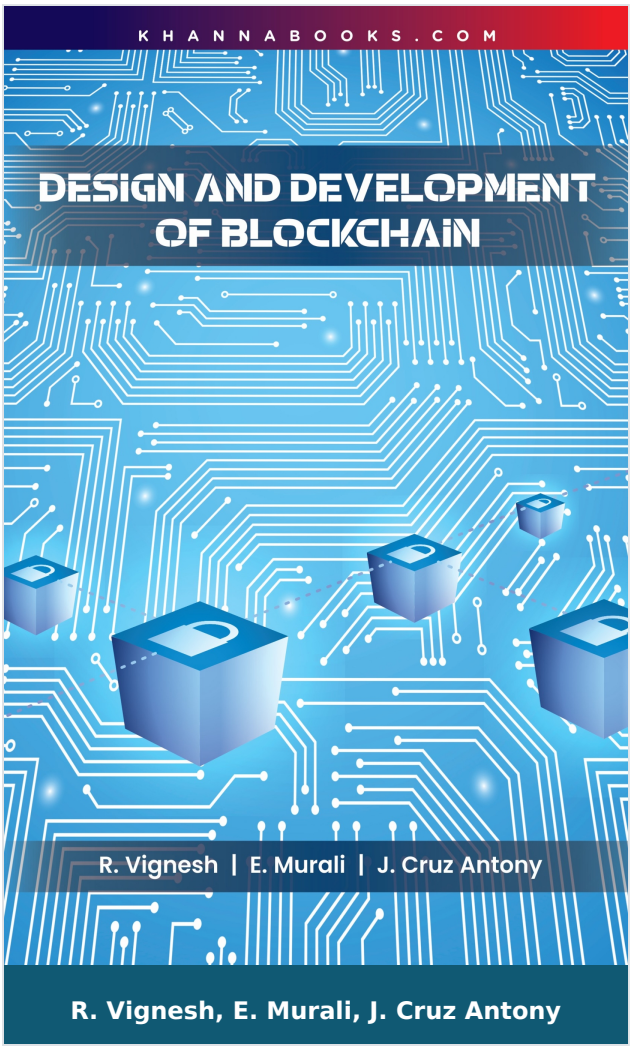

Design and Development of Blockchain

Author :	R. Vignesh, E. Murali, J. Cruz Antony
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Product Description

"Design and Development of Blockchain" offers a comprehensive and practical guide to understanding the fundamentals and applications of blockchain technology. The book bridges the gap between theoretical concepts and hands-on implementation by providing detailed coverage of Distributed Ledger Technology (DLT), consensus mechanisms such as Proof-of-Work (PoW) and Proof-of-Stake (PoS), and the principles of cryptoeconomics. Discussions are grounded in real-world blockchain platforms, including Bitcoin and Ethereum.

The primary objective of the book is to equip readers with both conceptual knowledge and practical skills needed to design, implement, and innovate blockchain solutions. It explains decentralization in depth, covering decentralized computing, storage, and communication systems. The text also explores Smart Contract and Decentralized Application (DApp) development while addressing important industry challenges such as scalability, energy efficiency, and security. Additionally, it examines blockchain integration with Artificial Intelligence (AI), Internet of Things (IoT), and Cloud Computing.

This book serves as a valuable resource for students, researchers, developers, and industry professionals interested in building secure, efficient, and future-ready blockchain-based systems.

Salient Features:

- • Cryptoeconomic Principles: Explores the economic incentives and cryptographic security mechanisms that resolve the Byzantine General's Problem in decentralized P2P networks.

  • Architectural Components: Details the core building blocks of a blockchain, including blocks, hashing, digital signatures, and the structural variations in Bitcoin

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and Ethereum blocks.

• Practical Consensus: Clarifies the operation, advantages, and energy trade-offs of major consensus algorithms, such as Proof-of-Work (PoW), Proof-of-Stake (PoS), and other hybrid models.

• Hands-on Chain Building: Provides a step-by-step guide to developing an independent blockchain, covering P2P network creation, Genesis Blocks, registering miners, and block storage.

• Ethereum Development: Offers practical instruction on setting up the Ethereum environment using developer tools like Ganache and Truffle Suite to create, test, and deploy functional Smart Contracts.

• Decentralization Ecosystem: Focuses on achieving full ecosystem decentralization for computation, storage, and communication, along with developing decentralized applications (DApps) and DAOs.

• Emerging Technology Integration: Delves into the intersection of blockchain with AI, IoT, and Cloud Computing, showcasing how it enhances data integrity, network security, and automation in various sectors.

• Security and Challenges: Addresses key technical and commercial hurdles, including scalability limitations, energy efficiency concerns, regulatory frameworks, and mitigating DDoS and Sybil attacks.

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