



# SERVICE-ORIENTED DESIGN WITH RUBY AND RAILS

*Foreword by* **Obie Fernandez**, *Series Editor*

**PAUL DIX**

*with* TROTTER CASHION ■ BRYAN HELMKAMP ■ JAKE HOWERTON

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Paul Dix

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*To Pops, for encouraging my weird obsession with computers.*

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# Foreword

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It's an honor for me to present to you this timely new addition to the Professional Ruby Series, one that fills a crucially important gap in the ongoing evolution of all professional Rubyists and couldn't come a moment sooner! It is authored by one of the brightest minds of our international Ruby community, Paul Dix, described as "genius" and "A-list" by his peers. Paul is no stranger to the Ruby world, a fixture at our conferences and involved in some of the earliest Rails project work dating back to 2005. He's also the author of Typhoeus, a successful high-performance HTTP library that is an essential part of the service-oriented ecosystem in Ruby.

Why is this book so timely? Serious Ruby adoption in large companies and project settings inevitably necessitates service-oriented approaches to system design. Properly designed large applications, partitioned into cooperating services, can be far more agile than monolithic applications. Services make it easy to scale team size. As the code base of an application gets larger, it gets harder to introduce new developers to the project. When applications are split into services, developers can be assigned to a specific service or two. They only need to be familiar with their section of the application and the working groups can remain small and nimble.

There's also the fact that we live in the age of The Programmable Web, the boom of web applications, APIs, and innovation over the past few years that is directly attributable to the rise of interoperable web services like those described in this book. Applications that rely on web resources present unique challenges for development teams. Service-oriented traits impact various aspects of how applications should be designed and the level of attention that needs to be paid to how the application performs and behaves if those services are unavailable or otherwise limited.

My own teams at Hashrocket have run into challenges where we could have used the knowledge in this book, both in our Twitter applications as well as our large client projects, some of which we have been working on for years. In a couple of notable cases, we have looked back in regret, wishing we had taken a service-oriented approach

sooner. I assure you that this book will be on the required-reading list for all Rocketeers in the future.

Like Hashrocket, many of you buying this book already have big monolithic Rails applications in production. Like us, you might have concerns about how to migrate your existing work to a service-oriented architecture. Paul covers four different strategies for application partitioning in depth: Iteration Speed, Logical Function, Read/Write Frequency, and Join Frequency. Specific examples are used to explore the challenges and benefits of each strategy. The recurring case study is referred to often, to ensure the discussion is grounded in real, not imaginary or irrelevant situations.

Paul doesn't limit himself to theory either, which makes this a well-rounded and practical book. He gives us important facts to consider when running in a production environment, from load balancing and caching to authentication, authorization, and encryption to blocking I/O to parallelism, and how to tackle these problems in Ruby 1.8, 1.9, Rubinius, and JRuby.

Overall, I'm proud to assure you that Paul has given us a very readable and useful book. It is accurate and current, bringing in Rack, Sinatra, and key features of Rails 3, such as its new routing and ActiveRecord libraries. At the same time, the book achieves a timeless feeling, via its concise descriptions of service-oriented techniques and broadly applicable sample code that I'm sure will beautifully serve application architects and library authors alike for years to come.

—Obie Fernandez

Author of *The Rails Way*

Series Editor of the Addison-Wesley Professional Ruby Series

CEO & Founder of Hashrocket

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# Preface

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As existing Ruby on Rails deployments grow in size and adoption expands into larger application environments, new methods are required to interface with heterogeneous systems and to operate at scale. While the word *scalability* with respect to Rails has been a hotly debated topic both inside and outside the community, the meaning of the word *scale* in this text is two fold. First, the traditional definition of “handling large numbers of requests” is applicable and something that the service-oriented approach is meant to tackle. Second, *scale* refers to managing code bases and teams that continue to grow in size and complexity. This book presents a service-oriented design approach that offers a solution to deal with both of these cases.

Recent developments in the Ruby community make it an ideal environment for not only creating services but consuming them as well. This book covers technologies and best practices for creating application architectures composed of services. These could be written in Ruby and tied together through a frontend Rails application, or services could be written in any language, with Ruby acting as the glue to combine them into a greater whole. This book covers how to properly design and create services in Ruby and how to consume these and other services from within the Rails environment.

## Who This Book Is For

This book is written with web application and infrastructure developers in mind. Specific examples cover technologies in the Ruby programming ecosystem. While the code in this book is aimed at a Ruby audience, the design principles are applicable to environments with multiple programming languages in use. In fact, one of the advantages of the service-oriented approach is that it enables teams to implement pieces of application logic in the programming language best suited for the task at hand. Meanwhile, programmers in any other language can take advantage of these

services through a common public interface. Ultimately, Ruby could serve simply at the application level to pull together logic from many services to render web requests through Rails or another preferred web application framework.

If you're reading this book, you should be familiar with web development concepts. Code examples mainly cover the usage of available open source Ruby libraries, such as Ruby on Rails, ActiveRecord, Sinatra, Nokogiri, and Typhoeus. If you are new to Ruby, you should be able to absorb the material as long as you have covered the language basics elsewhere and are generally familiar with web development. While the topic of service-oriented design is usually targeted at application architects, this book aims to present the material for regular web developers to take advantage of service-based approaches.

If you are interested in how Ruby can play a role in combining multiple pieces within an enterprise application stack, you will find many examples in this book to help achieve your goals. Further, if you are a Rails developer looking to expand the possibilities of your environment beyond a single monolithic application, you will see how this is not only possible but desirable. You can create systems where larger teams of developers can operate together and deploy improvements without the problem of updating the entire application at large.

The sections on API design, architecture, and data backends examine design principles and best practices for creating services that scale and are easy to interface with for internal and external customers. Sections on connecting to web services and parsing responses provide examples for those looking to write API wrappers around external services such as SimpleDB, CouchDB, or third-party services, in addition to internal services designed by the developer.

## What This Book Covers

This book covers Ruby libraries for building and consuming RESTful web services. This generally refers to services that respond to HTTP requests. Further, the APIs of these services are defined by the URIs requested and the method (GET, PUT, POST, DELETE) used. While the focus is on a RESTful approach, some sections deviate from a purist style. In these cases, the goal is to provide clarity for a service API or flexibility in a proposed service.

The primary topics covered in this book are as follows:

- REST, HTTP verbs, and response codes
- API design



- Building services in Ruby
- Connecting to services
- Consuming JSON- and XML-based services
- Architecture design
- Messaging and AMQP
- Securing services

## What This Book Doesn't Cover

Service-oriented architectures have been around for over a decade. During this time, many approaches have been taken. These include technologies with acronyms and buzzwords such as SOAP, WSDL, WS-\*, and XML-RPC. Generally, these require greater overhead, more configuration, and the creation of complex schema files. Chapter 9, “Parsing XML for Legacy Services,” provides brief coverage of consuming XML and SOAP services. However, SOAP, XML-RPC, and related technologies are beyond the scope of this book. The services you'll create in this book are lightweight and flexible, like the Ruby language itself.

This book also does not cover other methods for building complex architectures. For example, it does not cover batch processing frameworks such as MapReduce or communications backends such as Thrift. While these technologies can be used in conjunction with a web services approach, they are not the focus. However, Chapter 11, “Messaging,” briefly covers messaging systems and message queues.

## Additional Resources

Code examples are used heavily throughout this book. While every effort has been made to keep examples current, the open source world moves fast, so the examples may contain code that is a little out-of-date. The best place to find up-to-date source code is on GitHub, at the following address:

<http://github.com/pauldix/service-oriented-design-with-ruby>

In addition, you can subscribe to a mailing list to discuss the code, text, services design, and general questions on the topic of service-oriented design. You can join here:

<http://groups.google.com/group/service-oriented-design-with-ruby>

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# Acknowledgments

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# About the Author

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**Paul Dix** is co-founder and CTO at Market.io. In the past, he has worked at Google, Microsoft, McAfee, Air Force Space Command, and multiple startups, filling positions as a programmer, software tester, and network engineer. He has been a speaker at multiple conferences, including RubyConf, Goruco, and Web 2.0 Expo, on the subjects of service-oriented design, event-driven architectures, machine learning, and collaborative filtering. Paul is the author of multiple open source Ruby libraries. He has a degree in computer science from Columbia University.

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## CHAPTER 1

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# Implementing and Consuming Your First Service

In the grand tradition of programming books beginning with a “hello, world” example, this book starts off with a simple service. This chapter walks through the creation of a service to store user metadata and manage authentication. This includes building the web service to handle HTTP requests and the client library for interacting with the service.

### What’s a Service?

In this book, *service* generally refers to a system that responds to HTTP requests. Such HTTP requests are usually to write, retrieve, or modify data. Examples of public-facing HTTP services include Twitter’s API (<http://apiwiki.twitter.com>), the Amazon S3 service (<http://aws.amazon.com/s3/>), the Delicious API (<http://delicious.com/help/api>), the Digg API (<http://apidoc.digg.com>), and the New York Times APIs (<http://developer.nytimes.com/docs>). Internally, services could exist to contain pieces of data and business logic that are used by one or more applications.

Using a broader scope of definition, *service* can refer to a system that provides functionality through a standard interface. Working at this level of abstraction are services such as relational databases (for example, MySQL), Memcached servers, message queues (for example, RabbitMQ), and other types of data stores, such as Cassandra (<http://incubator.apache.org/cassandra/>).

While this book touches on the broader definition of *service* in a few places, the majority of the material focuses on HTTP-based services. More specifically, this book focuses on services that are designed to roughly follow a RESTful paradigm, as described in the appendix, “RESTful Primer.” Further, this book focuses on using services within an organization and infrastructure to build out applications. These services may or may not be public facing, like the previous examples.

The details of why, when, and how to use services are covered throughout the course of the book. For now the goal is to implement a simple service.

## Service Requirements

A simple user management system is an example of something that can be pulled out as a service. After implementation, this service could be used across multiple applications within an organization as a single sign-on point. The goals and requirements of the service are fairly simple:

- Store user metadata, including name, email address, password, and bio.
- Support the full range of CRUD (create, update, delete) operations for user objects.
- Verify a user login by name and password.

In later versions of the user service, features could map which users work with each other, which user each user reports to, and which groups a user is a member of. For now, the basic feature set provides enough to work on.

## The Ruby Tool Set

Ruby provides many tools to build both the service and client sides of services. However, this book heavily favors some specific tools due to their aesthetics or performance characteristics. The following libraries appear often throughout this book.

### Sinatra

Sinatra is a lightweight framework for creating web applications. It can be described as a domain-specific language for web applications and web services. Built on top of Rack, Sinatra is perfectly suited for creating small web services like the example in this chapter. In addition to encouraging an elegant code style, Sinatra has fewer than 2,000



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