An advanced approach for Smart Parking Solution Based on Ethereum Block chain System

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Abstract: **In the past few years, the use of the internet and mobile applications has rapidly increased. People use them for all of their needs, from online shopping to online bank transactions. With such enormous use, there comes a high risk of this data getting hacked and/or misused. Such attacks are quite common with applications that use a centralized server. Such shortcomings of centralized servers can be overcome by using decentralized networks like the block chain. Through this paper, I propose a solution that would help solve the problem of finding a parking lot for your vehicles. This solution has been created with the use of the Ethereum block chain (a distributed computing platform that is based on blockchain), and with the use of smart contracts. [1]This application is designed to provide an efficient way to further utilize the private parking spaces available in urban cities. It provides both the owners of parking lots and those who are in search of parking lots (in urban areas), a platform where they can exchange these resources. In the application, sellers lease out their parking lots while buyers book the parking lots.**

Keywords: Ethereum,Block chain, Bit coin, Smart contracts, Crypto Currency,Parker

I. INTRODUCTION

A blockchain can be said to be a public ledger that stores all the bit coin transactions ever taken place in time. It is a series of time-stamped, unchangeable data records which is managed by a cluster of computers and not owned by a single body. Each one of these data blocks is securely connected to every other block of the network using various cryptographic principles. There is not one single central authority in a blockchain network —which complies with the very definition of a decentralized system. Since the blockchain network is a shared and unchangeable ledger, the information which is present in this network is open for everyone to view. Therefore, everything built on the blockchain network is transparent

and everyone involved in it is accountable for the actions they perform.

[1]Ethereum can be termed as a distributed computing platform which is also an operating system featuring the smart contract functionality. It is based on blockchain technology and is an open-source tool. Ethereal can be used to perform [2] various activities which involve money. This is achieved with the use of smart contracts, which can be written anywhere in the world and can be accessed to build applications, from any other part of the world. The crypto currency which is associated with the Ethereum blockchain has been termed as "Ether".
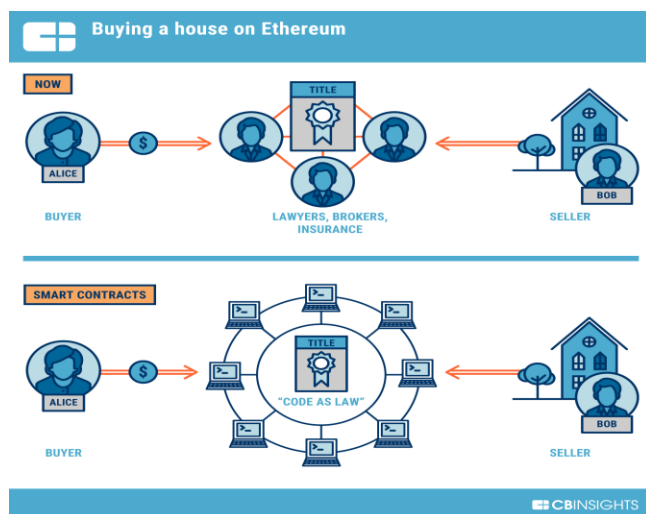

Fig 1 Depiction of transaction using smart contract

[3]Smart contracts can be defined as applications deployed onto the blockchain registry and are executed instinctively [3]as a part of the transaction validation. The migrate command is used to get the smart contract deployed in Ethereum, which would introduce the smart contract onto the blockchain network. During this procedure, a unique address is assigned to the contract,

which is in the form of a 160-bit identifier, following the code is then uploaded to the blockchain. Once the smart contract is successfully created, it consists of a contract address, a contract balance, predefined executable code, and a state.Fig.1 shows the Depiction of transaction using smart card.Fig.2 shows how smart card works.
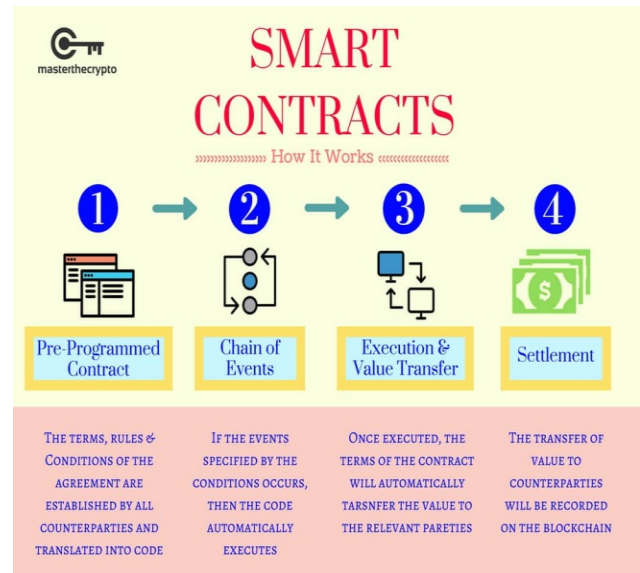

Fig 2 how a smart contract works

II. LITERATURE SURVEY

A centralized system can be defined as a system where one single controller has the central authority to control the other components involved in the system. This power can be [5] exercised either directly or indirectly by the use of hierarchy. As a result of this central controller's [6] authority over the other components in the system, this showcases a relatively complex behaviour.[7]A decentralized system, on the other hand, can be defined as a system where each component involved is equally responsible for contributing to the

overall behaviour of the system.[8] It does so by working on the local information available to it and not by following any central authority's commands. This possible could be the reason behind why a decentralized system is considered to be complex. Fig.3 shows centralized distribution.

The components present in the lower levels use various mechanisms based on the interaction between each component present in the system in order to be aware of the responses.
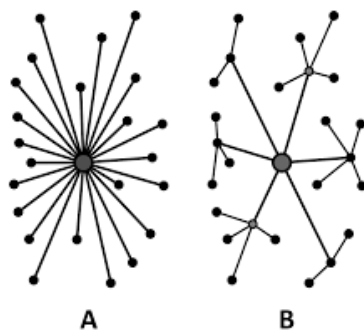

Fig 3 Centralised (A) vs Decentralised

[9]Block chains allow the interaction of the blocks involved in a distributed network, without having the need for any trusted central authority. To accomplish this, we can consider the blockchain network a set of interconnected nodes which provide certain features to the infrastructure, as demonstrated in Fig. 4.

These transactions indicate an agreement between two or more participants, which might include either the transfer of physical/digital assets, the completion of a task, etc. This transaction [10] is signed by at least one participant, and is then distributed to its neighbours'. Generally, any entity which is connected to the blockchain network is termed a node. However, nodes that verify all the blockchain rules are termed full nodes. These nodes are responsible to determine the validity of

the transactions and group them into blocks in order to decide which are to be kept.

There are various ways in which Ethereum is being used in the real world. As [11] mentioned by Arne Meeuw in his paper, Dapps can revolutionize the business of sharing resources (similar in behaviour to Uber and Airbnb).
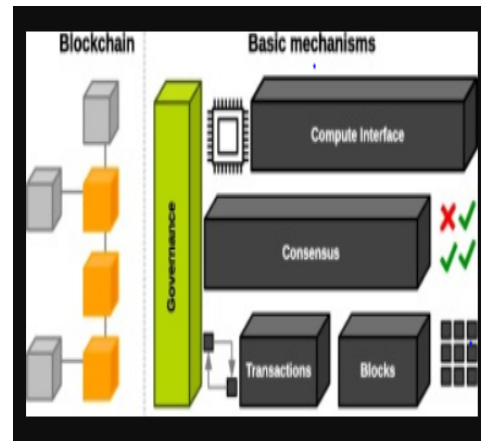

Fig 4 Block chain architecture overview.

Authors like [12] Gunther Lenz have also researched how feasible it is to use the technology of blockchain and Ethereum in the healthcare system. These metrics would help in the evaluation of the capability and the compliance of this technology in the vast domain of healthcare.

[12] Thilo Sauter and others in their work have mentioned in detail how bitcoin and the technology beneath it (the blockchain technology) could have their uses in microgrid trading activities. They also highlighted a PV generation in their work.

There have also been numerous researches and research papers on the pros and cons of blockchain technology; its applications and of its durability. A few of them also talk about the challenges faced in the usage and sustenance of this booming technology.

III. METHODOLOGIES:

The problem most people face today is the inability to find a parking lot for their vehicles. There are several applications in the market, out there, which can help solve this problem.

A few of the available services are:

- Parker

- SpotHero

- ParkMe

- Parking Mate

But most of these applications are built upon centralized servers, which come with their own share of disadvantages:

- The entire system will fail if a node loses connectivity, as there is only one central server.

- There would be an abrupt failure of the entire system.

- There is very little chance of data backup, and if the system fails the data will be lost forever.

- Since the entire application is backed up by only a single server, the risk of various security attacks is quite high.

These issues can be resolved with the use of decentralized servers to build applications.

The proposed solution provides a platform to potential "Sellers" and "Buyers" who are willing to share their resources. This platform will be useful to the people who are void of parking spaces in urban cities as they would get to utilize the vacant parking areas in private properties. The project proposed by me acts as a medium between the 2 parties (the Buyer: the ones who need a parking space and, seller: the ones who have an empty area available).

Here is used Ganache to launch 10 dummy Ethereum accounts that would be used for the transactions. This behaved like a proxy [13] Ethereum blockchain network

for my proposed work. With the use of Truffle, this compiled the smart [14]contract and migrated it to the Ethereum network, where all the participating blocks could view it (hypothetically). Once the smart contract was deployed [15][16]onto the network, Here it is made use of the truffle console to interact with the smart contract and to make transactions.

Using the application, the user (if a Seller) can put up their parking lots for lease for any amount of time and can specify the[14] lease amount for that amount of time. When another user (say a Buyer) opens the application he/she can see the parking lots available near their area and can lease the space for the duration specified by the Seller. Once the Buyer has used the parking he/she would have initiated the payment to the Seller (owner of the parking lot).Fig.5 show the process flow of back end execution.
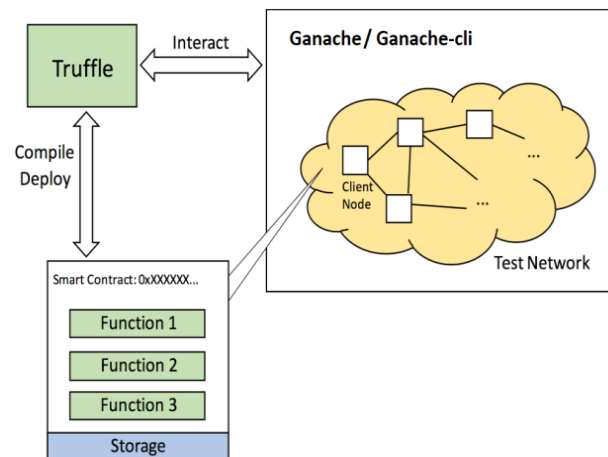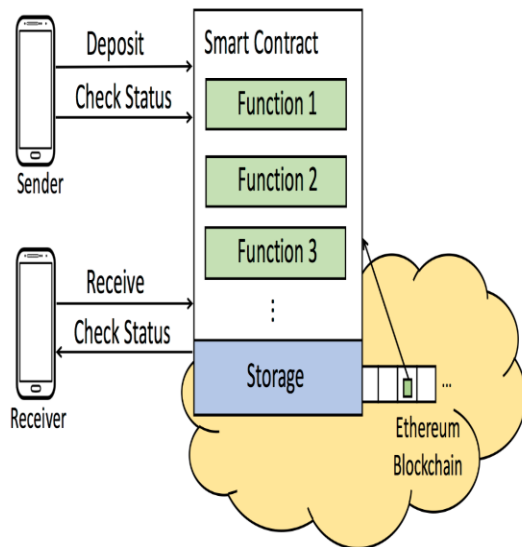

Fig 5 Flow of backend execution

Fig 6 Application communicating with the backend

Fig 6, depicts how the application communicates with the smart contract and thereby with the Ethereum blockchain. Once an operation is performed on the application, the smart contract validates if it satisfies the condition specified in it. If the condition is met, the smart contract executes and performs the mentioned operation (either a transaction or data fetching).

Procedure for proposed system

The result of my proposed work was the usage of the decentralised blockchain network to store and execute the smart contract, which would thereby carry out transactions between the buyer and the seller of parking lots.

Algorithm:

Step 1: Deploy the Smart Contract onto the block chain network.

Step 2: Fetch the contract address

Step 3: View the Ethereum accounts (on the Ganache-cli interface) for the initial amount in each account

Step 4: Enter the details of the new parking information

Step 5: Enter new seller data

Step 6: Enter new buyer data

Step 7: Perform a transaction from the buyer's account to the seller's account.

IV. RESULTS AND DISCUSSIONS:

Fig 7 shows the best obtained results for the way how block chain technology works in suitable way to process the bit coins.

Fig 7 Deploy Smart Contract

Fig 8 Contract address

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Fig 8 shows how contract addresses works and this process is very helpful in obtaining the secure transactions.

V. CONCLUSION:

This paper proposes a solution to the problem of finding parking lots in urban cities, using the Ethereum blockchain technology. It also shows in which ways the decentralized network is better when compared to the centralized servers which are widely being used these days. The decentralized networks provide protection against most of the security attacks by their usage of cryptographic algorithms and proof-of-work mechanisms. the network may be prone to any kind of attack only because of the loopholes in the smart contract and/or by knowingly/unknowingly leaking the private keys. Therefore, it is concluded that the proposed solution in this paper is based on a decentralized network and is, therefore, better compared to its counterparts which are built on centralized servers.

VI. LIMITATIONS AND FUTUREWORK

This work is having its own limitations. This work is limited to up to 50 parting lots. When more parking lots are there then there is a change in accuracy levels. In future work, working on the algorithms which can overcome the mentioned limitation.

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