HEALTH INSURANCE CLAIM USING BLOCKCHAIN

Jaya Kuckreja[1], Pranit Nigde[2], Pranjal Patil[3]

[1-3]Student, Dept. of Computer Engineering, Sinhgad Institute of Technology, Lonavala, Maharashtra, India

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Abstract - *During Medical Emergencies Health Insurance plays an extremely important role in providing us the coverage against medical expenses. But Preventing Data Breach and Fraudulent activities of data related to health care is the biggest challenge in this sector. Blockchain Technology provides transparency which is the biggest issue in health sector. In this paper, we design the insurance claim model in which Blockchain will help our system maintaining transparency between the insurer and the company. This proposed model replaces the agent and offers the direct contact between the insurer, hospital and the company. IPFS is the distributed file storage system where one can share large files in secured manner. our papers concentrates on using and combining both blockchain and IPFS where the patient's private data is stored in this distributed file storage named IPFS and the cryptographic address of the files gets store in the blockchain technology.*

***Key Words:* Blockchain, Health Insurance, Insurance Claim, IPFS, Medical Record.**

1. INTRODUCTION

A blockchain is confidential, secure and immutable. Blockchain is a list of blocks chained together. Blockchain is used for storage of transaction metadata and hash of data. The business logic in blockchain technology is implemented using smart contracts which are also used to automate various transactions in the blockchain system. It is a distributed ledger Technology in which there is no Central authority, so the transaction data and hashes are stored in a distributed ledger.

A lot of Healthcare information is generated everyday which is stored for future references in a database system. This critical Healthcare information is to be stored securely such that no data leak or tampering of data takes place. The data stored in a blockchain is encrypted and stored in a distributed ledger so modification or unauthorized access is not possible. In this paper we propose a Health Insurance system using blockchain Technology, IPFS and smart contracts where data security, immutability and transparency is obtained.

IPFS is used to store large files like medical health reports, insurance policy details, personal data in a distributed system. It returns a hash value to be stored. Document sharing can be securely done by using encryption algorithms

so that only authorized user can access data. These hashes can be stored on the blockchain.

IPFS is a distributed file system which uses a content-addressed system. The cryptographic hash generated by IPFS itself is the address of the file. Data is stored on the distributed network after it is divided and hased. IPFS maintains a distributed Hash table. IPFS uses DHT, BitTorrent protocols and a Merkle tree. Merkle tree tracks content across the entire web system.

2. EXISTING SYSTEM

In the existing system, the Insurance claim process is coordinated between the health care providers and insurance company by insurance agents. Insurance agents may intentionally or unintentionally leak critical documents like patient information, Medical Health records and insurance policy records. The insurance claiming process is carried out manually and consumes a lot of time and energy.

In a traditional distributed database, read/write operations are managed by a centralized system. These records can get changed. With the rise of Technology and increase in the amount of records, data breach and record tempering are a threat to privacy and authentication of records when stored in a central server. Thus, data integrity and access control are major concerns in healthcare and insurance industry.

Insurance industries are also facing the issue of claim frauds. False information can be provided for payment of false claims by policy holder. Detecting frauds has become a challenge which can result in losses to the company but also increase the transaction processing time and payment settlement time as the company may have to contact additional sources for information.

3. PROPOSED SYSTEM

In our proposed system we built a web application based on blockchain technology and interplanetary file system. The User has to register himself by entering his personal information. Personal Information, insurance policy details, Medical Health report and medical bill information will get added into the system and stored in the blocks of blockchain. This data will stored in the Interplanetary file system after it is encrypted using hasing algorithm. IPFS will return a 'Qm'

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hash of the data which can be referred as the address of the data stored on it. The 'Qm' hash will get stored in the MySQL database for keeping track of data.

3.1 Advantages of proposed system:

- Reduction of insurance claim fraud
- Faster claim process
- Increased transparency in the claim process
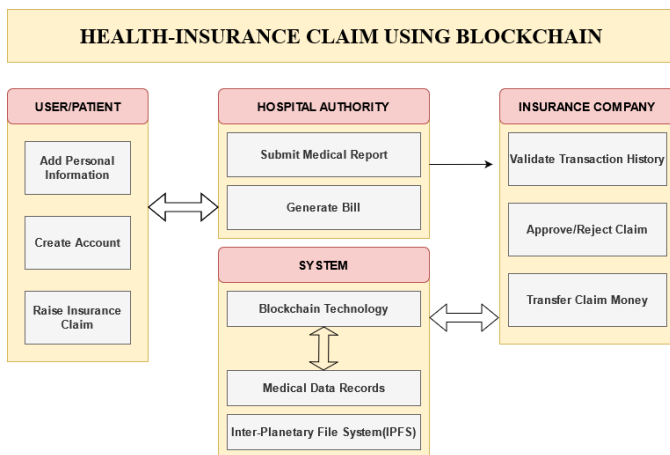
4. SYSTEM DESIGN

Figure 1: System Architecture

Within the architecture design displayed in Figure 1 is the representation of the healthcare institutions, their peer clients, Insurance company, IPFS and the Blockchain. Each person accesses the blockchain in accordance to their roles. Each node holds the same copy of the immutable blockchain and the insurance claim.

There are three different types of entries in the Blockchain: (i) patient healthcare records, (ii) insurance claim records, and (iii) The Bill amount. Entries in the Blockchain cannot be updated, forcing a new entry will create a new Block. A patient can view all the entries related to the medical report and payments.

The process starts when the insurer issues the policy of the patient in Blockchain. The medical reports uploaded by the hospital authorities gets store in the IPFS and their transaction gets store in the Blocks. IPFS uses a P2P (Peer-to-Peer) network model for sharing a file in a decentralized and distributed manner across nodes. Files are stored across a network of nodes after they are broken in parts and hashed. When the parts are assembled together, based on their hash value, it recreates the original file.

5. IMPLEMENTATION

Our IPFS-based blockchain storage model is performed in the IPFS distributed file sharing system. Each transaction is stored on IPFS and a unique hash is calculated and stored in blockchain transaction. The implementation our proposed system was carried out in four phases. The first phase consists of developing backend services where the Business logic was designed using smart contract. The second phase consists of uploading file to IPFS. The third phase consists of designing user friendly UI. The fourth phase consists of integrating and testing the smart contracts with the UI.

A. First Phase :
The development of a smart contract took place in 3 steps: 1)Analyze 2) Design 3) Implementation:
Analyze: We did the analyzation and identification of all links between each the modules.
Design: The problem need to be solved by the smart contract was identified and based on it ,the smart contract was designed. Various functions were declared and defined based on the work of each module.
*Implementation :*The component of smart contract was implemented and was broadcast on the blockchain network.

B. Second Phase:
We used IPFS to store transactions and medical files of the patient. The transaction and file that are very large in size could not be stored on Blockchain so to achieve efficient transaction we used IPFS. Files are stored across a network of nodes after they are broken in parts and hashed.

C. Third Phase:
We have developed web user interface for our application using JSP and is being used by all the three entities. Various pages were designed according to the role of the user. Database was designed for the purpose of authentication of the users.

D. Fourth Phase:
The Fourth phase involves the integrating the the smart contract with the UI. This provides the smart Contract's functionalities to the authorities and stores data in distributes manner. As we progress, various types of testing are done:
1) Unit Test -An individual components were tested and all the functions of the module were tested for accuracy and edge test cases.
2) Integration Test - Selenium is used to test multiple functions that passed a unit test to assure that these functions work together.
3) System Test - This test is performed to check whether the system as a whole behaves as desired.

4) Smoke and Regression Test - Regression testing is performed when the development environment changes, this makes sure that lack or mismatch of dependencies doesn't affect the behavior of the prototype.

5) Performance Test - Apache JMeter is used to find the latency of the server.

6. LITERATURE SURVEY

A. PAPER TOWARDS PRIVACY ASSURED HEALTH INSURANCE CLAIMS

The medical insurance claim process is carried out by healthcare providers, insurance companies, and clearinghouses. Clearinghouses may intentionally or unintentionally leak critical health records. This paper proposes a distributed system to replace the role of middlemen during the process of claiming the health insurance and to reduce the risk of data leakage. The solution enhances the patients' privacy protection through developing a system for the medical insurance claim process in a decentralized manner using blockchain technology. Data structures for patient information, medical record, insurance payment, and insurance policies are designed within the ledger. The paper focused on defining smart contracts for privacy assurance, as well as automating the insurance claim process. The proposed framework was implemented using Hyperledger Fabric.

B. HEALTH CARE INSURANCE FRAUD DETECTION USING BLOCKCHAIN

In the present study, when patient claims for a certain amount from an insurance company, it checks for particular information like reason for visit, claim amount, and other Identifications of patient. Using this information, the company can generate a transaction with the network. After the transaction has been approved, a logical block is created in the network that represents this transaction. This transaction is viewed by everyone participating in the network. The next time when the same patient visits another company to claim, the company can now check for the patient details across blockchain. If claim matches with the previously committed transaction on the network, the request for the claim will be denied to the patient.

C. A Blockchain and IPFS based framework for secure Research record keeping

Blockchain is emerging technology which attempts to solve issues by creating tamper proof event of records in a distributed environment. IPFS is a protocol designed to store hypermedia in a peer-to-peer distributed file storage with content-addressability. This paper combines blockchain technology and encryption methods to create a secure, immutable system to store records. This system uses Ethereum smart contracts to store metadata received from IPFS to the blockchain network to create secure and immutable records.

7. CONCLUSIONS

Blockchain has shown its potential for transforming the traditional industry with its key characteristics such as decentralization, persistency, anonymity, and auditability. The proposed system provides reliable and secure healthcare scheme using blockchain that works in decentralized environment   by removing the cost of resources such as cost, time to manage the healthcare data records. The system is able to maintain the privacy and provide top level security to healthcare data records as it contains some private information related to health.

8. ACKNOWLEDGEMENT

9. REFERENCES

[1] Rajalakshmi, Lakshmy, Sindhu and Amritha   "A Blockchain and IPFS based framework for secure Research record keeping" , International Journal of Pure and Applied Mathematics Volume 119 No. 15 2018, 1437-1442 ISSN: 1314-3395 (on-line version) url: http://www.acadpubl.eu/hub/ Special Issue

[2] Dr.Jaideep Gera , Anitha Rani Palakayala , Dr.Venkata Kishore Kumar Rejeti , Tenali Anusha, "Blockchain Technology for Fraudulent Practices in Insurance Claim Process", Proceedings of the Fifth International Conference on Communication and Electronics Systems (ICCES 2020) IEEE Conference Record # 48766; IEEE Xplore ISBN: 978-1-7281-5371-1

[3] Mayank Raikwar, Subhra Mazumdar, Sushmita Ruj, Sourav Sen Gupta, Anupam Chattopadhyay, and Kwok-Yan Lam, "A Blockchain Framework for Insurance Processes", 978-1-5386-3662-6/18/$31.00 ©2018 IEEE

[4] Veneta Aleksieva, Hristo Valchanov, Anton Huliyan," Application of Smart Contracts based on Ethereum

Blockchain for the Purpose of Insurance Services", 978-1-7281-4754-3/19/$31.00 ©2019 IEEE

[5] Gokay Saldamli ,Vamshi Reddy,Krishna Bojja,Manjunatha K. Gururaja,Yashaswi doddaveerappa,Loai Tawalbeh,"Health Care Insurance Fraud Detection Using Blockchain",2020 Seventh International Conference on Software Defined Systems (SDS), 978-1-7281-7219-4/20/$31.00 ©2020 IEEE

[6] Randhir Kumar ,Rakesh Tripathi,"Implementation of Distributed File Storage and Access Framework using IPFS and Blockchain", 2019 Fifth International Conference on Image Information Processing (ICIIP), 978-1-7281-0899-5/19/$31.00 ©2019 IEEE