Software Defined Architecture
For Hybrid Edge Computing

Jude Vivek Joseph, Master of Science in Computer Science

University of Dublin, Trinity College, 2018

Supervisor: George Iosifidis

ABSTRACT

The technological advancement in mobile devices has enabled the evolution of new resource-intensive mobile applications. However, the local execution of computationally demanding applications in the mobile devices are constrained by the limited battery power and energy consumption. By leveraging mobile cloud computing (MCC) which offloads the local workloads to the cloud for remote execution, the performance of the mobile computing can be significantly improved. Nevertheless, the cloud computing technology induces a significant delay to exchange data back and forth between the mobile devices and cloud servers. To cope with this network delay problem, mobile edge computing (MEC) paradigm brings the computation and storage to the network edge enabling to handle peak loads efficiently from the mobile devices. However, the edge devices are limited in storage and capacity, making it less reliable for massive workload computations.

Employing a hierarchical hybrid architecture of mobile, edge and cloud enables to manage the workloads across all the tiers effectively. This minimizes the processing delay or energy consumption at the mobile devices by opportunistically deciding the tiers for the task execution. With the goal of achieving higher energy efficiency and minimal delay in workload processing, we suggest a novel algorithm which minimizes the energy consumption at a mobile device in a hybrid mobile-edge-cloud architecture. The proposed idea is fully implemented and validated in a real network environment using various network interfaces. i.e., WiFi/Cellular (4G). We optimize the CPU speed and the transmission delay by evaluating the energy consumption at the mobile devices. On top of these primary results, we propose an algorithm that effectively reduces energy consumption up to 47% by trading off minimal processing delay.