Chapter 15
Improving the Blockchain Protocol for 5G, Web3, and Edge Computing Applications

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ABSTRACT

The abstract highlights the potential of integrating blockchain into 5G networks and the Metaverse and proposes an enhanced blockchain protocol for various applications. It emphasizes the transformative nature of 5G and blockchain technologies and their ability to revolutionize industries. It also discusses the capabilities of blockchain, such as smart contracts and decentralized storage, and the opportunities it presents for in- novative 5G services. It also addresses the challenges and open research problems in this domain. Furthermore, it explores the application of blockchain in the Metaverse, focusing on security, privacy, and scalability concerns. The proposed innovation aims to improve the blockchain protocol to effectively support 5G, Web3, Edge Computing, Metaverse, and many more applications. It prioritizes immutability, confidentiality, and availability and offers advantages to interaction and digital experiences. The objective is to create a protocol that meets diverse industry requirements while considering different approaches to achieve its goals.

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1. INTRODUCTION

Blockchain research has grown in prominence in recent years due to the emergence of cryptocurrencies such as Bitcoin, Ethereum, Solana, Polygon, Cardano, and Polkadot. Blockchain is a distributed, trusted, and immutable method of storing and distribut- ing data that does not require centralized dependencies or intermediaries to check/vali- date transactions or mine. Blockchain provides a more straightforward mechanism for transparently accessing ledger-based transactions via networks. It increases calculation speed dramatically by connecting with varied processing powers from multiple nodes in the blockchain network.

Blockchain technology employs a distributed network to store data in tamper-proof for- mats. Existing blockchain transactions cannot be amended since they can only be al- tered or added by establishing new hash values. The Blockchain's distinctive features include distributed ledger, P2P networking, consensus process, hash cryptography, min- ing, provenance, immutability, finality, and smart contracts. Blockchain technology can improve transparency and security by eliminating all intermediaries or third parties.

Duplicating a blockchain network in another location, such as an insurance provider, is feasible. Blockchain is connected to a network that shares data and assures that the data is accurate, dependable, and consistent. We can add data to a blockchain from any location and disseminate it to several sites on the same network. The data is shared throughout multiple network locations, eventually disseminating it to the entire network and providing location access to the most recent data.

Transactions that are verified and validated using a distributed ledger become immutable in a consensus-based Blockchain network with a complex working sequence and secure ledger technology. When any network node requests a transaction on a Blockchain network, the necessary processes are taken to complete the transaction. These transactions are subsequently distributed to peer nodes in the peer-to-peer network. Then, it generates a unique and connected hash from a prior hash, resulting in an unbreakable network of transactions. The network node, smart contract, or consensus will validate any attempt to attach a transaction. This immutable ledger, thus, cannot be altered. It can only be used with block transactions. An algorithm determines whether or not the user is authentic. When a transaction is validated, it is added to the ledger, forming a new block in the network. As shown in Figure 1 the block's structure consists of an Index, Timestamp, Data, and Previous and Current block hashes. A new block is then added to the distributed chain to make it immutable and tamper-proof.