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Review:Performance Evaluation of Various Burst Mapping Algorithm for WiMAX Systems

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Abstract: WiMAX is an emerging technology and has many issues that are yet to be addressed. This paper aims at the burst mapping analysis and improvement of the resource allocation scheme for WiMAX. The main aim is to do Performance Improvement of WiMAX downlink OFDMA using Various Burst Mapping algorithms.

Keywords: WiMAX, OFDMA, IEEE 802.16e, Resource Utilization.

I. INTRODUCTION

Worldwide Interoperability for microwave access (WiMAX) constitutes one of the most promising candidate networking technology for the realization of the 4G vision, supporting high-speed, sustainable, and long-distance wireless connections (Joel Vanderpyen and Luarent Schumacher). WiMAX is based on the orthogonal frequency division multiple access (OFDMA), which is responsible for arranging bandwidth requests from the medium access control (MAC) to Physical (PHY) layer and vice versa in both time and frequency dimensions. Considering a WiMAX-based access network, the downlink scheduler, located in the base station (BS), receives the requests originating from all mobile stations (MSs) and forwards MAC requests to the mapper. The mapper decides on the final bandwidth distribution, taking into account the available resources in terms of slots, which define the minimum allocation unit in OFDMA systems. Very common downlink mapping algorithm is adopted as the main allocation policy that simply creates allocation rectangles to provide full support of the various downlink requests. The remainder of this paper is organized as follows. Section 2 Burst allocation problems and presents the analytical solution modelling its performance. Section 3 validates the analysis and Section 4 concludes the paper.

BURST ALLOCATION PROBLEM

In IEEE 802.16 standard, the resource for uplink (UL) and downlink (DL) transmissions involve the time and frequency Domains, which are represented by subcarrier and OFDMA Symbol, respectively. The resource is specially called bandwidth, and a unit of such resource is termed the OFDMA slot. An OFDMA slot is composed of a certain number of Subcarriers and OFDMA symbols.

A logical collection of contiguous of distributed subcarriers forms a sub channel. The data is sent in the slot-called burst, this is composed of a number of OFDMA slots. In addition, a burst is associated with a specific burst profile, which is made up of a set of transmission parameters, such as modulation and coding schemes. For simplicity, we use slot to represent OFDMA Symbol.

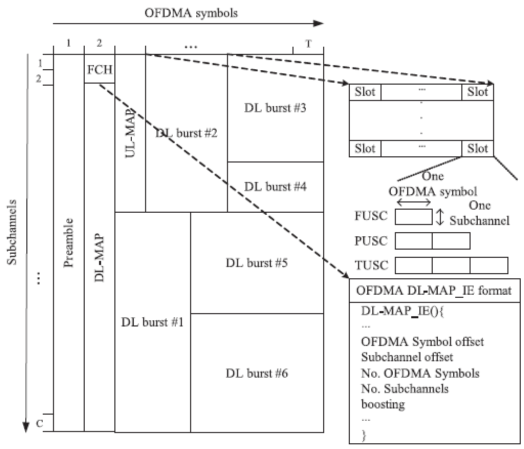

Fig 1. WiMAX OFDMA Frame Structure [2]

As illustrated in Fig. 1, DL and UL transmissions are respectively accomplished in the DL and UL sub frames in an OFDMA frame, which begins with the preamble, frame control header (FCH), DL-MAP, and UL-MAP, and followed by the DL and UL sub frames. In general, BS is regarded as a central controller in the IEEE 802.16 WiMAX system. It has to allocate the burst for the corresponding MS so as to enable the MS to receive the data from BS and transmit the data toward BS. It is worthwhile to note that the allocated downlink burst for each MS is considered a rectangle. The size of a burst is described by the parameters, number of OFDMA symbols and number of sub channels. The corresponding MS will obtain these parameters when receiving the DL-MAP message.

Recall that more MSs can be served and the network Throughput can be improved if BS can allocate bursts with high sub channel utilization to MSs. This paper introduces a Burst allocation problem (BAP), whose main objective is to efficiently arrange the shape, location and modulation scheme of a burst with high sub channel utilization. Although in WiMAX system DL and UL transmissions can be accomplished, the amount of DL traffic is generally higher than that of UL traffic in the majority of realistic

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applications, such as IPTV, remote file download, etc. Moreover, MS has low power of transmission compared to BS, and thus its power used in UL transmissions is most likely to exhaust quickly if using logically distributed sub channels. Therefore, in the standard, the BS allocates the UL burst mainly formed by the logically contiguous sub channels, as shown in Fig.1, and thus the standard does not adopt rectangle-shaped burst in the UL Sub frame. As a result, we argue that BAP is more significant especially in the DL sub frame, and thereby discussing burst allocation in the DL sub frame only. Recall that the standard Specifies that the burst assigned to each MS in the DL sub frame should be rectangular. The unused and unallocated Slots, respectively caused by Internal Bandwidth Wastage and External Bandwidth Wastage, will generate. The two kinds of wastage are regarded as the wasted slot.

II. ANALYSIS OF VARIOUS ALGORITHMS

2.1 Bucket Based Algorithm

Bucket Based Algorithm is a well-known and simple to implement mapping scheme, arranging MS requests in the grid of OFDMA slots provided by the WiMAX frame. There are two variants of the specific algorithm; the vertical and the horizontal. The difference between these two variants lies in the way consecutive slots are allocated to a MS. In the vertical case, a request occupies slots in a column-by-column manner, where each column corresponds to an OFDMA timeslot. On the other hand, horizontal Bucket Based Algorithm assigns OFDMA slots in a row-by-row basis; starting with the slots of the first sub-channel, the algorithm then proceeds with the allocation of the second sub-channel's slots and so on. Both Bucket Based Algorithm variants have to align with a basic condition derived by the 802.16 physical layer specifications for the downlink; each MS request must form a rectangular area of OFDMA slots called data region. On this ground, vertical Bucket Based Algorithm always allocates a MS request either to a part of a single column or to multiple whole columns and horizontal Bucket Based Algorithm always allocates a MS request either to a part of a single row or to multiple whole rows. Each request forwarded by the scheduler is examined to decide whether it is small enough to fit into a single column/row (vertical/horizontal Bucket Based Algorithm) or it has to be mapped to multiple columns/rows. It is noted that one column/row is allowed to include multiple MS requests as long as the rectangular shape constraint is satisfied. This process carries on until all requests are examined or the available slots are exhausted and there is no adequate frame space to handle the remaining requests.

2.2 SDRA Algorithm: Raster Based Algorithm

In general, the main task of burst allocation is to determine the shape, size, and location of a burst. How to determine these factors has been proved as an NP problem (Joel Vanderpyen and Luarent Schumacher), and thus it is more difficult to design a solution with absolutely low Computation complexity. As a practical scheme, namely SDRA, associated with several heuristic strategies for allocating downlink bursts. SDRA has four steps and is performed per frame, as shown in following Algorithm. Let *tcurrent* be the unit in the time domain for BS to allocate burst. Initially, *tcurrent* = 0 when no burst has been allocated. The four steps are described as follows:

Step 1: Determination of the Sequence of Burst Allocation
Step2: Determination of Burst Shape
Step 3: External Bandwidth Wastage Alleviation
Step 4: Burst Location Determination.

2.3 SRP Algorithm: Sequential Rectangle Placement

The Procedure of the SRP algorithm useful for the burst mapping problem. Different bursts cannot share the same sub channel during the same symbol time. So ceiling operations have to be considered, both at subcarrier Scale on frequency dimension and at symbol scale on time Dimension. These ceiling operations lead to wasted slots, whose quantity has to be minimized.

In SRP algorithm Bursts are treated sequentially and do not need to be sorted out. The allocation is done through vertical stripes of variable width. Each stripe is first composed of a single burst, with full height and rounded width. The number of wasted slot is evaluated. Then it sequentially tries to add each of the unallocated bursts. If adding the burst reduces the number of Wasted slots, it is added to the stripe. When adding any of the remaining bursts cannot reduce the number of wasted slots, start a new stripe, and try each unallocated burst.

PERFORMANCE EVALUATION

Above three algorithms Implimented in MATLAB scripts. We will detail first the parameters of these simulations, and then we will present some allocation results. Afterwards, averaged results on the amount of wasted slots and computational time will be presented.

SIMULATION PARAMETERS

We focused here on a TDD WiMAX system, with a DL: UL ratio of 2:1. So the DL sub frame lasts a 29-symbol duration, whose first one is preamble. We considered a 10 MHz bandwidth divided into 30 sub channels. As a result, the surface we have for burst mapping is of size 28 × 30, giving 840 slots. As (Joel Vanderpyen, and Luarent Schumacher) mentions, the FCH represents 24 bits. The DL-MAP has a fixed 88-bit part, plus 60 extra bits for each burst. The FCH and the DL-MAP are repeated 4 times and are transmitted with QSPK 1/2. Since we do not consider any UL sub frame, only a burst of random size will act as the UL-MAP.

No.	Algorithm	Waste Slots
1	Bucket	180
2	SDRA	210
3	SRP	150

Table 1. Algorithms Wastage slots [1]

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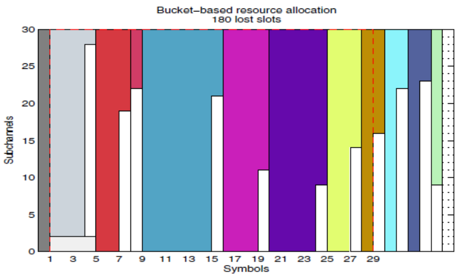
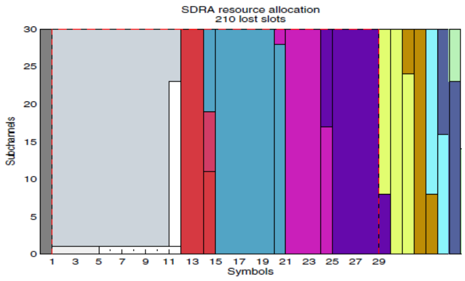
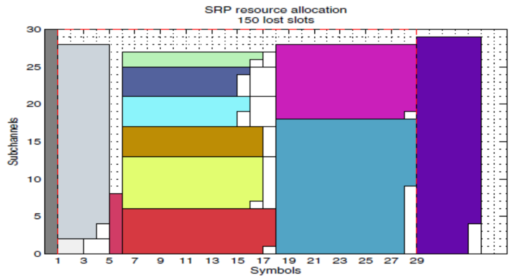


(a) Bucket-based



(b) SDRA



(c) SRP

Fig (a) (b) (c) Consider three reference algorithms sample allocator left corner are the FCH and the DL-MAP. The wastage -slots in different algorithms are shown in fig. Bucket based, SDRA, SRP. The first dark grey stripe is the preamble and the two light grey rectangles of the low.

CONCLUSION

The Proposed paper is evaluated such that the Maximum Numbers of Subscribers will allocate the given Bandwidth. For the Better Performance Scheduling is done on the Downlink Data Stream Considering the Different System Parameters. So By Developing WiMAX OFDMA Systems with proper Scheduling and Burst Mapping the Proposed System or Algorithm Performance is improved. Advantages of the Given System are maximum Utilization of Bandwidth and Number of Subscribers allocation in Available Bandwidth at the Same Time as per the Requirement.

REFERENCES

[1]. Joel Vanderpyen, and Luarent Schumacher, “Treemap-based Burst Mapping Algorithm for Downlink Mobile WiMAX Systems”, 978-1-4244-8327-3 IEEE 2011

[2]. Joo-Young Baek, and Young-Joo Suh, “Heuristic Burst Construction Algorithm for Improving Downlink Capacity in IEEE 802.16 OFDMA System”, IEEE Transaction on Mobile Computing, Vol. 11, No.1, January 2012

[3]. Hung-Chang Chen, Kuei-Ping Shish, Sheng-Shih Wang, and Chi-Tao Chiang, “An Efficient Downlink Bandwidth Allocation Scheme for Improving Subchannel Utilization in IEEE 802.16e WiMAX Networks”, 978-1-4244-2519-8 IEEE 2010