A Secured Miner-Independent Blockchain Architecture Leveraging Computational Resources for Trustless Transactions

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Abstract

This research paper introduces an innovative blockchain model aimed at eliminating human intervention from transaction processing. It relies solely on the computational resources of miners, such as hashing capabilities and machine hash rates, while ensuring miners have no authority over block generation or transaction selection. By adopting this groundbreaking approach, the model seeks to enhance decentralization, security, and fairness within the blockchain ecosystem, ultimately fostering a trustless environment. Through a comprehensive analysis of the mechanisms driving this miner-independent model, the paper explores its potential to revolutionize the blockchain landscape.

Ⅰ. Introduction

Blockchain technology has revolutionized trust and decentralization, challenging traditional record-keeping systems [1]. The consensus mechanism lies at the core of blockchain networks, ensuring security and immutability [4]. However, existing models, influenced by miners or validators, pose limitations. Transactions begin in the MEMPOOL, awaiting validation for inclusion in the ledger [2]. Miners or validators, driven by transaction fees, select and process transactions, introducing a dependency on human actors, undermining decentralization [3]. This paper proposes an autonomous, minerindependent blockchain ecosystem, minimizing human intervention and relying solely on computational resources. It introduces a systematic process for transaction collection and storage, aiming to reduce centralization and enhance security. By overcoming limitations of traditional models like PoW and PoS, the proposed ecosystem mitigates the threat of the 51% attack [5]. It decouples human decision-making from transaction processing, balancing efficiency, security, and decentralization. Through rigorous analysis, this paper explores the operational intricacies and implications of the proposed model, offering a promising evolution in blockchain technology.

Ⅱ. Proposed Methodology

In our proposed model, the entire system operates autonomously, free from human intervention. All processes, from block generation to block attachment, are automated. This blockchain system relies solely on miners' computational resources, such as hashing capabilities and machine hash rates, with no input or control from miners regarding block generation or transaction competition. The complete procedure is segmented into the following 6 stages:

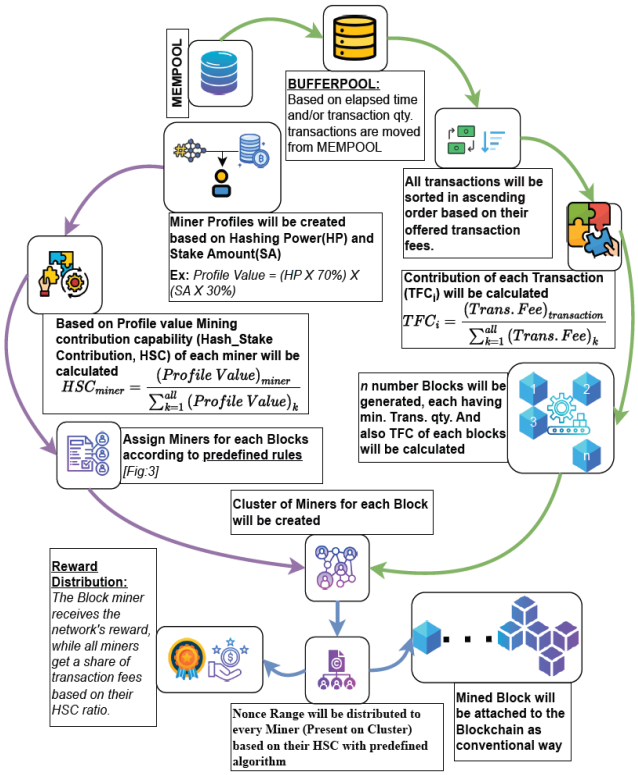

Fig. 1. Flow diagram of proposed model

1. Transaction collection. 2. Creating blocks from the transactions stored in the Buffer POOL. 3. Generating a Hash Stake Contribution (HSC) profile for each miner. 4. Allocating blocks among miners and Forming miner groups for each block. 5. Distributing nonces to miners within each group. 6. Establishing a mining reward mechanism. The overall process flow is shown in Fig. 1.

The mining process begins by collecting transactions from the MEMPOOL and organizing them into Buffer POOLs based on transaction fees as Fig. 2.

Transactions are sorted, and mining pending blocks are created sequentially, each with a minimum transaction quantity. Transaction Fee Contribution is calculated for each transaction, and Total TFC for each block is determined by summing the TFCs of its transactions.

Hash Stake Contribution (HSC) profiles for miners are

computed from their hashing power and stake amount. Miners are then assigned to mining pending blocks based on their HSC and the block's TFC, following predefined rules to ensure fairness according to the

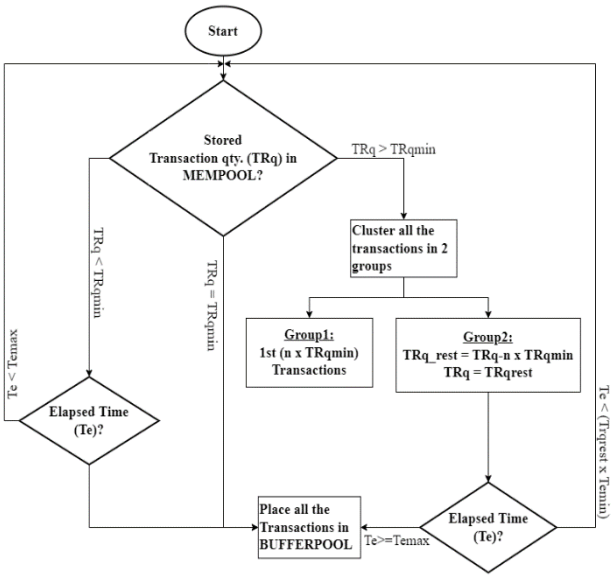

Fig. 2. Flowchart of collecting Transactions from MEMPOOL

flow diagram presented in Fig. 3. Nonces, essential for block mining, are distributed to miners proportionally to their hashing power.

Miners successfully mining a block receive the assigned reward, while others in the cluster obtain transaction fees based on their individual contribution. This ensures equitable distribution of rewards based on each miner's contribution to the mining process, optimizing efficiency and fairness.

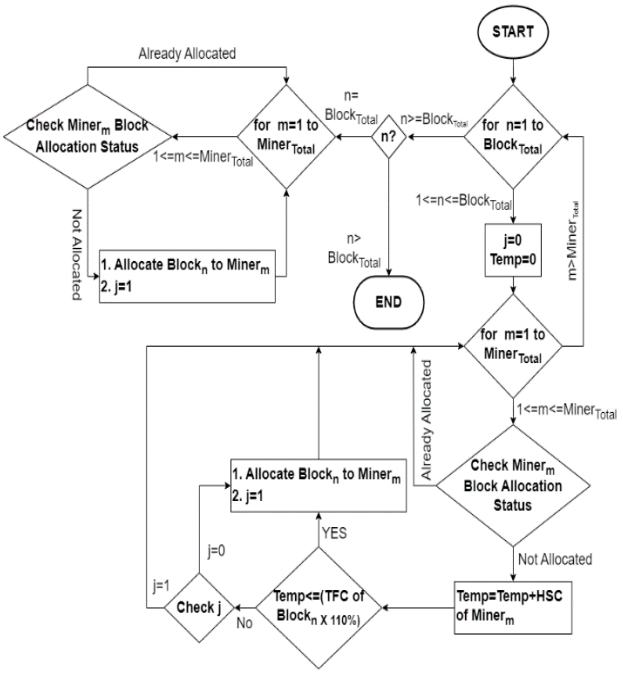

Fig. 3. Flowchart of Block distribution among Miners

III. Conclusion and Future Work

In our proposed work full Blockchain network will be operated by the system not by any node or group of nodes and system will do all the tasks based on various algorithms. Based on requirement system will be able to prioritize miner's Hashing Power/ Hash rate or miner's stake value. So, The Blockchain network will be fully Human/ Miner/ Node independent, and the Block mining won't be dependent or controlled by only Hashing Power or by Stake amount or by other parameters which fully belongs to miner or human. As a result, all types of miners will get the opportunity to participate in Block mining, and due to synchronous Block generation method, no transaction will be in waiting queue for long time. Also due to miner independency 51% attack and biasness is quite impossible.

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