

A Compendious Study on Blockchain Technology in Healthcare Systems

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Abstract— The advancement in blockchain technology has paved path to the development of various sectors that are curious in its potential. Some of these include government, energy, finance, and health. Privacy and data confidentiality are some of the most critical concerns that people have when it comes to the storage of their medical data. The development of a technology platform that can provide a secure and smooth communication system for healthcare organizations is very important. Most developers are drawn to blockchain due to its immutability, distributed ledger, and decentralization. Its potential to allow the safe storage of medical records has led to its widespread adoption. The paper describes a healthcare system that can allow patients, doctors, pharmacists, and insurance providers to communicate securely. It compares this to existing systems and discusses the potential work areas for future developments.

Index Terms— Blockchain, Distributed Systems, Database, Secure Health, Decentralisation.

I. INTRODUCTION

A ledger or database that is shared by network nodes is referred to as a blockchain. It is used to cache and control data. One of the most popular applications of block-chain technology is to maintain a record of transactions in Bitcoin and other crypto-currencies. Its novelty is that it eliminates the need for a third party to safeguard a data record, which promotes confidence.

In a blockchain, data is organized differently from other types of records. Each of its units, which are referred to as blocks, holds sets of information. Whenever there is enough storage space, blocks are joined to one another to complete the set.

In a database, data is arranged into tables. On the other hand, in a blockchain, data is arranged into blocks, which are then strung together. This type of data format produces an immutable record of its data whenever it is used in a decentralized manner. Each block is then put to a timeline, and a correct timestamp is assigned to it as it is added to the network.

The main advantage of blockchain is that it allows users to maintain a single data-base that is not subject to regulation. This makes centralised authority unnecessary and makes it possible for it to be a reliable source of information. Its technical architecture has been modified several times. Without the capability to reconstruct an individual's fingerprint, hash capacities are the as it were way to affirm that a person's unique mark matches a

certain person. A hash value can also identify and copy data. The strength of a network lies in its ability to disperse information among various processing units and nodes, as well as maintaining confidence in its encryption. One advantage of using the SHA-256 hash function is that it can be used regardless of the original data's size.

The hash value generated by the hash function serves as the keyless signature for each request for electronic data, enabling a third party to verify the transaction's specifics, such as the transaction's time, identity, insurance number, and data integrity, by comparing it to the Blockchain. Hashing is a mathematical operation that converts variable-length data into a string of data with a specific length. The computer that connects to the Blockchain network is considered a node or hash function, and it can be assigned a smart contract, which is a type of code that enables automatic transactions. This program only operates according to the general-purpose conditions set by the contract's participants. The data could be perceived as private and public due to the various features of Blockchain.

II. EXISTING SYSTEM

Given the existing situation and all the conventional healthcare delivery systems, a person must go through all the formalities anytime they attend a hospital, including setting an appointment, filling out paperwork, and having a few easy tests performed. After speaking with the patient, the doctor will then prepare a prescription that contains every medication needed to treat that particular ailment. The next step is making the full consultation and medication payment. If the patient has health insurance, the expense is covered by the insurance company. However, integrating the whole process is time-consuming and ineffective. Additionally, while visiting a new physician, a patient is required to provide a thorough description of any ailments they may have previously experienced, sometimes omitting minor medications or allergies. However, it takes time and is wasteful to save all of this knowledge in hard copy form. Additionally, it was discovered that specific doctors in the epidemic charged patients in numerous manners, which is completely erroneous in many ways. Almost every sector has turned to third parties in previous years to facilitate payments. Most of the transactions conducted through the Unified Payment Interface (UPI) are carried out through third-party applications such as PhonePe and Amazon-Pay. In the medical sector, for instance, when a patient submits a prescription or receives a payment, banks or other electronic means of payment can deduct a certain sum. In this type of scenario, Blockchain technology eliminates the need for these third parties. The transaction value decreases as soon as it is completed, and the time it takes to complete the process is also a major issue with traditional systems. The application of Blockchain technology can also serve as a solution to this issue, a distributed computing system that speeds and optimizes each transaction.

III. ADVANCED HEALTHCARE MANAGEMENT FOR PATIENT'S BENEFIT

A decentralised database that is regularly kept current offers the healthcare sector significant benefits. When numerous parties require access to the exact same information, these advantages become increasingly intriguing. Medical treatment procedures are a natural area of use where Blockchain technology may offer value, especially in the care of the elderly or chronic conditions. When a patient is being addressed, there are often multiple parties involved and multiple media interruptions, which can make the authentication and information procedures for all concerned medical players time-consuming and resource-intensive.

The National Health Policy (NHP) was created by the Indian government in 2017 with the intention of guaranteeing the general health of all Indian people and ensuring every individual has unrestricted access to medical care of the highest calibre. NHP plans to establish a digital healthcare technology environment among numerous other objectives. The security of user data and privacy rights, along with data gathering, storage, and sharing, will be essential to its establishment. The Digital Information Security in Healthcare Act (DISHA) was formulated in 2017 for preserving the confidentiality of patients and the integrity of health data. By standardising and regulating the entire data retrieval process, as well as by protecting users' rights, DISHA will presumably streamline electronic medical records for millions of people with easy access in the future. In this scenario, the gap between creating rules and regulations and putting them into exercise could be filled by a federated permissioned Block-chain network in conjunction with the health information exchange (HIE) architecture.

To address this shortcoming, the government and private actors can collaborate in a public-private partnership model, which could hasten blockchain technology acceptance in the healthcare and other sectors. India has already made some strides in this direction. Using its unique Blockchain-powered ChainTrail, ThynkBlynk has

teamed with CallHealth, a Hyderabad-based start-up that offers healthcare platforms, to allow various healthcare suppliers enable safe exchange of information on system's convergence.

IV. ADOPTION

Blockchain technology has the potential to revolutionize the healthcare industry by improving data privacy, security, and interoperability. The healthcare sector has been slow to adopt blockchain, meanwhile, due to a variety of issues. One of the primary barriers to the adoption of blockchain in healthcare is the lack of understanding among healthcare professionals about the technology and its potential benefits. Healthcare workers may be hesitant to adopt a new technology because they may not fully understand how blockchain may improve data security and interoperability.

To solve this issue, programs for education and awareness creation should be developed to help medical professionals understand the potential benefits of block-chain technology. This may require arranging training sessions, workshops, and seminars for healthcare personnel to help them comprehend technology and its potential benefits in healthcare.

Another obstacle to the adoption of blockchain technology in the healthcare sector is the expense of deployment. Many healthcare organizations could find the price of developing a blockchain-based healthcare system prohibitive. Healthcare organizations can develop cost-effective blockchain solutions to circumvent this issue by collaborating with tech firms or blockchain consortiums. To reduce implementation costs, this can require developing open-source blockchain frameworks or using cloud-hosted blockchain systems.

Interoperability is another barrier to the use of blockchain technology in the healthcare industry. It can be difficult for various healthcare providers to interact and exchange data since healthcare data is usually stored in a variety of forms and platforms. As a result, the healthcare system can become ineffective, endangering patient care.

Blockchain technology can improve interoperability by providing a secure and de-centralized platform for the sharing of healthcare data. To accomplish interoperability utilizing blockchain technology, it may be challenging for different healthcare providers to cooperate and standardize.

To address this issue, healthcare organizations can collaborate with technology providers and regulatory bodies to develop standards and protocols for data exchange. To provide efficient data exchange across different healthcare providers, consistent data models, data dictionaries, and APIs may be needed. Regulatory concerns are another barrier to the use of blockchain technology in the healthcare industry. A variety of regulatory issues, including those pertaining to data security and privacy, moral, legal, and ethical challenges, and HIPAA compliance, are raised by the usage of blockchain technology.

To get over these challenges, healthcare institutions can work with regulatory bodies to establish clear guidelines and standards for the use of blockchain technology in healthcare. This may require developing brand-new regulatory frameworks that are customized for blockchain technology or modifying existing frameworks to account for the unique features of blockchain technology.

Finally, technical challenges can make it impossible to apply blockchain technology in the healthcare sector. As with creating a blockchain-based healthcare system, many healthcare organizations may not have the necessary technical expertise or funding to use this technology.

To overcome this issue, healthcare institutions can work with tech firms or block-chain consortiums to develop blockchain solutions. This would require using cloud-hosted blockchain systems, which might make it easier to build a blockchain-based healthcare system technically. In the healthcare sector, where blockchain technology is still in its infancy, there are a number of barriers impeding its widespread deployment. These challenges include knowledge gaps, financial constraints, interoperability issues, governmental prohibitions, and technical challenges.

In order to address these challenges, healthcare organizations must develop de-fined rules and processes for the application of blockchain technology in healthcare in conjunction with technology providers, regulatory bodies, and other stakeholders. By doing this, healthcare organizations can fully take use of blockchain technology, which will improve patient outcomes by enhancing data security, privacy, and interoperability.

IV. HEALTHCARE BLOCKCHAIN TECHNOLOGY USE CASE

Blockchain reduces the need for a centralised expert to certify data judgement and ownership, intervene in exchanges and trading of electronic assets with safe and feigned anonymity transfers alongside open communication between collaboration parties. It includes important characteristics like constancy,

decentralisation, and simplicity that may help with pressing challenges in healthcare like insufficient documentation restricted to gain access to patients' medical information at the moment of care. Interoperability is necessary for a competent and productive healthcare system since it enables apps and innovation platforms to exchange information over health organisations and app developers in a secure and reliable manner.

The Ethereum blockchain incorporates sensible agreements, which constitute enhancements to blockchain that give code to explicitly govern the exchanges or redistributions of electronic assets among multiple parties who agree to specific rules or ascendance already established between included members. To make it possible for DApp development to be connected to blockchains and offer legitimate assistance for consumers of applications, smart contracts may save information objects and characterise operations on the information. Clever agreements may be linked in the healthcare sector in order to build solid, persuasive specialized foundations that will improve the integration of care and effectiveness, improving the prosperity of individuals as well as neighborhoods. In a perfect scenario, health organisations and app providers would be able to use the information that was exchanged between computer programme, stages of innovation and applications in a compliant healthcare setting.

A design that is ubiquitous will undoubtedly be essential for a variety of healthcare applications that face similar communication and information-sharing difficulties. From a more specialised perspective, while addressing core security and privacy problems in the medical field, significant study is required to adhere to the most rational approach intended in developing an integrated biological system using technology known as Blockchain. We need to decide whether to use an existing Blockchain, like Ethereum, to build a decentralized application. A contemporary Blockchain network may in certain cases be more appropriate than the present Blockchains; as a result, another course might be looking at how to expand an current blockchain or develop a blockchain for healthcare.

VI. CONCLUSION

An HLF-based blockchain network will be used by the suggested systems. As a component of the Linux Foundation's Hyperledger project, HLF is a blockchain application. It is an electronic ledger system that excels at par excellence-grade and offers adaptability and flexibility for a variety of corporate use scenarios. Its operation can be summed up as follows: By getting a certificate obtained through the Membership Service Provider from the certificate organization, the participant uses the client app to create a personal wallet. The result is that the participant receives a certificate and a private key. Each user may only view the records to which he has been granted access on the Blockchain network, which distributes transactions. Despite the fact that the suggested system would use Hyperledger fabric, other Blockchain systems like Ethereum can also simply implement it. Participants communicate with the system using a client app by executing Smart contracts are intended to expand the Blockchain network's transactional capacity. All participants peer get updates as soon as a transaction is committed to the network, and because of encryption, transactions become irreversible, verifiable, and cannot be reversed by the originator. Records are accessible to all network users, but owing to the Access Control smart contract, only authorised users can see and update records.

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