MongoDB设计模式（影印版）

MongoDB Applied Design Patterns

O'REILLY®
東南大學出版社

Rick Copeland 著

MongoDB设计模式(影印版)

无论你正在搭建一个社交媒体网站还是一个内部使用的企业应用，这本注重实践的指南都可以为你展示出在MongoDB和它所用来解决的商业问题之间的紧密联系。你将学习如何把MongoDB设计模式应用到多个具有挑战性的领域中，比如电子商务、内容管理和在线游戏。通过使用Python和JavaScript的代码实例，你将了解MongoDB是如何让你在调整数据模型的同时简化开发流程。

很多商业应用在还没有理解如何更有效地使用NoSQL数据库之前就直接启用了它。这本书将为你演示文档嵌入、多态性架构和其他处理特定大数据用例的MongoDB模式的优势所在，包括：

- 营运智能：执行商业数据的实时分析
- 电子商务：让MongoDB成为产品目录大师或者库存管理系统
- 内容管理：学习用来存储内容节点、二元资产和讨论区的方法
- 在线广告网络：把技术运用于广告播放的频次控制、关键字定位和竞价
- 社交网络：学习如何存储一个仿效Google+的复杂社交图
- 在线游戏：为一个多人角色扮演游戏提供对人物和世界数据的并发访问

“对于新手和那些想要获取更多实践知识的有经验用户来说，《MongoDB设计模式》都是一本必要的读物。”

——Michael Dirolf
《MongoDB：The Definitive Guide》作者之一

Rick Copeland是Arborian咨询公司的首席咨询师和创办者。Arborian咨询公司是一家着重于MongoDB和Python定制开发和培训的商业机构。作为《Essential SQLAlchemy》（O'Reilly）的作者，Rick是10gen公司的“MongoDB大师”的创立委员之一。

Strata
Making Data Work
Strata是新兴的人员、工具和技术的生态系统，它使用海量数据来支持智能化决策。

O'REILLY®
oreilly.com.cn

责任编辑：张烨
封面设计：Karen Montgomery，张健

O'Reilly Media, Inc.授权东南大学出版社出版

此影印版仅限于在中华人民共和国境内（但不允许在中国香港、澳门特别行政区和中国台湾地区）销售发行
This Authorized Edition for sale only in the territory of People's Republic of China (excluding Hong Kong, Macao and Taiwan)

ISBN 978-7-5641-4458
9 787564 144586 >
定价：36.00元(册)

2013

MongoDB设计模式（影印版）

Copeland 著

东南大学出版社

O'REILLY®

MongoDB设计模式（影印版）

MongoDB Applied Design Patterns

Rick Copeland 著

O'REILLY®

Beijing · Cambridge · Farnham · Köln · Sebastopol · Tokyo

O'Reilly Media, Inc.授权东南大学出版社出版

南京 东南大学出版社

图书在版编目（CIP）数据

MongoDB 设计模式：英文/(美)科普兰（Copeland, R.）著.—影印本.—南京：东南大学出版社，2013.10

书名原文：MongoDB Applied Design Patterns

ISBN 978-7-5641-4458-6

I. ① M… II. ①科… III. ①关系数据库系统－英文 IV. ① TP311.138

中国版本图书馆 CIP 数据核字（2013）第 203656 号

江苏省版权局著作权合同登记

图字：10-2013-137 号

©2013 by O'Reilly Media, Inc.

Reprint of the English Edition, jointly published by O'Reilly Media, Inc. and Southeast University Press, 2013. Authorized reprint of the original English edition, 2013 O'Reilly Media, Inc., the owner of all rights to publish and sell the same.

All rights reserved including the rights of reproduction in whole or in part in any form.

英文原版由 O'Reilly Media, Inc. 出版 2013。

英文影印版由东南大学出版社出版 2013。此影印版的出版和销售得到出版权和销售权的所有者 —— O'Reilly Media, Inc. 的许可。

版权所有，未得书面许可，本书的任何部分和全部不得以任何形式重制。

MongoDB 设计模式（影印版）

出版发行：东南大学出版社
地　　址：南京四牌楼 2 号　　邮编：210096
出 版 人：江建中
网　　址：http://www.seupress.com
电子邮件：press@seupress.com
印　　刷：扬中市印刷有限公司
开　　本：787 毫米 × 980 毫米　16 开本
印　　张：11
字　　数：215 千字
版　　次：2013 年 10 月第 1 版
印　　次：2013 年 10 月第 1 次印刷
书　　号：ISBN 978-7-5641-4458-6
定　　价：36.00 元（册）

本社图书若有印装质量问题，请直接与营销部联系。电话（传真）：025-83791830

此为试读，需要完整PDF请访问：www.ertongbook.com

Preface

Whether you're building the newest and hottest social media website or developing an internal-use-only enterprise business intelligence application, scaling your data model has never been more important. Traditional relational databases, while familiar, present significant challenges and complications when trying to scale up to such "big data" needs. Into this world steps MongoDB, a leading NoSQL database, to address these scaling challenges while also simplifying the process of development.

However, in all the hype surrounding big data, many sites have launched their business on NoSQL databases without an understanding of the techniques necessary to effectively use the features of their chosen database. This book provides the much-needed connection between the features of MongoDB and the business problems that it is suited to solve. The book's focus on the practical aspects of the MongoDB implementation makes it an ideal purchase for developers charged with bringing MongoDB's scalability to bear on the particular problem you've been tasked to solve.

Audience

This book is intended for those who are interested in learning practical patterns for solving problems and designing applications using MongoDB. Although most of the features of MongoDB highlighted in this book have a basic description here, this is not a beginning MongoDB book. For such an introduction, the reader would be well-served to start with *MongoDB: The Definitive Guide* by Kristina Chodorow and Michael Dirolf (O'Reilly) or, for a Python-specific introduction, *MongoDB and Python* by Niall O'Higgins (O'Reilly).

Assumptions This Book Makes

Most of the code examples used in this book are implemented using either the Python or JavaScript programming languages, so a basic familiarity with their syntax is essential to getting the most out of this book. Additionally, many of the examples and patterns

are contrasted with approaches to solving the same problems using relational databases, so basic familiarity with SQL and relational modeling is also helpful.

Contents of This Book

This book is divided into two parts, with Part I focusing on general MongoDB design patterns and Part II applying those patterns to particular problem domains.

Part I: Design Patterns

Part I introduces the reader to some generally applicable design patterns in MongoDB. These chapters include more introductory material than Part II, and tend to focus more on MongoDB techniques and less on domain-specific problems. The techniques described here tend to make use of MongoDB distinctives, or generate a sense of "hey, MongoDB can't do that" as you learn that yes, indeed, it can.

Chapter 1: To Embed or Reference
: This chapter describes what kinds of documents can be stored in MongoDB, and illustrates the trade-offs between schemas that embed related documents within related documents and schemas where documents simply reference one another by ID. It will focus on the performance benefits of embedding, and when the complexity added by embedding outweighs the performance gains.

Chapter 2: Polymorphic Schemas
: This chapter begins by illustrating that MongoDB collections are schemaless, with the schema actually being stored in individual documents. It then goes on to show how this feature, combined with document embedding, enables a flexible and efficient polymorphism in MongoDB.

Chapter 3: Mimicking Transactional Behavior
: This chapter is a kind of apologia for MongoDB's lack of complex, multidocument transactions. It illustrates how MongoDB's modifiers, combined with document embedding, can often accomplish in a single atomic document update what SQL would require several distinct updates to achieve. It also explores a pattern for implementing an application-level, two-phase commit protocol to provide transactional guarantees in MongoDB when they are absolutely required.

Part II: Use Cases

In Part II, we turn to the "applied" part of *Applied Design Patterns*, showing several use cases and the application of MongoDB patterns to solving domain-specific problems. Each chapter here covers a particular problem domain and the techniques and patterns used to address the problem.

Chapter 4: Operational Intelligence

This chapter describes how MongoDB can be used for operational intelligence, or "real-time analytics" of business data. It describes a simple event logging system, extending that system through the use of periodic and incremental hierarchical aggregation. It then concludes with a description of a true real-time incremental aggregation system, the Mongo Monitoring Service (MMS), and the techniques and trade-offs made there to achieve high performance on huge amounts of data over hundreds of customers with a (relatively) small amount of hardware.

Chapter 5: Ecommerce

This chapter begins by describing how MongoDB can be used as a product catalog master, focusing on the polymorphic schema techniques and methods of storing hierarchy in MongoDB. It then describes an inventory management system that uses optimistic updating and compensation to achieve eventual consistency even without two-phase commit.

Chapter 6: Content Management Systems

This chapter describes how MongoDB can be used as a backend for a content management system. In particular, it focuses on the use of polymorphic schemas for storing content nodes, the use of GridFS and Binary fields to store binary assets, and various approaches to storing discussions.

Chapter 7: Online Advertising Networks

This chapter describes the design of an online advertising network. The focus here is on embedded documents and complex atomic updates, as well as making sure that the storage engine (MongoDB) never becomes the bottleneck in the ad-serving decision. It will cover techniques for frequency capping ad impressions, keyword targeting, and keyword bidding.

Chapter 8: Social Networking

This chapter describes how MongoDB can be used to store a relatively complex social graph, modeled after the Google+ product, with users in various circles, allowing fine-grained control over what is shared with whom. The focus here is on maintaining the graph, as well as categorizing content into various timelines and news feeds.

Chapter 9: Online Gaming

This chapter describes how MongoDB can be used to store data necessary for an online, multiplayer role-playing game. We show how character and world data can be stored in MongoDB, allowing for concurrent access to the same data structures from multiple players.

Conventions Used in This Book

The following typographical conventions are used in this book:

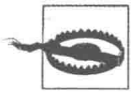
Italic
: Indicates new terms, URLs, email addresses, filenames, and file extensions.

`Constant width`
: Used for program listings, as well as within paragraphs to refer to program elements such as variable or function names, databases, data types, environment variables, statements, and keywords.

`Constant width bold`
: Shows commands or other text that should be typed literally by the user.

`Constant width italic`
: Shows text that should be replaced with user-supplied values or by values determined by context.

This icon signifies a tip, suggestion, or general note.



This icon indicates a warning or caution.

Using Code Examples

This book is here to help you get your job done. In general, if this book includes code examples, you may use the code in this book in your programs and documentation. You do not need to contact us for permission unless you're reproducing a significant portion of the code. For example, writing a program that uses several chunks of code from this book does not require permission. Selling or distributing a CD-ROM of examples from O'Reilly books does require permission. Answering a question by citing this book and quoting example code does not require permission. Incorporating a significant amount of example code from this book into your product's documentation does require permission.

We appreciate, but do not require, attribution. An attribution usually includes the title, author, publisher, and ISBN. For example: "*MongoDB Applied Design Patterns* by Rick Copeland (O'Reilly). Copyright 2013 Richard D. Copeland, Jr., 978-1-449-34004-9."

If you feel your use of code examples falls outside fair use or the permission given here, feel free to contact us at *permissions@oreilly.com*.

Safari® Books Online

Safari Books Online is an on-demand digital library that delivers expert content in both book and video form from the world's leading authors in technology and business.

Technology professionals, software developers, web designers, and business and creative professionals use Safari Books Online as their primary resource for research, problem solving, learning, and certification training.

Safari Books Online offers a range of product mixes and pricing programs for organizations, government agencies, and individuals. Subscribers have access to thousands of books, training videos, and prepublication manuscripts in one fully searchable database from publishers like O'Reilly Media, Prentice Hall Professional, Addison-Wesley Professional, Microsoft Press, Sams, Que, Peachpit Press, Focal Press, Cisco Press, John Wiley & Sons, Syngress, Morgan Kaufmann, IBM Redbooks, Packt, Adobe Press, FT Press, Apress, Manning, New Riders, McGraw-Hill, Jones & Bartlett, Course Technology, and dozens more. For more information about Safari Books Online, please visit us online.

How to Contact Us

Please address comments and questions concerning this book to the publisher:

O'Reilly Media, Inc.
1005 Gravenstein Highway North
Sebastopol, CA 95472
800-998-9938 (in the United States or Canada)
707-829-0515 (international or local)
707-829-0104 (fax)

We have a web page for this book, where we list errata, examples, and any additional information. You can access this page at *http://oreil.ly/mongodb-applied-design-patterns*.

To comment or ask technical questions about this book, send email to *bookquestions@oreilly.com*.

For more information about our books, courses, conferences, and news, see our website at *http://www.oreilly.com*.

Find us on Facebook: *http://facebook.com/oreilly*

Follow us on Twitter: *http://twitter.com/oreillymedia*

Watch us on YouTube: *http://www.youtube.com/oreillymedia*

Acknowledgments

Many thanks go to O'Reilly's Meghan Blanchette, who endured the frustrations of trying to get a technical guy writing a book to come up with a workable schedule and stick to it. Sincere thanks also go to my technical reviewers, Jesse Davis and Mike Dirolf, who helped catch the errors in this book so the reader wouldn't have to suffer through them.

Much additional appreciation goes to 10gen, the makers of MongoDB, and the wonderful employees who not only provide a great technical product but have also become genuinely close friends over the past few years. In particular, my thanks go out to Jared Rosoff, whose ideas for use cases and design patterns helped inspire (and subsidize!) this book, and to Meghan Gill, for actually putting me back in touch with O'Reilly and getting the process off the ground, as well as providing a wealth of opportunities to attend and speak at various MongoDB conferences.

Thanks go to my children, Matthew and Anna, who've been exceedingly tolerant of a Daddy who loves to play with them in our den but can sometimes only send a hug over Skype.

Finally, and as always, my heartfelt gratitude goes out to my wonderful and beloved wife, Nancy, for her support and confidence in me throughout the years and for inspiring me to many greater things than I could have hoped to achieve alone. I couldn't possibly have done this without you.

此为试读，需要完整PDF请访问：www.ertongbook.com

Table of Contents

Preface vii

Part I. Design Patterns

1. To Embed or Reference 3
Relational Data Modeling and Normalization 3
What Is a Normal Form, Anyway? 4
So What's the Problem? 6
Denormalizing for Performance 7
MongoDB: Who Needs Normalization, Anyway? 8
MongoDB Document Format 8
Embedding for Locality 9
Embedding for Atomicity and Isolation 9
Referencing for Flexibility 11
Referencing for Potentially High-Arity Relationships 12
Many-to-Many Relationships 13
Conclusion 14

2. Polymorphic Schemas 17
Polymorphic Schemas to Support Object-Oriented Programming 17
Polymorphic Schemas Enable Schema Evolution 20
Storage (In-)Efficiency of BSON 21
Polymorphic Schemas Support Semi-Structured Domain Data 22
Conclusion 23

3. Mimicking Transactional Behavior 25
The Relational Approach to Consistency 25
Compound Documents 26
Using Complex Updates 28

Optimistic Update with Compensation 29
Conclusion 33

Part II. Use Cases

4. Operational Intelligence..... 37
Storing Log Data 37
Solution Overview 37
Schema Design 38
Operations 39
Sharding Concerns 48
Managing Event Data Growth 50
Pre-Aggregated Reports 52
Solution Overview 52
Schema Design 53
Operations 59
Sharding Concerns 63
Hierarchical Aggregation 63
Solution Overview 64
Schema Design 65
MapReduce 65
Operations 67
Sharding Concerns 72

5. Ecommerce..... 75
Product Catalog 75
Solution Overview 75
Operations 80
Sharding Concerns 83
Category Hierarchy 84
Solution Overview 84
Schema Design 85
Operations 86
Sharding Concerns 90
Inventory Management 91
Solution Overview 91
Schema 92
Operations 93
Sharding Concerns 100

6. Content Management Systems..... 101

Metadata and Asset Management 101
Solution Overview 101
Schema Design 102
Operations 104
Sharding Concerns 110
Storing Comments 111
Solution Overview 111
Approach: One Document per Comment 111
Approach: Embedding All Comments 114
Approach: Hybrid Schema Design 117
Sharding Concerns 119

7. Online Advertising Networks..... 121
Solution Overview 121
Design 1: Basic Ad Serving 121
Schema Design 122
Operation: Choose an Ad to Serve 123
Operation: Make an Ad Campaign Inactive 123
Sharding Concerns 124
Design 2: Adding Frequency Capping 124
Schema Design 124
Operation: Choose an Ad to Serve 125
Sharding 126
Design 3: Keyword Targeting 126
Schema Design 127
Operation: Choose a Group of Ads to Serve 127

8. Social Networking..... 129
Solution Overview 129
Schema Design 130
Independent Collections 130
Dependent Collections 132
Operations 133
Viewing a News Feed or Wall Posts 134
Commenting on a Post 135
Creating a New Post 136
Maintaining the Social Graph 138
Sharding 139

9. Online Gaming..... 141
Solution Overview 141
Schema Design 142

Character Schema 142
Item Schema 143
Location Schema 144
Operations 144
Load Character Data from MongoDB 145
Extract Armor and Weapon Data for Display 145
Extract Character Attributes, Inventory, and Room Information for Display 147
Pick Up an Item from a Room 147
Remove an Item from a Container 148
Move the Character to a Different Room 149
Buy an Item 150
Sharding 151

Afterword **153**

Index **155**

PART I
Design Patterns

此为试读,需要完整PDF请访问: www.ertongbook.com