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1. ABSTRACT

Ridesharing is a solution for drivers to share journeys with other riders, which not only saves money on transportation but also reduces traffic congestion. Existing ridesharing solutions are dependent on third parties, making them vulnerable to single point of failure and denial of service assaults. It also presents issues of privacy. The proposed solution is to use blockchain technology. This document intends to connect the smart city idea by presenting the smart transportation system and investigating the possibilities of using blockchain technology into ride-sharing services. A distributed, decentralised ledger using blockchain technology enables safe peer-to-peer transactions without the presence of a third party.

2. REQUIEREMENTS

Blockchain is a distributed ledger system that evolved from Bitcoin, a cryptocurrency created in 2008 by Satoshi Nakamoto. Blockchain's overwhelming success may be attributed to its distinguishing qualities such as distributed, decentralised, immutable, secure, and shareable. Every transaction is recorded on the blockchain, and anyone on the network may view and verify the transactions. Blockchain removes the need for middlemen since it operates on a peer-to-peer (P2P) system.

A. Ethereum Smart Contract

Vitalik Buterin introduced Ethereum, a public and permissionless blockchain. Ethereum is developed with the Turing complete programming language, which solves some of Bitcoin's

scripting language limitations. Transactions on Ethereum are done by Smart Contracts. When specific criteria are satisfied, smart contracts execute a set of specified rules. Ethereum transactions are cryptographically signed instructions. These transactions are charged a fee in Ether. A smart contract based on the Ethereum blockchain is a cryptographic bundle that takes and processes inputs, writes outputs, and stores information.

B. Decentralized Applications (DApp)

A DApp is a decentralised application that runs on a peer-to-peer blockchain network. Ethereum hosted DApps across a variety of fields, including insurance, energy, finance, health, and many more. However, many DApps are only partially decentralised.

The DApp design is two-tiered, with one tier being the front-end client-side application and the other being the back-end server-side tier where the smart contract is implemented in the blockchain network.

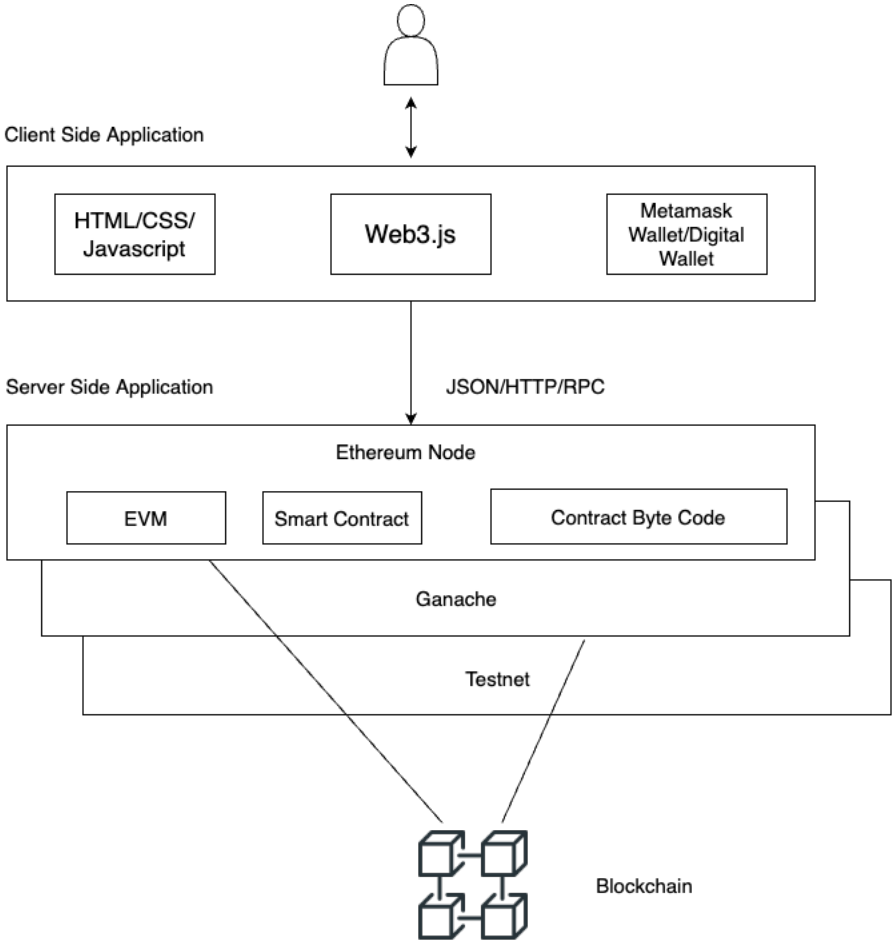

Figure 1DApp Architecture

C. Web3.js

Web3.js The client-side application functions similarly to any other web application created using HTML, CSS, and Javascript. Web3.js is a collection of libraries that allows the Dapp browser to communicate with the blockchain. It also helps in reading and writing data from smart contracts, transacting ethers from one account to another, and so on.

D. Ethereum Virtual Machine (EVM)

In an Ethereum network, every Ethereum node runs its EVM and is involved in running the same instructions of smart contracts over the entire Ethereum network.

3. PROBLEM WITH EXISTING SYSTEM

Ridesharing and carpooling are becoming increasingly popular, particularly in metropolitan cities with heavy traffic. The unoccupied seats in a car in ridesharing services might be shared by other passengers to reduce travel charges, reduce environmental damage, and make better use of the driver's time. Many ridesharing services, such as Uber with its UberPool, Lyft Line, and Poparide, have created a monopoly in this space. They are traditional services in the sense that they have a single point of failure and trusting these services and the data we provide to them is becoming increasingly challenging.

a) Costly Payments due to Intermediates

When a passenger books a trip in the current situation, an email is sent to the firm, which then allocates a driver for the route. The service providers impose a 10-20% surcharge on the overall fare throughout this process. As a result, it is pricey for the consumer, but the driver also receives payment after a commission deduction. Indeed, the existence of intermediaries between a driver and a passenger incurs additional expenditures.

b) **Insufficient Transparency**

Drivers often fail to understand how these organisations operate due to a lack of accountability in the present, centralised procedures. If you've ever used a ride-sharing service, you've probably heard of peak pricing. Riders and drivers alike receive no

explanation for sudden price increases since a ride-sharing corporation involves multiple unknown responsibilities.

c) **No Data Security and Privacy Mechanisms**

One important difficulty that businesses confront is maintaining the security and privacy of driver and rider information. Even though corporations spend millions of dollars on user authentication, the number of fraudulent identities is increasing daily.

Consider the following infographic, which compares the present approach to a blockchain-powered ride-sharing software model.

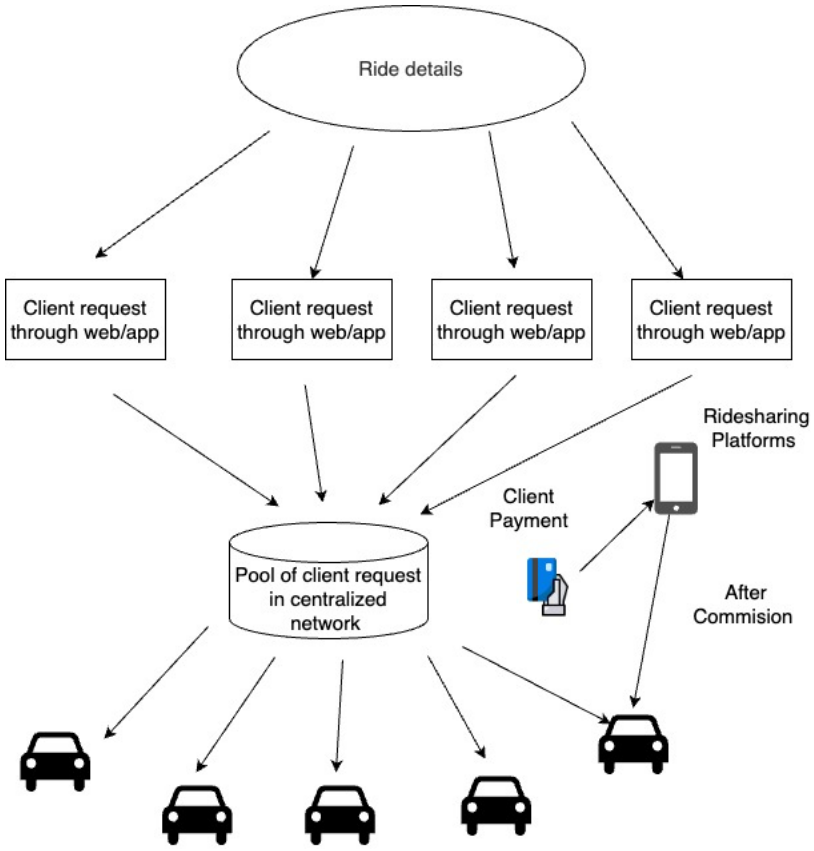

Figure 2Existing Ridesharing Framework

4. BLOCKCHAIN SOLUTION

Based on existing architecture, a decentralized P2P system based on Blockchain is presented. At the backend, a decentralized Ethereum blockchain is used to power a decentralized application (DApp). This is where the power of blockchains, a burgeoning field of technology, may be put to use. Blockchains are just a series of peer-to-peer distributed blocks. They provide immutability because they include a layer of cryptographic hashing.

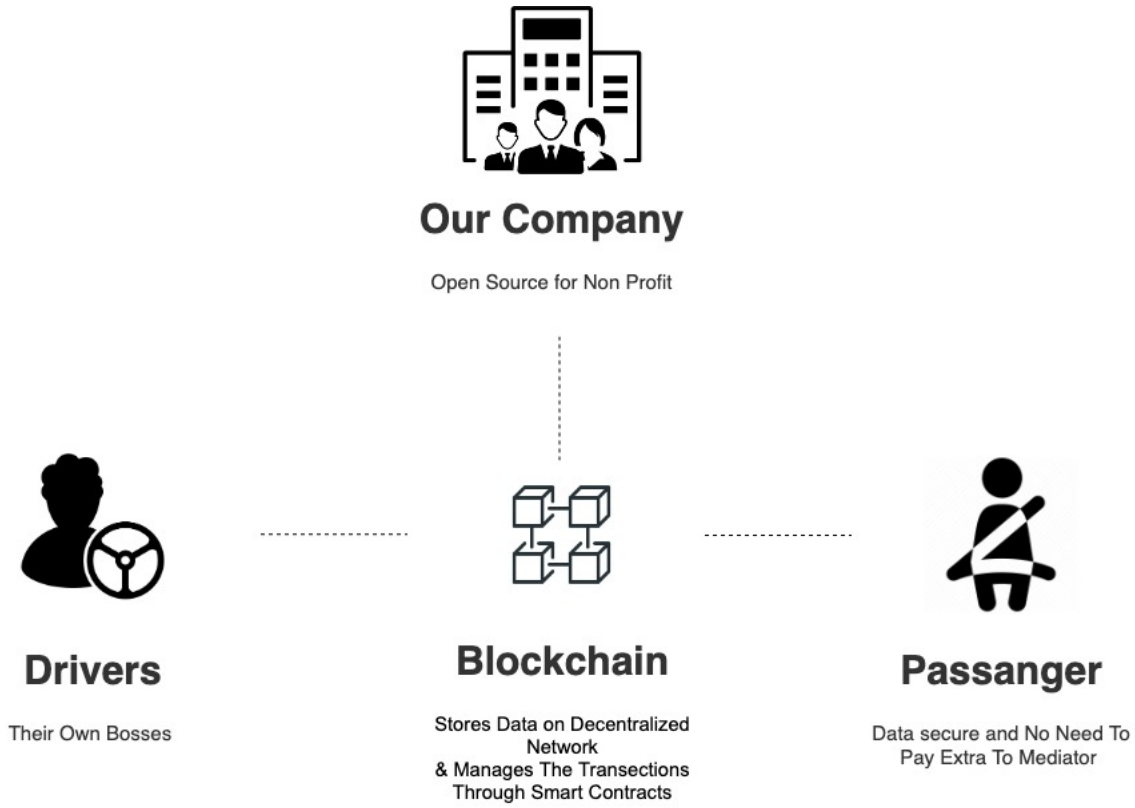

Figure 3Blockchain based framework for ridesharing

a) Fast Secure, and Efficient Transactions

The blockchain platform enables riders to communicate directly with drivers, eliminating the need for a middleman. This minimizes the additional costs associated with having multiple intermediaries.

b) Increased Security and Privacy Standards

The standards defined in smart contracts ensure that drivers do not engage in any illegal conduct by providing an acceptable ranking for riders.

c) Enhanced Network Data Security

Blockchain technology can protect ridesharing data from data hackers. This information is only accessible through Dapps (decentralised apps) that allow transfers between drivers and riders. There is no central database to be compromised in this way.

d) Optimized Economic Activities

Using the approach of a decentralised carpooling network, anyone can make money with their vehicle. Because there are no intermediaries, market potential develops for those with a smartphone and a secure modern car.

Both the user and the driver get registered in the blockchain network with the necessary information in this framework. This meta-data information is associated to each of their profiles, which are viewable by all network nodes. As part of this framework, three user roles were created: the driver, the user, and some legal authorities for verification.

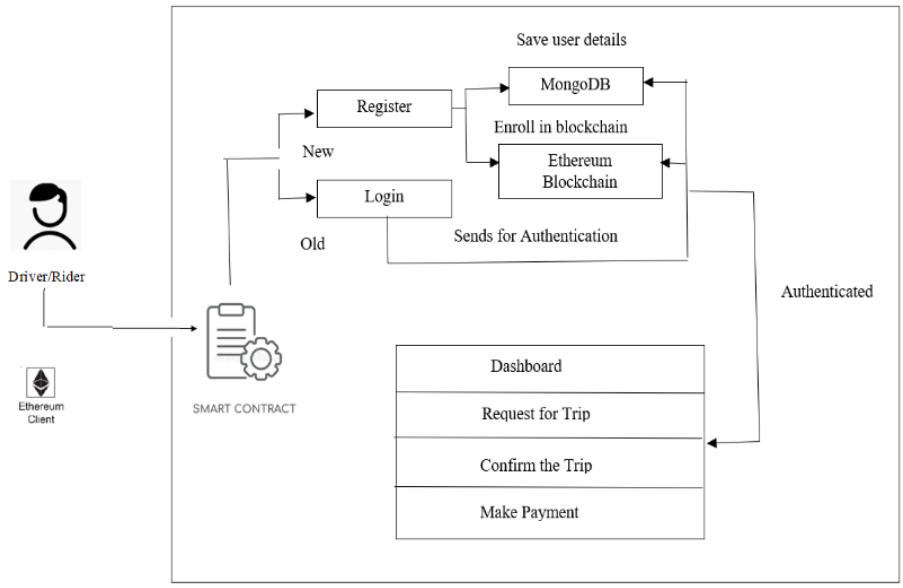

Figure 4DApp Ridesharing Workflow

5. BLOCK MODULE

Table 1Transaction Structure

Field	Type	Description
name	string	the name of the rider placing the request
message	string	additional note to the driver
start	string	coordinates of the starting point
end	string	coordinates of the destination
price	int	the actual price of the ride
fair_price	int	the fair price quoted by the rider
timestamp	datetime	the timestamp when the ride was confirmed

6. CONCLUSION AND FUTURE WORK

The primary purpose of this document is to examine the revolutionary technology Blockchain and its use in the sharing economy, which can serve as a foundation for the smart city concept. This article describes an existing architecture for decentralized, peer-to-peer, blockchain-based ridesharing services and proposes an upgraded version. A decentralized application (DApp) is also being created to support this ride-sharing system. It will serve as a front-end user interface, aided by blockchain technology. This DApp uses Ethereum, a permissionless public blockchain, and smart contracts to manage network transactions and information sharing. To summarise, blockchain may be used to build a system in which smart contracts embedded in digital code are stored in decentralized, transparent databases. These databases' data is thought to be changeable.

In the future, we want to expand the work by a) analyzing the cost and performance of the produced application. b) to investigate the technology from the standpoint of data processing, as blockchain technology is a trust-free system that allows consumers to trust data. Although blockchain technology develops overall data quality, it is critical to understand data processing capabilities when connecting the blockchain with a larger software system. c) Examine data processing workloads on various forms of blockchain.