A Survey on Video service enhancement using Mobile Edge Computing

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Abstract- Recent advances in Software-Defined Network (SDMN), in Network Catching and Mobile Edge Computing (MEC) can have significant effects on video services in next generation in terms of improving the QoE (Quality of Experience). Over the past decades, the importance of multimedia service such as, video streaming has increased considerably. In this thesis, first mobile edge computing is explained with its benefits and how it is better than the traditional cloud and also said how the overall video services can be improved. We proposed an algorithm through which we can decrease the latency and some other barriers which are not letting the consumers get a better quality of video services.

Index Terms- Mobile Edge Computing, Video streaming, Software Defined Network

I. INTRODUCTION

Over the past few years Mobile Edge Computing (MEC) ranks alongside 5G, IoT and NFV as a hot industry topic. Service providers worldwide are aggressively pursuing MEC projects because this application promises not only operational cost reductions but also significant opportunities to generate new revenue from new customers.

Mobile Edge Computing (MEC) is a new technology which is currently standardized in an ETSI Industry Specification Group (ISG) of the same name.

Mobile Edge Computing provides an IT services environment and cloud computing capabilities at the edge of the mobile network, within the Radio Access Network (RAN).

Fig 1: Mobile Edge Computing [1]
The aim is to reduce latency, ensure highly efficient network operation and service delivery, and offer an improved user experience. Mobile Edge Computing is a natural development in the evolution of mobile base stations and the convergence of IT and telecommunications networking. The environment of Mobile Edge Computing is characterized by low latency, proximity, high bandwidth, and real-time insight into radio network information and location awareness. All of this can be translated into value and can create opportunities for mobile operators, application and content providers enabling them to play complementary and profitable roles within their respective business models and allowing them to better monetize the mobile broadband experience.

Mobile edge computing opens up services to consumers and enterprise customers as well as to adjacent industries that can now deliver their mission-critical applications over the mobile network. It enables a new value chain, fresh business opportunities and a myriad of new use cases across multiple sectors.

Fig. 1, we consider a MEC enabled heterogeneous network (HetNet) and the radio access network (RAN).
Mobile Edge Computing is also called as Mobile Cloud Computing. Basically it is divided into two: 1. Centralized MEC and 2. Distributed MEC. In Centralized MEC there will be a main server which will be providing services to the users through Radio Access Network (RAN) whereas, in Distributed MEC there will be local servers enabling the services and providing the services to the consumers. These servers are also called as Fog servers. Very often it happens that the consumers which are using centralized services, wishes to get accessed for local services well. In this case, the main problem is that the user has to make request to the Centralized MEC and from there the user request will be passed on the local servers and local servers will give a response to the centralized MEC and then the server will provide the response for which user has made a request but, here user has to wait for a long time to get the request fulfilled. To overcome such barrier, Centralized MEC provides the consumers with an API through which user can very easily get an access to the local services and same with local consumers as well. They will be provided with an API to access the centralized services.

II. ADVANTAGES OF MEC

1. By using mobile edge computing technology, a cellular operator can efficiently deploy new services for specific customers or classes of customers.
2. The technology also reduces the signal load of the core network, and can host applications and services in a less costly way.
3. It also collects data about storage, network bandwidth, CPU utilization, etc., for each application or service deployed by a third party.
4. MEC has been created using open standards and application programming interfaces (APIs), using common programming models, relevant tool chains and software development kits to encourage and expedite the development of new applications for the new MEC environment.
5. Mobile Edge Computing is being used in many models, networking architecture, 5G or any next generation mobile network, video service enhancement and many more.

III. VIDEO STREAMING

Video streaming is becoming more and more popular for media content delivery over the Internet.

Streaming protocols are HLS (from apple), RTMP (from adobe), RTSP, HDS, smooth (Microsoft), DASH are being used.

IV. MEC IN VIDEO SERVICE ENHANCEMENT

Mobile edge computing (MEC) has become a promising Paradigm to enhance the mobile networks by providing cloud computing capabilities within the application developers and content providers can take advantage of close proximity to cellular subscribers and real-time RAN information.
radio access network (RAN). With the ability of content caching and context awareness, MEC could provide low-latency and adaptive-bit rate video streaming to improve service providing ability of the RAN.

The MEC server has the context-aware ability and could adjust the actual transmission bit rate version flexibly based on the QoS supporting ability of time-varying wireless channels. The adaptive bit rate video delivery could make it more effective to utilize network resources.

It provides the ultra-low latency and high bandwidth as well as real-time access to radio network information that can be leveraged by applications. It also ensures the high rate of data processing.

V. RELATED WORKS

Much research has studied the data offloading in MCC environment. They proposed many different methods for different optimization objects. Zhang et al. [1] provides a theoretical framework for energy-optimal MCC under stochastic wireless channel. They focus on conserving energy for the mobile device, by executing tasks in the local device or offloading to the remote cloud. The paper [2] proposed a scheduling algorithm based on Lyapunov optimizing problem, which schedules the tasks for the remote server or local execution dynamically. It aims at balancing the energy consumption and delay between the device and remote server according to the current network condition and task queue backlogs. Liu et al. [3] formulate the delay minimization problem under power-constrained using Markov chain. An efficient one-dimensional search algorithm is proposed to find the optimal task offloading policy. Their experimental results show that proposed task scheduling policy could achieve a shorter average delay than the baseline policies. Considering the total execution time of tasks. Kim et al. [4] considered the situation that the cloud server is not smooth and large-scale jobs are needed to process in MCC. They proposed an adaptive mobile resource offloading to balance the processing large-scale jobs by using mobile resources, where jobs could be offloaded to other mobile resources instead of the cloud. Shahzad and Szymanski [5] proposed an offloading algorithm called dynamic programming with hamming distance termination. They try to offload as many tasks as possible to the cloud server when the bandwidth is high. Their algorithm can minimize the energy cost of the mobile device while meeting a task’s execution time constraints. However, existing researches have some limitations. Paper [6] considered using MEC-side adaption algorithm for improving the QoE of the videos which are being delivered to the consumers. Limitation of such strategy is that its experimental methodology and set up is quite difficult to understand. Paper [7] makes use of a new video experience evaluation standard called U-vMOS (Huawei Video Mean Opinion Score) and during the experiment they faced an optimization problem and to solve it decomposition method was used. Yet this method is expensive and requires a lot of mathematical calculation which becomes tough to resolve if any equation needs to be solved again. In paper [8] due to the coupling of video data rate, computing resource, and traffic engineering (bandwidth provisioning and path selection), the problem becomes intractable in practice. Thus, they used dual-decomposition method to decouple those three set of variables. Paper [9] presents the comparison of traditional cloud infrastructure and MEC structure. It shows how MEC is more beneficial compared to traditional cloud. MEC can provide better QoE to the members of group to take an advantage of both proximity and distribution of mini data centers. The video delivery is performed through the DASH3 protocol. They have use ABR algorithm named Segment Aware Rate Adaption (SARA) for improving the video quality. This algorithm treats each and every segment separately. Problem using this algorithm is that it requires a lot of time since it divides the whole message frame into small segments and treats them individually.

VI. CONCLUSION

In this article, we studied how MEC is better than the traditional cloud infrastructure and how an improvised services will be provided to the end users. MEC concepts has been used widely in order to enhance the QoE of video services. MEC provides many methods through which we can achieve better quality of experience. Major issues such as latency can be solved using these techniques and number of barriers which are not letting the consumers get the services they are expecting can be reduced.
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REFERENCES

[1] Chengchao Liang, Member, IEEE, Ying He, Richard Yu, Fellow and Nan Zhao. “Enhancing video rate adaption with mobile edge computing and caching in software-defined mobile network”, Year 2018.
[5] Chengchao Liang, Member, IEEE, Ying He, Richard Yu, Fellow and Nan Zhao. “Video rate adaption and traffic engineering in mobile edge computing and caching enabled wireless networks”, Year 2018.