

Smart Contracts for Insurance based on Hyperledger Fabric

Animesh Wakade, Ashish Jain, Samruddhi Bhosale, Nitin Kumar

Department of Computer Engineering, Sinhgad Institute of Technology and Science, Narhe, Pune, India
India

Abstract - In order to make the current insurance system more secure we propose a trustworthy policy between the customer and the insurer by using blockchain based smart contracts. This system approaches towards bringing transparency between both the peers so that the customer can easily claim his insurance and is also able to see his claim processing in the proposed system. Our system uses Hyperledger Fabric which is a framework to build blockchain network (distributed ledger) and deploy peers in it. We will be concentrating on the three main participants (peers) i.e. the Customer, the Insurer and the Auditor. The system will include a mobile application for ease of customer and web based console for the Insurer and the Auditor. This system will overcome the issues faced by the current Digital Insurance system.

Key Words: Blockchain, Smart Contracts, Insurance, Hyperledger, Peers, Ledger.

1. INTRODUCTION

A blockchain is a distributed ledger maintained by network nodes, recording transactions executed between nodes (i.e., messages sent from one node to another). Information inserted in the blockchain is public, and cannot be modified or erased. Smart contracts are self-executing contracts (generally saved on a blockchain) whose terms are directly written into lines of code. Blockchain [1] is a technology for a new generation of transactional applications that establishes trust, accountability and transparency while streamlining business processes. Think of it as an operating system for interactions. It has the potential to vastly reduce the cost and complexity of getting things done. It's essential for Blockchain technology to be developed following the open source model so a critical mass of organizations will coalesce around it—and reap its full benefits [2]. Because of the open source rules, participants can trust that the technology will fulfill their needs and conform to industry standards—assuring interoperability between Blockchain applications.

The insurance sector, as with many others, started to investigate the application of blockchain technology through considerable investments from both big and small companies, investigations from consultancy firms and the creation, in 2016, of the first blockchain-centered insurance consortium. The hype cycle for the insurance sector [19], however, depicts blockchain technology at the beginning of the curve connecting the technology trigger phase with the peak of inflated expectation, meaning that this technology

has not been fully explored yet in this particular sector. This paper addresses the performance and security concerns of insurance processes by designing a blockchain based solution. The main purpose of the blockchain-based solution for the insurance industry is — (1) to automate and speed up business processes in the insurance industry, from client registration and policy issuance to claims handling, (2) to make fraud-detection easier using decentralized digital repository, (3) to make client data confidential and accessible only to the authorized parties, (4) to reduce administrative and operational costs, and (5) to enable regulators and auditors to detect suspicious transaction patterns and market behaviors.

2. LITERATURE REVIEW

A. Blockchain and Smart Contracts for Insurance: Is the Technology Mature Enough?[1]

The hype cycle for the insurance sector [7], however, depicts blockchain technology at the beginning of the curve connecting the technology trigger phase with the peak of inflated expectation, meaning that this technology has not been fully explored yet in this particular sector. Hence, the questions that insurance companies are asking themselves right now are “Are there clear use cases exploiting blockchain technology and smart contracts in the insurance sector?”, “In case we want to adopt a blockchain, what is the most suitable blockchain architecture for our needs?” and, more in general, “Is blockchain technology mature enough for insurance?”. It has been estimated that they will need to wait about 3 to 5 years to see whether they made the right choice today by deciding to invest or not in blockchain for their business. The objective of this paper is to help companies operating in the insurance sector to answer the above questions by providing an overview of blockchain (and smart contracts) based use cases in such specific sector, and by highlighting strengths, weaknesses, opportunities and threats for this technology.

B. A Blockchain Framework for Insurance Processes[2]

Our contribution in this paper is the design of a blockchain framework for insurance use cases to offer fine-grained access control by specifying different set of endorsers for each smart contract. In reality, different insurance policies have different set of endorsers, which is mimicked by creating different smart contracts for different policies in our model. We used Hyperledger fabric to implement our insurance blockchain framework. Extensive experiments have been conducted by scaling up the network to test the

robustness of the system, and a detailed analysis of the latency has been carried out with a varying set of parameters. We also investigated the relationship between transaction latency and network size. The idea behind our model is to implement the processes of an insurance company as smart contracts, and place the contracts in a blockchain-enabled distributed platform, for both execution of the contracts and storage of the results.

C. *Data Exchange Platform to fight Insurance Fraud on Blockchain*[3]

The Blockchain makes the popular crypto currency, Bitcoin, possible, ensuring that 'coins' passed between parties are cash-like: unique, immutable and final. The way Bitcoin implements Blockchain makes Bitcoins an unregulated, censorship-resistant shadow currency. IBM has no interest, and does not support, unregulated currencies that operate outside regulated financial markets. The Blockchain is seen as a main technological innovation of Bitcoin, since it stands as proof of all the transactions on the network. A block is the 'current' part of a Blockchain, which records some or all the recent transactions, and once completed goes into the Blockchain as permanent database. Each time a block gets completed, a new block is generated. There is a countless number of such blocks in the Blockchain. To use conventional insurance as an analogy, Blockchain is like a full history of insurance transactions. Bitcoin transactions are entered chronologically in a Blockchain just the way insurance transactions are. Block, meanwhile, is like individuals.

D. *BlockCIS—A Blockchain-based Cyber Insurance System*[4]

In this short article, we introduce BlockCIS, a blockchain-based cyber insurance system that aims to provide solutions to these challenges. In a nutshell, our system considers four participant types: customers, insurers, third party services, and auditors. These entities will be connected via a permissioned blockchain. A permissioned blockchain is a secure private common ledger agreed on by the entities, and that securely enforces pre-specified access policies. A blockchain-based cyber insurance system has a natural incentive structure that can encourage entities seeking insurance to participate in the system: insurers can devise premiums tailored for a company's security posture, a company can prove that a potential cyber incident is covered by its cyber insurance and third party services can be paid when their data is used. Our system leverages the automated nature of smart contracts (on the insurer side), and is entirely decoupled from the payment aspect of the blockchain between customers and insurers (contrary to many related work). BlockCIS is a continuous monitoring and processing cyber insurance system. Finally, we show that there are several options to ensure confidentiality and privacy of the data being collected and stored within the system, and instantiate the BlockCIS design using the Hyperledger Composer framework. A recent study by Romanosky et al. Surveys the current state of the cyber insurance market, and its many shortcomings. This study

shows that the security posture of customers is difficult to properly assess. Existing assessment methods are static, i.e., customers have to fill security questionnaires furnished by insurers. Such questionnaires consist of a list of questions related to information technology, management, policy, and adopted compliance practices. In particular, Romanosky et al. identify the lack of attention insurers pay to the technical infrastructure and its correlation with the risks from the broader environment the customer operates on.

3. BLOCKCHAIN BASED INSURANCE SYSTEM

A. *Involved Entities*

1) *Customer*: This is the entity that requires cyber insurance, e.g. a corporation, a hospital, a university. This entity owns and operates a (possibly geographically distributed) computing and networking infrastructure; such infrastructure may also involve non-local outsourced elements in the cloud.

2) *Insurer*: This is the entity providing insurance for the customer. It is in their interest to accurately assess the likelihood of any incident, for each of entities it insures, to adjust the premiums and other fees.

3) *Third Party Services*: These are entities that provide very specialized services that may be hard for the customer and insurer to perform and are useful to assess the likelihood of an incident, or the damage resulting from it. One example of such a service could be one that is analyzing dark web forums and markets, and determine whether the network and systems of the customer are compromised.

4) *Auditor*: In case of a (legal) dispute between the insurer and customer, there may be a need for a third party to investigate and audit the data on the blockchain to settle such a dispute. It could also be possible that such an industry becomes highly regulated and that there will be a need for auditors to be always involved in such a distributed system, and only randomly (or periodically) perform audits to ensure that the insurers actions and rates are consistent with the logged data and events.

4. METHODOLOGY

A. *Framework for Insurance*

Our insurance framework consists of assets that enable the exchange of almost anything with monetary value over the network. The framework has smart contracts that govern the rules for transactions. A block is created in the insurance blockchain network when the peer nodes run consensus over a set of transaction results (key-value pairs). Each smart contract contains an endorsement (or verification) logic, which specifies under what conditions a transaction can be executed by the smart contract. The endorsement

logic is executed by a set of endorsers (may be particular to a smart contract SC) who access the blockchain to determine whether contract conditions are satisfied.

B. Block Diagram

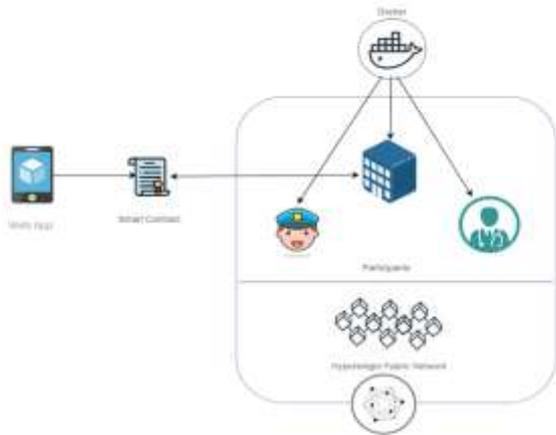


Fig. 1. Block Diagram of Proposed System

C. Model for Insurance

We consider a simple scenario where the main processes (transactions) are standard insurance operations like - client registration, policy assignment, paying premium, claim sub-mission, processing refunds etc. The blockchain maintains execution and results of each transaction and ensures that the clients do not falsely accuse the insurance company, and that the insurance company is accountable for all services that it provides.

REFERENCES

- [1] Dvalemtnina Gatteschi , Favrizio Lamberti Claudio Demartini Chiara Pranteda Victor Santamaria-Blockchain and Smart Contracts for Insurance: Is the Technology Mature Enough?
- [2] Mayank Raikwar , Subhra Mazumdar , Sushmita Ruj , Sourav Sen Gupta , Anupam Chattopadhyay , and Kwok-Yan Lam-A Blockchain Framework for Insurance Processes..
- [3] Indranil Nath -Data Exchange Platform to fight Insurance Fraud on Blockchain.
- [4] Gabriela Ciocarlie, Karim Eldefrawy, and Tancrede Lepoint -BlockCIS—A Blockchain-based Cyber Insurance System.
- [5] R. Böhme and G. Schwartz -Modeling cyberinsurance: Towards a unifying framework in WEIS, 2010.
- [6] Blockchain in Insurance – opporutnity or threat? McKinsey & Company, July 2016.
- [7] C. D. Clack, V. A. Bakshi, and L. Braine-Smart contract templates: essential requirements and design options