Chapter 3
Blockchain Primer:
Introduction to Blockchain Foundations and Implementation

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ABSTRACT

Blockchain technology has the potential to revolutionize several industries including finance, supply chain and logistics, healthcare, and more. This primer introduces readers to basic development skills to blockchain foundations including blockchain cryptography, the consensus algorithm, and smart contracts. Further, this primer explains stepwise how to implement and deploy basic data stores using blockchain with Python. The primer serves as a succinct introductory guide to blockchain foundations by relying on a case study illustrated with visuals together with instructions on implementation. This primer is intended for educators, students, and technology enthusiasts with foundational computer science and Python development skills.
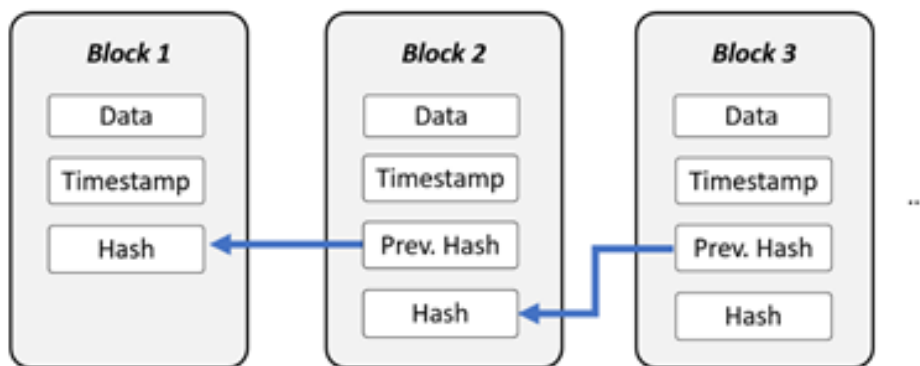
INTRODUCTION

Blockchain technology has rapidly become a disruptive technology for a host of industries including finance, healthcare, real estate, and more, thanks to its ability to assure data privacy, ownership protection, and manage huge volumes of data.

The first realization of blockchain began in 2009 with cryptocurrencies, particularly, the Bitcoin blockchain, a secure, peer-to-peer digital monetary system (Wallac, 2011). Since then, numerous other manifestations of blockchain technology have emerged ranging from securely transferring medical data (Burstiq, 2021) to automating and securing real estate transaction (Propy, 2021) and to identity and credential management (Evernym, 2021).

Simply put, a blockchain is a distributed growing network of data records, called blocks (Narayanan et al., 2016). Figure 1 shows a simplified version of a chain of blocks. Each block consists of the stored data as well as the data and time the data was stored (timestamp). Further, a block is uniquely identified by a hash code. Moreover, a block refers to the previous block using the previous hash code. The first block, also called the Genesis block, has no predecessor, and thus, it does not contain a previous hash attribute.

Figure 1. An illustration of a chain of blocks

The purpose of this chapter is to introduce the reader to the foundations of the blockchain technology by answering the following research questions (RQ) using the literature:

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