Evaluation of Long Term Evolution Cellular Network Performance when Transmitting Multi-view Video Content

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ABSTRACT

The Long Term Evolution (LTE) cellular technology provides higher data rates than its predecessor technologies. This advancement paves the way for more data services, including improved multimedia services. Three-dimensional (3D) video transmission is one such service that can benefit from LTE deployment. For a positive uptake of 3D video transmission, the network must provide a good Quality of Service (QoS). In this paper the authors evaluate the LTE network’s performance when transmitting Multi-view Video Coding (MVC) using simulcast and inter-view prediction coding. Furthermore, the authors evaluate the system using both the H.264/AVC (Advanced Video Coding) and the more recent High Efficiency Video Coding (HEVC) and their MVC extensions. Results show that, in an urban environment, LTE can accommodate a maximum of 93 users per cell, with adequate QoS, when transmitting 3D HEVC video at Common Intermediate Format (CIF) resolution. Moreover, cross-layer techniques can be used to reduce the QoS degradation as the user moves away from the eNodeB by transmitting lower resolution video.

Keywords: 3D Video Transmission, Long Term Evolution Networks, Multi-View Video Coding, Quality of Service

INTRODUCTION

Transmission of multimedia content has been increasing over the years demanding more bandwidth from the telecommunication networks. Recent surveys (CISCO, 2014) indicate that Internet Protocol (IP) video traffic will reach around 79% of all the consumer generated Internet traffic in 2018. IP TeleVision (IPTV) is gaining popularity and is now a feasible option for service providers to offer multimedia services. Standardization has played an important role in the success of IPTV with standards being developed by the Digital Video Broadcasting

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The use of multimedia applications and services has been increasing throughout the years. This has led to continuous improvements in telecommunication technologies and services. The investment was necessary to avoid congestion and hence degradation of customers’ satisfaction. The latest advancements saw the development of Long Term Evolution (LTE) technology, which offers more promising performances compared to other technologies, for example Worldwide Interoperability for Microwave Access (WiMAX), and legacy networks. LTE is a packet-switched network system and thus allows for easy development and deployment of new applications and services (Cox, 2012).

In this paper we extend the work in Ellul and Debono (2014) in evaluating the feasibility of transmitting 3D IPTV using the LTE technology. This is done to identify the limitations of the current technology in providing 3D video services in the mobile environment. The Quality of Service (QoS) parameters obtained from the LTE network are used as an indicator to identify the maximum number of users supported. The evaluation is done using both simulcast and inter-view prediction coding of the Multi-view Video Coding (MVC) streams and for different content resolutions, representing different portable devices. The results obtained show that LTE is a promising technology that can support the transmission of multi-view video if the number of users within a cell is limited. Furthermore, a cross-layer solution is proposed to reduce the impact of throughput degradation and increase in packet loss as the user moves away from eNodeB.

The paper is divided into five sections. The next section gives some background information on the technologies used in this work. A section describing the implementation of the system and another one presenting the results obtained follows this. At the end, a conclusion is given.

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