Chapter 8
The Green Revolution of Smart Contracts:
How Innovative Architecture Is Driving Performance, Pollution Reduction, and Energy Conservation

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ABSTRACT

The focus of this study is to examine the challenges associated with smart contracts and their overall concept. The research proposes a solution that can effectively address all the current issues related to smart contracts. Furthermore, the study recommends a new architecture for smart contracts and blockchain. The author identifies the problems, conducts an analysis, and presents a solution that will enhance the performance of smart contracts, increase their extensibility, and promote an eco-friendly environment by reducing pollution and conserving energy.

INTRODUCTION

For more than ten years, blockchain has been recognized as a technology that functions as a distributed database (Bernstein & Lange, 2016). It is utilized to track financial transactions involving various types of cryptocurrencies (Brown, 2016) like BTC, ETH, and others. Transactions are processed through a peer-to-peer network, which decentralizes the network participants and grants them equal privileges. This network architecture differs from the traditional client-server architecture, where clients are dependent on the server. If the server is down, no client can connect and perform transactions (Heuvel, 2014).

Blockchain technology (see Figure 1) also introduced the concept of smart contracts, which was first proposed by Nick Szabo in the 1990s (Szabo, 1997). The idea is straightforward: a smart contract is a computer program that verifies various conditions and decides which function(s) to execute to perform the smart contract.

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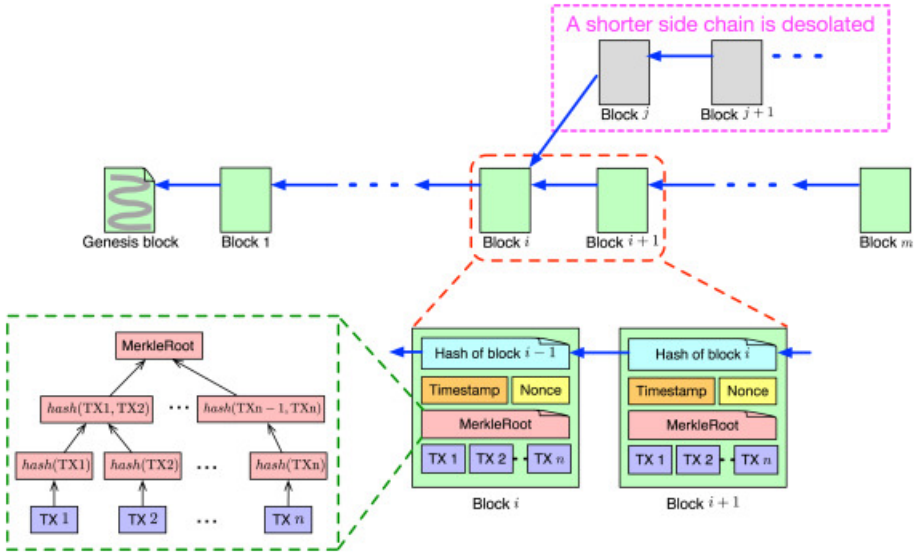
Figure 1. Illustrates a typical blockchain schema



Bitcoin is widely recognized as the first cryptocurrency that gained global popularity, although an earlier version had appeared in the early 1990s (Li et al., 2017). Bitcoin's blockchain primarily focuses on financial transactions, and it doesn't contain any other data. Ethereum is the second well-known cryptocurrency that introduced the concept of smart contracts into the blockchain world (Nguyen, 2019; Nguyen et al., 2019; Atzei et al., 2017). Smart contracts are small programs that run on the blockchain when triggered by a request, allowing users to add more logic to the blockchain beyond financial transactions, including creating simple games. From a technical perspective, a smart contract is treated as a user that can send and receive transactions and has a record of different states, or variables, which can be changed or read on the blockchain (Szabo, 1997; Pearce, 2021).

Blockchain technology has revolutionized the way we conduct transactions and store data. Smart contracts, in particular, have gained immense popularity due to their ability to automate and execute agreements without the need for intermediaries. However, the current architecture of smart contracts has several limitations that hinder their full potential. The current approach is too slow and limited, consuming too much electricity, and has scalability issues. These limitations make it difficult for blockchain technology to reach its full potential and make it less attractive to businesses and developers. Furthermore, security vulnerabilities and lack of interoperability between different blockchain networks pose serious threats to the integrity of the technology. Inflexibility in the current architecture of smart contracts also makes it difficult to modify and upgrade the contracts when needed (Galiautdinov & Mkrttchian, 2019a, 2019b; Galiautdinov, 2020a). Changing the architecture of smart contracts can address these limitations and provide more flexibility, adaptability, and scalability to blockchain technology. It can also enable interoperability between different blockchain networks, allowing for seamless transactions and communication between them. A new architecture can also make smart contracts more secure and less prone to hacks, ensuring the safety and integrity of the transactions. In addition, a new architecture can attract more developers and businesses to adopt blockchain technology, leading to increased innovation and growth in the industry. The current architecture of smart contracts has limited adoption as it