

Preface

Distributed hash table (DHT) has been playing an important role in distributed systems and applications, especially in large-scale distributed environments. DHT was introduced to address a daunting challenge in large-scale system architecture. Specifically, in a normal client/server model (C/S model), centralized servers would potentially become the bottleneck of the whole system. As a comparison, the distributed model, exemplified by the peer-to-peer (P2P) model, leverages the resources spread across a list of nodes in the system. At the same time, it is desirable to utilize all the peers' capability efficiently and provide better robustness. DHT technology was developed to meet these requirements. Indeed, in DHT, distributed resources are managed so well that peers only need to know part of the system. The elegance of DHT is its implicitness in operations, providing only two basic operations, including: (i) GET data from DHT and (ii) PUT data into DHT. Finally, given its simplicity, DHT is yet suitable for a great variety of applications and provides robustness and high efficiency, especially in large-scale systems.

For decades extensive work has been conducted for DHT. In academia, researchers have proposed several variants of DHT and associated improvements, which manage the resources in different structures, providing abundant choices to build distributed systems. Meanwhile, many practical platforms of DHT have been implemented, which can be regarded as a bridge translating DHT from theory to practice and solving many practical problems such as load balance, multiple replicas, consistency, latency, and so on. Finally, a lot of applications based on DHT have been proposed, for example, multicast, anycast, distributed file systems, search, storage, content delivery network, file sharing, and communication. Previous surveys on DHT have been mainly focused on the theoretic aspect, with less attention paid to platforms and applications.

In this book, we aim to report the development of DHT in both academic pursuit and industrial development. It covers the main theory, platforms, and applications of DHT. From this book, readers could learn the basic principle of several popular DHT structures, many platforms used in both academic and commercial fields, and a wide range of DHT-based applications. We have also presented our view of potential limitations of DHT.

This book consists of five chapters. In Chap. 1 background information about DHT is introduced. Seven variants of DHT are studied and compared in Chap. 2. In Chap. 3, we classify 15 existing DHT platforms into two categories: (i) academic and open-source platforms and (ii) commercial platforms. In Chap. 4 we present eight DHT-based applications with detailed analysis of their pros and cons. In Chap. 5, we outline the benefits and limitations of DHT.

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