Project	**IEEE 802.16 Broadband Wireless Access Working Group** <http://ieee802.org/16>	
Title	**Uplink resource allocation unit for 802.16m**	
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Re:	IEEE 802.16m-08/016r1 –Call for Contributions on Project 802.16m System Description Document (SDD); Uplink Physical Resource Allocation Unit (Resource blocks and Symbol Structures).	
Abstract	This contribution proposes uplink resource allocation unit for 802.16m system.	
Purpose	To be discussed and adopted by TGm for use in the IEEE 802.16m SDD	
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Uplink resource allocation unit for 802.16m

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1. Introduction

In IEEE 802.16m, the uplink resource allocation unit should be designed in order to meet the requirements of following features, such as:

- Proper resource block size for scheduling efficiency
- Proper resource block structure for coverage improvement and spectral efficiency
- Pilot efficiency
- Impact on uplink control channel design
- Multiplexing of 16m and 16e.

In the IEEE802.16m system requirement document (SRD), it has been agreed that IEEE802.16m shall support the following features:

- legacy compatibility, coexistence, interference mitigation and power saving
- significantly improved coverage with respect to the reference system
- lower latency

Based on the requirements mentioned above, the uplink resource allocation unit design should be flexible to meet specific requirements under different scenarios. In this contribution, we propose the basic resource block design for IEEE 802.16m system.

2. Basic resource allocation unit design overview

Two types of resources are defined as follows:
- Localized: resource unit size : 18x6
- Distributed: resource unit size : 18x6, normal tile size: 9x6 , irregular tile size: 6x6

The structure of resource unit of different types:
- Localized: consecutive 18 subcarriers by 6 OFDMA symbols, as shown in figure 1
- Distributed:
  - normal RU: consecutive 9 subcarriers by 6 OFDMA symbols within one tile;
    two tiles consist of one resource unit with tile permutation within one subframe,
    example as shown in figure 2.
  - Irregular RU1: consecutive 9 subcarriers by 6 OFDMA symbols within one tile;
    RU1 spans two subframes;
    Two tiles consist of RU1 with tile permutation, while each tile is in one subframe, as shown in figure 3;
    Frequency diversity can be achieved.
  - Irregular RU2: consecutive 6 subcarriers by 6 OFDMA symbols within one tile;
    RU2 spans three subframes;

Three tiles consist of RU2 with tile permutation, while each tile is in one subframe, as shown in figure 4;
Frequecy diversity can be achieved.

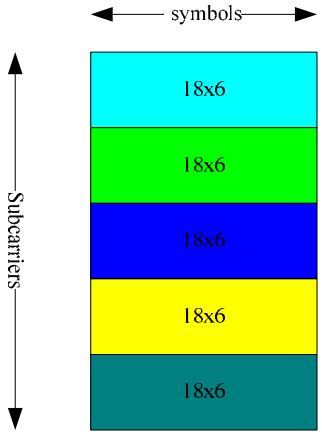

Figure 1 localized RU, each color represents one RU

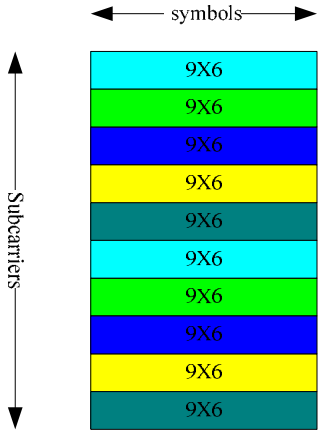

Figure 2 Distributed normal RU, each color represents one RU

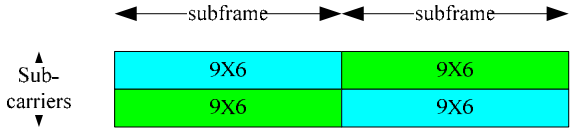

Figure 3 Distributed irregular RU1, each color represents one RU

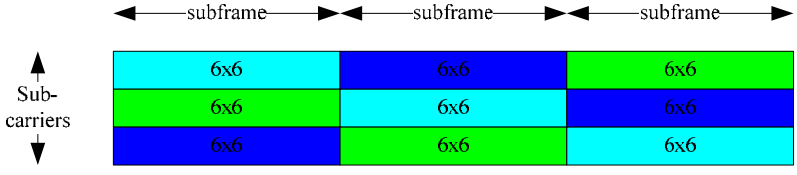

Figure 4 Distributed irregular RU2, each color represents one RU

3. Different RU usage scenarios

As shown in figure 5, the total resources are divided into different groups, which have different subchannellization method. Localized RU and distributed normal RU are used for localized group and distributed group1 respectively. While distributed irregular RU1 and RU2 are used for distributed group2 and 3 respectively.

Distributed irregular RU1 and RU2 can be used under the scenario where terminals are power limited and only one RU is scheduled for the terminal. When 2 uplink subframes can be concatenated for scheduling, irregular RU1 can be used under this power limiting circumstance, so that the terminal can collect more power to improve coverage or to increase the data rate by using higher MCS level. When 3 uplink subframes can be concatenated for scheduling, irregular RU2 can be used under this power limiting circumstance.

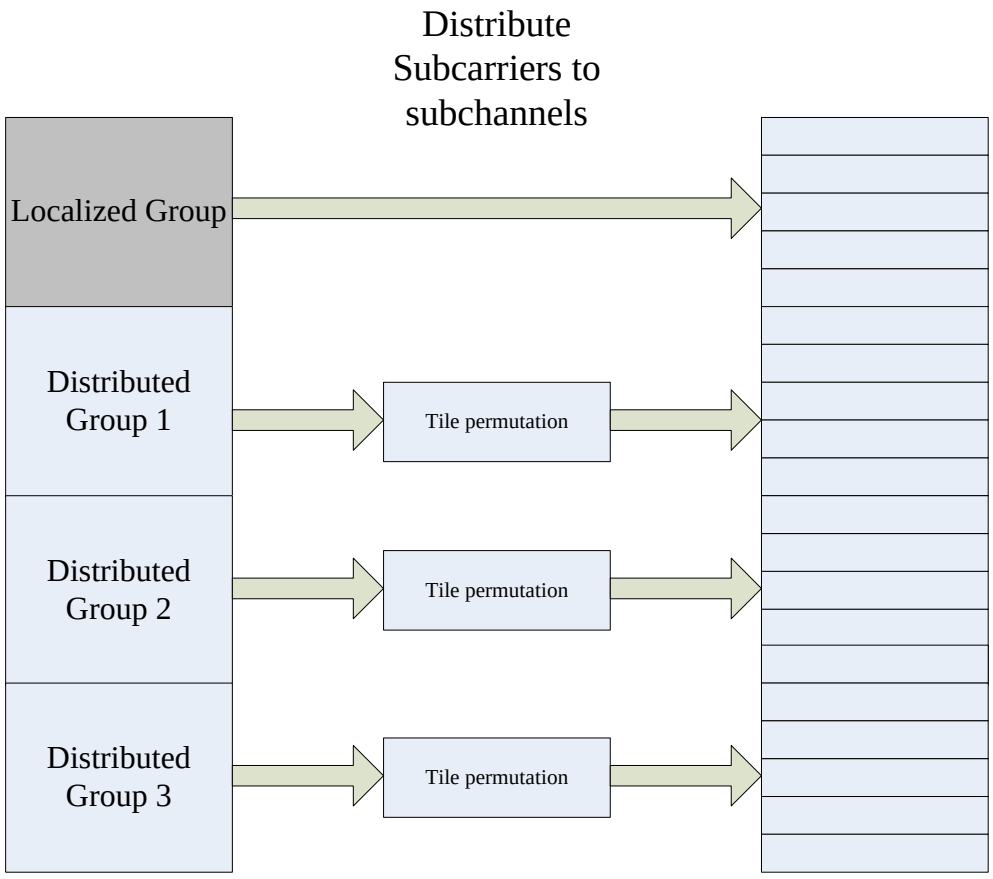

Figure 5. subchannelization

4. Extended RU for flexible scheduling

In most cases, a terminal can be scheduled for more than one RU. For the signaling efficiency, RUs may be extended to different sizes according to different traffic packet sizes. The extension can be in time domain, frequency domain or both depending on the specific scenario. For example, extension in frequency domain may

be applied to the terminals who have critical latency requirement. Extension in time domain may be applied to the terminals who are power limited without requiring critical latency. And also extension can be in both domain under some other cases.

Figure6 and 7 shows the example for extended RU. Where figure 7 gives the RU with the property of both collecting power and frequency diversity.

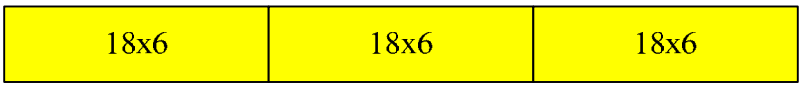

Figure 6 extended RU by concatenating three subframes

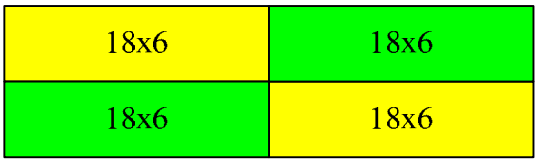

Figure 7. extended RU by concatenating two subframes and 2 subchannels

Text Proposal for the 802.16m SDD

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

Section x.x: Uplink Resource Block

1. Basic resource block

- Localized RU size: 18x6
- Distributed RU size : 18x6, normal tile size: 9x6 , irregular tile size: 6x6
  - Normal RU: consecutive 9 subcarriers by 6 OFDMA symbols within one tile; two tiles consist of one resource unit with tile permutation within one subframe,
  - Irregular RU1: consecutive 9 subcarriers by 6 OFDMA symbols within one tile; RU1 spans two subframes; Two tiles consist of RU1 with tile permutation, while each tile is in one subframe
  - Irregular RU2: consecutive 6 subcarriers by 6 OFDMA symbols within one tile; RU2 spans three subframes; Three tiles consist of RU2 with tile permutation, while each tile is in one subframe

2. Extended (Concatenated) Resource Block

Extended (concatenated) Resource Block can be made by extending or concatenating multiple same basic resource blocks which may be physically or logically contiguous. This kind of extension can be in frequency domain, time domain or both domains. In addition, the extension operation can proceed in a sub-frame partition.