

A many-to-many matching with externalities solution for parallel task offloading in IoT networks

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Publication Year 2024

Grant Number IMSIU-RP23054

DOI link <https://doi.org/10.1016/j.ijsuci.2024.102134>

Abstract: The efficient and timely execution of tasks is a fundamental challenge in the realm of future Internet of Things (IoT) networks. To address this challenge, fog devices are often deployed close to end devices to facilitate task processing on behalf of IoT nodes. One strategy for improving task computational delay is to employ parallel task offloading, in which tasks are subdivided into subtasks and sent to different fog devices for execution in parallel. However, allocating computational resources to fog nodes and mapping these resources to IoT subtasks is a key challenge in this area. This work models the parallel task offloading problem as a graph-matching problem and utilizes a many-to-many matching technique to achieve a stable mapping of IoT subtasks to fog node resources. Unfortunately, the proposed solution is subject to the problem of externalities due to the dynamic preference profiling of fog nodes. To address this issue, we employ an iterative algorithm to resolve any blocking pairs that may arise. Our results demonstrate that the proposed technique reduces the task latency by 29% as compared to other matching-based techniques available in the literature