Multi-user Multi-task Computation Offloading in Green Mobile Edge Cloud Computing

ABSTRACT

- Mobile Edge Cloud Computing (MECC) has becoming an attractive solution for augmenting the computing and storage capacity of Mobile Devices (MDs) by exploiting the available resources at the network edge.
- In this work, we consider computation offloading at the mobile edge cloud that is composed of a set of Wireless Devices (WDs), and each WD has an energy harvesting equipment to collect renewable energy from the environment.
- Moreover, multiple MDs intend to offload their tasks to the mobile edge cloud simultaneously.

CONTINUE

- We first formulate the multi-user multi-task computation offloading problem for green MECC, and use Lyapunov Optimization Approach to determine the energy harvesting policy: how much energy to be harvested at each WD.
- And the task offloading schedule: the set of computation offloading requests to be admitted into the mobile edge cloud, the set of WDs assigned to each admitted offloading request, and how much workload to be processed at the assigned WDs.
- We then prove that the task offloading scheduling problem is NP hard, and introduce centralized and distributed Greedy Maximal Scheduling algorithms to resolve the problem efficiently.

EXISTING SYSTEM

- Nowadays, Mobile Devices (MDs) such as smartphones, tablet computers, wearable devices and etc., are playing more and more important role in our daily life.
- Moreover, mobile applications running on MDs, such as immersive gaming, human-computer interaction, often demand stringent delay and processing requirements.
- A mobile edge cloud consists of either one edge server or a set of devices that serve mobile users cooperatively.

CONTINUE

- Though the mobile edge cloud is less powerful compared with a remote cloud, as it is located at the edge of the network the transmission latency between a MD and the mobile edge cloud is much lower than that of the remote cloud .
- Mobile Edge Cloud Computing (MECC) has becoming an attractive solution for augmenting the computing and storage capacity of Mobile Devices (MDs) by exploiting the available resources at the network edge.

PROPOSED SYSTEM

- We propose a multi-user multi-task computation offloading framework for a green mobile edge cloud computing system. In the proposed approach, the dynamics of energy arrivals at the mobile edge cloud as well as task arrivals at different MDs are jointly considered;.
- We introduce the concept of energy links (not real wireless links) and show that offloading a task from a MD to mobile edge cloud is equivalent to routing the harvested energy from mobile edge cloud to a MD. With energy links, the multi-user multi-task offloading problem is then cast into a Maximal Independent Set (MIS) problem.

CONTINUE

- Since the problem is NP-hard, centralized and distributed greedy maximal scheduling algorithms and their performance bound are studied. Both theoretical analysis and simulation results indicate the proposed centralized and distributed greedy scheduling algorithms achieve similar performance.

HARDWARE REQUIREMENTS

- Processor - Pentium –III
- Speed - 1.1 Ghz
- RAM - 256 MB(min)
- Hard Disk - 20 GB
- Floppy Drive - 1.44 MB
- Key Board - Standard Windows Keyboard
- Mouse - Two or Three Button Mouse
- Monitor - SVGA

SOFTWARE REQUIREMENTS

- Operating System : Windows 8
- Front End : Java /DOTNET
- Database : Mysql/HEIDISQL

CONCLUSION

- In this work, we discuss multi-user multi-task offloading scheduling schemes in a renewable mobile edge cloud system.
- As the mobile edge cloud is composed of a set of WDs with relatively low processing ability (the processing ability is not as high as that of a server), scheduling schemes needs to map the workload from a MD to multiple WDs.
- Moreover, scheduling schemes also needs to handle uncertain energy supply at each WD properly so as to make the best of the mobile edge cloud system.

CONTINUE

- In detail, the scheduling algorithms determine the energy harvesting strategy, a set of offloading requests to be admitted, and a sub-set of WDs to compute the workload for the admitted offloading request so as to maximize the overall system utility.
- To exploit the computing capacity at the green mobile edge cloud thoroughly, the scheduling algorithms match the offloading energy consumption at the mobile edge cloud to its harvestable energy.
- Since the scheduling problem is NP hard, centralized and distributed greedy maximal scheduling algorithms are proposed.

REFERENCE

[1] Pavel Mach and Zdenek Becvar. Mobile edge computing: A survey on architecture and computation offloading. IEEE Communications Surveys Tutorials, PP(99):1–1, 2017. Yuyi Mao, Changsheng You, Jun Zhang, Kaibin Huang.

[2] Khaled B. Letaief. Mobile edge computing: Survey and research outlook. arXiv preprint arXiv:1701.01090, 2017.

[3] Min Chen, Yixue Hao, Yong Li, and Chin Feng Lai. On thecomputation offloading at ad hoc cloudlet: architecture and servicemodes. Communications Magazine IEEE, 53(6):18–24, 2015.

CONTINUE

[4] Xue Lin, Yanzhi Wang, Qing Xie, and Massoud Pedram. Taskscheduling with dynamic voltage and frequency scaling for energy minimization in the mobile cloud computing environment. IEEE Transactions on Services Computing, 8(2):175–186, 2015.

[5] S. Eman Mahmoodi, R. N. Uma, and K. P. Subbalakshmi. Optimal joint scheduling and cloud offloading for mobile applications. IEEE Transactions on Cloud Computing, PP(99):1–1, 2016. Weiwei Chen, Chin Tau Lea, and Kenli Li. Dynamic resource.

[6] allocation in ad-hoc mobile cloud computing. In IEEE Wireless Communications and NETWORKING Conference, pages 1–6, 2017.