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A Secure Healthcare System Design Framework Using Blockchain Technology

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ABSTRACT: Sharing healthcare data between institutions is challenging. Heterogeneous data structures may preclude compatibility, while disparate use of healthcare terminology limits data comprehension. Even if structure and semantics could be agreed upon, both security and data consistency concerns abound. Centralized data stores and authority providers are attractive targets for cyber-attack, and establishing a consistent view of the patient record across a data sharing network is problematic. In this work we present a Blockchain-based approach to sharing patient data. This approach trades a single centralized source of trust in favour of network consensus, and predicates consensus on proof of structural and semantic interoperability.

KEYWORDS: : blockchain; chaotic maps; access control; healthcare information; information security; patient privacy

I. INTRODUCTION

Cross-institutional sharing of healthcare data is a complex undertaking with the potential to significantly increase research and clinical effectiveness[1]. First and foremost, institutions often are reluctant to share data because of privacy concerns[2], and may fear that sending information will give others a competitive advantage[3]. Next, even if privacy concerns could be addressed, there is no broad consensus around the specific technical infrastructure needed to support such a task[4]. Finally, healthcare data itself is complex, and sending information across institutional boundaries requires a shared understanding of both data structures and meaning. Even assuming data can be shared efficiently and securely, these interoperability issues left unchecked will limit the utility of the data. Despite evidence that the value of healthcare data exchange is large[5], these issues, described below, remain significant barriers.

Failing to secure the patient record has financial and legal consequences, as well as the potential to impact patient care. Securing the electronic medical record is a challenging task[6], and the ramifications of a breach are a strong d isincentive to sharing data. For this work, we focus on both privacy and anonymity and how they apply to data sharing. Data privacy involves ensuring only authorized parties may access the medical record. This impacts any healthcare system, as patient privacy is not only an ethical responsibility, but a legal mandate[7]. Patient data is also an asset to the institution, and unauthorized access could compromise competitive advantages or reveal proprietary practices. Data anonymity may also be used to secure the record. In this way, identifiable information is left out, and only summary/partial data is shared. This can be acceptable, but is challenging, as it requires a large number of attributes with potential resource or patient care value to be removed from the record in order for it to be considered de-identified[8].

II. LITERATURE SURVEY

According to Davidson et al. 2016 [1] as said, BT is a new institutional technology of governance that competes with other economic institutions of capitalism, namely firms, markets, networks, and even governments. present this view of BT through a case study of Backfeed, an Ethereum-based platform for creating new types of commons-based collaborative economies. This case was developed for evaluating contributions to projects on a network. Backfeed introduces a social protocol on top of blockchain-based infrastructures to coordinate individuals through the creation and distribution of economic tokens and reputation scores. Its purpose is to eventually allow for the emergence of meritocratic systems and emergent alternative economies that can variously augment or substitute for extant modes of economic governance (i.e. provided by hierarchies or markets). At its core, Backfeed is an engine for decentralized cooperation between distributed agents. It implements a Social Operating System for decentralized organizations,

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enabling massive open-source collaboration without any form of centralized coordination. Backfeed builds upon the power of open-source collaboration and enhances it with a distributed governance system for decentralized value production and distribution. A peer-to-peer evaluation system is used to determine the perceived value of each contribution in a decentralized fashion, in order to allocate influence and rewards accordingly.

According to Johansen, 2016 [2] Due to the novelty of concepts and the underlying technologies, system provide a new overview on recent developments and related literature in this book and strive to explore the related concepts in the literature. Through exploration of the concepts, system dive into the blockchain utilization as a technological platform for an upcoming ecosystem of applications and software and look at the theoretical features of the technology as a foundation for this paper. Thus, system enhance the understanding of the technology in other contexts throughout the literature and explore the current contributions to the literature. This study has implications for both researchers and practitioners. For researchers system seek to open research lines on enablement of the BT as a platform-centric technology for ecosystems to flourish as those of OI. For practitioners, system illustrate that it is crucial to keep developing on the technology, as research indicates that system have still not reached the tipping point of the technology.

According to Glaser & Bezzenberger, 2015 [3] following the theoretical introduction, this system aims to further elaborate on the theoretical grounding in order to give a brief summary of prior research and highlight potential areas for future research. Additionally, system seek to establish a common understanding of the theory within the field of OI regarding the BT. Within the OI research area, BT is still considered a novel innovation and has yet to become a part of the mainstream OI research. This is furthermore supported by the general landscape, whose primary focus has been on the blockchain as a cryptographic economic system, e.g. Bitcoin. System also consider the amount of literature within the area as an important factor when evaluating the matureness of the concepts. System find that the concept of bitcoin with 24,500 results has been explored similar to blockchain with 17,500 results on Google 3 Scholar. That has grown by 10 in only one year from 2016 regarding the first searchers of (Johansen, 2016). Still there is gap of understanding the BT in OI. This system tries to provide a novel perspective on the BT by examining current research on BT and by combining this with the other OI concepts such as blockchain as a platform, ecosystems, innovations, and technological features.

On the governance of OI and BT platforms, ("Blockchain Governance", 2017) writes that at the heart of the problem, as always, lies the governance challenge, namely who dictates and enforces the rules as well as who do system hold accountable when things go wrong. What the developers with strong IT capabilities are failing to understand is that the public wants to place trust in the institutions operating the "conventional" platforms, especially when they are operated by real people, so that they could be held accountable. For instance, Airbnb was built on a notion that people organize and arrange themselves, but soon enough the trust issues emerged – bad consumer experience, fraud, vandalism, etc. Soon Airbnb found itself transformed from a tech company and a platform to rules and standard authority. As long as blockchain's governance challenges are not thought through, BT truly transformative potential will fail to be realized.

According to Lember, 2017 [5] In fact, the several technologies associated with the "smart city", such as electronic sensors or urban control rooms and city labs, as well as emerging technologies, such as blockchain, 21 that enable peer-to-peer service delivery are becoming more central to the ways citizens engage with public-service delivery under the schemes of OI dedicated user/citizen-innovation, technology, and living labs to accelerate technological innovations in the public sector. All these approaches aim at putting user experience at the center of the public sector innovation processes, however, these experimental units and methods are still far from becoming an organic part of the public sector and its change.

According to Pazaitis et al., 2017 [6] explores the potential of the blockchain technology in enabling a new system of value that will better support the dynamics of social sharing. System study begins with a discussion of the evolution of value perceptions in the history of economic thought. Starting with a view on value as a mechanism that defines meaningful action within a certain context, system associate the price system with the establishment of capitalism and the industrial economy. system then discuss its relevance to the information economy, exhibited as the techno-economic context of the sharing economy, and identify new modalities of value creation that better reflect the social relations of sharing. Through the illustrative case of Backfeed, a new system of value is envisioned, comprised of three layers: (a) production of value; (b) record of value; and (c) actualization of value. In this framework, system discuss the solutions featured by Backfeed and demonstrate a conceptual economic model of blockchain-based decentralized cooperation. system conclude that the blockchain technology has the potential to enable the creation of commons-oriented ecosystems in a sharing economy.

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According to Potts et al., 2017 [7] the Smart City agenda of integrating ICT and IoT, computer infrastructure to improve the efficiency and adaptability of city governance has been shaping urban development policy for more than a decade now. A smart city has more data, gathered though new and better technology, delivering higher quality city services. The BT could shift the Smart City agenda by altering transaction costs with implications for the coordination of infrastructures and resources and encourage OI as said in previous section. Like the Smart City the Crypto City utilizes data informatics, and is coordinated through distributed rather than centralized systems. The data infrastructure of the Crypto-City can enable civil society to run local public goods, and facilitate economic and social entrepreneurship towards OI

According to Blockchain and Open Innovation", 2017 [8], during the past few years, a new technology – blockchain – has developed which is expected to replace many current digital platforms. It first came to light in the late 2000's as the architecture for bitcoin, the best known virtual currency. But, as with the Internet, the Web and other major technologies, the blockchain technology (BT) has now transcended its original objective. It has the potential to revolutionize the finance industry and transform many aspects of the digital economy. The Open Innovation (OI) and the IP-industry (Intellectual Property) will also be affected so here system will address the issues relating to the adoption of BT in OI that will be discussed in this paper.

Global Supply Chains", 2017 [9], to understand BT, it is useful to step back to realize that Business – and Governments – never operate in isolation. They are participants in a business network. Ownership of assets pass across the network in return for payments, governed by contracts. Network participants currently keep their own ledger – recording all assets they own and updated on when asset ownership changes. Whilst well tried and tested, this process is very inefficient, often piling cost on cost.

According to Blockchain Governance", 2017 [10] on the governance of OI and BT platforms, writes that at the heart of the problem, as always, lies the governance challenge, namely who dictates and enforces the rules as well as who do system hold accountable when things go wrong. What the developers with strong IT capabilities are failing to understand is that the public wants to place trust in the institutions operating the "conventional" platforms, especially when they are operated by real people, so that they could be held accountable. For instance, Airbnb was built on a notion that people organize and arrange themselves, but soon enough the trust issues emerged – bad consumer experience, fraud, vandalism, etc. Soon Airbnb found itself transformed from a tech company and a platform to rules and standard authority. As long as blockchain's governance challenges are not thought through, BT truly transformative potential will fail to be realized.

III. RESEARCH METHODOLOGY

The central outline of the proposed algorithm is the implementation of ration distribution data storage using block chain. System creates the trustworthy communication between multiple parties without using any third-party interface.

- We use the Hash generation algorithm and the Hash will be generated for the given string.
- Before executing any transaction, we use peer to peer verification to validate the data.
- If any chain is invalid then it will recover or update the current server blockchain.
- This will validate till the all nodes are verified and commit the query.
- Mining algorithm is used for checking the hash generated for the query till the valid hash is generated.

The system also have the ability to eliminate the runtime differential privacy base attacks and proposed consensus algorithm provides the runtime block validation which will provide flexibility to the system.. This is a middleware system in which the processing environment will balance the load using threads. The request generated will be parallelly saved on all nodes in a Block chain manner. Hash generation algorithm and the Hash will be generated for the given string. Before executing any transaction, we use peer to peer verification to validate the data. If any chain is invalid then it will recover or update the current server block chain. This will validate till the all nodes are verified and commit the query. Mining algorithm is used for checking the hash generated for the query till the valid hash is generated.

Basically this system carried out an block chain strategy to implement in peer-to-peer environment. The SHA-256 algorithm has used to generate has scored and mining algorithm for fear verification. During the execution system uses consensus algorithm to evaluate whole blockchain with a different pair. Basically, system validates each block when end user generates any data manipulation request, before execution of such a request system validation on blockchain using consensus algorithm. The voting-based majority technique measures trust for each node, and according to highest majority of different pianos system recovers the data losses from different blocks. This technique ability to eliminate

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various kind of attacks like collision attack, SQL injection attack, man in the middle attack, session hijacking etc. Moreover, system execute in fog environment which illustrate the data processing environment install hardware network, the different locks parallelly communicate with all data nodes as well as user request simultaneously. This approach also reduces the time complexity for data processing.

Methodology of Evaluation

- The SHA-256 compression function operates on a 256-bit intermediate hash value.
- Automatic attack recovery by system.
- Quality assurance during the transaction
- Immediate show of all historical transaction is single click, without any third party interface.

Our Observations

- Improved performance and security as parallel processing.
- Transparent transactions through the use of blockchain technology.
- Authenticity of assets and fraud prevention.
- By streamlining and automating the processes with blockchain, transactions can be completed faster and more efficiently.
- Reduction in costs.

IV. CONCLUSION

The challenges of data sharing within the healthcare domain are significant. Simply sharing data is not enough we have shown that effective data sharing networks require consensus on data syntax, meaning, and security. We've proposed that a blockchain can play a fundamental role in enabling data sharing within a network, and have defined the high-level structures and protocols necessary to apply this new technology to healthcare. Building on techniques used successfully by other blockchain applications, we've introduced a new consensus algorithm designed to facilitate data interoperability. Finally, we have applied extra measures of security on the blockchain such as network-wide keys and smart contracts, keeping security a top priority. Ultimately, we believe that a blockchain-based data sharing network is a tenable solution for the complex problem of sharing healthcare data.

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