

Secure and Transparent Insurance Application using Blockchain Technology

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Abstract - In recent times, getting insurance and filing a claim can be a lengthy and time-consuming process. The majority of insurance claims are denied by the insurance company due to time delays in a large amount of paperwork. Thus, we are proposing the use of permissioned based blockchain solutions including four peers namely insurance peer, police peer, shop peer and technical support(repair) peer for the insurance industry in application and claiming process. It ensures that data is transferred, claims and applications are processed, and fraud is prevented in a more secure, transparent, and time efficient manner. The permissioned blockchain network applied is Hyperledger Fabric and smart contracts are written in Go language because of Go language compatibility with the Hyperledger blockchain architecture.

Key Words: Blockchain, Insurance, Hyperledger Fabric, Smart Contract, Consensus Mechanisms.

1. INTRODUCTION

In today's world, applying for insurance and filing a claim is a tedious and time-consuming procedure. Insurance firms are subjected to a large number of fraudulent claims and lose billions of dollars each year as a result. Customers may also wait a long time to claim insurance on damaged or stolen products since insurance firms must go through a lot of paperwork before reimbursing the money to the client. This creates an unethical and unreliable relationship between the organization and its customers. There is a need for a digital platform to handle these challenges due to fraud, payment delays, and a non-transparent and insecure insurance system.

Traditional insurance procedure consists of a huge bundle of paperwork which could lead to various malpractices. Nowadays, insurance companies create lengthy paperwork which could lead to a maximum number of claim denial by these companies. Various scams[1] are also being submitted due to a non-transparent and less secure system. Due to a centralized storage system by the insurance companies there leads to an increase in file tampering, file manipulation and hacking which could lead to a decline in trust by its users.

The application of blockchain technology in the insurance industry will fundamentally alter the old insurance industry, resulting in a new industry that is faster, cheaper, and more secure. Furthermore, blockchain-based

insurance will be more transparent and trustworthy than traditional insurance, allowing clients to better assess which coverage is best for them and a proper fraud protection mechanism may be created. The advantages of blockchain technology, such as security, interoperability, and data integrity, will enhance the insurance industry's advancement.

In our proposed system we have four peers in this application: insurance, shop, police, and technical support(repair shop). In addition, each participant will have their own peer node. The insurance peer is the insurance company that insures the products and is also in charge of processing the claims. The theft claims must be verified by a police peer. Repair shop peers are in charge of product repairs, while shop peers are in charge of selling products to customers.

2. LITERATURE SURVEY

According to the survey conducted by Pramod Niraula and Sandeep Kautish of the Lord Buddha Education Foundation, Nepal [2] on the digitization status of the insurance industry and the obstacles faced by them in going digital, Analysis of the responses from insurance customers shows that the implementation of information and communications technology (ICT) in the insurance sphere is below the average. While about 82% of the respondents from a group of insurance customers had shown a willingness to use digital platforms to buy policies. Employees listed improper regulation as the most difficult barrier, followed by inflexible organizational structure, security concerns, and product complexity to sell online, while customer desire to use an online platform was ranked as the lowest degree, although being higher than the norm. This demonstrates that insurance companies are still heavily involved in digitization. From the analysis of the results, we could suggest that the insurance regulatory body should facilitate the digital transformation of insurance companies.

Lanqing Zhao of Bishop Allen Academy in Toronto, Canada [3], investigated the use of blockchain in the insurance sector. He discussed how blockchain technology can significantly reduce insurance companies' operating costs, increase the efficiency of insurance companies' claims because smart contracts [4] are built into the blockchain technology, and how blockchain technology can

significantly reduce the current "excessive risk-taking" in the insurance industry because smart contracts are built into the blockchain technology itself. According to the author, "self-purchase insurance," "automatic claim settlement," "fraud detection," and "money flow record tracking" are some of the existing blockchain uses in the insurance business. KYC is also based on blockchain technology[5] has a number of advantages, including decentralization, transparent transactions, and no centralized power.

Valentina Gatteschi, Fabrizio Lamberti, Claudio Demartini, Chiara Pranteda, and Vctor Santamara [6] looked into whether blockchain technology is ready for use. They have carried out a comprehensive swot analysis of the blockchain technology's adoption. Fast and low-cost money transactions are among the internal benefits, according to their research. There is no need for intermediaries. It is available from anywhere in the world thanks to automated processes (through smart contracts). Transparency, a platform for data analytics, scalability, low performance, and low energy consumption are advantages, while data loss/modification/falsification and non-repudiation are disadvantages. The privacy of users has been jeopardized. Volatility in cryptocurrencies is a problem. The same results were achieved while the technology was still in its early phases. The majority of limitations may now be eliminated with the use of a private and enhanced blockchain network. Thus these problems can be resolved with use of hyperledger composer as it is permissioned based blockchain network.

Mayank Raikwar, Subhra Mazumdar, Sushmita Ruj, Sourav Sen Gupta, Anupam Chattopadhyay, and Kwok-Yan Lam of Nanyang Technological University's School of Computer Science and Engineering [7] describe a model for a blockchain-based insurance app based on Hyperledger fabric, an open source permissioned blockchain design framework. In their approach, the client and the agent are two separate entities; the agent acts on behalf of the client and manages the client's requests to the blockchain network. The main components of their model are a distributed blockchain ledger to store the execution results of all transactions, a database (alternatively encrypted) to maintain all clients' insurance contracts and transaction results in key and value format, a set of validators to verify and store the transaction blocks on the blockchain, and a set of orders to order the transaction. According to their research, as the number of nodes in the network grows, so does the transaction confirmation time. Proof of Work (POW) [8], Proof of Stake (POS) [9], and Practical Byzantine Fault Tolerance (PBFT) [10] are three types of consensus mechanisms with varying confirmation times. They kept track of the transactions on an unencrypted database.

The authors Suporn Pongnumkul, Chaiyaphum Siripanpornchana, and Suttipong Thajchayapong[11] studied the performance of Ethereum and Hyperledger Fabric as private blockchain platforms with varied amounts of transactions. They discovered that Hyperledger Fabric provided quicker throughput and lower latency than Ethereum when workloads ranged up to 10,000 transactions. The average throughput of Hyperledger Fabric swings at a far faster rate than Ethereum's. Ethereum, on the other hand, can handle more transactions at the same time while using the same processing resources. Hyperledger Fabric will be able to handle a large number of simultaneous transactions for the same computing resources in the future.

Eberhardt and Tai [12] conducted research to help understand alternate solutions to the blockchain scalability issue, as well as to identify projects that are attempting to solve the problem. Blockchain is described as a peer-to-peer system that integrates many computational and financial aspects. The purpose of this study was to determine which data should be stored on the blockchain and which should be stored off chain. This study identified five off-chain data storage patterns, as well as the underlying ideas and implementation architecture for each. On-chain data, according to the authors, is any data that is stored on the blockchain as a result of transactions. While off-chain data storage implies the storing of data on media outside than the blockchain, it does not include any transactions.

Yurong Guo, Zongcheng Qi, Xiangbin Xian, Hongwen Wu, Zhenguo Yang, Jialong Zhang, and Liu Wenyin[13] came up with the idea for a blockchain-based web identity security insurance system. They emphasize the importance of effective business models for providing insurance for web services, such as insurance, security businesses, commercial websites, and end consumers. The DengLul Server, insurance companies, security companies, end users, and commercial websites are all part of their blockchain-based database platform. Every second, they save the hashed data from the website's logs. They used the parity POA as a consensus approach. To save all of the insurance conditions for a website database, they employed predefined smart contracts. The claim proof is recorded to the blockchain to confirm its legitimacy. The efficiency of the system can be enhanced with the POW[8].

Yingli Wang, Jingyao Wang, Meita Singgih, and Mihaela Rit [14] conducted research on consensus processes and their applicability in blockchain technology. The authors suggested how smart contracts can be applied to the concept of parallel blockchains. They say that smart contracts' application in blockchain is based on the decentralisation given by the programming language code represented in them. According to authors the layers involved in blockchain technology are information,

networking, agreement, incentives, contracts, and application server. The smart contracts are examined in terms of their structure and foundation, as well as their applications and problems.

Luca Foschini, Andrea Gavagna, Giuseppe Martuscelli, and Rebecca Montanari of the University of Bologna in Italy [15] investigate the Fabric platform's transaction performance by identifying the pieces that contribute the most to the total overhead at a fine-grained degree level. They were particularly interested in how transaction delay is affected by the programming language used to create the chaincode and the number of participating endorser peers. They discovered that the programming language used has a major impact on transaction latency, and that Go is arguably the most efficient programming language for practically all of the tests carried out while employing a total of 16 nodes in the blockchain network as a consequence of their research.

3. MODULES AND FUNCTIONS IN PROPOSED SYSTEM

In our proposed system for secure and transparent transactions of insurance claims, we have used a four peer system to initiate and validate the smart contracts in the blockchain network. Peers from the police and technical support (repair) are critical in validating the assertions. For greater transparency, the user would be able to see the entire claiming procedure. Because of the use of smart contracts and peer-to-peer transaction verification, manipulation of any data in the insurance contract that could be used by the insurance company to deny a claim is impossible. The system representation is shown in fig1.

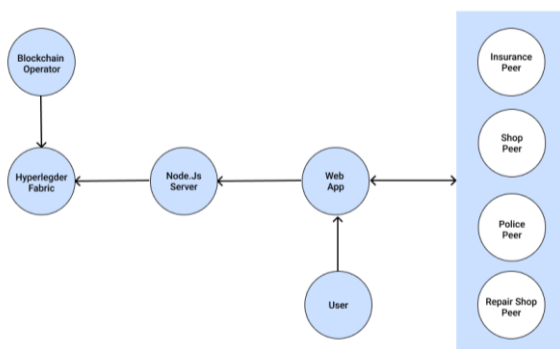


Fig1. Module representation

3.1 Insurance Peer:

The smart contract for the products offered by the store peer is initiated by the Insurance peer. It encapsulates all of the insurance company's smart contracts for items acquired by its consumer base. It validates all the smart contracts initiated by the blockchain network along with the remaining peers.

3.2 Shop Peer:

The Shop module allows users to purchase desired products as well as insurance from a certain insurance carrier. A smart contract is started when a product's transactions are fully completed by the end user. It, together with the remaining peers, validates all of the blockchain network's smart contracts.

3.3 Police Peer:

All of the items reported stolen by the user to the insurance peer are confirmed by the Police peer. Following validation of the stolen product, this peer creates a smart contract that represents the product's status and cannot be altered. It, together with the remaining peers, verifies all of the smart contracts started by the blockchain network.

3.4 Technical Support(Repair-Shop) Peer:

The Technical Support(Repair-Shop) peer verifies all of the goods that the user has reported as damaged or repaired to the insurance peer. Following confirmation of the damaged goods, this peer creates a smart contract that represents the product's state and cannot be altered. It, together with the remaining peers, validates all of the blockchain network's smart contracts.

3.5 Orderer:

The Orderer in hyperledger fabric grants full network access to the blockchain's owner. It also grants permission for any process to all peers and runs the census algorithm among them. It also includes the Raft protocol, which is based on a leader-follower concept and aids in determining the leader for a specific network process.

4. RESULT AND CONCLUSIONS



Fig 2. Enrollment of peer identities

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ritesh@ritesh-Virtual-Machine: ~/build-blockchain-insurance-app-local
File Edit View Search Terminal Help
Step 1/5 : FROM docker.io/hyperledger/fabric-ca:latest
--> dbbc768aec79
Step 2/5 : RUN mkdir /ca
--> Using cache
--> b29827c8916c
Step 3/5 : COPY fabric-ca-server-config.yaml /ca
--> 5cf6d94311ef
Step 4/5 : COPY tls /ca/tls
--> 430dd8313dc0
Step 5/5 : COPY ca /ca/ca
--> 5a3df6b620f2
Successfully built 5a3df6b620f2
Successfully tagged repairshop-ca:latest
Creating orderer0 ... done
Creating police-ca ... done
Creating repairshop-ca ... done
Creating insurance-ca ... done
Creating shop-ca ... done
Creating insurance-peer ... done
Creating shop-peer ... done
Creating repairshop-peer ... done
Creating web ... done
Creating police-peer ... done
    
```

Fig 3. Creation of Blockchain network

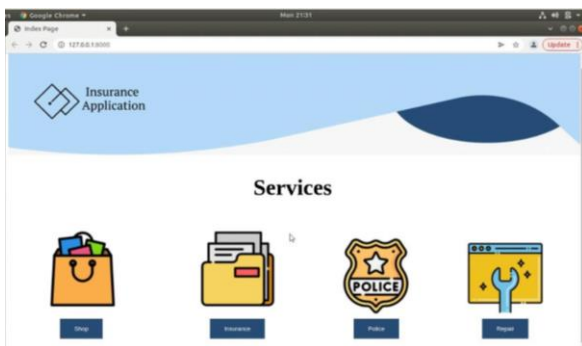


Fig 4. Home Page

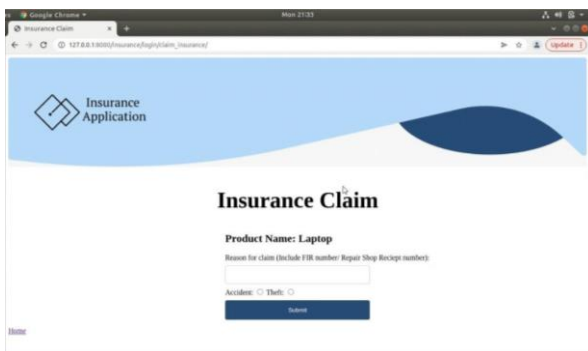


Fig 5. Insurance Claiming Page

The objective of this study is to showcase a blockchain-based insurance application with smart contracts. The insurance transaction procedure is carried out in a secure

private Hyperledger fabric-based decentralized system, which greatly improves security. In this application, smart contracts are used to create standard insurance contracts. By virtue of its immutable nature, this application utilizes decentralized chain code to alleviate the difficulties associated with claim settlements and insurance. The PoA technique is used in this application to save a lot of space and money. As a result, the system offers a cost-effective and secure solution for insurance operations and functions. This is not a domain-specific application as it emphasizes a uniform approach to all insurance companies. This application provides a safe way to complete the entire insurance process, from registration to refund, in a secure and transparent manner.

In the future, the proposed system application has a lot of space for improvement. This structure is also widely used for any specific type of insurance policy, with modifications in the smart contract. Depending on the system to be created, blockchain technology may be used to create a broad range of systems using private or public blockchains. The blockchain technology may be used to create a highly secure and adaptable system. We may also trace the transaction to see if there are any mistakes or defects that need to be fixed in the future. It can also assist in tracking data loss or modifications in the event of a cyber attack.

ACKNOWLEDGEMENT

It's a pleasure to express our gratitude to everyone who contributed to this project in various forms. First of all, we want to thank Prof. Kishor Patil, who served as our mentor. This work would not have been possible without his oversight, support, and encouragement. We hope that the application we're working on will improve people's interactions with computers. The application that is currently being developed will provide a better communication and daily living solution. It would be a useful computing approach that would lead to an effective and reliable solution.

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