Chapter 6
Blockchain Implementation Using Python

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ABSTRACT

This chapter covers an introductory overview of blockchain using Python code. This chapter will give a basic understanding of using Python codes in development of blockchain. The chapter throws light on beginner-level blockchain creation which will help in understanding developing an advance blockchain project using Python codes. This chapter covers basic building blocks which will help in creating various functions and methods to enhance the blockchain in terms of security. This will also help students in creating advanced level of Python program in creating better mining algorithms, better queue management, enhanced and secured transactions, consensus algorithm, wallets, and accounts.

PREFACE

The motivation for this writing is originally triggered for my passion into network security and data leak prevention. Due to innovation of latest technology and at the same time rise in breach of digital security, there are greater needs for a technology which has high rate of data security, tamper proof and data leak prevention. With a hope to achieve this success, blockchain technology claim to produce a same effect of data security, needless to say that using this technology, data tampering is immutable where the entire information is stored in blocks and hashed. The use of this technology is not restricted only to cryptocurrencies but being used in other industries like logistics, supply chain, healthcare and so on. This chapter discuss an introduction to blockchain using python code. The change in the outlook and market trends due to the usage of this technology which is future proof with high level of data security without the involvement of any central authority.

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It is my interest to find out those latest trends in blockchain technology, future developments and a platform to use in various platforms. In reality, the success credit goes to everyone who was involved to make this writing a success.

INTRODUCTION TO BLOCKCHAIN

Blockchain can be said as a public ledger which is distributed across systems irrespective of geographical locations. The ledger is stored and updated across many systems across the world. The man behind the blockchain technology is Satoshi Nakamoto. The white paper of blockchain was submitted in 2009 where the technology exhibits peer to peer, decentralization, consensus algorithm and use of technology without the intervention of any third party. Initially the technology was exclusively meant for bitcoin but on later stage the functionality extended to every line of business with its attribute of high security, append only, decentralized network and most importantly does not require any third party approval (Jena et al., 2019). The usage of currency is not new and had been in vogue since medieval period. The common method of transactions during ancient times were barter method, as the settlements were done in exchange of items of same corresponding value like metals, precious stones etc. Advent of development, the transactions took a drastic change with introduction of coins and notes. The centralized authority is responsible for generation of these currencies and has full control over it. The government, regulatory body has a strong hold on these currencies and has full authority on circulation. These currencies are fixed and doesn't decline with period. During recent times, introduction of floating currencies made transactions easy and quite faster. However these transactions which involves, record keeping, identification and verification, transfers are centrally managed. Information technology has made life easy with users to execute transaction at any point in time but however the cyber threat is a challenge. The vulnerabilities are still there and has already made a footprint of losses globally. The transactions are centrally managed and non-visible. Data and transactions can be modified, tampered, spoofed with well orchestration of IT vulnerabilities and loop holes. In fact the data can be a threat from an internal traitor as well. There are various other factors and ways of violating critical data which is centrally managed. The Blockchain technology which during its manifestation stage introduced Bitcoin to start a parallel economy claim to solve these problems. Blockchain uses decentralized and distributed network along with distributed ledger which doesn't require any intervention of third party or centralized authority to approve or manage. Bitcoins currency is said to be the mother of cryptocurrencies and was the first currency introduced using the blockchain technology (Jena et al., 2020). The ledger copy of bitcoin is already shared among the nodes and each nodes holds the same copy of this distributed ledger. The sender uses private and public key to sign and encrypt the transaction to send to a receiver. These transactions can be authenticated with the public key by anyone but can only be deciphered with the sender's private key. A group of people known as "Miners" known for validating transactions and accumulate these transactions with other transactions into a block for which they are paid some rewards. This process is also known as mining. After the mining process, once the block is generated and the shared ledger is updated to all nodes, the receiver is said to have received the amount. These transactions are transparent and cannot be modified or tampered. Bitcoin, digital cryptocurrencies invention was an innovation, however the blockchain technology has evolved these years with different types of consumptions. Industries has started finding ways to use this secured technologies in various forms such that the data remains secured, un-tampered, decentralize and no control of any party. Ethereum, an open source cryptocurrency and blockchain platform, has