Beta Edition 0.9.0

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1 Engineering Software is Different from Hardware 21

To help understand the nature of engineering software, we contrast it with hardware engineering with regards to product lifetimes, development processes, productivity, and assurance. The similarities and differences led to popular processes for software development: Waterfall, Spiral, and Agile. We show the synergy between Software as a Service (SaaS), Cloud Computing, and Agile software development. We conclude with a tour of the remainder the book.

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2 SaaS Architecture 49

Whether creating a new system or preparing to modify an existing one, understanding its architecture at multiple levels is essential. Happily, good software leverages patterns at many levels—proven solutions to similar architectural problems, adapted to the needs of a specific problem. Judicious use of patterns helps simplify design, reveal intent, and compose software components into larger systems. We'll examine the patterns present at various logical layers of SaaS apps, discuss why each pattern was chosen, and where appropriate, note the opportunity cost of not choosing the alternative. Patterns aren't perfect for every problem, but the ability to separate the things that change from those that stay the same is a powerful tool for organizing and implementing large systems.

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3 Ruby for Java Programmers

This quick introduction will get you up to speed on idiomatic Ruby, a highly productive scripting language. We focus on the unique productivity-enhancing features of Ruby that may be unfamiliar to Java programmers, and we omit many details that are well covered by existing materials. As with all languages, becoming truly comfortable with Ruby's powerful features will require going beyond the material in this introduction to the materials listed in Section 3.11.

3.1 Overview and Three Pillars of Ruby.
3.2 Everything is an Object.
3.3 Every Operation is a Method Call.
3.4 Classes, Methods, and Inheritance.
3.5 All Programming is Metaprogramming.
3.6 Blocks: Iterators, Functional Idioms, and Closures.
3.7 Mix-ins and Duck Typing.
3.8 Make Your Own Iterators Using Yield.
3.9 Fallacies and Pitfalls.
3.10 Concluding Remarks: Idiomatic Language Use.
3.11 To Learn More.
3.12 Suggested Projects.

4 Rails From Zero to CRUD

Rails is a Ruby-based framework that uses three patterns from Chapter 2 to organize SaaS apps: Model-View-Controller for the app as a whole, Active Record for models backed by a relational database in the persistence tier, and Template View for constructing HTML pages. For conciseness, DRYness and productivity, Rails makes pervasive use of Ruby's reflection and metaprogramming (Chapter 3) as well as convention over configuration, a design paradigm that automates some configuration based on the names of data structures and variables. Although Rails presents a lot of machinery for the simple examples developed in this chapter, you will quickly "grow into" these features as your apps become more sophisticated.

4.1 Rails Basics: From Zero to CRUD.
4.2 Databases and Migrations.
4.3 Models: Active Record Basics.
4.4 Controllers and Views.
4.5 Debugging: When Things Go Wrong.
4.6 Form Submission: New and Create.
4.7 Redirection and the Flash.
5 Validating Requirements: BDD and User Stories

The first step in the Agile cycle, and often the most difficult, is a dialogue with each of the stakeholders to understand the requirements. We first derive user stories, which are short narratives each describing a specific interaction between some stakeholder and the application. The Cucumber tool turns these stylized but informal English narratives into acceptance and integration tests. As SaaS usually involves end-users, we also need a user interface. We do this with low-fidelity (Lo-Fi) drawings of the Web pages and combine them into storyboards before creating the UI in HTML.

5.1 Introduction to Behavior-Driven Design and User Stories
5.2 SMART User Stories
5.3 Introducing Cucumber and Capybara
5.4 Running Cucumber and Capybara
5.5 Lo-Fi User Interface Sketches and Storyboards
5.6 Enhancing Rotten Potatoes
5.7 Explicit vs. Implicit and Imperative vs. Declarative Scenarios
5.8 Fallacies and Pitfalls
5.9 Concluding Remarks: Pros and Cons of BDD
5.10 To Learn More
5.11 Suggested Projects

6 Verification: Test-Driven Development

In test-driven development, you first write failing tests for a small amount of nonexistent code and then fill in the code needed to make them pass, and look for opportunities to refactor (improve the code's structure) before going on to the next test case. This cycle is sometimes called Red-Green-Refactor, since many testing tools print failed test results in red and passing results in green. To keep tests small and isolate them from the behavior of other classes, we introduce mock objects and stubs as examples of seams—places where you can change the behavior of your program at testing time without changing the source code itself.

6.1 Background: A RESTful API and a Ruby Gem
6.2 FIRST, TDD, and Getting Started With RSpec
6.3 The TDD Cycle: Red-Green-Refactor
6.4 More Controller Specs and Refactoring
6.5 Fixtures and Factories
6.6 TDD for the Model
6.7 Stubbing the Internet
6.8 Coverage Concepts and Unit vs. Integration Tests
6.9 Other Testing Approaches and Terminology
6.10 Fallacies and Pitfalls
6.11 Concluding Remarks: TDD vs. Conventional Debugging
6.12 To Learn More
6.13 Suggested Projects
7 Improving Productivity: DRY and Concise Rails

This chapter explores three sets of mechanisms for DRYing out your code, thereby making it more concise, beautiful and maintainable. Model validations and controller filters centralize what invariants must hold in order for a model object to be valid (for example, a movie must have a nonblank title) or for a controller action to proceed (for example, the user must be logged in as an admin). ActiveRecord Associations use Ruby language features to represent and manipulate relationships among different types of ActiveRecord models, while using relational-database functionality to represent these relationships as foreign-key associations. Finally, scopes let you encapsulate different ActiveRecord functionality into composable "building blocks" that you can easily reuse to add new query functionality to your app. In each case, tastefully-chosen language features and framework architecture support DRY and concise app code.

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8 Legacy Software, Refactoring, and Agile Methods ................................................. 229

Out of every dollar spent on software, 36% is spent on enhancements, 10% on fixing bugs, 11% on adapting to environmental changes such as new library versions or API changes, and 3% on refactoring to make the software more maintainable. In total, therefore, about 60% of software expenses is devoted to software maintenance, so your first job is more likely to involve improving existing code than creating a brand-new system from a clean slate. In Chapters 5 and 6 we looked at disciplined ways to evolve new code. Although thorough formal documentation of legacy systems may be lacking or inaccurate, the Agile techniques we already know can be pressed into service to help understand the structure of legacy software and create a foundation for extending and modifying it with confidence. We will describe what good code looks like and why, and show how to apply refactoring techniques to legacy code both to make it more testable (and therefore modifiable with confidence) and to leave it in better shape than we found it for the next developers.

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9 Working In Teams vs. Individually

Programming is now primarily a team sport, and this chapter covers techniques that can help teams succeed. Everyone on the team must agree on dividing up work, how to estimate the difficulty of the work to produce a schedule, how to correct the schedule when actual progress differs from predicted progress, and know where and how to check in code. Velocity-based iteration planning, supported by tools such as Pivotal Tracker, address the managing and scheduling tasks. Pair programming, design reviews, and code reviews can improve software quality. Good version control practices, supported by tools such as Git, address code management.

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10 SOLID Design Patterns for SaaS

Besides reusability, programmer productivity requires concise, readable code with minimal clutter. In this chapter, we describe some concrete guidelines for making your class architecture DRY and maintainable: the SOLID principles of object-oriented design—Single Responsibility, Open/Closed, Liskov Substitution, Injection of Dependencies, and Demeter—and some design patterns supporting them. We will learn about design smells and metrics that may warn you of violations of SOLID, and explore some refactorings to fix those problems. In some cases, those refactorings will lead us to one of a collection a design patterns—proven "templates" for class interaction that capture successful structural solutions to common software problems.

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11 Enhancing SaaS With JavaScript

Proper use of JavaScript enhances the user experience for newer browsers without excluding older browsers or those in which JavaScript is disabled. The Web's client-side
programming language has a bad reputation because most people who use it lack the programming experience to use its unusual features to write beautiful code. Fortunately, your Ruby knowledge will let you grasp JavaScript's unusual features easily, your SaaS knowledge will let you quickly understand frameworks like jQuery, and your TDD and BDD experience will apply directly to using Jasmine for test-driven JavaScript development.

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12 Performance, Upgrades, Practical Security ..................................... 339

Unlike shrink-wrapped software, SaaS developers are typically much closer to post-release operations and maintenance. This chapter covers what your SaaS app should not do when released: crash, become unresponsive when it experiences a surge in popularity, or compromise customer data. Since many of these concerns are greatly alleviated by deploying in a well-curated PaaS (Platform-as-a-Service) environment such as Heroku, we focus on how to steward your app to leverage those benefits as long as possible by monitoring to identify problems that interfere with responsive service, addressing those problems with caching and efficient database usage, and thwarting common attacks against customer data.

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13 Looking Backwards and Looking Forwards .................................... 371

In this chapter we give perspectives on the big ideas in this book—Agile, Cloud Computing, Rails, SaaS, and SOA—and show how Berkeley students who have graduated and taken jobs in industry rank their importance.

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Holds the template files for layouts to be used with views. This models the common header/footer method of wrapping views. In your views, define a layout using the `layout :default` and create a file named `default.html.erb`. Inside `default.html.erb`, call `<% yield %>` to render the view using this layout. app/helpers. Engineering Software as a Service: An Agile Approach Using Cloud Computing. Armando Fox. 4.3 out of 5 stars.

David Patterson is the Pardee Professor of Computer Science at UC Berkeley and is currently Director of the Parallel Computing Lab. In the past, he served as Chair of Berkeley's CS Division, Chair of the CRA, and President of the ACM. His best-known research projects are Reduced Instruction Set Computers (RISC), Redundant Arrays of Inexpensive Disks (RAID), and Network of Workstations (NOW). Introduction Software processes Agile software development Requirements engineering System modeling Architectural design Design and implementation Software testing Software evolution. Dependability and Security. Chapter 10 Chapter 11 Chapter 12 Chapter 13 Chapter 14 Chapter 15. I mostly use Extreme Programming as an example of an agile method but also briefly introduce Scrum in this chapter. The remainder of the chapters in this part are extended descriptions of the software process activities that will be introduced in Chapter 2. Chapter 4 covers the critically important topic of requirements engineer-ing, where the requirements for what a system should do are defined.