International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 04 | April - 2023 Impact Factor: 8.176 ISSN: 2582-3930

Rideshare Using Block-Chain

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Abstract - This project proposes a blockchain-based framework from the existing centralized framework for a ride-sharing service and implements the same as a decentralized application based on smart contracts on Polygon Blockchain. A ridesharing system helps riders to reach a particular destination driven by the owner of the ride. Most services available in the market are centralized and hosted by a third party which gives them the authority to monitor features like fare calculation, user data, etc. Privacy and trust are major concerns in such a system. The purpose of our project is to make a decentralized application for ride sharing where all transactions, fare calculation, matching and information is stored on a Distributed Ledger. The ledger will be accessible to all the peers in the network. This will match users with rides in a decentralized way without relying on third parties of any centralized network which makes the system transparent and reliable. The data on blockchain is immutable. Hence, this technology is used to store rides and user information to maintain security and ensure user privacy. Finally, this project provides guidance for future research with the promising and important directions in blockchain-based ride-sharing services.

***Key Words*:** Blockchain; Peer to peer network; Security; Transactions; Ridesharing; Smart Contract; Polygon.

1.INTRODUCTION

In today's world, public transit is a major problem in many large cities. Daily travelers are increasing daily, leading to increased use of public transit due to population growth. This causes high traffic congestion on roads and highways. Pollution is also one of the factors that is increasing as a result of increased public transport. The number of vehicles per person has risen significantly over the past year, which also translates into slower traffic movements. Vehicles are the major contributors to air and noise pollution. So, a solution to all these problems would be the full utilization of every vehicle on the road. vehicles must be encouraged to use the vehicle as part of a public transportation system. To facilitate circulation, this would also contribute to reducing the level of air pollution. Public transportation must therefore be modernized and use the latest technologies available. Therefore, public transport must be reliable and convenient for everyone.

Blockchain is an emerging technology. It can revolutionize the whole organization and the whole community. Transparency, immutability, data security are all the characteristics of blockchain to make blockchain very strong and coherent. Thus, the use of blockchain in carpool operation will be very efficient. It will help you to maintain the security of data and avoid privacy intrusion. Today, the global carpooling service is centralized and controlled by the organization. Because of this the organization can sell and use the user's data for their profit. The centralized system is unable to maintain data security due to data breaches and recorded privacy breaches. Blockchain technology is highly secure and guarantees data confidentiality.

This project is intended to provide a deeper understanding and insight into polygonal blockchain technology. And to create a decentralized application for the ridesharing service based on a smart contract on a Polygon blockchain. The use of smart contracts helps the user with numerous automated systems and features. The Dapps are highly secure and contain no third-party implication. In our Dapp, Blockchain contributes to decentralized implementation by connecting drivers and riders directly to each other by peer-to-peer connection. The user's data will be stored directly in the blocks of Polygon blockchain and the transaction between the driver and rider will be carried out using Metamask wallet. A Blockchain ride-sharing service will help to secure user's data and reduce the number of vehicles on the roads, which will be a major contribution to preserving the environment.

2.CONCEPT USED

Blockchain

Blockchain is a Distributed Ledger Technology having decentralized peer to peer network. Simply, A Blockchain is an immutable read only data structure, where new blocks get added onto the end of the ledger by linkage to the previous block's hash identifier. It organizes the data into several blocks interconnected with each other. A blockchain-based system requires approval from its every node. To make a change in the system, all involved parties must validate and approve the change.

Polygon Blockchain

Polygon (formerly known as Matic Network) is a Layer 2 scaling solution built on top of the Ethereum blockchain. It aims to address the scalability and usability issues faced by the Ethereum network, which often results in slow transaction processing times and high fees.

Polygon achieves this by using a variety of technologies such as Plasma, Rollups, and Sidechains to provide a faster and cheaper alternative for Ethereum-based transactions. By offloading transactions to Polygon, users can benefit from faster confirmation times and lower transaction fees. In addition to improving the scalability of Ethereum, Polygon also provides an ecosystem for developers to build decentralized applications (dApps) and protocols that can leverage the benefits of its Layer 2 scaling solution. This allows developers to create innovative applications without being limited by the high gas fees and slow transaction times of the Ethereum network.

Overall, Polygon aims to create a more user-friendly and accessible blockchain infrastructure that can serve as a hub for a wide range of decentralized applications and services.

Smart Contracts

A smart contract is a computer program stored on Polygon Blockchain that directly and automatically controls the processing of digital assets, between the nodes, if only met with a certain condition. Smart contracts are programs that execute as they were defined by the developer. These contracts are used to automate the execution of an agreement, so that the public can access the outcome only if the predefined conditions are met. Solidity is the most common programming language used to create Smart contracts. Smart Contracts are the most important part of the Dapps.

A smart contract is just a digital contract that is stored in Blockchain. It has details and permissions written in code that require an exact sequence of the event according to the code to trigger the agreement in Smart contracts. These triggers or actions could include releasing funds to the parties, registering a vehicle, booking tickets or sending notification. Smart contracts have good efficiency, speed, and accuracy. It is very secure and has trust and transparency because of no involvement of third parties. Smart contracts are transparent where all contract participants can view and track them at any time. This transparency is not available in project-based contracts. Finally, smart contracts are signed digitally while project-based contracts are signed manually.

3.LITURATURE REVIEW

A. Literature Review

Researchers Rishabh Shah Athrava Date, Pratik Vane and Amay Chugh proposed a system, named Blockwheel - a peer to-peer ridesharing network. In the system, the rider and the driver had direct communication between them without any involvement of any middle man. Their proposed system is a DApp (Decentralization Application) for the ride sharing service using Ethereum blockchain. Their focus was to preserve privacy and improve trust between the riders and the drivers. They used MongoDB, google.api in their proposed system. Once the data is entered in the blockchain then it cannot be tampered. The proposed system is on a peer-to-peer network avoiding any privacy leak and confidential data. In their system, the user can be the rider as well the driver. They stored the drivers and the vehicle details in the Blockchain but the public key was stored in MongoDB, which they were able to use as a primary key. They developed various algorithms for each function in their system for adding user, adding ride, adding user ride and payment. Their main focus was to secure the data of the Rider and driver. The Rider and the driver must have peer-to-peer connection between them with no involvement of any third party. The proposed system is build on the Ethereum blockchain but they are looking forward to using Ethereum 2.0 in the coming future, which will be faster than Ethereum.

In the research project of Sathya A. Renu and Barnali Gupta Banik implemented a secure ridesharing service DApp using smart Contract on Ethereum blockchain named Ether Ride. Their aim was to provide a deeper understanding and knowledge about Blockchain technology and to give their suggestions and thoughts on how to integrate it into their business strategies. Their research project claim two-fold contribution:

1)A blockchain based ride sharing architecture for safe and secure traveling.

2)A prototype Dapp on the Ethereum blockchain named Ether Ride.

The main motive of their project is to bring transparency in the various organizations around the world. While researching they find out most of the ridesharing companies adopt surging price concepts based on the demand the organization charge high cost especially in meteor cities. The majority of the customers are unaware of all these concepts because of no transparency between User and organization. They mentioned that the centralized organization charges 10- 20 percent higher than the actual charges to the customer. To overcome all this unawareness in the organization, they implemented blockchain to their ride sharing system. They used various functions and algorithms such as greedy heuristic optimization, meta-heuristic optimization, Exact formulation and heuristic solution, decomposition algorithm, and dynamic programming. dynamic programming used to solve the ride matching problem because ride matching was the major problem in the p2p ride sharing

system. Their future aspect is to analyze the cost and performance of the application developed and to analyze the data processing workloads on different types of blockchain. They successfully developed and tested the DApp named Ether Ride, but they were not sure and didn't give any guarantee for privacy in their Dapp.

In the project of Rahul Kumar, Shivangi Balodia, Rounak Kumar Kedia and Sai Dileep Suvvari they tried to implement a new system inspired by Blockchain, for the ride sharing application. While implementing they only used two peers, driver and rider. The rider can create a request for a ride, which reaches all nearby drivers and the ride will be confirmed if any of the drivers accept the ride. In their system they present the calculated fare amount to the rider before the ride starts and after the ride is completed, the fare amount is transferred to the driver wallet in ethers because in their system the driver must set their base charges per kilometer in rupees and the final fare is calculated using base charges price per kilometer multiply to how many kilometers the ride traveled. They used smart contracts for the payment procedure using Blockchain. They use various functions and algorithms in their system such as: Initialize (), Fund Ride (), Confirm Ride (), Release Funds (). Their project presented a framework for developing a decentralized ride sharing application. Their application can be used as a platform to connect the rider and the driver directly. Their application maintains transparency between the two peers, rider and driver. Their Dapp can help people in socializing to help and save the environment and to save transportation costs. They removed the third parties' concept in their application to avoid commission of third parties to make the ride cheap and transparent. Their application preserves the privacy and trust between the rider and the driver but they don't test payment successfully.

Research of Mohamed Baza, Noureddine Lasla, Mohamed Mahmoud, Gautam Srivastava and Mohamed Abdallah proposed a decentralized ride sharing service using the revolutionary public blockchain, named B-Ride. They analyzed and tested their proposed system and the results indicate that the B-Ride is practical in terms of both on-chain and 0ff-chain. Their system has transparency and privacy. They proposed a time-clocked deposit protocol to ensure security against malicious and dishonest drivers and riders. This system suggests the use of the reputation management system that tracks drivers' behavior allowing them to behave honestly in the system if they show dishonesty they will not be selected for future ride and service. They used the pay-as-you driver methodology for the fare payment which is a trustless environment. An important point for this project is that their work is the first which integrates ride sharing service and blockchain. They used Ethereum Blockchain which is a public and open blockchain. Their main focus was to avoid middlemen involvement between the rider and the driver. But because Ethereum blockchain cost get higher as compared to polygon.

In the case study of Nesma Mahmoud, Asmaa Aly and Hatem Abdelkader they had done very hardworking research on ride sharing services from Centralization to Decentralization. They stated that ride sharing services are effective and popular but they still suffer from various crises such as lack of security, privacy violation, user data safety and transparency of transactional data. They disclosed that Blockchain enabled ride sharing service can help in solving these crises alongside blockchain can provide more functionality and ease of use of management. They thoroughly reviewed, analyzed, studied and discussed many blockchain based ride sharing service projects and gave their opinion that blockchain based ride sharing service is still in a very early stage and much more research must be done. In their case study, they study every term and everything related to blockchain ride sharing service and released a detailed report. The Figures and Table in their report contain a massive amount of information but it is represented in a very easy and understandable manner. They ended their project by disclosing that more intensive research on blockchain ride sharing service must be done.

B. Problem Statement

As there are existing ride-sharing applications uses centralized third-party systems to provide ride-sharing services to customers. Because of the intermediator their costly payments and Insufficient Transparency.

To overcome this problem our aim is to build a decentralized application with ridesharing service.

The application would be driven by real-time data and availability.

If a user needs to go to a particular destination, then they can tag along with someone who is going in the same direction. The user can update its source and destination on the application to let drivers know about the ride.

The passengers could share the costs, get a comfortable ride and travel faster as compared to public transportation.

4.METHODOLOGY

A. Methodology

The application consists of multiple classes of activities to support the functionality of the project as a whole. Most of the existing ride-sharing applications like Ola, Uber etc. uses centralized third-party systems to provide ride-sharing services to customers.

The project plan is to implement a ride-sharing platform with all the features of a ride-sharing platform but on the polygon blockchain that will make it secure. Basically, Blockchain is a system which records the information in a way that makes it impossible to change, hack or cheat the system. Blockchain is essentially a digital ledger of transactions that is duplicated and distributed across a network of computer systems on the blockchain. Each block in the chain contains a certain number

of transactions, and every time a new transaction occurs on the blockchain, a record of that transaction is added to each participant's ledger. A decentralized database managed by multiple participants is known as Distributed Ledger Technology. Because of this decentralization and peer to peer network trust can be built in our application.

Here in our web application rider and driver has to sign up for get registered on the app. While doing registration user have to connect their crypto wallet with it, where all the transaction can be done and these wallets are connected to the smart contract. After completing the registration process user has to first login and then users can request for a ride on the network following all the drivers on the route will be notified near the user. The "Directions-API" is used for traversing efficient routes from the source towards the destination and The app display the total distance between the pick-up point and drop point along with the charges that is in Matic. These routes would help the drivers in the system to reach the destination quicker and in a correct manner without being lost the way. The user can have a ride with the driver who accepts the ride request coming from the user. Payment for the ride will be done after the completion of a ride by using crypto wallet. Our application that is built using React Native ensures that the travel data of the traveler is secure and visible only to the necessary entities within the system.

Remix-IDE is used to connect the application to the blockchain using smart contracts. Information about the ride and user will be stored on blockchain by creating instances. Also details about the user once registered will be stored on the Blockchain network. Details about the ride will also be stored on the Blockchain whose Ride ID will be stored in the database. The information about the ride will only be visible to the user and driver who are a part of the ride. Any user can become a driver if they own a vehicle, only they need to register as a driver. The driver will add his/her vehicle details. These details will get verified once the registration process is completed. Once the ride is over, it will validate that the trip has been completed successfully and then it pays the service fee to the driver. For the payment we use Metamask wallet which is connected to smart contracts and it store the transaction in blockchain, currency for payment we used is Matic. After successful payment is done then driver confirms the payment and click on complete ride option. After that driver is available for next ride.

B. Block Diagram

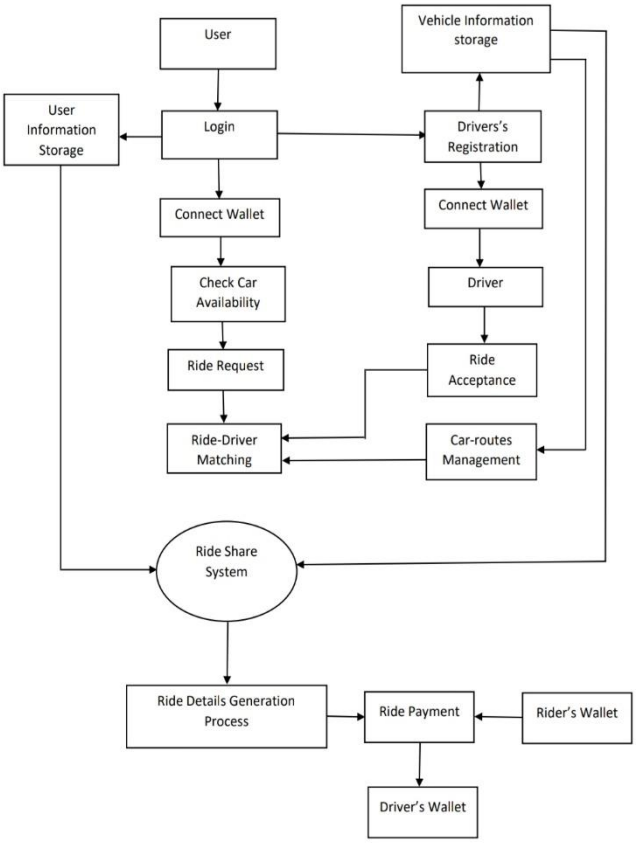


Fig -1: Block Diagram of Rideshare Using Blockchain

A user has to sign up first to get registered on the app. Also, Driver has to sign up to get registered on the app. It has to provide vehicle information along with the credentials. And while registering both rider and driver have to connect their wallet. Thereafter, it can log into the application for daily use. On verification, the user will become a driver on the application. The user can request for the cars. The acceptance of the request depends solely on the driver. With the help of Google Maps integrated in the application, the driver can know the rider location, so as to catch up before the ride. Once the ride is complete, user have pay the payment using the wallet. When the payment is done then driver has to confirm that the ride is completed. After that car will available for another user.

5.RESULTS AND ANALYSIS

Based on the methodology being used we create a platform that connects drivers and passengers in order to facilitate the sharing of rides. This app based on polygon blockchain in that we created smart contract and store the data. For payment we used metamask wallet. In our app we can request for the ride by choosing the pick-up drop point as shown below. Blockchain ensures security and privacy of data by using public and private keys. Also, the results of a successful ride-sharing decentralized app help in lower Costs By sharing rides, both drivers and passengers can save money on transportation costs.

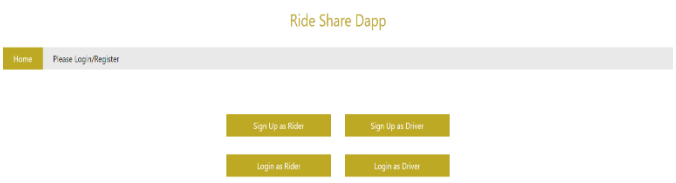


Fig -2: Sign In/Login Page for Rider/Driver

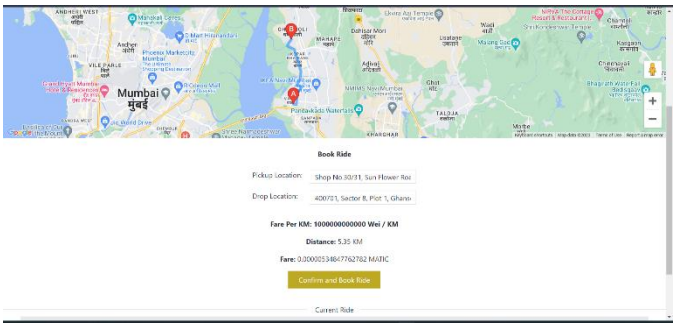


Fig -3: Rider Dashboard

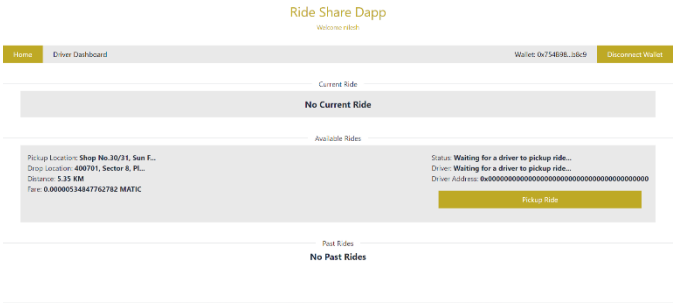


Fig -4: Driver Dashboard

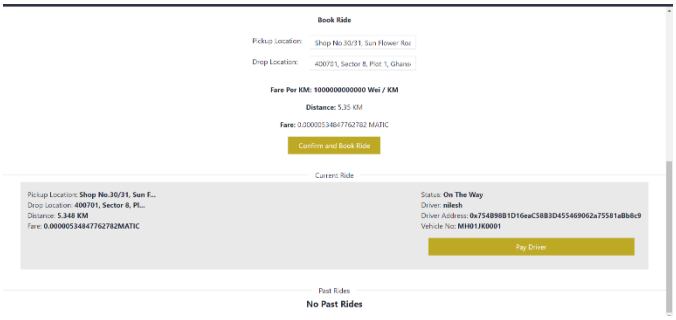


Fig -5: Pay Driver

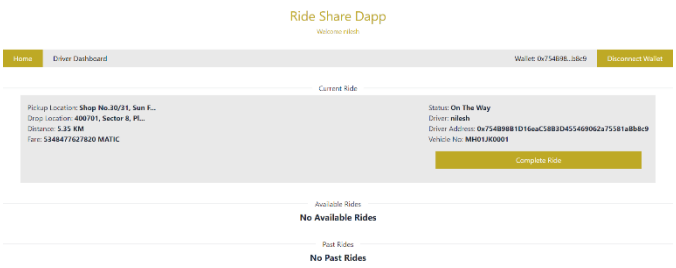
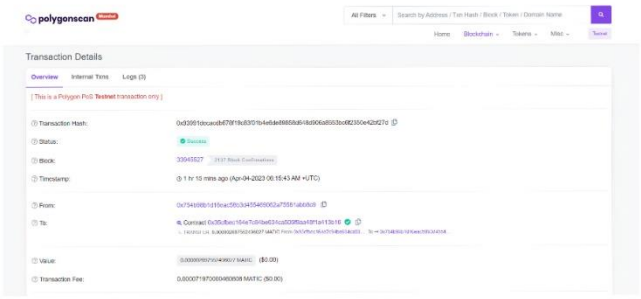


Fig -6: Complete Ride



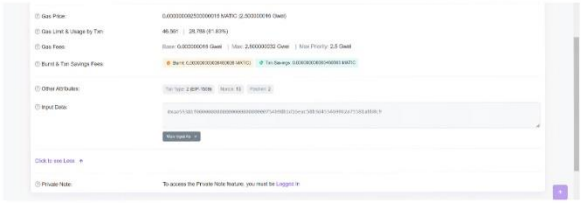


Fig -7: Transaction

6.CONCLUSION

This report presents a framework for developing a decentralized ride sharing application. This application can serve as a platform to connect the riders directly with the drivers. This concept maintains transparency between the two peers and also there is no involvement of third-party commission, which is further profitable as the entire ride becomes cheap.

The main goal of this project is to look at the revolutionary technology Blockchain. Blockchain ensures security and privacy of data by using public and private keys. It uses public-key cryptography to handle transactions between users. It does not permit users to tamper data once the data is added to the chain. In the earlier methods, the main focus was not on all the aspects at the same time. And some had a physical verification system for the driver. A centralized ridesharing application is prone to violation of privacy of the personal data. Decentralized approach towards ridesharing will store all transactions, fare calculation, ride-matching and user information on a

distributed ledger. It would make sure that there is no single point of failure.

To summarize, blockchain can be used to create a system in which smart contracts incorporated in digital code are maintained in decentralized and transparent databases.

7.FUTURE SCOPE

The future scope of a rideshare dApp using the Polygon blockchain is quite promising. The Polygon network is rapidly growing and gaining popularity due to its high speed, low-cost transactions, and easy-to-use developer tools. As such, a rideshare dApp built on Polygon could have several potential benefits and opportunities for growth

One potential future scope for a rideshare dApp on the Polygon network is the ability to expand into other regions and countries. As the network continues to expand, it could become increasingly feasible to provide rideshare services in areas that have previously been underserved or overlooked by traditional ridesharing platforms. Additionally, a rideshare dApp on Polygon could provide opportunities for integration with other blockchain-based services, such as decentralized identity solutions, insurance platforms, and payment gateways. This could help to create a more comprehensive ecosystem that provides a range of services for both riders and drivers.

A dynamic ride-matching approach can also be used to assign vehicles to riders.

ACKNOWLEDGMENT

We record our heart-felt gratitude and indebtedness to our guide Prof. Aasha Kantekar. for supervising us care and zeal throughout our project “Rideshare using Blockchain”.

We would like to thanks Principal Dr. Sunil S. Chavan. and Dr. V.P. Patil. (HOD OF EXTC DEPT And Vice Principal) of our prestigious institute for his helpful guidance and encouragement.

We are immensely thankful to all the respected teachers of EXTC Department for the hands to help that they offered to us with affectionate understanding whenever we needed it

REFERENCES

[1] R. Joseph, R. Sah, A. Date, P. Rane and A. Chugh, "BlockWheels - A Peer to Peer Ridesharing Network," 2021 5th International Conference on Intelligent Computing and Control Systems (ICICCS), 2021, pp. 166-171, doi: 10.1109/ICICCS51141.2021.9432188.

[2] Renu, Sathya A., and Barnali Gupta Banik. "Implementation of a secure ridesharing DApp using smart contracts on Ethereum blockchain." International Journal of Safety and Security Engineering 11.2 (2021): 167-173.

[3] Mahmoud, Nesma, Asmaa H. Ali, and Hatem Abdel-Kader. "Ride-Sharing Services: From Centralization to Decentralization." IJCI. International Journal of Computers and Information 9.2 (2022): 45-63.

[4] Kumar, R., Balodia, S., Kedia, R.K., Suvvari, S.D. and Gowrishankar, D., 2021. Decentralized Ride Sharing System. Int. J. Innov. Sci. Res. Technol, 6(6), pp.1347-1350.

[5] Baza, Mohamed & Lasla, Noureddine & Mahmoud, Mohamed & Abdallah, Mohamed. (2019). B-Ride: Ride Sharing with Privacy Preservation, Trust and Fair Payment atop Public Blockchain.

[6] Kanza, Yaron & Safra, Eli. (2018). Crypto Transport: Blockchain-Powered Ride Hailing While Preserving Privacy, Pseudonymity and Trust. 10.1145/3274895.3274986.

[7]] Pal, P., & Ruj, S. (2019). BlockV: A Blockchain Enabled Peer-Peer Ride Sharing Service. 2019 IEEE International Conference on Blockchain (Blockchain). doi:10.1109/blockchain.2019.00070.

[8] Khanji, Salam & Assaf, Sameer. (2019). Boost ing Ridesharing Efficiency Through Blockchain: GreenRide Application Case Study.10.1109/IACS.2019.8809108.

[9] Valašt ín, Vikt or & Kostal, Kristian & Bencel, Rast islav & Kotuliak, Ivan. (2019). Blockchain Based Car-Sharing Platform. 10.1109/ELMAR.2019.8918650.

[10]Sant i, Paolo & Resta, Giovanni & Szell, Michael & Sobolevsky, Stanislav & St rogatz, Steven & Rat t i, Carlo. (2014). Quantifying the benefits of vehicle pooling with shareability networks. Proceedings of the National Academy of Sciences of the United States of America. 111.10.1073/pnas.1403657111.