Interoperability and Synchronization Management of Blockchain-Based Decentralized e-Health System

Prof. Anuja Phapale[1], Pratik Patil[2], Paras Patil[2], Suman Goswami[2], Shrinivas Kendre[2]

[1]Assistant Professor at Information Technology Department, AISSMS Institute of Information technology, Pune, Maharashtra, India

[2] B.E. Scholar, Information Technology Department, AISSMS Institute of Information technology, Pune, Maharashtra, India

ABSTRACT

A huge amount of data, generated by different applications in computer network, is growing up exponentially based on nonstop operational states. Such applications are generating an avalanche of information that is disruptive for predictable data processing and analytics functionality, which is perfectly handled by the cloud before explosion growth of Big Data. Blockchain technology alleviates the reliance on a centralized authority to certify information integrity and ownership, as well as mediate transactions and exchange of digital assets, while enabling secure and pseudo-anonymous transactions along with agreements directly between interacting parties. It possesses key properties, such as immutability, decentralization, and transparency that potentially address pressing issues in healthcare, such as incomplete records at point of care and difficult access to patients' own health information. An efficient and effective healthcare system requires interoperability, which allows software apps and technology platforms to communicate securely and seamlessly, exchange data, and use the exchanged data across health organizations and app vendors. Unfortunately, healthcare today suffers from fragmented data, delayed communications, and disparate workflow tools caused by the lack of interoperability. Blockchain offers the opportunity to enable access to longitudinal, complete, and tamper-aware medical records that are stored in fragmented systems in a secure and pseudo-anonymous fashion. The proposed work carried out blockchain implementation in distributed computing environment and it also provide the automatic recovery of invalid chain. This also determines the impact of those security issues and possible solutions, providing future security-relevant directions to those responsible for designing, developing, and maintaining distributed systems.

Keywords: Blockchain Technology, Decentralization, Decentralized System, Distributed Computing, Peer-to-Peer Network, Healthcare

I. INTRODUCTION

A blockchain system can be considered as a virtually incorruptible cryptographic database where critical medical information could be recorded. The system is maintained by a network of computers, that is accessible to anyone running the software. Blockchain operates as a pseudo-anonymous system that has still privacy issue since all transactions are exposed to the public, even though it is tamper-proof in the sense of data-integrity. The access control of heterogeneous patients' healthcare records across multiple health institutions and devices needed to be carefully designed. Blockchain itself is not designed as the large-scale storage system. In the context healthcare, a decentralized storage solution would greatly complement the weakness of blockchain in the perspective.

The blockchain network as a decentralized system is more resilient in that there is no single-point attack or failure compare to centralized systems. However, since all the bitcoin transactions are public and everybody has access, there already exist analytics tools that identify the participants in the network based on the transaction history. With popularity analytics, similarity or closeness among topics within large volume of data can be detected. Groups of items or topics can be system generated using closeness relationship formulation. As information flows among different nodes in bitcoin network, Bitcoin transaction is slow due to the fact that information needs to be propagated across the network to synchronize the ledger replicas. The slow dissemination of information exposes a potential security hole for the malicious attacks. Some measures have been implemented to mitigate the number of the blockchain forks in the network

by 50%. However, a long-term solution is still needed. Like any other networks, Bitcoin network is no exception when it comes to malicious attacks. One of the notable forms of attack against Bitcoin network topology is eclipsing attack by using information propagation knowledge. Bitcoin peer-to-peer network topology can be inferred and utilized by malicious attackers to perform precise attacks such as eclipsing attack. By observing the flooding process of the information flow, a flooding network's topology can be inferred. A network topology inference method has been proposed along with a proof of concept in real network. The critical players of bitcoin transactions can be identified use various network centrality metrics. Blockchain might replace conventional methods of keeping track of valuable information such as contracts, intellectual-property rights, and corporate accountings. Personal healthcare records need to be protected with the highest standard. With the increasing number of data breach incidents in the past several years, the awareness of the general public about the personal data privacy will continue to increasing. The necessity for data privacy will grow stronger with an increasing number of services and device collecting our personal data associated with our personal identity. There are techniques that obfuscate the linking of pseudonymous address and the real person such as Coin Join.

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 Back feed, 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. Back feed 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, enabling massive open-source collaboration without any form of centralized coordination.

- 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 researcher's 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.

- According to **Lember, 2017** [4] 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** [5] 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.

III. PROPOSED WORK

The security challenges are still among the major obstacles when considering cloud adoption services. The main reason is that the database is hosted and processed in the cloud server, which is beyond the control of the data owners. For the numerical query, these schemes do not provide sufficient privacy protection against practical challenges. In this system we propose different data instance architecture for a secure database with that provide protection to several questions related to the numeric range. We implement a three-layer/instance storage framework based on data computing.

The technology of Blockchain attracts high attention first of all due to the possibility of decentralizing highly risky operations, which are traditionally carried out in predetermined data centers. The most well-known example of use is the replacement of the function of conducting transactions within the system of bank transfers to a decentralized network of cryptographic handlers. The essence of this method of processing financial transactions is the encryption of transaction sets combined into blocks with the inclusion in the code of the unique identifier code of the previous block.

- Large data storage at the required of decentralized data storage as well as information system

- The different attack issues in centralized database architectures.
- There is no automatic attack recovery in central data architectures
- The decentralized architecture provides the automatic data recovery from different attacks.

After the analysis of this system we move to develop the decentralized system architecture, and distributed computing provide parallel processing in distributed environment.
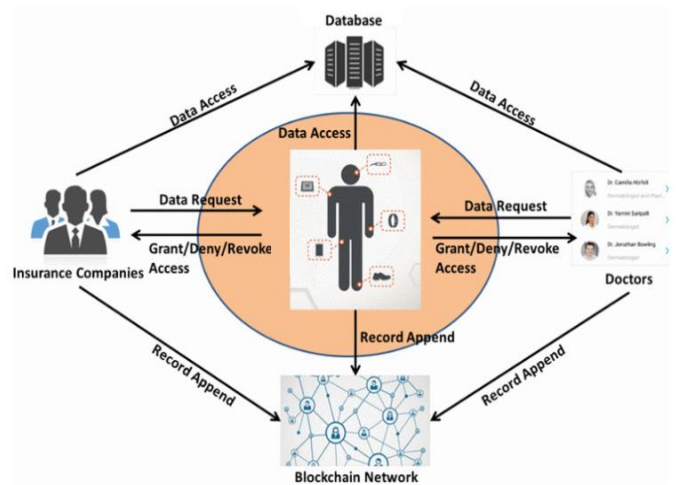

Figure1 : System Architecture

IV. OBJECTIVES

- To design approach for health insurance company where system store all historical data into block chain manner.
- To create a distributed computing environment hierarchy for parallel data processing for end user's applications.
- To design implement own SHA family block for whole blockchain.
- Each transaction has stored on dependent blockchain in cloud environment.
- To design and implement a new mining technique for generate new block for each transaction.
- To implement a verification algorithm which can validate each peer on every access request.

V. CONCLUSION

There are many research directions in applying Blockchain technology to the healthcare industry due to the complexity of this domain and the need for more robust and effective information technology systems. An interoperable architecture would undoubtedly play a significant role throughout many healthcare uses cases that face similar data sharing and communication challenges. From the more technical aspect, much research is needed to pinpoint the most practical design process in creating an interoperable ecosystem using the Blockchain technology while balancing critical security and confidentiality concerns in healthcare. Whether to create a decentralized application leveraging an existing Blockchain, additional research on secure and efficient software practice for applying the Blockchain technology in healthcare is also needed to educate software engineers and domain experts on the potential and also limitations of this new technology. Likewise, validation and testing approaches to gauge the efficacy of Blockchain-based health care architectures compared to existing systems are also important (e.g., via performance metrics related to time and cost of computations or assessment metrics related to its feasibility). In some cases, a new Blockchain network may be more suitable than the existing Blockchain; therefore, another direction may be investigating extensions of an existing Blockchain or creating a healthcare Blockchain that exclusively provides health-related services.

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