A REVIEW PAPER ON BURST SCHEDULING ALGORITHM FOR WIMAX OFDMA SYSTEM

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Abstract— Worldwide interoperability for Microwave Access (WiMAX) is a Broad Band Wireless Access (BWA) technology. It provides high data rates and multimedia services. It also supports Quality of Services (QoS) for various types of application. When large number of users use these application, the OFDMA is used to divide the channel into several subchannels and those subchannel can be provided for different users. The resource allocation method in OFDMA system manages the distribution and assignment of shared resources among the users serviced by the base station. The OFDMA resource allocation algorithm determines which user to schedule, how to allocate subcarrier to than, and how to determine the appropriate power levels for each user on each subcarrier.

Keywords— WIMAX, scheduling, OFDMA, burst scheduling, subframe.

I. INTRODUCTION

WIMAX, based on the IEEE 802.16, is one of the emerging technologies of broadband wireless system. Its transmission rate and distance can reach upto 75 mbps and 50 km in WiMAX network, mobile station can access the network in highly mobile condition. The multiple access technique based on OFDM modulation provides significant advantages in terms of high spectrum efficiency, robustness against multipath fading channels, resistance to multi users interference, and simplified equalization. IEEE 802.16 OFDMA divides the available resources (frequency and time) into several orthogonal subcarriers in frequency domain and into several adjacent symbols in time domain, or OFDMA subframe can be logically viewed as a rectangle of N subchannel (in frequency domain) and K slots (in time domain). The problem of assigning the N subchannels by K slots to users with the objective of maximizing the data transmitted over a single downlink subframe, is called WiMAX burst assignment problem. Figure 1 shows the frame structure of OFDMA, it is based on orthogonal frequency division multiplication transmission scheme that partition the available bandwidth into N orthogonal narrowband subcarriers. The subcarriers are placed very close to each path propagation and fading and resolve Inter Symbol Interference (ISI). In OFDMA subcarrier is divided into groups of subcarrier, each group is named a subchannel which is allocated to a user at a given symbol.

Each frame is divided in to Downlink and Uplink subframes seprated by Transmit/Recive and Receive/Transmit transition gap to prevent DL and UL transmission collision.

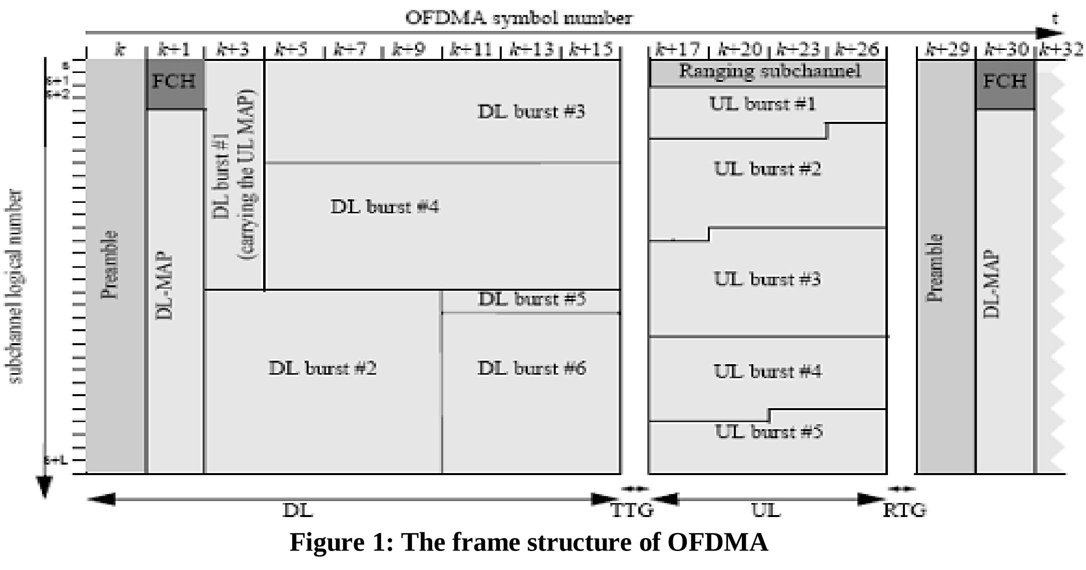

Figure 1: The frame structure of OFDMA

other, which results in high spectral efficiency by dividing the bandwidth in to N subcarrier. This results in longer symbol duration for each substream which reduces the influence of multi-

Preamble: The preamble, used for synchronization, is the first OFDM symbol of the frame.

Frame control Header (FCH): the FCH follows the preamble. It provides the frame configuration information such as MAP message length and coding scheme and usable sub-channels.

In the downlink subframe, two management messages DL-MAP and UL-MAP are transmitted which indicate the Bandwidth allocation for data transmission in both the downlink and uplink direction respectively.

Burst: In OFDMA a data region (or burst) is a two dimensional allocation of a group of slots; i.e. group contiguous subchannels, in a group of contiguous OFDMA symbols. Figure 2 shows the resource allocation in WiMAX OFDMA.

Downlink resource allocation can be done in two steps. In the first step, the scheduler decides the allocation (number of slots to be allocated) to each Mobile Station based on demand (the number of packets to be sent to a station); capacity (total available slots); and Quality of Services (QoS). Thus scheduler prioritized the demand or say traffic. In the second step the mapping algorithm is used and this traffic is mapped to a burst. In the following section two practical method will be analyzed to assign bursts that maximize the scheduled data.

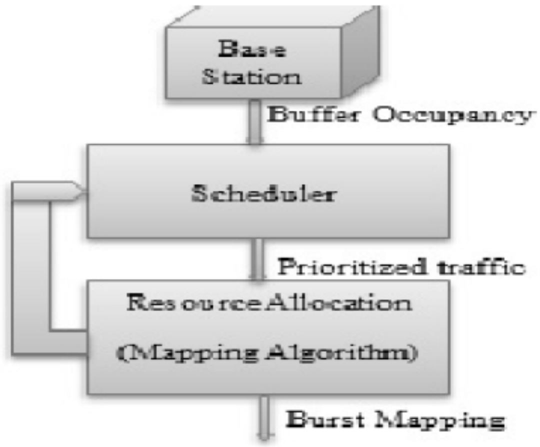

Figure 2: Resource allocation in WiMAX DL OFDMA

A. Burst Size Method :

- In this method, assume all users have the same channel quality over all subchannels and therefore have the same SINR (signal to interference plus noise ratio) and MCS (Modulation and coding scheme) over all subchannels.

In this method, scheduled users based on their demand as follows

1. For each user, M calculate the number of slots require to satisfy dm (user demand, the number of packets to be sent to a station); denote this S_m:

$$S_m = \left\lceil \frac{d_m}{b_{all}} \right\rceil$$

2. Sort S_m in descending order.
3. Divide S_m in two sets.
   a) Set of users that require more than k slots ($S_m \geq k$), denote this set as S_{large}.
   b) Set of users that require less than k slots ($S_m < k$), denotes this as S_{small}.
4. Start assigning the users to slot as follows:
   a) Start assigning users from S_{large} in order assign each user to $\left\lceil \frac{S_m}{k} \right\rceil$ consecutive subchannels.

In this method, if the assigned user demand dm requires more than one subchannel to be satisfied, there could be wasted slots in the last subchannel allocation to user m, denote this wasted slot as Sw_n, The wasted slots per assigned user can be calculated as

b) Start assigning users from S_{small} in order using the first fit decreasing (FFD) b_{in} – packaging method.

Figure 3 shows the flow chart of Burst Size Method

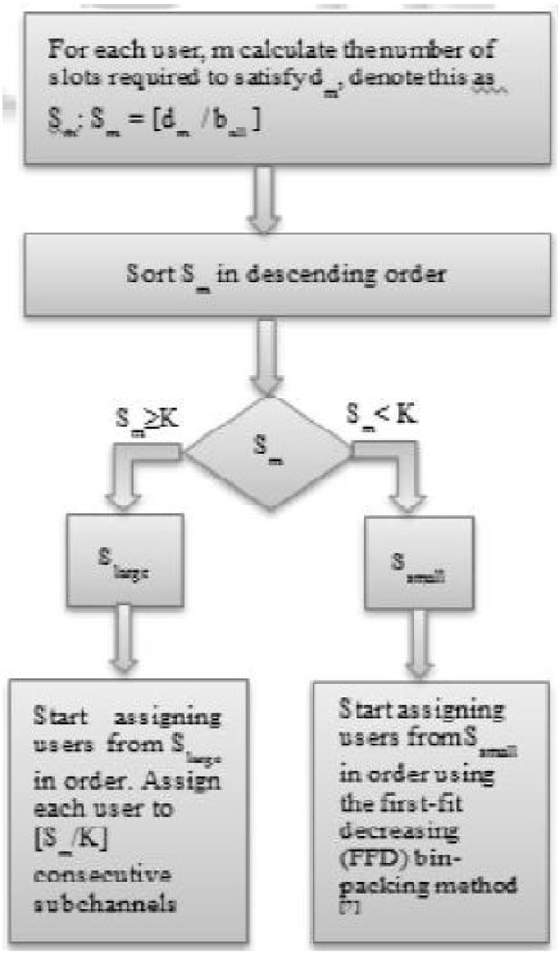

Figure 3: Flow chart for Burst Size method

$$S_{w_n} = k\left\lceil \frac{S_m}{k} \right\rceil - \left\lceil \frac{d_m}{b_{all}} \right\rceil$$

B. Best Channel Method

In this method, it is not necessary that all users have the same channel quality over all subchannels and therefore not have the same SINR and MCS over all subchannels. The base station maintains B sets of subchannels. Each set in B is sorted based on the number of slots needed to meet the user demand.

Best channel method is a more general case where users have different channel quality on different subchannels. Some users might have a good channel quality on subchannel n while others might have low or bad channel quality over the same subchannel. Figure 4 shows the flow chart for the best channel method.

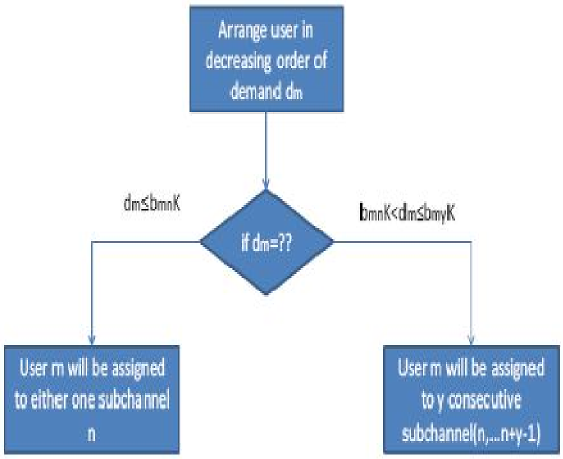

Figure 4 : Flow chart for best channel method

In best channel algorithm, user m is assigned to the best channel or set of concecutive subchannels that have slots available to satisfy d_m. User m will be assigned to either to either one subchannel n if $d_m \leq b_{mn} K$ or to y concecutive subchannels (n,……….,n+y-1) if b_{mn}K< $d_m \leq b_{my} K$ where $y = \frac{d_m}{K b_{my}}$ and b_{my} is the MCS of user m over the y consecutive subchannels.

CONCLUSION

WiMAX is a wireless communication standard designed to provide high-speed Internet access to home and business subscriber. In this paper two burst assignment algorithm namely Burst size method and Best channel method for WiMAX OFDMA are studied. By comparing both burst assignment algorithm we come to a conclusion that the best the best channel method is more efficient than burst size methods in terms of throughput, because subscriber will take advantage of multiuser diversity and assigning each user to slots on the subchannel with the superior quality.

REFERENCES

[1] Ashraf Nusairat and Xiang – Yang Li, "WiMAX/OFDMA Burst Scheduling Algorithm to Maximize Scheduled Data "IEEE TRANSACTIONS ON MOBILE COMPUTING , VOL. 11, on NOVEMBER 2012.

[2] Zeyad T. Sharef, Ammar E. Alaradi and Bara'a T. sharef "Performance Evaluation for WiMAX 802.16e OFDMA Physical Layer", Computational Intelligence, Communication Systems and Networks (CICSyN), 2012 Fourth International Conference on 24-26 July 2012.

[3] Jia- Ming Liang, Jen-Jee Chen; You – Chiun Wang ; Yu-Chee Tseng "A Cross – Layer Framework for overhead Reduction, Traffic Scheduling, and Burst Allocation in IEEE 802.16 OFDMA Networks" , Vehicular Technology, IEEE Transactions on (Volume:60, Issue:4) May 2011

[4] William P. Furlong and Ratan Guha "OFDMA Extension of NS-3 WiMAX Module", Computer Modeling and Simulation (EMS), 2010 Fourth UKSim European Symposium on 17-19 Nov. 2010.

[5] T. Ohseki, M. Morita, and T. Inoue, "Burst Construction and Packet Scheme for OFDMA Downlinks in IEEE 802.16 Systems," in Proceeding of the IEEE Global Telecommunications Conference (GLOBECOM), 2007, pp. 4307 – 4311.

[6] K.-P. Shih, H.-C. Chen, C.-T. Chiang, and T.-H. Hsieh, "Channel – Aware Subchannel Renumbering and Downlink Burst Allocation for IEEE 802.16 OFDMA Systems," in Proceedings of the IEEE Wireless Communications and Networking Conference (WCNC), 2010.

[7] D.S. Johnson, " Fast Algorithms for Bin Packing," J. Computer and System Sciences vol. 8, no. 3, pp. 272-314, June 1974.

[8] "Mobile WiMAX – Part I: A Technical Overview and Performance Evaluation", WiMAX Forum, 2006.

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