A NOVEL GENETIC MULTI OBJECTIVE TASK SCHEDULING ALGORITHM IN CLOUD COMPUTING

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Masters of Science in Computer Science

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June 2024

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Dissertation submitted in partial fulfillment of the requirements for the degree
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DECLARATION

I declare that this is my own work and this Dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text. I retain the right to use this content in whole or part in future works (such as articles or books).

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The above candidate has carried out research for the Masters of Science in Computer Science Dissertation under my supervision. I confirm that the declaration made above by the student is true and correct.

Name of Supervisor: Dr. Sunimal Rathnayake

Signature of the Supervisor: Date: 09/07/2024

ACKNOWLEDGEMENT

I wish to convey my deep appreciation to the Department of Computer Science and Engineering for their support and encouragement. My sincere thanks go to my research supervisor, Dr. Sunimal Rathnayake, for his unwavering dedication and insightful guidance. Additionally, I am profoundly grateful to my parents and family for their continuous support throughout my academic journey.

ABSTRACT

Cloud computing is a trending cutting-edge model that allows users to utilize services through the internet. It offers on-demand scalable resources and compensates customers based on their usage. The cloud platform provides extensive computing power with a variety of configurable options. Effective resource management is crucial for optimizing the underlying system and ensuring that both cloud providers and users meet the Quality-of-Service (QoS) requirements specified in Service Level Agreements (SLAs). Numerous strategies are employed for cloud resource management, with scheduling being a prominent approach for optimizing cloud systems. Task and workflow scheduling are key unresolved challenges within cloud computing scheduling. Assigning tasks to suitable cloud resources is known to be an NP-complete problem. There are various factors affecting the execution of different workloads. Hence there is no single optimal solution under a given polynomial time. Many factors and objectives need to be considered when trying to find an optimal schedule. The total execution time of virtual machines has not been considered by previous studies as a scheduling parameter in the quest for an optimal schedule using meta-heuristic methods such as genetic algorithms. This study introduces G-TRETA, a new multi-objective genetic algorithm that aims to find an optimal schedule considering both total resource execution time and cost. The proposed algorithm was compared with FCFS, MaxMin, MinMin and MCT algorithms for the degree of imbalance, makespan, cost, and system throughput. CloudSim 5.0 simulator and DEAP framework with synthetic data traces and Nasa Ames/iPSC 860 real-world traces were used to evaluate the algorithm. From the evaluation results the proposed algorithm gives better results. We can observe 36.37% and 50.46% for makespan, 57.16%, 101.88% for system throughput, 1.47 and 0.94 differences of index improvement for degree of imbalance for synthetic and real-world traces respectively while having efficient cost values.

Keywords: Multi-Objective Task Scheduling, Cloud Computing, Total Resource Execution Time Aware Scheduling, Genetic Algorithms

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