



Survey on Peer to Peer Decentralize Ridesharing using Blockchain Technology

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Abstract: Ride sharing services conveniently allows the drivers to share short to long distances trips with other riders, contributing to the benefits of travel cost, reducing traffic congestion and climate change mitigations. The existing ridesharing services depends on the centralized trust based system for the regulation of the ride set up, fare calculation, tracking, cancellation etc. These central third party authorities control and maintain data about the users, raising the issue about the data reliability and service policies. In case, this centralized based system make them subject to single point of failure and privacy disclosure concerns. Besides they demand high fees for providing the services. Blockchain based ridesharing gives us a chance to shift from the traditional centralized platforms to the decentralized ones. This work explores smart contracts to build and deploy the functionalities such as create ride, deposit transfer, cancel and complete ride method for our decentralized ride sharing application. The work also studies on how to automate the ridesharing service by using the blockchain and smart contract to harvest the benefits of decentralized collaboration and blockchain perspectives.

Index Terms - Blockchain, Decentralize Application, Smart Contracts, Ridesharing, Innovation.

I. INTRODUCTION

The world is currently experiencing a rapid change in data driven. Digital transformation encompasses all social programs; government, asset management, energy, health, traffic, and marketing where the data is placed at the highest level, most efficient, and transparent and accountable. It is important to build infrastructure that keeps data systems healthy, efficient, and secure to ensure that our highly connected world is not stored in unsafe repositories. Blockchain is one promising solution that provides robust architecture and distributed environment to accommodate the needs of dynamic network-driven networks, self-regulating and sharing supportive systems.

Transportation is the significant part of the world. Lately the ride sharing applications allows consumers to book a private or shared ride with a few taps of a mobile application. Contrast to the traditional cab these methods have become more convenient when it comes to automatic payment from the user account. Pricing and service rules are fixed with the aid of the centralized authority and is tied to the events. However there exist some issues with such management structure. System seems to be less obvious, rigid and extraordinarily centralized that owns all of the management and can dictate policies and provider conditions. There exist disputes in these ridesharing services, and the lack of suitable rules, regulations, and flexible management structure is a barrier to pushing such ridesharing activities further into the sharing economy.

Blockchain technology started with crypto currencies like bitcoin but has since grown beyond the financial worlds and has expanded into other industries and areas, including content distribution. With the destruction of new businesses and technological applications, these industries now represent the provision of people in many areas that will soon affect the world. Blockchain helps to spread the cost of using the platform to its various participants.

In the ride sharing platform blockchain is gaining traction by allowing people to communicate directly with willing drivers transport. A ride based on blockchain on commendable platforms can alleviate the issues of flexibility, data integrity and stability by helping co-management between passengers and drivers. Instead of agreeing on a single trustworthy authority, participants can participate and share transaction details on a large network of nodes. This removes the mediators who perform any gate maintenance role. The transaction details are stored in a distributed ledger accessible to all blockchain network nodes which makes it clearer and safer.

II. RELATED WORKS

Several ride sharing/hailing applications have arisen so far to bring changes into the operation of online car-hailing systems with innovative ideas.

In real time sharing a ride is intended to expand platform fee without compromising on quality. Their results show efficiency and effectiveness outline. This work has received a lot of attention. A work named PEBERS demonstrate how consortium blockchain based system can developed to keep track of ride data. The PEBERS model uses fog computing nodes as authorized places. Fog nodes are units on the side of four roads storage, computer and communication skills [1].

Another work, called GreenRide illustrates integration of the blockchain into rideshare application to incentivize users to share their rides with colleagues and hence decrease carbon emission. The architecture of GreenRide utilizes the decentralization and distribution nature of blockchain to create the GRT to reward users for their carbon emission reduction. The GRT is GreenRide token that is compliant with the ERC-20 standards. It has endless deliver of tokens and provider issuer can mint as a good deal as possible of tokens as in keeping with the token is mapped to kilograms of CO₂ decreased in keeping with each experience. The entire GRT circulation is then maintained on the private blockchain network. The following table gives us the estimation of annual CO₂ and money saved through GreenRide [2].

Table -1: Estimated Annual CO and Money Saved Via GreenRide [2]

Number of Rideshared Vehicles	Annual Commuted Distance (Million Km)	Number of Commuters/Vehicle	Annual Saved Co2 (Million kg)	Annual money saved (million \$)
100000	780	2	195	85.8
100000	780	3	390	171.6
100000	780	4	585	257.4

A scheme named Ridecoin is blockchain based peer-to-peer transportation marketplace that supports network growth through cryptocurrency rewards. Ridecoin combines principles from the rideshare enterprise with the technological advantages of a blockchain. It is one of the first crypto currencies to seek registration with the SEC to provide a new level of security to cryptocurrency investment through a dual token design. The major difference between the traditional ridesharing offerings and Ridecoin is that passengers are able to negotiate directly and set their own prices. Ridecoin also offers numerous advantages to drivers, passengers compared to conventional ridesharing networks [3].

A project named cryptotransport demonstrates how by using blockchain, cryptocurrency, and smart contracts a decentralized ride-hailing service that preserves location privacy and pseudonymity could be trusted. Key features of cryptotransport are preserving the location privacy, anonymity and trust. In layman terms it permits passengers to anonymously order an experience from an anonymous driver in which the starting place and vacation spot of the ride are revealed best to the motive such that the payment is according to the provided service, i.e., preventing the fraudulent behavior of either drivers or passengers. Furthermore, by using blockchain generation, cryptotransport fits riders with automobiles in a decentralized fashion, without counting on any corporation or company to control the machine [4].

B-Ride, a ridesharing service model proposes a way to avoid the malicious customers to take advantage of the anonymity furnished through the public blockchain to publish more than one trip requests or offers, while now not committing to any of them, so that it will discover the better offer and thereby make the system unreliable. Second paper contributes and proposes a permission blockchain and zero-knowledge proof for safe and digital identity verification in current systems [5-6].

BlockV is a platform which maintains the transparency in the journey and the overall system is reliable and solid recognizing to the growing quantity of the participants and their frequency of rides. This is likewise because the transactions prices are little. Also, the in-build recognition device is secured in blockchain. Moreover, the platform allows the users to behave as a rider as well as driver based totally on his private requirements with none switching account. This makes the system person pleasant [7].

Another technique name hyperledger proposes a framework for developing a decentralized experience-hailing structure carried out at the Hyperledger Fabric blockchain platform. A consortium blockchain technology also known as the Hyperledger Fabric, in which nodes must be certified before they can participate in the network. However one entity doesn't necessarily own all the nodes. Hyper ledger Fabric helps smart contracts (term "chaincode") that may be written in any programming language which define all allowable interactions within the network. Each chaincode characteristic has get right of entry to control functionality such that best sure users/friends can invoke it [8].

Another work endorses a Block chain-based totally structured system to defend the privacy of users and to increase the security of the vehicular surroundings. Wireless far off software updates and different rising services including dynamic automobile coverage expenses are used to demonstrate the efficacy of the proposed security architecture [9].

The most important intention of scheme named SmaRi is to explore a promising generation carried out to the sharing economy to draw blueprints of smart towns. It presents an innovative method of carrying out the transactions of sharing resources. Another

article presents a preliminary survey on the emerging blockchain technology and its possible applications in transportation industry [10-11].

III. SYSTEM ARCHITECTURE OVERVIEW

The following diagram gives us the overview of the architecture of the ridesharing service using blockchain technology.

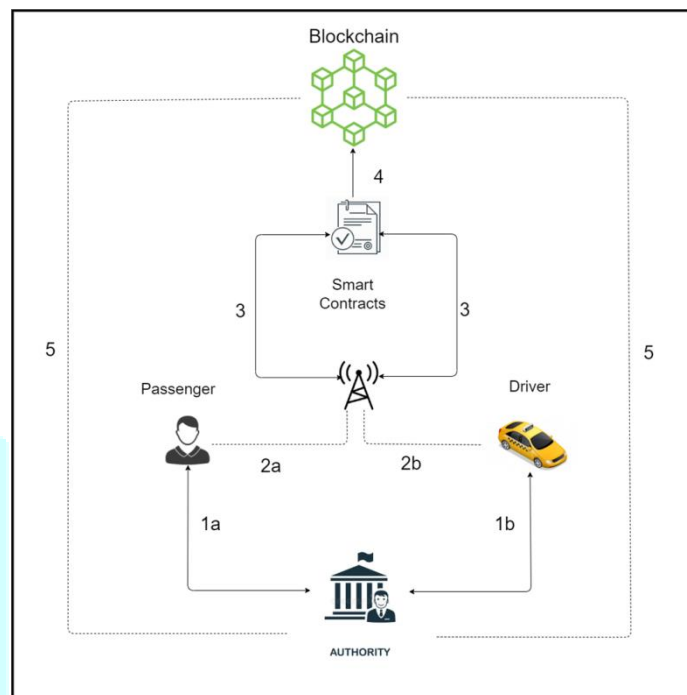


Fig -1: SYSTEM ARCHITECTURE

- 1) *Registration Phase:* Registration takes place on the machine user's layer which encompasses all of the extraordinary entities of the trip hailing software, consisting of drivers and passengers. Firstly, customers sign-as much as the software. This phase is performed simplest once inside the manner. During this step, customers can pick out both driving force and passenger as their account category.
- 2) *Authentication and Send Request Phase:* This phase is to authenticate the registered customers. When a person first accesses the utility, our Authentication smart settlement tests if the user deals with are legitimate. After a hit authentication, users can begin using the service and send requests as per their needs.
- 3) *Match Found and Smart Contract Execution Phase:* When a request is received from the passenger, the system tries to perform one too many matching based on the current location of the passenger and returns the list of potential available driver details. Once the passenger selects the potential driver the smart contract execution process is started between the two individuals.
- 4) *Add Contract Phase:* Once the contract is made between the rider and passenger, it is then added to the transactions pool from where it will be converted to a node entity and eventually will be added on the blockchain network.
- 5) *Trusted Authority:* Trusted Authority is responsible for the generation of the cryptographic keys for passengers and drivers. During registration phase, the user identity is verified by the trusted authority. The trusted authority has access to the blockchain network.

Following paragraph gives us the information about the background of the blockchain technology components which are mainly used in building the decentralize applications.

A. Solidity and Smart Contracts

Solidity is an object-oriented, high-level language for imposing smart contracts. A contract in the sense of Solidity is a collection of functions and state that resides at a specific address on the Ethereum blockchain. You can consider it as a slot in a database that can be queried and changed by using calling capabilities of the code that manages the database. Solidity become inspired via C++, Python and JavaScript and is specifically designed to target the Ethereum Virtual Machine (EVM) [12].

B. The Ethereum Blockchain

The Ethereum blockchain is a consortium blockchain that enables people to develop and deploy their own decentralized applications. It also offers a programming language called solidity which enables anybody to develop smart contracts and decentralized applications. Users can create an Ethereum account which is assigned with a deal with. Every computational step of transaction made has a related Gas fee [13].

C. Cryptocurrency

Cryptocurrency is a term given to the virtual form of cash. It is a decentralized economic digital asset which makes use of cryptography to ensure comfy change or transactions. The Ethereum blockchain has its very own cryptocurrency called Ether. When users create an Ethereum accounts they pack up ethers to carry out different transactions.

IV. PROPOSED SOLUTION

The majority of current ride-sharing services rely upon an important third party to prepare the provider, which lead them to concern to a single point of failure and privacy disclosure worries by each internal and external attackers. Moreover, they may be vulnerable to distributed denial of carrier (DDoS) assaults launched via malicious customers and external attackers. Besides, high carrier charges are paid to the trip-sharing service issuer. These problems can be eliminated by completely shifting to the decentralize systems working on blockchain technology. These decentralize platforms enables the users to not rely on the trusted third party systems and hence ensuring the fair payment, privacy and trust benefits during the sharing economy.

V. CONCLUSIONS

The major goal of this article is to reviews different scheme which uses blockchain technology for ride hailing services combined with the smart contracts. It also provides studies on how it impacts on the environment and promotes carbon emission reduction, and enhances air quality. This technique also presents an innovative way of handling transactions of resource sharing services and economy. These exercises can provide interoperability and automatic execution strategies.

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