

# Chapter 11

## Green Computing–Based Digital Waste Management and Resource Allocation for Distributed Fog Data Centers

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### ABSTRACT

*The term “green computing” describes the efficient use of resources in computing and IT/IS infrastructure. This study suggests a unique method for dispersed fog data centres’ work scheduling and resource allocation based on digital waste management. Here, the bandwidth differential preemption evolution moving average method (BDPEMA) is used to control the network’s digital waste while allocating resources. Reinforcement adversarial hierarchical group multi-objective cuckoo optimisation (RAHMCO) is used to schedule network tasks. In terms of resource sharing rate, energy efficiency, reaction time, quality of service, and makespan, experimental study is conducted. The proposed approaches have been evaluated in a simulated cloud environment. The proposed method outperformed the current rules when QoS features were considered. The proposed technique attained QoS of 66%, energy efficiency of 96%, resource sharing of 88%, response time of 45%, and makespan of 61%.*

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## **1. INTRODUCTION**

Green computing embraces green infrastructure by studying as well as implementing global best practices in their design, manufacture, usage, and disposal (Mukta & Ahmed, 2020). Despite rise of African computer community, preliminary research revealed a lack of awareness of green computing. It is claimed that Africans continue to rely on information and communication technology (ICT) to sustain their way of life, with little concern given to the negative environmental effects of computers. Meanwhile, computing by both corporate and private users has been shown to increase global temperatures through the use of fossil fuel byproducts, worsen environment through production of hazardous chemicals, and reduce energy accessibility. Green IT, sometimes known as green computing, is study and practise of efficiently and successfully designing, manufacturing, and using computers, servers, screens, printers, storage devices, networking, and correspondence systems with zero or little environmental impact (Gupta, 2022). Green IT is also about utilizing IT to support, assist, and leverage other environmental projects, to raise green awareness. The primary goals are to maximise energy efficiency throughout item's lifetime, decrease use of hazardous chemicals, and enhance the recyclability or biodegradability of obsolete products as well as plant waste (Purnomo et al., 2021). Prasad et al. (2021) describes a method-driven engineering method to optimising architecture, energy utilisation, and operational costs of cloud auto-scaling infrastructure in order to provide greener computing environments with lower emissions from idle resources. In the absence of regular energy from public networks, many computing enterprises rely on fuel generators for power delivery. Because carbon is present in all hydrocarbon fuels, it is emitted as carbon dioxide (CO<sub>2</sub>) after combustion. Non-combustible sources, such as sunlight, wind, nuclear, and hydropower (Das et al., 2022), on the other hand, lack the potential to convert hydrocarbons to CO<sub>2</sub>, which is well recognised as a heat-trapping greenhouse gas. Scientists agree that the emission of greenhouse gases (GHGs) into the atmosphere has a negative impact on climate method. Nonetheless, because a cost-benefit analysis shows that benefits of ICT much outweigh the costs, steps for ecologically friendly ICT use in Sub-Saharan Africa must be put in place. Recycling computer equipment helps keep hazardous materials like lead and mercury out of landfills. Reuse can occur in a variety of ways. It is capable of carrying a load of obsolete equipment. Environmental management entails efforts such as assessing the current state of the planet, dealing with the direct and indirect effects of large-scale human operations such as agriculture, transportation, and assembly, and enlightening people's own choices in usage and behaviour. The current status of e-waste handling is quite terrible. By improving ewaste management, the globe will become greener and more environmentally friendly. Electronic devices built of several integrated circuit chips may cost less occasionally, but they consume enormous amounts of non-renewable resources. This is due to the fact that the chips are made of highly precious elements such as gold, lead, mercury, silicon, and so on. As a result, managing e-waste with the purpose of reusing these valuable metals is unquestionably beneficial. The development of e-wastes is currently expanding at an alarming rate, and the radiations from e-wastes can cause major genetic problems among personnel at collection sites as well as residents in surrounding areas (Gaharwar et al., 2022).

## **2. RELATED WORKS**

Green computing has turned into a critical point in these new days. A few works have been completed with various methodologies in this field. Work Soesanto et al. (2023) surveyed the ongoing writing on

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