

MongoDB for Jobseekers

*Reach new heights in your
career with MongoDB*

Justin Jenkins



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Dedicated to

My wife Jessica

And my sons Caderyn & Evan

About the Author

Justin Jenkins has nearly two decades of experience in the tech industry, having held various roles. Early on, he found a passion for databases. An early adopter of MongoDB after years of working with SQL, he has made contributions to startups, well known tech companies, and non-profit organizations. Recognized by MongoDB as an Enthusiast, he shares his expertise through resources like this book, online courses which you can find on LinkedIn Learning, and speaking events. Having lived on both coasts of the US, he currently resides in Colorado Springs, Colorado with his wife and two incredibly fun, and incredibly exhausting boys. When not coding, he enjoys cooking, supporting soccer teams like the Seattle Sounders and Manchester United, and exploring the outdoors. He constantly meditates on the words of Mark 9:23-24 and hopes to for the rest of his life.

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Acknowledgement

I am deeply grateful to my family for their unwavering patience and support throughout the process of writing this book.

To my parents, David and Giselle, I extend a special thank you for tolerating that chaotic pile of computer parts in your basement during my formative years. Your belief in my abilities and continuous encouragement have shaped my career in more ways than I can express.

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Preface

Within these pages, we invite you on an immersive journey to discover the remarkable capabilities of MongoDB and gain the expertise to harness its full potential. Whether you are an experienced professional seeking to deepen your knowledge or an enthusiastic beginner eager to embrace this cutting-edge technology, this comprehensive guide will be your trusted companion.

As we explore MongoDB, you will uncover its unique qualities that sets it apart from traditional databases. MongoDB's Document Model revolutionizes data organization and retrieval, propelling it to the forefront of the industry.

We will guide you through practical skills, including installation on various operating systems and essential tools such as MongoDB Shell and Compass. Engaging examples will demonstrate how MongoDB's document-based approach efficiently stores and organizes complex data structures.

You will learn to master fundamental operations such as creating, updating, and deleting documents within MongoDB. We will equip you with the skills to work with complex data types as well, using MongoDB's powerful array and embedded document features.

We will delve into crucial concepts such as indexing and collection management, as well as how to enhance query performance and effectively handle data scaling challenges. From Data migration, security, backup strategies, and encryption, we will provide comprehensive guidance to safeguard your data.

Programming with MongoDB is easy and powerful. To show this, we will explore code examples in Python, Node.JS, and PHP, enabling you to harness MongoDB's capabilities within your applications. We will also discover MongoDB's cloud services, provided by MongoDB Atlas, which offers cloud hosting, database tools, and effortless application development and maintenance.

Finally, we will provide valuable interview preparation resources, bolstering your MongoDB expertise and increasing your chances of success in the job market.

Prepare for an adventure as we unravel the core concepts and features of MongoDB. Whether you aspire to become a MongoDB professional, strengthen your database management skills, or satiate your curiosity, this book is your gateway to unlocking the true potential of MongoDB and your future career opportunities.

Here is a brief overview of the chapters:

Chapter 1: Why MongoDB? – This chapter will start off with a brief history of databases, and how MongoDB and its Document Modal are different, as well as how these differences make it so powerful and popular.

Chapter 2: MongoDB Jobs and Roles – This chapter is dedicated to providing some context and explanation of different job roles available to those with MongoDB experience as well as what sections of this book you might want to pay particular attention to, based on each particular job role.

Chapter 3: Getting Started – In this chapter, we will cover installing MongoDB Server on various different operating systems, as well as Docker and MongoDB's Cloud service Atlas. Additionally, we will walk through installing the MongoDB Shell, Tools and the official GUI MongoDB Compass.

Chapter 4: A Better Way to Store Data – Documents – In this chapter, we will cover some key details about Documents, rules you should know, and most importantly, some examples of real-life data put into Documents that will help you understand how you might put your own data into Documents.

Chapter 5: Let's Do It - Create, Update and Delete Documents – By the end of this chapter, you will have a basic idea of how to create, update and delete documents within MongoDB. We will also discuss how to do each of these actions to multiple documents at one time.

Chapter 6: Getting What You Want – Querying – By the end of this chapter, you should be comfortable with querying MongoDB using various query operators, have an understanding of the core concepts of querying with MongoDB, as well as tools that you can use to deal with unique challenges such as case sensitivity in MongoDB.

Chapter 7: Complex Data, Made Simple – MongoDB's document model allows us to store much more complex data than legacy databases, by using arrays and embedded documents. These data types give us a lot of flexibility, but with flexibility can come complexity. Fortunately, the MongoDB Query API provides robust tools for dealing with these complex types. By the end of this chapter, you should have a solid understanding of how to perform typical queries to find and modify arrays as well as embedded objects. Additionally, you will have a high-level understanding of the many MongoDB operators available for these data types, and how to use them.

Chapter 8: The MongoDB Aggregation Framework – For more complex cases, MongoDB offers what is called the Aggregation Framework, which allows a

structured way to formulate a series of steps, called a “pipeline”, to get back just the data you need. In this chapter, we will discuss this framework and dive into some examples of its use. Covering the Aggregation Framework in-depth is beyond the scope of this book. However, by the end of this chapter, you should have a solid idea of how the framework works and how you can use it to fit your needs.

Chapter 9: Planning for Performance - Collections and Indexes – In this chapter, we will explain what an index is, how MongoDB uses indexes, different index types, different collection types, and how to create, configure and delete indexes and collections. By the end of this chapter, you should have a solid foundation of indexing and collection options in MongoDB and lots of areas you can look further into, if you want to learn more.

Chapter 10: Getting In and Getting Out - Data Migration – By the end of this chapter, you should feel comfortable with importing and exporting in MongoDB using MongoDB Compass, MongoDB Database Tools as well as scripting methods. Additionally, you will have a good idea of how to transfer data between collections and databases.

Chapter 11: Make It Great - Configuration and Monitoring – In this chapter, we will consider how the server’s start, stop and restart processes work, as well as how to configure your server. We will focus on important settings you will need to know, to properly administrate your server, as well as various monitoring tools and tips for troubleshooting.

Chapter 12: Seamless Scaling – Replication and Sharding – In this chapter, we will cover the core concepts of replication in MongoDB, discussing how to setup a replica set and how to leverage the concept of “sharding” for horizontal scaling using MongoDB. By the end of this chapter, you should be comfortable setting up a basic replica set and have a knowledge of how to administrate that replica set. You will also have a solid idea of how sharding works in MongoDB and how and why you would use it for your application.

Chapter 13: Being Proactive – Security and Backups – In this chapter, we will begin by discussing how to protect your database via authentication, authorization and roles. Then we will transition to how to effectively backup and restore your databases, wrapping up with a brief discussion about database encryption.

Chapter 14: Making Stuff – Programming with MongoDB – By the end of this chapter, you should have a solid idea of how to connect and perform basic queries against MongoDB, using code written in Python, Node.JS (JavaScript) and PHP.

Make sure to see the section about the book's free GitHub Codespace, where you can try some of this code out for yourself, without installing anything locally.

Chapter 15: Tools for Success – MongoDB Shell and Compass UI – In this chapter, we will dig a bit deeper into some of the most useful and common tools you will use with MongoDB. We will learn how to configure and personalize the MongoDB Shell, `mongosh`, as well as how to create useful custom functions you can use within the shell. Then, we will explore the MongoDB Visual Studio Code extension, and MongoDB Playgrounds. Lastly, we will do a bit of a review, as well as a more expansive investigation of MongoDB Compass, the official GUI for MongoDB. By the end of this chapter, you should be empowered to take your use of all these tools to the next level.

Chapter 16: Cloud Services – MongoDB Atlas – This chapter will only briefly cover a couple of the key aspects of the cloud services offered by MongoDB Atlas, as indeed, a whole book in itself could be written about Atlas. With that said, after reading this chapter, you should have a solid understanding of what Atlas has to offer and how you can use it to leverage the power of MongoDB even further. Atlas has essentially three main categories of features, two of which we will talk about in this chapter: cloud hosting services and database tools, such as Search and Charts. In the next chapter, we will discuss the third category, Atlas Application Services.

Chapter 17: MongoDB Atlas – Application Services – We will be building a React app using Atlas App Services which allows us to build on top of MongoDB, without actually having to run or maintain our own Replica Set, or server. Rather, we will rely on a shared free MongoDB Cluster, Atlas Functions, the Realm SDK for Web and the Atlas' Data API.

Chapter 18: Jobseeker – Interview Prep – This chapter will present fifty different interview-like questions, at various levels of difficulty, as well as a response. These may not be the exact questions you would be asked in an interview, for which MongoDB skills are required, but you can expect to be asked some variation of them. For each question, a response is offered, as well as a reference to the chapter we discussed the topic in general, or directly. We will discuss how to use this chapter's questions in the next section.

Chapter 19: Conclusion – In this final chapter, we will briefly touch on a few more complex topics such as Change Streams, Transactions in MongoDB, GridFS for storing large files and some comparisons between SQL queries and their MongoDB equivalents.

Code Bundle and Coloured Images

Please follow the link to download the *Code Bundle* and the *Coloured Images* of the book:

<https://rebrand.ly/9kqvjnp>

The code bundle for the book is also hosted on GitHub at **<https://github.com/bpbpublications/MongoDB-For-Jobseekers>**. In case there's an update to the code, it will be updated on the existing GitHub repository.

We have code bundles from our rich catalogue of books and videos available at **<https://github.com/bpbpublications>**. Check them out!

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Table of Contents

1. Why MongoDB?	1
Introduction.....	1
Structure.....	2
Objectives.....	2
Recipes as Data.....	2
<i>Find me a recipe query</i>	4
The history of data.....	4
<i>Databases of clay</i>	4
<i>Computer Databases</i>	6
<i>Relational databases</i>	7
<i>Relational Databases vs Document Databases</i>	7
<i>Bringing separate data together</i>	10
Data that goes together, can live together.....	11
<i>Team document breakdown</i>	13
Thinking of data differently	15
This is why MongoDB.....	15
Conclusion.....	16
Challenge – Storing data in a document	16
2. MongoDB Jobs and Roles	19
Introduction.....	19
Structure.....	19
Objectives.....	20
Interest in MongoDB.....	20
Jobs and Career Paths	21
<i>Job Roles</i>	21
<i>Full-stack Developer</i>	22
<i>Data Engineer</i>	22

Database Administrator.....	23
DevOps Engineer.....	23
Business Intelligence Analyst.....	23
Data Scientist.....	23
Technical Consultant.....	24
Technical Writer.....	24
Future MongoDB Jobs.....	24
Example Interview Questions.....	24
Questions.....	25
Conclusion.....	25
3. Getting Started.....	27
Introduction.....	27
Structure.....	27
Objectives.....	28
Prerequisites.....	28
Installing MongoDB.....	28
Installing MongoDB on Windows.....	29
Installing MongoDB server, compass, and tools.....	30
Connecting to MongoDB Server.....	32
Installing MongoDB on macOS.....	33
Installing MongoDB Server, Shell and Tools.....	33
Running MongoDB Server.....	34
Connecting to MongoDB Server via Compass.....	35
Installing MongoDB on Docker.....	36
Running MongoDB server on demand.....	36
Persisting database data files.....	37
Connecting to MongoDB on Docker.....	37
Connect via the MongoDB Shell mongosh.....	37
Connect via MongoDB Compass.....	38
Running MongoDB Server via Docker Compose.....	38

Setting up MongoDB on MongoDB Atlas Cloud.....	39
Conclusion.....	42
4. A Better Way to Store Data – Documents	43
Introduction.....	43
Structure.....	43
Objectives.....	44
Importing example documents	44
<i>Importing with MongoDB Compass</i>	<i>44</i>
<i>Importing on the Command Line with mongoimport</i>	<i>47</i>
What is a Document?	47
<i>Other Considerations.....</i>	<i>48</i>
<i>Document Structure.....</i>	<i>49</i>
<i>MongoDB Shell Commands.....</i>	<i>50</i>
More about types.....	50
<i>String.....</i>	<i>50</i>
<i>Numbers</i>	<i>50</i>
<i>Dates</i>	<i>50</i>
<i>Epoch dates.....</i>	<i>51</i>
<i>Arrays and objects</i>	<i>52</i>
<i>Types when importing/exporting.....</i>	<i>52</i>
Examples of documents.....	52
<i>Stock data.....</i>	<i>53</i>
<i>User profile.....</i>	<i>54</i>
<i>Recipe.....</i>	<i>55</i>
<i>Home sale listing</i>	<i>57</i>
Conclusion.....	58
5. Let’s Do It – Create, Update and Delete Documents.....	59
Introduction.....	59
Structure.....	59
Objectives.....	60

Creating Documents.....	60
<i>Using the MongoDB Shell</i>	60
<i>Inserting a Document</i>	62
<i>View Our New Document</i>	62
<i>Other ways to query</i>	63
<i>Find By ObjectId</i>	63
<i>Find By Document Field</i>	63
<i>Find one document</i>	63
<i>Creating more complex documents</i>	64
<i>Using the MongoDB Shell as a JavaScript Shell</i>	64
<i>Inserting multiple documents</i>	65
<i>Insert using MongoDB Compass</i>	66
Updating Documents.....	67
<i>Adding new fields</i>	67
<i>Removing fields</i>	68
<i>Updating multiple documents</i>	68
<i>“Upsert” a Document</i>	69
<i>Updating Using MongoDB Compass</i>	70
Deleting Documents.....	71
Conclusion.....	72
6. Getting What You Want – Querying	73
Introduction.....	73
Structure.....	73
Objectives.....	74
Importing Example Documents	74
MongoDB Shell vs MongoDB Compass.....	74
<i>MongoDB Shell Queries</i>	74
<i>MongoDB compass queries</i>	75
Querying MongoDB.....	76
<i>Why cursors?</i>	76

The MongoDB Query API.....	76
<i>Using Filter to match documents</i>	77
<i>Using Projection to Control Output</i>	77
<i>Using sort() to Order Output</i>	79
<i>Using Variables in Queries</i>	81
<i>Using count() and limit() and skip()</i>	82
MongoDB Query Operators.....	83
Comparison Operators.....	83
<i>Using Operators in update queries</i>	85
Field Update Operators.....	85
Atomic Operations.....	87
Logical Operators.....	87
Element Operators.....	89
Objects and arrays.....	90
Query Case Sensitivity.....	91
<i>Using regex queries</i>	91
<i>Options for Dealing with Casing Issues</i>	91
Maintaining Shadow Fields.....	92
Storing Shadow Fields as Objects.....	93
Conclusion.....	94
7. Complex Data, Made Simple.....	95
Introduction.....	95
Structure.....	96
Objectives.....	96
Arrays and embedded documents.....	96
<i>A Note on quotes</i>	96
<i>Example Documents</i>	97
Querying arrays.....	99
<i>Array Order Matters</i>	99
<i>Matching multiple array values</i>	100

<i>Mixed data type arrays</i>	100
<i>Arrays and query operators</i>	101
Querying embedded documents.....	102
<i>Exact matches</i>	102
<i>Matching inside embedded documents</i>	103
Array update operators	104
<i>Optional example documents</i>	104
<i>Adding array items</i>	105
<i>Appending multiple items</i>	105
<i>Sorting array items</i>	106
<i>Removing array items</i>	107
Conclusion.....	110
8. The MongoDB Aggregation Framework.....	111
Introduction.....	111
Structure.....	111
Objectives.....	112
Typical aggregation pipelines	112
<i>Pipeline stages</i>	112
<i>Building a pipeline</i>	112
<i>Projecting aggregated fields</i>	113
<i>Aggregations in MongoDB Compass</i>	114
<i>MongoDB compass pipeline features</i>	116
<i>Combining operators</i>	117
<i>Filtering matching documents</i>	119
<i>Using stages multiple times</i>	121
<i>Making large pipelines more readable</i>	122
<i>Grouping and sorting stages</i>	123
Complex pipelines.....	125
<i>Create a complex pipeline</i>	126
<i>Complex Pipeline Example</i>	127

<i>Stages of a complex pipeline explained</i>	129
<i>Stage one</i>	129
<i>Stage two</i>	129
<i>Stage three</i>	129
<i>Stage four</i>	130
<i>Stage five</i>	130
Additional uses.....	131
<i>Case insensitive searching and sorting</i>	131
<i>Using a pipeline for better searches</i>	132
<i>Stage one</i>	132
<i>Stage two</i>	133
<i>Stage three</i>	133
<i>Stage four</i>	133
<i>Stage five</i>	134
<i>Updating documents</i>	136
Conclusion.....	138
9. Planning for Performance – Collections and Indexes.....	139
Introduction.....	139
Structure.....	139
Objectives.....	140
Indexing collections.....	140
<i>Basic Indexes</i>	141
<i>Creating an index</i>	141
<i>Creating an Index in MongoDB compass</i>	142
<i>Naming an index</i>	142
<i>Indexes on Arrays</i>	143
<i>Compound indexes</i>	143
<i>Unique indexes</i>	143
<i>Query plans</i>	144
<i>Using explain() With an Index</i>	145

<i>Special index types</i>	147
<i>Case insensitive indexes</i>	147
<i>Wildcard indexes</i>	148
<i>Time to live indexes</i>	149
<i>Geospatial indexing</i>	150
Maintaining indexes.....	150
<i>Hiding Indexes</i>	151
<i>Deleting indexes</i>	152
<i>Modifying indexes</i>	152
Collection settings and types.....	152
<i>Capped Collections</i>	153
<i>Time-Series collections</i>	154
<i>Storing files with GridFS</i>	155
Document schema validation.....	156
<i>Basic schema validation</i>	156
<i>Validation in MongoDB compass</i>	158
Collection maintenance.....	159
<i>Collection statistics</i>	159
<i>Deleting collections</i>	161
Conclusion.....	161
10. Getting In and Getting Out – Data Migration	163
Introduction.....	163
Structure.....	163
Objectives.....	164
Importing data.....	164
<i>Importing via MongoDB Compass</i>	164
<i>Using database import tools</i>	166
<i>MongoDB database tools</i>	166
Using the mongoimport Command.....	167
<i>Importing Into Non-empty Collections</i>	169

<i>Importing JSON from an API</i>	169
<i>Bulk Inserts</i>	172
Exporting data.....	172
<i>Exporting via MongoDB Compass</i>	172
<i>Using database export tools</i>	173
<i>Using the mongoexport Command</i>	173
<i>Using the mongodump Command</i>	174
Using the mongorestore command.....	174
Transferring data.....	175
<i>Transferring via the Aggregation Framework</i>	175
<i>Archiving documents</i>	175
Conclusion.....	176
11. Make It Great – Configuration and Monitoring	177
Introduction.....	177
Structure.....	178
Objectives.....	178
MongoDB server operations.....	178
<i>Starting the MongoDB server</i>	178
<i>Stopping the MongoDB Server</i>	179
<i>MongoDB Server binary</i>	179
<i>The importance of ports</i>	179
<i>Other MongoDB binaries</i>	180
Configuration.....	180
<i>Server binary and data</i>	180
<i>MongoDB Data Files</i>	181
<i>Command line</i>	181
<i>Configuration file</i>	182
<i>File Format</i>	182
<i>Server defaults</i>	182
<i>Common Options</i>	183

<i>Externally sourced config</i>	188
Monitoring MongoDB.....	188
<i>Database statistics</i>	189
<i>The dbStats command</i>	189
<i>The serverStatus command</i>	189
<i>Command line tools</i>	192
<i>The mongotop command</i>	192
<i>The mongostats command</i>	193
<i>Monitoring software</i>	194
Conclusion.....	195
12. Seamless Scaling – Replication and Sharding	197
Introduction.....	197
Structure.....	198
Objectives.....	198
Reducing risk with replication	198
<i>Replica sets</i>	199
<i>Primaries, secondaries and elections</i>	199
<i>Automatic failover</i>	199
<i>Initiation and configuration</i>	201
<i>Replica set configuration</i>	201
<i>Initiating a replica set</i>	204
<i>Connecting to a replica set</i>	204
<i>The local database</i>	207
<i>The oplog collection</i>	208
<i>Changing a primary to a secondary</i>	209
<i>Member roles and types</i>	210
<i>Priority</i>	210
<i>Voting nodes</i>	211
<i>Hidden nodes</i>	211
<i>Delayed nodes</i>	212

<i>Arbiters</i>	212
<i>Administration</i>	213
<i>Changing an existing replica set</i>	213
<i>Fail-safes</i>	213
<i>Maintenance and disaster recovery</i>	215
<i>Monitoring</i>	216
Scaling with Sharding.....	216
<i>Sharding data and Shard keys</i>	217
<i>Config Servers and the mongos process</i>	217
<i>Replica Set Considerations</i>	218
<i>Sharding configuration</i>	219
Conclusion.....	219
13. Being Proactive – Security and Backups	221
Introduction.....	221
Structure.....	221
Objectives.....	222
Authentication – Proving who you are	222
<i>Enabling access control</i>	223
<i>Localhost exception</i>	223
<i>Authorization on Docker</i>	224
<i>Creating Users</i>	224
<i>Logging in With a User</i>	226
<i>Types of authentication</i>	227
<i>Users on different databases</i>	227
<i>Authentication and replica sets</i>	228
Authorization: What you can do.....	228
<i>Privileges</i>	229
<i>Roles</i>	229
<i>User-defined roles</i>	230
Backup strategies.....	232

<i>Filesystem Backups</i>	232
<i>MongoDB Database Tools</i>	233
<i>Example backup script</i>	233
<i>MongoDB services</i>	235
Restoring backups	235
<i>Restoring via MongoDB data files</i>	235
<i>MongoDB Database tools</i>	235
<i>Example Restore script</i>	236
Database encryption.....	237
<i>Network encryption</i>	237
<i>Application-level encryption</i>	237
Conclusion.....	238
14. Making Stuff – Programming with MongoDB.....	239
Introduction.....	239
Structure.....	239
Objectives.....	240
Programming with MongoDB.....	240
<i>Code examples</i>	240
<i>Book GitHub Codespace</i>	240
Python and MongoDB.....	241
<i>Installing the PyMongo library</i>	241
<i>Connecting to a Database with Python</i>	242
<i>Performing queries with python</i>	243
<i>Query options with python</i>	243
<i>Inserting a document with Python</i>	244
<i>Aggregation with Python</i>	246
Node.JS and MongoDB.....	247
<i>Installing the MongoDB Driver</i>	247
<i>Connecting to a Database with Node.JS</i>	247
<i>Query Options with Node.JS</i>	249

<i>Inserting a Document with Node.JS</i>	251
<i>Aggregation with Node.JS</i>	252
<i>Using MongoDB with Mongoose</i>	254
PHP and MongoDB.....	256
<i>Installing the MongoDB Driver and Library</i>	256
<i>Autoloading the PHP MongoDB library</i>	256
<i>Connecting to a database with PHP</i>	257
<i>Query Options with PHP</i>	258
<i>Inserting a document with PHP</i>	259
<i>Aggregation with PHP</i>	260
<i>Using MongoDB with Laravel</i>	262
Other language examples.....	263
Go.....	263
C#	265
Java.....	266
Kotlin	267
Rust.....	268
C++.....	268
Ruby.....	270
Swift.....	270
Perl.....	271
Scala.....	272
Bash.....	272
Conclusion.....	273
15. Tools for Success – MongoDB Shell and Compass UI	275
Introduction.....	275
Structure.....	275
Objectives.....	276
MongoDB Shell	276
<i>Configuration</i>	276
<i>Editor mode</i>	276

<i>Node.JS Scripting</i>	277
<i>Snippets</i>	282
Visual Studio Code	283
<i>MongoDB extension</i>	283
<i>MongoDB Playgrounds</i>	284
MongoDB compass	285
<i>Advanced connection options</i>	285
<i>Creating Collections</i>	287
<i>My Queries</i>	287
<i>Exporting Queries</i>	288
<i>Aggregation Framework and Pipelines</i>	288
<i>Schema</i>	290
<i>Explain plan</i>	291
<i>Performance monitoring</i>	292
Conclusion	293
16. Cloud Services – MongoDB Atlas	295
Introduction	295
Structure	295
Objectives	296
Database Services	296
<i>Multi-Cloud Database Services</i>	296
<i>Clusters</i>	296
<i>Serverless</i>	298
<i>Viewing and Editing Data</i>	298
<i>Users</i>	299
<i>Network Access</i>	299
<i>Connecting to Atlas Cluster</i>	301
<i>Data API</i>	301
<i>Backups</i>	303
Cloud Tools	304

<i>Search</i>	304
<i>Triggers</i>	306
<i>Device Sync</i>	307
<i>Data Lake</i>	307
<i>Atlas CLI</i>	308
Charts.....	308
<i>Create Charts</i>	309
<i>Sharing and Embedding</i>	312
Conclusion.....	313
17. MongoDB Atlas – Application Services	315
Introduction.....	315
Structure.....	315
Objectives.....	316
Atlas Database and App.....	316
<i>Create Atlas App</i>	318
<i>Database User Access</i>	320
<i>Anonymous Realm Users</i>	320
<i>User Create Function</i>	321
React App.....	325
<i>Create React App</i>	325
<i>Dependencies</i>	326
<i>Using the Realm Web SDK</i>	326
Coding the App.....	327
<i>Core Components</i>	327
<i>Realm Context</i>	332
<i>Context Hooks</i>	334
<i>User Context</i>	335
<i>useUser Hook</i>	337
<i>useAggregate Hook</i>	340
<i>Question Context</i>	342

<i>Displaying Questions</i>	345
Question Component.....	346
Question Tabs Component.....	349
<i>Question Navigation Component</i>	356
<i>Wrap Up</i>	358
Conclusion.....	358
18. Jobseeker – Interview Prep.....	359
Introduction.....	359
Structure.....	360
Objectives.....	360
MongoDB Questions and Response	360
<i>How to use these questions</i>	361
<i>MongoQuest</i>	361
Questions round 1	361
Questions round 2	362
Questions round 3	364
Questions round 4	365
Questions round 5	367
Questions round 6	368
Questions round 7	370
Questions round 8	371
Questions round 9	372
Questions round 10	374
Conclusion.....	375
19. Conclusion.....	377
Introduction.....	377
Structure.....	377
Objectives.....	378
Change Streams	378

<i>Subscribing to Database Changes</i>	378
<i>Triggering Actions with Change Streams</i>	379
<i>Running Change Streams</i>	381
Transactions	383
<i>Transactions in mongosh</i>	383
<i>Transactions in Code</i>	384
Storing Files with GridFS	386
<i>Using mongofiles</i>	387
<i>Using Code</i>	388
SQL to MongoDB	389
Conclusion	390
Index	391-399

CHAPTER 1

Why MongoDB?

“There is a great deal of difference between the eager man who wants to read a book, and the tired man who wants a book to read.”

-G. K. Chesterton

Introduction

Many people love to cook. But do not worry; this is not a book about cooking. We are bringing up food to whet your appetite a little and maybe even illustrate how you are probably using a lot of the concepts we will learn about here, in your everyday lives.

If you are picking up this book, you probably have some idea of what MongoDB is or you might have heard that learning it will help you along in your career. Maybe you just really want to know more: Why should I learn MongoDB; you might be asking?

MongoDB is a powerful, fast, and modern database that was designed for modern applications. From its flexible Document Model (for data), JavaScript based query language, blazing speed, advanced replication and scaling, simple redundancy, advanced aggregation framework, and hooks into the wider MongoDB Atlas Cloud ecosystem, it just might be a clear choice for your next project (or even an existing one)!

Through real life examples and analogies (like cooking), we are going to learn all about MongoDB and its concepts, its associated technologies and how those concepts might apply to the next step in your career.

Hopefully, you are hungry to learn some more. Let us get started.

Structure

In this chapter, we will discuss the following topics:

- Recipes as data
- The history of data
 - Databases of Data
 - Computer Databases
 - Relational Databases
 - Bringing Separate Data Together
- Data that goes together, can live together
- Thinking of data differently
- This is why MongoDB...

Objectives

By the end of this chapter, you will have a basic idea of the history of data and databases, how different types of databases work and how MongoDB differs with a newer, modern way to store and interact with data.

Recipes as Data

We all need food and *good* food that is cooked well, is appreciated throughout the world and across cultures. Food (and cooking it) can sometimes be subjective and complex, yet somehow simple (at its best), at the same time.

What your favourite meals do have in common is some form of structure: there are important details about what ingredients you need (their measurements, units, and so on). There are precise steps to follow, specific temperatures as well as cooking techniques needed, to successfully make the dish. *Figure 1.1* is an example of an old recipe:

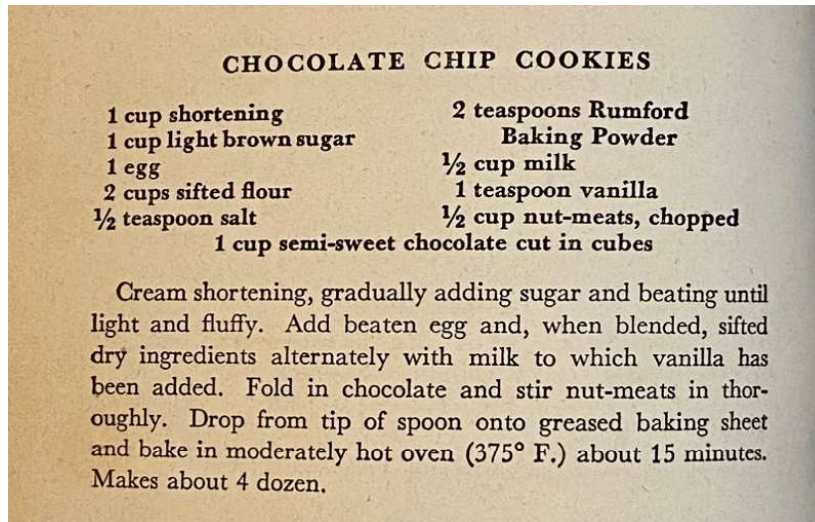


Figure 1.1: Century Old Chocolate Chip Cookie Recipe (Public Domain)

In essence, these instructions are an orderly set of data which we simply call a “recipe.” We compile it into a document, which in turn is sometimes gathered into a collection of documents. In simple English, it is called a “Cookbook” or a “Recipe Book”.

Switching to a more modern example; what if you wanted a recipe for dinner? You have about half an hour and all you have in your refrigerator, is a chicken. So, you ask the voice assistant on your phone:

“Find me recipes for chicken that I can cook in 30 minutes or less.”

That might seem like a simple statement but (going with our theme here) there is a lot of information packed into this short sentence. Let us break it out a bit, and see how we might turn this spoken request into a database query:

“Find me recipes for chicken”

Starting off, this has the makings of a good query. The user wants us to “find” a particular thing: a “recipe”. To make this simple, we will query for recipes literally titled “Chicken”. Now, in reality, we would probably do some sort of wildcard search for recipes with the word “chicken” in the title, or more likely also as one of the ingredients.

“... that I can cook in 30 minutes”

This is a little more complicated. Do they mean the actual time to cook the recipe is 30 minutes? Or do they mean cooking time plus the preparation time? Given the context here, we will assume that they mean the *combination* of both. Also, this would mean 30 minutes or less, as in less than or equal to.

Find me a recipe query

Here is how we might construct this as a query in MongoDB:

```
db.recipes.find( { "title" : "Chicken", "total_time" : { $lte: 30 } } );
```

We will gain more information about how querying works and how to compose queries in future chapters. For now, you can see we are looking for a match on the **title** field and doing our less than or equal to on a **total_time** field. It might look a little funny right now, but the **\$lte** means “less than or equal to” **30** and it is called a Query Operator (they start with a **\$**). We will learn more about them soon.

Put back into English, it translates to: “Find me recipes where the title is Chicken, and the total time to make it is less than or equal to 30 minutes.”

With MongoDB, we will search our recipes, which are stored in **Documents** (more on that in *Chapter 4, A Better Way to Store Data – Documents*) within a **Collection** here called “recipes” (more on that in *Chapter 9, Planning for Performance – Collections and Indexes*) by using the **find** method. Given this method of storing data, MongoDB is commonly referred to as a **Document Database**.

Before we go much further, let us step back for a moment and delve a little into the history of data and databases.

The history of data

“As a general rule, the most successful man in life is the man who has the best information.”

-Benjamin Disraeli

“Information is the oxygen of the modern age. It seeps through the walls topped by barbed wire; it wafts across the electrified borders.”

- Ronald Reagan

There are many types of databases, and the concept of a computer database has been around for almost as long as (electronic) computers themselves. However, data is not a “new” or even “modern” concept. Humans may have only had computers for a couple decades, but data (and even forms of databases) have been around for millennia.

Databases of clay

The first computer database is generally credited to Charles Bachman in the 1960s while working for IBM. However, the general concept itself goes back thousands