Chapter 11
A Comprehensive Guide to Blockchain Technology and Its Role in Enhancing Cyber Security and Combating Social Engineering

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ABSTRACT

This book chapter will provide an in-depth exploration of blockchain technology, covering its history, fundamental principles and practical applications. The chapter begins with an introduction to the decentralized nature of blockchain, explaining how it works to provide security, immutability and transparency in a trustless environment. It also examines various types of blockchain including public, private and permissioned and explores the advantages and limitations of each. This chapter looks at the future of blockchain technology discussing emerging trends and potential developments in the field. It highlights ongoing research and development efforts aimed at improving the functionality and security of blockchain, as well as exploring new use cases and business models. Overall, this book chapter will provide a comprehensive introduction to blockchain technology, offering insights into its workings, practical applications and potential impact on various industries.

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1.1 INTRODUCTION TO BLOCKCHAIN

Blockchain is supposed to be the technology of the future. A group of researchers first proposed the core structure for blockchain in mid-1991. The concept was originally designed to ensure the authenticity of digital documents, preventing them from being backdated in the future. In 2008, an anonymous researcher Satoshi Nakamoto issued a research article titled "BitCoin: A Peer-to-Peer Electronic Cash System. Blockchain is a cooperative and decentralized ledger where transactions are digitally documented and interconnected, creating a complete historical record of an asset. It stores data in blocks that are subsequently chained together (Jia, Chen, Liu, Wang, Xiao, & Xu, 2023). Upon the arrival of new data, it is incorporated into a newly created block. Once the data in any particular block are finished or accomplished, that is then chained or attached to its previous block, which results in a chain of data that is arranged in chronological order. Once a data block is linked to another, its information cannot be changed or modified again. Blockchain technology is used to securely transfer items such as money, property, and contracts without the intervention of a third-party middleman such as a bank or government. Every block within the chain comprises multiple transactions and when aany new transaction takes place on the blockchain then a record of that transaction is added to the ledger of every participant. Each block on the chain is made up of several transactions, and each time a new transaction occurs on the blockchain, a record of it is recorded to each participant's ledger.

1.1.1 Blockchain Components

Blockchain has generally following components:

1. **Blocks:** A block in a blockchain is a digital record containing information about transactions. It contains information about transaction. Block is made of header & long list of transactions. Every block has a unique hash and nonce assigned to it.
2. **Ledges:** Ledger is list (chain) of blocks of transaction. Distributed nodes facilitate the connection of nodes to the chain. Participants can see only appropriate transactions.
3. **Node:** Node is a computer system which has its own copy of ledger. Nodes update its copy of ledger based upon the consensus of the network. A node does transaction processing and blocks creation.
4. **Minors:** It is a group of participants, commonly called miners who ensure the accuracy and legitimacy of network transactions.