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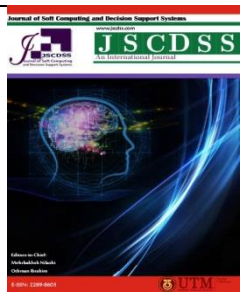

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A Hybrid Swarm Particle Optimization Algorithm for Task Scheduling in Cloud Computing

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Abstract

Today, cloud computing experts seek internet-based service providing to share resources using service providing techniques. This environment provides users with an image of abundant resources. The present paper recommends a combination of particle swarm optimization algorithm and simulated annealing algorithm to obtain an improvement in the performance of task scheduling to resources considering the available bandwidth allocated to each virtual machine. The performance of the proposed algorithm is investigated by the use of the Cloudsim Simulator. Research results show that the proposed algorithm outperforms the Swarm Particle Optimization (SPO), bat, and raven roosting optimism algorithms in terms of task execution time, response time, and performance efficiency.

Keywords: Cloud computing, Cloudsim Simulator, Swarm Particle Optimization, Efficiency, Task scheduling

1. Introduction

At the present age, the speed in the advancement of science and the fast development of information technology had led to the need to use new computing methods. In the past, models such as high-performance computing, utility computing, and grid computing were presented (Zhang, Cheng, & Boutaba, 2010). Considering the developments in computing areas, many techniques such as data clustering, grid computing, and distributed database management system have been introduced to distribute resources and use data (Beloglazov, Buyya, Lee, & Zomaya, 2011). Today, cloud computing technology is very popular due to providing numerous facilities and advantages such as high computing power, flexibility, high performance, providing services proportionate with demands, users' ease of accessibility without time and place limitations and simultaneous access to multiple documents, and it is used in everyday life at a higher speed (Asadi, Nilashi, Husin, & Yadegaridehkordi, 2017; Mohammed, Ibrahim, Nilashi, & Alzurqa, 2017; Rimal, Choi, & Lumb, 2009; Yadegaridehkordi, Shuib, Nilashi, & Asadi, 2019). Cloud computing shares the data and provides its services clearly under the title of internet services(Wang et al., 2010) . Three sets should be taken into consideration when defining scheduling problems: tasks, processors, and resource sets. The relationships between the tasks and the time constraints of each task need to be determined. Scheduling means determining the allocation order of processor of set P and resources of set R to tasks set T such that all the tasks are completed under the predetermined and governing conditions and constraints. Scheduling is one of the issues where an increase in the size of the problem leads to an exponential growth in the problem-solving time. Such problems are called complete-NP (Buttazzo, 2011). With an increase in the number of cloud users, the tasks that need to be scheduled will increase. Cloud scheduling is considered a mechanism that allocates user tasks to appropriate resources to be performed and affects the cloud performance directly (Choudhary & Peddoju, 2012). Cloudsim simulator is a general simulator framework that can be developed and it allows researchers to model and simulate different scenarios in the cloud computing environment (Calheiros, Ranjan, Beloglazov, De Rose, & Buyya, 2011). In the cloud simulator, the data centers, virtual machines, tasks, network connections, different allocation policies, service broker, and virtualization management can be defined. Therefore, the proposed method is investigated in cloudsim environment and the simulations are modeled according to the information from the real data centers to achieve the actual results. The remaining sections of the paper are organized as follows. Section 2 describes the proposed method. Section 3 describes the proposed algorithm and the process