Architecture for the transfer of NFTs using Trustchain and Euro-tokens

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Abstract

Creating content in the digital era has never been so easy. However, the ownership of this content has often been loosely defined leading to illegal use of content. NFTs are digital certificates of physical or digital items. These certificates stored with the blockchain technology allow to provide certified ownership of digital content. However, current Blockchain technologies are not scalable. For instance, it would not be ready to handle the transation of the entire music industry to store digital certificates. The proposed architecture based on Trustchain will allow digital content to be shared, attributions to be mantained and royalties to be payed.

1 Introduction

Blockchain is defined as a technological protocol enabling data to be exchanged between different parties within a network without the need for intermediaries [2]. In the case of cryptocurrencies, the decentralisation removes the need of central banks. Currently, the creation and trading of non-fungible tokens (NFTs) is one of the largest use-cases of blockchain technology. Despite marketplaces achieving a trading volume of millions of dollars daily, traditional blockchains are suffering form scalability issues, deriving in the management and exchange of NFTs being prohibitively expensive for mass usage. At the same time, the ever-growing amount of digital content would benefit from a scalable ecosystem where artists, and their respective digital identities, enjoy the freedom of sharing their work while ensuring entitled attribution and royalty payments. In this work, we devise a fully decentralized system architecture for the management, transfer, and attribution of any digital content. Our programming interface enables any artist to quickly link their work to their verified identity and to share the content with others using the BitTorrent protocol. The enabling element of our system is a scalable and lightweight distributed ledger that is based on fraud detection instead of fraud prevention.

2 Problem Description - Incremental Digital content

The main challenge is to create an scalable architecture for the managing of incremental digital content. Currently, the largest NFT marketplaces, mainly built on top of the Ethereum blockchain, lack scalability leading to expensive transactions fees. This is mainly due to the fraud prevention approach rather than fraud detection approach proposed in this architecture. In fact, due to the verification algorithms of Bitcoin, the waiting time for a transaction has increased up to 29 minutes. In the case of Ethereum, it is only able to process around 20 transactions per seconds. This numbers are dangerously small compared to electronic payment giants like Paypal and Visa, which are able to verify around 193 and 1670 transactions per second respectively [1]. It is therefore clear, the architecture proposed should aim to increase the number of transaction per second compared to current blockchains.
On another note, the ownership hierarchy achieved with the proposed architecture allows to maintain the ownership attribution and the payment of royalties to the original content creator when its work is used as the base for other content. This enhances the content sharing and the developments of collaborative projects. For instance, in the case of an author releasing a song, a remix can be done using the original song as the main raw material and it is therefore clear that the original author should be rewarded for any income the remix author obtains. The enhancement of collaborative digital content is one of the main contributions of this research project. Furthermore, our generic solution allows for the transfer of ownership of any digital content irrespective of the digital coin.

3 Your contribution

The contribution of this research is two-fold. Firstly, it enhances the sharing, distribution and cooperation of digital content while maintaining attribution and royalties payment to the original authors in a scalable manner. Secondly, the generic architecture allows for the transfer of this digital content by any coin. This proves to be a big advantage compare to existing architectures which rely on volatile cryptocurrencies. For instance, the plummeting of the coin Ether would undermine the NFT market based on the Ethereum network.

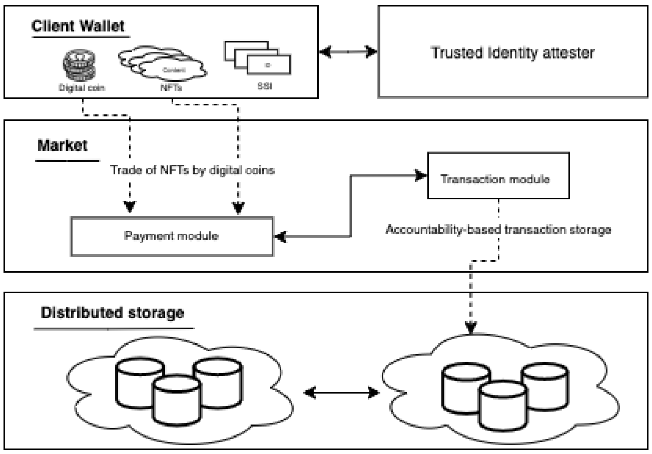

Figure 1: System architecture

We now present the proposed architecture shown in Figure 1. Firstly, the client wallet consists of the *digital certificates* the client owns, representing any physical or digital piece of content; *digital coins*, which by designed can be any digital coin; and the *verified public key*, attested by a trusted external party. Secondly, in the market section, we discern two main modules: the payment module and the transaction module. The payment module is concerned with the transfer of NFTs by the stipulated value in a specific digital coin and the payment of royalties to original creators of content. On the other hand, the transaction module relies on Trustchain and is therefore based on maintaining accountability. This leads to a fraud detection rather than a fraud prevention approach. Furthemore, this module is responsible to record the transfers and to allow the creation of collaborative content.

As explained previously, the main contributions in the proposed architecture are the possibility to trade NFTs by any digital coin; and the opportunity to build upon and transfer existing content in a scalable manner. In order to illustrate this added scalability, a comparison study between the performance of the Ethereum Network and the proposed Trustchain-based architecture will be done.

Experimental work

In this case, this section will mostly contain a description of the methods/algorithms you will be comparing. Although not all methods need to be described in detail (providing appropriate references are available), make sure that you reveal sufficient details to a reader not familiar with these methods to: a) obtain a high-level understanding of the method and differences between them, and b) understand your explanation of the results.

Improvement of an idea

In this case, you would need to explain in detail how the improvement works. If it is based on some observation that can be proven, this is a good place to provide that proof (e.g., of the correctness of your approach).

4 Experimental Setup and Results

As discussed earlier, in many sciences the methodology is explained in section 2 and this section only discusses the results. However, in computer science, most often the details of the evaluation setup are described here first (simulation environment, etc.). Very important here is that any skilled reader would be able to reproduce this setup and then obtain the same results.

Then, results are reported in an accessible manner through figures (preferably with captions that allow them to be understood without going through the whole text), observations are made that clearly follow from the presented results. Conclusions are drawn that follow logically from the previous material. Sometimes the conclusions are in fact hypotheses, which in turn may give rise to new experiments to be validated.

You may want to give this section another name.

5 Responsible Research

Reflect on the ethical aspects of your research and discuss the reproducibility of your methods.

6 Discussion

Results can be compared to known results and placed in a broader context. Provide a reflection on what has been concluded and how this was done. Then give a further possible explanation of results.

You may give this section another name, or merge it with the one before or the one hereafter.

7 Conclusions and Future Work

Summarize the research question(s) and the answers to the research question(s). Make statements. Highlight interesting elements.

Discuss open issues, possible improvements, and new questions that arise from this work; formulate recommendations for further research.

ideally, this section can stand on its own: it should be readable without having read the earlier sections.

References

[1] Om; Singh Mor Tejinder; Singh Mor Tejinder Chauhan, Anamika; Malviya. Blockchain and scalability, 2018.

[2] Nils; Regner, Ferdinand; Urbach and André Schweizer. Nfts in practice: Non-fungible tokens as core component of a blockchain-based event ticketing application, 1900.

A The obvious

A.1 Reference use

- use a system for generating the bibliographic information automatically from your database, e.g., use BibTex and/or Mendeley, EndNote, Papers, or ...
- all ideas, fragments, figures and data that have been quoted from other work have correct references
- literal quotations have quotation marks and page numbers
- paraphrases are not too close to the original
- the references and bibliography meet the requirements
- every reference in the text corresponds to an item in the bibliography and vice versa

A.2 Structure

Paragraphs

- are well-constructed
- are not too long: each paragraph discusses one topic
- start with clear topic sentences
- are divided into a clear paragraph structure
- there is a clear line of argumentation from research question to conclusions
- scientific literature is reviewed critically

A.3 Style

- correct use of English: understandable, no spelling errors, acceptable grammar, no lexical mistakes
- the style used is objective
- clarity: sentences are not too complicated (not too long), there is no ambiguity
- attractiveness: sentence length is varied, active voice and passive voice are mixed

A.4 Tables and figures

- all have a number and a caption
- all are referred to at least once in the text
- if copied, they contain a reference
- can be interpreted on their own (e.g. by means of a legend)