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ROLE OF BLOCKCHAIN IN IOT

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Abstract
The Internet of Things (IoT) uses blockchain, a cutting-edge technology, to store transactions between IoT nodes in a decentralised, distributed, public, and real-time ledger. A blockchain connects each block to the ones that came before it. Each block includes its own data, the hash of the one before it, and a secret hash code. Blockchain transactions serve as the fundamental units used to transfer data between Internet of Things nodes. The many physical, intelligent IoT nodes come in different shapes and sizes and have software, sensors, and actuators that can connect to other IoT nodes. The role of blockchain in the Internet of Things is to provide a way for IoT nodes to process secure data records. Blockchain is a secure technology that anybody may use.
Keywords:Internet of things (IOT), Blockchain, Cryptography.

I. Introduction

The Internet of Things is growing rapidly year after year thanks to its emphasis on 5G technologies, which include distributed intelligence, smart cities and homes, e-health, and so on. For IoT devices, decentralised connectivity is used. The use of current conventional security measures in the connection between IoT nodes is therefore extremely challenging. The blockchain is a technology that provides security for exchanges between IoT devices. It provides a distributed, open-access shared ledger that is decentralised in order to hold the details of the blocks that are processed and verified in an IoT network. The Blockchain is a system that allows transactions between IoT nodes to be performed in the form of a block. Every device has an address for its prior device, and the blocks are linked to one another. The public ledger's data is autonomously managed using the peer-to-peer topology. The combination of IoT and Cloud underlies the operation of the blockchain and IoT. The Blockchain would revolutioniseIoT connectivity in the future.

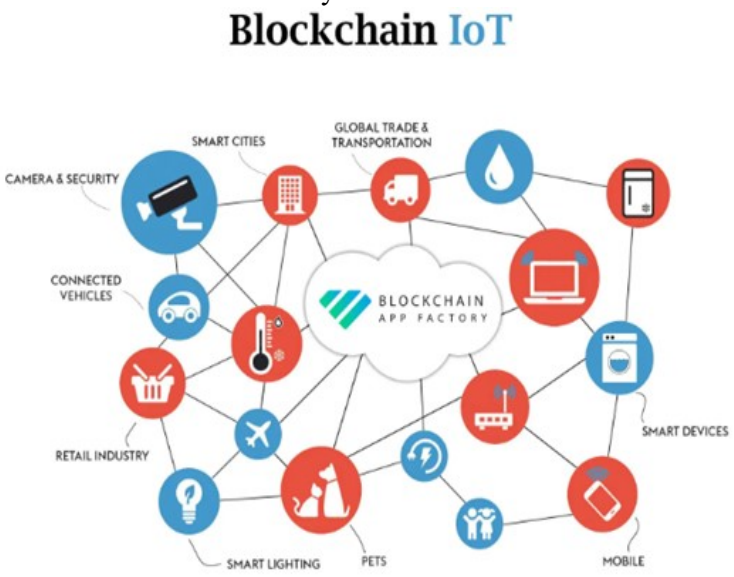

Figure 1: Role of Blockchain in IOT

II. Literature

The objective of the literature review is to find and explore the benefits of using Blockchain in IOT and also to find the short comings in existing technologies and techniques. The main goal of this literature review is to find the gaps in existing research and techniques and possible solutions to overcome these gaps.

A blockchain-based security framework for IoT, focusing on data integrity and privacy proposed by Azaria et al.[1] The architecture and components of the framework were outlined and discusses how blockchain can enhance security in IoT ecosystems.[1] A Systematic Literature Review on the potential applications and research trends, different blockchain architectures was conducted by Christidis and Devetsikiotis.[2] It the design considerations and challenges of implementing blockchain-based solutions in industrial IoT environments discussed by Xu et al.[3] The integration of blockchain technology in smart cities and IoT applications in order to enhance security, privacy, and trust in IoT-enabled smart city environments was discussed by Biswas and Anupam[4] A theoretical framework and taxonomy for understanding the security challenges in IoT presented and also proposed how blockchain can address these challenges by Dorri et al .[5] To examines the various applications and architectures of blockchain in IoT, highlighting the potential benefits, challenges, and research gaps a review was conducted by Dorri et al .[6]

2.1 Role of Blockchain in IOT

In the context of IoT (Internet of Things), blockchain performs a number of crucial roles. These are some of the major functions that blockchain can perform:

1. Security of data: One of the primary uses of blockchain in the Internet of Things is to guarantee the accuracy and security of data created by and exchanged between IoT devices. Blockchain's distributed and unchangeable ledger allows for the storage of IoT data in an open and secure manner. By logging data transactions on the blockchain, which makes them nearly hard to alter or fake, the integrity of the data is ensured.
2. Decentralisation and peer-to-peer communication: Blockchain enables the decentralisation of IoT networks, eliminating the need for a centralised authority or mediator for the transmission of data. IoT devices can immediately communicate with one another through the blockchain network.
3. Trust and Identity Management: Blockchain creates a decentralised and tamper-resistant way for managing identities, offering a layer of trust for Internet of Things (IoT) devices. Each IoT device can have a unique identifier stored on the blockchain, allowing for secure device authentication and verification. In addition to protecting against tampering and unauthorised access, this fosters device trust.
4. Smart Contracts and Automation: Platforms built on blockchains usually include smart contracts, which are self-executing contracts with specified conditions. IoT devices can communicate with smart contracts on the blockchain, enabling automated and secure implementation of contracts without the need for middlemen. This enables the automation of IoT processes including device provisioning, data sharing, and payment settlements.
5. Data Monetization and Ownership: Blockchain can empower individuals or groups to maintain ownership and control over their IoT-generated data. Users may control who has access to their data, keep track of how it is being used, and even monetize it by selling it directly to buyers via blockchain-based technologies. By giving IoT data owners more privacy and control over their data, this might potentially create new business models and value generation opportunities.
6. Scalability and Interoperability: Since blockchain protocols are designed to handle a large volume of users and transactions, they are suitable for growing IoT networks. Interoperability between diverse IoT platforms and protocols is made possible by the standardised, decentralised foundation that blockchain provides for data exchange and communication.

2.2 Opportunities and threats in the integration of blockchain and IoT

Blockchain and IoT (Internet of Things) have different but occasionally overlapping aimsin certain areas. Let's examine each of their objectives in turn:

Combining blockchain with IoT opens up a lot of possibilities. It can improve healthcare data management and interoperability, improve supply chain management by ensuring transparency and traceability, convert energy grids into smart and efficient systems, enable autonomous vehicles, enable the development of smart city infrastructure, and enable people to monetize and control their IoT-generated data. But when blockchain and IoT are coupled, issues with scalability, interoperability, and the resource constraints of IoT devices arise. To get over these challenges, more research, development, and standardisation work is required.

The combination of blockchain and IoT generally portends a promising future for IoT applications by Blochchain technology.

2.3 Future Scope

The Internet of Things (IoT) and blockchain integration have a huge future potential and offer great promise for a variety of sectors. In the following domains in particular, blockchain and IoT can open up new possibilities:

1. Improved Security and Privacy: Blockchain can address security and privacy issues in IoT by providing a transparent, tamper-resistant platform for data storage and exchange. In turn, this reduces vulnerabilities and increases confidence in IoT environments by facilitating secure data integrity, access management, and authentication.
2. Supply Chain Management: Blockchain has the potential to transform supply chain management by enabling end-to-end traceability, transparency, and accountability. IoT devices may use the blockchain to track and verify each step in the supply chain, ensuring product provenance and authenticity while reducing costs.
3. Smart Energy networks: The development of smart, decentralised energy networks has the potential to be greatly aided by the use of blockchain and IoT. Smart metres and other IoT devices can collect real-time data on energy consumption, and blockchain technology can securely record and confirm transactions, enabling peer-to-peer energy trading, enhance grid optimisation, and control energy usage.
4. Healthcare and Medical Records: Blockchain can improve the security, usability, and interoperability of healthcare data and medical records. The blockchain enables easy and secure access to medical records by authorised parties by securely storing and sharing real-time patient data generated by IoT devices, such as wearables and medical sensors.
5. Autonomous Vehicles: The use of blockchain and IoT can help with the development of autonomous vehicle systems. IoT sensors and devices may gather real-time vehicle data, such as performance measurements and maintenance needs, and store it on the blockchain. After that, this data can be used for automated decision-making, secure vehicle-to-vehicle communication, and fleet management.
6. Smart Cities and Infrastructure: Using blockchain and IoT technology, smarter, more efficient cities may be built. The Internet of Things' sophisticated sensors and measurements may collect data on several subjects, including trash management, energy use, and traffic patterns. Blockchain technology may be used to securely store and process this data, enhancing resource management, urban planning, and citizen engagement.
7. Digital Identity and Authentication: Blockchain can provide digital identity and authentication.
8. Data Monetization and Sharing: Blockchain enables people and businesses to profit from and distribute IoT-generated data in a secure and open manner. Blockchain-based markets allow data owners to directly sell or licence their data to interested parties, creating new opportunities for collaborations and data-driven business models.

III. Conclusion

IoT and blockchain integration have a lot of promise to alter many industries and address urgent concerns. The decentralised, secure, and transparent architecture provided by blockchain technology enhances data privacy, data integrity, and user trust in IoT ecosystems. Without the use of intermediaries, IoT devices can automate transactions, securely communicate data, and authenticate one another using blockchain.

References

[1] "Blockchain-based Security Framework for IoT" by Azaria et al. (2016)
[2] "Blockchain for the Internet of Things: A Systematic Literature Review" by Christidis and Devetsikiotis (2016)
[3] "Blockchain for Secure and Efficient Data Sharing in Industrial IoT" by Xu et al. (2018)
[4] "Blockchain Technology for Smart Cities and Internet of Things Applications" by Biswas and Anupam (2019)
[5] "Blockchain-based IoT Security: Theoretical Framework, Taxonomy, and Open Challenges" by Dorri et al. (2017)
[6] "A Systematic Review on Blockchain Technology in Internet of Things" by Yuan et al. (2019)
[7]. Reyna, Ana, et al. "On blockchain and its integration with IoT. Challenges and opportunities." Future Generation Computer Systems (2018). DOI: https://doi.org/10.1016/j.future.2018.05.046
[8]. Zheng, Zibin, et al. "Blockchain challenges and opportunities: A survey." International Journal of Web and Grid Services 14.4 (2018): 352-375. DOI: https://doi.org/10.1504/IJWGS.2018.095647
[9]. Alphand, Olivier, et al. "IoTChain: A blockchain security architecture for the Internet of Things." Wireless Communications and Networking Conference (WCNC), 2018 IEEE. IEEE, 2018.
[10]. Alam, Tanweer. (2018) "A reliable framework for communication in internet of smart devices using IEEE 802.15.4." ARPN Journal of Engineering and Applied Sciences 13(10), 3378-3387