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All-Inclusive Feature for Delivering Video Content in Cellular Networks Using Small Stations

Azam Barfar [a], Mohsen Mahrami [a,*], Behnam Hadi [a,b]
[a] Department of Computer Engineering, Malard Branch, Islamic Azad University, Malard, Iran
[a] Department of Computer Engineering, Malard Branch, Islamic Azad University, Malard, Iran
[a,b] Department of Computer Engineering, Malard Branch, Islamic Azad University, Malard, Iran

*** Corresponding author email address**: azambarfar@yahoo.com

Abstract

With the advancement of technology, demand for video traffic is still increasing, and on the other hand, the frequency spectrum in cellular networks is saturated. In addition, to the important issue of saturation of the frequency spectrum, video traffic is another important factor for cellular networks, which is a high quality video service. If in a cellular network all users traditionally demand a high-traffic video from the central station, it may not be possible for the quality video data to reach the user and in the user's term, the problem of lack of proper service quality will be encountered. Assisting stations allow users to get better quality, faster speed and timely delivery of their video traffic requests by providing the new platform. In this paper, we have modelled the network, considering that at a given time, several users are requesting a high-res content, and the result is that the helping stations can respond to the needs of several users at a single time. The higher popularity of the file is, the more users are satisfied, and the amount of unloaded traffic has increased. In this paper, we showed that even with a limited number of files stored in the network using Zeta's distribution, a significant amount of traffic has been evacuated by unconnected communications through small stations. We set the average number of users under different network conditions, and the average rate of sending data is calculated and optimized through all-inclusive links.

Keywords: Content delivery, Zeta distribution, Cellular networks, Small stations, All-in-one communications

1. Introduction

With the ever-increasing demand for high data rates and high traffic volumes, cellular networks have undergone dramatic changes in recent years (Baştuğ et al., 2015; Bastug et al., 2013). The third-generation network was provided for high-speed data, and in the evolution of cellular networks, a fourth-generation network was provided that greatly matched the needs of users for high data rates. Fourth generation networks have been introduced in the evolution of mobile communication systems, which uses IP protocol over the network layer to transfer data, image and sound, and uses packet switching to transmit data. The speed characteristic of this generation of mobile communications is much higher than previous generations. For fixed communications in speed mode, speeds of up to 1 gigabit per second are available for mobile communications such as cars or trains up to 100 Mbps (Gregori et al., 2016; Pingyod et al., 2014). Also, the upload speed has been increased in relation to previous generations up to 300 Mbps. Another important feature of this generation is the latency, which is very low in comparison with previous generations. In LTE, the delay is less than 10 ms, which is less and less depending on the network scenario using optimization algorithms. The main advantage of this network is the use of TCP / IP protocols in the network core compared to previous generations, which is much more flexible and traffic control is simpler than the previous generations using conventional signalling (Pingyod et al., 2014). In this research we will use device-to-device communication capabilities to optimize the video traffic management algorithms to a large extent to meet the needs of network users.

2. Background

Liu et al., in 2016, determined the idea of coding at these stations, in which the stored content is encoded. In this research, the content is provided to users with various encodings depend on the physical conditions of the channel and the quality of the link (Liu et al., 2016).
Sadeghi et al., in 2015, determined the idea of using small stations as a content saver (Shnaiwer et al., 2015).
Siderar et al., in 2016, designed the architecture of the use of small stations as important contributors to wireless cellular networks. This research provided more opportunities in the field of wireless communications for researchers (Sridhar et al., 2016).