Chapter 99

A Study of Use Cases for Smart Contracts Using Blockchain Technology

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ABSTRACT

Blockchain technology is an emerging and rapidly growing technology in the current world scenario. It is a collection of records connected through cryptography. They play a vital role in smart contracts. Smart contracts are present in blockchains which are self-controlled and trustable. It can be integrated across various domains like healthcare, finance, self-sovereign identity, governance, logistics management and home care, etc. The purpose of this article is to analyze the various use cases of smart contracts in different domains and come up with a model which may be used in the future. Subsequently, a detailed description of a smart contract and blockchain is provided. Next, different case-studies related to five different domains is discussed with the help of use case diagrams. Finally, a solution for natural disaster management has been proposed by integrating smart contract, digital identity, policies and blockchain technologies, which can be used effectively for providing relief to victims during times of natural disaster.

1. INTRODUCTION

A blockchain can be defined as a distributed database which may contain records of transactions done digitally or public ledger that have been executed and shared among the interested or participating parties. In simple words, a blockchain is a chain of blocks that contain information which is completely open to anyone. The information once entered in a block chain cannot be changed or erased easily. This

technology has worked efficiently over the years and is successfully being applied to trade, finance and security applications throughout the world. It has the potential to bring a storm of revolution in the digital world in which all the transactions both past and present can be verified.

A smart contract (Szabo, 1996) can be defined as "a set of promises, specified in digital form, including protocols within which the parties perform on these promises." In other words, it is software that stores rules for negotiating the terms of a contract, is responsible for verifying the contract and executing the required agreed terms.

This article is divided into multiple sections and further into subsections for better readability and understanding. In section 1, the authors introduce the concepts of blockchain and smart contracts, elaborate about their need and working principle. Further, this section also lists out the strengths and weaknesses of smart contracts, the current challenges being faced and applications of such technology. Thereafter in section 2, a thorough examination of the literature materials is done which were referred to in this paper. Section 3 contains the various case studies related to different domains like Healthcare, Finance, Self-Sovereign Identity, Governance and Logistics Management. Furthermore, in Section 4, the authors propose a representation of a model which could be used in future work. Finally, in section 5, the paper is concluded based upon some ideas by the authors and section 6 contains the references.

1.1. Relation Between Blockchain And Smart Contract

Blockchains helps in the creation of smart contracts, with terms and conditions, subsequently specified and discussed by the parties involved in the contract. Blockchain combined with smart contracts removes the dependency on central systems for transactions. A distributed system running on multiple servers work continuously to maintain the integrity and security of each transaction that happens between the involved parties. If any party tries to change a contract or a transaction on the blockchain, all other parties will be able to detect it and in turn they can use any preventive measure.

1.2. Need Of Smart Contract

Systems today work in a centralized manner where the entire responsibility is on a single big system. All the exchange of data or transactions between parties takes place through this centralized system. If the system fails, there can be a huge loss of data which can lead to huge financial losses. Smart contracts help in reducing the dependency on a single system. It makes the communication between parties simple and efficient by providing a copy of rules and agreements to the respective parties. It also prevents data loss. As the smart contracts are coupled with blockchains, data manipulation is also a tough task.

A party can modify rules and agreements if all the other parties are willing to opt for the change. A smart contract functions electronically and consists of code, rules and agreements required by the parties.

1.3. How Smart Contract Work?

Smart contracts work with the help of blockchain technology which provides Public Key Encryption Infrastructure (PKI) which provides security and credibility to the smart contract. PKI provides two encryption keys (Swan, 2015):

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