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Original Article

The Indian Healthcare Information Management System (HIMS) architecture is based on blockchain.

Sandeep Kumar[1], Abhay Kumar[2], Vanita Verma[3]

[1]*M.Tech (CS) BIT Mesra, Ranchi*
[2,3]*Assistant Professor- University Polytechnic C-DAC Kolkata*

Abstract *- In recent years blockchain technology has shown considerable adaptability as various market sectors require integrating its potential into their operations. Blockchain is well-known for its potential applications in the financial and banking sectors. However, as a distributed technology, blockchain can be a powerful tool for immense daily life applications. Healthcare is one of the significant areas of application, among others, where blockchain makes a strong impact. Nowadays, huge amounts of healthcare data are generated every day from both medical institutions. Hospitals, private hospitals, and individuals. Storage and sharing such a large amount of healthcare data is important while challenging.*

Keywords *- Blockchain, new business models, healthcare, digital health, health information management, patient data, medical research.*

I. INTRODUCTION ABOUT BLOCKCHAIN

Blockchain can be referred to as a digital ledger where all the transactions are recorded chronologically. It is a distributed system that records and stores transaction records. More specifically, a blockchain is an immutable, shared record of peer-to-peer transactions stored in a digital ledger created from linked transaction blocks. Blockchain is the technology that can securely maintain continuously growing lists of data records and transactions. Blockchain relies on established cryptographic techniques to allow each participant in a network to interact to store, exchange, and view information. In a blockchain system, no authority can be treated as central; instead of it, transaction records are stored and distributed across all the networks.

Most importantly, all data entries are stamped with date and time. Interactions with the blockchain medium become known to all participants and require verification by the network before adding the information, enabling trustless collaboration between network participants while recording an immutable audit trail of all the interactions. For security purposes, users can update only the block to which They have access, and those updates get replicated across the network.

II. KEY FEATURES OF BLOCKCHAIN TECHNOLOGY

A. Autonomy

The blockchain solely works according to the rules defined by its members. There is no central authority for defined rules.

B. Automation

Manual processes generally guided by the legal contracts can be automated with a self-executing computer program called a smart contract. A smart contract is a component of a blockchain-based system that can automatically enforce stakeholder-agreed rules and process steps. Once launched, smart contracts are completely autonomous; when the contract conditions are met, pre-specified and agreed actions occur automatically.

C. Security

There are various ways that a blockchain is more secure than other record-keeping systems. Transactions must be agreed upon before they are recorded in the system. Once a transaction is approved, it is encrypted and linked to the previous transaction. This, along with the fact that information is stored across the network of computers instead of on a single server, makes it very hard for hackers to compromise the transaction data. In any industry where protection of sensitive data is crucial — financial services, government, healthcare — blockchain has an opportunity to change how the critical information is shared by helping to prevent fraud and unauthorized activity.

D. Transparency

Changes to public blockchains are publicly viewable by all parties creating transparency, and all transactions are immutable, meaning they cannot be altered or deleted.

III. TYPE OF BLOCKCHAIN ARCHITECTURE

There are different kinds of blockchain architecture, and each of them has a different design and architecture.

A. Public Blockchain

All participants across the network can access the database, store a copy, and modify it by making available their computing power. Public Blockchain is a form of the decentralized peer-to-peer network that allows multiple nodes to participate in the network and perform the transactions without the need to rely on a trusted third party. Public Blockchains are said to be permissionless as they do not restrict access to certain nodes. The transactions get stored in blocks on a public ledger. Each transaction exchanged between various nodes is verified and added to the blockchain by a set of special nodes called miners. The transactions get stored publicly in the blockchain, and everyone, including adversaries, can view its content. Miner nodes are required to solve a difficult mathematical problem known as proof of work.

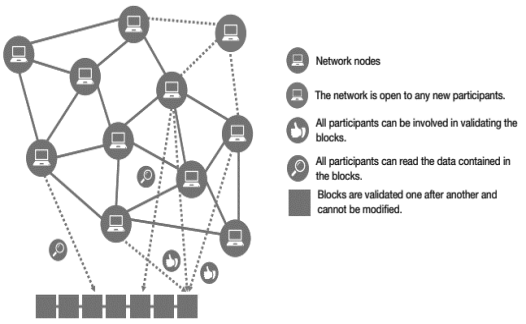

Fig. 1 Public Blockchain

B. Private Blockchains

These are where a central authority body manages the right to access or modify the database. The system can be easily incorporated within information systems, and it offers the additional benefit of an encrypted audit trail. The network does not need to encourage miners to use their computing power to run the validation algorithms in private blockchains. Private Blockchains are based on a decentralized topology to ensure that chosen participants can view the blockchain's activity, introduce control over which the transactions are permitted, enable mining securely without proof of work, and add associated costs. In private Blockchains, high privacy is available because of the restriction over reading and write permissions. The other important advantage of private blockchain is that a company running private Blockchains can easily modify the used rules and revert the transactions. Private blockchains are nothing more than a specified distributed ledger, which records the consensus of transactions between authorized parties into blocks. Any authorized node creates a transaction or a block. The transaction is validated and distributed via the referee without cryptographic hashing.

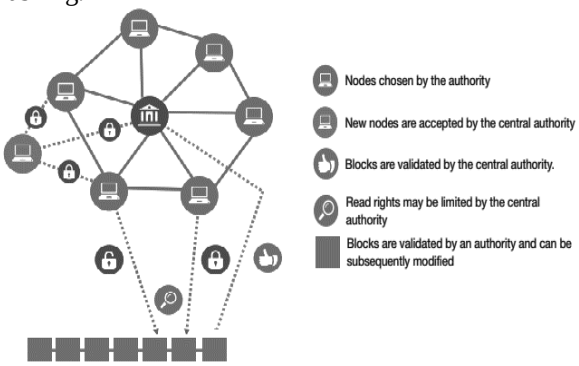

Fig. 2 Private Blockchain

C. Consortium Blockchains

These blockchains are open to the public, but not all the data is available to all participants. User rights vary, and blocks are validated based on the predefined rules. Consortium blockchains are hence "partly decentralized." Consortium Blockchains are where a preselected set of trusted nodes controls the consensus process. A block is added to the chain after consensus is achieved through validating the transaction by a group from the preselected set of nodes. In a consortium Blockchain, the right to read the blockchain can be public or restricted only to participants. In addition, consortium Blockchains are considered partially decentralized, unlike private Blockchains. A consortium blockchain model tends to appeal more to corporate companies because it is decentralized, unlike private Blockchains.

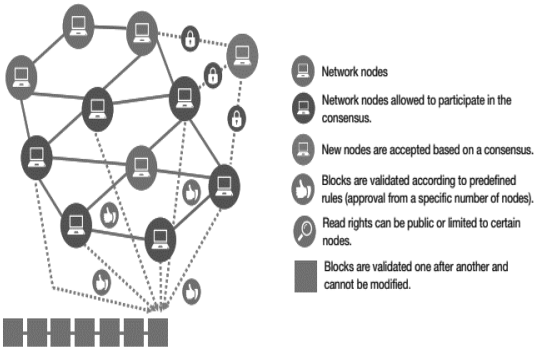

Fig. 3 Consortium Blockchain

IV. HEALTHCARE ARCHITECTURE BASED ON BLOCKCHAIN

Blockchain in the healthcare domain can address a variety of problems, such as care coordination, data security, and interoperability issues. Every day, the healthcare industry generates new data – medical records, laboratory test results, billing, clinical trials, remote monitoring, and other sources – which are often trapped in numerous disparate, isolated databases. Blockchain technology can be used to solve the problem of health data exchange. It aims to

create a platform where different healthcare agents such as doctors, hospitals, laboratories, pharmacists, Govt. Healthcare Agency, R&D Company, Medical Students, healthcare NGO, Health Ministry Departments, Govt. Hospitals, Private Hospitals, Users or local People, or ASHA health workers and insurers to request permission and access and interact with the medical records. Each interaction is transparent, auditable, and secure and will be recorded as a transaction on the distributed ledger. The project will surely guarantee privacy issues as this is built on the permission-based Hyperledger. Blockchain and smart contract technology integration in critical healthcare services to provide standardization and scalability while tackling the inflated costs, limited access to adequate services, and misuse of patient data.

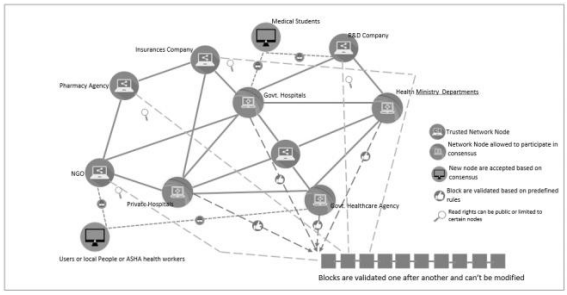

Figure-5. Healthcare Blockchain

V. CONCLUSION

This paper proposes an Indian Healthcare Architecture, a Blockchain-based platform for healthcare information exchange. We consider a new architecture of healthcare and electronic medical records and personal healthcare data, analyzing different requirements to store and share them. The techniques of on-chain verification are integrated to take good care of privacy and authentic ability. It also promotes new digital business models and digital healthcare initiatives. Moreover, we propose transaction packing algorithms to upgrade the system policy among users and different governing bodies.

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