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Professional

Clojure

PROFESSIONAL Clojure

Jeremy Anderson Michael Gaare Justin Holguín Nick Bailey Timothy Pratley



Professional Clojure

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PROFESSIONAL CLOJURE

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ABOUT THE AUTHORS



JEREMY ANDERSON is a developer at Code Adept, a West Michigan-based software consultancy focused on delivering high-quality software through providing software development, agile coaching, and training services. He is a Clojure enthusiast and contributor to a few different Clojure libraries. He is very passionate about teaching others how to program and volunteers to help teach computer science to area high-school and middle-school students.



MICHAEL GAARE is the platform technical lead at Nextangles, a financial technology startup. He's been using Clojure professionally since 2012 to build web services, data processing systems, and various libraries—not frameworks! In his spare time, he enjoys spending time with his wife and two daughters, and his hobby is opera singing.



JUSTIN HOLGUÍN is a software engineer at Puppet Labs, where he specializes in Clojure back-end services. Justin has a passion for functional programming and a special interest in technologies that improve software reliability, such as advanced type systems and property-based testing.



NICK BAILEY is a Clojure enthusiast and the maintainer of the Clojure java.jmx library. He is a software architect at DataStax, where he uses Clojure to build enterprise-level software for managing distributed databases. He was introduced to Clojure in 2010 and has been a fan ever since.



TIMOTHY PRATLEY is a Clojure contributor and advocate. Clojure has been his language of choice since 2008. He develops solutions in Clojure, ClojureScript, and Clojure-Android at his current role at Outpace Systems, Inc. He has 15 years of professional software development experience during which he has used many languages, frameworks, and databases. He loves Clojure, Datomic, pair programming, and thinking.

ABOUT THE TECHNICAL EDITORS

JUSTIN SMITH is a full-time Clojure developer who is active in the online Clojure community. His day job is 100% Clojure development.

ZUBAIR QURAISHI is a UX/Design and marketing hacker based in Denmark who has sold 2 startups and invested in over 30 startups over the last 20 years. He has been using Clojure and ClojureScript for the last 5 years. He has worked in many startups and Fortune 500 companies based in the United States, Europe, and Asia. You can find his blog is at www.zubairquraishi.com.

ALEX OTT is a software architect in Intel Security (formerly McAfee), based in Paderborn, Germany. He works in the area of information security and has been using Clojure since release 1.0 (2009) to build prototypes, internal services, and open source projects, like Incanter.

DOUG KNIGHT has been programming computers professionally for 18 years, using Microsoft technologies for most of that time. He switched to Ruby on Rails in 2014 when he joined LivingSocial, and in 2015 he added Clojure as part of his work for the company.

CREDITS

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INTRODUCTION

WHAT IS CLOJURE?

Clojure is a dynamic, general-purpose programming language, combining the approachability and interactive development of a scripting language with an efficient and robust infrastructure for multithreaded programming. Clojure is a compiled language, yet remains completely dynamic—every feature supported by Clojure is supported at runtime. Clojure provides easy access to the Java frameworks, with optional type hints and type inference, to ensure that calls to Java can avoid reflection.

Clojure is a dialect of Lisp, and shares with Lisp the code-as-data philosophy and a powerful macro system. Clojure is predominantly a functional programming language, and features a rich set of immutable, persistent data structures. When mutable state is needed, Clojure offers a software transactional memory system and reactive Agent system that ensure clean, correct, multithreaded designs.

—RICH HICKEY, AUTHOR OF CLOJURE

This quote from Rich Hickey, the creator of Clojure, captures what Clojure is. Many people equate Clojure with functional programming, but much like Lisp, its predecessor, it's a general-purpose language that will support you no matter what paradigm you decide to program in.

Clojure is, however, very opinionated and offers great support for programming in a functional manner, with its focus on immutable values and persistent data structures. You may be surprised to know that Clojure also offers the ability to do object-oriented programming, which we cover in this book.

WHO IS THIS BOOK FOR?

This book was written with the professional programmer in mind. This means you should have experience programming in a language, and you should know the basic syntax and concepts in Clojure, and be ready to take Clojure programming to the next level. Our goal is to take you from a Clojure beginner to being able to think like a Clojure developer. Learning Clojure is much more than just learning a new syntax. You must use tools and constructs much differentely than anything you may be familiar with.

DEMO APPLICATION SOURCE CODE

You can access the source code from the Wiley website at www.wiley.com/go/professionalclojure or at our demo application via Github at https://github.com/backstopmedia/clojurebook.

A powerful programming language is more than just a means for instructing a computer to perform tasks. The language also serves as a framework within which we organize our ideas about processes.

-STRUCTURE AND INTERPRETATION OF COMPUTER PROGRAMS

This book assumes some prior knowledge of Clojure and programming in general, but does not assume proficiency in Clojure. It will cover a broad scope of topics from changing the way you think and approach programming to how you integrate the REPL into your normal development routine to how you build real world applications using Ring and ClojureScript.

WHAT WILL YOU LEARN?

Our goal is to provide you with some real world examples of how to apply your Clojure knowledge to your day-to-day programming, not just theory and academia.

Chapter 1

In Chapter 1, you will learn about Clojure's unique view on designing programs. You'll discover some of the things that set Clojure apart from other languages, for example, how immutability is the default, and how Clojure qualifies as object-oriented programming.

Chapter 2

In Chapter 2, you will learn how to become proficient with the REPL and various tips and techniques for interacting with your actual application through the REPL. You'll learn how to run your code and tests from the REPL as well as how to write code that is easily reloaded from the REPL without having to restart it.

Chapter 3

In Chapter 3, you learn about building web services with Compojure, and the various concepts involved such as routes, handlers, and middleware. You will build a complete web service, and then learn various techniques for deploying your new application.

Chapter 4

Chapter 4 covers testing in Clojure, focusing primarily on the clojure.test testing library. You'll learn various techniques for many common testing scenarios, along with tools to help measure the quality of your code.

Chapter 5

In Chapter 5, you will learn how to build a task management web application similar to the popular Trello application in ClojureScript. You'll also learn the techniques for sharing functions between both your server-side and client-side applications.

Chapter 6

Chapter 6 takes a look at Datomic and how it applies the concept of immutability to databases. You'll learn the basics of how to model data in a Datomic database and how to extract that information. Then you'll apply this knowledge to building a database to support the task management application from Chapter 5.

Chapter 7

In Chapter 7, you'll take a look at performance and how to make your Clojure code execute faster. You'll discover how with a little work you can tweak your Clojure code to be as fast as Java code.

TOOLS YOU WILL NEED

Just as in any good adventure or journey, having the right tools makes things go much smoother. Fortunately, to work through the examples in this book, you only need three things: Java, Leiningen, and a good text editor.

Java

Most computers these days come with Java pre-installed, but in order to run the examples contained in this book you need to make sure you have installed a recent version. The code examples in this book were written with and confirmed to work with JDK 1.8.0_25. For instructions on how to download and install the proper JDK for your platform, see the documentation at Oracle's JDK download page: (http://www.oracle.com/technetwork/java/javase/downloads/index.html).

Leiningen

Leiningen, according to their website (http://leiningen.org), is the most contributed-to Clojure project. For those of you coming from a background in Java, Leiningen fills a similar role that

Maven does for the Java world, only without all of the XML, and you can avoid wanting to pull your hair out. It helps you manage the dependencies for your project and declaratively describe your project and configuration, and provides access to a wealth of plugins for everything from code analysis to automation, and more. Leiningen makes your Clojure experience much more enjoyable.

Fortunately, getting Leiningen up and running is a fairly simple task. You'll want to install the latest version available, which at the time of this writing is 2.5.3. Please refer to the Leiningen website for instructions particular to your programming environment.

Editors

Once you have Leiningen installed, the only thing left to do is to make sure you have a good text editor to efficiently edit your Clojure code. If you have a favorite editor, just use what you're already comfortable with. However, if your editor doesn't support basic things like parentheses balancing, integration with the REPL, syntax highlighting, or properly indenting Clojure code, you may want to consider one of the editors below.

Emacs

Emacs is the favored editor of many grizzled veterans. It has a long history with Lisp. Even though it has a steep learning curve, it is considered by many to be very powerful, and no other editor is as extensible. There are many custom Emacs configurations designed to help ease the learning curve, such as Emacs Prelude (https://github.com/bbatsov/prelude), which also contains a sensible default configuration for developing in many languages, including Clojure.

LightTable

LightTable (http://lighttable.com) began life as a Kickstarter project with a unique new vision of how to integrate the code editor, REPL, and documentation browser for Clojure. It has delivered on those promises and then some and has gained popularity among many in the Clojure community.

Cursive (IntelliJ)

If you're already comfortable with using any of the various JetBrains IDEs, you'll be happy to know that there is a plugin for IntelliJ called Cursive (https://cursive-ide.com). Besides having good integration with nREPL, it also stays true to its reputation and contains excellent refactoring support, as well as debugging and Java interop.

Counterclockwise (Eclipse)

For those who are familiar with Eclipse, there is Counterclockwise (http://doc.ccw-ide.org), which can be installed as either an Eclipse plugin or a standalone product. Counterclockwise boasts many of the same features as the previous editors, integration with the REPL, and ability to evaluate code inline.

CONVENTIONS

To help you get the most from the text and keep track of what's happening, we've used a number of conventions throughout the book.

NOTE Notes indicates notes, tips, hints, tricks, and/or asides to the current discussion.

As for styles in the text:

- ➤ We *highlight* new terms and important words when we introduce them.
- We show code within the text like so: persistence.properties.
- We show all code snippets in the book using this style:

```
FileSystem fs = FileSystem.get(URI.create(uri), conf);
InputStream in = null;
try {
```

➤ URLs in text appear like this: http://<Slave Hostname>:50075.

SOURCE CODE

As you work through the examples in this book, you may choose either to type in all the code manually, or to use the source code files that accompany the book. All of the source code used in this book is available for download at www.wiley.com. Specifically for this book, the code download is on the Download Code tab at:

```
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```

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- 2. Read the terms of use and click Agree.
- **3.** Complete the required information to join, as well as any optional information you wish to provide, and click Submit.
- **4.** You will receive an e-mail with information describing how to verify your account and complete the joining process.

NOTE You can read messages in the forums without joining P2P, but in order to post your own messages, you must join.