

Project Proposal

Level 4

Enhancing Trust and Efficiency of Decentralized Equity Investment Platforms Using DAG-based Blockchain Architecture

Troyrangers

Faculty of Information Technology

University of Moratuwa

2024

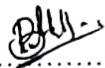



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Troyrangers

Group Members

Name	Index Number	Signature
Dissanayake D.M.B.M.	204047J	
Herath P.A.U.D.	204074M	
Jayathilaka P.H.P.	204087F	
Karunaweera R.L.	204096G	

Supervisors

Supervisor	Signature	Date
K.A. Dilini T Kulawansa		09/10/2024
Dr. M.F.M. Firdhous		09/10/2024

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Introduction

Decentralized Finance (DeFi) is transforming traditional financial systems by leveraging blockchain technology to create decentralized, transparent, and secure financial services without the need for intermediaries like banks or brokers [1]. While DeFi applications such as lending, borrowing, and trading have gained widespread traction, equity investment platforms continue to rely heavily on centralized structures, posing challenges such as high transaction costs, security vulnerabilities, and limited accessibility. Furthermore, centralized equity platforms often struggle to maintain investor trust and efficiency, especially when it comes to ensuring transparency and reducing the complexity of transactions.

This research aims to explore how Directed Acyclic Graph (DAG)-based blockchain architecture can address these limitations in equity investment platforms. Unlike traditional blockchain structures, DAG offers enhanced scalability, faster transaction finality, and higher throughput, making it particularly suitable for environments with high transaction volumes, such as equity markets[2]. By utilizing DAG-based blockchain, we aim to build a platform that enhances trust, efficiency, and transparency while addressing key issues such as security, regulatory compliance, and global accessibility.

The proposed research will focus on optimizing the equity investment process by integrating DAG's unique features with decentralized governance and identity management protocols. This will not only minimize the need for intermediaries but also ensure compliance with regulatory standards such as Know Your Customer (KYC). We hypothesize that DAG-based systems, by enabling faster, more secure, and highly efficient transaction processing, can revolutionize the equity investment landscape and make equity markets more accessible, secure, and trustworthy.

Background & Motivation

Decentralized Finance (DeFi) has seen rapid growth, with increasing interest in decentralized equity investment platforms that offer enhanced transparency, security, and efficiency over traditional, centralized systems. However, equity investments continue to depend on centralized platforms, which introduce challenges such as high transaction costs, limited scalability, and security vulnerabilities stemming from intermediaries. These limitations have driven the need for decentralized solutions that can better meet the demands of modern equity markets[3].

Many existing decentralized platforms use traditional blockchain models like Bitcoin and Ethereum, but these face significant scalability issues and transaction bottlenecks, particularly in high-frequency trading environments[4]. As a result, they struggle to deliver the speed, efficiency, and trust required for equity investments. To address these challenges, this research proposes leveraging **Directed Acyclic Graph (DAG)-based blockchain architecture**, which supports parallel transaction processing for increased

scalability, faster finality, and reduced network congestion, making it ideal for the fast-paced nature of equity trading.

In addition to scalability, trust and regulatory compliance are critical for equity investment platforms. This research incorporates **decentralized identity verification** and **Know Your Customer (KYC)** protocols to ensure regulatory compliance while protecting user privacy through cryptographic techniques[1]. Our motivation stems from prior experience with blockchain technology, where we developed a decentralized vehicle registration system, inspiring us to explore blockchain's potential in the equity investment space. By enhancing scalability, security, and compliance, our **DAG-based equity investment platform** aims to set a new standard in decentralized finance.

Problem in Brief

While Secure Equity Investment Platforms (SEIPs) exist, the majority are either centrally controlled or fail to meet the growing demands for scalability, efficiency, and regulatory compliance. Centralized platforms carry significant risks, including high transaction costs, limited transparency, and susceptibility to security breaches. Even when decentralized, many SEIPs lack critical features such as integrated Know Your Customer (KYC) compliance, which is increasingly necessary to meet global regulatory standards and protect against fraud and illegal activities.

Moreover, many decentralized equity platforms continue to rely on traditional blockchain structures that use some token standards. These token standards, while widely used, present significant cost inefficiencies, especially in high-frequency trading environments typical of equity markets. High gas fees associated with executing transactions on these platforms make them expensive and impractical for large-scale equity trading. The cost of maintaining and executing trades in these systems can become a major barrier to accessibility and adoption[5].

Another critical issue is the scalability and efficiency of existing decentralized platforms. Many blockchains, particularly those relying on linear chains, struggle with transaction bottlenecks and congestion as the network grows. This results in delays and reduced performance, which are unacceptable in equity markets that demand real-time transaction finality. Additionally, centralized control over many of these platforms introduces significant security vulnerabilities, as centralized systems are often more prone to attacks or manipulation[6].

The absence of a highly scalable, secure, and cost-effective decentralized solution that integrates regulatory compliance mechanisms such as KYC remains a key gap in the current landscape of SEIPs. This research seeks to address these challenges by exploring how DAG-based blockchain architecture can enhance both the trust and efficiency of equity investment platforms, providing a decentralized solution that overcomes the limitations of existing systems.

Aim & Objectives

The aim of this research is to enhance trust and efficiency of decentralized equity investment platforms by utilizing DAG-based blockchain architecture, ensuring scalability, security, and compliance with integrated KYC identity management.

- To develop a decentralized equity investment platform using DAG-based blockchain architecture.
- To improve the scalability and transaction efficiency of equity investment platforms through DAG's parallel transaction processing capabilities.
- To implement decentralized identity management mechanisms that integrate KYC processes for regulatory compliance while preserving user privacy.
- To ensure trust and security by leveraging cryptographic techniques and DAG's inherent resilience to network congestion and attacks.
- To provide a model that addresses the current limitations of decentralized equity investment platforms, balancing trust, compliance, security, and scalability.
- To prepare the final documentation and technical report for academic submission.

Proposed Solution

This research proposes a **DAG-based Blockchain Secure Equity Investment Platform** to enhance trust, efficiency, and scalability in equity markets. The platform leverages **Directed Acyclic Graph (DAG)** technology for faster, scalable transactions and integrates decentralized identity management with **Know Your Customer (KYC)** protocols for regulatory compliance and privacy protection.

Technology Adapted

The platform uses DAG-based blockchain architecture, which supports parallel transaction processing, improving scalability and performance without block confirmations. This is particularly beneficial for high-frequency equity trades, reducing bottlenecks and enabling real-time processing. Additionally, a decentralized KYC system ensures that all participants—companies and investors—meet regulatory standards like Anti-Money Laundering (AML) and Counter-Terrorist Financing (CTF), maintaining compliance while protecting personal data through cryptographic techniques.

Nature of the Solution

The proposed platform enables companies and investors to participate by first completing KYC (Know Your Customer) verification to ensure compliance with regulatory standards. Once verified, companies can list their equity offerings as secure digital tokens on the platform. The Directed Acyclic Graph (DAG) architecture enables efficient, near real-time processing of transactions, eliminating the need for intermediaries, which reduces transaction costs and enhances accessibility to global markets. The platform

outputs a decentralized, secure, and compliant environment for equity token trading, providing benefits such as cost reductions and increased security for both companies and investors. The users of the platform include companies that register, complete KYC, and list equity tokens, as well as investors who go through the KYC process and trade equity tokens securely.

Feasibility of Implementation

The proposed platform is highly feasible due to existing **DAG-based frameworks** (e.g., IOTA, Fantom) and decentralized KYC tools. DAG's architecture supports low-cost, high-speed transactions, while widely adopted smart contract frameworks automate processes like token issuance and trade settlement.

Capability to Solve the Problem

This solution effectively addresses several core challenges in equity markets. The DAG-based architecture enhances scalability and efficiency through parallel processing, allowing for faster transactions suitable for high-frequency trading environments. Decentralization ensures greater trust and security by creating an immutable and transparent system, reducing the risk of fraud and manipulation. Integrated KYC systems ensure regulatory compliance without compromising user privacy, while the elimination of intermediaries and reduction in transaction costs improve the platform's accessibility and cost efficiency for users globally.

Resource Requirements

- Server 1 - To host test blockchain
 - 2 core CPU
 - 4 GB RAM
 - 50 GB Storage
- Server 2 - To host the system
 - 2 core CPU
 - 4 GB RAM
 - 50 GB Storage

Reference

- [1] P. K. Ozili, “Decentralized finance research and developments around the world,” *Journal of Banking and Financial Technology*, vol. 6, no. 2, pp. 117–133, Oct. 2022, doi: 10.1007/s42786-022-00044-x.
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- [6] A. Alamsyah, G. N. W. Kusuma, and D. P. Ramadhani, “A Review on Decentralized Finance Ecosystems,” Mar. 01, 2024, *Multidisciplinary Digital Publishing Institute (MDPI)*. doi: 10.3390/fi16030076.

Appendix A – Plan of Action

Task	September			October			November			December			January			February			March			April			May			June			July			August		
Idea Generation																																				
Proposal Preparation																																				
Research																																				
Interim Preparation																																				
Implementation																																				
Testing																																				
Final Evaluation																																				