Multicasting in Heterogeneous Networks

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Abstract: Mobile devices, such as smart phones and tablet PCs, are becoming ubiquitous; it is increasingly popular for users to watch online streaming videos from their mobile devices. Because of the nature of wireless transmission, wireless routers (such as access points or base stations), they can get video transmissions from the video server and then send leads to several interested customers. In these videos, however, customers can be placed in different positions, and therefore they can deal with different wireless channels. In addition, customers may be interested in different video content, so different videos may have some popularity. Wireless heterogeneity and user interests make it difficult to break the bandwidth of wireless router video multicast. In this article, we propose a Utility-Based Layer-Encoded Multicast Scheme, based on an instrument that takes into account the characteristics of the channels and heterogeneous users. The proposed approach that takes into account interests can improve the average visual quality to 9 db.

I.INTRODUCTION

Wireless devices such as smartphones and tablet PCs have become ubiquitous. With the growing popularity of streaming applications like YouTube and Netflix, a wireless router can help restore video streams from video servers and send them to customers who are interested in this video. Recently, customers increasingly choose to demand video content through wireless support based on their personal interests. Since various videos are heterogeneous in popularity, the limited use of wireless bandwidth for all of the video images requested is a delicate issue for wireless multimedia.

On the most powerful wireless networks, such as 802.11, packets can be sent using one of the many available bit rates. The speed used in this document corresponds to PHY rates. For example, 802.11a, 6 Mb/s refers to speed with BPSK and 1/2 encoding speed. Higher throughput uses higher coding speeds and modulation, which allocates multiple bits per constellation point; As a result, the number of bit errors is higher than the lower bit rate in the same channel state. In a multicast environment, the wireless router can transfer each camcorder to a fixed bit rate only. However, due to heterogeneous customer channel conditions, it is possible that the frame can only be transferred to a part of the customers whose channel conditions are good enough. As traffic transmission usually has a strict latency limitation, the wireless router can use this heterogeneous functionality to control the visual quality of each customer. For example, a router may choose a higher tariff to use a time-limited channel to send more video footage; In this case, only some customers with good channel conditions can properly receive these boxes and get good visual quality.

In turn, the router can send slower shots (such as base layer primary shots) so that all customers can achieve basic video quality. It is therefore difficult to choose the appropriate bit rate for each video image so wireless bandwidth can be used to fully meet the visual quality of users. On the other hand, since customers may require different video clips, multicast broadcasts must be limited to a limited wireless bandwidth. Routers may be naive to assign an equal share of bandwidth sources to each video stream. However, this solution is unacceptable, because each video has a different number of requests.

Some videos require more customers; therefore, the router can produce a larger overall visual quality improvement if it provides more radio frequency source for sending popular video images. You might think that another possible solution is to allocate bandwidth sources for videos that are in proportion to their popularity. Even if the two videos have the same number of customers, their customers may have different channel conditions, and video images must be sent at a different speed, thus using different channel times. As a result, the flow selection problem becomes more difficult if heterogeneity is to be considered in the interest of users.

II.RELATED WORK

To the best of our knowledge, the research field concerning selection of a network in heterogeneous wireless networks from a perspective of multicast delivery is not well explored. We found that previous work in the area of mobile multicast focuses on subjects like optimal multicast tree construction in multihop ad hoc networks [1–2].

Ormond and Murphy [3] propose a network selection approach that uses a number of possible utility functions. Their solution is user-centric and does not present any multicast scenario. Interplay between different users and networks are not considered either. Ormond and Murphy conclude that the impact of multiple users operating in the same region needs to be further examined.

Gluhak et al. [4] consider the problem of selecting the optimal bearer paths for multicast services with groups of heterogeneous receivers. The proposed algorithm selects the bearer path based on different optimization goals. However, Gluhak et al. address the problem only for the ideal static multicast case without taking into account users crossing different cells. In addition, it requires that the knowledge of the conditions in wireless networks and preferences of receivers is fully shared. In their work, multicast membership does not change during the duration of a service, and multicast groups are not built with consideration of users' movements. In our opinion, this is not a realistic case for wireless networks. Also, the proposed selection algorithm is built upon a rule according to which the receivers are partitioned into two sets: the receivers where only one network is available versus the receivers where several networks are available. The impact of the users inside the second set, as a result of this partitioning, is neglected.

Yang and Chen [5] propose a bandwidth-efficient multicast algorithm for heterogeneous wireless networks that is formulated as an Integer Linear Programming problem that is solved using Lagrangian relaxation [6]. The algorithm deals only with constructing optimal shortest path trees for multicast groups. In this approach, important parameters, such as cost of service or user's velocity are not considered.

Jang et al. [7] present a mechanism for efficient network resource usage in a mobile multicast scenario. This mechanism is developed for heterogeneous networks and implements network selection based on network and terminal characteristics and Quality of Service (QoS). However, in the proposed mechanism, the network selection is performed purely based on the terminal's preferences; the network perspective is not considered; and the solution does not optimize the utilization of network resources.

Hou et al. [8] propose a cooperative multicast scheduling scheme for multimedia services in IEEE 802.16 based wireless metropolitan area networks (WMAN). The scheduling is considered for one base station that further re-sends the data to multiple subscriber stations. These are grouped into different multicast groups and the users are assigned to the groups. The authors consider two approaches to select multicast groups for services: the random selection and the channel state aware selection. The process is controlled by the base station and limited to one network technology. No network heterogeneity is considered.

The Multicast Mobility (multimob) working group [9] focuses its activity on supporting multicast in a mobile environment. The main goals of the group are to work out mechanisms for supporting multicast source mobility and mechanisms that optimize multicast traffic during a handover. The group also documents the configuration of IGMPv3/MLDv2 in mobile environments. In this sense, they extend the IGMPv3/MLDv2 protocols for implementation in the mobile domain and improve Proxy Mobile IPv6 to handle multicast efficiently. However, they do not consider any modifications across different access networks.

III. UTILITY-BASED LAYER-ENCODED MULTICAST SCHEME

The WiMAX burst profile is a set of codec parameters (reflecting the channel state) that allows the BS to send data to the SS, and each SS must agree its transmission profile with the BS before the connection begins. Various overload profiles provide robustness and transmission speeds at different levels. The stronger the overload profile, the lower the data transfer rate. If the stream is transmitted to a set of users with different transfer profiles, the BS must choose the most powerful transfer profile (that is, the one with the lowest data transfer rate) so that all users can receive the same video quality level. In our system, the base station collects group members based on the user group in order to use them in descending order of the channel conditions and uses the strongest transmission profile from all users selected to receive the data. ship. In fact, the transmission of multiple subscriber streams for those with better channel quality makes it possible to make better use of resources. To send a multicast application to multiple users, you need to use a stronger switch profile. Therefore, a longer period of time is required to send the program.

We classify previous works related to wireless video multicast into two categories: 1) single-rate video multicast, and 2) multi-rate video multicast.

Single-rate Video Multicast:

[10] Proposed a layered hybrid ARQ scheme to determine whether channel time should be used to transfer more layer yields or send FEC packets to restore packet loss. Work [11] improves visual quality through network coding to combine packets from different multicast sessions. Another work [12] - [15] focuses on the fixed speed selection for packet transmission. They

offer a leader board algorithm that allows multicast resources to efficiently select a rate that can send data to customers who are facing the worst channel status. In this article, we focus on multi-speed video multicasting, which allocates bandwidth resources by transferring a well-selected set of frames at correct bit rates according to the heterogeneity of wireless conditions and user interests.

Multi-rate Video Multicast:

[16] Focuses on each frame rate corresponding to each video frame to better utilize the bandwidth source to optimize overall visual quality. [17], it is proposed to use relay nodes to further improve the visual quality of the multicast multicast video. Our work is based on previous protocols, but our protocol is different, because both wireless conditions and heterogeneity are taken into account in the interests of the users.

Broadcast and Multicast Services

Multicast and Broadcast Services (MBS) are compatible with the heterogeneous network. Network broadcasting and multicast are two important routing systems used in group communications. In the case of network transmission, the source node generates in the alternative, distributed to all nodes in the network, while the multicast packets only form a subset of subsets, creating and maintaining the structure data dissemination. Due to the multicasting overhead costs, sometimes it's more efficient to use broadcasts across the entire network, not multicasting, even if the data is for a subset of nodes and meets the following requirements.

• Flexible distribution of radio resources
• MS low power consumption
• Supports audio and video broadcasts for data transmission.
• Low channel switching time

Heterogeneous Network

A heterogeneous network is designed as a combination of various (wired / wireless) network technologies for efficient data connectivity across the network. Heterogeneous network environments illustrate the integration and coexistence of various wireless access technologies with different protocol stacks and support for a range of applications and services that meet the various service requirements that must be met configured for network resources with different levels of multimedia capabilities to access available networks. The need for heterogeneous networks results from the need for effective coexistence of the latest and oldest technologies. For example, new technologies such as HSDPA and WiMAX will need to be shared with existing technologies such as GSM, GPRS. The heterogeneous network also includes telecommunication networks. UTRAN and GERAN standardized 3GPP networks as well as other mobile access networks such as 802.11 and WLAN transport technologies, as well as support for increased mobility. The heterogeneous structure of the network is shown in Figure 1.

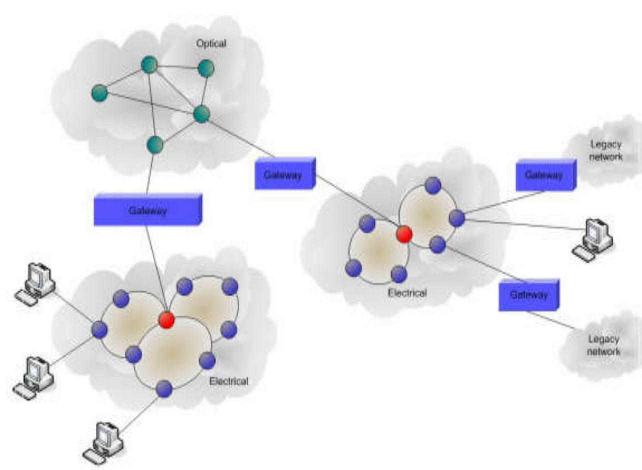

Fig 1. Structure of Heterogeneous Network

IV.CONCLUSION

We have investigated wireless video multicasting due to the heterogeneity of wireless channels and user interests. We formulate a problem with the choice of attached images and the flow of the whole programming model. In order to effectively assign a bandwidth to a limited channel, we propose a utility based video multicast, called boundary value, capable of forwarding the frame at an appropriate speed to increase overall visual quality. Our proposed scheme, which is a bit useful, can improve visual quality by improving the PSNR by 9 dB.

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