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An Enhanced Solution for Traffic in Wireless Systems

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ABSTRACT: The Wireless Access System is an emerging trend. The sharing of resources in such systems is a complex one due to its heterogeneous nature. Thus Quality of Service in such systems is a crucial one. In this scheme a class based packet scheduling algorithm is proposed. The proposed scheme employs practical economic models through the use of novel utility and opportunity cost functions to simultaneously satisfy the diverse QoS requirements of the mobile users and to maximize the revenue of the network operators. Unlike the existing scheme, the proposed scheme is general and can support multiple QoS classes with the users having different QoS and traffic demands. It minimizes the revenues of the network operators. When compared to existing schemes, the proposed scheme satisfies the Quality of Service on different demands such as traffic and user counts. This supports three conditions of traffic situations such as best effort traffic, traffic with minimum data requirements, and traffic with maximum data requirements.

I. INTRODUCTION

Wireless Access System is also called as WiMAX. These systems can support point to multipoint communication. In such systems the heterogeneous users will share resources according to their requirements. Mobile WiMAX is the WiMAX mechanism incarnation that has the most commercial interest to date and is being deployed in many countries. Mobile WiMAX is also the basis of future revisions of WiMAX. The quality of service provisioning in wireless access system is performed in three levels. They are admission level, class level and packet level. The admission level QoS provisioning is responsible for accepting or rejecting new users' connections. It aims at satisfying the long term QoS of users by maximizing the number of admitted connections while maintaining the QoS of ongoing ones. The class level QoS provisioning deals with the aggregate demand of the admitted users. It determines the number of transmission time frames that each QoS class needs in order to maintain the QoS of its admitted users. The packet level QoS provisioning is utilized in order to determine which of the users' packets are transmitted in a single frame. The functionality of the packet level QoS provisioning is therefore equivalent to the packet scheduling in the wireless access systems.

II. EXISTING SYSTEM

The scheduling concepts that are being used for obtaining maximum QoS are already present which may be 1) State-of-Art Packet Scheduling, 2) Score Based Opportunistic Scheduling and 3) Utility Based Resource Allocation and Scheduling. The earlier method [3] is delay sensitive such that each packet should be transmitted within the delay bound. Each traffic type can have a packet loss rate (PLR) requirement. Call-level QoS in a cellular system, a new call will be blocked or dropped if no sufficient capacity. In the opportunistic scheduling [2] the packet delay tolerance of the data application allows the system flexibility in scheduling user packets. Also it ensures transmission occurring while radio conditions are favorable. During recent scenarios [7] the cross layer resource management framework is proposed for the utility optimization which includes resource management, QoS architecture and rate and delay based multi channel scheduling. In these existing schemes the effective resource management lacks while providing QoS. Also it selects the users with high data rate compared with its own rate. It neglects the low rate and average rate users. In utility based scheme it represents the each user by a utility function depending on the user traffic type. It provides fairness only for the best effort users and avoids delay sensitive users.

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III. WORK DONE

This paper proposes a novel packet scheduling scheme at the base station for next generation wireless access systems. This scheme supports multiple classes of service for the users having different QoS and traffic. It satisfies the conflicting requirements of the users and network operators. Also this will maximizes the throughput and offers fair distribution. It enhances the support of the existing applications and will enable the development of a wide range of heterogeneous, content rich multimedia applications that have different QoS requirements. The proposed scheduling scheme utilizes utility and opportunity cost functions to simultaneously satisfy the QoS requirements of users and minimize the revenue loss of network operators. Unlike the existing schemes, the proposed scheduling scheme is designed to support multiple QoS classes, where users within the same QoS class can have different QoS requirements.

More specifically, the new protocol satisfies the following desirable properties.

1) Fairness Measure means the satisfaction of the mobile users and cost for serving them. The satisfaction to the mobile users may depend on the resources they request for and also on the main features for which they access these wireless network. The cost for serving them means the revenue that the users need to pay for the usage of the wireless network. Fairness measure is the level of fairness of the scheduling scheme to the traffic generated. The fairness measure of the users may depend on the maximum number of chosen quantitative measure of the users. The main objective of the packet scheduling scheme is to determine the subset of the users. The subset of the users may be obtained by grouping them into various groups depending on their classes of traffic.

2) Data Rate may depend on the finding of the subset of users to transmit their packets. QoS measure for the users may depend on the lower and the upper bounds of the data rate. The major objective is to determine the maximum supportable data rate for the user at the corresponding time. Cost function may be one of the parameters while calculating the data rate. Cost function is the cost of serving the selected users at the corresponding time.

3) Revenue Cost is a cost function maintains the trade off between the fairness and the revenue. Fairness while considering the user requirements may make revenue loss to the network operator. To prevent such revenue loss for the network operator the bounds for the revenue functions may be maintained so as to prevent the revenue loss. The parameter for the revenue loss may also contain the details about the revenue that the operator will collect from user at the particular time.

4) Utility Function may be used to ensure whether the user may be satisfied with more allocated network resources. When the QoS measures the minimum value then the user's utility also measure the minimum value. Thus it shows that the users are dissatisfied with the allocations. If the utility function measures the maximum values, then the QoS measures may also be maximum which shows the users are satisfied with their allocated resources. If the user receives higher network resources then the user utility will also be high.

IV. FAIR CLASS BASED PACKET SCHEDULING

The fairness may depend on two major categories such as satisfaction of mobile users and cost of serving them. To attain the QoS in the system number of measures should be carried out such as Fairness Measure, Data Rate, Revenue Cost and Utility Function. The satisfaction of the user at a particular time slot may depend on the fairness measure which is the level of fairness of scheduling scheme to the traffic generated. The main aim of the packet scheduling scheme is to find the subset of users. As the subsets of users are obtained then the system may transmit their packets. The cost function may be used to manage the trade-off between frames and revenue. Fairness may force revenue loss to the network operator. The calculation of the maximum attainable revenue in the current time frame may serve the way to easily transmit the data with revenue efficiency. If the QoS measures the minimum values then the users' utility also has minimum value which turns the user dissatisfied. Similarly if all the QoS attains maximum value then the users' utility also attains maximum value which makes the user satisfied. The user receives higher utility only if the network resources are higher.

V. THE PROPOSED SCHEME

It is assumed that the base station may contain any number of users. The users in the base station may be grouped into number of groups or classes according to their classes of traffic. The traffic may be classified as best effort traffic,

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traffic with minimum data requirements, and traffic with maximum data requirements. The users within the same group may have different QoS requirements.[1] The transactions are done in the system in time frames. The base station is responsible of packet scheduling and time frames handling. The time frames may be of fixed size or even may be of variable size duration.

Each time frame consists of a number of time slots. The packet scheduling schema is carried out in these time slots. The users send the reports to the base station which contains the instantaneous channel quality condition of the user.[2] The base station selects appropriate users to adopt scheduling schema. The packet scheduling scheme mainly concentrate on the fairness of the system. Fairness depends on satisfaction the mobile users and the cost of serving them. To provide packet scheduling scheme with satisfaction of QoS the conditions should be considered are Fairness Measure, Data Rate, Revenue Cost and Utility Function.

This proposed scheme is designed to simultaneously achieve the following objectives: 1) Supporting multiple classes of service for users having different QoS and traffic demands, 2) Satisfying the conflicting requirements of the users and network operators, 3) Maximizing the throughput of the wireless system and 4)Ensuring a fair distribution of wireless resources.[3]

Unlike most existing schemes, where different users within each class are assumed to have the same QoS requirements, it considers a more generalized problem, which is supporting multiple users with different QoS requirements within each class. This is more practical since each QoS class in next generation wireless access systems can include various applications with different QoS requirements. Another problem that is uniquely dealt with in our scheme is satisfying the conflicting requirements of the network operator and the users.

In practice, different users may have different preferences depending on many factors including the types of applications they are running, age, budgets.[4] These preferences are accounted for in our scheme by employing a utility function with certain realistic properties.

The preferences of the network operator are represented by an opportunity cost function to bound revenue loss resulting from serving low revenue generating users. Proposed work consists of three modules. 1) Server Module, 2) Client Module and 3) QoS Module[5].

A. Server Module

The server should provide proper accesses to any number of users or the clients in the system. Similarly the client should handle with those resources provided by the servers. In between the server and the client scheduling should be carried out. The scheduling should come with the allocation of time slots for those clients.[6]

The server module will keep update of the details about the clients who are online in the network. Also this module should handle with updating of the requirements needed by the clients. The server will update and edit the documents updated in the system. These documents which may be updates by the server may be accessed by the clients when they come online.[7]

B. Client Module

The client module is responsible for downloading their requirements. They can view the list of documents that are being updated by the server.[8] For authentication the clients are provided with individual user id, user name and password. As the client login with the corresponding user id and password the client can request the server to satisfy their requirements. Then the server will provide the requested access to the client. Thus the client can get easily satisfied with their requirements.[9]

C. QoS Module

The QoS provisioning is performed in the wireless access system in three different levels namely admission level, class level and packet level. The admission level QoS provisioning is responsible for accepting or rejecting new users' connections. It aims at satisfying the long-term QoS of users by maximizing the number of admitted connections while maintaining the QoS of ongoing ones[10].

The Class Level QoS provisioning deals with the aggregate demand of the admitted users.[11] It determines the number of transmission time frames that each QoS class needs in order to maintain the QoS of its admitted users. The Packet Level QoS provisioning is utilized in order to determine which of the users' packets are transmitted in a single frame. The functionality of the packet level QoS provisioning is therefore equivalent to the functionality of the packet scheduling in the wireless access systems. [12]

To attain the Quality of Service following conditions should be considered: 1) Fairness Measure, 2) Data Rate, 3) Revenue Cost, 4) Utility Function and 5) Dynamic Computation of Opportunistic Cost.[13]

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VI. CONCLUSION

Based on the class level packet scheduling scheme this proposed system will satisfy the QoS of all the heterogeneous users. The proposed scheduling scheme utilizes utility and opportunity cost functions to simultaneously satisfy the QoS requirements of users and minimize the revenue loss of network operators. Unlike existing schemes, the proposed scheduling scheme is designed to support multiple QoS classes, where users within the same QoS class can have different QoS requirements. To demonstrate its effectiveness, the proposed scheme is evaluated with three different types of traffic with different QoS requirements, namely, best effort traffic, traffic with data rate requirements, and traffic with delay requirements.

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