Genetic-Based Algorithm for Task Scheduling in Fog–Cloud Environment

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Abstract

Over the past few years, there has been a consistent increase in the number of Internet of Things (IoT) devices utilizing Cloud services. However, this growth has brought about new challenges, particularly in terms of latency. To tackle this issue, fog computing has emerged as a promising trend. By incorporating additional resources at the edge of the Cloud architecture, the fog–cloud architecture aims to reduce latency by bringing processing closer to end-users. This trend has significant implications for enhancing the overall performance and user experience of IoT systems. One major challenge in achieving this is minimizing latency without increasing total energy consumption. To address this challenge, it is crucial to employ a powerful scheduling solution. Unfortunately, this scheduling problem is generally known as NP-hard, implying that no optimal solution that can be obtained in a reasonable time has been discovered to date. In this paper, we focus on the problem of task scheduling in a fog–cloud based environment. Therefore, we propose a novel genetic-based algorithm called *GAMMR* that aims to achieve an optimal balance between total consumed energy and total response time. We evaluate the proposed algorithm using simulations on 8 datasets of varying sizes. The results demonstrate that our proposed *GAMMR* algorithm outperforms the standard genetic algorithm in all tested cases, with an average improvement of 3.4% in the normalized function.

Keywords Fog–cloud · Task scheduling · Genetic algorithm · Makespan · Energy consumption

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