Paper Title:
SQGA: Quantum Genetic Algorithm-based Workflow Scheduling in Fog-Cloud Computing

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1 Summary

1.1 Motivation/purpose/aims/hypothesis:

The research aims to tackle the task scheduling difficulty in Fog-Cloud computing by minimizing makespan, cost, reaction time, and energy consumption. This would ultimately improve the efficiency of IoT systems.

1.2 Contribution

This paper introduces the SQGA algorithm, which is derived from the quantum genetic algorithm, for the purpose of scheduling operations in the Fog-Cloud environment. The objective is to maximize the efficiency of applications implemented in this infrastructure by minimizing the time it takes to execute them. The suggested method is compared to traditional genetic algorithms and the First Come First Served algorithm.

1.3 Methodology

The study found that the performance of task scheduling is directly impacted by the quantity of Cloud layer nodes. An augmentation in the quantity of Cloud nodes leads to a reduction in makespan, owing to the higher capabilities of Cloud nodes in comparison to Fog nodes. This discovery is especially advantageous for Internet of Things (IoT) applications that require timely action, without sacrificing operational expenses. The SQGA scheduling method frequently surpasses classic GA (Genetic method) and FCFS (First-Come, First-Served) algorithms by decreasing the makespan and successfully responding to the available resources.

1.4 Conclusion

This paper presents a new scheduling technique based on quantum computing to improve job scheduling in the Fog-Cloud Computing environment and reduce workflows processing time. This research investigates the superiority of the SQGA algorithm over GA and FCFS, demonstrating a substantial reduction in makespan by 40% and 50% respectively. The SQGA has exceptional resource flexibility within the Fog-Cloud system. Future research endeavors to include supplementary Quality of Service (QoS) measurements to further optimize scheduling performance, and to employ dispersed models for enhanced efficiency.

2 Limitations

2.1 First Limitation

A limitation of the study is its exclusive emphasis on optimizing makespan, without taking into account other quality of service (QoS) metrics that may be pertinent in Fog-Cloud computing systems.

2.2 Second Limitation

A further limitation is the absence of real-world implementation and verification of the suggested SQGA method, which could offer more understanding of its practical applicability.

3 Synthesis

The paper presents the SQGA algorithm as a promising solution for workflow scheduling in Fog-Cloud computing. It demonstrates the algorithm's effectiveness in optimizing makespan and adjusting to the resources that are easily accessible. However, additional research and implementation in the real world are required to prove its practical effectiveness and take into consideration additional quality of service measures.