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Title: RESOURCE ALLOCATION IN OFDMA WIRELESS NETWORKS

Abstract

WiMAX is a wireless broadband access technology based on IEEE802.16 standard which aims to provide very high data rate services, at different quality-of-service levels, under high mobility. WiMAX uses OFDMA to efficiently allocate the available radio resource among the users. OFDMA WiMAX networks allocate frequency–time resources on a per-frame basis using dynamic resource allocation. The information about resource allocation is delivered in map messages at the beginning of each frame. Therefore, the resource allocation parameters and the amount of allocated resources can be changed frame by frame. This highly flexible resource allocation mechanism allows WiMAX systems to meet their requirements. However this flexibility gain throws big challenges on its resource allocation process. One key performance factor of OFDMA resource allocation is its downlink burst allocation. In IEEE802.16 standard based OFDMA the downlink data is allocated into down link frames in the form of rectangular slots called burst. This constrain converts the allocation into a two-dimensional rectangle packing NP problem. The standard leaves details of allocating mechanism as an open issue for researchers and manufacturers. In this thesis, we focus on Downlink burst allocation problems for IEEE802.16 WiMAX networks.

- Several burst allocation schemes for OFDMA-based WiMAX networks are surveyed to get deep insight into the burst allocation problems and to help identify key factors and corresponding trade off issues associated with the design of downlink burst allocation algorithm for IEEE802.16 WiMAX. In this survey we found that radio resource utilization in OFDMA-based WiMAX networks depends highly on the efficiency of burst allocation algorithms. Also there are several key performance issues coupled with burst allocation such as Quality of Service (QoS) requirements, power consumption and overhead reduction.

- Implementation of downlink burst allocation algorithm for IEEE 802.16 WiMAX in Qualnet simulation software has been discussed. Several WiMAX simulation scenarios have been conducted in QualNet and the collected result shows that the implemented burst allocation algorithm through Qualnet is not in conformity with the standard. Therefore we implemented one of the recently proposed burst allocation algorithm which conforms to the standard namely, eOCSA (enhanced One Column Striping with nonincreasing Area first mapping). In addition some improvement in eOCSA algorithm has been suggested.

- WiMAX supports several service classes and each service generates different burst sizes. However, most of the proposed allocation algorithms do not account for the effect of the number and sizes of the bursts on the allocation algorithm. In this context, we study effect of burst sizes on the burst allocation algorithm and we propose a novel Adaptive Burst Allocation algorithm (ABA) for downlink IEEE802.16 WiMAX networks. The proposed algorithm allocates the burst vertically to reduce burst time slots which leads to minimized SS power consumption, meets requirement of the rectangle shape allocation, achieves high through-put by allocating the larger burst first at the beginning of each column and avoids fragmenting the burst to reduce DL-MAP overhead. The algorithm is based on column strips and its basic idea is to select the adaptive strip column width based on number of the bursts to be allocated. The bursts are allocated in such way that the unused slots in the column are minimized. The performance of the proposed algorithm is compared with that of eOCSA. Simulation results show that the proposed algorithm achieves higher allocation efficiency and minimizes the unused slots.