Green Computing:Techniques for Eco-Friendly IT Operations

By K. Sonawane & A. Padalkar

Abstract- Attention over the effects of computing on the environment has increased as a result of the increasing demands placed on information technology. This paper explores the field of environmentally friendly computing, highlighting creative approaches to energy saving and efficient e-waste disposal. The study looks at important technologies that are promoting a greener digital environment and investigates the importance of implementing eco-friendly practices in the IT industry. To achieve sustainable computing, energy-efficient algorithms, integration of renewable energy sources, and responsible disposal of electronic waste are highlighted as essential elements. This study tries to offer a significant understanding of the application of green computing practices and their advantageous environmental effects through case studies and real-world examples.

Keywords: sustainable development, green computing, data centre, energy efficiency, energy, computer and it.

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GREENCOMPUTINGTECHNIQUESFORECOFRIENDLYITOPERATIONS

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Green Computing: Techniques for Eco-Friendly IT Operations

K. Sonawane [α] & A. Padalkar [σ]

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I. Introduction

In this section, a brief discussion is made on various issues related to green computing. This is followed by a section on a survey of recent research in the field of green computing.

The passage begins by highlighting the significant changes in temperature and weather patterns over the past few decades, attributing them to factors like increased greenhouse gases due to deforestation, fossil fuel burning, and rapid industrialization. It emphasizes the consequences of these changes on the Earth's environment, such as rising temperatures and sea levels.

Impact of Information Technology on the Environment:

The introduction connects these environmental changes with the rapid increase in computer usage over the same period. It underscores the combined environmental impact of the energy required to operate computers and the electricity needed for their cooling infrastructure. This sets the stage for the need to address these concerns through research in the field of Green Computing.

Green Information Technology:

The passage introduces the concept of Green Computing, emphasizing its role in addressing environmental sustainability. It defines Green I.T 1.0 as focusing on improving the energy efficiency of I.T

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products and processes, while Green I.T 2.0 extends the scope to include coordination, reengineering, and optimization of the entire supply chain, manufacturing process, and organizational workflow to minimize environmental impact.

Section Structure:

The passage outlines the structure of the paper, indicating that Section I contains the introduction, Section II presents a survey of recent literature, and Section III concludes the paper with a brief discussion on the direction of future research and its importance.

II. Survey

The following are the various areas where research in green computing is being carried out.

Usvuv et al. [1] proposed some techniques to make cloud computing more energy efficient. A resource-utilization- aware energy-saving server consolidation algorithm (RUAEE) is proposed by Han et al. [5] which can be used to provide better utilization of resources while causing a reduction in the number of virtual machine live migrations. Experimental results show that can reduction in the energy consumption and service-level agreement (SLA) violation in cloud data centers can be achieved by RUAEE as per the experimental results.

Shaikh et al. [2] discussed about green Internet of Things by exploring ways of successful and efficient deployment of various enabling technologies like the Internet, smart objects, and sensors to name a few. They have also made a review of various IoT applications, projects, and standardization efforts going on at present along with identification of a few challenges that have to be addressed shortly to successfully enable a green IoT.

Kharchenko et al. [3] explained notions and classification of green IT engineering besides analyzing the main principles of development and implementation, indicators and values of green computing, and description of the European Union project GreenCo. More et al. [10] studied various techniques, models, and algorithms, for energy-competent green cloud computing. The technique used is virtualization. The study mainly involves the consolidation of virtual machines (VMs). Power consumption can be decreased by deactivating and reactivating physical machines as per the existing demand of workload. The approaches

discussed are centered around saving power and making data centers energy efficient.

SAHA Biswajit [4] has analyzed various issues related to green computing the relation between environment and information technology, green information technology advantages, the adoption of green computing, eco-friendly practices, green computer design, green information technology standards and regulations, and about industry associations.

Sen Deepanjan [5] et al. in their study emphasized reducing the energy consumption and carbon footprint of various computing devices.

Lin et al. [6] proposed a new green video transmission (GVT) algorithm using video clustering and channel assignment that will help in video transmission. Design is also made of a video clustering model based on game theory for grouping the different video parts stored in mobile devices. The analysis and simulations demonstrate a superior video transmission performance by the proposed GTV algorithm.

Asad et al. [7] divided the big data enterprise into six planes which they considered vital in influencing the energy consumption of data centers. A survey is also made by them about the important strategies that will make these six vital planes greener. The challenges and directions in this area are also discussed.

Nanath et al. [8] discussed the impact of Green information systems (Green IS) practices on Green innovations and the various ways in which corporations get an advantage over competitors because of better performance of Green innovations.

Pahlevan et al. [9] presented an optimization framework for managing green data centers using multilevel energy reduction techniques jointly. The results obtained demonstrate satisfactory results as there is considerable, up to 96% savings in electricity bill. Taufiq et al. [18] in their study discussed about cloud computing and green I.T to discover the important factors that influences adoption of SaaS cloud computing as a means to adopt green I.T. Theory of planned behaviour (T. P. B) is used and their proposed model successfully explains the concept of cloud computing and green I.T jointly.

III. Conclusion

There will be a significant amount of research work in the field of green computing in the upcoming years.

The focus of the research could be on improving the energy efficiency of cloud computing and data centers. Corporate entities need to engage in more environmentally friendly activities. To create a greener world, all stakeholders must collaborate. If not, the human race will have serious issues in the years to come. This survey has no restrictions as of yet, but it is anticipated that there will be a lot more research on green computing in the future. That is the extent to which this work can be improved in the future.

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