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B-Ride: Block chain-Ride Sharing with Privacy-Preservation, Trust and Fair Payment with Driver Facility

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ABSTRACT: B-Ride is a novel ride-sharing system that employs public blockchain technology to preserve the privacy of its users. The proposed system aims to address the privacy concerns of traditional ride-sharing platforms, which require users to disclose their personal information and travel history to a centralized entity. B-Ride leverages the transparency and immutability of blockchain to facilitate secure and decentralized ride-sharing without compromising user privacy. The B-Ride system uses a smart contract to execute the ride-sharing process, which ensures the authenticity of the transaction and the privacy of user data. The smart contract automates the matching of riders with drivers, the payment process, and the provision of feedback. The system also incorporates a reputation-based mechanism to incentivize good behavior and enhance the trustworthiness of the platform. B-Ride uses a public blockchain to ensure transparency and accountability, allowing users to verify the integrity of the system and the accuracy of the information. The use of a public blockchain also eliminates the need for a central authority, which reduces the risk of data breaches and enhances the security of user data. In summary, B-Ride provides a privacy-preserving ride-sharing solution that leverages the power of public blockchain technology. The proposed system addresses the shortcomings of traditional ride-sharing platforms by offering a decentralized, transparent, and secure platform that prioritizes user privacy.

KEYWORDS: Blockchain; decentralization; encryption; peer-to-peer network; ridesharing; intermediaries; public blockchain; etc.

I. INTRODUCTION

Currently, cab service aggregators are using a centralized methodology to carry out their day-to-day operations. The policies, rules and regulations, terms and conditions that both the user and the driver must follow vary from company to company. Furthermore, the booking of cabs requires mediators or third-party businesses to carry out the payment process. With more parties involved, this proves to be problematic with the creation of a lack of transparency. These disadvantages have led to an extensive study of the blockchain technology and subsequently several proposals of ride-sharing architecture built atop the blockchain. This paper aims to compare and contrast between such existent methodologies. The main objective of this paper is to shed light on the various ways in which the decentralized, transparent ideas of blockchain have been implemented and the reasons for doing so. In this work, we have highlighted advantages as well as shortcomings of these methodologies, along with information about how the blockchain modules and concepts are used in different phases of the system.Ride-sharing platforms have gained immense popularity in recent years, providing a cost-effective and convenient mode of transportation. However, traditional ride-sharing platforms have raised concerns about user privacy due to the collection and storage of personal information. Centralized ride-sharing platforms require users to disclose their personal information, such as their name, phone number, and travel history, which can compromise user privacy and lead to data breaches.To address these privacy concerns, this project proposes a novel ride-sharing system called B-Ride that employs public blockchain technology to preserve user privacy. The proposed system leverages the transparency and immutability of blockchain to provide secure and decentralized ride-sharing without compromising user privacy. B-Ride uses a smart contract to execute the ride-sharing process, which automates the matching of riders with drivers, the payment process, and the provision of

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feedback. The system also incorporates a reputation-based mechanism to incentivize good behavior and enhance the trustworthiness of the platform. By using a public blockchain, B-Ride ensures transparency and accountability, eliminating the need for a central authority, which reduces the risk of data breaches and enhances the security of user data. The proposed system offers a decentralized, transparent, and secure platform that prioritizes user privacy, providing a viable alternative to traditional ride-sharing platforms.

II. LITERATURE SURVEY

Dandage and Ramteke (2022) [1], Ride Sharing Using Blockchain: Security and Trust Issues." International Journal of Innovative Technology and Exploring Engineering (IJITEE). It addresses security and trust issues in ridesharing through blockchain. They discuss the vulnerabilities of traditional ridesharing systems and propose blockchain as a solution to enhance security measures. The authors highlight the need for robust identity management and transaction verification to build user trust and ensure a secure ride-sharing experience.

Ali and Wazir (2021) [2], Smart Contracts for Secure and Fair Ride-Sharing: A Blockchain Perspective." Journal of Information Security and Applications. It focuses on the use of smart contracts to ensure secure and fair ride-sharing experiences. Their study highlights how smart contracts can automate transactions and enforce agreements between drivers and riders without intermediaries, thereby enhancing trust. The authors argue that this technology can address common issues like payment disputes and ensure that all parties adhere to agreed terms.

B¨ohm and Haller (2021)[3], Privacy and Trust in Blockchain-based Ride-Sharing Platforms." Proceedings of the 2021 International Conference on Information Systems. It examines privacy and trust in blockchain-based ridesharing platforms. They analyze how these platforms can maintain user anonymity while ensuring trustworthiness through transparent and immutable records. The study suggests that balancing privacy with accountability is crucial for user adoption and the long-term success of blockchain solutions in ride-sharing.

Zhang et al. (2020) [4], Blockchain Technology in the Ride-Sharing Industry: Challenges and Opportunities." IEEE Access They explores the integration of blockchain technology in the ride-sharing industry, highlighting both challenges and opportunities. The authors discuss how blockchain can enhance transparency, reduce fraud, and streamline operations. However, they also note issues such as scalability, regulatory hurdles, and the need for collaboration among stakeholders, making it a complex yet promising avenue for improving ride-sharing services.

Chen and Zhao (2020) [5], A Blockchain-based Trust Management Framework for Ride-Sharing Services." Journal of Network and Computer Applications They propose a blockchain-based trust management framework specifically for ride-sharing services. Their framework aims to enhance user trust by providing a decentralized verification process that addresses issues related to user identity and transaction transparency. The authors argue that their approach can significantly improve user confidence and engagement in ride-sharing platforms by ensuring that all interactions are secure and verifiable.

III. PROPOSED SYSTEM

Ride-sharing is a service that enables drivers to share trips with other riders, contributing to appealing benefits of shared travel cost and reducing traffic congestion. However, the majority of existing ride-sharing services rely on a central third party to organize the services, which make them subject to a single point of failure and privacy disclosure concerns by both internal and external attackers. Moreover, they are vulnerable to distributed denial of service (DDoS) and Sybil attacks launched by malicious users and external attackers. Besides, high service fees are paid to the ride-sharing service provider. In this paper, we propose a decentralized ride-sharing service based on public Blockchain, named B-Ride. B-Ride enables drivers to offer ride-sharing services without relying on a trusted third party. Both riders and drivers can learn whether they can share rides while preserving their trip data, including pick-up/drop-off location, departure/arrival date and travel price. However, malicious users exploit the anonymity provided by the public blockchain to submit multiple ride requests or offers, while not committing to any of them, in order to find a better offer or to make the system unreliable. B-Ride solves this problem by introducing a time-locked deposit protocol for a ride-sharing by leveraging smart contract and zero-knowledge set membership proof. In a nutshell, both a driver and a rider have to show their good will and commitment by sending a deposit to the blockchain. Later, a driver has to prove to the blockchain on the agreed pick-up time that he/she arrived at the pick-up location on time. To preserve

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rider/driver privacy by hiding the exact pick-up location, the proof is performed using zero-knowledge set membership proof. Moreover, to ensure fair payment, a pay-as-you-drive methodology is introduced based on the elapsed distance of the driver and rider. In addition, we introduce a reputation model to rate drivers based on their past behaviour without involving any third-parties to allow riders to select them based on their history on the system. Finally, we implement our protocol and deploy it in a test net of custom blockchain. The experimental results show the applicability of our protocol atop existing real-world blockchain's.

IV. SYSTEM ARCHITECTURE

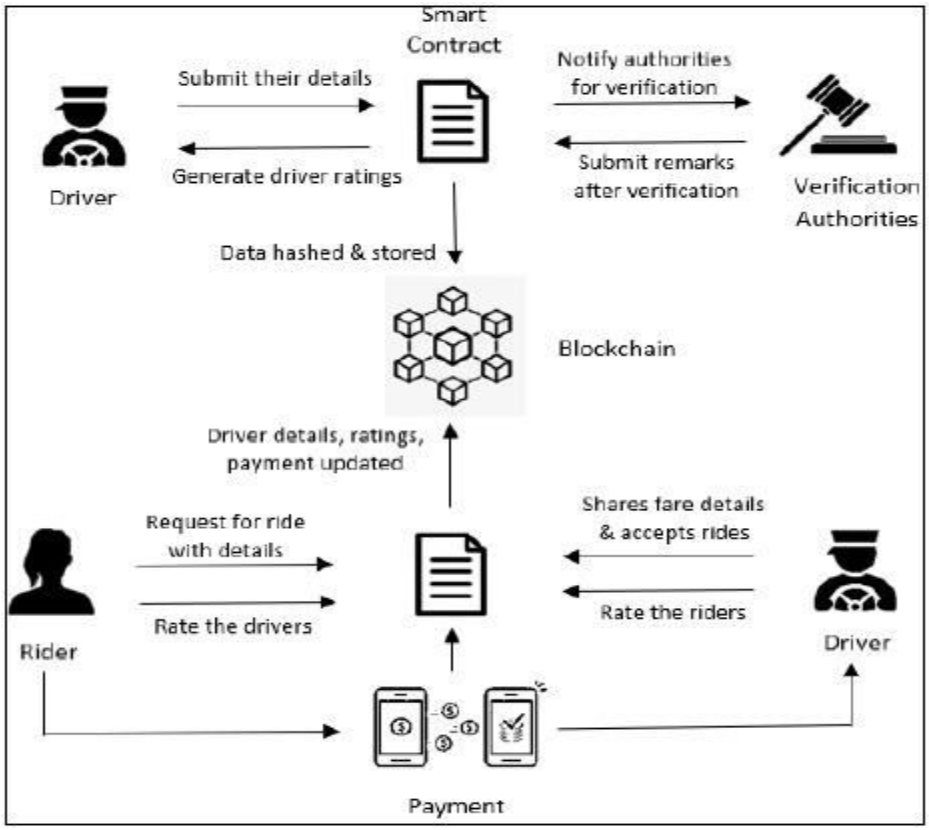

Fig.1: System Architecture

V. METHODOLOGY

B-Ride is a novel ride-sharing system that uses public blockchain technology to preserve user privacy. The proposed system employs a smart contract to automate the ride-sharing process, ensuring the authenticity of the transaction and the privacy of user data. The following sections describe the key components of the proposed system.

- **User Registration and Authentication:**

To use B-Ride, users need to register with the platform, providing their basic details such as name, phone number, and email address. Users also need to authenticate themselves using a one-time password (OTP) sent to their registered phone number.

- **Smart Contract:**

B-Ride uses a smart contract to automate the ride-sharing process, which ensures the privacy and security of user data. The smart contract automates the matching of riders with drivers, the payment process, and the provision of feedback.

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- **Ride Request:**

A rider can request a ride by selecting the destination and the preferred ride time. The smart contract matches the rider with an available driver who is heading in the same direction.

- **Payment:**

B-Ride uses a cryptocurrency-based payment system to ensure the security and transparency of the payment process. The rider pays the driver using the B-Ride cryptocurrency, which is stored in the rider's digital wallet. The smart contract ensures that the payment is made only after the completion of the ride.

- **Feedback and Reputation System:**

After the completion of the ride, both the rider and the driver can provide feedback on each other, which is stored in the blockchain. B-Ride uses a reputation-based mechanism to incentivize good behavior and enhance the trustworthiness of the platform.

- **User Privacy:**

B-Ride employs several measures to preserve the privacy of user data. Firstly, user data is stored in a decentralized manner in the public blockchain, ensuring transparency and accountability. Secondly, B-Ride uses a pseudonymous approach, where the user's identity is not revealed to the driver until the ride is confirmed. Finally, B-Ride uses encryption techniques to secure user data and prevent unauthorized access.Finally, B-Ride is a novel ride-sharing system that uses public blockchain technology to provide a secure, transparent, and decentralized platform while preserving the privacy of user data. The proposed system offers a viable alternative to traditional ride-sharing platforms and addresses the privacy concerns of users.

VI. EXPECTED RESULT

The proposed "B-Ride" system is expected to achieve significant improvements in privacy, trust, fairness, and efficiency in the ride-sharing ecosystem through the integration of blockchain technology. The primary outcome is enhanced **privacy preservation**, ensuring that user identities, trip details, and payment information remain secure and accessible only to authorized parties. This is achieved through encryption and decentralized storage on the blockchain.The system also fosters **trust** between riders and drivers by employing blockchain-based trust scores. These scores provide a transparent and tamper-proof mechanism to verify the reputation of all participants, reducing instances of fraud and promoting accountability. Additionally, **fair payment systems** using smart contracts ensure accurate fare calculations and automatic transfers, eliminating overcharging or underpayment concerns.For drivers, the platform offers real-time data on earnings, transparent ride allocation, and a streamlined payment process, contributing to higher **driver satisfaction**. Scalability and efficiency are also improved, as the blockchain framework enables seamless handling of increasing users without delays or system bottlenecks.

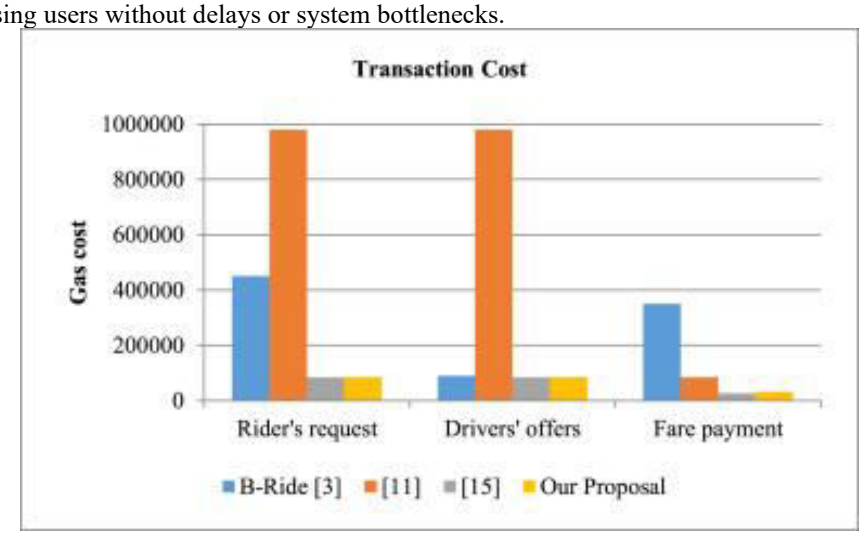

Fig.2: Graphical Representation

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VII. CONCLUSION

The proposed blockchain-based ride-sharing platform represents a significant advancement in addressing critical challenges within the ride-sharing industry, including data privacy, trust issues, and payment fairness. By leveraging decentralized technology, the system empowers users with control over their personal data while ensuring secure and anonymous interactions. The integration of a transparent trust management system enhances accountability and fosters a reliable environment for both drivers and passengers. Additionally, the implementation of smart contracts automates payment processes, ensuring fairness and minimizing disputes with driver facility.To Improvement, this innovative approach not only improves user satisfaction and safety but also sets a new standard for transparency and trust in the ride-sharing sector. As the demand for secure and efficient transportation solutions continues to grow, this research contributes to the development of a more equitable ride-sharing ecosystem that prioritizes the needs and rights of all users. By addressing these fundamental issues, the proposed system has the potential to reshape the future of ride-sharing, making it a safer and more enjoyable experience for everyone involved.

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