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SUPERPOSITION CODING FOR ENERGY EFFICIENCY IN OPPORTUNISTIC MULTICAST SCHEDULING

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***Abstract—* Channel conditions of mobile stations (MSs) are time variant and location dependent due to fading and shadowing multiuser diversity effect. Since lot of users independently lacked, within the given time some division of users will likely have channel conditions strongly. The scheduling opportunistic takes advantage of the instantaneous channel conditions to derive the instantaneous data rates of each MS. Superposition Coding(SC) provides a channel gain threshold for enhanced layer based on user selection ratio and power allocation coefficient which can optimize system throughput dynamically. It provides enhanced QoS and efficiency for layered video multicast over Mobile WiMAX based on an opportunistic multicasting optimization formulation, to Minimizes resource usage and the scheduled users are determined to maximize full utility. Therefore the common video quality can be efficiently guaranteed to all subscribers while creating most utilities out of limited resource on enhancement layers information. An unavoidable FEC rate adaptation scheme is developed to provide reliable delivery.**

Keywords- Resource allocation, scalable video, multicasting, mobile WiMAX, Superposition Coding.

I.INTRODUCTION

The traditional protocol and algorithm design and development in wireless networks is towards maximization of the performance observed by the end-user, interns of quality of service (QoS) throughput, delay etc. This does not consider the power consumed by wireless devices and networks which creates a gap between the energy a wireless network needs to operate and the battery capacity of the wireless devices. Energy Efficiency is the tool to realize the vision of green wireless networks, which are important these days because of the increasing share of wireless systems of the total energy expended in communications and networking systems.

The telecommunication industry has focused on highly energy efficient transmission technologies, by achieving the target of a high data rate and low cost, a factor which will strongly recommend to the global success of communication. Although more efficient transmission technologies, such as MIMO, OFDM and Turbo coding etc., the efficiency of frequency has been improved greatly, the data cost transmission in wireless telecommunication is still extremely high due to more bandwidth requirement, which is considered as the most valuable resource in wireless telecommunication.

This scheme aims at improving system throughput and still does not consider the energy efficiency which can be optimized. It proposed a scheme of superimposing multicast traffic onto unicast (which is known as basic multicast service: BMS and enhanced multicast service: EMS), which efficiently improve system throughput. This scheme can be implemented as follows: the best-effort services are assorted by different categories first, and thus divided into hot traffics and non-hot traffics based on a user number threshold. Since the non-hot traffics are superimposed onto hot traffics and hot traffics are the main service objects. It can be anticipated that this scheme can improve throughput significantly.

The unicast and multicast SC scheme can transmit EMS and BMS simultaneously, the BMS and EMS is for transmitting the transmission power, which means each of users can only use a smaller amount of the total transmission power than that in the unicast scheme. Particularly for the EMS, very smaller portion of transmission power is got, which cannot guarantee adequate quality for the enhanced layer. On the other side, the BMS data rate is determined by the instantaneous worst channel user, the data rate and the system throughout is very low in transmitting and the power which is allocated to BMS is part of the full transmission power, so that the latency is insufficient.

A. Layered Video Multicast Transmission

The emerging deployment of Internet protocol TV (IPTV),provide a more function-rich and user-interaction form of TV(IPTV) to the consumers, thus the existing Internet Protocol infrastructure calls for sufficient bandwidth and QoS. The system transmits video frames as a stream of encoded video data packets from a sender to one or more receivers among a network. The transporting device transport each sub stream as an independent flow capable of being received by each of the one or more receivers. The controller enables the receivers to select one or more of the independent video streams in accordance with the congestive state of the receiver. For each layer, a retransmission error recovery scheme is also provided to recover lost packets of the multicast stream based on the congestive status of the receiver.

B. Superposition Coding With Unicast And Multicast

This kind of method is to divide the source data into several streams with different rates and send them using different level of modulation and coding schemes (MCS), where the lower layers have higher priorities which provides a basic description of the source multimedia traffic and the higher layers have lower priorities which provides a enhanced explanation for the multimedia traffic. Thus the users with a worse channel condition can get the common informations.

The basic multicast stream (BMS) - source layer with higher priority with transmit power λP ($0.5 < \lambda < 1$). [One-to-many communications between the server and a client. It means that each client receives same stream when clients request the stream].

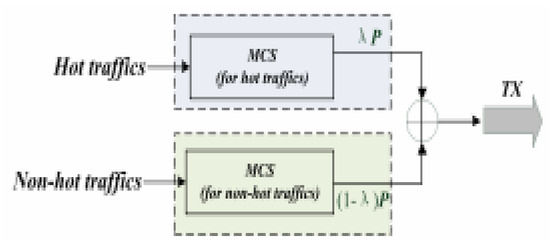

Fig. 1.1 **:** Structure of transmitter using SC scheme

The enhanced multicast stream (EMS) enhanced layer with lower priority with transmit power $(1 - \lambda) P$. [One-to-one connection between the server and a client. It means that each client receives a distinct stream and only those clients that request the stream receive it].

II. RELATED WORK

The extension of H.264/AVC Scalable Video Coding (SVC) standard allows efficient, standard based scalability of temporal, spatial, and quality resolution of a decoded video signal through adaptation of the bit stream. The Scalability measures of a video bit stream allows for media bit rate as well as for device capability adaptation without the need of transcoding or reencoding[6] to support higher quality media, also the adaptation of the bit rate of a video signal is a desirable key feature.

The main objective of MAC layer multicast is to provide efficient channel access to resolve channel contention and maximize network throughput. To improve the performance of the Threshold-0 strategy, a Threshold-1 has been proposed where the transmitter broadcasts the request-to-send (RTS) packet first and then transmits the packet if at least one clear-to-send (CTS) packets are received.

A quality-of-service (QoS)-based adaptive Forward Error Correction (FEC) scheme for multicast communication has been proposed to dynamically control coding parameters. In erasure coding scheme has also been used in wireless security design to guarantee the reliability of multicast authentication Multicast scheduling and resource allocation has attracted growing attention in the literatures and propose a resource allocation scheme that first serves all mandatory layers and then offers additional enhancement layers to some scheduled users by optimizing the total utility, which is described to be proportional to the amount of quality of experience (QoE) of users, within a scheduled frame The throughput capacity of opportunistic multicasting can be further improved by collaborating with forward error correction (FEC) codes.

III. SYSTEM IMPLEMENTATION

Adaptive modulation and coding scheme (MCS) capability which enables a better throughput- delay trade off by changing the targeted/scheduled users in every transmission. Resource optimization for layer encoded video over WiMAX using adaptive MCS is deployed. The scheme serves all mandatory layers and enhancement layers to some scheduled users by optimizing the total utility within scheduled frame. Greedy algorithm maximizes total utility in every scheduled frame to find the best MCS for each layer. Thus throughput capacity of opportunistic multicasting can be further improved by collaborating with forward error correction (FEC) codes.

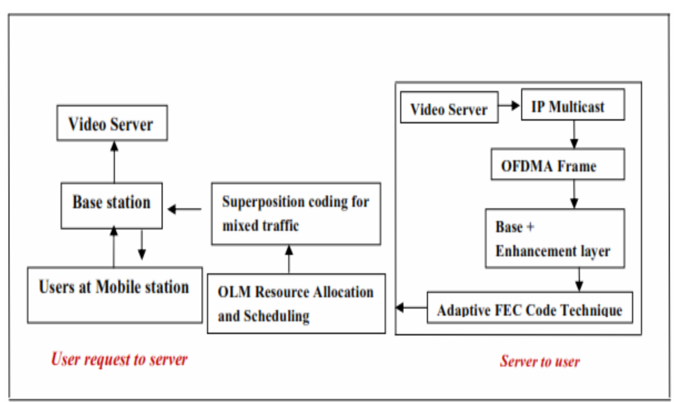

Fig. 3.1 Architecture diagram

The resource usage is minimized across all users for mandatory (base) video layer delivered through following MCS. On the other hand, the MCS is the optional (enhancement) video layers and the scheduled users are determined to maximize total utility. Thus basic video quality can be efficiently guaranteed to all subscribers while creating most utilities out of limited resource on enhancement layers information. Packet loss in a multicast session is avoided by FEC rate adaptation scheme to provide reliable delivery. Multicast and Broadcast Service in Mobile WiMAX is supported by either constructing a separate MBS region in the downlink frame along with unicast service or the whole frame can be dedicated to MBS. The opportunistic scheduling algorithm is based on fixed rate of FEC code and throughput requirement per resource unit. Thus opportunistic schedulers often achieve higher network performance than schedulers that do not take into account channel conditions result in higher throughput. This method is called opportunistic multicasting.

Opportunistic multicasting schedules the best subset of users in each transmission to receive the same content. Mobile WiMAX supports multicast and broadcast service (MBS) while utilizing orthogonal frequency division multiple access (OFDMA) with adaptive modulation and coding scheme (MCS) capability which enables a better throughput-delay trade-off by changing the targeted users in every transmission.

The energy-efficient opportunistic multicast transmission scheduling based on SC proposed in this article.In each transmission, the optimized user selection ratio should be determined first which can minimize the transmission delay, and then the transmission rate can be occured based on the user selection ratio. After occuring the user selection ratio of basic layer and the energy allocation coefficient, the throughput can be increased through choosing a certain traffic as the enhanced layer traffic whose channel gain is larger than the threshold.

IV. RESULTS

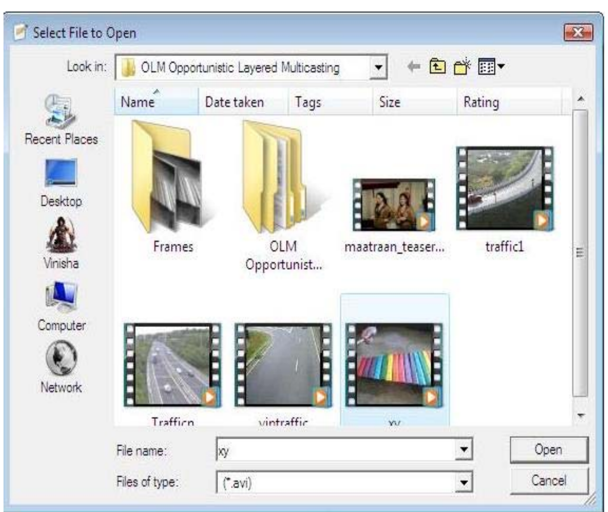

Fig.4.1 Input image

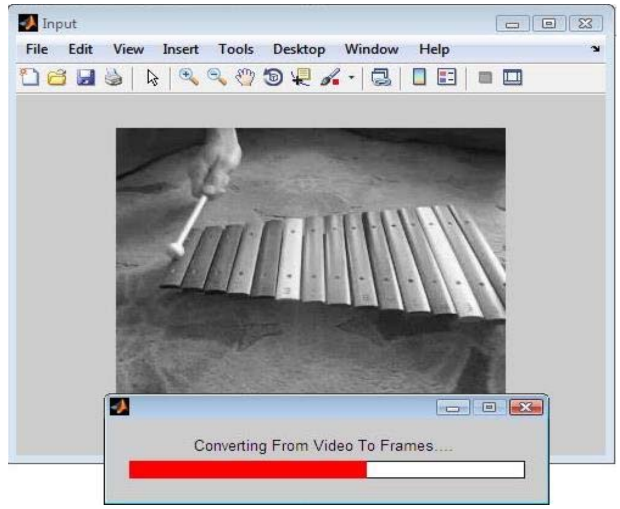

Fig. 4.2 To Convert Video Into Frames

Fig. 4.3 Process of OFDMA

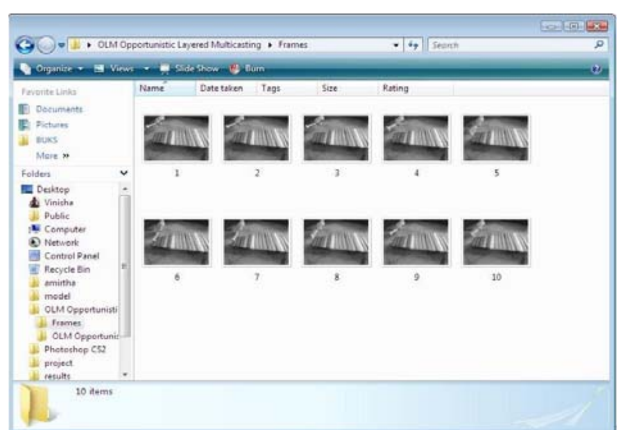

Fig. 4.4 Converted Frames

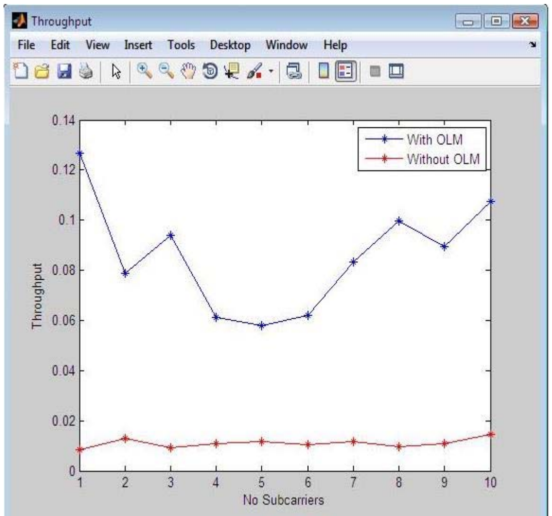

Fig. 4.5 Throughput graph

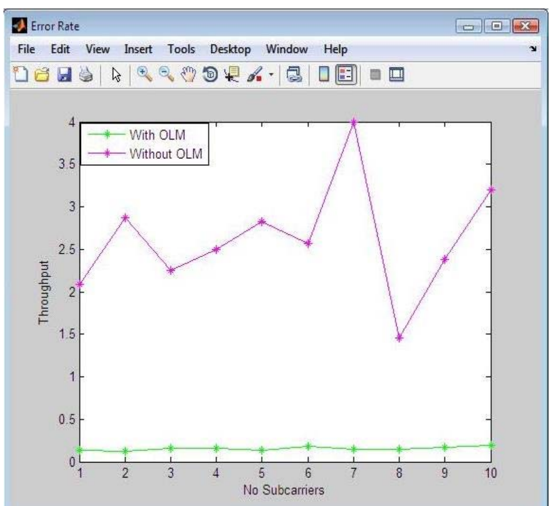

Fig. 4.6 Error Rate Graph

V. CONCLUSION AND FUTURE WORK

Opportunistic network is an emerging system that is getting growing in networking research group. The opportunistic network places unique research challenges on different layers of a protocol stack. It is mainly focused in providing solutions to various issues in an opportunistic network. The simulations show that, incorporating opportunistic concept and the base mandatory video layers can be transmitted using fewer resources. The system utility can also be optimized for optional enhancement video layers. Quality and efficiency for layered video is provided without packet loss. An extension of SPC is aimed with the goal of providing additional functionalities and improved coding efficiency.

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