

A Blockchain System to Rent Cars Using Smart Contracts

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ABSTRACT: Through the provision of shared vehicles to users and the reduction of the use of private automobiles, car-sharing programs can address a number of urban challenges. People may now drive a shared car with ease by making quick mobile device gestures thanks to the advent of the Blockchain.

The car issue, though. Blockchain technology was used in this paper to create a decentralized car-sharing system. The decentralization car-sharing service and data integrity were specifically provided by blockchain technology. It is possible to anonymously authenticate the participating entities of the proposed system. By utilizing informal mutual authentication, the suggested car-sharing system can be protected against a variety of assaults. Through the provision of shared vehicles to users and the reduction of the use of private automobiles, car-sharing programs can address a number of urban challenges.

KEYWORDS: Blockchain, Smart contracts, Security, Ethereum, Decentralized.

I. INTRODUCTION

In order to address urban transportation problems including congested roads, air pollution from burning gasoline, and a lack of parking places brought on by an increase in the number of automobiles, vehicle-sharing schemes are being put into place. The benefits of driving a private car less often without the costs and responsibilities associated with ownership are provided through vehicle-sharing systems. A home or business can use a fleet of shared vehicles instead of purchasing one or more automobiles as needed.

PROBLEM DEFINITION

By offering shared vehicles to individuals and limiting the use of personal automobiles, vehicle-sharing schemes can help with several urban challenges. To manage the data

about tenants and owners, we are establishing a decentralized network. We allocate the cars to the tenants using smart contracts, and because these contracts are immutable, the data we give to the tenants is secure and cannot be altered by either the owners or the tenants, maintaining data integrity.

EXISTING SYSTEM

The present system is a collection of decentralized apps created on the blockchain. For deploying, administering, and monitoring their decentralized applications, most software developers lack a practical plan. This means that the application's dependability and security cannot be guaranteed. The most significant nuance in this is how difficult blockchain technology is, though there are other subtleties as well. Software developers seldom consider the influence of the blockchain infrastructure after deployment when structuring business code, which leads to inefficient decentralized systems. Additionally, several applications do not use blockchain, so there is no safety for vehicles. Even when they are not being charged what they should be, pricing changes may still be made depending on the mediator's power.

II. PROPOSED SYSTEM

The five organizations that make up the proposed authentication technique for a car-sharing system are the trust authority, stations, owners, vehicles, and users. The authentication scheme was developed using the blockchain. The system is set up by a trust authority, which also issues the credential and pseudo-identity to the user and the owner of the vehicle as trust entities. Stations store data, do computations, and manage the federated blockchain. Through the station, the user communicates the vehicle-sharing request to the owner.

User and owner send the real identities and licenses to TA to obtain the pseudo-identity and the credentials for registering a car-sharing system.

- The user and owner register their pseudo identities, public keys, and information of shared car at the station to access the car-sharing service.
- The user sends the station a request for access to a shared car using a mobile device. The station authenticates the user and notifies the request to the owner. The owner issues a code to access a shared car and sends the code to the user and car through the station.
- The user utilizes the mobile device that stores the code to access the shared car and starts the sharing service.

REQUIREMENTS SPECIFICATIONS

A. Software Requirements:

- 1) Ethereum Platform
- 2) OS-windows 7 or newer
- 3) Solidity compiler
- 4) Visual Studio 2017 or any other IDE
- 5) MetaMask wallet extension
- 6) Node package Manager(npm)
- 7) CSS(Cascading Style Sheets)
- 8) React js
- 9) Html
- 10) Hardhat local server
- 11) Localhost connection 3000
- 12) Speddy node rpc endpoint url
- 13) Metamask Account private keys

B. Hardware Requirements:

- 1) Ram 4gb Minimum
- 2) Hard disk space 8gb
- 3) Car or any vehicle
- 4) Laptop or mobile

III. DESIGN AND METHODOLOGY

A. General Architecture :

Design Architecture A Blockchain System To Rent Cars Using Smart Contracts consists of five modules which are needed for the transaction those are Trust Authority, Stations, Blockchain, User , Owner , Vehicles.

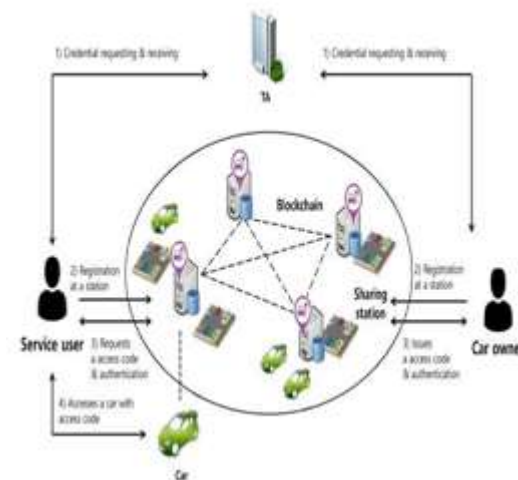


Figure 1: Flow Diagram representing the Tenant to access a Car

1.Trust authority: A trust authority is responsible for setting up the system, generating the keys for the stations, and issuing credentials and pseudo-identity to the user and vehicle owner. It is assumed that the trusted authority is not captured easily and is completely trustworthy. The credential proves who has a right and ability to drive, and the pseudo-identity is used in the car-sharing system to replace the real identity.

2.Stations: The station provides the car-sharing service place and platform for users and vehicle owners as an arbitrager. The station receives the user and owner’s credentials for registration in the car-sharing system.

3.Blockchain. It provides the car-sharing service by transmitting the information received from the vehicle owner.

4.User: The user can use the car-sharing service through a mobile device, such as a smartphone. The user sends the request and authentication messages to the station to prove that the user is an authorized driver.

5.Owner: The owner translates their vehicle to the shared vehicle by registering the information of the vehicle at the station. Once the station sends the user’s request for sharing the vehicle, the owner generates the access code and transmits it to the station to distribute the access code to the user and vehicle.

6.Vehicles: Vehicles are parked at the station and are ready for sharing by authorized users. There are communication modules and tamper-proofing modules in vehicles. The Vehicle receives the access code through the communication modules which it uses to check Authentication of the user weather the user is authorized. All the parameters used in vehicle are stored in tamper-proof module or block for security purpose.

B. Structure of Accessing Vehicle

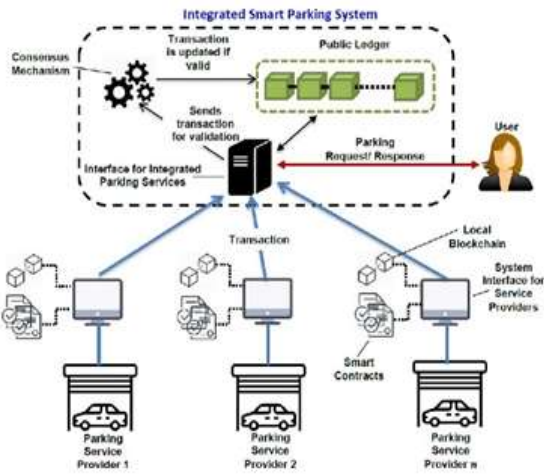


Figure 2: Working of the Rental Structure

Blockchain is a linked list kind of data structure, where each block has a unique hash, data, timestamp, previous hash, nonce, and difficulty. Genesis Block is the first Block in the Blockchain; it does not have any previous hash. The genesis block is stored with default identification values. Blocks consist of 4 important data values.

- Timestamp – Record the time when the block was created.
- Previous Hash – It refers to the hash of the block that came before it.
- Individual Hash – Hash (SHA-256) is a unique value for a block that is generated based on all of its unique data fields.
- Data – Any type like string, numbers, array, or JSON object can be stored here.

IV. RESULTS

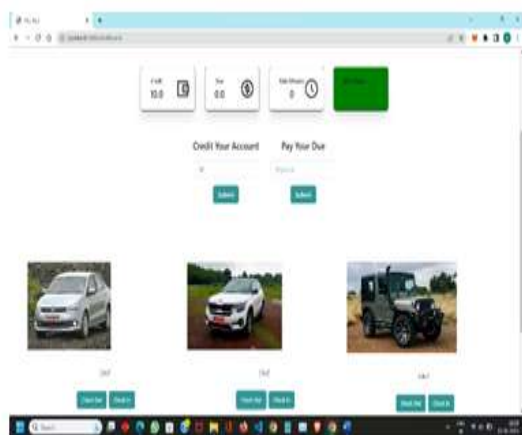


Figure 3: Crediting the Account using Metamask

Figure3 depicts the credit into the user dashboard through the metamask wallet when amount is entered clicked on submit button.



Figure 4: Vehicle Checked-out

When check out is confirmed on the wallet, status is turned into Green from Red indicating that you have accessed the vehicle.



Figure 5: Rental Payment

Rental Fare due is entered and clicked on submit, wallet confirmation is done and transaction is successfully completed.

Figure 6: Crypto debited from wallet

Due is deducted from the credit after conformation on due-payment and Time and due are set to Initial values.

V. CONCLUSION

In our car-sharing system, a new car slot virtually is created and made available for rental by generating an unlock token for the user. Each transaction on the blockchain network requires a user payment, which can be considered as their initial investment in listing the car for rental. Regarding vehicle registry operations, we introduced various functionalities such as initial vehicle registration and change of ownership transactions. These operations minimize the need for registry employees to manually intervene in the transaction flow. We conducted performance tests on a basic configuration of the unique id and analyzed the data collected from these tests. We evaluated the system's throughput and latency by

varying the block size. Although our Car registration system primarily focuses on car registry data, it can serve as a basis for connecting the car registry systems of member states into a distributed system using blockchain technology. Additionally, blockchain technology can be applied to other government registry domains, including civil registry, land registry, and business registry, to enhance efficiency and transparency.

FUTURE SCOPE

While our current work only accepts Ethereum for transactions, we are open to accepting multiple cryptocurrencies in the future. This will allow users to take advantage of new cryptocurrency developments for their transactions. Overall, our decentralized car-sharing system based on blockchain technology provides a secure, user-friendly, and efficient alternative to centralized car-sharing services, with the potential for further advancements and expansion in the future.

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