

Project Design Phase – Part 2

Open Source Frameworks

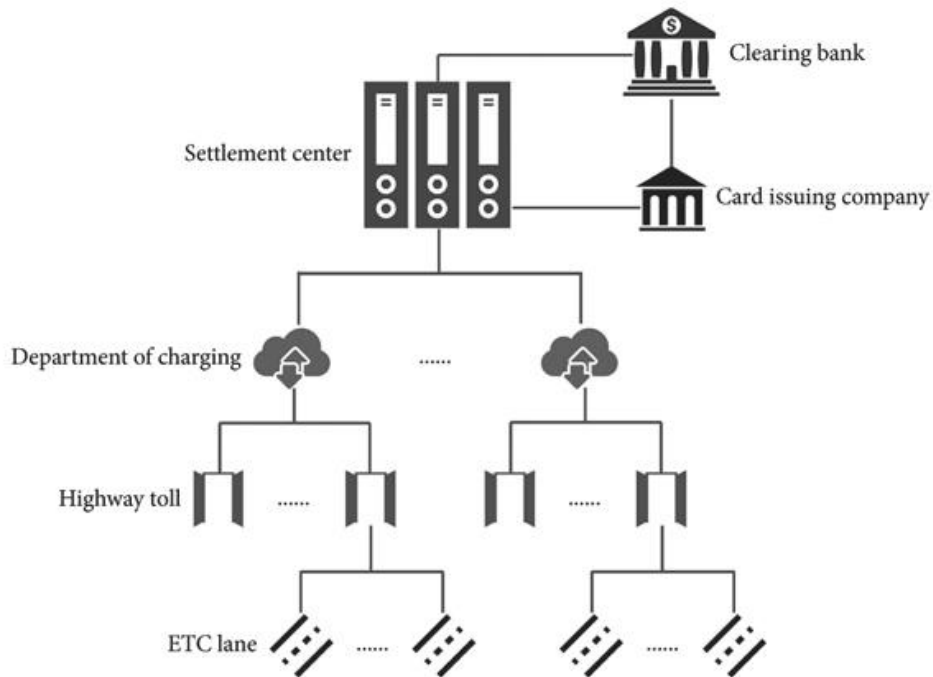
Team ID	NM2023TMID04427
Project Name	Project – Tracking Public Infrastructure And Toll Payments Using Blockchain

Introduction

Designing a complete smart contract system for tracking national and state highways, toll collection, and public infrastructure on the Ethereum blockchain is a complex task that requires careful consideration of various aspects such as contract architecture, data storage, user roles, and more. Below is a simplified outline of how you could structure such a system. Please note that this is a high-level conceptual design, and you would need to work with blockchain developers and experts to implement the actual code.

Framework

ETC adopts the layered-cascade architecture to deploy toll booths, toll stations, and a settlement center [12]. As shown in Figure [1](#), toll data are transmitted from toll booths to the settlement center. The settlement center processes the toll data, liquidates account points, and asks the card issuing company to pay the tolls which their IC cards recorded. Thus, the clearing bank can transfer money to each highway company.

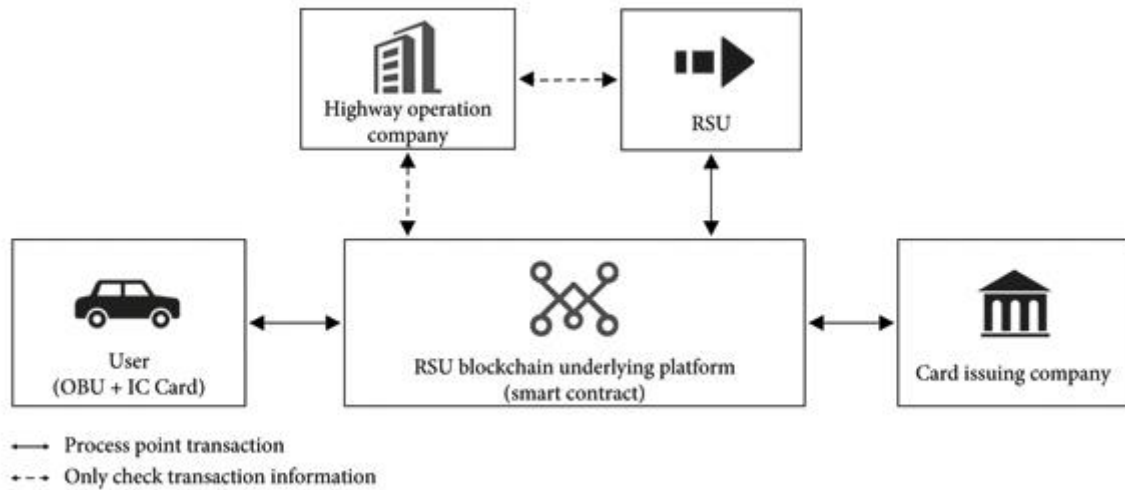


An ETC System Based on Blockchain

Targeting security issues of ETC systems, we propose a new ETC architecture based on smart contract and blockchain.

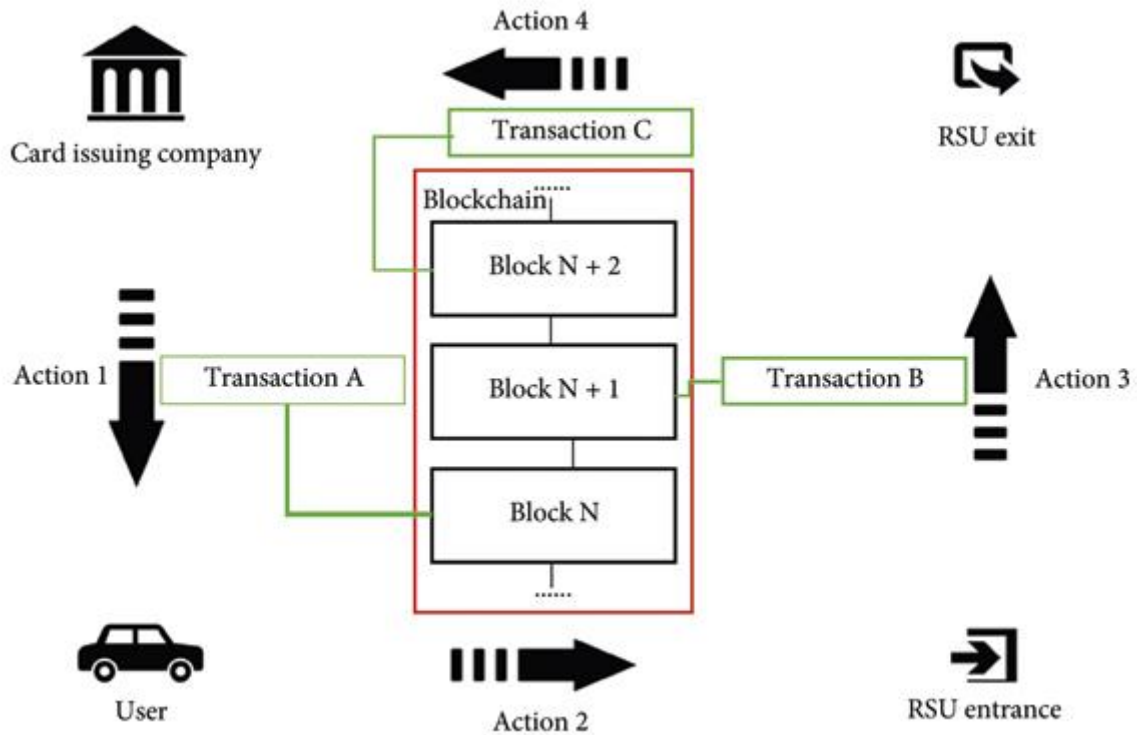
Framework

Highway Company. It manages RSUs of its own. First, it collects earning points of all its RSU exits through the blockchain underlying platform, and then asks the card issuing company to transfer the corresponding payment. Notably, highway companies do not participate in point transaction but check transaction information on the blockchain and store private key addresses of their own RSUs.



Typical Scenario

Typical scenario of the proposed architecture. Action 1 means the user registers an account in the card issuing company and buys a prepaid IC card. Action 2 indicates the RSU entrance records the user's information. Action 3 means the RSU exit charges the user. Action 4 means the card issuing company transfers the money to the highway company that the RSU belongs to according to the RSU exit's income. Transaction A represents that the card issuing company assigns certain points to the user's account.



Point Transaction Between User And Card Issuing Company

- 1) A user registers an account and obtains its own public and private keys
- 2) The user buys an IC card from the card issuing company while the card issuing company receives the corresponding money
- 3) The card issuing company reads the IC card
- 4) The card issuing company obtains the public key address of the IC card
- 5) The card issuing company transfers the corresponding points to the IC card through the smart contract
- 6) The blockchain records the transaction occurred in step 5.

