Chapter 2
Green Computing and the Quest for Sustainable Solutions

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ABSTRACT

The internet of things (IoT) connects devices of all sizes to the internet, providing seamless communication and ease. However, this technical improvement has prompted environmental concerns. Sustainable development has grown as we work to offset the effects of technology on our planet, economy, and consumerism. Innovative companies are exploring technology-based sustainability solutions. Green IT, a developing idea, uses sustainable design to reduce or eliminate IoT operations' environmental implications. This chapter evaluates IoT problems, defines Green IT, explores Green IT design methodologies, and describes how to implement these green designs as sustainable environmental solutions. It also thoroughly analyses numerous author proposals to find the best sustainable IoT architectures. Green IT solutions are essential to a sustainable and ecologically responsible future in a world where information technology is central to our lives, businesses, and marketing tactics.

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INTRODUCTION

Green Computing (Podder, 2022) is a crucial paradigm shift in the world of technology, and it emphasizes the need for environmentally conscious Information and Communications Technology (ICT) (Mory-Alvarado, 2023) practices and sustainable solutions to mitigate the unfavorable effects of technology on our planet. The IoT systems comprise various components critical to their operation, including identification, monitoring, locating, sensing, tracking, communication, and computation services (Tewari, 2020). The IoT is an evolution of internet-based networks that transcend traditional human-to-human interactions. It brings about a new era where communication extends its reach to include the dynamic interplay between humans and things and the interconnectedness between things themselves (Ahmad, 2019). The general usage of IoT devices has led to a concerning growth in energy consumption, resulting in a growing amount of waste, excessive heat, and carbon emissions that are poisonous to the environment (Al-Turjman, 2019). Additionally, the production and disposal of IT hardware have been a significant contributor to environmental issues, with complex processes that have the potential to disrupt the delicate balance of our ecosystem (Murugesan, 2008). According to contemporary studies, IoT is transforming rapidly, with 24 billion out of 34 billion interconnected devices projected to join the IoT realm by 2020 (Ahmad, 2019), and this highlights significant growth opportunities and the importance of staying ahead of the curve.

Green Computing encompasses many practices, such as using energy-efficient hardware, eco-friendly data centers, sustainable software design, and adopting sustainable strategies in designing, producing, operating, and disposing of ICT equipment and services (Naim, 2021). The significance of green computing lies in its potential to make technology a catalyst for environmental conservation rather than its adversary.

Green Computing presents a promising solution for a sustainable future by striving to minimize the environmental impact of computing systems. It achieves this by reducing the harmful materials used in computers, increasing energy efficiency, and promoting waste recyclability (Kaur, 2015). A primary area of focus for Green Computing is data centers that consume vast amounts of power. To address this, it uses various strategies like virtualization, power management techniques, and innovative cooling systems to curtail power consumption. Virtualization is a pivotal component of Green Computing that reduces the need for numerous servers, leading to significant energy savings. Energy-efficient cooling systems help dissipate the heat data centers generate, lowering power consumption and minimizing environmental impact (Zhang, 2021). Several tips, plans, tools, and technologies are available for pursuing Green Computing, ranging from choosing energy-efficient hardware components to implementing environmentally responsible disposal methods for obsolete equipment. Adopting sustainable practices like recycling and refurbishing computer components promotes a circular economy, reducing electronic waste and conserving valuable resources.

This research explores the multifaceted approaches and technologies that facilitate environmentally friendly IT practices. It will investigate the integration of Green Computing principles into the realm of IoT and other emerging technologies to mitigate the potential environmental impact. The aim is to inspire individuals, businesses, and policymakers to embrace a sustainable approach and work together to build a more environmentally friendly society and economy.