way to solve the problem described above is to take advantage of unused bits in the existing BW-request header, and to define a new ‘DL-allocation-cue header’ that will convey the missing information to the BS (that is available memory and DL C/N.

Proposed text changes

Add a new section 6.3.2.1.3 with the following text:

6.4.2.1.3 DL Allocation Cue header

The DL Allocation Cue PDU shall consist of DL Allocation Cue header alone and shall not contain a payload. The DL Allocation Cue PDU shall only be supported by systems operating below 11GHz. The DL Allocation Cue Header is illustrated in Figure aaa.

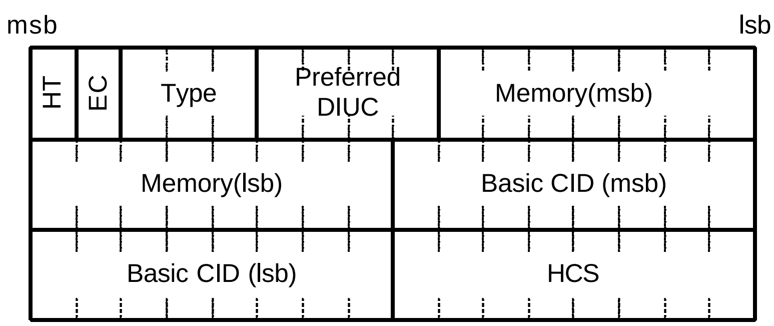

Figure aaa—DL Allocation Cue header format

The DL Allocation Cue 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 be the basic CID of the SS.
d) The Bandwidth Request (BR) field shall indicate the number of bytes requested.
e) The allowed type for DL allocation cue is “011”.
An SS receiving a DL Allocation Cue header on the downlink shall discard the PDU. The fields of the DL Allocation Cue header are defined in Table bbb. Every header is encoded, starting with the HT and EC fields. The coding of these fields is such that the first byte of a MAC header shall never have the value of 0xFX. This prevents false detection of the stuff byte.

Table bbb—DL Allocation Cue header fields

Name	Length (bits)	Description
Preferred DIUC	4	Index of the DIUC preferred by the SS
Memory	15	Memory available in the SS for receiving data (in 4-byte words)
Basic CID	16	SS basic CID
EC	1	Always set to zero
HCS	8	Header Check Sequence same usage as HCS entry Table 5
HT	1	Header Type = 1
Type	3	Type = '011'

Add a new section 6.3.6.7 with the following text:

6.4.6.7 C/N enhanced DL BW allocation

C/N enhanced DL BW allocation is a scheme that enables the DL scheduler in the BS to take advantage of varying C/N conditions experienced by the SS. When employing this scheme, the BS scheduler may allocate BW to SS based (among other considerations) on their temporary link quality. This scheme is support by utilizing the DL Allocation Cue headers (see 6.3.2.1.3). The support of this scheme is optional for both BS and SS in the sense that a SS is not required to send DL Allocation Cue headers, and a BS is not requied to schedule DL BW in accordance with cues provided by any SS.