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Insurance Application Using Blockchain Technology: A Survey

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Abstract - *In today's world, the insurance applying & claiming process is a very tiresome and time-consuming process. Insurance companies face a lot of fraudulent claims and lose billions of dollars every year to such claims. The customer also faces a lot of time to claim their insurance on damaged or stolen goods as the insurance companies have to go through a lot of paperwork's before redeeming the amount to the consumer. This creates an opaque and untrusty environment between the company and their clients. Due to frauds, delay in reimbursement, non-transparent and unsecure insurance process there is a need of a digital platform to address to these issues. Blockchain technology in the insurance domain ensures a more secure, transparent & time efficient way data is exchanged, claims & applications are processed and fraud is prevented. In this survey paper, we focus on an efficient approach for processing insurance related transactions based on blockchain-based platform. We have done an in-depth study on the existing different blockchain platforms, smart contract techniques and algorithms for an insurance application implemented on blockchain.*

Key Words: **Blockchain, Insurance, Hyperledger Fabric, Smart Contracts, Consensus algorithm.**

1.INTRODUCTION

Cryptocurrency has become a buzzword in both industry and academics in recent years. The basic technology used to construct Bitcoin[3-17] is blockchain. Bitcoin has been a great success as one of the most successful cryptocurrencies, with its capital market exceeding billions of dollars in 2021. Transactions in the Bitcoin network could take place without the involvement of a third party if a properly designed data storage structure is used. All committed transactions which are known as logs are kept in a chain of blocks, which may be thought of as a public ledger. This chain continues to expand as additional blocks are added to it [17]. There is no one definition of blockchain, and every effort at one frequently devolves into semantic debates. As defined by McKinsey[11] blockchain is a distributed register to store static records and or dynamic transaction data without central coordination by using a consensus-based mechanism to check the validity of transactions. It is thus well suited for applications requiring transparency on records with a permanent time and date stamp, such as titles, document histories, and notary services. Rishav Chatterjee, Rajdeep Chatterjee [10] defines Blockchain as basically a decentralized, distributed ledger of all the transactions or events which takes place only after involving multiple parties. Blockchain, in its most basic level, is a database that is shared by numerous users. Instead of a single peer, data is validated by many peers. Each participant then propagates and stores the data. The network becomes safer and more trustworthy as the number of blocks in the network grows. In order to achieve user's security and ledger consistency blockchain framework uses asymmetric cryptography[19] and distributed consensus methods. Ledger is a decentralized database which can be found across all the peers participating in the blockchain network. Every peer in the network has a copy of this ledger in their system at any given time. The blockchain framework's consensus algorithm[21] overcomes the problem of mutual trust among nodes in a distributed network. The performance of blockchain is directly influenced by whether or not the right consensus algorithm is used.

Blockchain ensures a high level of security as the transactions which take place are entirely anonymous.

When a transaction happens in a blockchain network it gets updated via hashing so each participant comes to know that a transaction has happened in a system but they won't be able to see the details of those transactions except participating nodes and the anonymity of data is maintained. Each transaction or digital event taking place in a Blockchain network is verified, only if it is agreed upon by the consensus of the majority party of the users participating in this process. Blockchain has many buzzwords associated with it, one of them is known as "smart contracts" that are nothing but computer programs that are executed to have an automatic transmission of digital assets based on certain conditions. In other words, business logic is written in terms of smart contracts. Importantly, the smart contract (a piece of code or logic) itself is immutable and it is part of a block in the blockchain[20].

One of the industries that potentially benefit from the implementation of blockchain is insurance. Insurance has always been a difficult process for anyone dealing with an issue, and we are hoping that blockchain insurance can change that. Because insurance policies are peer to peer, the current issues of the insurance system include a lack of adequate remote interaction, which leads to many scams. The benefits of blockchain technology, such as security, interoperability, and data integrity, will aid in the improvement of the insurance industry. Every year, billions of dollars are lost due to fraud. Transparency will be provided through blockchain, as well as a proper fraud prevention system can be implemented. Due to the complicated claiming process, it takes a long time for a client

to file an insurance claim. A better customer-centric approach will be provided by blockchain, ensuring better claim management. The rise in popularity of permissioned blockchain platforms in recent times is significant. Hyperledger Fabric[12] is one such permissioned blockchain platform.

The use of blockchain in insurance will significantly change the traditional insurance sector, creating a new industry that is faster, cheaper, and more secure. In addition, blockchain-based insurance will be more transparent and trustworthy than traditional insurance, making it easier for customers to evaluate which policy is best for them. This paper looks at recent work on using blockchain technology, smart contracts, Hyperledger fabric methods used in insurance applications. Section 2 looks at various blockchain an smart contracts technique used. Finally, Section 3 concludes our research.

2. LITERATURE SURVEY

The application of blockchain in the insurance industry was studied by Lanqing Zhao of Bishop Allen Academy in Toronto, Canada [1].He discussed how blockchain technology can effectively reduce insurance companies' operating costs because it can achieve permanent audit tracking, how blockchain technology can improve the efficiency of insurance companies' claims because smart contracts[16] are founded into the blockchain technology itself, and how blockchain technology can effectively reduce the existing "excessive risk - taking" in the insurance industry. "Self-purchase insurance," "automated claim settlement," "fraud detection," and "money flow record tracking" are some of the current applications of blockchain in the insurance industry, according to the author. Decentralization, transparent transactions, and no centralised power are only some of the benefits of KYC based on blockchain technology[18]. The nature of distributed systems allows for the tracking of capital flow records throughout time.

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 [2] describe a model for a blockchain-based insurance app using Hyperledger fabric, an open source permissioned blockchain design framework. Client and Agent are the two entities in their concept, the agent works on the client's behalf and handles the client's requests to the blockchain network. A distributed blockchain ledger to store the execution results of all transactions, a database (alternatively encrypted) to maintain the insurance contracts and transaction results of all clients in Key and Value format, a set of endorsers to verify the smart contract transaction conditions, a set of verifiers to verify and store the transaction blocks to the blockchain, and a set of orders to order the transact are the main components of their model. Each smart contract has its own set of authorizing peers in its model. The conclusion they obtained after proper testing of the blockchain network architecture is that as the number of nodes in the network grows, the transaction confirmation time grows. Proof of Work (POW)[13], Proof of Stake(POS) [14], and Practical Byzantine Fault Tolerance (PBFT) [15] are three distinct consensus methods that result in varying confirmation periods. They maintained the transaction information on an unencrypted database.

Vujii et al. [3], gave a presentation on blockchain technology, Bitcoin, and Ethereum. According to the authors, the information technology environment is continuously evolving, and blockchain technology benefits information systems. They defined bitcoin as a peer-to-peer distributed network that allows people to conduct bitcoin transactions. They also established the proof-of-work consensus algorithm as well as the blockchain idea of mining.The authors highlight that scaling is a serious challenge in blockchain, and that many solutions, such as SegWit and Lightning, Bitcoin Cash, and Bitcoin Gold, have been presented to address scalability issues. The paper further described Ethereum and its requirements, as well as the differences between the Ethereum and bitcoin blockchain systems.

The performance of Ethereum and Hyperledger Fabric as private blockchain platforms with variable numbers of transactions was investigated by the authors Suporn Pongnumkul, Chaiyaphum Siripanpornchana, and Suttipong Thajchayapong[4]. When workloads varied up to 10,000 transactions, they discovered that Hyperledger Fabric provides faster throughput and lower latency than Ethereum. Hyperledger Fabric's average throughput fluctuates at a considerably faster rate than Ethereum's. Ethereum, on the other hand, can accommodate more concurrent transactions for the same processing resources. In future, Hyperledger Fabric can accommodate a large number of concurrent transactions for the same processing resources.

Eberhardt and Tai [5] performed research to better understand alternative solutions to the blockchain scalability challenge, as well as to discover projects that aim to address the issue. They characterise blockchain as a peer-to-peer system that combines different computational and economic principles. The goal of this research was to figure out which data should be kept on-chain and which should be kept off-chain. This research provided five patterns for off-chain data storage, as well as the fundamental principles and implementation architecture for each design. According to the authors, on-chain data is any data that is kept on the blockchain as a result of transactions. While off-chain data storage refers to the placement of data on any other storage media other than the blockchain, it does not contain any transactions.

Yurong Guo, Zongccheng Qi, Xiangbin Xian, Hongwen Wu, Zhenguo Yang, Jailong Zhang, and Liu Wenyin [6], developed a concept for a web identity security insurance system blockchain based. They emphasise the necessity of practical business models including insurance, security businesses, commercial websites, and end users for providing insurance for web services. The DengLul Server, insurance firms, security businesses, end users, and commercial websites are all part of their model, which leverages blockchain as a database. They save the hashed data from the website's logs each second.As a consensus method, they utilised the parity POA. All users' web identities are saved on the DengLul server. Different insurance packages are available from insurance firms. They used predetermined smart contracts to hold all of the insurance conditions for a website database. To ensure the legitimacy of claim proof, it is posted to the blockchain. To create trust between insurers and policyholders, smart contracts are used regularly.

The research by Yingli Wang, Jingyao Wang, Meita Singgih, Mihaela Rit [7], focused on consensus mechanisms and their implementation in blockchain technology. They begin by explaining smart contracts, their functioning structure, operating systems, and other key terms associated with them. The authors also explore how smart contracts may be used to the new parallel blockchains idea. They claim that the decentralisation provided by the programming language code expressed in smart contracts is the basis for their use in blockchain. After explaining the fundamentals of smart contracts, the author went over the several layers of blockchain that work together to keep the system running. Information, networking, agreement, incentives, contracts, and application server are the layers involved. The article not only goes over the structure and foundation that smart contracts use, but it also goes over the uses and difficulties that they face. In addition, the article covers a significant future trend of parallel blockchain, which aims to develop a blockchain that can optimise two distinct but critical modules.

The researchers Luca Foschini, Andrea Gavagna, Giuseppe Martuscelli, and Rebecca Montanari from the University of Bologna, Italy [8], examine the Fabric platform's transaction performance by finding the elements that contribute more to the total overhead at a fine-grained degree level. They were particularly interested in how the programming language used to build the chaincode and the number of participating endorser peers impact transaction delay. The transaction latency is the time it takes for a client to receive a response after making a request.Query Latency (LpQ): the time between when the request is sent and when the client receives a confirmation event, which notices that the transaction has been entered in a block and added to the blockchain. Update Latency (LpT): the time between when the request is sent and when the client receives a confirmation event, which notices that the transaction has been entered in a block and added to the blockchain. Their programme helps developers to manage blockchain-based software projects (create, remove, update, and query). Their application has an identity number, a name, a description, an owner, a link to the source code repository, and a hash of the code for integrity. As a result of their research, they discovered that the programming language used has a significant impact on transaction latency, and that Go is perhaps the most efficient programming language for almost all of the tests carried out while using a total of 16 nodes in the blockchain network.

The researchers Valentina Gatteschi, Fabrizio Lamberti, Claudio Demartini, Chiara Pranteda, and Vctor Santamara [9], explored whether blockchain technology is ready for implementation. They had conducted a thorough swot study of the blockchain technology's adoption. Internal benefits, according to their study, include fast and low-cost money transactions. There's no need for middlemen. Automated systems (by means of smart contracts), It's accessible from anywhere in the world. Transparency, Data analytics platform, The positives include scalability, low performance, and energy consumption, whereas the drawbacks are data loss/modification/falsification and non-repudiation. Users' privacy has been compromised. Hackers love autonomous code because it's "sugar for them." Relay to an external oracle is required. In the event that a user's credentials are lost, there is no one to contact. Cryptocurrency volatility is a problem. Still in its early stages with well-mastered technology, the same outcomes were attained. Although, with the aid of a private and improved blockchain network, the bulk of drawbacks may now be overcome.

3. CONCLUSIONS

In today's time, the insurance claiming process is a very tiring & complicated process. Due to this there are many cases of insurance fraud as the whole process is done by the paperwork. Stockpiling of papers leads to many rejections of claims without transparency and loss of time.

Blockchain technology will provide a transparent, secure and faster system for insurance companies. Insurance based application requires a permissioned based private blockchain network where only two options Ethereum and Hyperledger Fabric are available, out of which Hyperledger Network has lower average latency time, lower average execution time, higher average throughput. Using Hyperledger fabric network we would be able to create a permissioned based private blockchain network as it enables the peers in the system to have specified accessibility in viewing and uploading data. Thus, we have opted for a permissioned based private blockchain network as insurance related work can be done more securely and efficiently using them. Existing models have given consideration to only customer and insurance company whereas other two factors (peers) that is police and repair shop plays an equally important role in the insurance issuing and claiming process. Thus, we would conclude that a four-

peer based model including customer, insurance company, police and repair shop could be developed for the insurance application.

In blockchain each transaction's log is stored in a block in encrypted form using a hash (SHA-256) algorithm and decryption of the data is impossible if an attacker tries to crack the system the only possible way is trial and error method which will take many years. It can also help to track loss or changes of data in case of any cyber-attacks. Smart contracts can be developed using Go, Java, Node.js and solidity but smart contracts created by Go language are more efficient and optimized.

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