Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 11, November-2021

A Theoretical Analysis of Blockchain In 5g Technology and Electrical Grid System

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***Abstract*- Until date, every communication standard evolution has been driven by the requirement to provide end-users with high-speed connection. However, 5G and beyond networks are being designed to be future proof by catering to the different needs of a variety of use cases, signalling a significant move away from this concentration. Ultra-Reliable Low Latency Communications, Massive Machine-Type Communications, and Improved Mobile Broadband are among the criteria. To achieve such features in 5G and beyond, present cellular networks must be rethought, as new radio access technologies and the utilisation of new spectrum are insufficient. Software-defined networking, network function virtualization, machine learning, and cloud computing are among the technologies being integrated into 5G networks to meet a variety of needs. However, decentralisation, transparency, interoperability, privacy, and security are all issues that these technologies raise.**

Keyword- BLOCKCHAIN, 5G technology, Distributed Power, Smart Grid

I.INTRODUCTION

5G wireless technology promises multi-gigabit per second peak data rates, ultra-low latency, better dependability, huge network capacity, higher availability, and a more consistent user experience. IoTs, big data, cloud computing, edge computing, blockchain, and AI all come together in 5G. Smart grid is a new trend in traditional power systems [1]. It combines contemporary sophisticated information and communication technology and focuses on the end-to-end linkages of power generation, transmission, distribution, and consumption [2]. Ultra-low latency (millisecond level) and high isolation (total isolation from other 5G vertices) are critical features of smart grid. Excellent isolation, high dependability, and huge access are just a few of the benefits. Edge computing puts cloud computing, storage, and networking resources closer to applications, devices, and consumers. On the 5G base station side, Smart Grid necessitates the deployment of edge computing services. Therefore, large power equipment may be connected via 5G multi-access edge computing technology (MEC). Blockchain has shown early success in a variety of industries in the recent era. Distributed energy transactions, smart microgrids, smart power distribution, and smart power consumption are all examples of blockchain use cases in energy applications. Blockchain is a decentralised trust mechanism. For distributed energy operations, blockchain provides a non-centralized trust mechanism. [6] evaluated the potential benefits of blockchain applications in smart energy systems by introducing some of the key blockchain platforms and research initiatives in smart grids. Because 5G is compatible with a large number of devices, blockchain now has more data than ever before. Blockchain eliminates 5G's insufficient property rights protection, lack of confidence in virtual transactions, and inadequate privacy and security. Data security, identity identification, and privacy protection will all benefit from decentralised edge computing based on blockchain technology [7], In blockchain, you may search for information because information may be dispersed and not indexed, finding information on a blockchain is currently a difficulty. As a result, a blockchain explorer is an excellent choice. This encourages the dissemination of localised information and the education of smart Grid IOT devices. The IoT device identification will be used as the index for the blockchain explorer to search for certain domain terms to get the needed information. As a result, IoT device identification is in the centre of the blockchain-based smart grid equipment management process. In this study, we examine unified coding by combining blockchain technology with 5G EC to enable the connectivity of huge power IoT services at the edge of the 5G network.

II. THE MAJOR CHALLENGES OF BLOCKCHAIN ARE AS FOLLOWS.

1.The Throughput of blockchain apps is quite low.

2. Most existing consensus algorithms are only applicable for a particular blockchain application. Pow is a widely used consensus method. However, when validating transactions, this approach necessitates additional computational resources, which is a significant barrier for smart grid edge devices with limited resources. To employ Blockchain applications in the smart grid, we must either upgrade or invent a new consensus method. This is a major prerequisite for the deployment of blockchain in the smart grid.

3. Blockchain is responsible for decentralising, immutability, and high reliability in a system. However, the Blockchain application platform is not very secure. As a result, we propose a smart contract method for smart grid Blockchain applications, which can improve the platform's security.

III. BLOCKCHAIN IN SMART GRID AND IOT

Smart Grid- A smart Grid is an electrical network that uses digital communication technologies to enable a two-way flow of electricity and data. It is a next generation power system with strong informatization, automation, and

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interactivity capabilities, among other things [8]. It optimises grid profit by enhancing grid power supply dependability, promoting energy savings, and lowering emissions. The smart grid links IoT devices and provides a push for information transfer. In all areas of smart grid, the 5G MEC is in charge of information collecting and local offloading.

IoT device Identification - The primary function of the IoT device Identifier is to identify IoT devices in the smart grid system. We can create a more secure and convenient digital identity authentication system for IoTs by combining blockchain technology, security algorithms, and encryption technology.

Smart grid equipment identification - Smart grid equipment code is very significant in smart grid equipment. Because smart grid equipment code is the sole index that may be used to do various database operations. He standardised smart grid device coding and identification by creating a uniform database.

Smart grid equipment coding- the current smart grid equipment management suffers from basic coding standardisation issues because different units, different types of professional equipment, and different systems each have their own coding schemes, and the formulation of the coding scheme lacks a unified standard. The current coding method primarily encodes equipment on the service link, and its coverage is insufficient; nevertheless, it has not yet covered equipment on the control link, such as power generation and smart grid transmission. As a result, standardised device coding can enable data exchange while also lowering expenses.

It can not only offer a basic level of assurance for the smart grid's integration of energy and information flows.

Unified coding and identification standard system-we create a uniform coding and marking standard system in which the equipment code is uniquely identified and unifiedly identified. "One item, one identifier" is the legal identity for the operation and control of smart grid equipment. As illustrated in Fig. 1, we created a basic foundation for a single coding and identification standard system for smart grid devices.

Blockchain Technology is Being Used We transform an IoT business platform into a decentralised business platform, allowing all IoT entities to cooperate in a decentralised manner. Smart contracts are supported by the IoT blockchain. As a result, it provides IoT services. IoT devices use smart contracts on the IoT blockchain to automatically manage registration, update, authentication, access, and data processing.

IV. METHOD

Because of 5G's proliferation of smart gadgets in smart grids, blockchain now contains more data than ever before. A blockchain system is made up of several components, including network, consensus, application, and meta-application layers [9]. For smart grids, we proposed a hybrid blockchain system. Blockchain is classified into three types: public, private, and consortium blockchain.

Hybrid blockchain system- hybrid blockchain system the hybrid blockchain architecture used in the smart grid would increase communication between multiple enterprises, which is extremely different from single blockchain design. On a hybrid blockchain, each organisation creates its own private blockchain. When data is exchanged between organisations, the organisation chooses which data to store in its own private blockchain, compresses it, and uploads it to the consortium blockchain.

5G MEC with blockchain -The use of blockchain technology to mobile edge computing [BMEC] provides access and administration of smart grid equipment, as well as data offloading [10]. Blockchain nodes are installed on the MEC server in BMEC. By connecting to the nearest MEC server, mobile devices carry out the blockchain consensus process. Each server runs a copy of the blockchain. The fundamental difficulty for single node design in distributed systems is consistency [11]. A virtual node can perform better than a real node. The process of establishing an agreement on a certain state among several nodes in a distributed system is described as consensus.

Some notable consensus algorithms include PoW, PoS, DPoS, and PDFT. The table below shows a performance comparison of the consensus algorithm. Hybrid Method-A Block chain cannot use a single consensus mechanism since speed, security, and centralization cannot all be accomplished at the same time. As a result, we suggest a hybrid paradigm in which two or more consensus processes collaborate. Mixed consensus can compensate for the shortcomings of a single consensus method, such as low efficiency, loss of security protection, or sacrifice of centralization degree. The hybrid PoW-PoS protocol, for example, has the same security as the PoW algorithm but does not use it.

Minor generates PoW blocks, while Mint generates PoS blocks. When miners/minters identify a valid PoW/PoS block, they broadcast it to the network and expect it to be validated by other nodes.

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ISSN: 2278-0181
Vol. 10 Issue 11, November-2021

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