Modeling Dynamics of Video Request Routing in Mobile Networks using Adaptive Scheme

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Abstract-3G and 4G equipment development has melodramatically increasing the mobile internet in the recent years. The devices like laptops, cellular mobiles and tablets using the mobile broadband internet like rise steeply. The most popular mobile presentation is the video streaming in the application of hypermedia. In a cost effective way, the big challenge is the quality to make obtainable these services to users. The above task is achievable by means of emerging the LTE (Long Term Evolution) in the world of mobile. With low latency and high data rates in the applications of multimedia the effective services is provided by the LTE equipment features. In this paper, we study and analyze the Quality of Experience (QoE) at the end user for Video on Demand (VoD) over the LTE network. To achieve this, we streamed High Definition (HD) videos based on H.264/AVC and these videos are delivered from foundation to destination using Transport Control Protocol (TCP) and User Datagram Protocol (UDP). Specifically, our study is about QoEassessment in terms of delay variation, packet loss metrics and provides performance assessment to characterize the impact of conveyance layer protocol in video streaming over radio systems like LTE.

Keywords: *Mobile Broadband, Video Streaming, Long Term Evolution (LTE), Quality of Experience (QoE),Video on Demand (VoD), Packet Loss Metrics.*

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I. INTRODUCTION

For the last two decades radio access technologies are not just limited to provide voice communications alone, but also used for the video and data applications as well. Due to the rapid development of technology used in telecommunication systems and consumer electronics, network operators are now able to provide better Internet services over radio networks. After the development of 2G and 3G technologies, the Internet based services are available on mobile systems, namely mobile broadband. According to CISCO report, mobile video has been growing at a Com- pound Annual Growth Rate (CAGR) of 75 percentages between 2012 and 2017, and it is the highest growth rate of any other mobile application [1]. Meeting this demand, maintaining the Quality of Service and user satisfaction has become a big challenge to network operators. To achieve this radio interface is needed, which can provide the best Quality of Services with design parameters like Data rates, Delay and Capacity. One of the main reasons for LTE evolution is to provide the IP based services to people on mobile devices with better QoS. Some services have been already provided by 3G networks, but providing HD video streaming, interactive video gaming and other multimedia services without degrading the Quality of Services is a major challenge. Among these multimedia services, video streaming over mobile Internet is the most popular one. In the burst growth of data rates and services, being aware of user experience is important to maintain the service quality and the application performance [2]. The Quality of Experience is defined as “The process of understanding the actual performance of services, as delivered to the customer, for the purpose of ensuring those services meet customer expectations and requirements". Understanding user experience is very critical for the network operators in managing the QoS of the network. Quality of Experience measurements are made at the point of delivery directly from the subscriber's smart phone or PC. QoE measurements deal with how well applications (Video streaming, VOIP and Web browsing) work in the hands of subscriber [3]. QoE measurements require an understanding of the Key Performance Indicators (KPI) that impact on the user perception. KPI's vary with the service type and services like VoIP, Video streaming, On-line gaming, Internet browsing has unique performance indicators to measure. QoE considers the individual subscriber experience with a service unlike network conditions in QoS. The knowledge of user actual experience is very important for the operators to know the customers satisfactory levels and then operators can concentrate on issues to prevent the churn.

II. BACKGROUND AND RELATED WORK

2.1 CACHING IN MOBILE NETWORKS

There are three basic schemes for mobile content caching: core network (CN)-based caching RAN-based caching [3], [4], [8], [11], [12] and client-based caching [6]. CN-based caching is presentlyextensivelyorganized in mobile networks. Woo et al. compared several common caching strategies in CN. However, CN is basically one hop away from the users than the RAN, and thus cannot reduce the network traffic at the RAN backhaul. On the other hand, client-based caching is either subject to the very limited cache and transmission capacities on user equipment [14] or beneficial to only the user itself and does not reduce network traffic [6].

2.2 SCALABLE VIDEO CACHING (SVC)

SVC is apostponement of the H.264/MPEG-4 AVC video density standard. A video file encoded using SVC consists of several operation points (OPs), each corresponding to a certain bitrate level of the video. In this paper, we assume that all OPs are linearly dependent, i.e., each higher bitrate OP is dependent on all the lower bitrate OPs. Each OP is attained by dropping some packets from the advanced OP's bitstream. Hence, a video content consists of multiple layers: a base layer and several improvement layers. The base layer encrypts the smallestbitstream required to sustenance the lowest bitrate version. Each enhancement layer includes all misplaced packets needed to offer a higher bitrate, in other words, all packages dropped after the higher OP's bitstream to obtain the lower OP's bitstream.

III. EXISTING APPROACH

The existing approach provides backhaul and wireless channel scheduler aim to maximize the number of videos that can be served, while ensuring each video served meets its QoE requirements, as will be defined later. If it is not possible to schedule the request with satisfactory QoE, i.e., commence playback before a preset timeout, the request is blocked by the scheduler. If, nevertheless, playback has happening and served rate drops, video request knowledge stalling. Unlike backhaul scheduling where, once self-confessed, we can ensure the user's video QoE due to the fixed-rate nature of the channel, training of the wireless frequency (also known as RAN scheduling) is best-effort given the time-varying frequency condition of each user. Some users may dependably experience bad channel conditions due to cell-edge circumstances or fluctuating channel conditions due to fading etc. Many RAN schedulers have been projected in the literature with the goal to schedule the requirements for the wireless channel. The goal of these schedulers is either to maximize overall quantity of the network or to optimize for user rate fairness or some mixture of both. Several video-aware scheduling methods have been also proposed that consider video frame structures and necessities. Video-aware schedulers mostly perform rate allocation either to exploit individual user utility functions, sum utility purposes, or an overall video QoE goal per organization, or allocate video packets or frames to achieve an objective goal, e.g., minimize distortion. However, none of the prevailing video-aware preparation techniques addresses initial delay and stalls of a video conference, which are the objectives of our projected scheduling approach. Moreover, existing scheduling techniques do not consider jointly arrangement RAN backhaul and wireless channel resources to minimizeexploit end-to-end video capacity.

IV. PROPOSED APPROACH

4.1 QUALITY OF EXPERIENCE

QoE is also defined as “The completesuitability of asubmission or service, as perceived subjectively by the end user". It mainly deals with how aseparate is satisfied with the provided service in terms of usability, convenience; retain ability and integrity of the service. Quality of Experience considers the comprehensive end-to-end system effects like, the effects of the client, system and substructure of the services.

4.2 VIDEO STREAMING

Today video sharing is the most effective way of entertaining and gaining knowledge. In order to share a video it must be stored and communicated over aannouncement channel, but it is expensive to transmit a raw video over a communication channel because of the huge amount of data size. Even to store a raw video, it necessitates a lot of space on the data storing devices. Usually the video taken from camera footage encompasses lot of redundant data. So, there is a need to reduce the size of the redundant data in the raw video also seeing the quality of the video. Here video compression comes into the picture, to reduce the jobless data by considering the excellence of the video.

4.3 SUPPORTED PROTOCOLS FOR VIDEO STREAMING

There are several protocols that support media streaming. Some of the major conventions are Hypertext Transfer Protocol (HTTP), Session Description Protocol (SDP), and Real-time Streaming Protocol (RTSP), Real-time Trans- port Protocol (RTP), Real Data Transport (RDT) and Real-time Transport Control Protocol (RTCP). Each etiquette is used depending on the type of application in that particular point and also be contingent upon the requirement of service. For most of the video gushing protocols, TCP and UDP serve as the underlying protocol. UDP is a preferable to its conflicting protocol TCP in video streaming application because UDP send sachets at a constant rate and it doesn't care around the lost packets. But the packet loss due to network mobbing is avoided in TCP protocol. On the same hand, TCP introduces delay due to the retransmission of data every time data is lost. But in case of UDP, there is no point of retransmission.

4.4 LTE (LONG TERM EVOLUTION)

The term LTE includes the expansion of the Universal Mobile Telecommunications System (UMTS) radio access finished the Evolved UTRAN (E- UTRAN). It is mainly talented by the evolution of core network known as System Architecture Evolution (SAE). LTE is able to support dissimilar types of services including HD video streaming, VoIP, Multi user online betting, Video on demand, Push-to talk and Push-to-view. Architecture of LTE The augmentation features like higher packet data rates and meaningfully lower-latency of LTE cannot be possible without the evolution of System Architecture Evolution (SAE). This includes the Evolved Packet Core (EPC) network. The Evolved Packet System (EPS) contains of LTE and SAE. It was decided to have a "Flat Architecture". EPS is defined to support only packet-switched traffic. It uses the perception of EPS bearers to direct the IP traffic from a gateway in the Packet Data Network (PDN) to the User Equipment (UE). EPS bearer is a virtual connection delivers transport service with specific QoS attributes between the entryway and the UE. Likewise the HSPA construction the LTE architecture also divided into two networks as radio access network and a core network. However the ultimate goal of the LTE is to minimalize the number of nodes. As a result of this, the Radio Access Network (RAN) encompasses only one node.

V. CONCLUSION

This paper work is based on the performance of video streaming over live LTE network. The work deals with streaming video from server to client with emulated packet loss and packet delay in the setup. The raw videos are encoded into the H.264 Mainline profile with the help of encoder. The encoded videos are streamed through emulated packet delay variation in traffic shaper from server to client, on client request. Like packet delay variations same process is repeated for packet loss too and the videos are saved for further subjective analysis from the users. The quality went even worse and it was hard to play as further increase in packet loss percentage. Paper presents the review of the papers based on the scheduling algorithm, cache management policies. Also it presents the user preferences to prefetch the contents from the CRN.

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