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Open platform for Tron blockchain forensics

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Abstract
This thesis addresses the lack of open-source forensic and analytical tools for the Tron blockchain. While Ethereum has robust explorers, Tron, despite its popularity, still lacks a public solution. An existing platform, Blockbook, was used for the implementation, which offers modular architecture to integrate support of new blockchains. Therefore, the solution was to create an extension to the platform to support this blockchain and to extend it with specific tools for forensic analysis – such as address attributions. The results of this work allow the public to analyze this blockchain on the first open platform for Tron.

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1. Introduction

Tron is a rapidly growing blockchain focusing on high throughput and low fees, yet it lacks an open-source explorer capable of detailed forensic analysis. While Ethereum benefits from a mature ecosystem of analytics tools, Tron—despite its high popularity still lacks a transparent, open-source blockchain explorer. This thesis fills that gap by extending the modular Blockbook platform to support Tron, enabling public access to transaction data and forensic insights.

Lack of an open-source blockchain explorer leads to several problems:

- **Limited transparency** - Without open-sourced code it is not possible to verify and validate how are data processed and shown to the user.
- **Difficult integration** - For developers, using proprietary solutions and adapting to its API can be problematic.
- **Higher costs** - Using a 3rd party API can result in high costs when a lot of data is required.

There are several publicly available blockchain explorers for Tron, such as Tronscan (being the official explorer for Tron), TokenView or OkLink. But all of the mentioned are closed-source with their definition of API and paid programs. While they offer all of the data that is needed for proper blockchain analysis, lack of a open-sourced code is a significant disadvantage.

Blockbook was chosen as an existing blockchain explorer, which, thanks to its modular architecture, offers smooth implementation of new blockchains. Tron support was integrated into that platform by implementing custom modules for Tron, such as address formats and other Tron-specific features. These changes were achieved with minimal disruption to the current system architecture.

As an extension of this thesis, the mentioned blockchain explorers were web-scraped to obtain address attributions. These attributions can significantly simplify further forensics analysis.

This work delivers:

- Comprehensive comparison with Ethereum.
- The first open-source Tron explorer based on Blockbook.
- Support of ERC-type smart contracts (TRC-20, TRC-721, TRC-1155).
- Forensic enhancements like address attributions.
- A uniform API consistent with other supported blockchains.
- 50+ millions of web-scraped address attributions.

2. Tron VS Ethereum

Tron and Ethereum share many similarities, especially thanks to the fact that **Tron is initially based on EthereumJ**, a Java client for Ethereum that is deprecated [5]. Both blockchains, therefore, support Turing-complete smart contracts, use a similar structure of transactions, and have compatible VMs. Major differences are in the consensual mechanism, resource management and network architecture. **Ethereum is using Proof of Stake** [3] with thousands of validators, while **Tron implements Delegated Proof of Stake (DPoS)** with only 27 Super Representatives (SRs), which are responsible for block production. Thanks to that, Tron transaction speed is much faster than Ethereum, but way more centralised. This problem is also described as the Blockchain Trilemma, which says that any blockchain can not be fully decentralised, secure and scalable [2]. Tron and Ethereum are shown in this trilemma in Figure 2.

There are also other differences, mainly in the resource model, where Ethereum is using a Gas system. This means that every user pays for the computational complexity of the transaction. Tron has a different model that offers a certain number of daily transactions for free, thanks to its Bandwidth and Energy model, which can be obtained by staking. Another significant difference is that **Tron is using a different address format (Base58Check)**, compared to Ethereum, which is using EIP-55 format with checksum [1]. A clear comparison of both Tron and Ethereum is shown in Table 1.

3. Blockbook

Blockbook is an open-source blockchain explorer originally developed by the Trezor company [4]. It supports Bitcoin-like blockchains, as well as Ethereum-like blockchains. **It provides both a RESTful API and a simple frontend** for users to explore transactions, blocks and addresses.

Internally, Blockbook consists of three main components: **Sync, Parser, RocksDB**. Top-view on Blockbook is shown in Figure 3.

- **Sync**
  - Ensures blockchain synchronisation and detection of new blocks.
  - Supports sequential and parallel block processing and fork resolution.
- **Parser**
  - Parses the data received from the backend Full-Node into a normalised format for indexing.
  - Every coin has its parser with support for specific functions (Smart contracts, unusual address format, etc.)
- **RocksDB**
  - High-perfomance key-value database using column families.
  - Column families are specifically designed to offer fast lookup.

4. Implementing Tron Support to Blockbook

Thanks to Blockbook's modular architecture, **it is possible to smoothly integrate the support of new coins with little to no disruption to the current system architecture.**

Tron's client, **which is originally a fork of EthereumJ**, offers an Ethereum-compatible JSON-RPC interface, although not for all methods, but for the most essential ones. This allows the existing Ethereum processing implementation to be utilised alongside additional Tron-specific features, such as the Base58 address format.

One of the main tasks of the implementation was **identifying which methods in the current implementation need to be overwritten (or wrapped)** to use as much of the current code as possible. This should allow the code to be less repeated (DRY principle).

Most of the changes were due to the Tron address format, which needs to be converted in 3 different formats, as shown in Figure 3.

5. Webscraping Address Attributions

To extend the functionality of the explorer and improve its forensic value, a custom Python-based webscraper was developed as part of the Blockchains and Decentralized Applications (BDA) course. The scraper collects publicly available address attributions from blockchain explorers. Design of the flow is shown in Figure 5.

Two blockchain-explorers were used for scraping: Tronscan and Oklink. Results from scraping **more than 300 million of addresses** are shown in Figure 6.

Obtained number of attributions is a great number that can significantly help in forensic analysis.

6. Conclusions

The goal was to create first open-sourced blockchain explorer for Tron. Thanks to Blockbook's modular architecture, Tron was successfully integrated without major disruptions of the current system. The result of this work is a functional REST API, that offers the same interface as for other blockchains. As an extension, web-scraping scripts for address attributions were developed. A total of 50 million attributions was obtained, which can further help in forensic analysis.

References

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