

Proposal for IEEE 802.16m UL Resource Blocks and Channelization

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*<http://standards.ieee.org/faqs/affiliationFAQ.html>>

Re: IEEE 802.16m-08/016r1 – Call for Contributions on Project 802.16m System Description Document (SDD), on the topic of “Uplink Physical Resource Allocation Unit (Resource Blocks and Symbol Structure)”

Purpose: Adopt the proposal into the IEEE 802.16m System Description Document

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Scope

- This contribution proposes a new UL resource block structure and channelization for IEEE 802.16m
- The UL pilot design and control structures are presented in separate contributions (see C802.16m-08/348 and C802.16m-08/350).

IEEE 802.16m System Requirements

- The TGm SRD (IEEE 802.16m-07/002r4) specifies the following requirements:
 - Provide support for FFR (A.2.2)
- The proposed resource block and channelization design targets the above requirements.

Motivation

- The legacy 16e standard uses a TDM approach to multiplexing the different permutation zones. The disadvantages are
 - Reduced granularity in multiplexing the zones
 - Channelization is irregular with varying number of symbols
- Sub-frames are defined in 802.16m (refer to IEEE 802.16m-08/003r1) which contains 6 symbols
 - In order to improve the resource block (RB) and pilot structure, each RB should span 6 symbols and therefore the multiplexing of different zones should use an FDM approach
- In addition, the DL and UL RB structure should be aligned

Overview of Channelization Design

- New channelization and control channel design are defined for IEEE 802.16m sub-frames
- The channelization for control and traffic is confined within each sub-frame and spans across all OFDM symbols within the sub-frame.
- Extended sub-frames can be defined to concatenate the sub-channel resources across multiple sub-frames to reduce control overhead and improve UL coverage. This is for FFS.

Channelization (1/3)

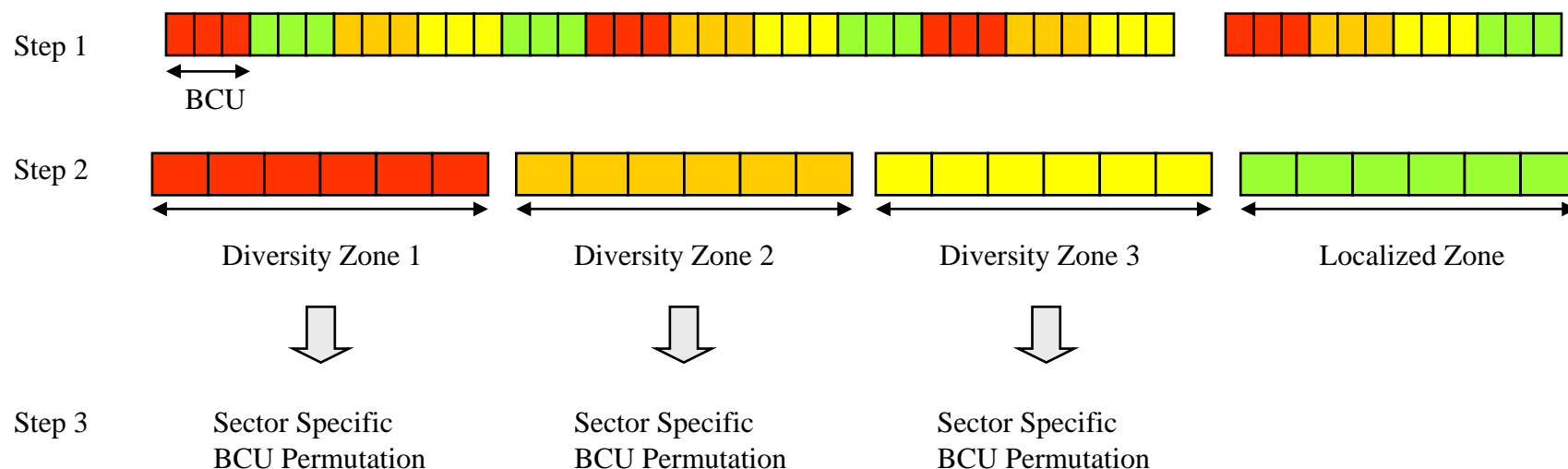
- The bandwidth is divided into a number of zones
- Each zone has a one-dimensional ordered list of resources, in units of Basic Channel Units (BCU)
- BCU
 - A BCU consists of 3 resource blocks (RB), where a RB is 12 sub-carriers and 6 OFDM symbols. The details of the RB definition and the pilot design are described in a separate contribution (see C80216m-08/348 “Proposal for IEEE 802.16m UL Pilot Structure”).
 - For a 10 MHz system, there are 24 BCUs.
 - Each BCU spans over all OFDM symbols in a sub-frame.
 - The partitioning of resources between the localized and diversity zone is in units of BCUs.
- The zones can be used for
 - Diversity assignments
 - Localized assignments (frequency selective scheduling)
 - Fractional frequency reuse (FFR) or interference avoidance.

Channelization (3/3)

- Defining a BCU size of 3 RBs has the following advantages
 - The RB size provides enough granularity and flexibility for VoIP assignments (see C802.16m-08/177 “Proposal for IEEE 802.16m VoIP Resource Allocation and Control”).
 - For non-VoIP assignments, the resource unit does not have to be as granular. In this case, assignments are in the units of BCUs.
 - For group assignments, such as VoIP, groups are allocated in units of BCUs, whereas individual VoIP users can be allocated resources in units of RBs.
 - This BCU size is an adequate size for proper trade-off between channel estimation performance and pilot overhead (see contribution C802.16m-08/348 “Proposal for IEEE 802.16m UL Pilot Structure”).
 - 3 RBs correspond to 394 kHz which provides adequate frequency selective scheduling performance
- The UL resources are assigned using a combination of a multicast message and separate unicast messages for each assignment. (The details of the resource allocation and control structure are described in contribution C802.16m-08/176 “Proposal for IEEE 802.16m Resource Allocation and Control Structure”).

Channelization Procedure

- Step 1: The entire band is divided into RBs, which consist of contiguous tones. Three contiguous RBs are grouped to form physical BCUs.
- Step 2: Each BCU is allocated to a zone, which can be either a diversity zone or a localized zone. Each zone consists of physical BCUs that are evenly spread out in the band.
- Step 3: The physical BCUs within each diversity zone are permuted using a sector specific BCU permutation to form logical BCUs. The BCUs within each localized zone are not permuted.



Summary

- The proposed resource block and channelization satisfies the requirements of the TGm SRD.
- The new resource block structure is designed to efficiently supports both VoIP and non-VoIP traffic.
- The new design also provides support for
 - Diversity resource allocation
 - Localized resource allocation
 - FFR or UL interference avoidance

Proposed Text for SDD

- Section 11.x DL Resource Blocks and Channelization
 - [*Add content of slide 6 to this section*]
- Section 11.x.1 Mapping of DL Physical Resources to Logical Resources
 - [*Add content and figure on slide 8 to this section*]
- Section 11.x.2 Channelization Procedure
 - [*Add content on slide 8 to this section*]