

Chapter 14

Efficient Resource Management in Green Computing Based on ISHOA Task Scheduling With Secure ChaCha20–Poly1305 Authenticated Encryption– Based Data Transmission


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ABSTRACT

One of the hottest new technologies that allows users to handle a broad range of resources and massive amounts of data in the cloud is green computing resource management. One of the biggest obstacles is task scheduling, and poor management leads to a decrease in productivity. The task must be efficiently scheduled to ensure optimal resource utilisation and minimal execution time. Given this, this study suggests a fresh method for efficient task scheduling in a green computing environment that also offers improved security. There is a development of an enhanced spotted hyena optimizer (ISHO). Finding the ideal or almost ideal subset with a straightforward structure to minimise the specified fitness function is a strong point of the SHO. It enhances a switch strategy in the spotted hyena's position updating mechanism and generates random positions in place of the violated spotted hyenas in order to support the proposed ISHO's exploration characteristics. Second, the data is encrypted using the ChaCha20–Poly1305 authenticated encryption algorithm, ensuring secure data transmission.

DOI: 10.4018/979-8-3693-1552-1.ch014

1. INTRODUCTION

In the field of green computing, resource management is essential, especially when it comes to task scheduling. Reducing the environmental effects of computer systems is the aim of green computing, and one of the most important ways to do this is through efficient resource management. Optimising resource utilisation becomes essential when it comes to task scheduling, which is the process of allocating computing resources to different tasks. Green computing places a strong emphasis on resource efficiency to lower energy use and environmental impact. Green Computing aims to optimise resource allocation to minimise energy consumption and maximise efficiency through intelligent task scheduling algorithms. This entails taking into account elements like the distribution of the workload, patterns of power consumption, and the utilisation of hardware that uses less energy. Green computing improves computer system performance and makes the computing environment more environmentally friendly and sustainable by utilising cutting-edge resource management strategies. Task scheduling needs to incorporate resource management techniques more and more as technology develops in order to promote environmentally conscious and more ecologically friendly computing practises.

A key component of computer science and information technology, task scheduling is essential to the effective and efficient use of computing resources. The fundamental idea behind task scheduling is to distribute computational tasks wisely among available resources, like processors, to maximise throughput, minimise completion times, or save energy usage. Efficient task scheduling is crucial for maximising system performance and resource utilisation, regardless of whether the system is in a distributed system, cloud computing environment, or standalone computer. The difficulties in handling different workloads, different priorities, and resource limitations require the creation of complex algorithms and plans to coordinate task completion. Scheduling tasks is very important in the context of emerging paradigms such as Green Computing, where the focus is on minimising environmental impact, in addition to its impact on the overall efficiency and responsiveness of computing systems. Task scheduling is essential in establishing the sustainability, scalability, and performance of computing systems in a variety of domains as technology develops.

By converting data into a safe and unintelligible format, encryption plays a critical role in protecting data privacy by averting unwanted access or interception. Encryption is a vital instrument in the digital age, as it shields private data from potential breaches and threats, especially in the context of massive data transmissions and storage. Fundamentally, encryption is the process of encrypting data using keys and algorithms so that anyone without the correct decryption key cannot decode it. This makes sure that information is rendered effectively useless even in the event that it is intercepted during transmission or unauthorised individuals gain access to storage systems. Encryption is used in many different contexts when it comes to protecting personal information. One method of securing communication channels is end-to-end encryption, which encrypts data at the source and only permits decryption at the end of the intended recipient. In platforms like email services, messaging apps, and others where privacy is critical, this is especially important. Further protecting information kept on devices or servers is data at rest encryption.

1.1. Main Contributions

- **Improved Spotted Hyena Optimizer (ISHO):** In order to schedule tasks efficiently in a green computing environment, the paper presents an improved version of the Spotted Hyena Optimizer

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