



Community Experience Distilled

HBase Design Patterns

Design and implement successful patterns to develop scalable applications with HBase

Mark Kerzner

Sujee Maniyam

[PACKT] open source*
PUBLISHING community experience distilled

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BIRMINGHAM - MUMBAI

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I would like to acknowledge the help of my colleagues, in particular Sujee Maniyam, and last but not least, of my multitalented family.

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I would like to thank and acknowledge the patience of my family for putting up with my weird work hours and a special thanks to Mark Kerzner for providing me with the privilege to review his work.

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I would like to thank Mark Kerzner for his wonderful lectures on Hadoop; my dear wife, Ilona, for just being around; and my sweet kids for leaving me some spare time to work on this book. This is my first review and I sincerely hope, my comments will help to make this book better.

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Preface

Software plays a paramount role in today's world, and NoSQL databases are an important part of the modern stack. They are found wherever a subsecond response access to vast amounts of information is needed. However, there is a huge gap between the first "Hello World" example in a NoSQL database and creating practical, scalable, and stable applications. The aim of this book is to fill this gap and to give you practical guidelines for building NoSQL software.

The book is specifically formulated in terms of HBase, and there are a few areas of design where HBase might be different from Cassandra or MongoDB, for example, but most of the design patterns discussed here can be transferred to other NoSQL databases. You are expected to invest efforts in learning, which will lead to rewarding skills in the end.

What this book covers

Chapter 1, Starting Out with HBase, covers what HBase is and the various ways in which you can install it on your computer or cluster of computers, with practical advice on the development environment.

Chapter 2, Reading, Writing, and Using SQL, covers the HBase shell and gives the first example of Java code to read and write data in HBase. It also covers using the Phoenix driver for higher-level access, which gives back SQL, justifying the "Not-only-SQL" meaning of NoSQL.

Chapter 3, Using HBase Tables for Single Entities, covers the simplest HBase tables to deal with single entities, such as the table of users. Design patterns in this chapter emphasize on scalability, performance, and planning for special cases, such as restoring forgotten passwords.

Chapter 4, Dealing with Large Files, covers how to store large files in HBase systems. It also covers the alternative ways of storing them and the best practices extracted from solutions for large environments, such as Facebook, Amazon, and Twitter.

Chapter 5, Time Series Data, shows that stock market, human health monitoring, and system monitoring data are all classified as time series data. The design patterns for this organize time-based measurements in groups, resulting in balanced, high-performing HBase tables. Many lessons are learned from OpenTSDB.

Chapter 6, Denormalization Use Cases, discusses one of the most common design patterns for NoSQL denormalization, where the data is duplicated in more than one table, resulting in huge performance benefits. It also shows when to unlearn one's SQL normalization rules and how to apply denormalization wisely.

Chapter 7, Advanced Patterns for Data Modeling, shows you how to implement a many-to-many relationship in HBase that deals with transactions using compound keys.

Chapter 8, Performance Optimization, covers bulk loading for the initial data load into HBase, profiling HBase applications, benchmarking, and load testing.

What you need for this book

All the software used in this book is open source and free. You need Linux and Internet access. The book teaches you how to download and install the rest.

Who this book is for

If you deal with implementing practical big data solutions, involving quick access to massive amounts of data, this is the book for you. Primarily intended for software developers and architects, it can also be used by project managers, investors, and entrepreneurs who plan software implementations.

Conventions

In this book, you will find a number of text styles that distinguish between different kinds of information. Here are some examples of these styles and an explanation of their meaning.

Code words in text, database table names, folder names, filenames, file extensions, pathnames, dummy URLs, user input, and Twitter handles are shown as follows: "The key is what you save when EC2 created the key pair for you, and `<cm-url>` is the URL of the server where you run the Cloudera Manager."