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Mobile Edge Computing to Assist the Online Ideological and Political Education

Dan Wang, Jilin Engineering Vocational College, China*
Jian Zhao, Northeast Normal University, China

ABSTRACT

With the rapid development of mobile internet technology, mobile network data traffic presents an explosive growth trend. Especially, the proportion of mobile video business has become a large proportion in mobile internet business. Mobile video business is considered as a typical business in the 5G network, such as in online education. The growth of video traffic poses a great challenge to mobile network. In order to provide users with better quality of experience (QoE), it requires mobile network to provide higher data transmission rate and lower network delay. This paper adopts a combined optimization to minimize total cost and maximize QoE simultaneously. The optimization problem is solved by ant colony algorithm. The effectiveness is verified on experiment.

KEYWORDS

Mobile Edge Computing, Online Education, Video Caching Strategy

1. INTRODUCTION

With the development of mobile Internet and Internet of things (IoT) (Srinivasan et al. 2019), mobile HD video (Usman et al. 2018), augmented reality and virtual reality (AR/VR) (Nayyar et al. 2018), and various intelligent hardware devices (Liu et al. 2019; Zhang 2020) have become an indispensable part of people's life. These network technologies and applications do not only enrich people's lives, but also generate huge mobile network traffic.

The rapid growth of mobile network traffic (Yan 2019), especially mobile video traffic, has brought great pressure and challenges to the mobile network. The traffic explosion has brought the following impacts on the current mobile network. First, the pressure of backhaul network and mobile core network is huge. The rapid growth of mobile network traffic makes the pressure of mobile backhaul network increase, the bandwidth resource be tight, and the load of mobile core network is serious. Second, the repeated transmission of content induces in a great waste of network resources. At present, the end-to-end transmission mechanism (Sun et al. 2017) in mobile network will cause the repeated transmission of a large number of popular content, especially the transmission of mobile high-definition video content. Third, the network delay is large which induces bad user experience. In the current mobile network, the user's content request must pass through the base station, S-GW, P-GW to enter the Internet (Zhou et al. 2020). The content is routed to the content server. The spatial distance between the user and the content server (Charu et al. 2017) makes the network transmission delay be larger. In addition, the quality of user experience is influenced on the processing delay of the

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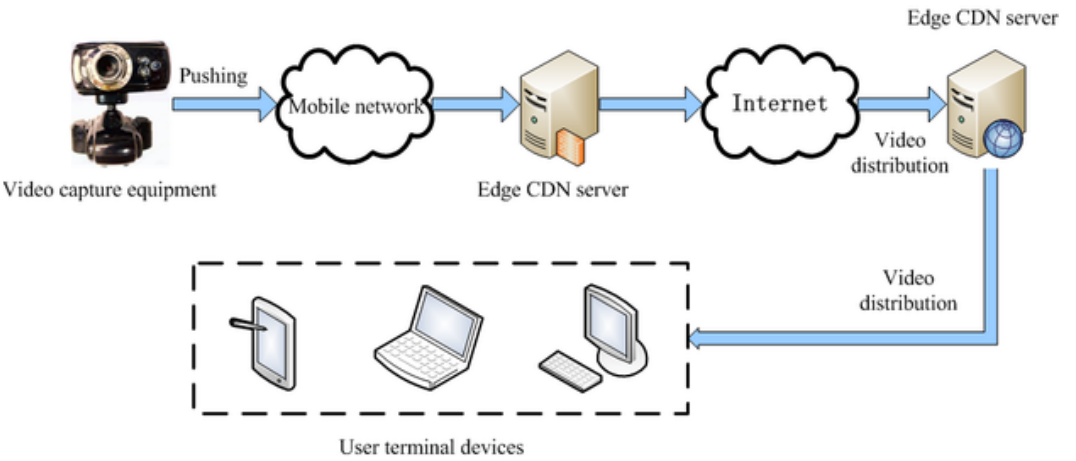
content server, the congestion and packet loss of the transmission link, link failure and other special circumstances (Medeiros et al. 2019).

In order to cope with the explosion of mobile network traffic, improve the quality of users' network experience, accelerate the efficiency of content distribution, and alleviate the transmission pressure of backhaul network, multi access edge computing (Pham et al. 2020) is proposed. It aims to provide end users with ultra-low latency and high bandwidth services through cloud computing capability and service environment for content providers and application developers at the edge of mobile network.

At the same time, the webcast has become an important network application (Na and Jahng 2019). Webcast refers to the process that the audio and video signals are compressed and uploaded to the web server or multimedia server, and distributed on the Internet according to the user's request. In recent years, with the rapid development of the Internet, the webcast has emerged in real life and become popular among mobile users. The current live broadcast services (Wang et al. 2018) include sports events, concerts, remote meetings, online education etc. However, there are still many problems in the current network video live broadcasting system, such as poor mobility, large delay, video jam, difficult to guarantee quality of service.

With the development of MEC technology, video distribution scheme based on MEC has become an important method to improve the quality of webcast. This paper adopts MEC to aid online ideological and political education. The architecture is illustrated in the following figure.

Figure 1. The architecture of MEC based webcast to assist online ideological and political education



2. PROBLEM DESCRIPTION AND PREVIOUS WORK

The content delivery network (CDN) based live video distribution is the mainstream live video distribution scheme (Retal et al. 2017; Viola et al. 2018). The video capture device pushes the collected and recorded video stream to the edge CDN server node which is responsible for caching and transcoding the live video stream. The video stream is distributed to the delivery network server through the Internet or content delivery network to provide live video service for users. In the aspect of mobility, because the edge CDN server is deployed outside the mobile network, when the video capture device is connected to the network through mobile mode, it needs to go through the mobile access network and the core network to access to the CDN server at the edge of the Internet. Thus, it will bring a certain network delay and affect the user experience. When the edge CDN server is