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Survey on Blockchain Technology

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Abstract: *The digital world has brought efficiencies, innovative new products and strong relationships with customers worldwide through the effective use of mobile devices, IoT (Internet of Things), social media, analytics, and cloud technologies to generate models for better decisions. Blockchain was recently introduced and revolutionized the digital world by bringing a new perspective on the security, resilience, and efficiency of systems. Although originally popularized by bitcoin, blockchain is much more than oneBase for cryptocurrency. It provides a secure way to share any kind of good, service or transaction. In addition, blockchain offers lower business costs with a trusted contract that is monitored without third-party intervention, which may not add direct value. It enables smart contracts, commitments and agreements with strong, inherent cyber security features. This paper contains a complete description of blockchain technology..*

Keywords: Blockchain, security, cryptocurrency, decentralization.

I. INTRODUCTION

The conception of a secure blockchain is not a new idea. It was proposed by Stuart Haber et al. 1991 as a means of digitally time-stamping electronic documents to protect against manipulation. However, recently it has gained popularity. Blockchain technology for storing offers of a cryptocurrency called "Bitcoin". The concepts of bitcoin and blockchain were first proposed in 2008 by someone using the pseudonym Satoshi Nakamoto, who described how cryptology and an open distributed ledger could be combined in a digital currency application (Nakamoto 2008). Initially, Bitcoin's extremely high volatility and many countries' attitudes towards its complexity somewhat limited its development, but the advantages of blockchain, which is Bitcoin's underlying technology, attracted increasing attention. Blockchain benefits include distributed ledger, decentralization, information transparency, tamper-proof construction, and openness. The development of the blockchain was an ongoing process. Blockchain is currently limited to Blockchain 1.0, 2.0, and 3.0 depending on your applications. Despite the growth, many questions surround the widespread adoption of Bitcoin. However, the underlying framework has drawn attention with application outside the financial world.

Blockchain innovation can tackle a few issues in each area of the country, which incorporates line control, government Identification, protection, transportation, land, publicizing, waste management, energy, tourism, and numerous others. It comprises of different algorithms, put away in the record, utilized in identifying blunders, additionally observes where the block blunder has happened. Numerous nations, for example, Estonia have carried out blockchain in a few areas and observed amazing outcomes inclining toward their development.

There are different types of Blockchains that supported their operation and distinct attributes: ie, Public blockchains Private blockchains, and Consortium blockchains. Public blockchains are truly localized and permit anyone to hitch the network and interact in managing them. Whereas in private blockchains solely invited individuals from one association will join the network and manage them. The institute Blockchain also appertained to as “Federated Blockchain” is between public and private Blockchain, in terms of permissions and operation. Invited people from multiple associations are allowed to join this Blockchain.

At the financial level, blockchain can fabricate a solid trust establishment for the two parties who don't know anything about exchanges with equivalent and trustworthy. In rundown, blockchain is an innovative coordination arrangement of various existing advancements that incorporates cryptography innovation, appropriated consistency protocol, network

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security, and other related innovations.The age, acknowledgment, protection, and exchanging of licensed property rights are confronting phenomenal difficulties in the IT era. Blockchain technology can tackle the above issues. The right utilization of blockchain technology will add to the protection and exchange of licensed property.

II. IMPLEMENTATIONS OF BLOCKCHAIN TECHNOLOGY

2.1 Blockchain in Health Care Industry

There are various plans of action for the medical services industry. A portion of the associations what they are doing today is they work on the proof of state (POS) point of view to the different group of stakeholders. This makes the blockchain technology somewhat destructive. Blockchain is the vulture technology of the decade. It is a gigantic chance for the blockchain technology for digital conversion into pharmaceutical chains and furthermore many sort of digital agreements tackled by the technology for wellbeing and care technology.

Initially, all the information from medical devices, labs, social media, and plenty of different sources are consolidated and build information that afterwards grew in scale to massive data. This data is the essential ingredient of complete blockchain-based healthcare, and it's the principal component that creates the first layer of the stack. Blockchain

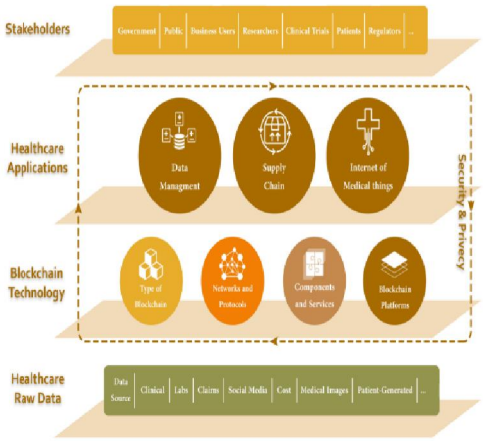

Figure 1. A workflow of blockchain-based healthcare applications

Technology sits on the top of the raw data layer that is taken into account the core framework in pursuit to form a secured healthcare design that is divided intofour components. Every blockchain platform has different features comparable to consensus algorithms and protocols. Blockchain stages work with clients to make and deal with their transactions. Many blockchain platforms were created and are presently in use, such as Ethereum, Ripple, and Hyperledger fabric. The first parts of the blockchain are smart contracts, signatures, wallets, events, membership, and digital assets. For communication with other programs and frameworks, or even across totally different networks, a wide variety of protocols can be used. This may embody for instance, P2P, centralized, decentralized, and distributed. Policymakers could make an alternative either public, private, or even federate supported the range of needs they have to fulfill. Once the platform is formed by implementing blockchain technology, the consequent part is to guarantee that the applications are coordinated with the entire system. Blockchain-based healthcare applications can be categorised into 3 broad classes. Firstly, data management, together with global scientific data sharing for research and development (R&D), data management, data storage (e.g., cloud-based applications) and EHRs.

The second class addresses SCM applications, including clinical preliminaries and pharmaceuticals. Finally, the third class covers the IoMT, including a confluence of healthcare IoT and medical devices, healthcare IoT infrastructure and data security, and AI.

2.2 Agricultural Sector

There is a mass degree of research to be done on blockchain technology in the agriculture area. This research can help major agricultural producers like India and Pakistan. As indicated by the information given by the Indian government, India is estimated to be the country with the highest GDP by 2020. Simultaneously the horticultural area, which contributes around 1/6th of India's GDP and is responsible for making half of the labour force, so proposing blockchain

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technology will be productive in this area. We can propose a framework utilizing blockchain technology which may helpful to the farmers. We can construct an agrarian blockchain-based environment that can put a farmer whole seller trade utilizing progressed procedures for their bonds. Omnipresent token component for the execution of the complex exchanges and fundings. Thinking about a rural region, we can likewise make a transportation network framework that can help these farmers who just need to work for a short timeframe. This can reduce their reliance on loans and finance with respect to the expenses of their tractors. Likewise, we can make a one of a kind group on confirming the land records and the solidification part and which can avail tractor sharing association.

Unfortunately, assuming we apply blockchain to the agrarian items, it may be trouble to operate due to the hash information put away in the database of the record/ledger. As it is an advanced technology, that might make a trouble for the farmers to work these at each time with full clearness and accuracy. We can utilize a prepared dataset so it may be more agreeable for the farmers to such an extent that they need to work just the more comfortable things and not the hard-core logic behind them. There can be a case that there are a few outer impacts which might influence the farmer's knowledge so we need to give them such a technology that they should be dependable to and can turn out productively for them.

2.3 Educational Sector

BT is one of the technologies which can help students in their studies. By studying Estonia's educational plan, we can see that it is not the same as standard blockchains because of its versatility.

2.4 Blockchain-powered Health Chain

Following HIPAA (Health Insurance Portability and Accountability Act of 1996) privateness rule, individually identifiable fitness statistics along with demographic and genetic statistics, this is transmitted or maintained in any shape or medium is classified as Protected Health Information (PHI). HIPAA privateness rule units requirements on maintaining the privateness of the individuals' PHI below manage and offers affected person's rights over the statistics. Although the speedy increase of cloud usage for the introduction of HIPAA-compliant database boosted the bodily safeguarding of statistics and decreased HIPAA violations, this mitigation to disbursed databases at the cloud could now no longer by myself solve the fitness care payee and provider's quandary of privateness breaches. The state of affairs worsens whilst dealing with unique infrastructure deployed through unique fitness care providers or maybe in addition whilst the records display a giant rise of cellular tool uses, along with clever telephones and tablet computers, amongst health practitioners and sufferers to talk with every other or get admission to PHI. Much has been carried out through introducing cellular apps and software programs for medical practices, but regardless of the traditional encryption and password settings carried out through HIPAA for an included entity, breaches can also additionally nevertheless arise and PHI can also additionally be compromised. The necessity of the right use and integration of recent devices, that have got admission to PHI, is utmost precedence in a green fitness care era. The modern-day paintings consider Blockchain era use cases to address the above-noted barrier of accommodating novel technology into the prevailing HIPAA compliant community facilitating extraordinary care and affected person comfort.

In accordance with the Health Insurance Portability and Accountability Act of 1996 (HIPAA) privacy policy, individually identifiable fitness statistics, along with demographic and genetic statistics, transmitted or maintained in any form or medium are classified as Protected Health Information (PHI) The HIPAA Privacy Rule establishes the requirements to maintain the privacy of the PHI of the individuals listed below and provides the rights of the individuals concerned concerning the statistics. Although the rapid increase in the use of the cloud for the introduction of the hypoacultant database increased the body protection of statistics and reduced HIPAA violations, this mitigation to pay the databases in the cloud could now no longer solve the beneficiaries of the care of physics and the quandie Use of mobile tools along with smartphones and tablets between doctors and patients to talk to each other or access PHI. Much has been accomplished with the introduction of mobile apps and software programs for physician offices, but regardless of the traditional HIPAA encryption and password setting for an affected entity, violations can still occur and PHI can also be viewed. A top priority in the age of green healthcare. Modern paintings consider the use case of the blockchain era to break down the previously mentioned barrier of absorbing novel technologies today. HIPAA compliant

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community and providing exceptional care and comfort to the data subject. Due to the fragmented support information system.

Considering people PHI as a digital asset, blockchain technology offers a robust solution where every authorized provider, including the patient, regardless of the network they belong to, has access to an agreed record (common ledger) of PHI, can analyse and update them. The proposed blockchain implementation of the PHI lifecycle, which we refer to as HealthChain, simultaneously targets multiple facets of an optimized design. The patient creates the first version of the PHI record when you visit one of the provider networks for the first time. Then the original version of the PHI (our on-chain digital asset) is uploaded to the blockchain. The use of smart contracts ensures that the patient can only create the original version of the PHI and upload it to the blockchain. The patient invocation of a transaction may result in the transfer of the asset (PHI record) to the provider. The transaction is not complete until consensus is reached. All PHI updates are visible to members of the chain with the correct permissions. The strength, security, privacy, and validity of PHI are continuously enhanced through the use of proven decentralized cryptocurrencies in conjunction with blockchain technology. The website is hosted in the middle tier, where a NodeJs server (www.nodejs.org) is responsible for communicating with the HyperLedger fabric and chain code. The user interface of the implemented system along with the structure of the backend node. Current life cycle of protected health information (PHI) in healthcare provider networks. Each of the networks involved, Emergency Care Network Primary physician (PCP) Network Referral Network creates and updates its own version of the correct actual PHI; (right) Health Chain, a proposed implementation of blockchain technology architecture. This design facilitates access to the most current and complete version of patient PHI while setting higher standards for security and robustness.

Challenges decreased by blockchain are as per the following:-

1. It can be arisen in framing an open-source environment. This can offer a method for putting away all the bonafide need by student during his/her course of study and can make a quality of authenticity for conveying less documents in their bags and accordingly making an elective method for education.
2. It can likewise establish an environment for altering and then putting away private databases of the students. The blockchain gives information access to the universities and information changed is a lot of preciser, and any change should not need as a remarkable burden.
3. 3)The issue introduced by theSchools/Universities is that the quantity of cases with respect to the fraud and the illegal authentications given to the students. The essential focal point of blockchain technology comes to a place where each block is a provable block so that in the event that any fraud will happen, this needful data is straightforwardly sent to the higher authorities so they can take a strict move critically.
4. One huge benefit of this technology to the educational foundation is that it gives every student a special id which helps student coordinate with his/her data, and in case any confusion for projects between two students occur, then it can be worked out without much of a stretch. Transparency for the review of the grades can be an incredible advantage.

III. ADVANTAGES OF BLOCKCHAIN TECHNOLOGY

3.1 Decentralization

Decentralization is a decentralized distributed structure. The whole network has no central hardware or mechanism, which is the core advantage. Decentralization is a key selling point of most public blockchain platforms. Decentralization removes the existence of intermediaries and reduces the cost of intermediaries, which makes blockchain widely used.

3.2 Collective maintainability

Collective maintainability is built on the basis of decentralization. With no interpretation of the participation of the third party, all nodes need to be united, and all parties have clear rights and responsibilities to maintain the normal operation of the blockchain. It can better maintain the stability and security of the entire blockchain system.

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3.3 Trust-free

Trust-free is to remove the third-party trust, which is manifested in 2 aspects, one is to trust the authenticity of the historical behaviour of the data on the chain, the other is to trust the future behaviour constrained by rules and mechanisms.

3.4 Traceability

Traceability means that the data on the chain can be found. Currently, many studies take advantage of the traceability of blockchain. We can track the data in the blockchain, which is convenient for supervision and tracking.

IV. DEMERITS OF BLOCKCHAIN TECHNOLOGY

4.1 This technology is early

Is it presently prepared for use or it is todays or the day after today's technology. Several outcomes are needed to be figured out.

4.2 Scaling up Problems

Not quicker when contrasted with others. So it can't be increased to a greater extent. For e.g, visa and master cards can process around 40 thousand exchanges each second however, the bitcoin blockchain could do around 8 to 10 exchanges each second.

4.3 Interoperability

Everyone needs to be part of the blockchain; this may be a burden for the engineers/developers.

4.4 Replacement of current information base

Blockchain got acquainted with more individuals through the cryptocurrency by the electro chip, so there is less number of real factors accessible for the blockchain technology.

V. CHALLENGES

5.1 Security-Related Challenge

A. Blockchain Underlying Code

There are several specific security holes in the architecture and implementation of blockchain technology. Blockchain security vulnerabilities are usually related to the consensus mechanism used to confirm and validate transactions. These security vulnerabilities include DDoS, block discarding, eclipse attack, selfish mining, etc. The characteristics of open source are conducive to the development and promotion of blockchain, but also provide opportunities for attackers. The lack of code evaluation in blockchain leads to frequent security events, which limits the development of blockchain.

B. Potential Hacking

Blockchain design limits the attack of some hackers. For example, if a hacker wants to tamper with the blockchain's data, he needs to have 51% computing power. But the benefits of using 51% computing power to attack the whole system are not as much as the benefits of using 51% computing power to mine normally, so, hackers will not choose to attack blockchain in an ideal state. Due to the immense attacking cost to perform the 51% attack, it was considered very unlikely for a long period. Hackers are not only trying to obtain benefits, but only want to destroy or show their own technical advantages. Under strict planning and organization, the possibility of blockchain system being broken is also theoretically there.

C. Legal Supervision Challenge

As blockchain technology has been widely concerned in recent years, the corresponding legal provisions are not perfect. Many countries and regions have different attitudes towards blockchain, lacking a unified regulatory standard. At the same time, due to the anonymity of the blockchain digital currency, bitcoin often appears in the dark network transactions, money laundering crimes and virus blackmail programs. Laws and regulations could impact how far and

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how fast the technology could develop. The events indicate that our blockchain related regulatory system and means are not advanced enough, which provides an opportunity for crime.

D. Space Storage Challenge

Each node in the blockchain must save complete backup data. As the amount of transaction data increase, the storage space it takes up is also increasing. Taking bitcoin as an example, there are more than 600000 blocks on the main chain at present, and the synchronous and complete block data needs more than 200G of space, which has a very high demand for storage space resources. It is a crucial problem restricting the development of the blockchain.

E. Talent Storage Challenge

The whole blockchain industry is still in the early stage of development, similar to the Internet industry in the 1990s or the early 21st century, few people really understand blockchain. Moreover, blockchain is the integration of various technologies, including cryptography, economics, and computer science, which is more complicated than the Internet and has a higher threshold for in-depth research. Therefore, blockchain related technical talents have been very scarce, which is the pain point restricting the development of the whole industry.

VI. CONCLUSION

Blockchain is a transformational technology, which provides a basis to develop distributed and secure applications for all industries beyond the monetary market blockchain evolution, Architecture and Security vast and rapid applications development, it is envisaged that Blockchain will do for trusted transactions what the internet did for communications. After the first appearance of Bitcoin in 2008, the concept of Blockchain has got considerable attention by the research and scientific community. On the basis of detailed and comprehensive analysis of the Blockchain evolution, frameworks, architectures, security and privacy characteristics, this paper has presented a survey of relevant works and elaborated on their contributions and limitations with a critical comparative analysis. The paper has provided a perspective to describe the Blockchain architectures in relation to cryptocurrencies, smart contracts and other applications.

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