

Computation Task Scheduling for Edge Computing System with SDN

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Abstract—For task offloading in Edge Computing, existing literature considers only processing power (CPU), transmission unit (TU), and channel condition at the user device (UE). Here, the system is able to get only half of the view of the entire system to make decision whether to offload a task or not. In this work, we propose that task offloading should consider dynamic changes in the network such as load on the path from UE to edge server (topology condition) and load on edge server, along with user side parameters with the help of Software-Defined Networking (SDN) architecture.

I. INTRODUCTION

The Edge Computing is an architecture, where cloud infrastructure is getting proximity to the UEs that runs computation-intensive and delay-sensitive applications. By Offloading the applications with huge processing demand to the edge servers rather than the conventional cloud, UE energy consumption and execution time can be reduced at user device.

In Edge Computing, computation offloading policies take critical role for efficient offloading decisions. Currently, these policies and computation offloading algorithms reside at the UE to take computation offloading decisions. This offloading decisions are to be made by considering local and edge server processing power, TU at UE, channel condition, and queuing state [1]. Since the UE is getting only half of the view of the entire system with these parameters, sometimes offloaded tasks may take more time to execute because of dynamic conditions of these parameters.

To get global view of the system to decide whether to offload the task or not, UE should have additional parameters such as load on the path from UE to edge server and load on edge server. To adapt these parameters dynamically, central coordination is required among edge servers. For this, another leading trend in networking, namely Software-Defined Networking (SDN) should be taken into consideration. SDN can help edge computing to achieve its real potential [2]. Because of SDN northbound applications like service discovery, service commissioning, performance tuning, and optimization, SDN will get centralized view of the topology to describe dynamic behavior through programmatic access.

II. MOTIVATION

In task offloading, If the channel condition between the UE and its edge server is not good or there is a bottleneck in the network, it is better to execute the task locally as the energy consumption for transmission/reception for offloading may be very high. With more users in the system, the application

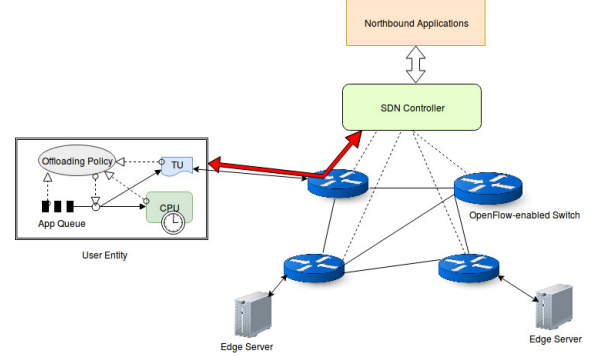


Fig. 1. SDN-Edge Server Architecture[1]

offloading and processing at the edge server may take sustained amount of time. The local processing may be profitable than edge processing for the applications which are time critical. Hence, a new offloading algorithm with prediction technique at UE is required for better offloading decision in dynamic environment.

III. PROPOSED IDEA

In this work, we propose that task offloading should consider additional parameters such as state queue, state of TU, state of local processing unit, time-varying state of topology, and state of edge server (load). Our architecture with SDN controller is shown in Fig. 1. Since SDN controller will get periodic information about each edge server, user entity will query the SDN controller (red bidirectional arrow in Fig.1) before offloading the task to the edge server to get additional parameters mentioned above.

IV. CONCLUSION AND FUTURE WORK

By analyzing the average delay of each task and the average power consumption at the UE, our future work is to formulate a power-constrained delay minimization problem and then propose an efficient heuristic algorithm to find the optimal scheduling policy.

REFERENCES

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