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BLOCKCHAIN TECHNOLOGY AS AN INFRASTRUCTURE: A REVIEW

Dr. Anjali Garg
Department of ECE,
The NorthCap University,
Gurugram, Haryana, India

Nishita Yadav
Department of ECE,
The NorthCap University,
Gurugram, Haryana, India

Nishant Yadav
Department of ECE,
The NorthCap University,
Gurugram, Haryana, India

***Abstract*— Blockchain technology is generating a lot of buzz around the world. If the results of staff and analyst surveys become more extensive, different industries and use cases found can benefit from the adoption of Blockchain. However, the emphasis has been on money rather than on the fundamentals of blockchain technology, such as peer-to-peer networks, encryption, and consensus methods. Despite early reservations about the technology, governments and large companies have recently attempted to implement and expand it in a range of applications, ranging from the banking, social, and legal sectors to architecture, manufacturing, and procurement networks. Given the size, diversity, and sophistication of the mechanisms involved in delivering a wide range of public services, India's governance poses particular challenges. Blockchain technology has the ability to completely transform government, industry, and citizen relationships in ways that were unimaginable just a decade ago. Our paper aims to illustrate the particular problems that have been encountered since their execution, as well as usage cases that the government and companies should investigate.**

Keywords— **Blockchain technology, Cryptocurrency, Bitcoin, Cryptographic password, Peer to Peer Network**

I. INTRODUCTION

Bitcoin and blockchain were first proposed in 2008 by someone going by the pseudonym Satoshi Nakamoto, who demonstrated how cryptography and decentralized distributed networks can be incorporated through a digital currency framework (Nakamoto 2008). The incredibly high volatility of bitcoin, as well as the reaction of many countries to its appearance, initially hampered its development, but the advantages of blockchain, which is bitcoin's core technology, have drawn increasing interest [1]. Blockchains are a modern form of network architecture that introduces distributed verifiability, auditability, and agreement to build "trust" in networks. Simply placed, Blockchain is a protocol for sharing value without the use of a middleman over the internet. The distributed ledger, geographic dissemination, knowledge privacy, the emergence of disruptive data, and accountability are all advantages of the blockchain. There have been advances, new applications, and applications as technology has achieved mainstream acceptance in recent years.The list of possible Blockchain implementations is infinite, ranging from digital currency to Blockchain-enabled legal contracts, with the most ambitious applications yet to be created[6][5].

WHAT IS BLOCKCHAIN?

A blockchain is essentially a distributed ledger: a sequence of 'block' periods, each of which contains information [1]. After the last node, a valid network operation record has been added to the series. In truth, the blockchain can be seen as a distributed timestamp-only data framework. For the first time, blockchain technology allows two or more organizations who do not meet or trust each other to share stable sums online without the use of a third party. Instead, the prerequisite for transaction authentication is met by a method known as ‘mining,' which guarantees the protection and functionality of the data attached to the chain. Internet marketing is aided by blockchain technologies. The fact that blockchains run on a low-level network means that no one company owns or dominates the infrastructure, which is a significant advantage. By removing the need for third-party resolution or regulation, dispute can be avoided in all forms of exchanges involving expense, risk, data, and control. Private Key Cryptography is used to protect identities, and hash functions are used to render the blockchain immutable. The distributed ledger's consistency is maintained by P2P computers on the network. Based on the criterion, the algorithm assigns a protocol to the blockchain [1].

II. PEER-TO-PEER NETWORK

P2P (peer-to-peer) is a modular network networking model that consists of a collection of machines (nodes) that end up exchanging and sharing files, with each node acting as a separate peer. P2P links are formed in this network without the use of a server or central control, implying that all nodes are similarly efficient and execute the same functions. In comparison to intermediate schemes; the networks used exclude single points of failure [15]. Blockchains survive for longer than intermediate networks and are better at preventing malicious access due to the spread of danger between its domains[2][11]. The peer-to-peer blockchain

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architecture enables all cryptocurrencies to be shared internationally without the need of a middleman. Anyone who wants to engage in the process of hashing and testing blocks will set up a Bitcoin node on a distributed peer-to-peer network. In a peer network, blockchain is a database that is sent to one or more intangible properties. When we say peer-to-peer network, we mean a network on which all machines are linked in some manner, and each one maintains a full copy of the ledger and compares it to other devices to ensure that the data is correct. This is not the same as a bank, where deposits are held confidential and only the bank has power of them [2][16][17].

Pair of cryptographic passwords, a Public Key and a Private Key, are held by each person. Any user connecting to the blockchain will see the Public Key, which is a randomly generated address. A Private Key, on the other hand, is a secreted address that is mathematically linked to all addresses attached to a blockchain but must be kept secret in order to verify transactions[20][7][12].

Each transaction is safeguarded by this infrastructure's digital encryption. The signature is digitally signed using the sender's "private key" and forwarded to the receiver's "public key." The owner of a cryptocurrency must prove possession of the "private key" in order to spend money. (Figure 1)

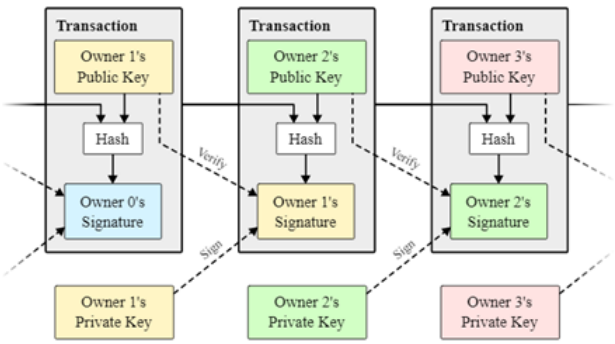

Figure 1: Transaction of digital coins.[20]

III. TYPES OF BLOCKCHAIN

Public: A public blockchain is a piece of ransomware that hasn't been used yet. Anyone with an internet connection may join a blockchain network as an authenticated node by logging into the blockchain portal. A shared blockchain node or user has the ability to browse current and historical data, check transactions or inbox processes, and mine. The fundamentals of mining community blockchains and cryptocurrency trading. As a result, Bitcoin and Litecoin became the most widely used social blockchains. If developers obey security guidelines and protocols, public blockchains are much safer. It is only risky if members do not follow the protection arrangements to the letter[18].

Private: On a closed network, private blockchain operates by blocking or granting permission only. Private blockchains are widely used by a company or entity where only a few people are allowed to join the blockchain network. The governing body controls the standard of protection, licensing, licenses, and access. As a result, proprietary blockchains are used similarly to public blockchains, but with a narrower network and more restrictions. Voting, wealth management, digital identity, asset ownership, and other private blockchain networks were sent [16].

Consortium: A consortium blockchain is a method of division in which a blockchain network is controlled by several organizations. This is in contrast to what we've seen in the private blockchain, which is controlled by a single entity. In this form of blockchain, more than one entity may function as a server, modifying data or creating mines. Banks, government departments, and other institutions often use consortium blockchains[9].

Hybrid: A mixed blockchain combines the benefits of both proprietary and public blockchains. It combines the benefits of all types of blockchains, allowing users to have a private license-based scheme as well as a public system with less restriction. Users will monitor who has access to what data in the blockchain with a hybrid network like this. Only some types of blockchain data or databases can be able to keep public records confidential. Users can conveniently join a private blockchain or several public blockchains thanks to the hybrid blockchain system's flexibility. A private hybrid blockchain network's transactions are normally checked on the network. Users may, however, exclude it from the public blockchain for authentication purposes. Many authentication nodes are used in social blockchains, which increases hashing. This increases the blockchain network's stability and accountability [18].

IV. BLOCKCHAIN USE CASES

In Financial Services Industry

Consortium Banking: Many large-scale ventures, such as road construction, railway lines, airports, warehouses, and new commercial centres, are undertaken by businesses. Receiving such large sums necessitates institutions banding together to form alliances and exposing their participants to financial harm. The bank's loyalty to any one entity would be limited as a result of such involvement in lending. Testing and maintaining protection should be done by the leader bank or rotation members. Automated selection criteria for syndicate forming in programmable smart contracts will speed up time-consuming processes including member selection based on financial soundness and market experience, as well as term and condition negotiation[9].

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Payments: The Indian banking sector is thriving, revitalizing and trying to adopt and initiate electronic payments to improve the banking system. Although Indian payment systems have always been dominated by paper-based operations, e-payments are no longer far behind. Since the introduction of e-payments in India, the banking sector has seen an unprecedented growth. The banking sector in India has seen exponential growth since the launch of e-payments. Banks are increasingly worried about the growing costs of complying with anti-money laundering (AML) and know-your-customer (KYC) regulations. Banks and financial institutions should perform the KYC procedure on their own. Currently, banks must upload KYC data to a central registry that banks can access in order to properly serve current and new customers. This series of failed attempts would eventually render blockchain technology obsolete. Both customer information will be available in near-real-time at both banks. It would aid in the reduction of fraud and non-performing assets (NPA), two issues that the Indian banking sector has been grappling with for some time[13][9].

Trade Finance: The use of blockchain technologies is highly recommended. If all big corporations, massive shippers, and suppliers, as well as cultural authorities, join a blockchain network, complex payment card transfers can be made simpler and quicker. Retailers, exporters, and their banks exchanged the details in a charger that was circulated privately. For multiple smart contracts, a trade deal may be made automatically after certain conditions are met. Data and decisions taken on their services can be viewed by relevant groups [10][3].

In Non-Financial Services Industry

Voting: The "secret keys" of each elector will be used to validate a voting procedure using blockchain technologies. The following protocol in this programme can be programmed in such a way that the users' identities are checked but kept secret during the finals of the election results in real time. As a consequence of the law, electors should be certain that the results are right and that they will not be subjected to bribery or abuse [9].

Digital Identity: Blockchain technology has the potential to provide infrastructure for measuring digital ownership at significantly lower costs and with significantly improved security. Rather than different governments granting IDs or passports to individuals, a patent service based on blockchain technologies would enable users from all over the world to obtain their digital identity through the power of space [19].

Smart Contracts: The most general understanding of smart contracts is that they are based around the principle of putting all properties in blockchain-based models. Any hard earth material depicted in the blockchain system can be given a digital ID. Ownership may be exchanged using these permissions, which are governed by intelligent agreements. For example, if the user's policy has expired, the door to the hotel room can be immediately opened there, the user's payment is approved, or the car may not allow that user to travel [8].

V. ISSUES IN BLOCKCHAIN IMPLEMENTATION

Both systems would have their own set of limits and concerns. Any analysts say the blockchain has been surpassed. Here are a few points to consider:

A. **Complexity:** The term "blockchain" has been given a new meaning. We've made cryptography a big competitor, elevating blockchain to a complex science [14].

B. **The scale of the Blockchain network:** Like all other digital technology, the Blockchain network expands exponentially in response to threats. Blockchain has a sizable consumer base. Full advantages would not be feasible until the blockchain supports a solid network with a large grid of nodes. Transaction costs and network speed: Using Bitcoin as an example, it was possible to perform seven transactions per second in late 2016. Each transaction cost $ 0.20 and could store up to 80 bytes of data. It also necessitates the addition of data to each network node as well as hash measurements, which consumes more network bandwidth.[4]

C. **Personal error:** When considering a blockchain as a database, high-level data such as input is needed. Since the records contained in the blockchain may be unstable, each occurrence must be meticulously documented. Otherwise, the adage "garbage in, garbage out" would be right[13].

D. **Politics:** The blockchain technology allows for the digitization of e-governance models. Miners develop a new form of enabling e-governance model. As a consequence, social tensions between different spheres of society are possible. It's an excellent function that clarifies partnerships by 'forking' a blockchain. This style of discussion will be more technical and, in some cases, more heated, but it will be more informative for those who want to combine democracy and consensus [14].

E. **The desire to communicate with one another**: There are three types of blockchain networks: proprietary, public, and consortium. Based on the application's requirements, each has advantages and drawbacks. Since no one answer suits all types of problems, one blockchain cannot be sufficient. The consensus solution can differ depending on the market. Other aspects like anonymity, convergence, and economy will differ depending on the industry. In this category, different kinds of blockchains are unable to interact with one another. To solve this problem, you'll need a number of networking strategies to connect the dots. Trends in Data In Blockchain technology, data unavailability is a secret problem. The possession of Bitcoin passed to the transaction is not guaranteed by the signatures.[4]

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VI.CONCLUSION

This paper argues that Bitcoin, and the blockchain technology that underpins it, is an evolving medium for more advancement not just in financial markets but also in government. The technology seems to be transforming into a stable paper handling support infrastructure, and it is therefore poised to have a major effect on potential technical developments, including in the public sector. Lessons learnt from previous attempts to incorporate modern technology, on the other hand, emphasize the importance of taking a practical and organized approach. As a first step, we've presented examples of implementation areas with strategies that are theoretically straightforward with little operational or institutional obstacles. However, considering the potential advantages of blockchain technologies, it is also critical that e-Government researchers begin debating the following issues: Are government agencies willing to explore blockchain technology's promise, and what are the major roadblocks? What are the main things to consider when deciding whether or not to use Bitcoin technologies in the public sector?

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