Design of Green IoT for Sustainable Smart Cities and Ecofriendly Environment

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Eur. Chem. Bull. 2023, 12 (Si6), 4014 – 4017

Abstract

Green IOT is basically referred to as the adoption of energy efficient norms to reduce the environmental impact of IOT applications. IoT devices need to be energy efficient to reduce the impact of CO_2 emissions. It basically aims towards the sustainable use of IOT to reduce the environmental impact and at the same time optimizing the carbon footprint of the rapidly evolving technology. Hence, the entire concept of Green IOT revolves around green design, production, utilization and ecofriendly disposal of the technology. From production to disposal, everything needs to have negligible impact on the environment. Green IoT is targeted towards improving the energy efficiency of IoT devices to create a more sustainable environment.

Keywords -*Green IoT, Sustainability, Carbon footprint, Energy efficiency*

Introduction

The use of IoT devices is witnessing an exponential growth with the mass adoption of digital technology since 2020. The production of these interconnected devices is going to reach 100 billion by 2030. It has caused an alarming rise in the energy consumption levels. With the initiative of the government towards the development of smart cities, there is a heavy investment expected in the field of IoT technology. Iot is expected to play a significant role in the management of many depleting resources **[1]**.
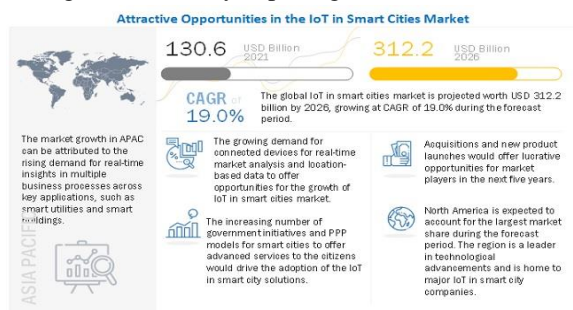

Figure1: Market size of IoT for smart cities (Source: 1)

In smart city arrangement, IoT is going to look after the effective utilization of the resources. The application of IoT in real time requires a high level of connectivity between a large number of IoT devices. Every activity has an associated cost with it. According to experts, the cost of these devices in the form of environmental impact is going to see a phenomenal rise in the coming years. Amid the situation of high emission and environmental impact, renewable and green technologies are gaining importance in the technology arena. This gives rise to the concept of Green IoT and its applications [2]. To reduce the environmental impact of IoT, it needs to be improved in terms of energy efficiency to make it cleaner and greener. The deployment of Green IoT will slash its carbon footprint and will highly reduce

environmental exploitation. The problem with the normal IoT connectivity is the high energy consumption followed by harmful emissions. The large-scale energy consumption by IoT ecosystem is also a huge concern. Green IoT is the future as it operates with sustainable designs to improve the energy consumption and reduce the environmental pollution [3]. Green IoT is primarily development of energy efficient networks and systems. The connected devices under this process will reduce the energy consumption, greenhouse effect and will also help minimize the carbon footprint. For developing Green IoT, sustainable design and energy efficiency are the foremost requirements [4]. The development of Green IoT products encompasses four stages – Green design, utilization, production and green disposal. Green design is related to the designing of equipment's, servers and networks as well as highly energy efficient components. The aim of Green IoT is to create a smarter world through energy harvesting [5].

Literature Review

The current study aims to develop smart cities based on the application of IoT devices to improve sustainability, environmental health and safety. The current research will trace all the strategies for the improvement of sustainable cities [6].
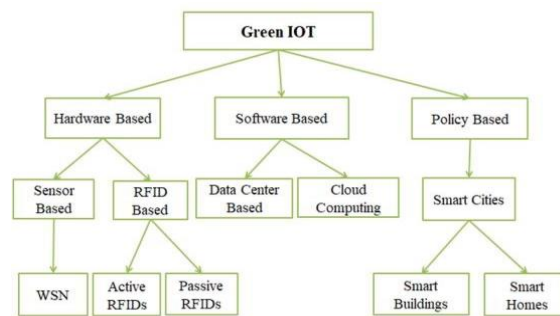

Figure 2: Taxonomy of Green IoT

(Source: 2)

Sustainability of cities can be assessed based on certain parameters such as reduced traffic, lower emission, improved waste disposal, efficient resource utilization, efficient energy consumption, lower pollution and improved quality of communication networks. The existing literature on Green IoT based smart cities is dispersed. There is inappropriate information on the recognition of Green IoT. There is no indepth explanation of the application of IoT systems for reducing emission, improving energy consumption and so on [7]. The green IoT lifecycle has four stages which includes green design, green deployment, production and green disposal or recycling. Green IoT is particularly aimed at reducing emissions and improving the energy efficiency. Green design is the key step in moving towards green IoT. The design impact of Green IoT includes developing energy efficient components, networks and communication protocols [8]. It basically aims at the concept of Green by IoT [8]. Green in IoT means all the hardware and software devices need to be green in design. Sustainability is the development of a process that can be used again and again. It is based on the assumption that resources are finite and must be used judiciously to meet future priorities. Green IoT promotes sustainability by efficiently utilizing the resources of an area. It also promotes overall sustainability through reduced environmental impact and improved energy consumption. It is aimed at reducing the carbon footprint by reducing the greenhouse effect]9]. The carbon footprint of interconnected devices is on the rise due increased power consumption and the development of gadgets.

The deployment of green IoT is aimed at resolving this issue.

Objectives

- To determine the concept behind Green IoT
- To explore the application of Green IoT for sustainable smart cities
- To explore the fundamental steps for developing green IoT
- To explore the challenges in the designing of green IoT devices

Methodology

To validate the research, authentic secondary sources of data need to be collected. The existing reports will provide crucial data for quantitative and qualitative analysis. The data collection method needs to be transparent for the validation of the research in real context [10]. The present research will open the scope for future research into the area. It will be a holistic approach to explore the sustainability of IoT devices.

Conclusion

The survey concludes that all the efforts in the designing of IoT devices will be beneficial for the society, unless the concept of Green IoT is taken into consideration. Green IoT is the future for the sustainable development of smart cities [11]. Greening IoT will help to achieve the primary goal of reducing emission and waste, improve ecological conservation and minimize the operating cost as well as energy consumption. Designing is the key essential step in moving towards Green IoT. The design must be in a way that it promotes the green lifecycle of the devices. [12]

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