Chapter 2
A Comprehensive Review on Blockchain–Based Internet of Things (BIoT):
Security Threats, Challenges, and Applications

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ABSTRACT

The internet of things (IoT) represents rapid development in research and industry that enables both virtual and physical objects to be linked and transfers information in order to produce various services that enhance our excellence of life. Traditional security and privacy methods are not applicable for IoT, mostly due to their topological constraints and versatility of IoT devices. Blockchain technology has started to fascinate younger generations because it works especially well in the digital world. Blockchain is suitable for internet of things applications. Advancements in IoT have propelled distributed systems. The blockchain concept demands a method for exchanging and storing data that is managed by a de-centralized network. The rise of IoT applications is hindered by these obstacles. One option to fix these problems is to use a distributed ledger technology using blockchain technology. This chapter gives a comprehensive overview of blockchain's strengths and weaknesses with its applications.

INTRODUCTION

The market has seen an exponential increase in IoT devices over the last decade. The number of IoT devices on the market is reaching 25 billion and is anticipated to reach 50 billion by the end of 2025. These devices feature sensors to connect to the network and provide data to a reserved node. Many devices in our daily lives are becoming wirelessly compatible with low-power wireless devices. A wide range of objects (or physical equipment) may be easily interacted via the IoT, including monitoring sensors, household appliances, security cameras and automobiles (Khan et al., 2018). These applications leverage massive amounts of data created by objects to assist individuals, governments, and businesses.

One of the most emerging technologies of this century, the Internet of Things (IoT) is a hyper-connected IoT is basically anything connected to the Internet. IoT devices are characterized by low power, limited storage, and low computing capacity. IoT devices are connected to the internet via "gateways" that allow the devices to "talk" to each other. IoT improves the global connectivity of people and their surroundings by bringing intelligence and greater efficiency to everything in the globe. Many "things" are being connected, thereby increasing the amount of data generated. These additional data help to further connect people and the environment, therefore enabling us to increase the intelligence of our surroundings. For instance, data may be gathered to support tailored services for customers. The popular IoT is now seeing fast expansion in both industry and research. A large number of well-known companies, like Amazon and Google, have invested billions of dollars to construct IoT platforms, like the Amazon AWS IoT and Google Cloud IoT (Agrawal et al., 2018).

Blockchain, a digital ledger technology that has lately captured the attention of the world and it is a database which records transactions. With respect to blockchain identification and accessibility, there are three broad categories: public, private, and consortium. Blockchain transactions, which are blocks of information, are used to securely store information. This aspect of blockchain is completely different from anything else. Decentralized consensus is very resilient because to its ability to stay consistent, continue operating, and automatically resolve any faults.

The new Blockchain technology may be used in a broad range of industries. Blockchain may be used in the IoT sector to share and exchange network data, validation, and security service between devices. Blockchain technology faces a few important problems that are being studied with an emphasis on security of cyber-physical systems in the IoT sector. A lot of legitimate companies are doing their best to guarantee there is appropriate connectivity, privacy, and security in the IoT network. Blockchain and cloud computing have been used to empower many entities. The technology improves the IoT information system by making it more transparent, reliable, and well-governed (Kumar et al., 2018).

Governments are using Blockchain in IoT applications to revolutionize data modelling. Because it is good at separating, safeguarding, and transferring IoT data and services, it is the best option for these kinds of programs. Many IoT technologies utilize blockchain nowadays. IoT services often experience risks and complications. Blockchain is a solution to many IoT cyber-physical system challenges. Management in smart communities and all of the associated elements must be described according to individual benefits (Da Xu et al., 2021).

Security is a key problem as we progress towards decentralization, persistence, anonymity, and auditability. This article gives an overview of blockchain characteristics and cyber-physical system security threats. It also discusses existing solutions and blockchain applications for various issues that may arise. Blockchain technology's decentralization, durability, anonymity, and auditing features have captivated

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