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Leveraging blockchain for open Mobility-as-a-Service ecosystems



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Mobility-as-a-Service (MaaS) provides the services of intermodal transport through a single digital platform. MaaS technology enables the integration of mobility systems, thus introducing the ability to perform transactions between a range of service providers. As the MaaS ecosystem becomes ever more complex, decentralised solutions are required. This study discusses the possibilities of leveraging blockchain technology for MaaS.

As more mobility solutions are introduced, the concept of MaaS has gathered momentum as a solution to integrate intermodal transport services that are all accessible via a smartphone application. A user can access integrated and personalised mobility along with booking and paying for services. Until now, MaaS operators have been positioned between transport operators and end users by making agreements with private and public operators to create tailored solutions for users.

The number of increasing mobility solutions involved in MaaS are creating an ever more complex ecosystem. As the number of actors increases, decentralised solutions are required to create a layer of trust that facilitates secure digital payments and identity management, as well as providing transparency. Blockchain technology can be leveraged to support MaaS in three fundamental areas:

- supporting the recording of transactions;
- establishing an open approach for identity management;
- providing a means for 'smart contracts'.

Blockchains have the potential to supersede intermediary MaaS operators by using digital tokens that can be tracked. Using this approach, digital assets and currency are tokenised to enable business logic automation, thereby reducing transaction fees and ensuring security. A digital currency with a value reflective of real money can be used as the common payment method. To avoid the problem of volatility, a stable token should be used.

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These tokens can be used as unique identifiers to represent ticketing, booking and payment-related data that is shared in the blockchain, thereby reflecting real-time transactions of mobility services. In addition to the improved security and reduction in transaction fee, a major benefit to using blockchain is the ability to create smart contracts. These permit trusted transactions to be executed between anonymous parties and enable conditional transactions. Blockchain-based tickets will allow users to use several public transport operators, meanwhile the fare is held in an escrow account until an operator has been used.

Improved transparency is a direct result of the data storing and mapping features of the blockchain network. Additional data, such as vehicle information or access rights, can be incorporated when digital assets are tokenised. Access rights to decentralised data increases the efficiency of the blockchain. Furthermore, using encryption and implementing selective access rights ensures that data is only accessible to the individual who provided it or others that have the legal right, thus protecting personal information. A further benefit of using blockchain is token-based incentivisation. Microtransactions enabled by blockchain allow for granular pricing of reward activities, such as sharing data or changing people's behaviour. By offering tokens in return for a change of route or mode of transport, users are incentivised to change their behaviour, which could have a significant impact on the large scale.

As an example, reviewing and rating can be rewarded in the blockchain network by giving back a portion of the ticket price to the traveller, while mobility operators gain the associated benefits of being reviewed. Another key application of token-based incentivisation is ride sharing. Carpooling apps are most effective when they can retain drivers. This can be facilitated by blockchain through 'proof of travel' whereby a host driver is still rewarded even if they can't find a guest rider. This means the driver is motivated to continue to sharing ride details. In a similar manner, token-based incentivisation is applicable to referrals, safe driving, and data sharing.

Data stored on the blockchain is immutable, so trusted entities are required to bring and validate external data. 'Oracles' are data feeds that enable transactions and provide the information required to trigger smart contracts. Transport operators can act as a trusted party and provide the data for the oracle.

Proof of identity is necessary for validating users and performing transactions. In addition to verifying the identity of an individual, the validation should include other relevant information such as if the person holds a valid driving licence. This introduces questions over use of private information. However, 'self-sovereign identity' addresses this by allowing users to have complete control over their personal data.

In summary, blockchain can replace intermediary MaaS operators and introduce additional benefits. Specifically, a reduction in transaction fees, improved security and transparency. The principal idea is the introduction of smart contracts to supersede the MaaS operator which, in itself, has several advantages.