Project	**IEEE 802.16 Broadband Wireless Access Working Group** <http://ieee802.org/16>	
Title	**Basic Resource Block Design for IEEE 802.16m**	
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Re:	IEEE 802.16m-08/005 –Call for Contributions on Project 802.16m System Description Document (SDD); Proposed 802.16m Downlink Physical Resource Allocation Unit	
Abstract	This Contribution proposes the basic resource block design for IEEE 802.16m	
Purpose	To be discussed and adopted by TGm for use in the IEEE 802.16m SDD	
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Basic Resource Block Design for IEEE 802.16m

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1. Introduction

In IEEE 802.16m, the flexible basic resource block should be designed in order to satisfy the requirements of different service types, and to improve the resource scheduling efficiency of the whole system, etc. A lot of factors affect the design of the resource block. For example, the Frame structure and the possible scheduling scheme. In addition, the resource block design should refer to the requirements related to the resource scheduling in the IEEE 802.16m SRD. In this contribution, we propose the basic resource block design based on the proposed resource block for IEEE 802.16m system.

2. Resource Block Design

2.1 General Frame Structure

To meet the system requirement of IEEE 802.16m, the basic resource block design should consider the frame structure. Here we give a general frame structure. In this contribution we will discuss the resource block design based on the general frame structure elements: sub-frame and sub-frame partition, as showed in Fig. 1.

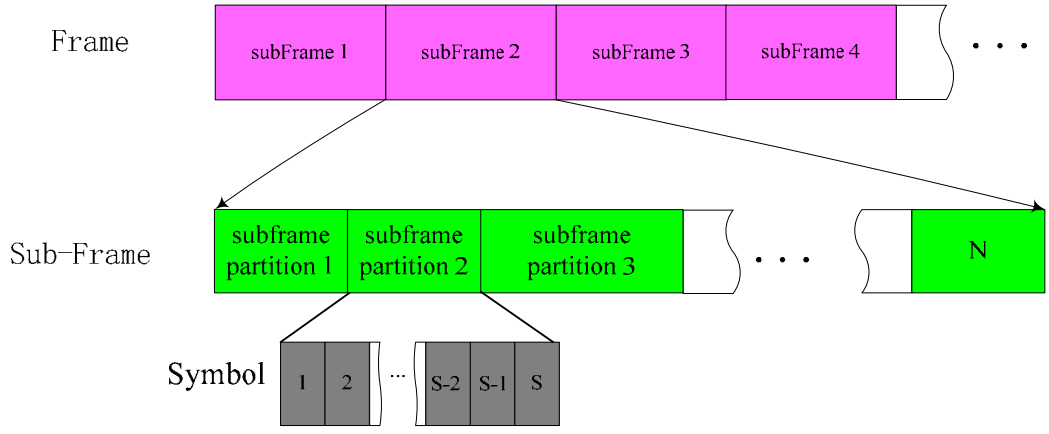

Figure1. General Frame Structure for 16m system

2.2 Resource Block

Considering the IPv4 protocol, the VoIP codec rate and the corresponding packet size for the popular VoIP codecs are listed in the table 1.

Table1: VoIP Packet Size

Codec Type	Rate(kbps) /Period(ms)	Payload (Bytes) Active/Inactive	Compressed Header (Bytes)	Total (Bytes) Active/Inactive	Total(Bits) Active/Inactive
AMR	12.2 /20	33/7	11	44/18	352 /144
	10.2 /20	28/7	11	39/18	312 /144

	7.95 /20	22/7	11	33/18	264 /144
	7.40 /20	21/7	11	32/18	256 /144
	6.70 /20	19/7	11	30/18	240 /144
	5.90 /20	17/7	11	28/18	224 /144
	5.15 /20	16/7	11	27/18	216 /144
	4.75 /20	15/7	11	26/18	208 /144
G.723.1	5.3 /**30**	19.875/0	11	30.875/0	247 /0
	6.3 /**30**	23.625/0	11	34.625/0	277 /0
G.729	8 /**20**	20/0	11	31/0	248/0
G.728	16 /**10**	20/0	11	31/0	248 /0
G.711	64 /**10**	80/0	11	91/0	728 /0

2.2.1 Basic Resource Block

During the resource block design, the following reasons are mainly considered.

1. To reduce the complexity of the resource scheduling.
2. To maximum the packing efficiency. During the activation state, a kind of VoIP codec may generate the data at a certain rate of all supported rates and output VoIP packets with the different size, but the packet length is constant during the silence period no matter which rate is selected during the activation period. For example, the packet length during of the silence state is always 144 (160) bits when IPv4 (IPv6) is used, so we should pay more attention to the silence packet than the activation packet when designing the basic resource block. In addition, the silence period of a user usually occupies 50 percent during a whole conservation. Consequently, the designed basic resource block according to the silence packet can remarkably improve the scheduling efficiency.

Because of three reasons mentioned above, the basic resource block size for 16m system is proposed and shown in Table 2 and Fig.2.

Table2: Basic Resource Block Size

Link Direction	sub-carrier Number	Symbol Number	Total pilot subcarrier number in one RB	Total data subcarrier number in one RB
Downlink	20	2	4	36

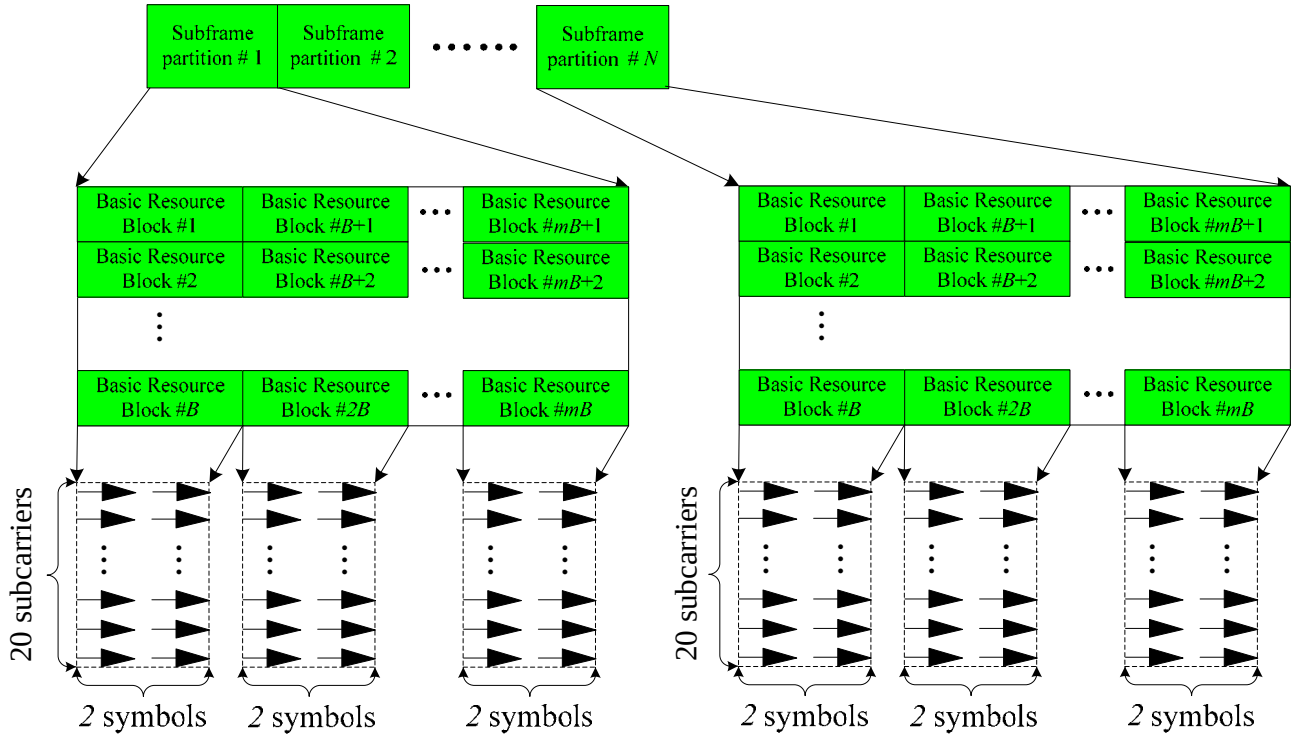

Figure2. The Basic Resource Block for 16m System

The proposed basic resource block is very suited to transmit the silence packet of AMR codec when IPv4 is used. For example, transmitting a silence packet exactly needs

4 Basic RB if QPSK1/2（No Repetition）is used;

or 2 Basic RB if 16QAM1/2（No Repetition）is used;

or 1 Basic RB if 64QAM2/3（No Repetition）is used;

At the same time, the proposed basic resource block can be very suited to transmit the silence packet of AMR codec when IPv6 is used. For example, transmitting a silence packet needs

3 Basic RBs if QPSK3/4（No Repetition）is used;

or 1 Basic RBs if 64QAM3/4（No Repetition）is used;

If a larger basic RB is defined, the scheduling granularity will be too large and unwanted resource waste will exist.

Obviously, the basic resource block design above considers more on the transmission for VoIP than the complexity of the scheduling. However, the scheduling complexity can be solved by the extended resource block described in section 2.2.2.

2.2.2 Extended Resource Block

In different parts of one sub-frame/sub-frame partition or between different sub-frames/sub-frame partitions, providing the resource blocks with different size or variable granularity are very meaningful, especially when transmitting small data or VoIP packet. We propose a concept, namely extended resource block (abbreviated by ERB), which can be obtained by extending multiple physical (or logical) basic resource blocks. This kind of extension can be in frequency domain, time domain or both domains.

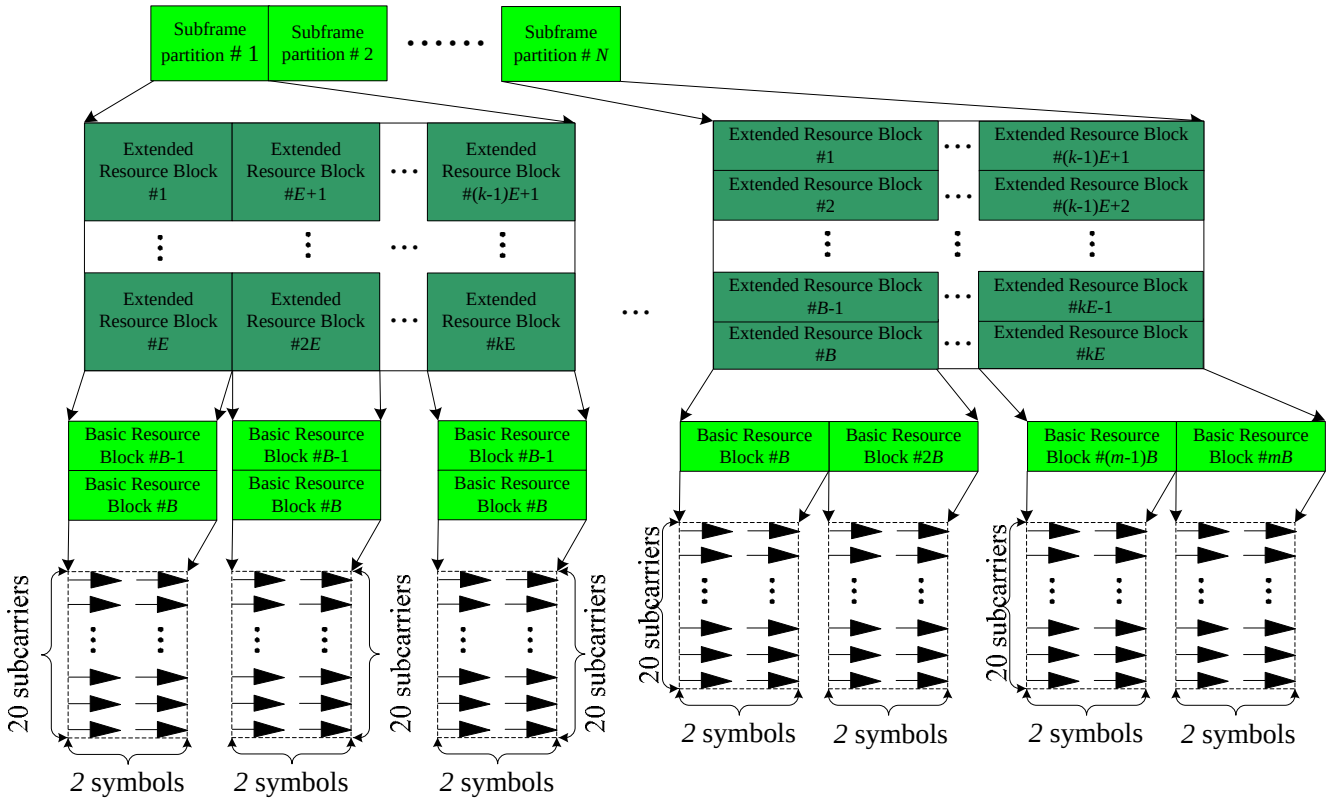

Figure3. The Extended Resource Block in one sub-frame partition

Text Proposal for the 802.16m SDD

========== *Start of Proposed Text* ==========

Section x.x: Resource Block

1. Basic resource block

Basic resource block is the minimum resource allocation unit in the downlink for data (or control signal) transmission. The Basic Resource Block is 20 sub-carriers by 2 symbols.

2. Extended (Concatenated) Resource Block

Extended (concatenated) Resource Block can be obtained by extending or concatenating multiple same basic resource blocks which may be physical continuous or discontinuous. This kind of extension can be in frequency domain, time domain or both domains. In addition, the extension operation can proceed in different parts of one sub-frame/sub-frame partition or between different sub-frames/sub-frame partitions.

========== *End of Text Proposal* ==========

Reference

1. WiMAX 16m system description document
2. WiMAX 16m evaluation document
3. C80216m-08_081-Base Frame Structure for IEEE 802.16m