RESEARCH ARTICLE   OPEN ACCESS

Significance of BlockChain Technology in the Section of Healthcare Organization

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Abstract:

Block chain technology is one of the revolutionary techniques implemented for handling healthcare data. The main aim of the blockchain technology is to give security, transparency and integrity to the personal data of patient which is stored in the form of distributed. To know blockchain in healthcare, it is important to have a particular type of distributed ledger technology (DLT) works and how it can be applied to the healthcare ecosystem.DLT influence to verify decentralized peer to peer network, cryptography and related technology. Blockchain technology is based on decentralized consensus and it is being currently implemented in both public and private settings .In this paper we discuss on the Electronic Health Records (HER) and present how blockchain technology can handle it .By using this we can tell how the data is shared to the patients and doctors and how it is maintained.

Keywords — **Blockchain , Electronic Heatlth record , distributed ledger technology.**

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I.   INTRODUCTION

Here we need to know one thing that every person sees that his personal data must be in a secured manner, either it may be related to Business, Education, Health related and etc. And in this paper we know how the person health related data is maintained .Before going to this we should notice that previously how this is managed and what is the drawback with that.

The health record is the place where it stores the data and information about the individual patient and his related healthcare services .By this we get who is patient, when he admit, what is problem and to give treatment.

For this health service providers used a Electronic Medical Records (EMR).It is a paper which is in digital version which contains medical history of patient. It is having advantages over paper record but along with that it is having some disadvantage also .The advantages are coding is accurate ,it decrease the patient wait time and multiple users can access. The disadvantage is that this medical history is not shared outside for making any clinical trials and for testing

II.   BLOCKCHAIN AND ITS RELATED WORK :

To overcome the problem here we used a distributed technology and its use in Electronic Health Record (EHR) which is having the advantage over EMR.

Distributed Ledger Technology refers to a novel and fast-evolving approach to recording and sharing data across multiple data stores (or ledgers). This technology Allows for transactions and data to be recorded, shared, and synchronized across a

Distributed network of different network participants.

A **'blockchain'** is a particular type of data structure used in some distributed ledgers Which stores and transmits data in packages called "blocks" that are connected to each Other in a digital 'chain' Block chains employ cryptographic and algorithmic methods to Record and synchronize data across a network in an immutable manner.

Distributed ledgers' (DLs) are a specific implementation of the broader category of **'shared Ledgers'**, which are simply defined as a shared record of data across different parties.

A **shared ledger** can be a single ledger with layered permissions or a distributed ledger, Which consists of multiple ledgers maintained by a distributed network of nodes, as defined above.

DLs are categorized as **permission** or **permissionless**, depending on whether network Participants (nodes) need permission from any entity to make changes to the ledger. Distributed ledgers are categorized as **public** or **private** depending on whether the Ledgers can be accessed by anyone or only by the participating nodes in the network.

A. Distributed technology and its working

DLT comes on the heels of several peer-to-peer (P2P) technologies enabled by the Internet, such as email, sharing music or other media files, and internet telephony.

`However, internet-based transfers of asset ownership have long been elusive, as this requires ensuring that an asset is only transferred by its true owner and ensuring that the asset cannot be transferred more than once, i.e. no double-spend. The asset in question could be anything of value. In 2008, a landmark paper written by an as yet unidentified person using the pseudonym Satoshi Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System", proposed a novel approach of transferring "funds" in the form of "Bitcoin" in a P2P manner. The underlying technology for Bitcoin outlined in Nakamoto's paper was termed Blockchain, which refers to a particular way of organizing and storing information and transactions. Subsequently, other ways of organizing information and transactions for asset transfers in a P2P manner were devised – leading to the term "Distributed Ledger Technology" (DLT) to refer to the broader category of technologies.

DLT refers to a novel and fast-evolving approach to recording and sharing data across multiple data stores (ledgers), which each have the exact same data records and are collectively maintained and controlled by a distributed network of computer servers, which are called nodes. One way to think about DLT is that it is simply a distributed database with certain specific properties (see section 3). Blockchain, a particular type of DLT, uses cryptographic and algorithmic methods to create and verify a continuously growing, append-only data structure that takes the form of a chain of socalled 'transaction blocks' – the blockchain – which serves the task of a ledger. New additions to the database are initiated by one of the members (nodes), who creates a new "block" of data, for example containing several transaction records. Information about this new data block is then shared across the entire network, containing encrypted data so transaction details are not made public, and all network participants collectively determine the block's validity according to a predefined algorithmic validation method ('consensus mechanism'). Only after validation, all participants add the new block to their respective ledgers. Through this mechanism each change to the ledger is replicated across the entire network and each network member has a full, identical copy of the entire ledger at any point in time. This approach can be used to record transactions on any asset which can be represented in a digital form. The transaction could be a change in the attribute of the asset or a transfer of ownership.

Blockchain is a chain of data or transactions as blocks which are linked together in a chain manner .For this it uses cryptographic signatures, which are known has hash .Block chain uses peer to peer network which connects all the nodes together Nodes are used to contain a copy of the total chain and these are continually revised and synchronized

This technology is different from previous programming, databases and networks.

The blockchain application in healthcare is budding to reduce cost of healthcare.

In **healthcare**, **Blockchain** is showing good opportunities. Firstly it is used to store the Patient personal data in EHR (Electronic **health** records). Block chain technology work on the encryption for keeping everything in private and secure. Because of this it efficiently provide services to the patients and give support as 24*7 as people need.

III. ELECTRONIC HEALTH RECORD

Electronic Health Record is a record which is in electronic version and maintain patient medical history .Everything in EHR is maintained by provider .EHR maintain different patient data from multiple doctors and allow the provider to take some decision on patient health history .In this along with patient medical history there are other things also like medications, test results, plans for treatment, and laboratory images etc.

There are two types of systems one is Physician Hosted System which means the data is maintained in physicians own server .Second is Remote System which share data to the other third party from physician.

IV BLOCKCHAIN FOR EHR

Now a days everyone intention is to personalize their data. Coming to health related information as it is shared for multiple purposes like Genomics,Medical Records ,Clinical trials etc. But the Major issues which limit all these are security and privacy because of sharing the data for large number of providers in EHR.

Every patient who is providing their personal Health history to providers wants to know how their data is used, accessed, and modified. The blockchain is giving good opportunity for providing privacy and security .The major thing that we get from the blockchain is that patient can control the access of his/her health record and he/she can give permission to the clinical person to find the problem and also can grant the access to other clinical person for the second opinion. Apart from

this the patient can provide the read only access to his/her data to the doctor, pharmacy and to any insurance related company by using their private key .In blockchain technology Hash code is used for verifying the integrity of the record.

In this way the blockchain technology can keep the information of patient and manage via peer to peer network and provide security when they are exchanged. Every individual person access the record information by using Elegant Agreements. For this block chain give facility to use an encrypted access link to every individual patient record.

A. Blockchain protocol:

As all of us already know, a protocol, in computer science, is a set of rules or procedures that govern the transfer of data between two or more electronic devices. This protocol helps in establishing how, in order for computers to exchange information, the information must be structured and how each party will send and receive it. Some examples of familiar internet protocols are TCP/IP, HTTPS, and DNS. This distributed ledger works on pre-defined rules which are agreed upon by all the participating nodes (the peers) in the network.

These rules include:

1. a how-to for governing and validating transactions,

2. an algorithm that defines the mechanism for all participating nodes to interact with each other, and,

3. (in some cases), application programming interface.

B. Terms for blockchain protocol:

Distributed Ledgers: Distributed ledgers are a type of database that are spread across the multiple peers and the records are stored one after the other in a continuous ledger.

Elegant agreement a set of logic rules in the form of a coded script which can be embedded into the blockchain to govern a transaction.

Consensus algorithm: an algorithm that defines the way consensus will be reached on the network to verify the transactions.

Coins and Tokens: Every blockchain protocol needs a digital asset to keep the network running

IV   IMPLIMENTATION OF THE BLOCKCHAIN IN OTHER HEALTH RELATED SYSTEM

In his section we notice some proposed applications for blockchain which are challenged in 2016.

A. Supplying medications

In this section we understand how the blockchain technology is used for supplying medicines and pharmacy products by controlling the temperature when they are transported. This is a secure and traceable supply.

B. Remote patient monitoring:

To know the status of the patient the patient data is collected through mobile devices, sensors which use (IOT) Internet of things devices .IOT play a major job in e-health for storing and managing of the e-health data.

C. Health Insurance:

Health insurance claims give benefit for the people .And these shows transparency on data of the patients which is stored on blocks in distributed ledger. MI stores is a blockchain based medical insurance system it provides medical insurance .It is encrypted and stored medical insurance data

V   STRENGTH AND PERFORMANCE OF EHR :

1) Elegant agreements:

Elegant agreements', in the context of DLT, are programs that are written on the underlying distributed ledger and are executed automatically by nodes on the network.

Any instruction that would be executed by a computer could theoretically be run by a elegant agreement. Transactions or data recorded on the distributed ledger trigger the elegant agreement and the actions taken are in turn recorded in the ledger. Another way of putting this is that elegant agreements "allow for logic to be programmed on top of the blockchain transaction. The same applies to other DLs, as elegant agreements can also be executed by DLs that are not blockchains. Elegant agreements have to be verifiable by each node on the network, meaning that each one node on the network must see the same data.

2) Elegant agreements:

Ethereum allows developers to build, among other things, dApps on its protocol. The node communication rules for one dApp can be different from another dApp which are defined by elegant agreements. Tokens are, therefore, the native digital asset of dApps.

VI   ALGORITHM USED IN EHR:

Assign job:
task Define Jobs (New Job, New Account)
add new job and account in
jobs mapping
end task
Add Data:
task Add Patient Record (contains variables to add data)
if (msg.sender = = doctor) then
add data to particular patient"s record
else Abort session
end if
end task
Retrieve Data:
task View Patient Record (patient id)
if (msg.sender = = doctor || patient)
then
if (patient id) = = true
then
retrieve data from specified patient (id) return (patient record) to the account that requested the retrieve operation
else Abort session
end if

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end if
end task
revise Data:
task Revised Patient Record ( contains variables to
revised data )
if ( msg.sender = = doctor )
then
if ( id = = patient id && name = = patient name )
then
revised data to particular patient"s record
return success
else return fail
end if
else Abort session
end if
end task
Remove Data:
task remove Patient Record ( patient id )
if(msg.sender = = doctor )
then
if ( id = = patient id )
then
remove particular patient"s record
return success
else return fail
end if
else Abort session
end if
end task
```

IV. CONCLUSION

The healthcare industry values many of the essential underlying tenets of blockchain technology, like trusted execution, non-repudiation of knowledge , auditable trails and records for transactions, full replications of knowledge in a secure environment, consensus on data changes, and decentralization of authority/data. Blockchain technology holds high promise of being a widely adopted mechanism within the healthcare system for resolving issues that have long concerned the industry.

At an equivalent time, there are many areas of blockchain that are relatively untested during a healthcare environment, like the necessity for a service level agreement, viability of privacy,

scalability of a system to handle large numbers of participants, control and restrictions around access to patient data, and problems with patient record ownership.

Despite its tremendous potential, healthcare systems should be cautiously optimistic regarding blockchain technology and maintain a healthy skepticism toward the hype surrounding it today. As healthcare systems start securing and digitizing their infrastructure, they ought to specialise in introducing novel clinical decision support systems using analytics and AI.

Blockchain shows great potential in providing a foundation to support and advance AI. As use cases for blockchain are identified that have compelling value to healthcare—from reducing cost to improving patient outcomes, engagement, and experiences—they are often prototyped attentively to privacy, security, and compliance from the beginning , and piloted with de-identified test data across consortiums of participating healthcare organizations to check , improve, and evolve the solutions for optimal effectiveness.

ACKNOWLEDGMENT

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