

EXPLORING THE POTENTIAL OF BLOCKCHAIN-BASED ASSETS

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Abstract. This study explores the potential of blockchain-based assets for issuing certificates and academic records. It examines the advantages of decentralized verification, transparency, and tamper resistance in ensuring the integrity and accessibility of educational credentials. The research evaluates existing blockchain solutions and highlights their impact on traditional record-keeping systems. The findings emphasize the potential for increased security, efficiency, and trust in the verification and transfer of certificates and academic records through blockchain technology. Future challenges and opportunities in adopting blockchain for this purpose are also discussed.

Keywords: blockchain in education, soulbond tokens, tokenization of certificates, smart contracts, asset management.

Introduction

Blockchain technology is a distributed ledger technology that allows for secure, transparent, and tamper-proof recording and verification of transactions. It is a database that is maintained by a network of computers, rather than a single entity. Each transaction on a blockchain is recorded in a block, which contains a unique cryptographic code called a hash. This hash is generated based on the contents of the block, including the transaction details and a reference to the previous block in the chain. Once a block is added to the chain, it cannot be modified or deleted. This makes the blockchain highly secure and resistant to fraud. Blockchain technology has numerous applications beyond digital currencies, such as supply chain management, identity verification, and voting systems. By providing a transparent and immutable record of transactions, it can help increase efficiency, reduce costs, and enhance trust in various fields including higher education.

Blockchain-based assets are digital assets that are issued, tracked, and managed using blockchain technology. These assets can be anything of value, such as currencies, tokens, or digital representations of physical assets like real estate or commodities. There are many benefits of blockchain-based assets:

- Decentralization and transparency
- Increased security and immutability
- Reduction of intermediaries
- Potential for automation and efficiency

Blockchain technology can facilitate automated transactions and processes, reducing the need for manual intervention and streamlining operations. Smart contracts, which are self-executing contracts that automatically enforce the terms of an agreement, are an example of how blockchain technology can automate transactions.

Blockchain-based assets can be divided into couple of different types.

- Cryptocurrencies, such as Bitcoin and Ethereum and tokens.
- Tokens are a digital dataset of information that is issued and managed on a blockchain network.

They can represent various assets, such as stocks, bonds, or real estate, utilities, or access rights, to give access to online or offline services and many more use-cases. Tokens can be created on existing blockchain platforms, such as Ethereum, or on custom blockchain. Tokens could be divided in couple major groups:

- Fungible tokens based on ERC-20 standart
- Semi-fungible tokens: They are based on the ERC-1155 standard, which limits their issuance to a small number of tokens, typically between 5 and 10

- Non-fungible tokens (NFTs) ERC-721 standart: NFTs are a type of token that represents a unique asset, such as artwork, music, or video. NFTs cannot be exchanged for one another because they are unique.
- Divisible tokens ERC-864 standart: Security tokens are digital assets that represent ownership of a real-world asset, such as equity in a company or a share in a real estate property.
- Soulbound NFT tokens (ERC-5114): are a new type of tokens. This is special type of non-fungible tokens which are supposed to stay with their owner forever. Once accepted they cannot be sold or transferred.

Use cases for blockchain-based assets:

- Payment and remittance
- Crowdfunding and fundraising
- Gaming and virtual worlds
- Supply chain management
- Identity verification and authentication
- Real estate and property rights
- Intellectual property rights
- Issuing of official documents

Identity verification and authentication: Blockchain-based assets can be used to facilitate secure and decentralized identity verification and authentication. By using blockchain technology to store and manage personal information, individuals can have more control over their data and can easily verify their identity without the need for intermediaries.

Intellectual property rights: Blockchain-based assets, such as NFTs, can be used to represent ownership and provenance of digital content, such as artwork, music, or videos. By using blockchain technology to store and manage ownership information, creators can protect their intellectual property rights and earn royalties for their work.

Blockchain empowers secure issuance of official documents and certificates, guaranteeing immutability, transparency, and decentralized verification. It bolsters trust by eradicating risks of fraud and tampering, facilitating convenient access, efficient verification, and seamless ownership transfers. It eliminates the need for traditional paper-based certificates, enabling efficient authentication and reliable record-keeping.

2. Examples of using blockchain and smart contracts in education

There are a couple of examples of the application of this technology in education, such as blockchain-based academic records, grade and attendance tracking systems and the creation of NFTs for student projects and artwork.

- Blockcerts is an open standard for issuing digital certificates
- Open Badges is an initiative aimed at providing a standardized way of verifying achievements.
- Sony Global Education has developed a standard for a "digital educational and qualification portfolio".
- Edublock aims to provide transparency in the management of student data in educational institutions.

3. Exploring the possibility of integration of certificate and diploma issuance on blockchain through a Moodle plugin.

We are working on implementing new features in Trakia Digital University, where we are using system based on Modular Object-Oriented Dynamic Learning Environment (Moodle). Our goal is to explore the possibilities of issuing certificates, diplomas, and other official documents through a newly developed plugin.

A survey has been conducted among the students, which confirms the need for tracking academic achievements in a secure and transparent manner.

4. Challenges and considerations

The issuance of certificates on the blockchain presents both challenges and important considerations. One of the primary challenges is ensuring the authenticity and integrity of the certificate data. Overcoming these challenges and addressing the associated considerations is essential for successful and widespread adoption of certificate issuance on the blockchain.

- Regulatory and legal issues. Blockchain-based assets are still a relatively new and evolving technology, and as such, there are many regulatory and legal challenges that need to be addressed. For example, there may be questions around whether certain types of blockchain-based assets are

considered securities or not, and how they should be regulated accordingly. It's important for businesses and investors to stay up-to-date on the latest regulatory developments and compliance requirements.

- **Regulatory and legal issues: Technical limitations and scalability:** Blockchain-based assets are currently facing technical limitations and scalability challenges. For example, some blockchain networks have limited processing power and can only handle a certain number of transactions per second, which may limit their ability to scale to meet growing demand. Additionally, there may be issues around interoperability between different blockchain networks and standards, which can make it difficult to transfer assets between different networks.
- **User adoption and education:** Blockchain-based assets are still relatively new and unfamiliar to many people, which can make it challenging to gain widespread adoption and understanding. Businesses and investors may need to invest in education and awareness campaigns to help people understand the benefits and potential of blockchain-based assets, and to build trust and confidence in the technology.
- **Environmental impact of blockchain-based assets:** The process of mining cryptocurrency and validating transactions on some blockchain networks can consume large amounts of energy, which can have a significant environmental impact. As the use of blockchain-based assets grows, it will be important to develop more sustainable and energy-efficient methods for validating transactions.

5. Conclusions:

- Blockchain-based assets offer benefits such as decentralization, transparency, increased security, and potential for automation and efficiency.
- The potential use cases for blockchain-based assets are numerous and diverse, and will likely continue to expand as the technology develops and matures.
- Blockchain-based assets have the potential to change the way we think about ownership and proofing of authenticity. Blockchain offer new opportunities for issuance of official documents, diplomas and other decentralized academic records. The benefits of blockchain-based assets make them an attractive option for various use cases. However, there are also challenges and considerations, such as regulatory and legal issues and technical limitations.