

HOP IN (Peer to Peer Ridesharing System)

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Abstract: 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 service, which makes them subject to a single point of failure and privacy disclosure concerns by both internal and external attackers. The proposed system 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. Proposed system 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 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-youdrive 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 behavior without involving any third-parties to allow riders to select them based on their history on the system.

Keywords: Peer to Peer rideshare, Blockchain, Decentralization, Etheriam, Solidity