

## ETSCC006 - Collaborative Cloud and Edge Computing for Latency Minimization

### Abstract

By performing data processing at the network edge, mobile edge computing can effectively overcome the deficiencies of network congestion and long latency in cloud computing systems. To improve edge cloud efficiency with limited communication and computation capacities, we investigate the collaboration between cloud computing and edge computing, where the tasks of mobile devices can be partially processed at the edge node and at the cloud server. First, a joint communication and computation resource allocation problem is formulated to minimize the weighted-sum latency of all mobile devices. Then, the closed-form optimal task splitting strategy is derived as a function of the normalized backhaul communication capacity and the normalized cloud computation capacity. Some interesting and useful insights for the optimal task splitting strategy are also highlighted by analyzing four special scenarios. Based on this, we further transform the original joint communication and computation resource allocation problem into an equivalent convex optimization problem and obtain the closed-form computation resource allocation strategy by leveraging the convex optimization theory. Moreover, a necessary condition is also developed to judge whether a task should be processed at the corresponding edge node only, without offloading to the cloud server. Finally, simulation results confirm our theoretical analysis and demonstrate that the proposed collaborative cloud and edge computing scheme can evidently achieve a better delay performance than the conventional schemes.

**Index Terms**—Mobile edge computing, mobile cloud computing, latency minimization, joint resource allocation, task splitting, strategy, collaborative cloud and edge computing.



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