

A Brain-Friendly Guide

Head First Rails

**A Learner's Companion
to Ruby on Rails**



Master your
data with
Rails finders



Integrate your apps
with Google Maps and
never get lost again

Learn how Suzy
validated all
her dates and
avoided another
awful evening



Get inside Embedded
Ruby, and take
control of your apps



Add Ajax and
XML to your Rails
universe

O'REILLY®

David Griffiths

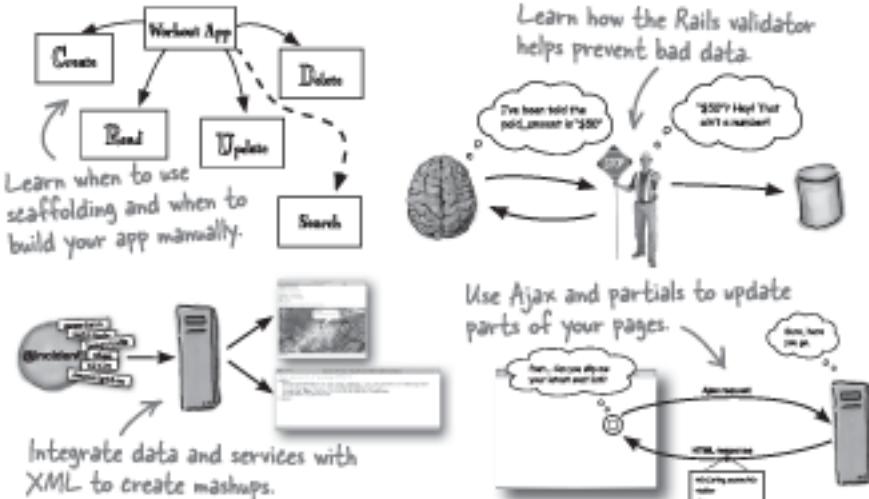
Head First Rails

Programming/Rails

What will you learn from this book?

Looking to take your web applications beyond stodgy, and into the Web 2.0 generation? *Head First Rails* takes your programming—and productivity—to the max. You'll learn everything from the fundamentals of Rails scaffolding to building customized interactive web apps, all using Rails' rich set of tools and the MVC framework.

You'll master database interactions, integration with Ajax and XML, rich content, and even dynamic graphing of your data... all in a fraction of the time it takes to build the same apps with Java, PHP, ASP.NET, or Perl. You'll even get comfortable and familiar with Ruby... but you'll do it in the context of web programming, not another boring version of "Hello, World!"



Why does this book look so different?

We think your time is too valuable to spend struggling with new concepts. Using the latest research in cognitive science and learning theory to craft a multi-sensory learning experience, *Head First Rails* uses a visually rich format designed for the way your brain works, not a text-heavy approach that puts you to sleep.

US \$49.99

CAN \$49.99

ISBN: 978-0-596-51577-5



5 4 9 9 9

Safari
Books Online

Free online edition
for 45 days with
purchase of this book.
Details on last page.

"*Head First Rails* continues the tradition of the Head First series, providing useful, real-world information to get you up and going quickly. *Head First Rails* is an excellent book for people learning Rails, as well as those brushing up on the latest features."

—Jeremy Durham,
Web Developer

"I wish this book was out when I was getting started with Rails. It would have helped immensely."

—Mike Isman,
Web Developer

O'REILLY®

www.oreilly.com
www.headfirstlabs.com

Head First Rails

by David Griffiths

Copyright © 2009 O'Reilly Media, Inc. All rights reserved.

Printed in the United States of America.

Published by O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.

O'Reilly Media books may be purchased for educational, business, or sales promotional use. Online editions are also available for most titles (safari.oreilly.com). For more information, contact our corporate/institutional sales department: (800) 998-9938 or corporate@oreilly.com.

Series Creators: Kathy Sierra, Bert Bates

Series Editor: Brett D. McLaughlin

Editors: Brett D. McLaughlin, Louise Barr

Design Editor: Louise Barr

Cover Designers: Louise Barr, Steve Fehler

Production Editor: Brittany Smith

Proofreader: Matt Proud

Indexer: Julie Hawks

Page Viewers: Dawn Griffiths, Friski the Wi-fi Bunny

Printing History:

December 2008: First Edition.

Dawn Griffiths



Friski the Wi-fi bunny

The O'Reilly logo is a registered trademark of O'Reilly Media, Inc. The *Head First* series designations, *Head First Rails*, and related trade dress are trademarks of O'Reilly Media, Inc.

Many of the designations used by manufacturers and sellers to distinguish their products are claimed as trademarks. Where those designations appear in this book, and O'Reilly Media, Inc., was aware of a trademark claim, the designations have been printed in caps or initial caps.

While every precaution has been taken in the preparation of this book, the publisher and the authors assume no responsibility for errors or omissions, or for damages resulting from the use of the information contained herein.

No stick figures were harmed in the making of this book.



This book uses RepKover™, a durable and flexible lay-flat binding.

ISBN: 978-0-596-51577-5

[M]

Advance Praise for *Head First Rails*

“*Head First Rails* continues the tradition of the Head First series, providing useful, real-world information to get you up and going quickly. *Head First Rails* is an excellent book for people learning Rails, as well as those brushing up on the latest features.”

—**Jeremy Durham, Web Developer**

“I wish this book was out when I was getting started with Rails. It would have helped immensely.”

—**Mike Isman, Web Developer**

“I love the Head First Books. They are both educational and entertaining!!”

—**LuAnn Mazza**

“*Head First Rails* is a great, broad introduction to iterative Web 2.0 development. This book will show you how quick and easy it is to develop robust, next-generation websites.

—**Matt Proud, Systems Administrator and Developer**

“*Head First Rails* is the book I wish I had when I was first learning Rails. It leads you through the essential things you need to know in a humorous, no-nonsense, manner.”

—**Eamon Walshe, Agile Coach**

Praise for *Head First Ajax*

"Ajax is more than just revisiting existing technologies, making some small changes to your web application and then declaring it Ajax-enabled. Rebecca M. Riordan walks you through all of the steps of building an Ajax application in *Head First Ajax*, and shows you that Ajax is more than 'that little asynchronous part', but a better approach to web design all together."

— **Anthony T. Holdener III, author of "Ajax: The Definitive Guide"**

"You don't just read Head First books, you *do* Head First books. And it makes all the difference."

— **Pauline McNamara, Techno-pedagogical Consultant for university
eLearning projects, Switzerland**

"The author does an excellent job teaching the various aspects of Ajax, bringing back previous lessons without being repetitive and introducing common problems in a way that helps readers discover the problems themselves. In areas where there still isn't a definitive practice, the reader is exposed to all the options and encouraged to make up his or her own mind."

— **Elaine Nelson, Website Designer**

"Behind the Ajax eight ball? Get out of the shadows with this book. You'll wrap your mind around the core concepts, and have some fun in the process."

— **Bear Bibeault, Web Applications Architect**

Praise for other *Head First* books

"I received the book yesterday and started to read it...and I couldn't stop. This is definitely très 'cool.' It is fun, but they cover a lot of ground and they are right to the point. I'm really impressed."

— **Erich Gamma, IBM Distinguished Engineer, and co-author of *Design Patterns***

"One of the funniest and smartest books on software design I've ever read."

— **Aaron LaBerge, VP Technology, ESPN.com**

"What used to be a long trial and error learning process has now been reduced neatly into an engaging paperback."

— **Mike Davidson, CEO, Newsvine, Inc.**

"Elegant design is at the core of every chapter here, each concept conveyed with equal doses of pragmatism and wit."

— **Ken Goldstein, Executive Vice President, Disney Online**

"I ♥ Head First HTML with CSS & XHTML—it teaches you everything you need to learn in a 'fun coated' format."

— **Sally Applin, UI Designer and Artist**

"Usually when reading through a book or article on design patterns, I'd have to occasionally stick myself in the eye with something just to make sure I was paying attention. Not with this book. Odd as it may sound, this book makes learning about design patterns fun."

"While other books on design patterns are saying 'Buehler... Buehler... Buehler...' this book is on the float belting out 'Shake it up, baby!'"

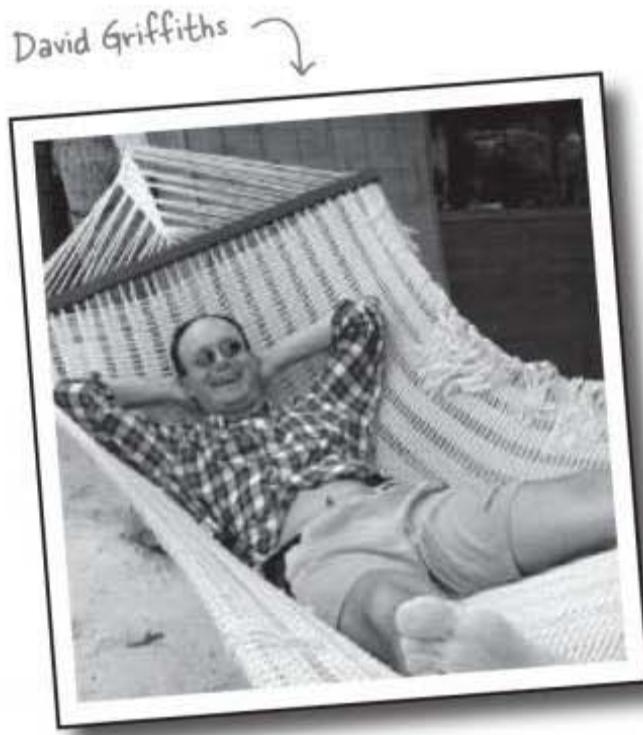
— **Eric Wuehler**

"I literally love this book. In fact, I kissed this book in front of my wife."

— **Satish Kumar**

For Dawn, and in memory of my Mother, Joan Beryl Griffiths.

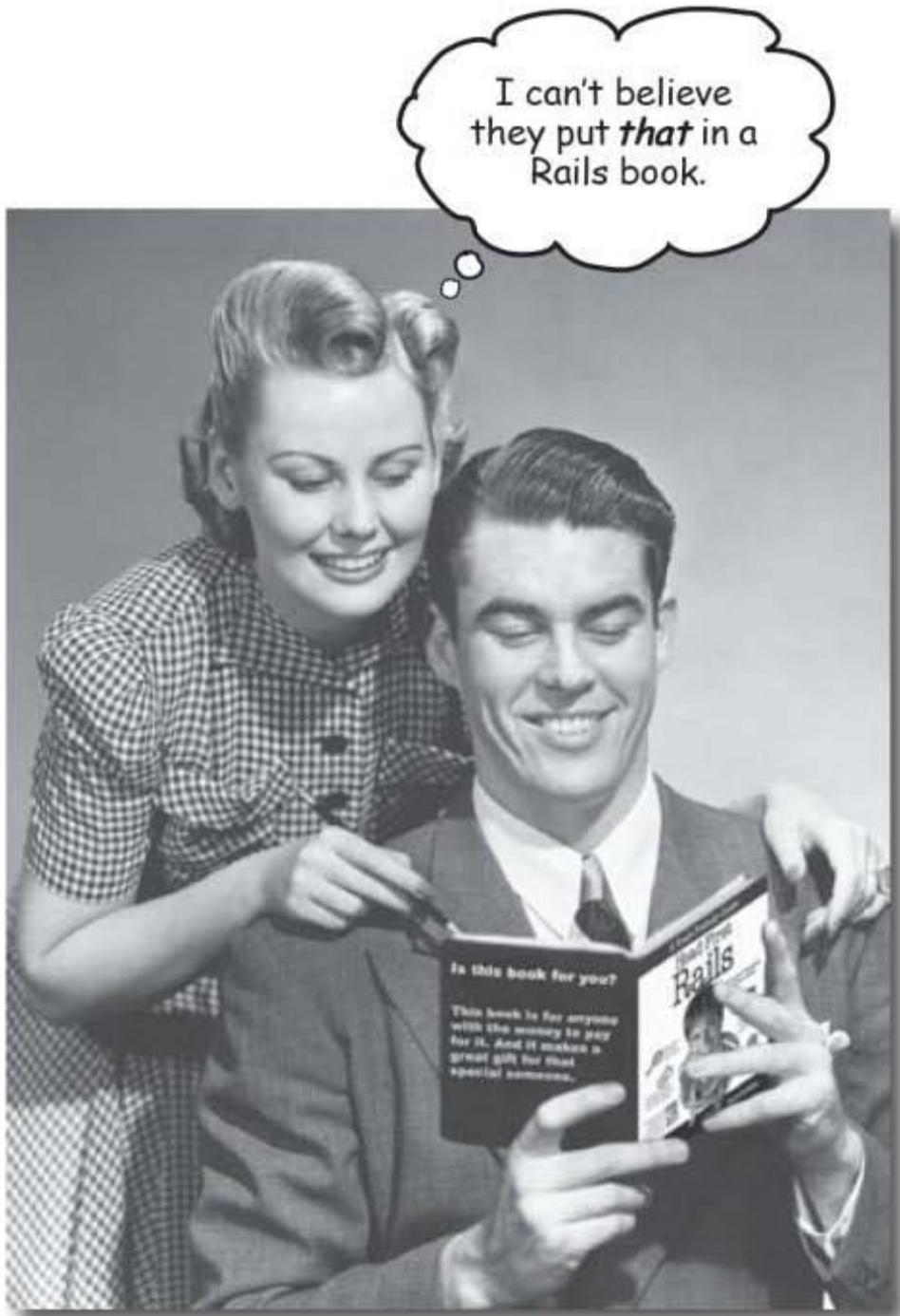
Author of Head First Rails



David Griffiths began programming at age 12, after watching a documentary on the work of Seymour Papert. At age 15 he wrote an implementation of Papert's computer language LOGO. After studying Pure Mathematics at University, he began writing code for computers and magazine articles for humans and he is currently working as an agile coach in the UK, helping people to create simpler, more valuable software. He spends his free time traveling with his lovely wife, Dawn.

how to use this book

Intro



In this section we answer the burning question:
"So why DID they put that in a Rails book?"

Who is this book for?

If you can answer “yes” to all of these:

- ➊ Are you **comfortable with HTML**?
- ➋ Do you have some experience of a computer language like **Java, C# or PHP**?
- ➌ Do you want to build **cool stuff** for the web in a **fraction of the time** it used to take?

this book is for you.

Who should probably back away from this book?

If you can answer “yes” to any of these:

- ➊ Are you someone who **doesn't have any experience with HTML**?
- ➋ Are you an **accomplished Rails developer** looking for a **reference book**?
- ➌ Are you **afraid to try something different**? Would you rather have a root canal than mix stripes with plaid? Do you believe a technical book can't be serious if it anthropomorphizes clients and servers?



If this is the case, don't worry. Go pick up *Head First HTML with CSS & XHTML* by Elisabeth Freeman and Eric Freeman, and then come back to this book

this book is not for you.



[Note from marketing: this book is for anyone with a credit card.]

We know what you're thinking

“How can *this* be a serious Rails book?”

“What’s with all the graphics?”

“Can I actually *learn* it this way?”

We know what your brain is thinking

Your brain craves novelty. It’s always searching, scanning, *waiting* for something unusual. It was built that way, and it helps you stay alive.

So what does your brain do with all the routine, ordinary, normal things you encounter? Everything it *can* to stop them from interfering with the brain’s *real* job—recording things that *matter*. It doesn’t bother saving the boring things; they never make it past the “this is obviously not important” filter.

How does your brain *know* what’s important? Suppose you’re out for a day hike and a tiger jumps in front of you, what happens inside your head and body?

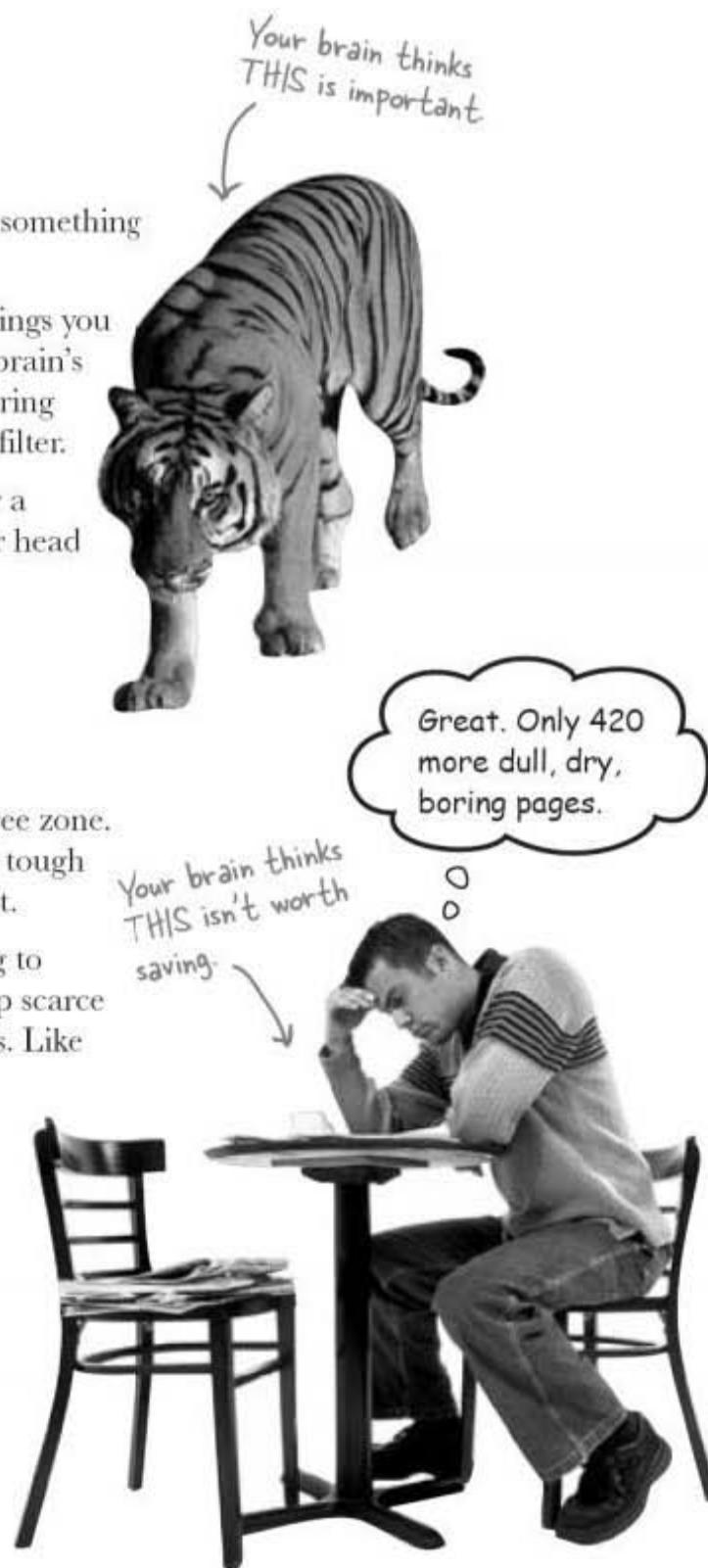
Neurons fire. Emotions crank up. *Chemicals surge*.

And that’s how your brain knows...

This must be important! Don’t forget it!

But imagine you’re at home, or in a library. It’s a safe, warm, tiger-free zone. You’re studying. Getting ready for an exam. Or trying to learn some tough technical topic your boss thinks will take a week, ten days at the most.

Just one problem. Your brain’s trying to do you a big favor. It’s trying to make sure that this *obviously* non-important content doesn’t clutter up scarce resources. Resources that are better spent storing the really *big* things. Like tigers. Like the danger of fire. Like the winners of the last three seasons of American Idol. And there’s no simple way to tell your brain, “Hey brain, thank you very much, but no matter how dull this book is, and how little I’m registering on the emotional Richter scale right now, I really *do* want you to keep this stuff around.”



We think of a “Head First” reader as a learner.

So what does it take to *learn* something? First, you have to *get it*, then make sure you don’t *forget it*. It’s not about pushing facts into your head. Based on the latest research in cognitive science, neurobiology, and educational psychology, *learning* takes a lot more than text on a page. We know what turns your brain on.

Some of the Head First learning principles:



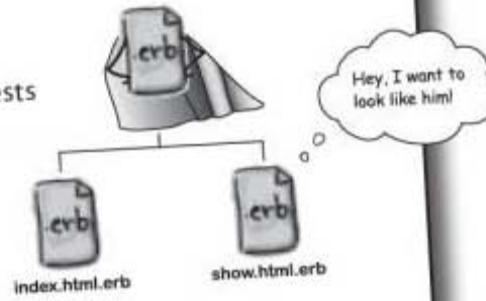
Make it visual. Images are far more memorable than words alone, and make learning much more effective (up to 89% improvement in recall and transfer studies). It also makes things more understandable. **Put the words within or near the graphics** they relate to, rather than on the bottom or on another page, and learners will be up to twice as likely to solve problems related to the content.

Use a conversational and personalized style. In recent studies, students performed up to 40% better on post-learning tests if the content spoke directly to the reader, using a first-person, conversational style rather than taking a formal tone. Tell stories instead of lecturing. Use casual language. Don’t take yourself too seriously. Which would you pay more attention to: a stimulating dinner party companion, or a lecture?



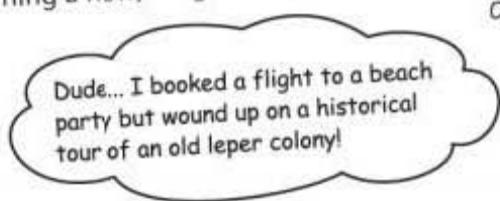
Get the learner to think more deeply. In other words, unless you actively flex your neurons, nothing much happens in your head. A reader has to be motivated, engaged, curious, and inspired to solve problems, draw conclusions, and generate new

knowledge. And for that, you need challenges, exercises, and thought-provoking questions, and activities that involve both sides of the brain and multiple senses.



Get—and keep—the reader’s attention. We’ve all had the “I really want to learn this but I can’t stay awake past page one” experience. Your brain pays attention to things that are out of the ordinary, interesting, strange, eye-catching, unexpected. Learning a new, tough, technical topic doesn’t have to be boring. Your brain will learn much more quickly if it’s not.

Touch their emotions. We now know that your ability to remember something is largely dependent on its emotional content. You remember what you care about. You remember when you feel something. No, we’re not talking heart-wrenching stories about a boy and his dog. We’re talking emotions like surprise, curiosity, fun, “what the...?”, and the feeling of “I Rule!” that comes when you solve a puzzle, learn something everybody else thinks is hard, or realize you know something that “I’m more technical than thou” Bob from engineering doesn’t.



Metacognition: thinking about thinking

If you really want to learn, and you want to learn more quickly and more deeply, pay attention to how you pay attention. Think about how you think. Learn how you learn.

Most of us did not take courses on metacognition or learning theory when we were growing up. We were *expected* to learn, but rarely *taught* to learn.

But we assume that if you're holding this book, you really want to master Rails. And you probably don't want to spend a lot of time. If you want to use what you read in this book, you need to *remember* what you read. And for that, you've got to *understand* it. To get the most from this book, or *any* book or learning experience, take responsibility for your brain. Your brain on *this* content.

The trick is to get your brain to see the new material you're learning as Really Important. Crucial to your well-being. As important as a tiger. Otherwise, you're in for a constant battle, with your brain doing its best to keep the new content from sticking.

So just how **DO** you get your brain to treat Rails like it was a hungry tiger?

There's the slow, tedious way, or the faster, more effective way. The slow way is about sheer repetition. You obviously know that you *are* able to learn and remember even the dullest of topics if you keep pounding the same thing into your brain. With enough repetition, your brain says, "This doesn't *feel* important to him, but he keeps looking at the same thing *over* and *over* and *over*, so I suppose it must be."

The faster way is to do **anything that increases brain activity**, especially different *types* of brain activity. The things on the previous page are a big part of the solution, and they're all things that have been proven to help your brain work in your favor. For example, studies show that putting words *within* the pictures they describe (as opposed to somewhere else in the page, like a caption or in the body text) causes your brain to try to make sense of how the words and picture relate, and this causes more neurons to fire. More neurons firing = more chances for your brain to *get* that this is something worth paying attention to, and possibly recording.

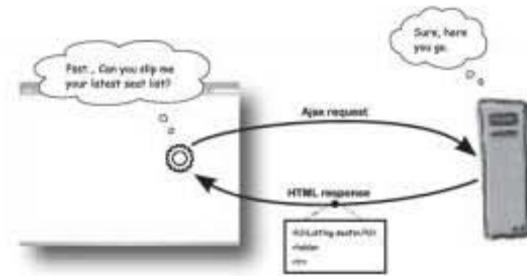
A conversational style helps because people tend to pay more attention when they perceive that they're in a conversation, since they're expected to follow along and hold up their end. The amazing thing is, your brain doesn't necessarily *care* that the "conversation" is between you and a book! On the other hand, if the writing style is formal and dry, your brain perceives it the same way you experience being lectured to while sitting in a roomful of passive attendees. No need to stay awake.

But pictures and conversational style are just the beginning...

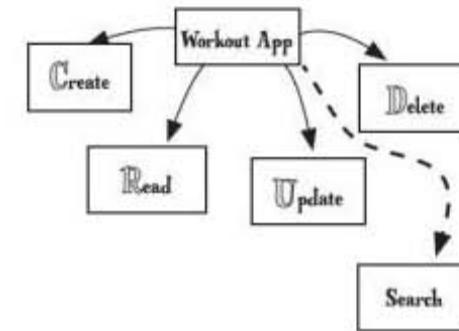


Here's what WE did:

We used **pictures**, because your brain is tuned for visuals, not text. As far as your brain's concerned, a picture really *is* worth a thousand words. And when text and pictures work together, we embedded the text *in* the pictures because your brain works more effectively when the text is *within* the thing the text refers to, as opposed to in a caption or buried in the text somewhere.



We used **redundancy**, saying the same thing in *different* ways and with different media types, and *multiple senses*, to increase the chance that the content gets coded into more than one area of your brain.



We used concepts and pictures in **unexpected** ways because your brain is tuned for novelty, and we used pictures and ideas with at least *some emotional content*, because your brain is tuned to pay attention to the biochemistry of emotions. That which causes you to *feel* something is more likely to be remembered, even if that feeling is nothing more than a little **humor, surprise, or interest**.

We used a personalized, **conversational style**, because your brain is tuned to pay more attention when it believes you're in a conversation than if it thinks you're passively listening to a presentation. Your brain does this even when you're *reading*.



We included more than 80 **activities**, because your brain is tuned to learn and remember more when you **do** things than when you *read* about things. And we made the exercises challenging-yet-do-able, because that's what most people prefer.



We used **multiple learning styles**, because *you* might prefer step-by-step procedures, while someone else wants to understand the big picture first, and someone else just wants to see an example. But regardless of your own learning preference, *everyone* benefits from seeing the same content represented in multiple ways.

We include content for **both sides of your brain**, because the more of your brain you engage, the more likely you are to learn and remember, and the longer you can stay focused. Since working one side of the brain often means giving the other side a chance to rest, you can be more productive at learning for a longer period of time.



And we included **stories** and exercises that present **more than one point of view**, because your brain is tuned to learn more deeply when it's forced to make evaluations and judgments.

We included **challenges**, with exercises, and by asking **questions** that don't always have a straight answer, because your brain is tuned to learn and remember when it has to *work* at something. Think about it—you can't get your *body* in shape just by *watching* people at the gym. But we did our best to make sure that when you're working hard, it's on the *right* things. That **you're not spending one extra dendrite** processing a hard-to-understand example, or parsing difficult, jargon-laden, or overly terse text.

We used **people**. In stories, examples, pictures, etc., because, well, because *you're* a person. And your brain pays more attention to *people* than it does to *things*.



Cut this out and stick it
on your refrigerator.

Here's what YOU can do to bend your brain into submission

So, we did our part. The rest is up to you. These tips are a starting point; listen to your brain and figure out what works for you and what doesn't. Try new things.

1 Slow down. The more you understand, the less you have to memorize.

Don't just *read*. Stop and think. When the book asks you a question, don't just skip to the answer. Imagine that someone really *is* asking the question. The more deeply you force your brain to think, the better chance you have of learning and remembering.

2 Do the exercises. Write your own notes.

We put them in, but if we did them for you, that would be like having someone else do your workouts for you. And don't just *look* at the exercises. **Use a pencil.** There's plenty of evidence that physical activity *while* learning can increase the learning.

3 Read the “There are No Dumb Questions”

That means all of them. They're not optional sidebars, **they're part of the core content!** Don't skip them.

4 Make this the last thing you read before bed. Or at least the last challenging thing.

Part of the learning (especially the transfer to long-term memory) happens *after* you put the book down. Your brain needs time on its own, to do more processing. If you put in something new during that processing time, some of what you just learned will be lost.

5 Talk about it. Out loud.

Speaking activates a different part of the brain. If you're trying to understand something, or increase your chance of remembering it later, say it out loud. Better still, try to explain it out loud to someone else. You'll learn more quickly, and you might uncover ideas you hadn't known were there when you were reading about it.

6 Drink water. Lots of it.

Your brain works best in a nice bath of fluid. Dehydration (which can happen before you ever feel thirsty) decreases cognitive function.

7 Listen to your brain.

Pay attention to whether your brain is getting overloaded. If you find yourself starting to skim the surface or forget what you just read, it's time for a break. Once you go past a certain point, you won't learn faster by trying to shove more in, and you might even hurt the process.

8 Feel something.

Your brain needs to know that this *matters*. Get involved with the stories. Make up your own captions for the photos. Groaning over a bad joke is *still* better than feeling nothing at all.

9 Practice writing Rails applications!

There's only one way to truly master Rails programming: **program Rails applications.** And that's what you're going to do throughout this book. The best way to understand a subject is by **doing it.** Activity strengthens the neural pathways, so we're going to give you a **lot** of practice: every chapter has apps that we'll build. So don't just skip over them—a lot of learning happens when you build these apps yourself. And don't worry if you make mistakes. Your brain actually learns more quickly from mistakes than it does from successes. Finally, make sure you understand what's going on before moving on to the next part of the book. Each chapter builds on the chapters that come before it.

Read Me

This is a learning experience, not a reference book. We deliberately stripped out everything that might get in the way of learning whatever it is we're working on at that point in the book. And the first time through, you need to begin at the beginning because the book makes assumptions about what you've already seen and learned.

Before you begin this book you will need to get Ruby on Rails installed on your machine.

This is not a *how-to* book, so we don't have any chapters that give you instructions on how to install Ruby on Rails on your computer. It's better to get that kind of information from the web. You will need to install Ruby on Rails version 2.1 or above, as well as SQLite 3. You can find out more from

<http://www.rubyonrails.org/down>

This is not a reference book.

So don't expect to see lots and lots of pages explaining 15 different ways to do something. We want you to **understand** by **doing**, so right from the get-go, we'll give you just enough information to move your learning forward. By the end of the book, you will have a mental framework of how Rails works and what it can do. You will then be able to slot the reference material into your brain much more rapidly and meaningfully than you would have been able to before. Psychologists call this the ability to **chunk** information.

All of the code in this book is available on the Head First site.

We'll present all of the code you'll need as we go along. It's a **good idea** to program along with the book, and it's a **great idea** to play around with the code and make it do your own thing. But sometimes you may want a copy of the code used in each chapter, so we've made it available on the Head First Labs web site. Rails applications are quite self-contained, so there's no reason why you can't have the code that does what the *book says* it should do, alongside your own buffed and pimped out version. You can download the code from

<http://www.headfirstlabs.com/books/hfrails>

We don't fully explain every piece of code.

Rails can generate a lot of code for you, and we don't want you to get bogged down in line-by-line descriptions. We'll describe the important parts that you need to know, and then we'll move on. Don't worry—by the end of the book, all of the pieces should fall into place.

This is a Rails book, not a Ruby book.

Ruby is the language that the Rails framework is written in, and we'll teach you just enough Ruby as we go along. Don't worry—if you have some experience of another programming language like **C#** or **Java**, you'll do just fine. Rails is such a powerful system that you can get a very long way with just a little Ruby knowledge.

The activities are NOT optional.

The exercises and activities are not add-ons; they're part of the core content of the book. Some of them are to help with memory, some are for understanding, and some will help you apply what you've learned. Don't skip the exercises.

The redundancy is intentional and important.

One distinct difference in a Head First book is that we want you to really get it. And we want you to finish the book remembering what you've learned. Most reference books don't have retention and recall as a goal, but this book is about learning, so you'll see some of the same concepts come up more than once.

We don't show all the code all the time.

Our readers tell us that it's frustrating to wade through 10 slightly different versions of the same piece of code, so sometimes we will only show the parts of a script that have changed.

The chapters are skills-based not technology-based.

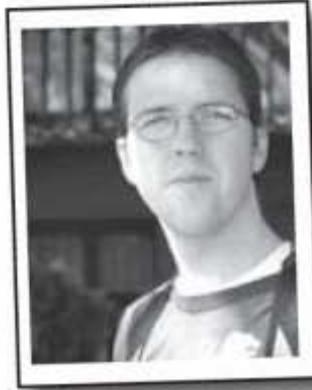
Each chapter will give you the skills to write more and more **advanced** and **valuable** applications. So we don't have chapters that just deal with talking to databases or designing a pretty interface. Instead, every chapter teaches you a little about the database, a little about the interface, and a little about several other parts of Rails. By the end of each one, you'll be able to say, "Cool—now I can build apps that can do **X**."

The technical review team

Andrew Bryan



Jeremy Durham



Matt Harrington



Mike Isman



LuAnn Mazza



Eamon Walshe



Technical Reviewers:

Andrew Bryan is a software development and business consultant from Auckland, New Zealand. He is currently working for an online media and advertising company in Boston, where he lives with his lovely wife Angie.

Jeremy Durham has been building web applications using Ruby on Rails since early 2005, and has contributed to several Ruby libraries. He lives in Arlington, Massachusetts with his wife and two children.

Matt Harrington is a Northeastern University alumni and has been an avid programmer since age 9.

Mike Isman has been working with Ruby on Rails since he joined the eons.com team early in 2006, before Rails 1.0 was released. While working at Eons, Mike has also written smaller sites in Rails including the Life Expectancy Calculator at livingto100.com. He graduated in 2004 with a degree in Computer Science from the University of Rochester and has been busy doing web development ever since.

LuAnn Mazza is a Computer Analyst from Illinois.

Eamon Walshe is an Agile Coach with Exoftware and a former Distinguished Engineer with IONA Technologies. He is a fan of Rails because it allows developers to concentrate on what matters—delivering real business value, quickly.

Acknowledgments

My editors:

I owe a huge debt of gratitude to my editors, **Brett McLaughlin** and **Lou Barr**. They were always available for advice and support and whenever I came across a problem that seemed completely insoluble, they were not only able to identify exactly *what* was wrong, but *why* it was wrong and then come up with several ways of fixing it.



↑
Lou Barr



Brett McLaughlin

I owe a very particular thank you to my wife, the author of *Head First Statistics*, **Dawn Griffiths**. This book would simply not have been completed on time had it not been for the immense amount of work she did on the final version.

This book is every bit as much hers as mine.



↑
Dawn Griffiths

The O'Reilly team:

To **Caitrin McCullough** and **Karen Shaner**, who kept track of everything from contracts to web content.

To **Brittany Smith**, the book's Production Editor, for being a powerhouse of practical support.

To **Catherine Nolan**, for patiently guiding me through the first phase of the book.

To **Laurie Petrycki**, for her faith in the book and for allowing me to use her office in Cambridge.

And to **Kathy Sierra** and **Bert Bates**, the creators of the *Head First Series*, whose original vision has transformed the way technical books are written.

And not forgetting:

Brian Hanly, the CEO at *Exoflware*, and **Steve Harvey**. Their unstinting support and kindness made this book possible.

And finally the entire **technical review team** who had to perform an amazing amount of work in a very small amount of time.

I owe you all more than I can ever repay.

Safari® Books Online



When you see a Safari® icon on the cover of your favorite technology book that means the book is available online through the O'Reilly Network Safari Bookshelf.

Safari offers a solution that's better than e-books. It's a virtual library that lets you easily search thousands of top tech books, cut and paste code samples, download chapters, and find quick answers when you need the most accurate, current information. Try it for free at <http://safari.oreilly.com>.

1 getting started



* *Really Rapid Rails* *



Want to get your web app development off to a flying start? Then you need to know **Rails**. Rails is the **coolest** and **quickest development framework** in town, allowing you to develop **fully functional web apps** quicker than you ever thought possible. Getting started is simple; all you need to do is **install Rails**, and start turning the pages. Before you know it, you'll be **miles ahead of the competition**.

Friday, 9 AM

The first email you open is from an old friend in trouble:

Hey - how you doing?

I need a *big* favor! Remember that ticket-sales application I said we were working on? It's not going well. We've been working on it for weeks! The team is having real problems.

Do you think you could create the application for us?

We need a web site that can:

- List all sold tickets

- Create a new ticket sale

- Read and display a single ticket

- Update the details of a sale

- Delete a ticket sale

I know that seems like a lot of functions, but the boss says that it's the minimum set of features they need - and you know he's a tough guy to argue with! Here's the data structure:

Ticket:

- name - name of purchaser (string)

- seat_id_seq - the seat number e.g. E14 (string)

- address - address of purchaser (long string)

- price_paid - sales price of ticket (decimal)

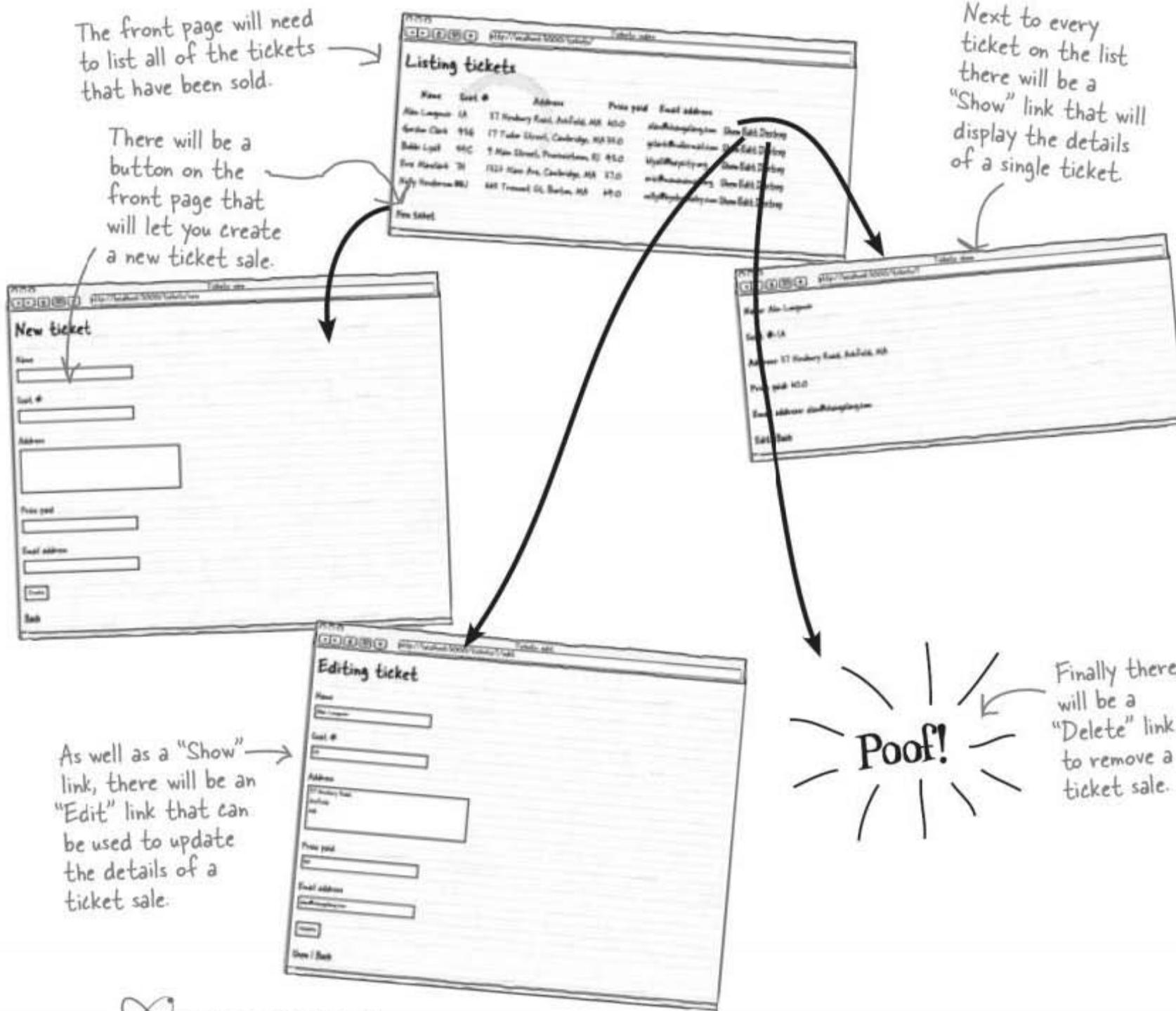
- email_address - email of purchaser (string)

I've attached sketches of the pages too so you know what we're aiming at.
Oh - and we need all of this for Monday or my butt's on the line. Help!

The system is designed to be used by front-of-house staff in the concert arena. The database will be reset for each concert, so it will only need to record the details for one concert at a time. Think you can help?

The application needs to do lots of things

Here are the sketches of the pages. How do they fit in with the system requirements?



What types of software will you need to build and run the application?

So what things do we need for the app?

There are several things we need to run the application on the arena's server. We need:

1 An application framework.

We need a set of pre-written code to that will form the foundation of the web application.

2 A database system.

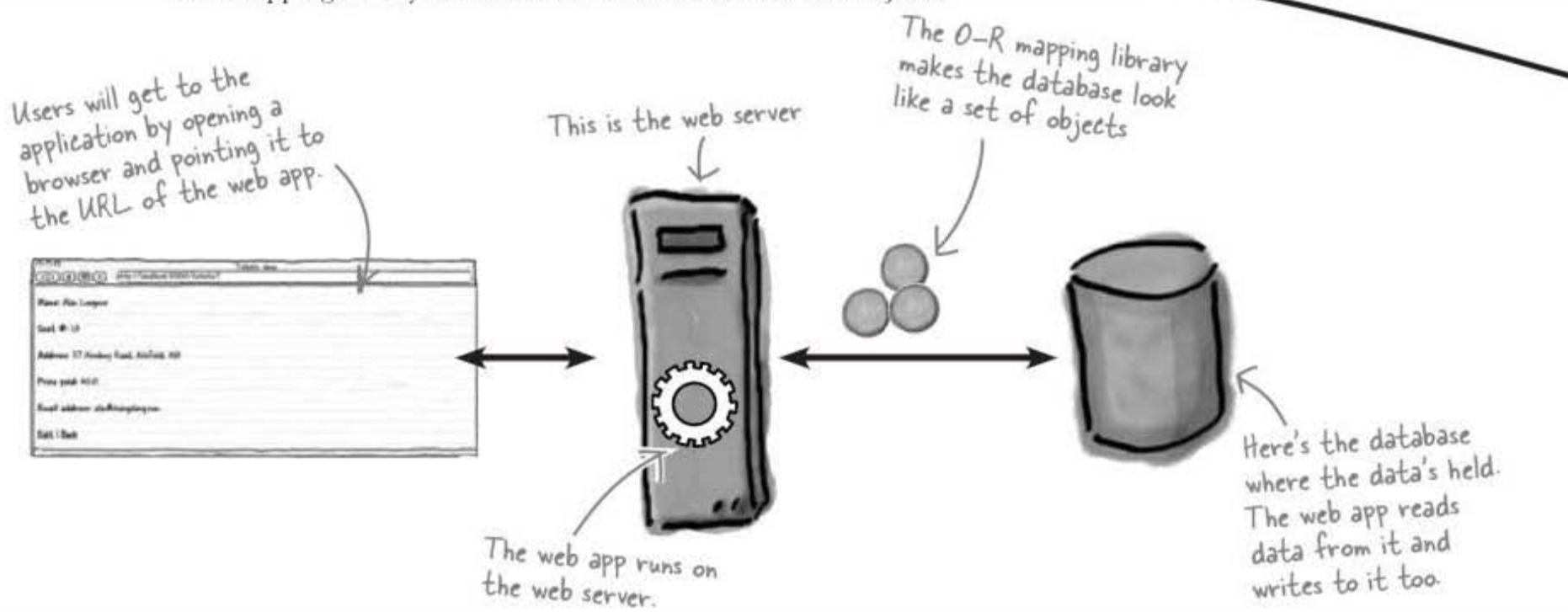
We need some sort of database where we can store the data.

3 A web server.

We need somewhere to run the web application.

4 An object-relational mapping library.

To simplify access to the database, most web applications now use an O-R mapping library to convert the database records into objects.



So how does Rails help us?

Regardless of what language you code in, you will probably still need these three things for your deployed application. One of the great things about Rails is that it contains *all* of the software you will need—***all bundled in for free***.

Let's see how this works.

Pool Puzzle



There are many features built in to Rails. Your job is to guess which of the features in the pool we need for the web app and then place them in the blank lines below. You won't need all of the features.

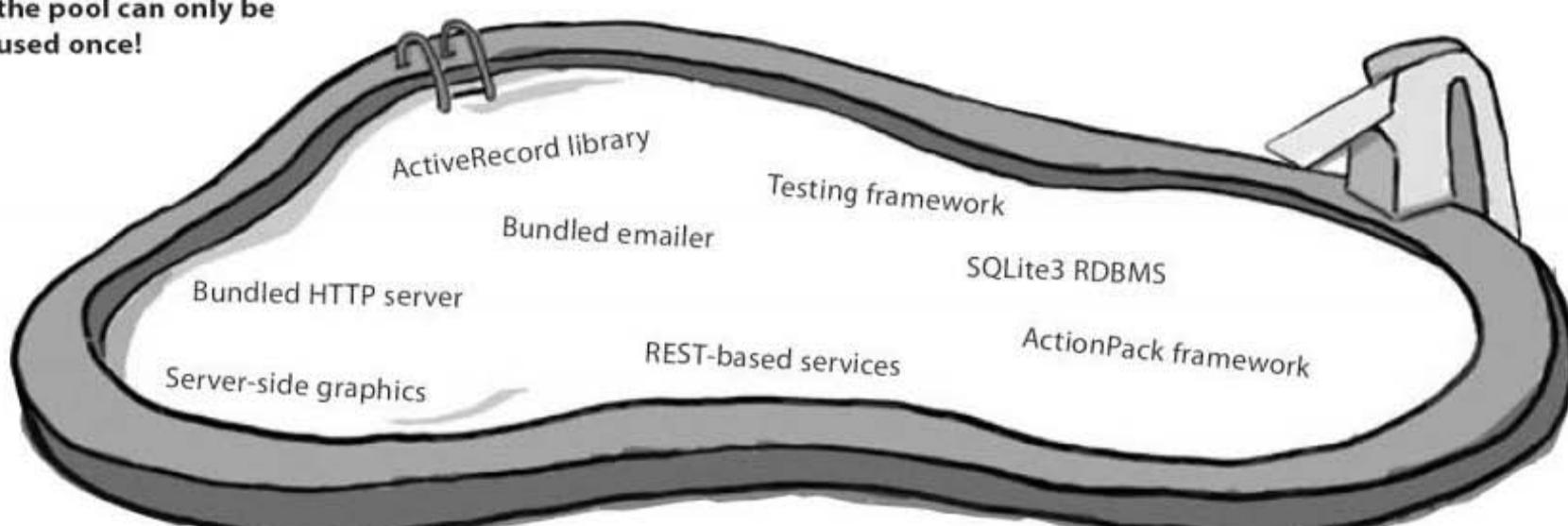
1

2

3

4

Note: each thing from
the pool can only be
used once!



Rails is for database-centric apps like the ticket sales system

A lot of applications have a database at the heart of them. The main reason these application exists is so that users can access and modify the contents of the database **without** using SQL directly.

So what are the problems that need to be solved when you connect a database to a web application?

Well, the web application will need to allow the user to access and modify data, so Rails includes an **application framework** called the **ActionPack** that will help you generate data-driven, interactive pages.

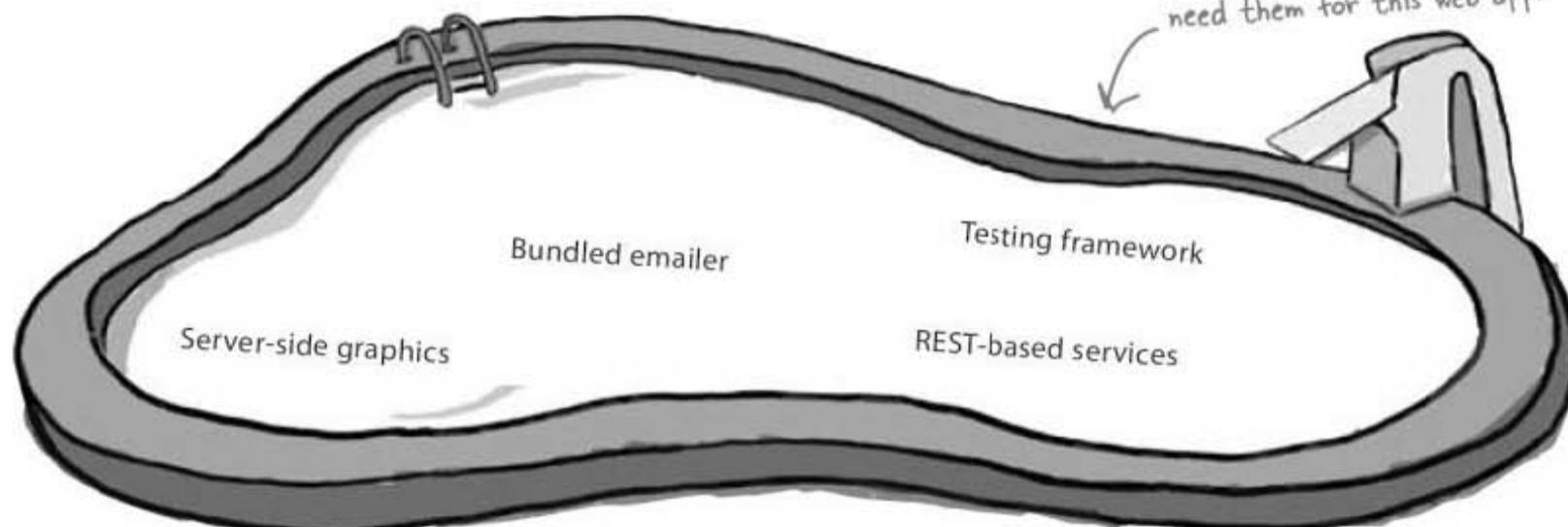
Secondly, web applications need to be run on a **web server** to display these pages, so Rails comes with one built in.

Thirdly, you need a **database**. Rails creates applications that are configured to work with an integrated **SQLite3** database.

The fourth thing you need is an **object-relational mapping library** and Rails provides one called **ActiveRecord**. This makes your database look like a collection of simple *Ruby objects*.

As well as all this, Rails also includes a pile of **tool scripts** to help you manage the application. So if you are creating a database-centric web application you'll find that

Rails gives you everything you need.



Pool Puzzle Solution



There are many features built in to Rails. Your job is to find the three features in the pool that we need for the web app and place them in the blank lines below. You won't need all of the features.

.....ActionPack framework.....

.....Bundled HTTP server.....

.....SQLite3 RDBMS.....

.....ActiveRecord library.....

On some operating systems you need to install this separately from Rails

Rails gives you all of these too, it's just that you don't need them for this web app.

You create a new application with the rails command

So how do you get started with Rails?

Creating a new web application is actually really simple in Rails. All you need to do is open up a command prompt or terminal window, and type in **rails tickets**, where tickets is the name of the application you want to create.



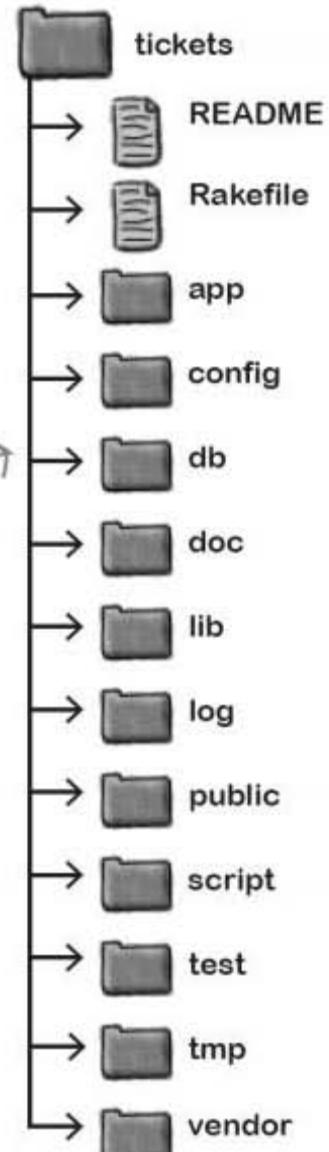
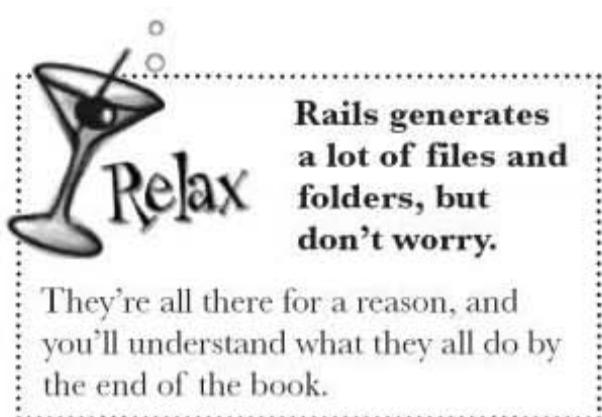
```
File Edit Window Help RailsRules
> rails tickets
```

 Just type "rails tickets" at a command prompt.

So what does this do?

Typing **rails tickets** cleverly generates a web application in a new folder called "tickets". Not only that, within the tickets folder, Rails generates a whole host of other folders and files that form the basic structure of a new application.

This means that you've effectively created an entire basic web application with just one short command.





Test Drive

Because the application you have just created is a *web* application, you will need to start the built-in web server to see it running.

At a command prompt or terminal, change into the tickets folder and type **ruby script/server**.

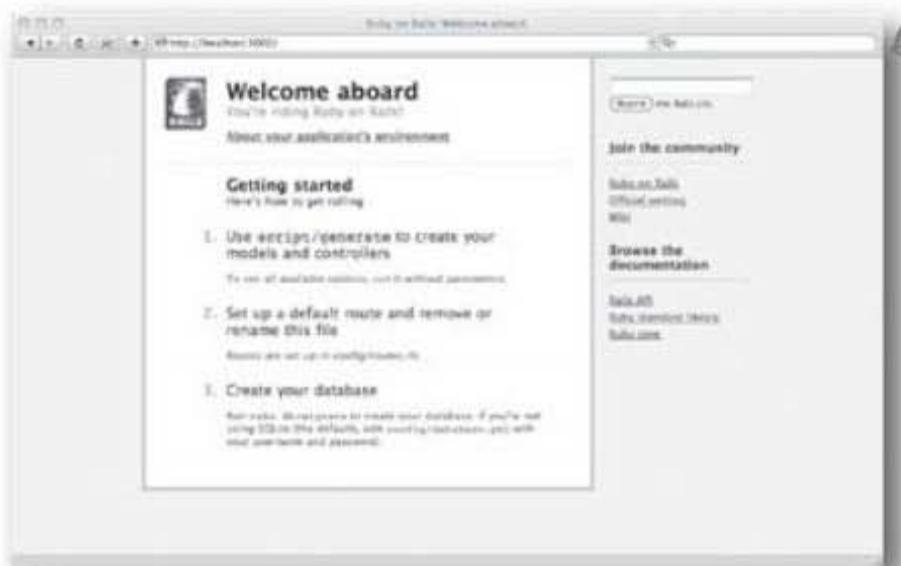
Go into the
folder for the
application...
...and start the
web server.

```
File Edit Window Help  
> cd tickets  
> ruby script/server
```

This is the console. You get
to it via a command prompt
in Windows or a terminal on
either Linux or a Mac.

A few messages will appear on the screen that will confirm the web server is running. Now you can see the default home page by opening a browser at:

`http://localhost:3000/`



This is the default
home page of the
web server.



Geek Bits

Rails starts its web server on port 3000 by default. If you want to use another port, such as 8000, run

`ruby script/server -p 8000`

Now you need to add your own code to the default app

Rails creates the basic structure of your app from the get-go, but you still need to add the code that is specific to what **you** want. Everybody's application is different, but does Rails have any tools or tricks that make it easier for you to create custom code?

Well, actually, it does. Did you notice how Rails created a whole file structure for you, almost as if it knew what you were going to need? That's because Rails apps follow very strong naming conventions.

Rails apps always follow conventions

All Rails applications follow the same basic file structure and use consistent names for things. This makes the application easier to understand, but it also means that the built-in Rails tools will understand how your application works.

So why is that important? Well if the tools know how your app is structured, you can use them to automate a lot of the coding tasks. That way, Rails can use conventions to generate code for you, without you having to configure your web application. In other words, Rails follows *convention over configuration*.

Let's look at one of Rails most powerful tools: scaffolding.

Rails principle: Convention Over Configuration

there are no Dumb Questions

Q: You keep talking about Ruby and Rails. What's the difference?

A: Ruby is a programming language. Rails is a collection of Ruby scripts. So the web server, the ActionPack application framework, and the bundled tool scripts are all just Ruby scripts... and therefore, part of Rails.

Q: How do I edit the front page of my new web site?

A: That HTML file in the public/index.html file below the application directory. The public directory contains all the static content for the application.

Q: What if I want to use a different web server? Can I do that?

A: It makes sense to use the bundled server while you're developing. If you want to deploy the live version of your application to another web server, you can.

Q: Does it matter which folder I'm in when I run ruby script/server?

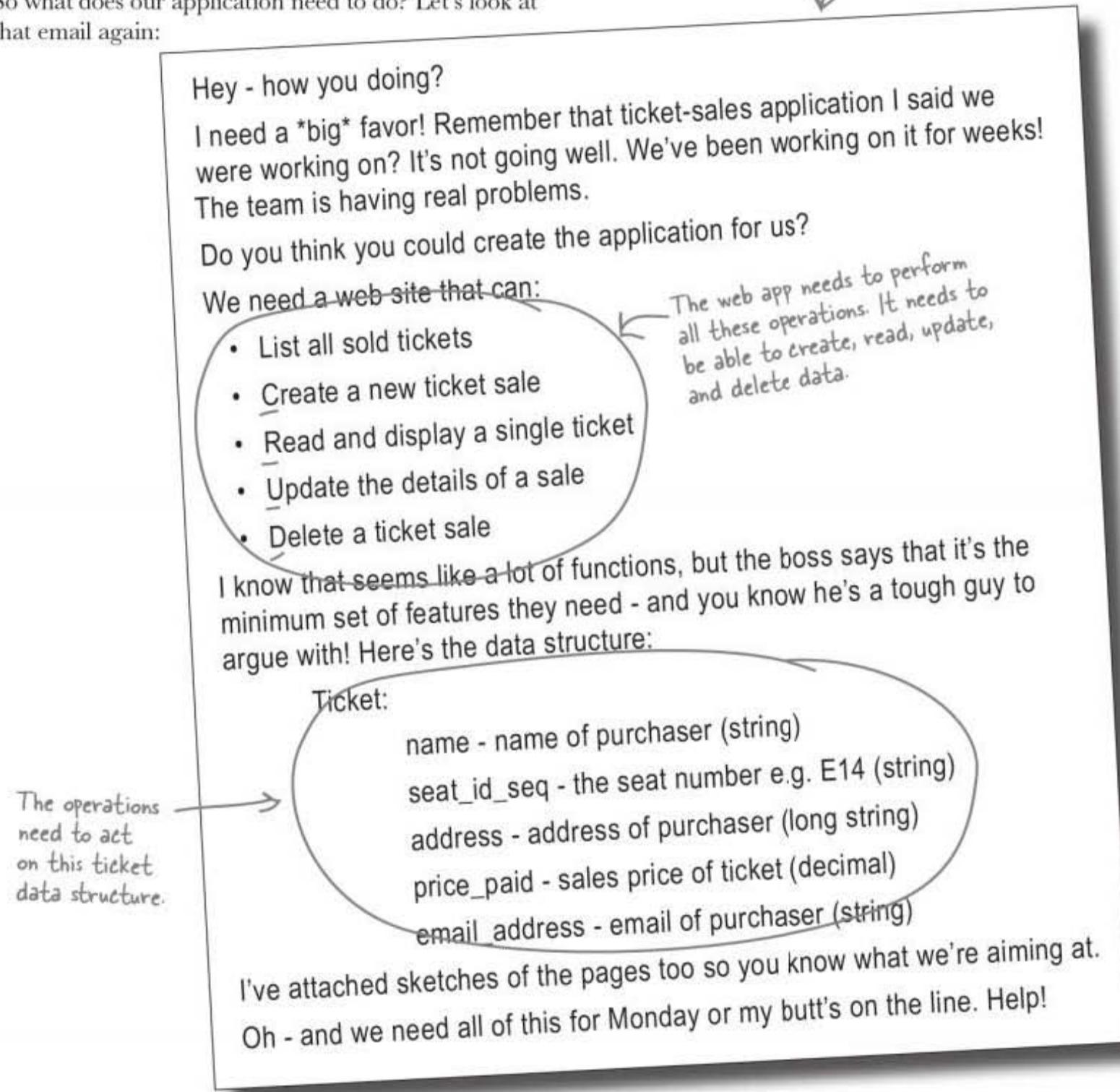
A: Yes, sure does. You need to be in the folder containing your web application.

Q: What is it that compiles my code?

A: Ruby is an interpreted language, like JavaScript. That means there is no compilation necessary. You can just change your code, and immediately run it.

Scaffolding is GENERATED code

So what does our application need to do? Let's look at that email again:



So we need to create web pages that allow us to **Create**, **Read**, **Update**, and **Delete** tickets. Because the initial letters of the operations are **C**, **R**, **U**, and **D**, they are known as the **CRUD operations**. These are pretty common operations in database-centric applications—so common that Rails has a way of quickly generating all the code and pages you need. It does all this using **scaffolding**.



Code Magnets

There's a simple command that you can issue from the console to generate the scaffolding code. See if you can arrange the magnets to complete the command.

`ruby script/generate ticket name:.....`

..... : :

..... : :

string

scaffold

seat_id_seq

price_paid

decimal

string

address

email_address

text

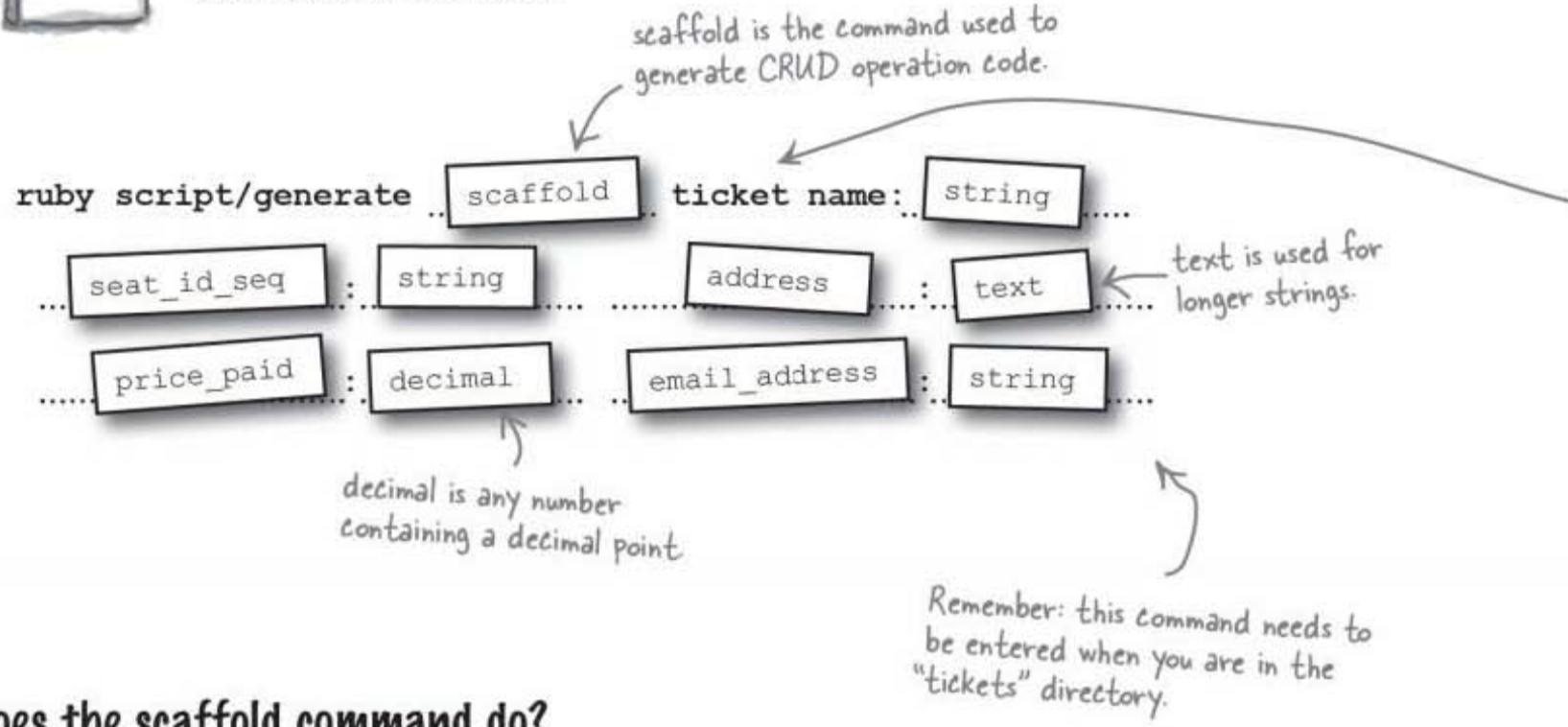
string

scaffold creates code



Code Magnets Solution

There's a simple command that you can issue from the console to generate the scaffolding code. See if you can arrange the magnets to complete the command.



So what does the scaffold command do?

Scaffolding creates code that allows a user to create, read, update, and delete data in the database.

If you have a database-centric web application that needs to create, read, update, and delete data from a database, then scaffolding can save you lots of time and effort.

Type the scaffold command for the ticket table into the console, and let's see what happens:

```
File Edit Window Help CRUD
> ruby script/generate scaffold ticket name:string
seat_id_seq:string address:text price_paid:decimal
email_address:string
```



Test Drive

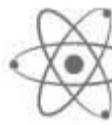
Now it's time to see if our application is really working. To see the new tickets pages, point your browser to

<http://localhost:3000/tickets>

This matches the name given in the scaffold-command. See how Rails made it plural?

Hmm... this definitely
doesn't look right.

So what went wrong? Even though we generated the scaffold code correctly, there's an error on the web server. All we get are a bunch of error messages being sent back.



BRAIN POWER

Think about the error message you can see in the web browser.
Why do you think the application crashed?

create tables with a migration

There are no tables in the database yet!

The application should have displayed an empty list of sold tickets, but it didn't. **Why not?** It needed to read the list from table called **tickets** in the database, but we haven't created any tables yet.

Should we just connect to the database and create the table? After all—the database is sitting right there in the application. But then, why should we have to? We already told Rails enough information for Rails to create the table for us. Look again at our scaffold command:

```
File Edit Window Help DRY  
> ruby script/generate scaffold ticket name:string  
seat_id_seq:string address:text price_paid:decimal  
email_address:string
```

Note: the scaffold is "ticket" (singular) and the table will be called "tickets" (plural).

tickets	
name	string
seat_id_seq	string
address	text
price_paid	decimal
email_address	string

We already told Rails the details of the data structure when we ran the scaffold command, and there is an important principle in Rails: **Don't Repeat Yourself**. If you tell Rails something once, you shouldn't have to say it again.

So how do we get Rails to create the table?



Geek Bits

Rails comes bundled with a database, SQLite3. So where is it?

The database is located within the db folder, in the file development.sqlite3.

Rails principle:

Don't
Repeat
Yourself

You'll hear this principle called DRY when you're talking programming with your buddies.

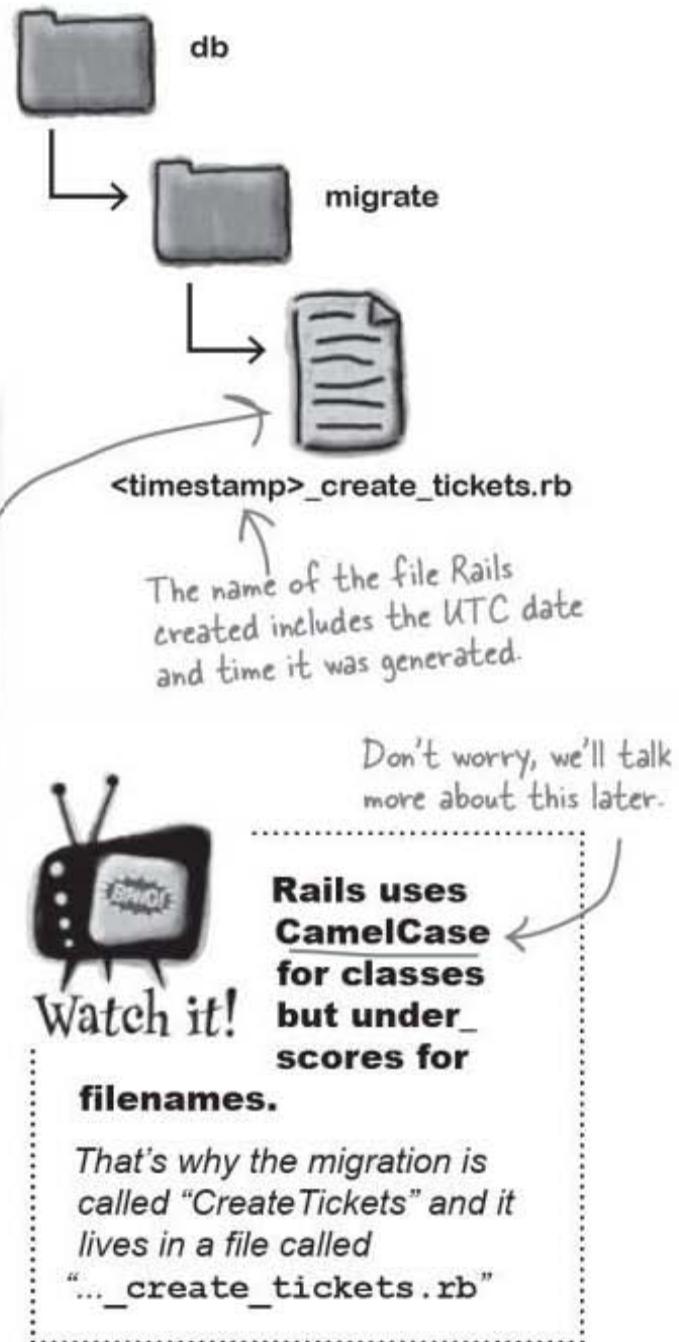
Create the table by running a migration

When Rails generated the scaffolding, it also generated a small Ruby script called a **migration** to create the table. A migration is a script that alters the structure of the underlying database.

Take a look in the db/migrate folder. You should see a file there called <timestamp>_create_tickets.rb where <timestamp> is the UTC timestamp of when the file was created. If you open the file in a text editor, it should look something like this:

```
class CreateTickets < ActiveRecord::Migration
  def self.up
    create_table :tickets do |t|
      t.string :name
      t.string :seat_id_seq
      t.text :address
      t.decimal :price_paid
      t.string :email_address
      t.timestamps
    end
  end
  def self.down
    drop_table :tickets
  end
end
```

Here's the contents of the migration file.



The migration is a small Ruby script. Instead of running this script directly, you should run this script using another Rails tool called **rake**. To run the migration, type **rake db:migrate** at the command prompt. This runs the migration code and creates the table:

```
File Edit Window Help DRY
> rake db:migrate
```



BRAIN BARBELL

Why does the migration include the date and time in its name?

welcome to your new system



Test Drive

Make sure you've created your tickets table with the rake command.
Then go back to the web browser and refresh this page:

`http://localhost:3000/tickets`

The web application works! Within a couple of minutes you should be able to enter a few test records:

These are a few records we added. Go ahead and add some yourself!

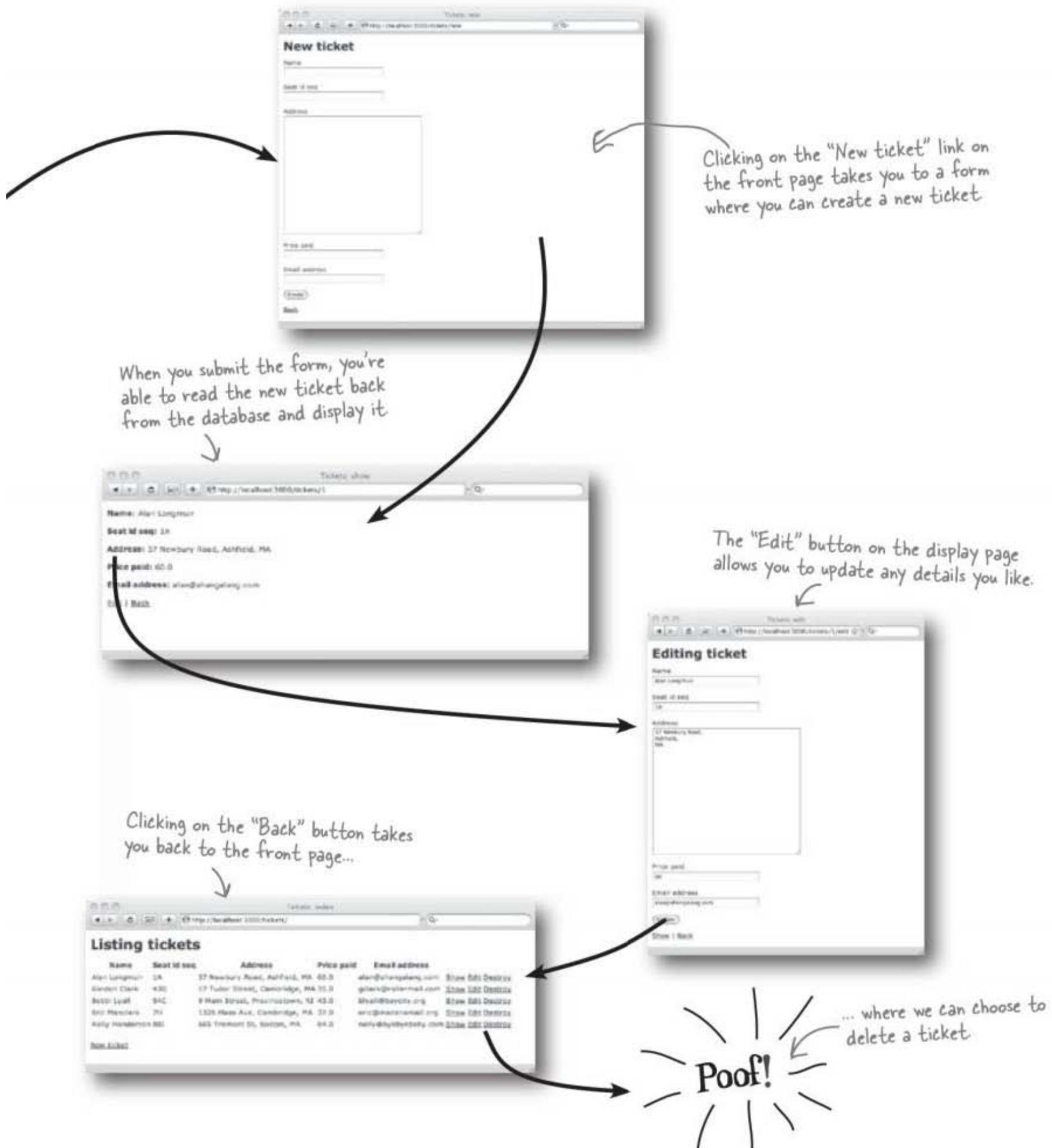
Name	Seat id seq	Address	Price paid	Email address	
Alan Longmuir	1A	37 Newbury Road, Ashfield, MA	60.0	alan@shangalang.com	Show Edit Destroy
Gordon Clark	43G	17 Tudor Street, Cambridge, MA	35.0	gclark@rollermall.com	Show Edit Destroy
Bobbi Lyall	54C	9 Main Street, Provincetown, RI	43.0	blyall@baycity.org	Show Edit Destroy
Eric Mandlark	7H	1326 Mass Ave, Cambridge, MA	37.0	eric@mananamall.org	Show Edit Destroy
Nelly Henderson	88J	665 Tremont St, Boston, MA	64.0	nelly@byebyebaby.com	Show Edit Destroy



Wait! No Way! We've only entered a few commands at the console and that's built the **entire app**?

Yes - we've built much more than just a front page. We've built an entire system.

Scaffolding generated a whole set of pages that allow us to create, modify, and delete ticket details. To see how the application hangs together, let's create and edit another record.





BULLET POINTS

- The command

```
rails <app name>
```

generates a web application for you in folder `<app name>`. Rails also creates the folders and files that form the basic structure of your application.

- Rails comes with a bundled web server. To start the server running, use the command

```
ruby script/server
```

The default home page is at

```
http://localhost:3000/
```

- Rails apps follow Convention Over Configuration.
- Create, Read, Update, and Delete operations on a database are known as the CRUD operations.

- Scaffolding generates CRUD code for you. To create scaffolding for "thing" data, run:

```
ruby script/generate scaffold
  thing
    <column name 1>:<column type 1>
    <column name 2>:<column type 2>
    ...
```

- To see your scaffolding, point your browser to URL

```
http://localhost:3000/things
```

- Rails apps follow the principle Don't Repeat Yourself.
- A migration is a script that alters the structure of the underlying database. You run a migration using the command

```
rake db:migrate
```

there are no Dumb Questions

Q: Some commands start with `rails` and some start with `ruby` and some with `rake`. What's the difference?

A: The `rails` command is used to create a new application. But `ruby` is the Ruby interpreter and it is used to run the tool scripts that are stored in the `scripts` folder. The `ruby` and `rake` commands are used for pretty much everything in Rails.

Q: So what's `rake`?

A: `rake` is the command we used to run the database migration. The name means "Ruby make," and it is used for some of the same kinds of tasks that `make` and `ant` are used for in other languages like C and Java, respectively. When `rake` is given a task to do (like running migrations), it is able to smartly analyze the application and decide which scripts to run. So it's a little smarter than `ruby` and is used for more complicated tasks like modifying the database structure and running tests.

Q: I don't understand the "Convention over Configuration" thing. What's it mean?

A: Many languages give you a lot of options to choose from, like picking options for a new car. If you have a language that has a lot of options available, you need to store the developer's choices somewhere - usually in large XML files. Rails takes a different approach. In Rails things are named consistently and are stored in standardized place. This is called a "conventional" approach - not because it is old-fashioned, but because it follows "conventions" or "standards".

Q: So I can't change how Rails works?

A: You can change pretty much everything in Rails, but if you follow the conventions you will find that you will develop your applications more quickly, and other people will find your code easier to understand.

Sweet! You saved your buddy's job!

Your quick Rails work saved the day for your pal... at least, for the moment. Looks like there's another email to deal with:

Thank you!

It's great to see the application up and running - and you did it so quickly! Rails sounds amazing. The way changes appear as soon as you edit the code. No compile. No deploy. Must be nice.

You really saved my butt on this one.

Just one thing - the labels for seat_id_seq should be something more human-readable, like maybe "Seat #". Do you think you could fix that?

So how can we change the labels?

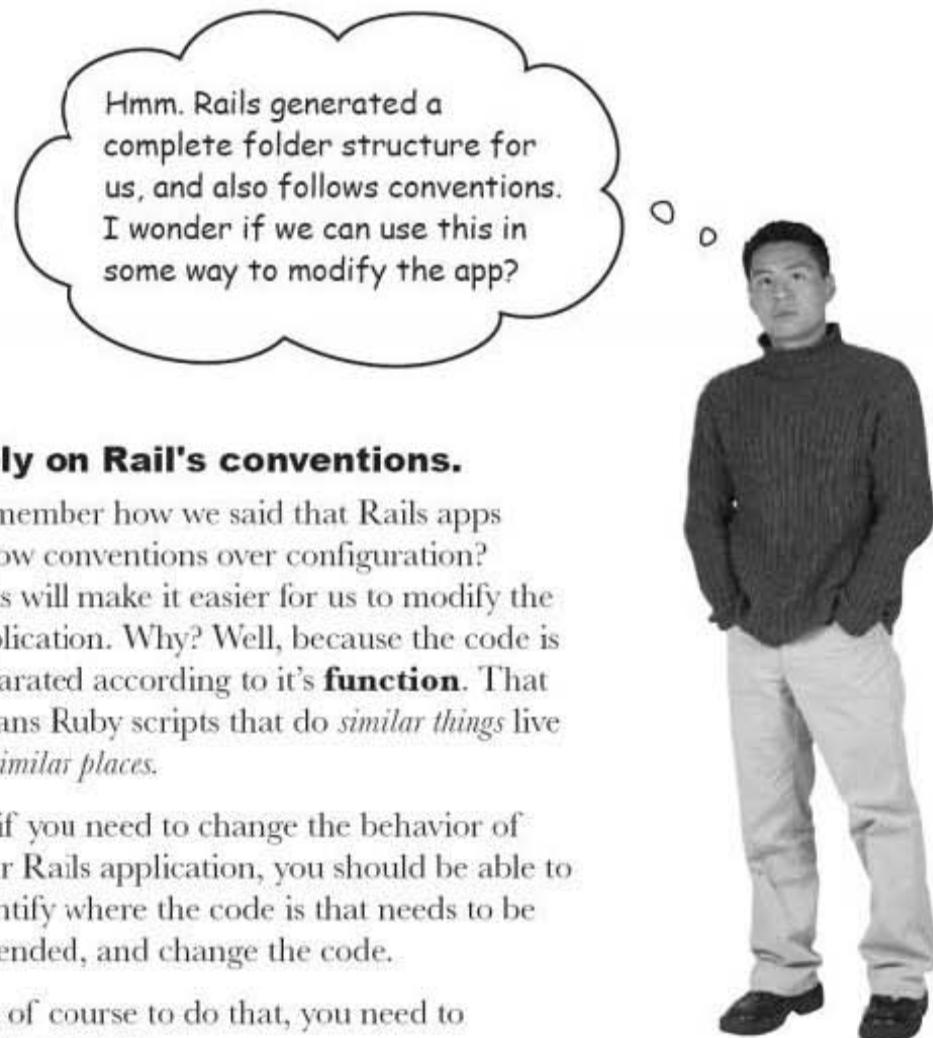
Rails generated a web app for us very quickly, which saved us a lot of time and effort. But what if we want to make small changes to the appearance of the generated pages, what do we do?

How easy is it to modify the pages that Rails has generated for us?

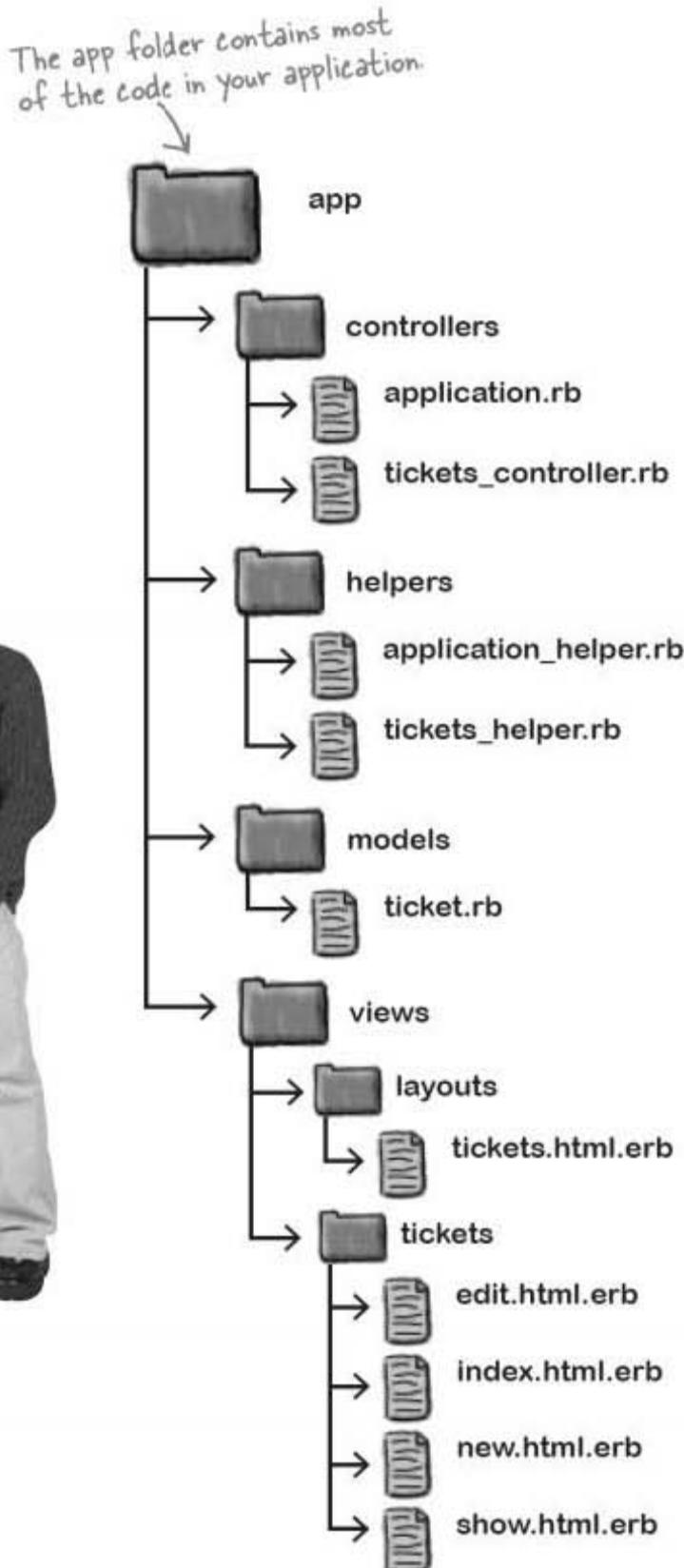
To modify an app, you need to dig into the app's architecture

Scaffolding just generates code for us. Once the code's been generated, it's up to you to customize that code. And if you look in the app folder, you'll see there's quite a lot of generated code you might want to customize.

So if you need to make a change to the application—like modifying the page labels—where do you begin?



Standard Rails Architecture



The 3 parts of your app: model, view, and controller

Pretty much all of the code in a Rails application falls into one of three categories:

1 Model Code

The model code manages how data is written and read to your database. Model code **objects** represent things that exist in the system's *problem domain*—like the **tickets** in the ticket system. This just means the business problems your app's trying to solve.



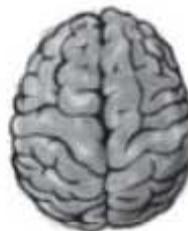
2 View Code

The view is the part of the application that is **presented** to the user. For that reason it is sometimes called the **presentation layer**. For a web application, the view mostly generates web pages.

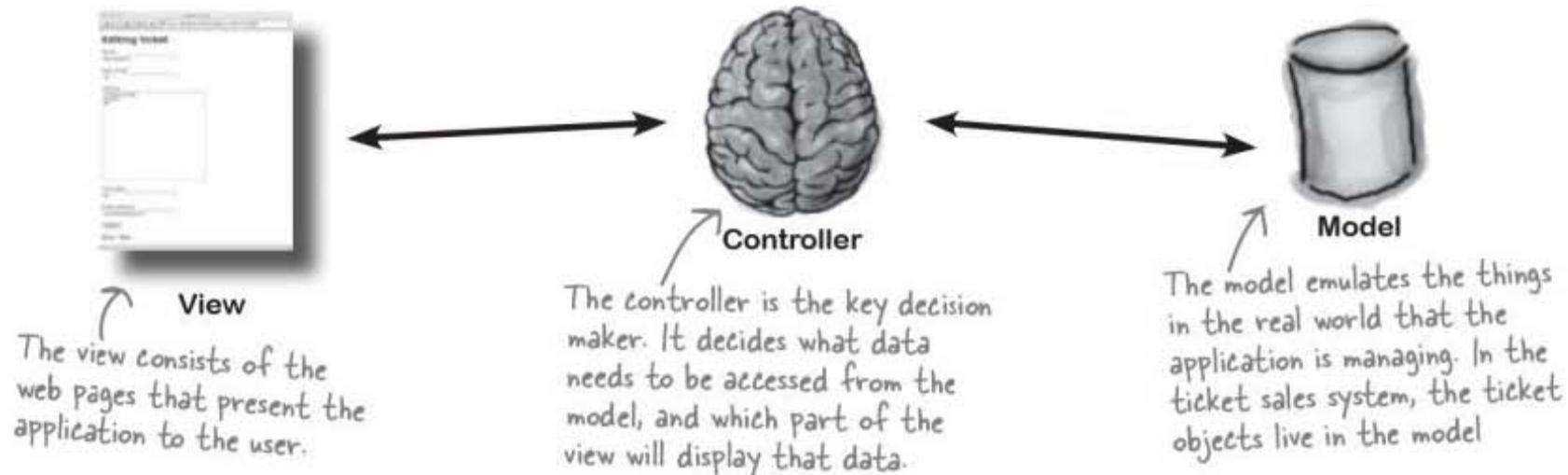


3 Controller Code

The controller is the real *brain* of the application. It decides how the user **interacts** with the system, controlling what data is accessed from the model, and which parts of the view will present it.



This is how the different types of code are connected in a Rails application:





Rails Exposed

This week's interview:
**We ask the web's hottest
framework what makes him tick**

Head First: Hello Rails, we're so glad you could join us.

Rails: Please - call me Ray. Glad to be here.

Head First: It must be tough to find a break in your hectic schedule.

Rails: I'm busy, sure. With database connections, application logic, and web pages to serve up I don't get a lot of what you'd call "Me time". But it's OK - I have good people.

Head First: One thing I was wondering: if you don't mind me asking, when you create a new application, why are there so many directories?

Rails: What can I say? I'm a helpful guy. Over time I've learned what kinda things people want to do in their applications. I don't like to see people manually creating the same stuff over and over again.

Head First: But isn't it all a little... well... confusing?

Rails: Please. I'm a conventional guy. No surprises. Once you've learned the way I work, you'll find me easy to get along with.

Head First: I hear you don't like to be configured.

Rails: You can configure me if you like, but most people prefer to work the way I like. Convention over configuration. Capiche?

Head First: Oh yes - that's one of your design principles isn't it?

Rails: Yeah - that and Don't Repeat Yourself.

Head First: And what?

Rails: Don't Repeat Yourself?

Head First: And what?

Rails: Don't... Hey, you're a funny guy.

there are no
Dumb Questions

Q: Where should the business logic go in my web app?

A: Well, it all depends what you mean by "business logic." Some people define the business logic as the rules associated with the management of data. In that case, the business logic lives in the model. Other people define business logic as the rules defining the workflow of the system - such as what features the application has and in what sequence the user accesses them. In that case the "business logic" lives in the

controller. In the rest of the book we will use "model logic" and "application logic" to distinguish these two cases.

Q: What is the difference between the view and the controller?

A: The view decides how the application *looks* and the controller decides how it *works*. So the view will define the color of a button on a page and what text appears on it, but the controller will decide what happens when the button is pressed.

Q: So what code will I write most?

A: It depends upon the application and the developer. If you find that you are mostly adding code to a particular one of the three app parts, you may want to think carefully whether the next piece of code you are adding is about presentation, interaction, or modeling.

* WHAT'S MY PURPOSE? *

Match the code description to the part of the app that code goes with.

The design of the cards in your online 3-card Monty game.

In an online banking application, this code decides whether you wanted to transfer money in or out of an account.

An “appointment” object in a diary application.

In a blog system, this decides whether to displays comments as a table or a list.

This code records a bid on an auction site.

Decides you need to log in to an email application.

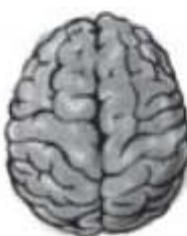
A menu of links.



Model



View



Controller

model, view, or controller?

WHAT'S MY PURPOSE? SOLUTION

Your job was to match the code description to the part of the app that code belongs in. What did you come up with?

The design of the cards in your online 3-card Monty game.

In an online banking application, this code decides whether you wanted to transfer money in or out of an account.

An “appointment” object in a diary application.

In a blog system, this decides whether to displays comments as a table or a list.

This code records a bid on an auction site.

Decides you need to log in to an email application.

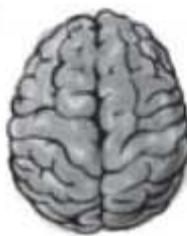
A menu of links.



Model



View



Controller

The 3 types of code are kept in SEPARATE folders

So Rails favors convention over configuration and uses the MVC architecture. So what?

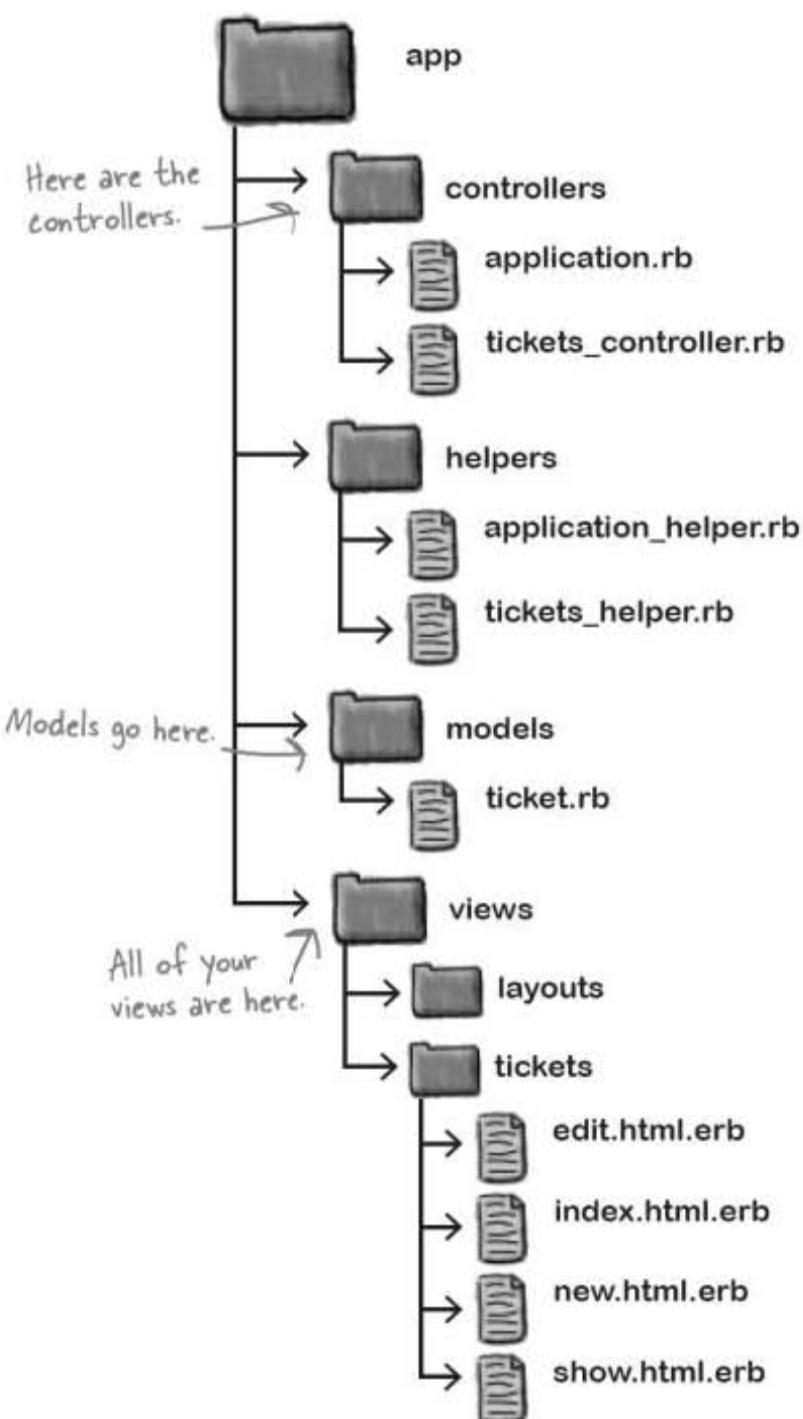
How does the MVC architecture help us change the labels on our pages and fix the app? Let's look back at the files that were generated by the scaffolding one more time. Because the code is cleanly separated into three distinct types—model, view, and controller—Rails puts each type in a separate folder.



Sharpen your pencil

On the folder diagram to the right, highlight the files that you think will need to be edited to change the labels in the pages.

Then note down **why** you chose those files.



labels are in the view

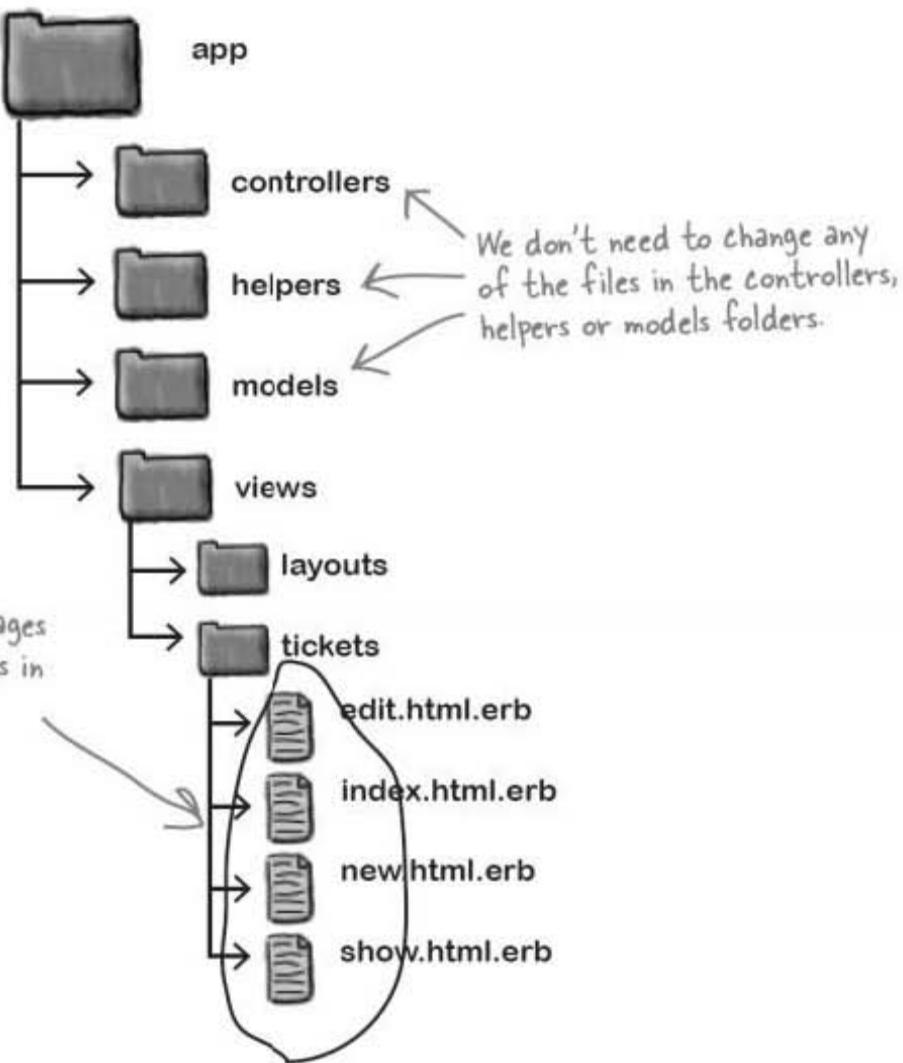


Sharpen your pencil Solution

Your job was to highlight the files that you'll need to edit to change the labels in the pages.

Since we need to change the appearance of the pages, we need to change the views. The files we need to update are found in the views folder and have the extension .html.erb.

We can change labels in the pages by changing the .html.erb files in the views folder.



The files in the VIEW need to be edited

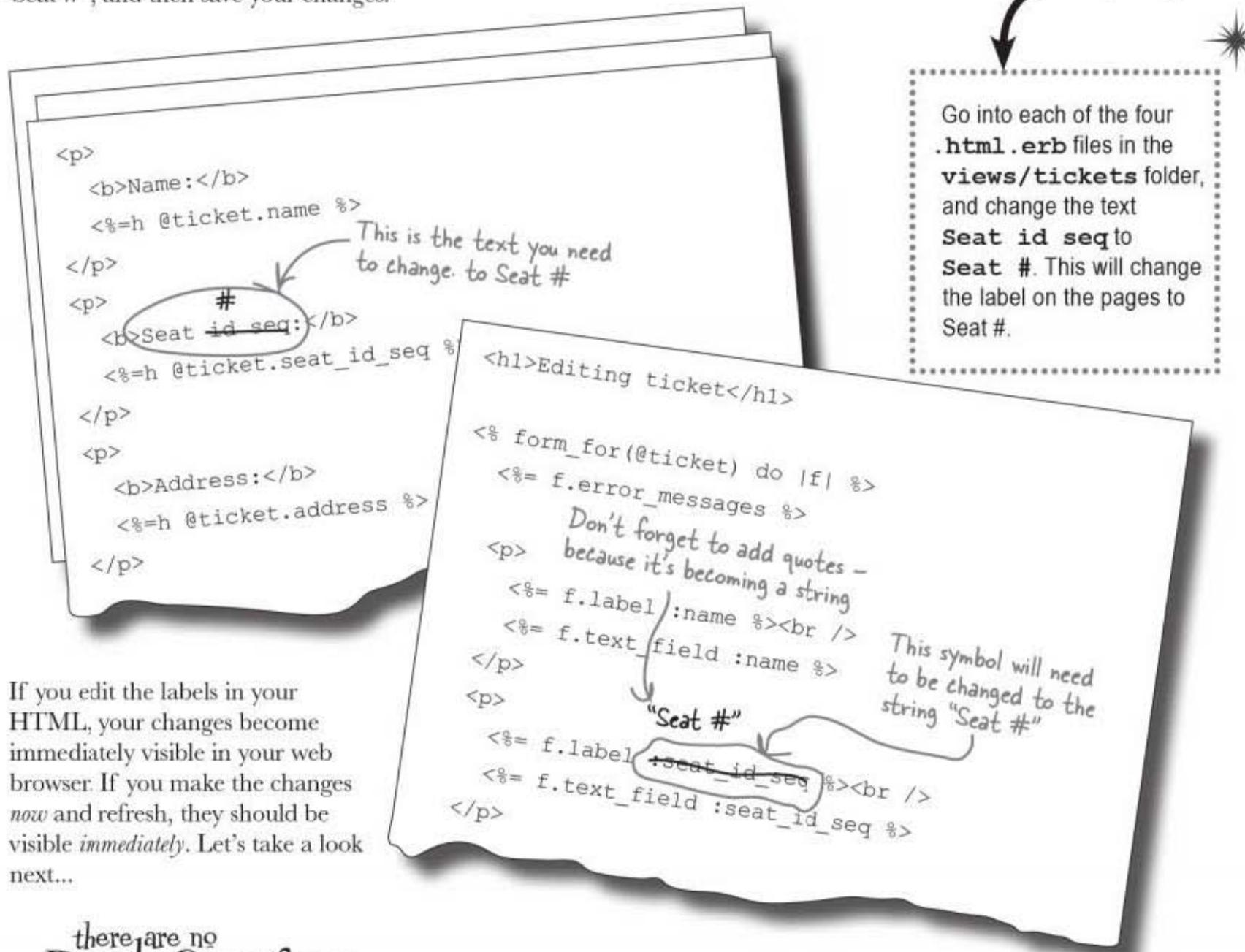
If we want to change the labels in web pages, we need to modify view code. And the view code all lives inside the app/views folder.

The view files generate web pages, and are called **page templates**. So what's a page template, and what do those templates contain?

Edit the HTML in the view

So what do the page templates actually look like? Open the four `.html.erb` files in the `views/tickets` folder using a text editor. The contents of the files look an awful lot like HTML.

We want to change the labels for `seat_id_seq` to `Seat #`. To do this, search for the text “`Seat id seq`” in the four files, change it to “`Seat #`”, and then save your changes.



there are no
Dumb Questions

Q: You called `:seat_id_seq` a symbol. What's a symbol?

A: A symbol is a little like a string. A string is surrounded with quotes, but a symbol always starts with a colon (:). Symbols are generally used to name things

in Rails because they are slightly more efficient in memory. In most cases symbols and strings can be used interchangeably.

change now, see now



Test Drive

Refresh the page at:

`http://localhost:3000/tickets/`

Now all the labels
read "Seat #".
Just what we want.

New ticket

Name	Seat #	Address	Price paid
Alan Longmuir	1A	37 Newbury Rd. Ashfield, MA	60.0

Listing tickets

Name	Seat #	Address	Price
Alan Longmuir	1A	37 Newbury Road, Ashfield, MA	60.0
Gordon Clark	43G	17 Tudor Street, Cambridge, MA	35.0
Bobbi Lyall	54C	9 Main Street, Provincetown, RI	43.0
	7H	1226 Mass Ave., Cambridge, MA	35.0

Did you notice how quickly the change appeared in your application?

That's because Rails is built with Ruby, and Ruby code doesn't need to be compiled. So the Rails web server can just run your updated source code. But is that really a big deal?

So you've got a lot fewer stages you need to go through to try out code that you change. You don't need to compile your code, for instance, and you don't need to package that code and deploy it anywhere. All you need to do is write your code and run it. The Rails development cycle is pretty quick, and it's quick to make changes to your web app, too.

Development Cycle

- Write/amend code
- ~~Compile the code~~
- ~~Package the application~~
- ~~Deploy the application~~
- Run it
- Repeat

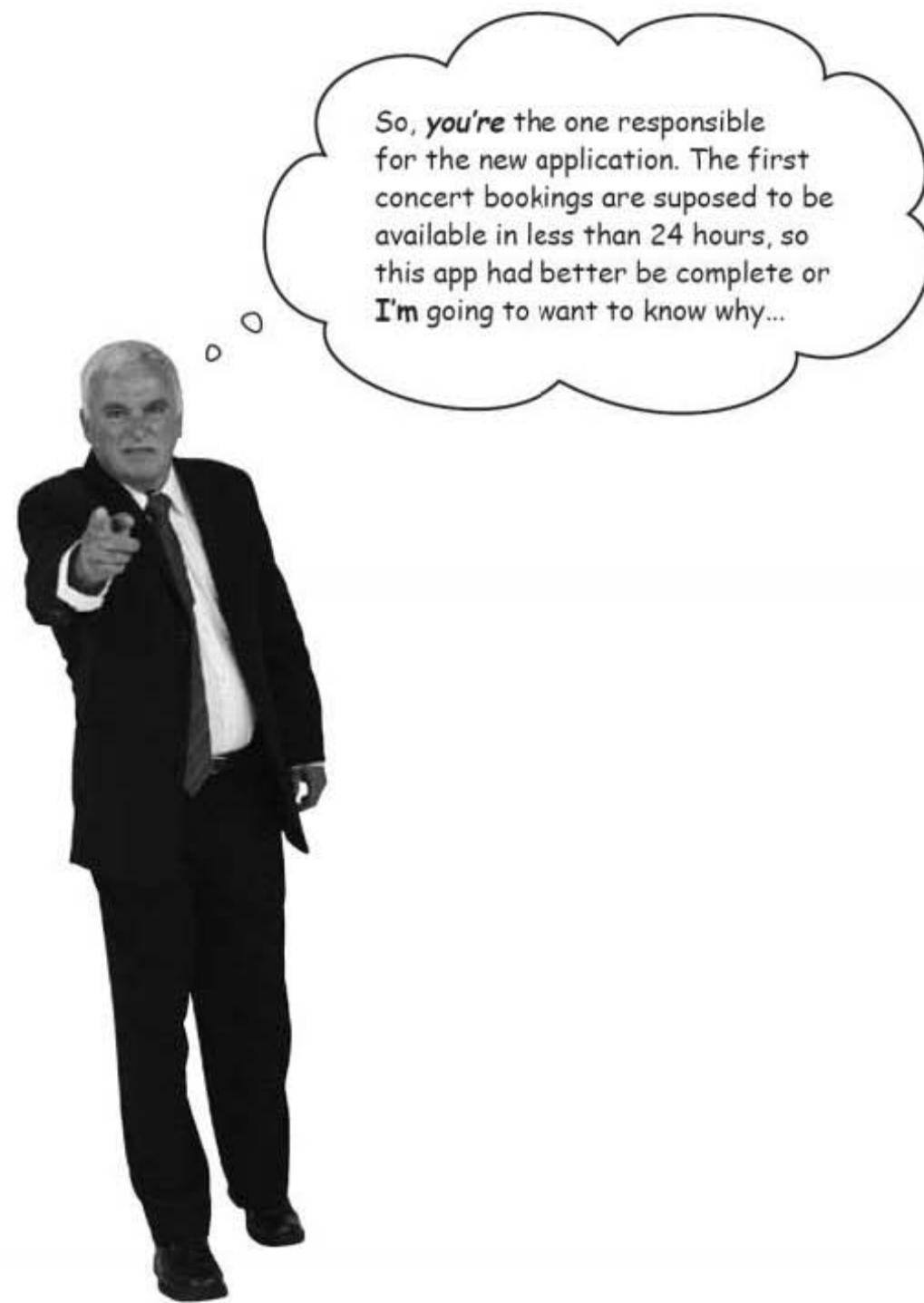
These steps are
irrelevant when you're
developing in Rails.

Sunday, 8 AM

Two fixes down, but your phone's ringing... what now?



you're on the hook



*So, you're the one responsible
for the new application. The first
concert bookings are supposed to be
available in less than 24 hours, so
this app had better be complete or
I'm going to want to know why...*

The application needs to store more information now

Everything was pretty much finished until your friend mentioned that phone numbers need to be recorded. We need more data, so what's that mean for our app?

1 We need an extra field displayed on each page.

Fortunately we know how to amend page templates, so this shouldn't be too big of a problem.

We need to add an extra field to the page like this.

Name	Seat #	Address	Price paid	Email address	Phone	
Kim Langmuir	IA	37 Newbury Road, Ashfield, MA 40.0		kim@kimlangmuir.com	999-123-0499	Show Edit Destroy
Gordon Clark	456	17 Tudor Street, Cambridge, MA	36.0	gclark@clarkmail.com	999-547-1110	Show Edit Destroy
Babbi Lyall	545	9 Main Street, Princeton, NJ 45.0		blyall@blyall.org	999-897-4558	Show Edit Destroy
Eve Mandelk	781	1324 Mass Ave, Cambridge, MA 37.0		evemandelk@gmail.com	999-227-7770	Show Edit Destroy
Kelly Bender	881	449 Tremont St, Boston, MA 45.0		kelly@kellybender.com	999-747-1877	Show Edit Destroy

2 We need to store an extra column on the database.

We need to store an extra column in our database, but how?

We need to add phone to the tickets table in the database.

tickets	
name	string
seat_id_seq	string
address	text
price_paid	decimal
email_address	string
phone	string



Sharpen your pencil

We need to add a column to the database table. Write down what **type** of script we used before to change the database structure.



You were supposed to write down what type of script we used before to change the database structure.

A migration

A migration is just a Ruby script

So we need a migration to add a column to the table. But what *is* a migration, really? Let's look back at the one that created our tickets table.

```
class CreateTickets < ActiveRecord::Migration
  def self.up
    create_table :tickets do |t|
      t.string :name
      t.string :seat_id_seq
      t.text :address
      t.decimal :price_paid
      t.string :email_address
      t.timestamps
    end
  end
  def self.down
    drop_table :tickets
  end
end
```

We need to create code that's something like this, except instead of creating a table, we need our migration to add a column.

Hello? How are we supposed to write code to change a table? We don't know how!

**We need to CREATE code,
but that doesn't mean we
need to WRITE code.**



there are no
Dumb Questions

Q: Some of the code in the migration looks like it is dropping the table. Why is that?

A: Migrations can do a lot more than we are showing here. For example, every migration has the ability to undo itself. That's why the code to create a new table is matched by code that can drop the table. But you don't need to know much about that just yet.

Q: I don't need to understand the code? Isn't it important to understand Ruby's code to master Rails?

A: The more you understand Ruby, the more control you will have over Rails. As we go through the book, you will learn more and more about the Ruby language.

Q: If the migration is just a Ruby script, why do I have to use rake? Why can't I just run the script?

A: Good question. Some Ruby is designed to be run directly and some is not. Migrations are not designed to be run directly. They are meant to be run by rake.

Q: Okay, great - but why?

A: rake is "smarter" than ruby. When you call rake db:migrate you are actually saying to rake, "Make sure all of the migrations have been run". rake may decide not to call the migration if it doesn't need to. Ruby can't make those kinds of decisions by itself.

Q: Can't I just edit my tickets table manually?

A: You could, but it is better to manage your database structure with migrations. When you make your application live, you will need to recreate your data structures in your production database. If you use migrations, then rake will be able to make the data structures in your production database match what you need for your application. If you modify your data structure manually, things can get out of sync pretty easily. Like most things in Rails, if you go along with the conventional way of using Rails, you'll make things easier for yourself.

Rails can generate migrations

Remember when we generated the scaffolding using:

```
ruby script/generate scaffold ticket name:string seat_id_seq:string
address:text price_paid:decimal email_address:string
```

generate is a script to create Ruby code. And the good news is that generate doesn't *just* write scaffolding code. It can also generate migrations.

Now suppose you were to type in this command:

```
ruby script/generate migration PhoneNumber
```

← Don't actually type this in.

This would generate a brand new blank migration file. We could then add in the Ruby code to modify the table. The trouble is, we don't know how to write the code to complete the migration.

So what can we do? And what can Rails do for us?

naming is important

Give your migration a "smart" name, and Rails writes your code for you

You've probably noticed by now that names are really important to Rails. When we created scaffolding called "ticket," Rails made the app visible at <http://localhost:3000/tickets> and generated a migration to create a table called tickets.

Naming conventions are important in Rails because they save you work. The same is true with how you name migrations. Instead of just giving the new migration any old name, try giving it a name like this:

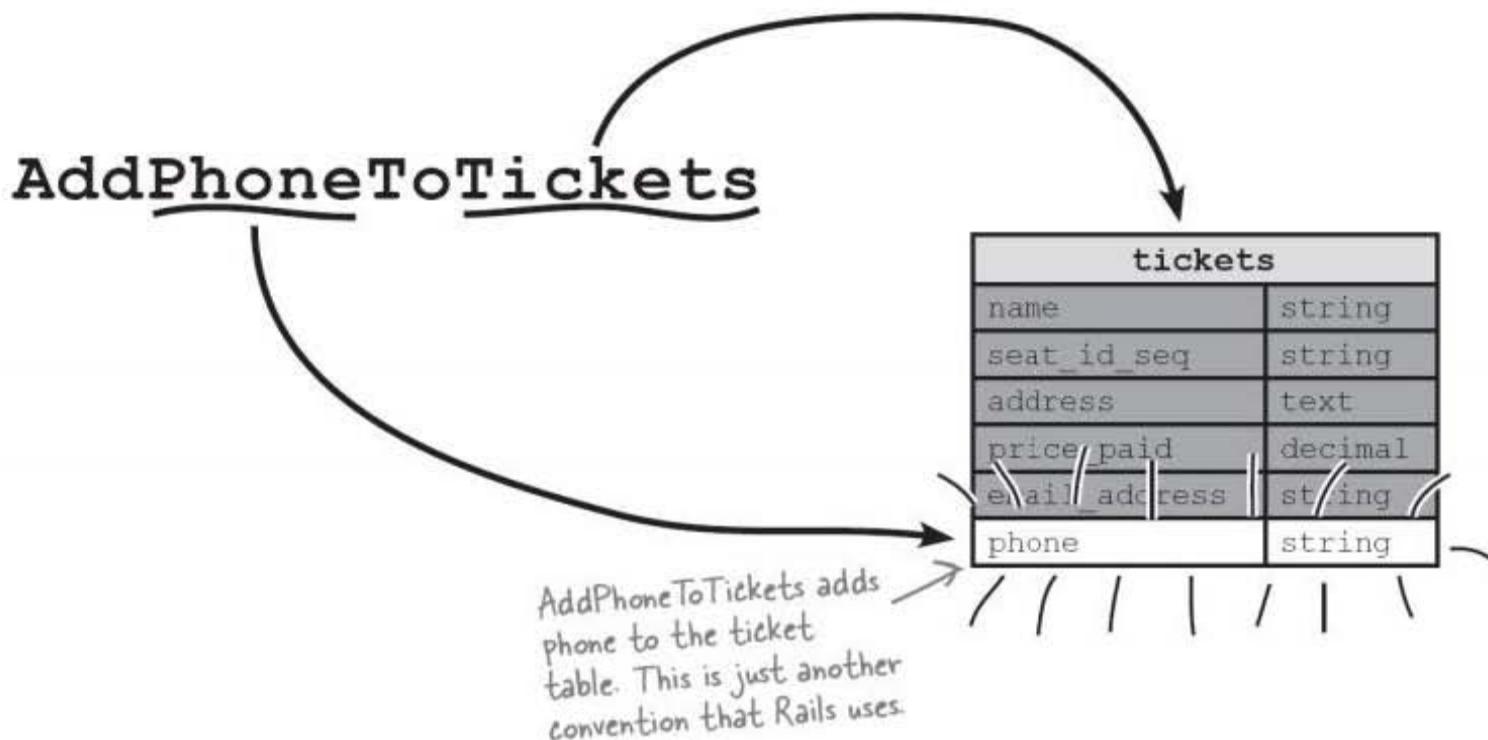
```
File Edit Window Help NamesMatter
> ruby script/generate migration AddPhoneToTickets phone:string
```

The important bit is this name here. It takes the form Add...To...

So why does the name make any difference?

Rails knows that a migration called Add...To... is probably going to be adding a particular column to a particular table, so instead of just generating a blank migration for you to fill in, **Rails will actually write your migration code for you**.

You need to run this command.

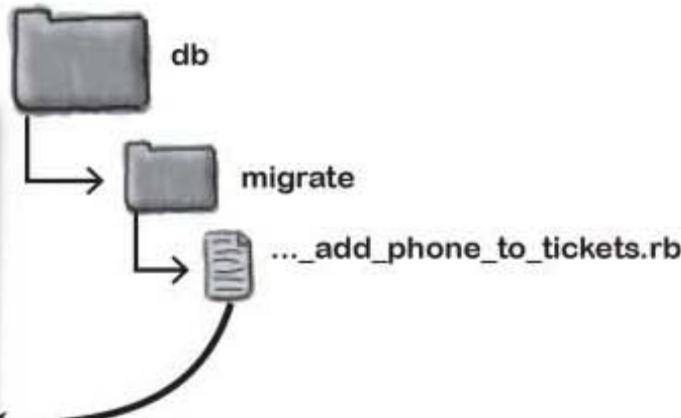


You need to run your migration with rake

Here's the migration that Rails cleverly generates for you.

```
class AddPhoneToTickets < ActiveRecord::Migration
  def self.up
    add_column :tickets, :phone, :string
  end

  def self.down
    remove_column :tickets, :phone
  end
end
```



When we wanted to run a migration before we used the `rake` command:

```
rake db:migrate
```

But can we do that this time? After all, we don't want `rake` to run the first migration again by mistake.

Timestamps tell `rake` which migrations to run, and in which order

Rails records the latest timestamp of all the migrations it runs. That allows `rake` to tell which migrations have been run and which haven't. This means that whenever you run `rake db:migrate`, **Rails will only run the latest migrations**.

Let's put this to the test. Run `rake db:migrate` again to add the phone column to the tickets table.

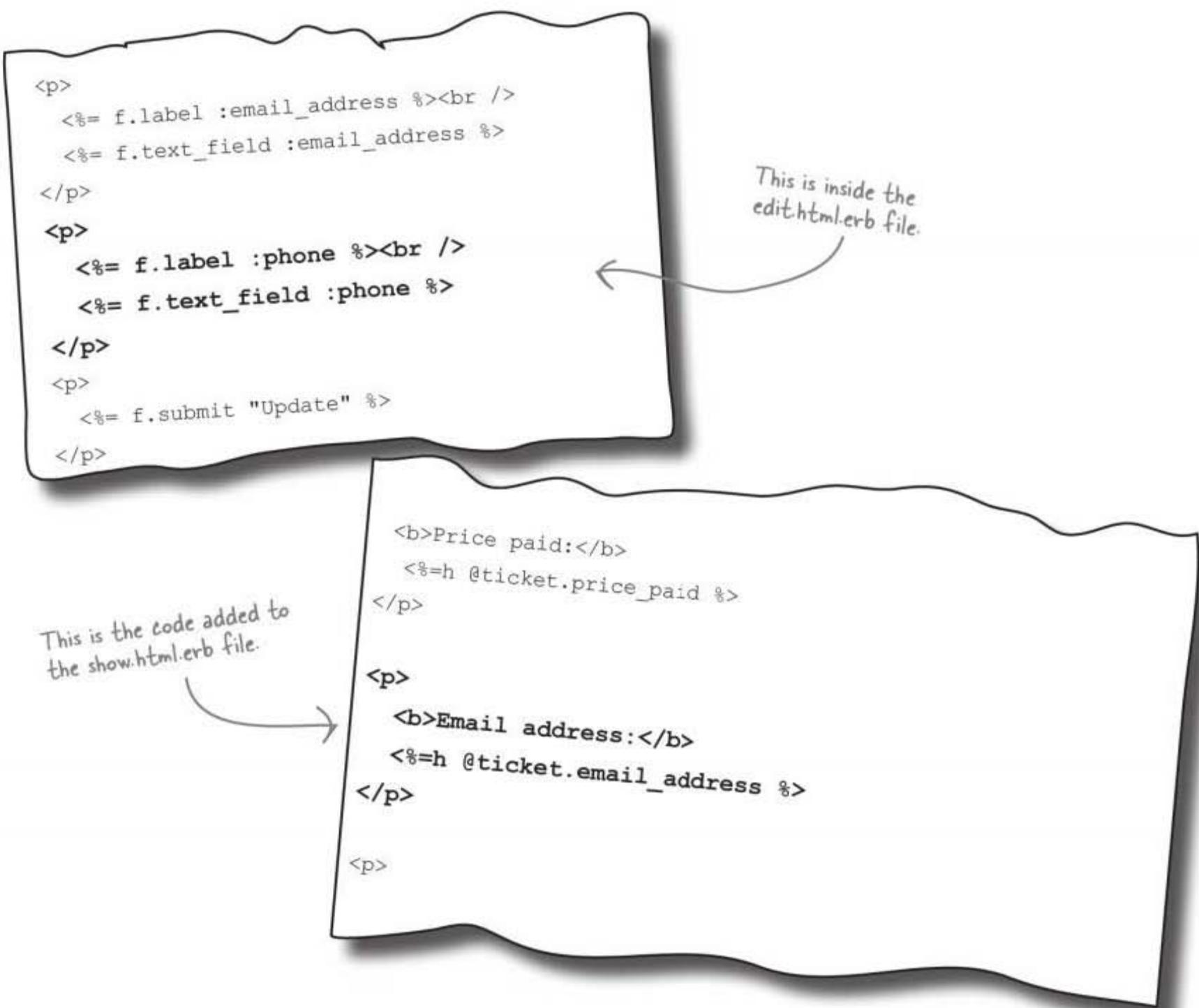


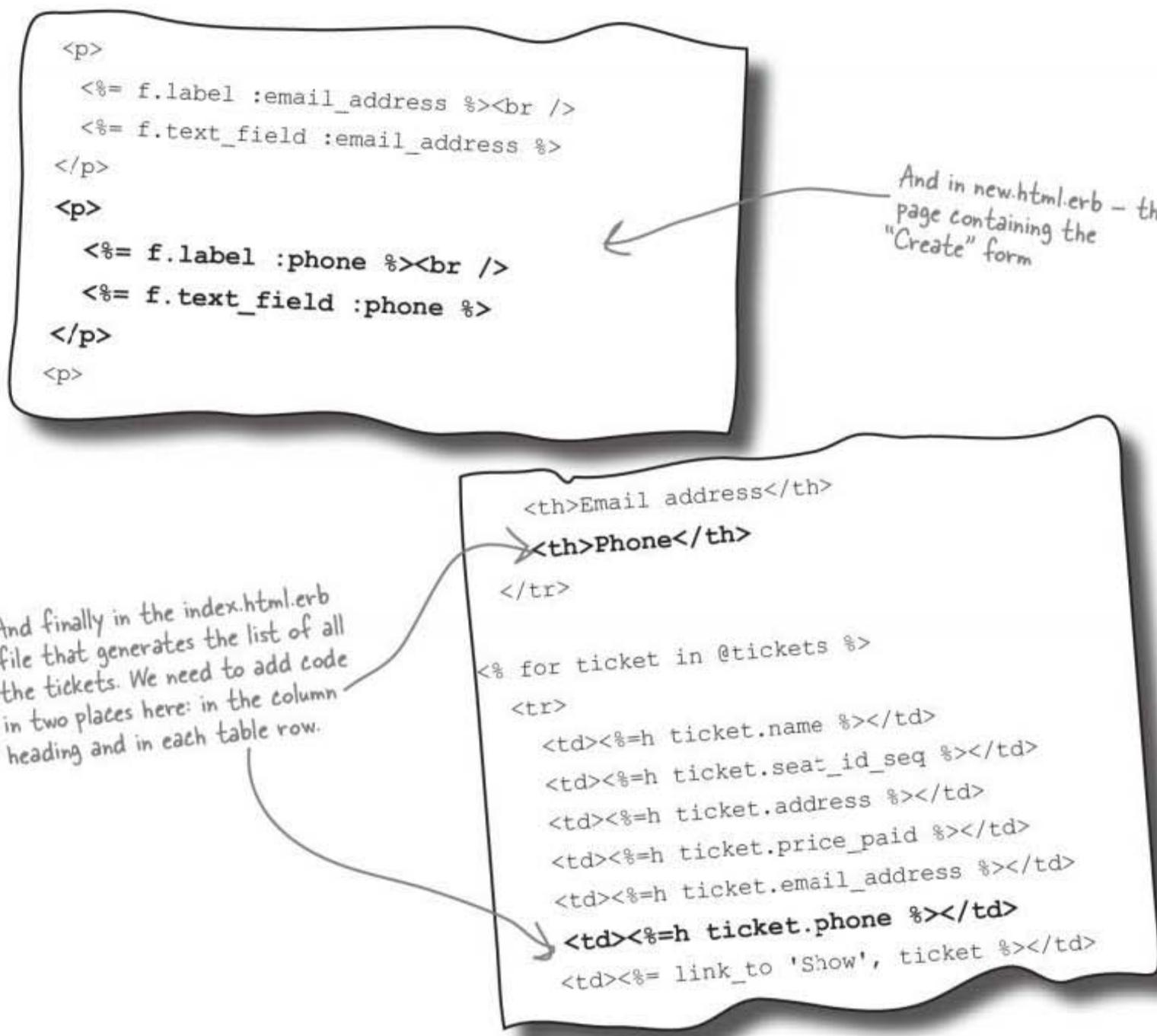
```
> rake db:migrate
```

But changing the database isn't enough

Scaffolding generates code—and that's great because it gets you up and running very quickly. But the downside is that once the code has been generated it's the **developer's responsibility** to keep the code **up-to-date**.

We just added a phone attribute to the database. But because the forms had already been created by scaffolding, they won't automatically pick-up the new phone field. So we'll have to go back to the page templates and add in references to the phone number:





there are no Dumb Questions

Q: Why does it say `<%=h ... %>` in some places? What does the "h" mean?

A: h is a helper method. Helpers are used for things like formatting output. The h helper escapes special characters in the field like "<" and "&". This will prevent anyone from submitting text to the web site that contains JavaScript or other potentially dangerous code.

Q: Why are strings used in some places, and symbols in others?

A: Strings are used in the page templates where a simple piece of text is required. Symbols (the words that begin ":"s) are commonly used in labels.

Q: Why?

A: Symbols are memory efficient and most methods (like f.label) that accept parameters like to have symbols instead of strings. But in most cases, Rails methods let you optionally use strings instead of symbols if they are easier to format.



Long Exercise

The boss is pleased with the way the application is going, and now he wants to record events as well as ticket sales. This is the events data structure:

Event:

artist - the performer (string)

description - short bio (text)

price_low - cheapest tickets (decimal)

price_high - sales price of ticket (decimal)

event_date - when it happens (date)

What command would you enter at the console to create scaffolding for the event data?

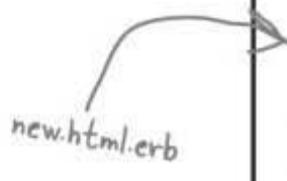
.....
.....

What would you type to create the events table in the database?

.....

The boss wants the labels in the pages for price_low to be "Prices from", price_high to be "To", and event_date to be "Date". You will need to edit four templates to make the change. Write the changes for the new.html.erb page template shown here:

```
<h1>New event</h1>
<% form_for(@event) do |f| %>
<%= f.error_messages %>
<p>
  <%= f.label :artist %><br />
  <%= f.text_field :artist %>
</p>
<p>
  <%= f.label :description %><br />
  <%= f.text_area :description %>
</p>
<p>
  <%= f.label :price_low %><br />
  <%= f.text_field :price_low %>
</p>
<p>
  <%= f.label :price_high %><br />
  <%= f.text_field :price_high %>
</p>
<p>
  <%= f.label :event_date %><br />
  <%= f.date_select :event_date %>
</p>
<p>
  <%= f.submit "Create" %>
</p>
<% end %>
<%= link_to 'Back', events_path %>
```



new.html.erb

What are the names of the other three templates in the app/views/events directory that will need changing?

.....



Long Exercise Solution

The boss is pleased with the way the application is going, and now he wants to record events as well as ticket sales. Here's the events data structure:

Event:

artist - the performer (string)
description - short bio (text)
price_low - cheapest tickets (decimal)
price_high - sales price of ticket (decimal)
event_date - when it happens (date)

What command would you enter at the console to create scaffolding for the event data?

```
ruby script/generate scaffold event artist:string description:text price_low:decimal  
price_high:decimal event_date:date
```

What would you type to create the events table in the database?

```
rake db:migrate
```

The boss wants the labels in the pages for price_low to be "Prices from", price_high to be "To", and event_date to be "Date". You will need to edit 4 templates to make the change. Write the changes for the new.html.erb page template shown here:

```
<h1>New event</h1>
<% form_for(@event) do |f| %>
  <%= f.error_messages %>
  <p>
    <%= f.label :artist %><br />
    <%= f.text_field :artist %>
  </p>
  <p>
    <%= f.label :description %><br />
    <%= f.text_area :description %>
  </p>
  <p>      :prices_from ←
    <%= f.label :price_low %><br />
    <%= f.text_field :price_low %>
  </p>
  <p>      :to ←
    <%= f.label :price_high %><br />
    <%= f.text_field :price_high %>
  </p>
  <p>      :date ←
    <%= f.label :event_date %><br />
    <%= f.date_select :event_date %>
  </p>
  <p>
    <%= f.submit "Create" %>
  </p>
<% end %>
<%= link_to 'Back', events_path %>
```

"Prices from"
would also work –
but using a symbol
is better

Or "To"

Or "Date"

new.html.erb

What are the names of the other three templates in the app/views/events directory that will need changing?

edit.html.erb, show.html.erb and index.html.erb

test it all out



Test DRIVE

The application now has all of the contact information on the tickets pages:

Name	Seat #	Address	Price paid	Email address	Phone
Alan Longmuir	1A	37 Newbury Road, Ashfield, MA	\$10.00	alanlongmuir@gmail.com	508-297-0449
Gordon Clark	4B	29 Tudor Street, Cambridge, MA 02138	\$10.00	gclark@gmail.com	617-547-1120
Beth Lovell	3C	9 Mass Ave., Cambridge, MA 02138	\$10.00	bethlovelly.org	617-423-4239
Eric Hancher	2D	1228 Mass Ave., Cambridge, MA 02138	\$10.00	erichancher@gmail.org	617-221-0000
Nelly Hernandez	8E	862 Framingham St., Boston, MA	\$10.00	nellyhernandez@yahoo.com	617-767-1677

And all of the events information is also recorded:

Artist	Date
Lyle Lovett	2009-03-20
Great Big Sea	2009-03-20

The concert is a sell-out!

The application runs perfectly all week, and the following Friday night, every seat in the arena is sold.



BULLET POINTS

- Rails follows a Model-View-Controller architecture, known as the MVC architecture.
- Rails generates separate folders for the model, view, and controller code.
- Any changes you make to your application can be seen as soon as you save your changes and refresh the pages in your browser. This is because Rails is built with Ruby, and doesn't need to be compiled.
- You can make changes to your table structure using a

migration. To generate a migration that adds a column to a table, use the following command:

```
ruby script/generate migration  
Add<column>To<table>  
<column>:<data type>
```

- To run a migration, use the command

```
rake db:migrate
```

rails tools



Tools for your Rails Toolbox

You've got Chapter 1 under your belt, and now you've added the ability to create Rails applications to your toolbox.

Rails Tools

`rails app-name`

Create an application

`ruby script/server`

Start the application

`ruby script/generate scaffold...`

Generate CRUD code for a model

`ruby script/generate migration`

Generate a migration to alter the database structure

`rake db:migrate`

Run new migrations on the database

2 beyond scaffolding

Rails apps, made to order

He's going to get a shock
when he realizes I've fitted
an after-burner.



So what's really going on with Rails? You've seen how **scaffolding** generates heaps of code and helps you write web applications wicked fast, but what if you want something a little different? In this chapter you'll see how to really **seize control** of your Rails development and take a look underneath the hood of the framework. You'll learn how Rails decides which **code** to run, how **data** is read from the database, and how **web pages** are generated. By the end, you'll be able to publish data the way **you** want.

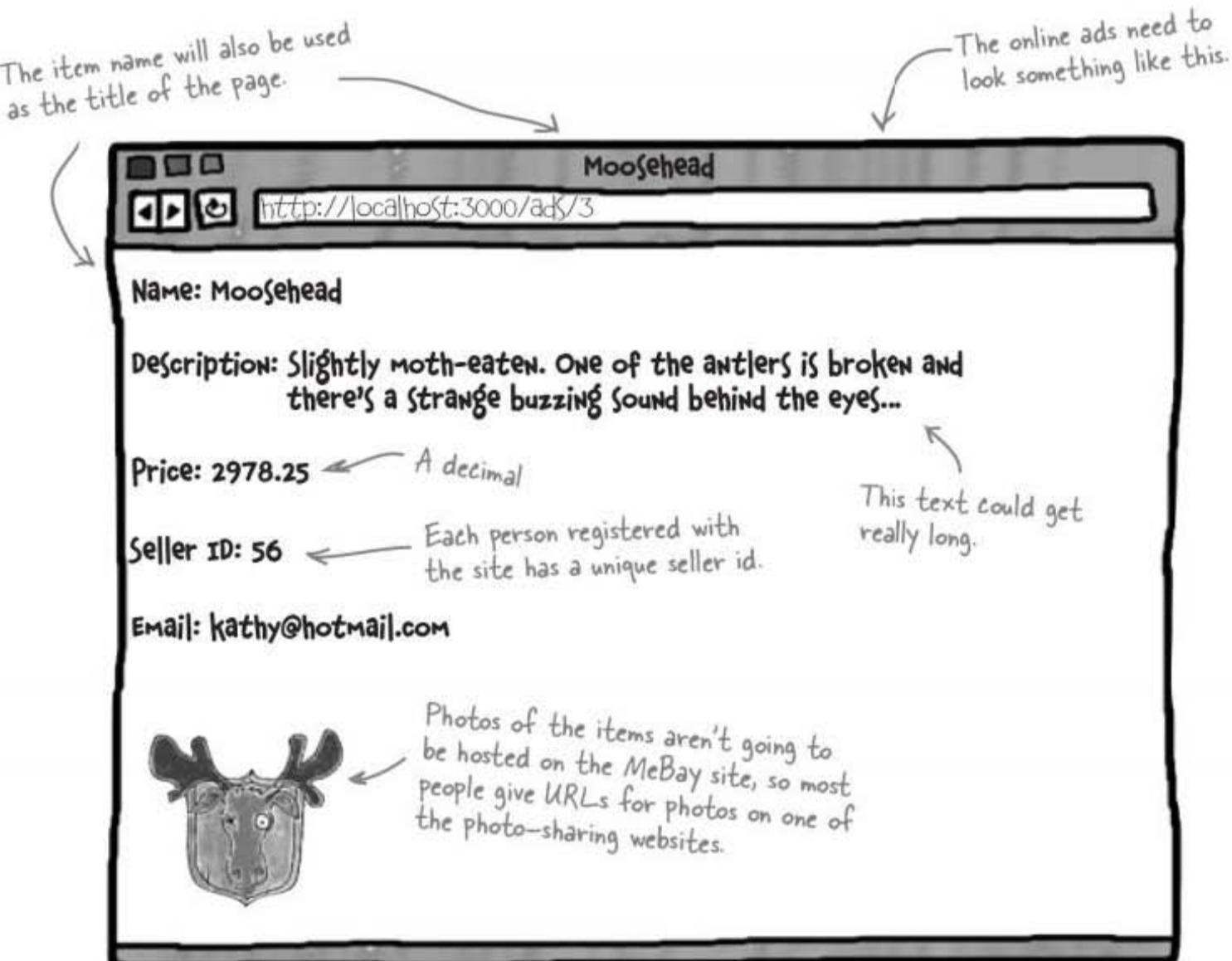
MeBay, Inc. needs your help

MeBay, Inc. is a sales company that helps people sell their unwanted stuff online. They need a new version of their site, and they need **you** to help them out.

To place an ad on the site, the seller calls MeBay on their toll-free number, and gives their seller ID and the details of the item they want to sell. MeBay has their own data entry system, and your application is needed to publish the MeBay ads online.

MeBay will store their ads in a database

All of the ads contain the same types of information, and MeBay wants to store the ads in a database. They'll insert the data into the tables you create when you build the app. They need something like this:

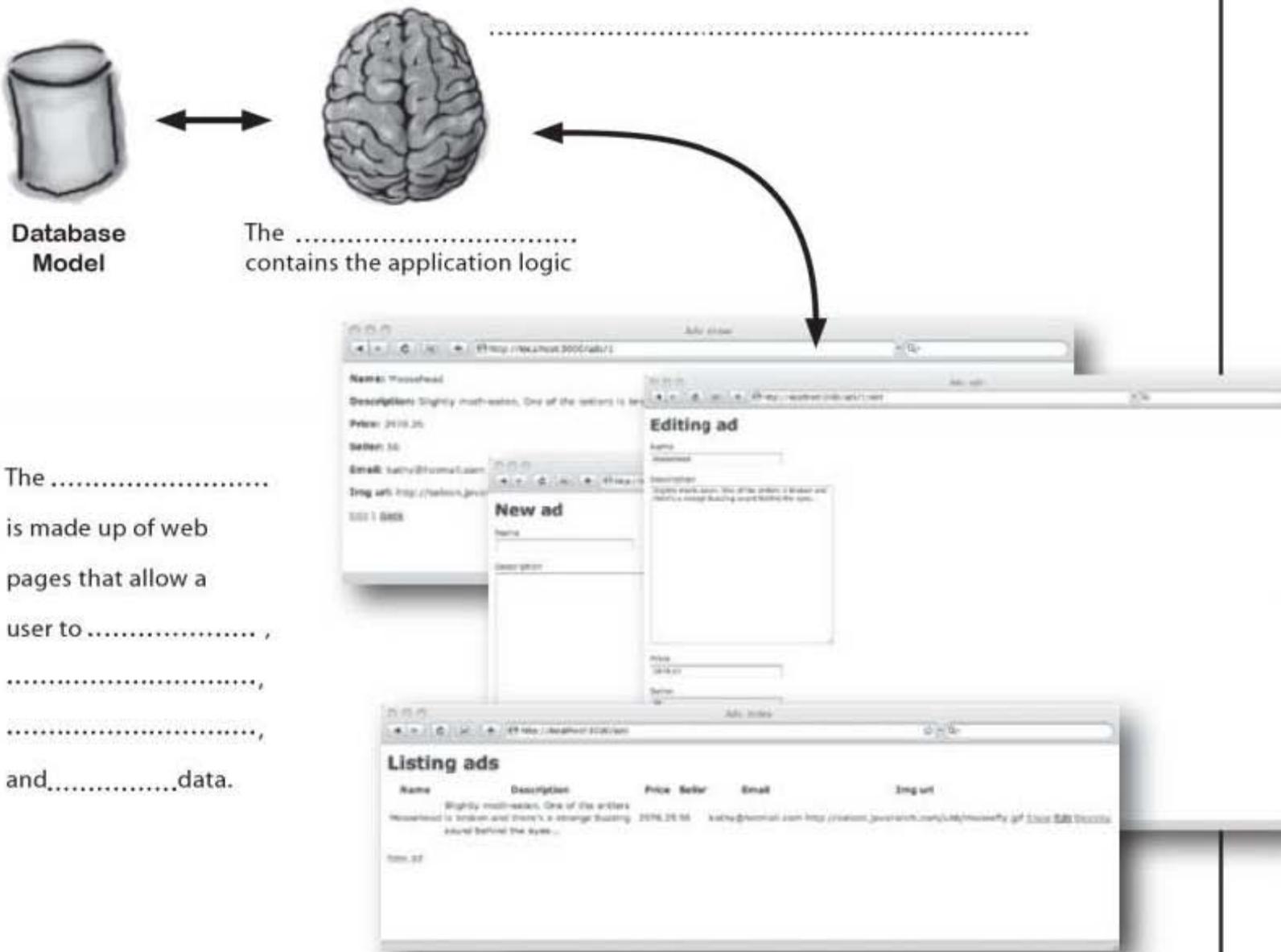


Sharpen your pencil



Suppose you were going to use Rails scaffolding for the website. Fill in the blanks in the architecture diagram below.

First, you'd create a new Rails application called mebay using this command:



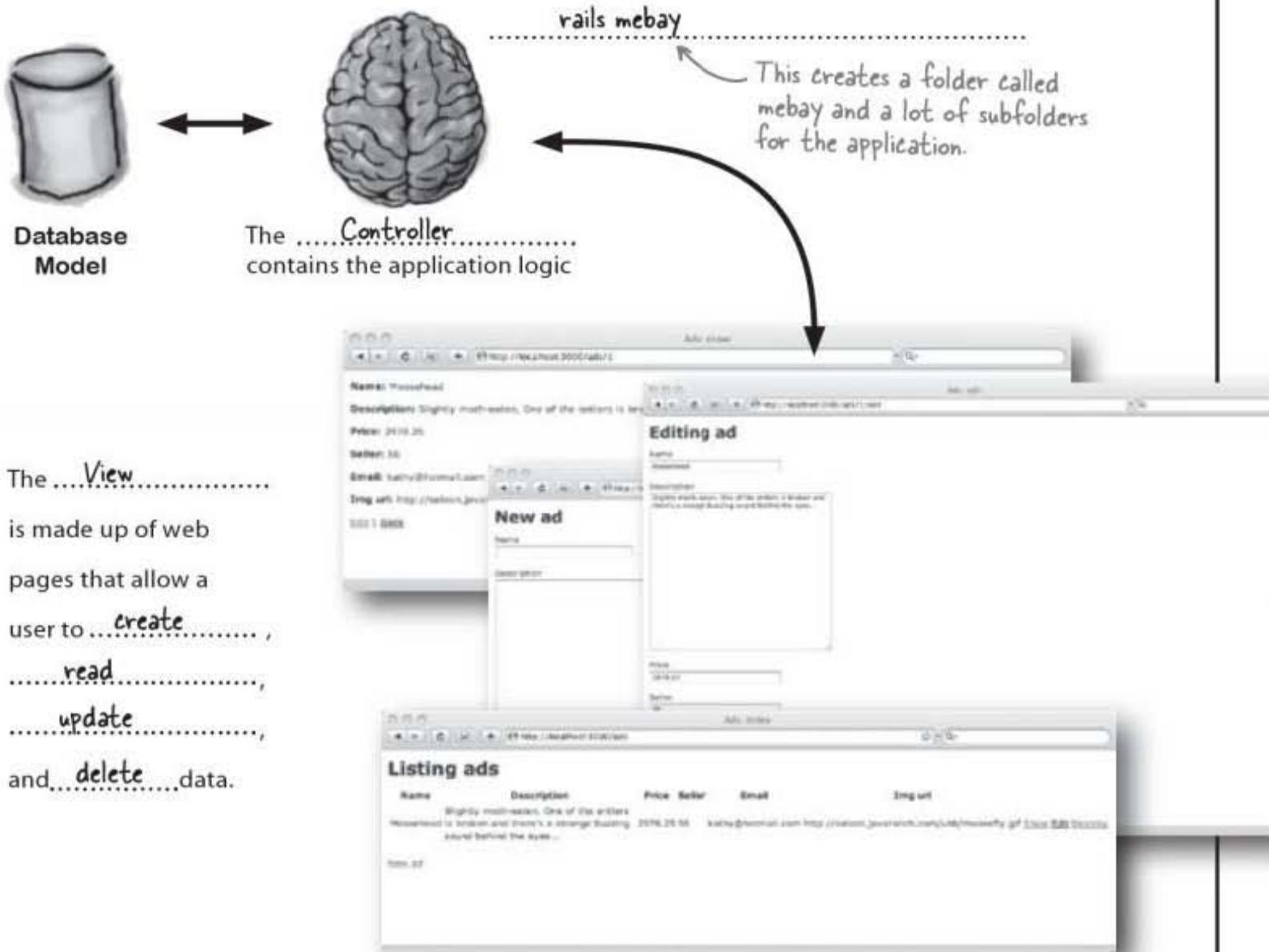
Would there be any problems using scaffolding for this site?

.....
.....
.....
.....
.....

Sharpen your pencil Solution

Suppose you were going to use Rails scaffolding for the website. Fill in the blanks in the architecture diagram below.

First, you'd create a new Rails application called mebay using this command:



Would there be any problems using scaffolding for this site?

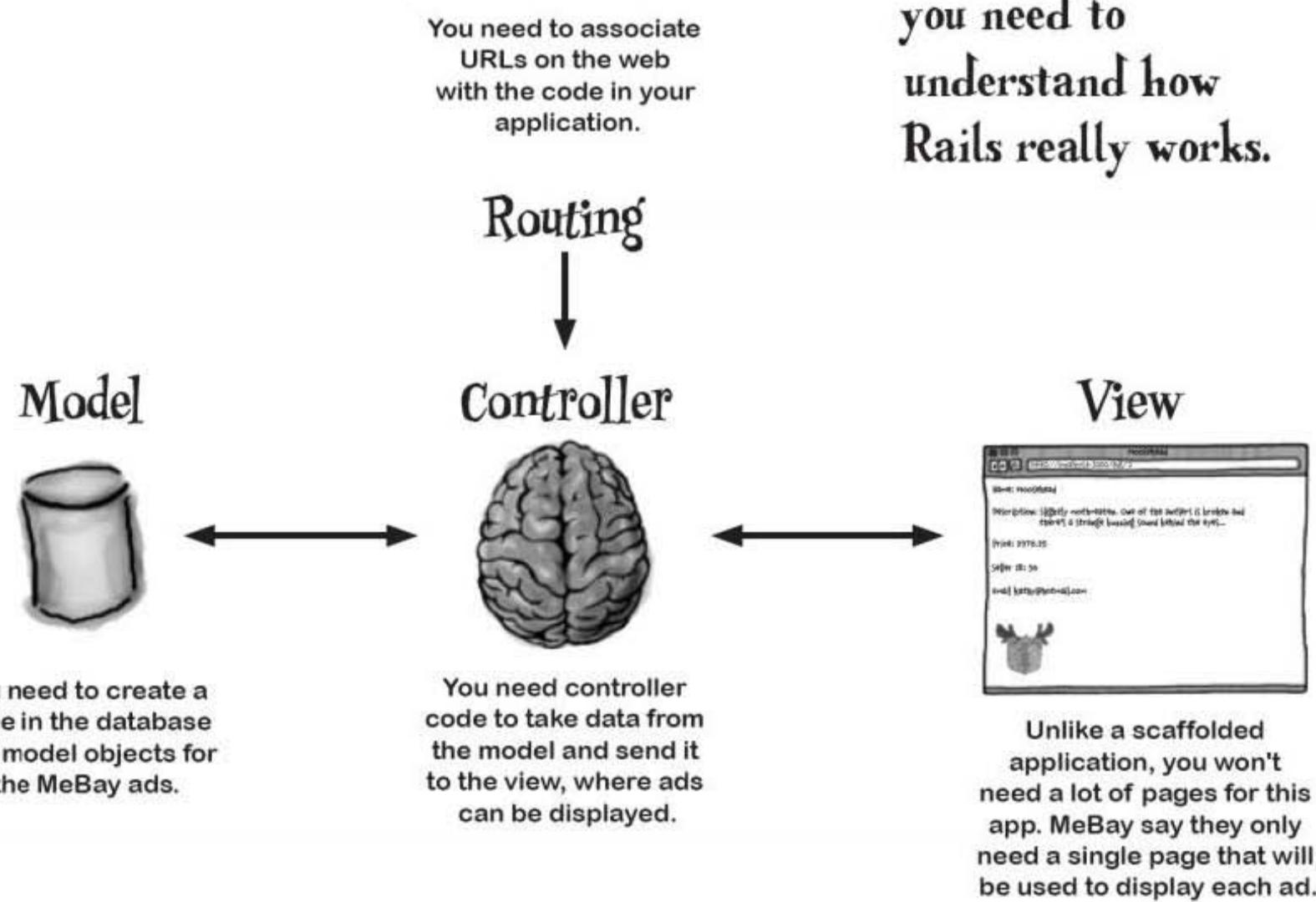
The problem here is that scaffolding generates code that allows user to edit the data, and MeBay only wants to publish ads. They don't want just anyone changing the prices and details of an item. All of the data will be entered by MeBay's own systems so—for now at least—they only need to display ad pages.

Scaffolding does WAY too much

MeBay want an application that does *less* than a scaffolded app would. Scaffolding's great, but some applications are so simple that you'll sometimes be better off building your app manually.

So why's that? Well, if you write the code yourself, the application will be **simpler** and **easier** to maintain. The downside to this is that in order to build a Rails web app manually, you need to go ***under the hood*** and understand how Rails really **works**.

Let's start by looking at what code you need to create for MeBay:



So which code will you write first?

model first

Let's start by generating the MeBay model...

It's a good idea to begin with creating the **model** code, because the structure of the data in the model affects both the controller and the view.

Creating model code is very similar to creating scaffolding. In fact, the only difference is that you replace the word "scaffold" with the word "model," like this:

Models have singular names – so it's "ad", not "ads".

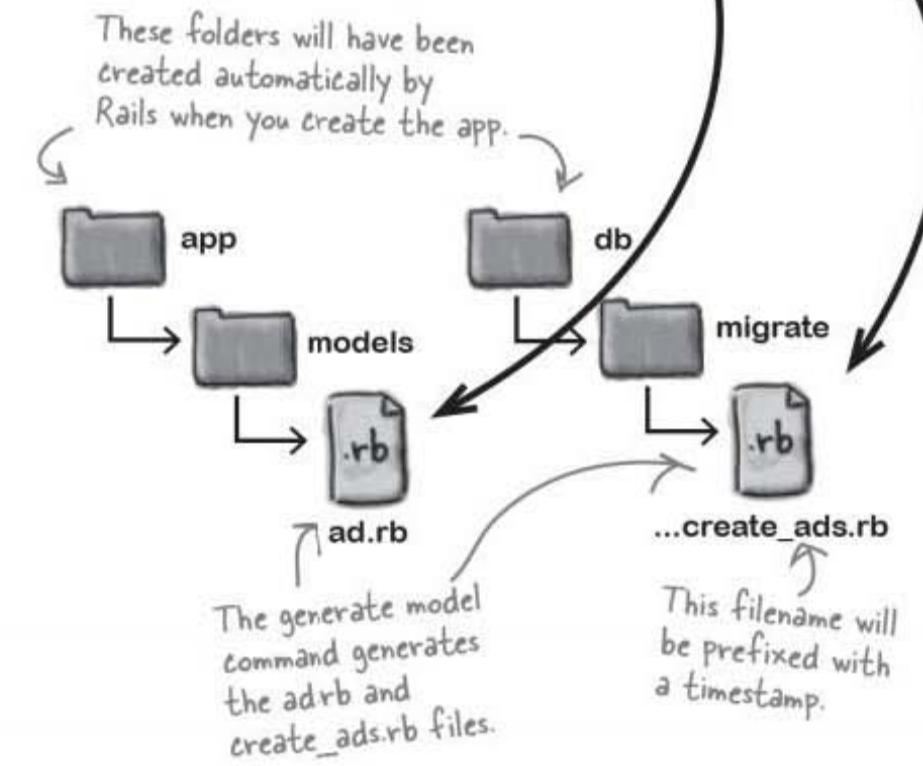
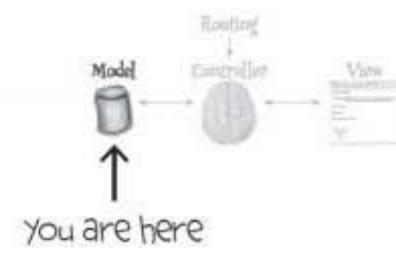
```
File Edit Window Help AdvertiseMeBaby
> ruby script/generate model ad name:string description:text
  price:decimal seller_id:integer email:string img_url:string
```

The model-generator command creates two key scripts within the app and db subfolders:

- the **model class** (app/models/ad.rb) and
- the **data migration** (db/migrate/..._create_ads.rb).

The migration is a Ruby script that can connect to the database and create a table for the ads. To run this script and create the table, we need to use rake.

This is just like we did in Chapter 1. rake figures out which migrations to run based on timestamps.



... and then we'll actually create the table using rake

To create the table, we need to call the migration using the `rake db:migrate` command:

```
File Edit Window Help AdvertiseMeBaby
> rake db:migrate
```

Remember, the `rake db:migrate` command creates a table in the database using the `..._create_ads.rb` script you just created with model1.

But if you were to look really closely at the table it creates, you'd see a strange thing. Rails creates three extra columns in the table *without being asked*.

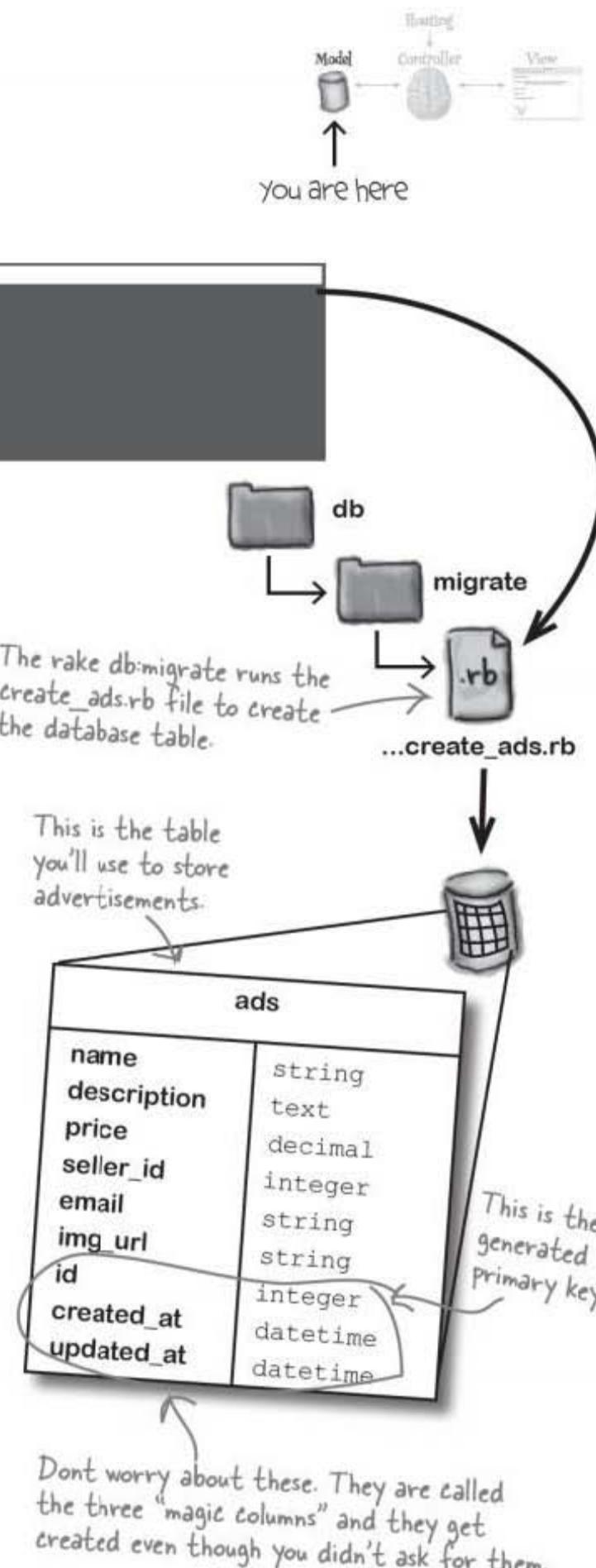
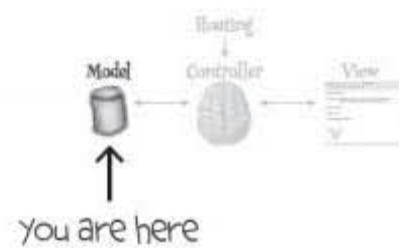
These are “magic columns”: `id`, `created_at`, and `updated_at`. The `id` column is a generated primary key, and `created_at` and `updated_at` record when the data is entered or updated.



Rake creates a table for you in the database, but what it *doesn't* do is populate that table with data for you to experiment.

You're going to need some data in the table before we get much further. Fortunately, the kind folks at MeBay Inc. have left a copy of their test data for you at the Head First website. Point your browser to www.headfirstlabs.com/books/hfrails for a full set of instructions and the data.

Make sure you do this, or you'll hit problems later on.



generate your code

But what about the controller?

The model isn't a lot of use on its own. You need some code that uses the data the model produces, and that's the job of the **controller**.

Just like scaffolding and the model, controllers have their own generators. Use the `generate controller` command below to generate an empty controller class:

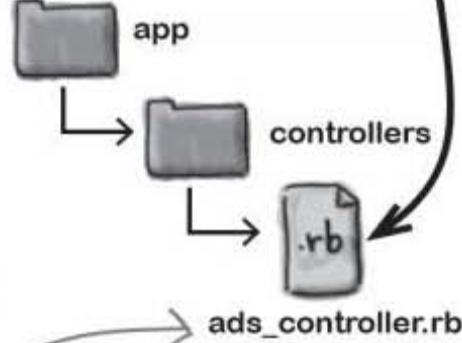


```
File Edit Window Help  
> ruby script/generate controller ads
```

This command generates a **class file** for your controller at **app/controllers/ads_controller.rb**. If you open the file with a text editor, you'll find some Ruby code like this:

```
This marks the start of  
the controller code.  
class AdsController < ApplicationController  
  # Your application  
  # logic goes here.  
end
```

The end of the
controller code.



Geek Bits

CamelCase means using uppercase within identifiers that consist of more than one word to help you make out the individual words.

We'll come back to what code needs to be added to this class in just a few pages... for now, it's just cool that we didn't have to write any of this Ruby- and Rails-specific syntax.

^{there are no} Dumb Questions

Q: Does rake db:migrate always add the magic columns?

A: Yep, it sure does.

Q: Even if the table is created by scaffolding?

A: Yes. If you examined the database table in the previous chapter, you'll see the magic columns in there as well.

Q: Is there any way I can open up the database and examine the tables?

A: Yes - but you'll need a tool. There's a Firefox add-in available called SQLite Manager that will open and read the sqlite3 files used by Rails.

Q: I noticed that in the `generate model` command you used `ad`, but in the `generate controller` command you used `ads`. Was that intentional?

A: Yes. In Rails, models all have **singular** names, but controllers and tables are **plural**. This means that when we used the command to generate the model, we gave the singular name of `ad`, but when we used the command to generate the controller, we gave the plural name `ads`.

Q: How important is it to get that right?

A: **Very!** Rails relies on these conventions, so it's crucial that you follow them too. If you don't, Rails won't be able to set up your web app for you properly, and some things may not work. Life is much easier if you follow the conventions Rails expects.

**Models have
singular names but
controllers and
tables are plural.**

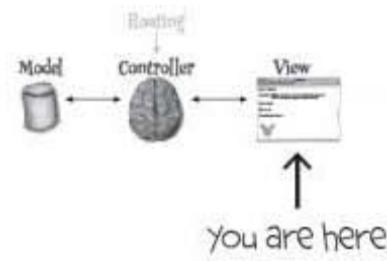
We've created the model and controller, now let's move onto the view...

page templates are (mostly) html

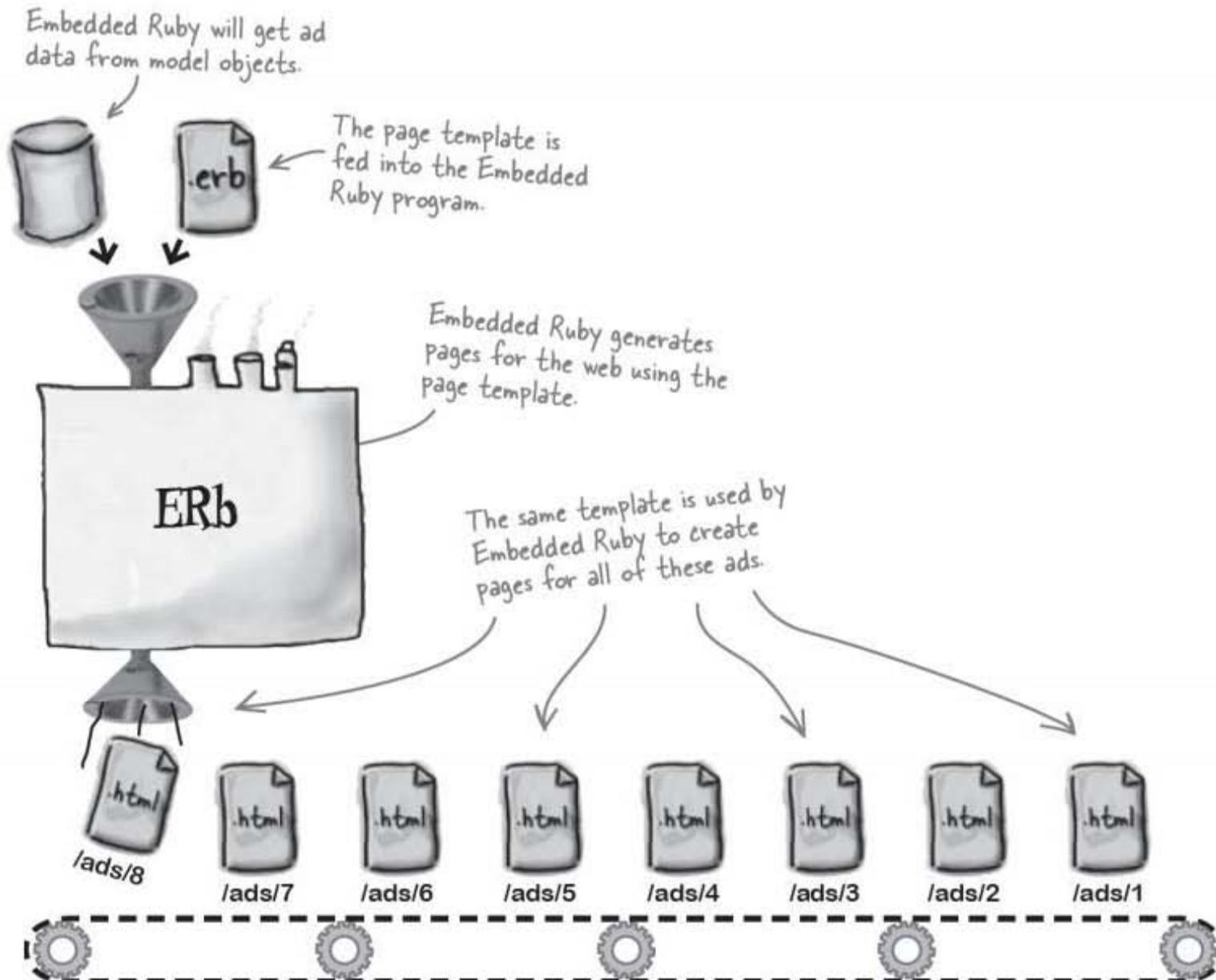
The view is created with a page template

So what view code do we need to create? The MeBay web app only needs a single page, and this page will be used as a template for all of the ads on the website. For this reason, pages in Rails are often called **page templates** (or simply **templates**).

Web pages are created from templates by Embedded Ruby (called ERb), and this is part of the standard Ruby library. If someone asks for ad #3, ERb will generate the HTML web page for the ad using the page template and data from the model.



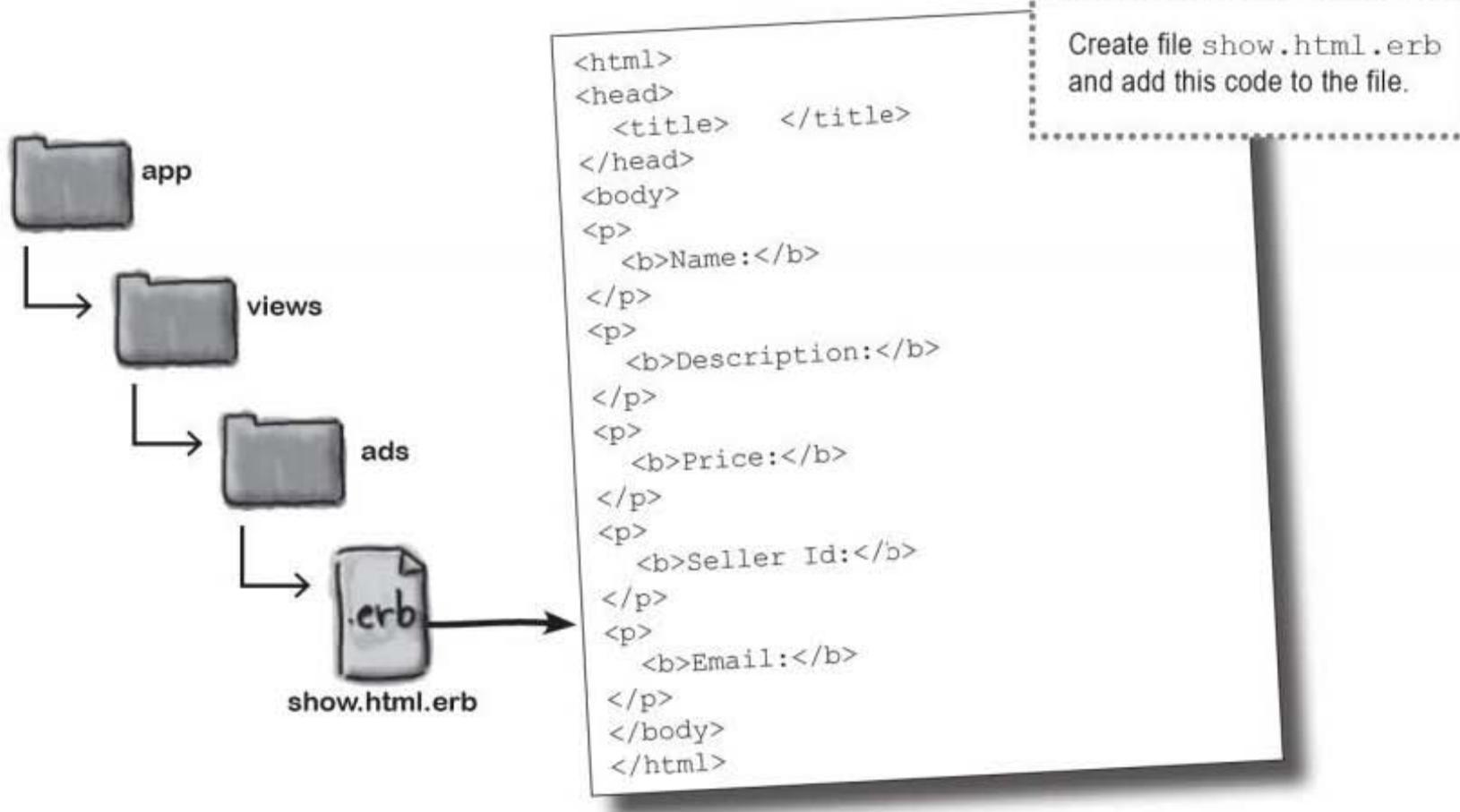
So how does ERb produce web pages?



The page template contains HTML

When you generated the model and the controller, Rails generated **Ruby** code. The view's a little different though. The application has an HTML interface, so it makes sense that the **view code is written in HTML**, too.

To create the ad template, open up a text editor and create a file called **show.html.erb** and save it in `app/views/ads`. Here's what you need the contents of `show.html.erb` to look like:



At the moment the template looks pretty blank, but you'll see in a little while how the controller can cleverly insert values into it.

So what does the actual web app look like?

Embedded Ruby (ERb) creates web pages from a template.

routes are required



Test Drive

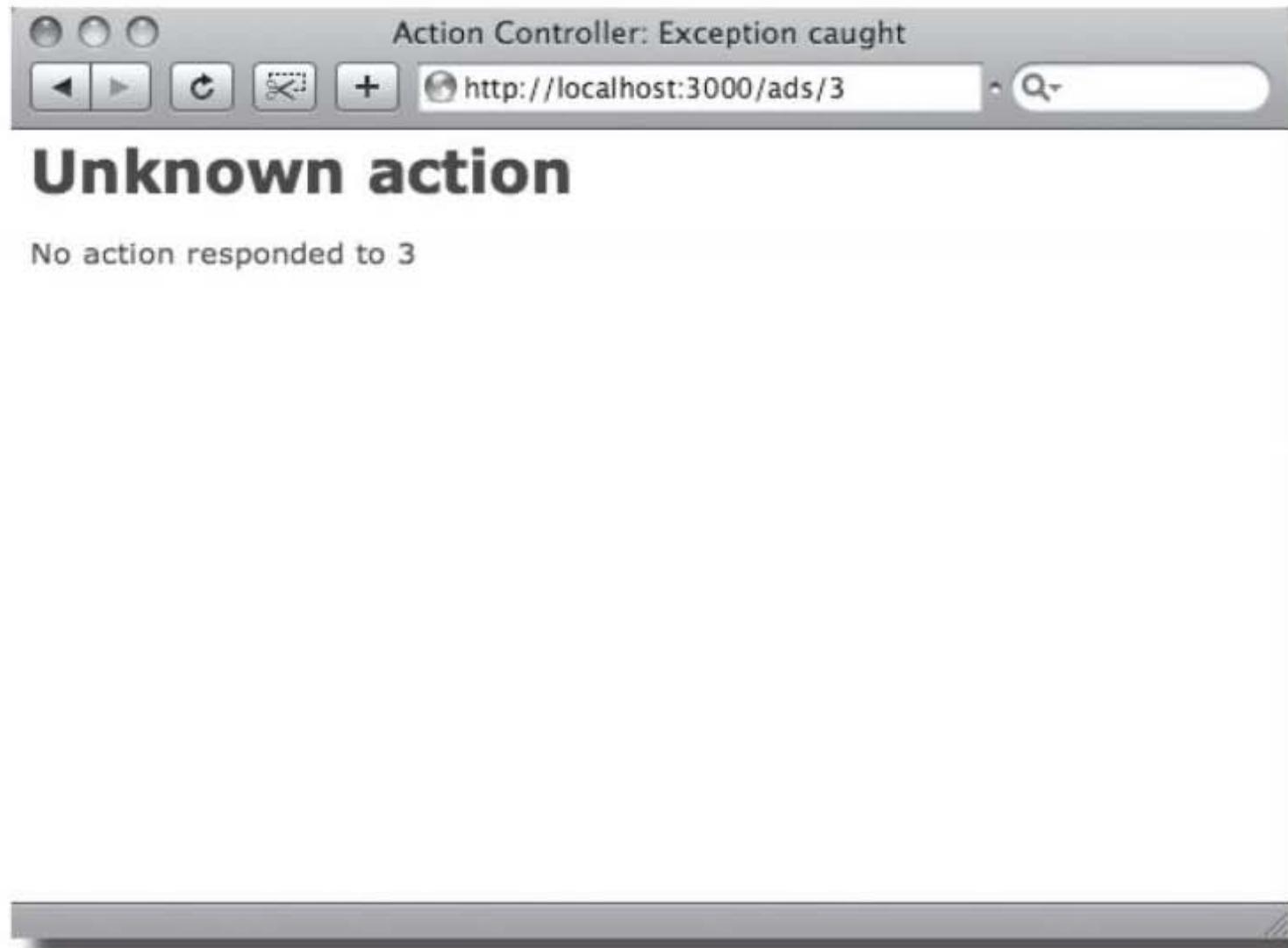
Start your server with

```
ruby script/server
```

and point a browser at

```
http://localhost:3000/ads/3
```

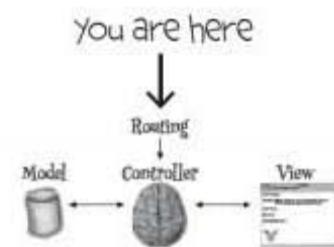
What happens?



The web app crashes. So what happened?

We've manually created the bare bones of a web app, but we haven't told Rails how to use the new `show.html.erb` template.

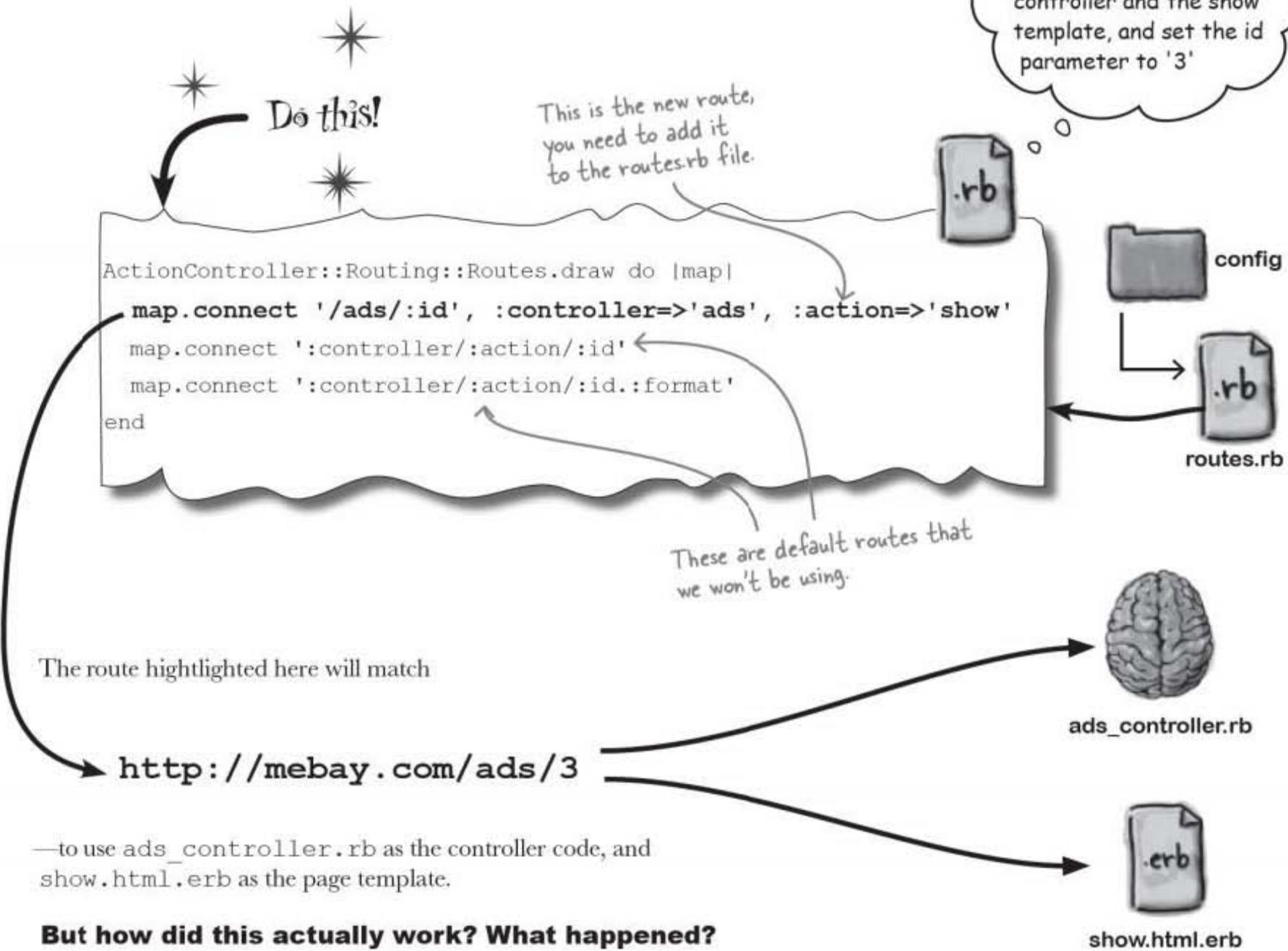
So how do we do that?



A route tells Rails where your web page is

Rails needs a rule to say which code to run for a given URL. It's one of the very few times where Rails actually needs some **configuration**.

The rules that Rails uses to map URL paths to code are called **routes**. Routes are defined in a Ruby program in **config/routes.rb**, and we need to add a new route for the `show.html.erb` template:



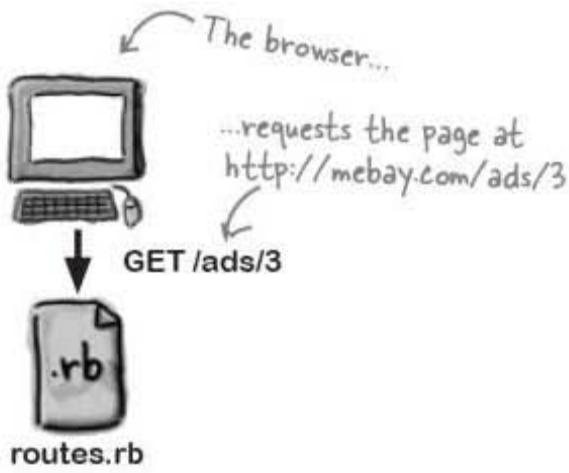
But how did this actually work? What happened?

`routes` handle url mapping

Behind the scenes with routes

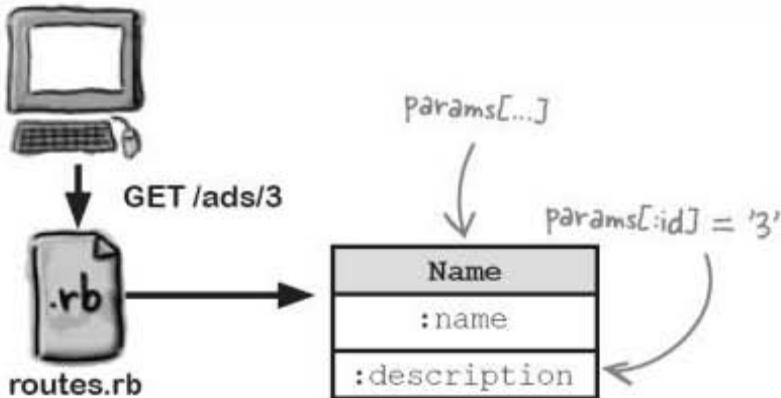
- 1 When Rails receives a request from a browser, it passes the request-path to the `routes.rb` program to find a matching route.

```
map.connect '/ads/:id',  
:controller=>'ads', :action=>'show'
```



- 2 If the matching route contains symbols, then the Routing system will create matching parameters in the request parameters table `params[...]`. By a symbol, we mean a sequence of letters prefixed with a colon (:).

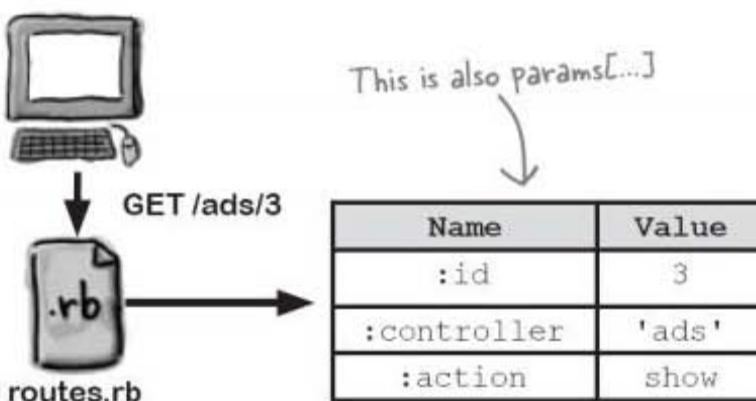
The Routing system sees a sequence of letters prefixed by a colon as a symbol.
map.connect '/ads/:id',
:controller=>'ads', :action=>'show'



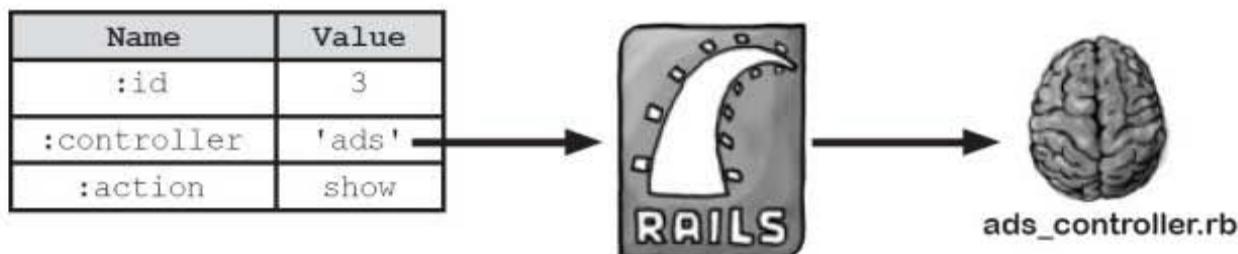
- 3 The route can also specify additional parameters that will be inserted into `params[...]`.
:controller and :action are often specified here. Can you think why?

```
map.connect '/ads/:id',  
:controller=>'ads', :action=>'show'
```

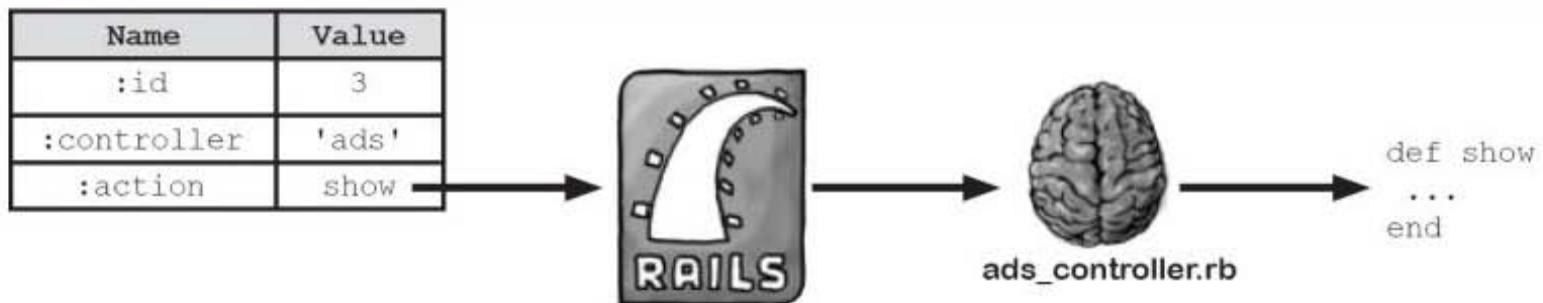
The route can also specify additional parameters.



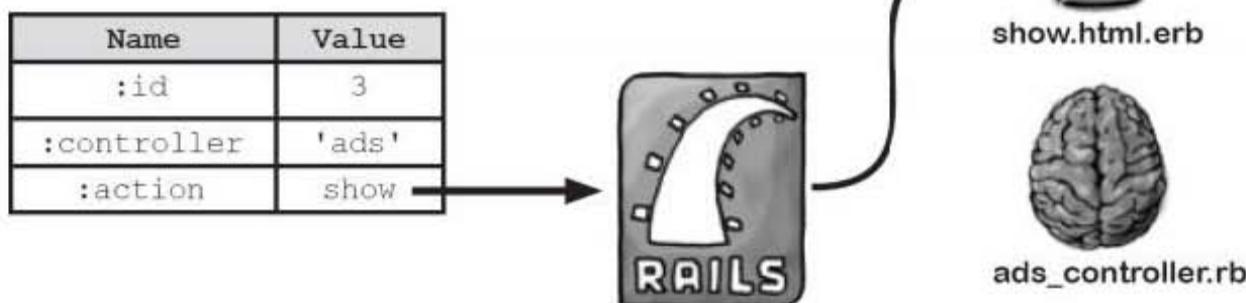
- 4 Once the routes.rb program has finished, Rails will look at the value of params[:controller] and use it to decide which type of controller object it needs to create.



- 5 Once the controller object has been created, Rails will then use the value stored in params[:action], to choose the method within the controller to call.



- 6 Then, when the controller method completes, Rails calls the page template that also matches the params[:action] value. The page template then generates the response which is sent back to the browser.



there are no Dumb Questions

Q: Wouldn't it be quicker to generate scaffolding and edit that?

A: It depends on the application.

MeBay only want a very small amount of functionality. If your application needs to work significantly differently than scaffolding, it will be quicker to just generate the model and controller, and then add your own code.

Q: Does scaffolding generate the model as well?

A: Yes. The scaffolding generator calls the generators for the model and controller. It also creates page templates for the standard create, read, update, and delete operations.

Q: What sort of parameter is :id?

A: It's a request parameter, like the values that are submitted by forms or parameters passed into a URL.

Q: What's a request?

A: A request is what the browser sends to the server whenever you click on a link. It tells the server exactly what path you want.

Q: So what's a response?

A: The response is the content that the server returns to the browser, as well as other information, like the mime-type of the content.

Q: Why does Rails need route configuration? Why not just have standard paths?

A: Rails always prefers convention to configuration, except when the system needs to talk to the outside world. The format of the URLs affects how the outside world sees the application, so Rails lets you configure them.

When you use scaffolding, Rails generates routes for you, but it's still useful to know how routes work in case you need to track down errors or create custom routes, like in this application.

Q: I still don't quite understand when to use camel case. What gives?

A: CamelCase just means using uppercase within identifiers that consist of more than one word. It's called that because the uppercase words look like a camel's humps.

In Rails, the filename and controller names are similar, but the controller uses "CamelCase" to separate words. Filenames use underscores to help you differentiate between a bit of code and a file.

Q: Which gets called first: the controller or the view?

A: The controller always gets called before the view.

Q: Why has the page template got a .html.erb file extension? Isn't it just an HTML file?

A: A template can simply be an HTML file, but templates can also contain extra instructions that will be processed by the Embedded Ruby system. Files that you want Embedded Ruby to process all have ".erb" at the end of their filename.

Q: Why are the templates in a folder called "views/ad" but the controllers are not in "controllers/ad"?

A: Imagine you want to edit an object and also view an object. There will be an "edit" page and a "view" page. But both "edit" and "view" requests will pass through a single controller. So models have a single controller, but potentially several pages. That's why page templates are in their own sub-folder; there may be several of them.

Q: I've heard some people talk about "business objects" and "domain objects". Does Rails have them?

A: Yes, because business objects and domain objects are just other names for model objects.

WHAT'S ? ROUTE?

MeBay's competition already has a Rails application, which is using this set of routes:

```
map.connect '/shows/:title', :controller => 'shows', :action=> 'display'
map.connect '/cats/:name', :controller => 'cats', :action=> 'show'
map.connect '/gadgets/:type', :controller => 'gadgets', :action=> 'show'
```

Can you work out which page template file will be used to generate the HTML for each of the given URLs? **Draw a line** to connect the URL to the page template that will be used, then write down the name and value of the parameter that will be extracted from each URL.

Draw lines from each URL to the correct page template file.

1 http://yourbay.com/gadgets/display

Parameter Name: Value:

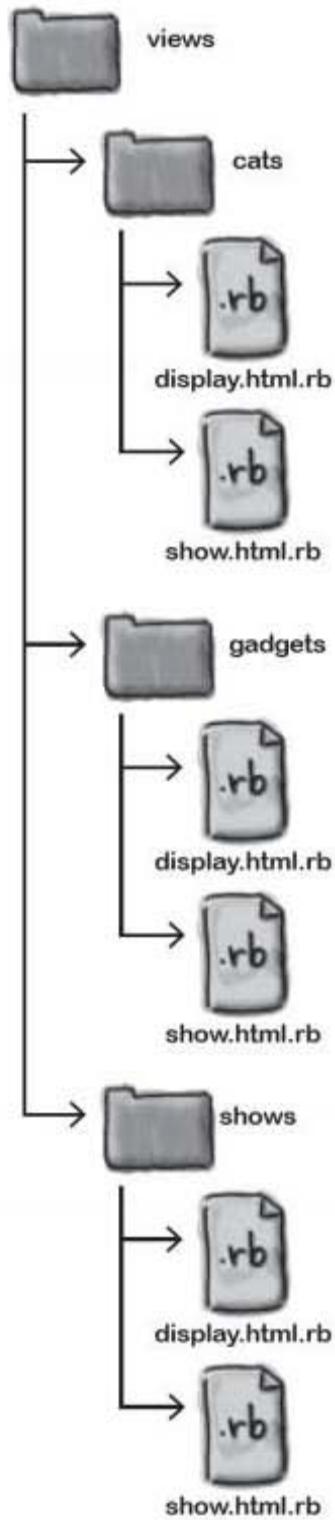
2 http://yourbay.com/shows/cats

Parameter Name: Value:

Write down the name and value of the parameter extracted from each URL.

3 http://yourbay.com/cats/gadget

Parameter Name: Value:



WHAT'S MY ROUTE? SOLUTION

MeBay's competition already has a Rails application, which is using this set of routes:

```
map.connect '/shows/:title', :controller => 'shows', :action=> 'display'
map.connect '/cats/:name', :controller => 'cats', :action=> 'show'
map.connect '/gadgets/:type', :controller => 'gadgets', :action=> 'show'
```

Can you work out which page template file will be used to generate the HTML for each of the given URLs? **Draw a line** to connect the URL to the page template that will be used, then write down the name and value of the parameter that will be extracted from each URL.

This URL matches this rule.

The matching rule has a `:type` parameter in the request path.

- 1 http://yourbay.com/gadgets/display

Parameter Name:`:type`..... Value: ..'display'.....

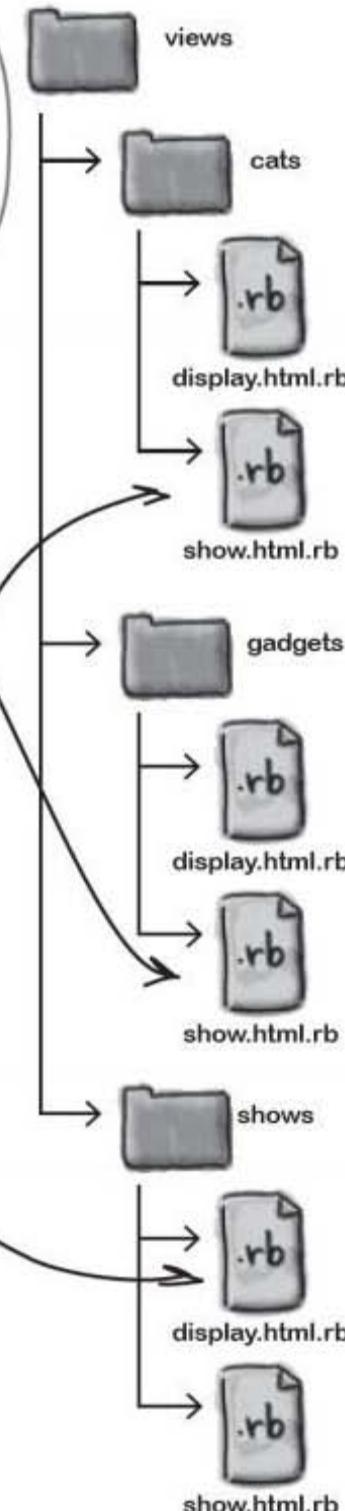
The value of the parameter is the part of the path that is in the same position as the parameter.

- 2 http://yourbay.com/shows/cats

Parameter Name:`:title`..... Value: ..'cats'.....

- 3 http://yourbay.com/cats/gadget

Parameter Name:`:name`..... Value: ..'gadget'.....





Test DRIVE

Open the browser at a couple of pages:

`http://localhost:3000/ads/3` and

`http://localhost:3000/ads/5`

The image shows two separate browser windows side-by-side. Both windows have their titles removed, as indicated by the handwritten note "The pages have no titles". The top window's address bar shows `http://localhost:3000/ads/3`. The bottom window's address bar shows `http://localhost:3000/ads/5`. Both windows display a form with five fields: Name, Description, Price, Seller Id, and Email. Handwritten annotations point to these fields: "Description:" and "Seller Id:" both have arrows pointing to them with the note "There are no values next to the labels".

The ads are blank!

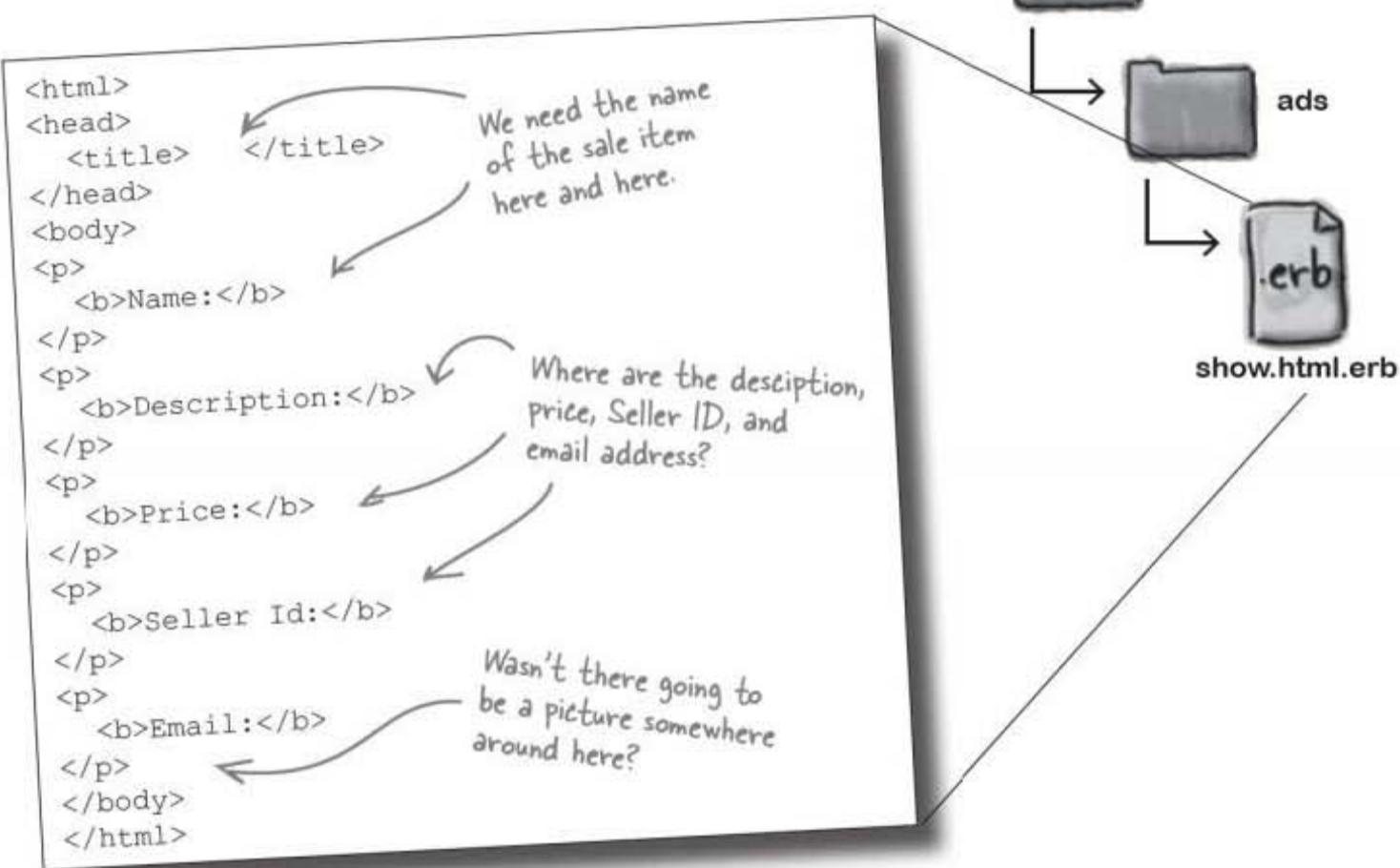


Why is there no detail on the pages? Was it the routing? The model? The view? The controller?

the view needs your data

The view doesn't have the data to display

Look back at `show.html.erb`. This file is used to create the pages for each of the ads—and that's exactly what the template has done:



Although we put the main skeletal parts of the HTML in place—the labels, the body and head sections—there were a couple of things that were missed out. We haven't specified:

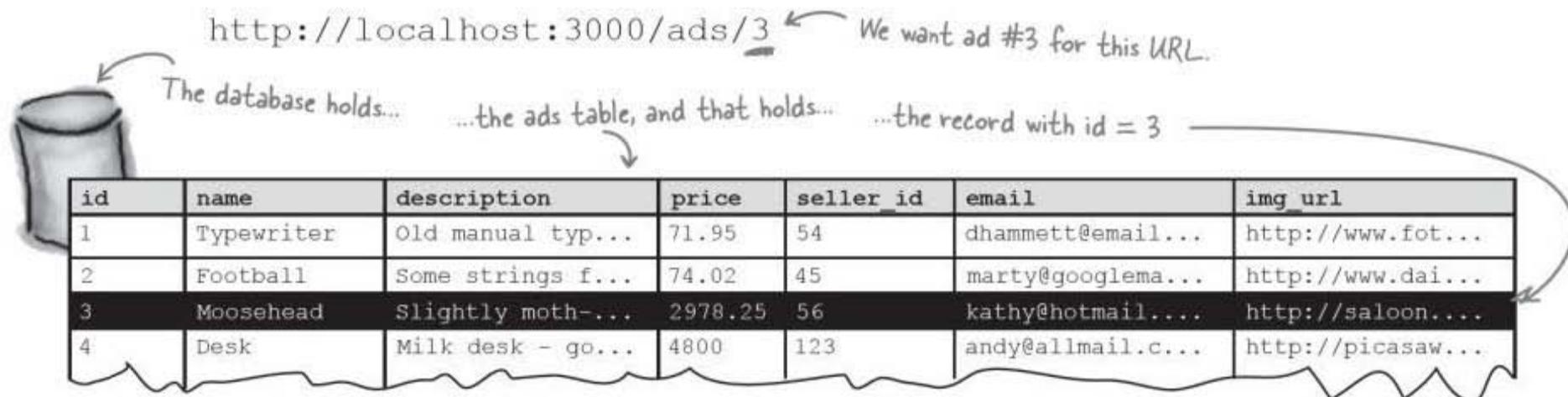
What data needs to be displayed

or

Where in the page that data needs to be inserted.

So what should the page show?

We need the ad page to display the data for the ad number specified in the URL. As an example, here's the URL for ad #3:

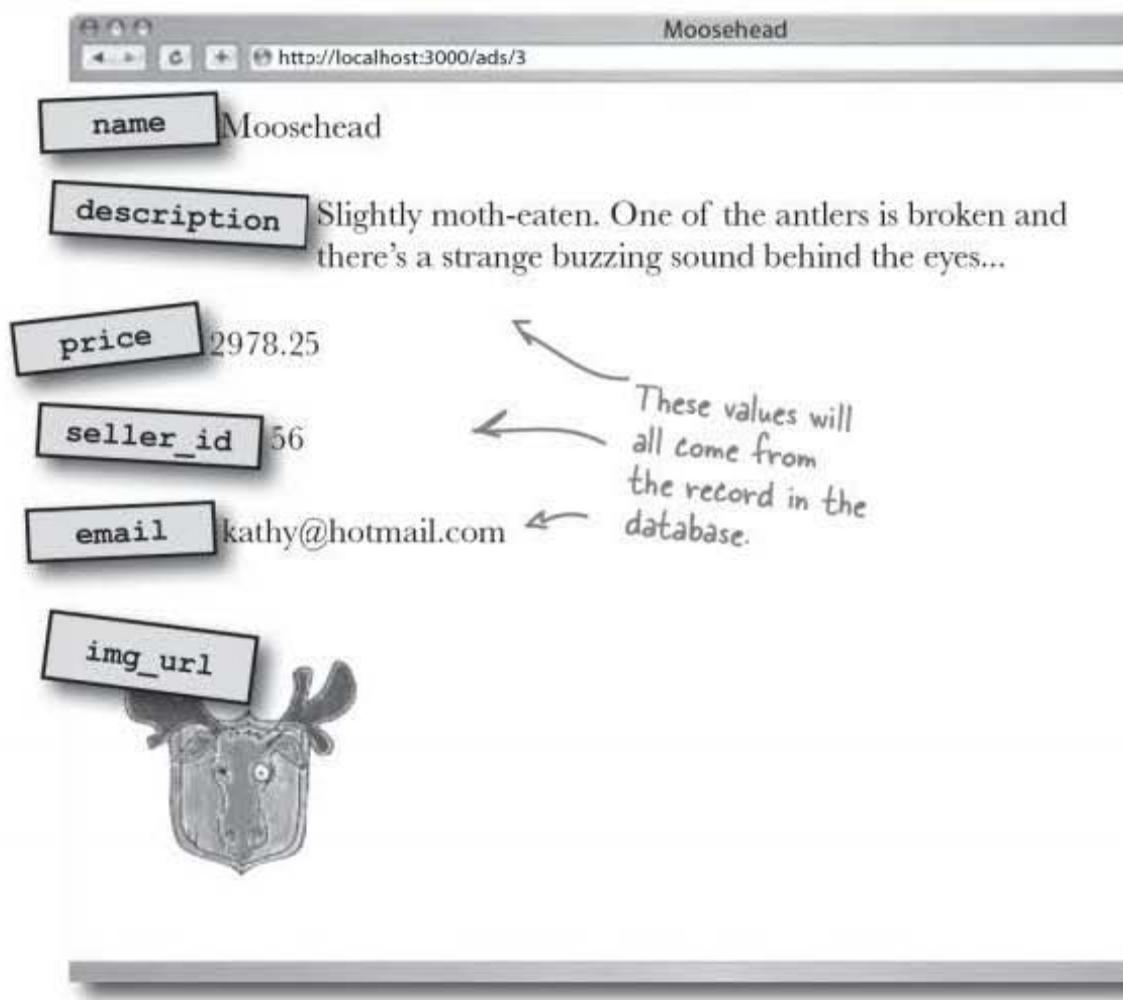


The first thing you need to do is to tell the model to read the record from the ads table in the database with an id number that's the same as the id number in the URL. If the user asks for the page for ad #3, the model needs to be told to read the record with `id = 3`.

We need to display the data in the right place

Reading the data's just half the story. Once the model's read the data, it needs to send the data to the view. The view then needs to know where to display the data in each of the pages. Each of the fields in the record needs to be displayed next to the corresponding labels in the web pages. Plus you need to use the value in the `img_url` column to insert an image of the sales item into the page.

So which part of the system is responsible for asking for the appropriate data from the database and then sending the data to the view?

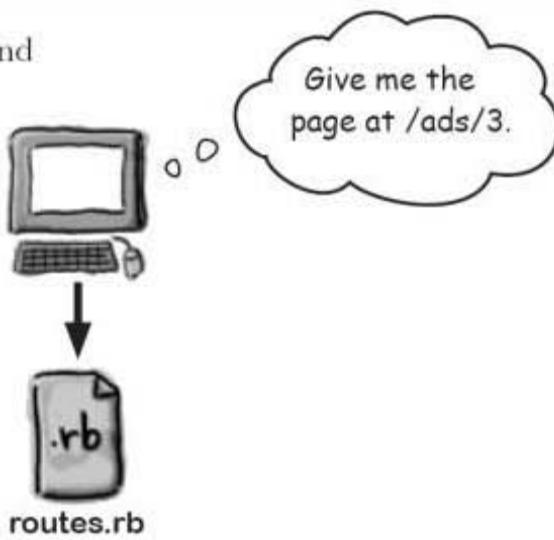


the controller works with the view

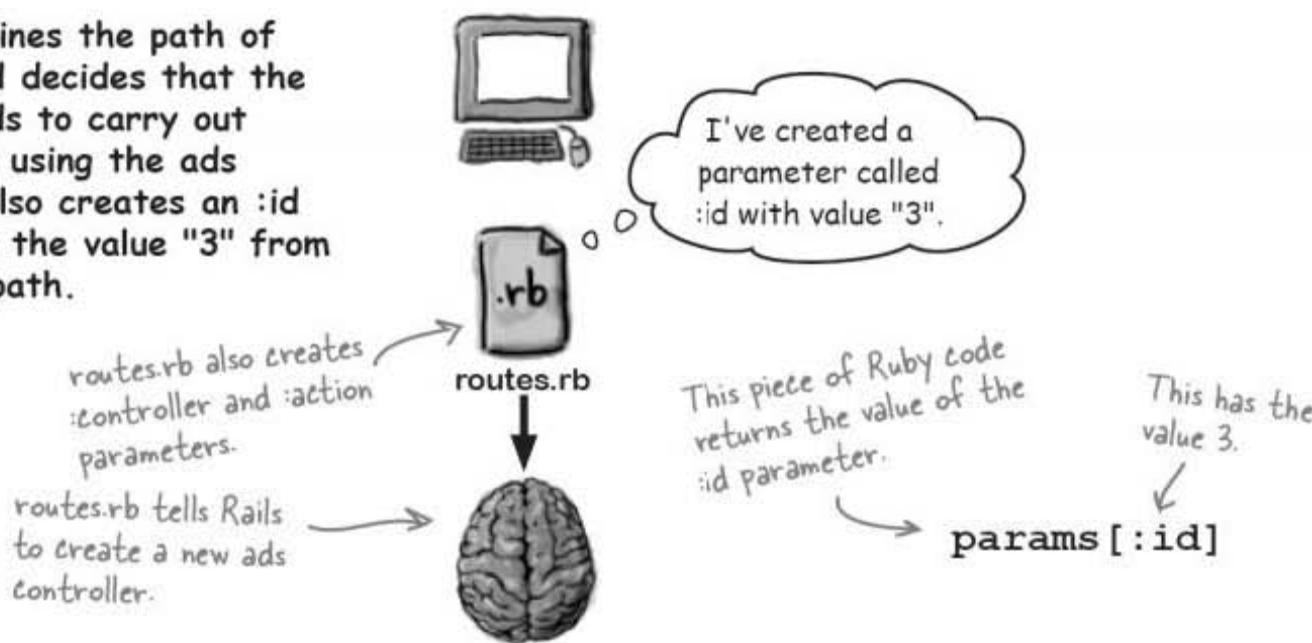
The controller sends the ad to the view

Let's see what the code in the controller will look like and how it will work:

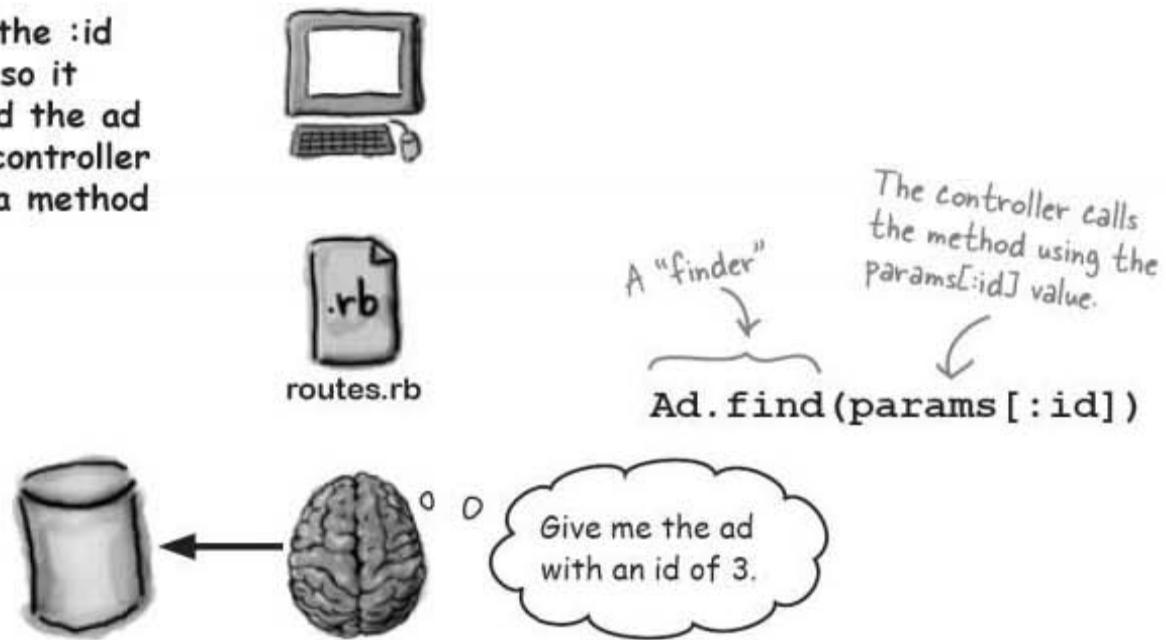
- When the user's browser sends a request for a page to the application, Rails calls the routes.rb program to decide which code needs to run.



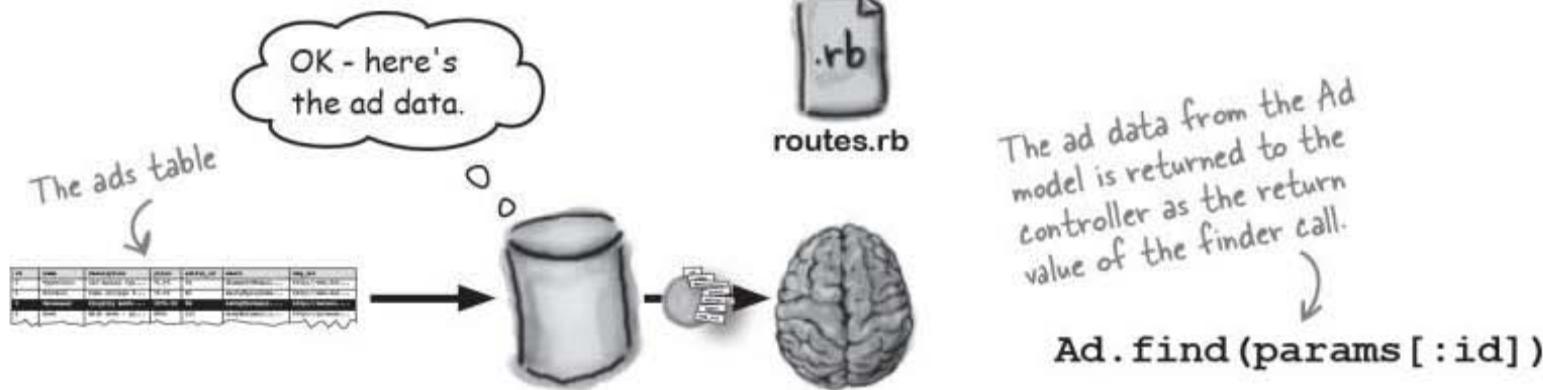
- routes.rb examines the path of the request and decides that the application needs to carry out a "show" action using the ads controller. It also creates an :id parameter with the value "3" from the requested path.



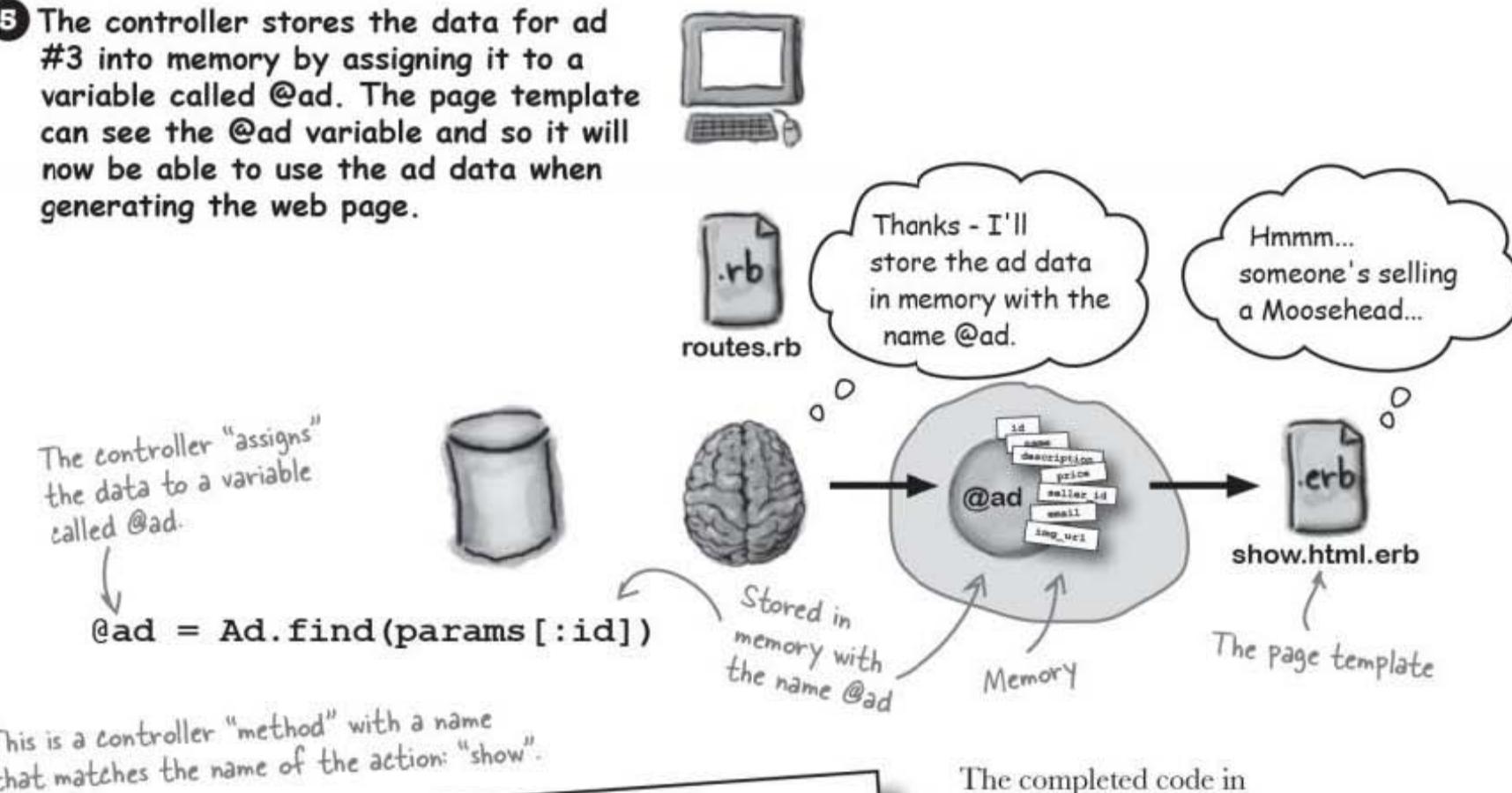
- The controller sees that the :id parameter is set to "3", so it asks the Ad model to find the ad object with id = 3. The controller talks to the model using a method called a "finder".



- ④ The Ad model reads the record from the ads table with id = 3 and sends the result back to the controller.



- ⑤ The controller stores the data for ad #3 into memory by assigning it to a variable called @ad. The page template can see the @ad variable and so it will now be able to use the ad data when generating the web page.



This is a controller "method" with a name that matches the name of the action: "show".

```
class AdsController < ApplicationController
  def show
    @ad = Ad.find(params[:id])
  end
end
```

Type in the completed controller code above.

Do this!

ads_controller.rb
/app/controllers/ads_controller.rb

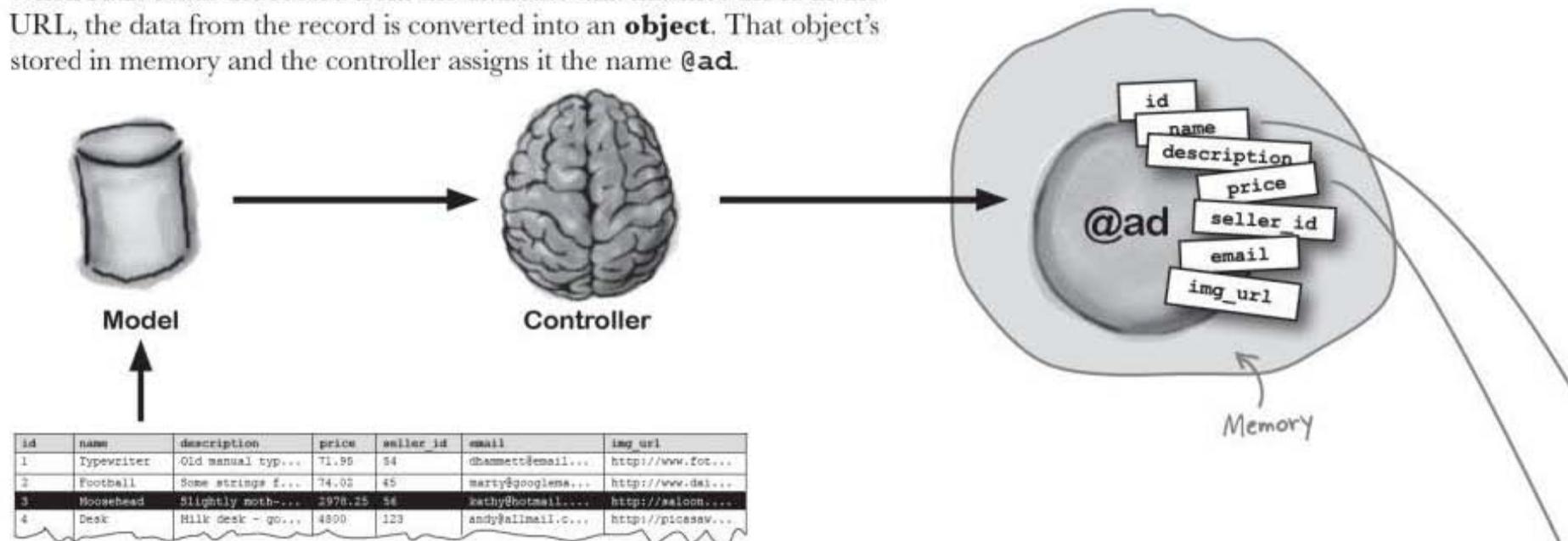
The completed code in **ads_controller.rb** needs to go inside a **method** called **show**—which matches the name of the :action parameter created by routes.rb

But how exactly does the model read the data from the database, and how will the page template use that data?

from record to object

Rails turned the record into an object

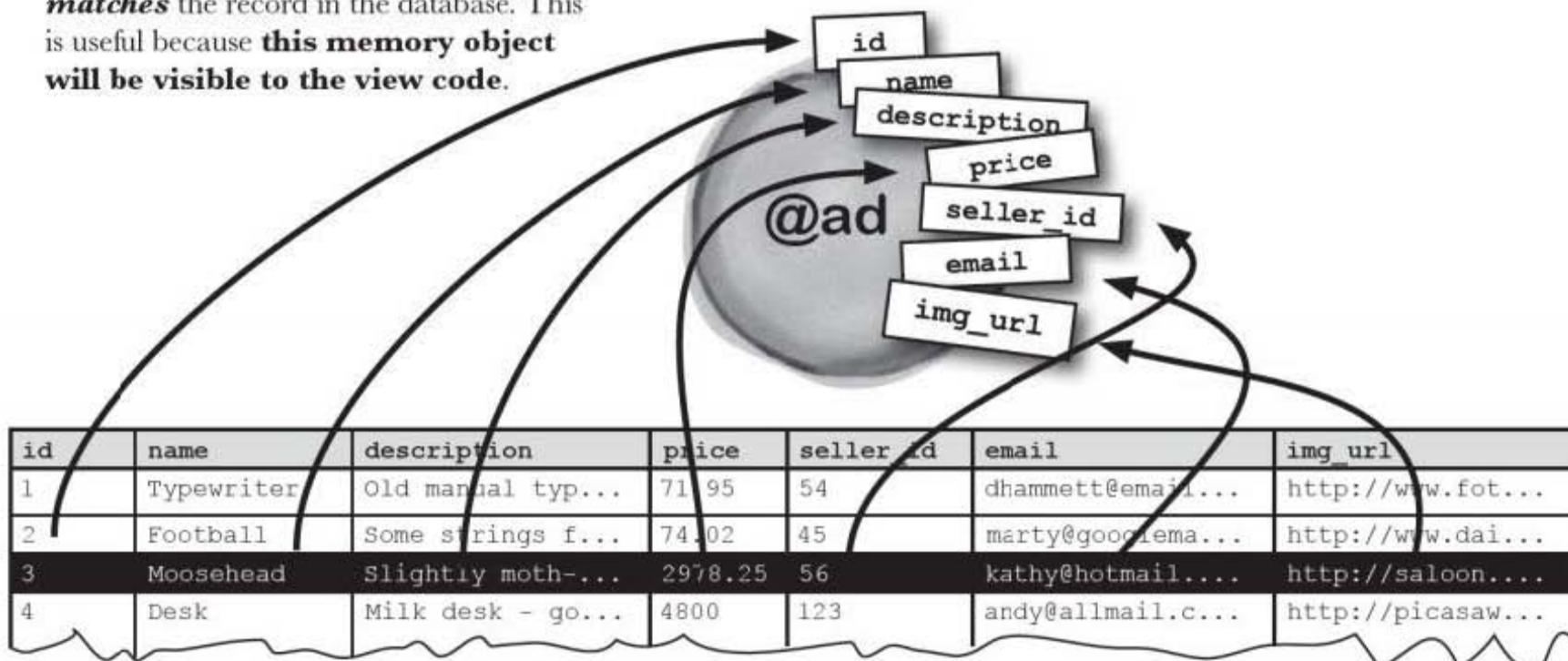
When Rails reads the record from the database that matches the id in the URL, the data from the record is converted into an **object**. That object's stored in memory and the controller assigns it the name `@ad`.



But a record has several fields with data in each one. How does all the data get stored in a single object?

The answer is that an object can have several **attributes**. An attribute is like a field in a record. It has a **name** and a **value**. So when Rails reads the `description` value from the record on the database, it stores it in the `@ad.description` attribute of the `@ad` object. The same thing for the `id`, the `name`, the `seller-id`, and so on.

In this way, the `@ad` model object **exactly matches** the record in the database. This is useful because **this memory object will be visible to the view code**.



The data's in memory, and the web page can see it

The page template (`show.html.erb`) isn't just sent straight back to the browser. First it gets processed by the **Embedded Ruby** program ERb, and that's why our template had that `.erb` file extension. So let's take a closer look at how ERb reads objects from memory.

ERb reads through the template looking for little pieces of embedded Ruby code called **expressions**. An expression is surrounded by `<%=` and `%>` and ERb will replace the expression with its value. So if it finds:

`<%= 1 + 1 %>`

somewhere in the web page, Rails will replace this expression with 2 before returning the page to the browser.

But what we *really* want to do is get at the values in the `@ad` object from memory, like this:

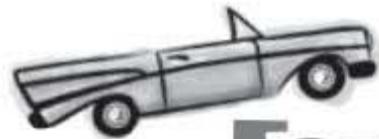
```
<html>
<head>
  <title><%= @ad.name %></title>
</head>
<body>
<p>
  <b>Name:</b><%= @ad.name %>
</p>
<p>
  <b>Description:</b><%= @ad.description %>
</p>
<p>
  <b>Price:</b><%= @ad.price %>
</p>
<p>
  <b>Seller Id:</b><%= @ad.seller_id %>
</p>
<p>
  <b>Email:</b><%= @ad.email %>
</p>
<p>
  
</p>
</body>
</html>
```

This ERb template with
embedded Ruby will generate
the HTML for this page.



Before sending the page back, Rails replaces all the `<%= ... %>` tags with their object values.

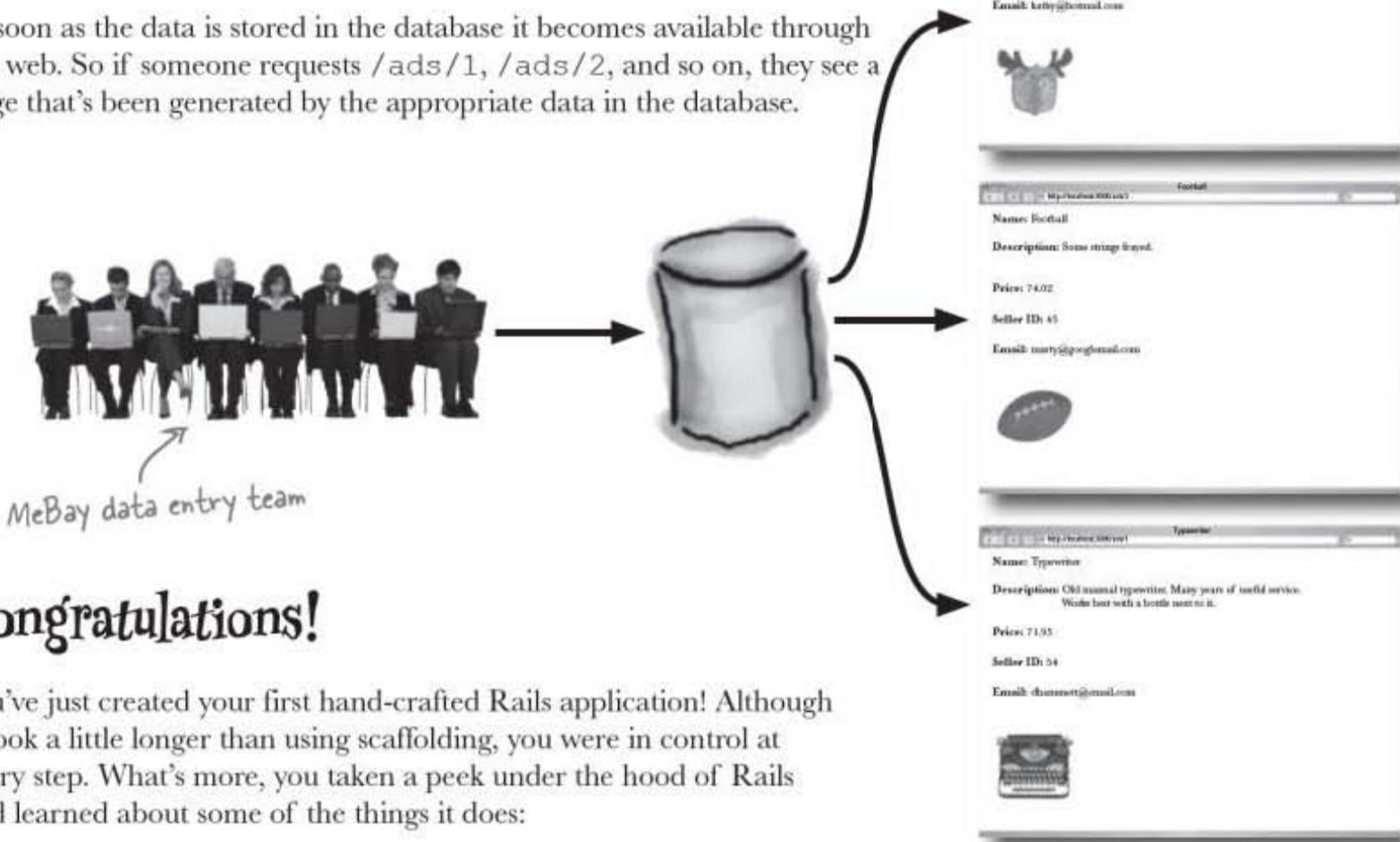
So—does it work?



Test Drive

To try out the system, the folks at MeBay have used their data entry system to insert data into the Rails database.

As soon as the data is stored in the database it becomes available through the web. So if someone requests /ads/1, /ads/2, and so on, they see a page that's been generated by the appropriate data in the database.



Congratulations!

You've just created your first hand-crafted Rails application! Although it took a little longer than using scaffolding, you were in control at every step. What's more, you taken a peek under the hood of Rails and learned about some of the things it does:



BULLET POINTS

- **Routes** tell Rails what code to run when a request is received for a URL
- The controller uses the **id** from the URL to read the correct data from the model
- The model reads the database and returns the data as a **Ruby object**
- The controller gives the object a name **in memory** so that it can be found by...
- ...the **page template**, which uses embedded Ruby expressions to insert the data values into the page

Pool Puzzle

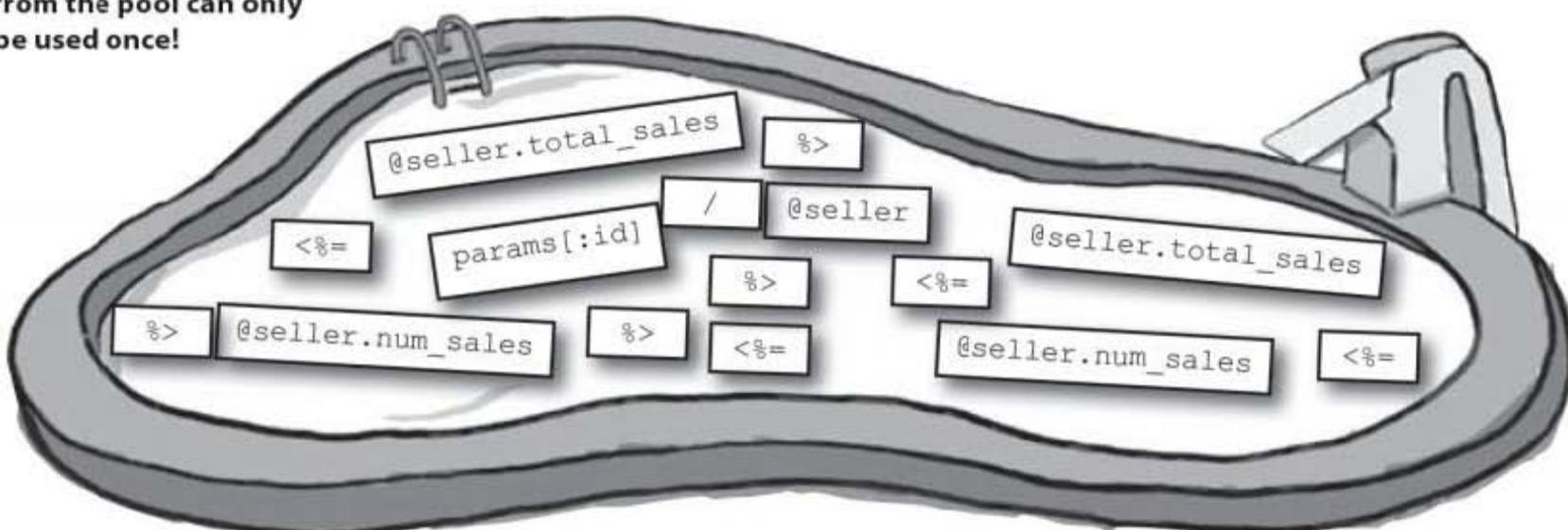


MeBay want to display information about sellers at /seller/:id. Complete the controller and the page template with the code provided.

```
def stats
    ..... = Seller.find(.....)
end

<p>
  <b>Number of sales:</b> .....
</p>
<p>
  <b>Total sales value:</b> .....
</p>
<p>
  <b>Average price:</b> .....
</p>
```

Note: each snippet from the pool can only be used once!



get out of the pool

Pool Puzzle Solution

MeBay want to display information about sellers at /seller/:id. Complete the controller and the page template with the code provided.



This object will have attributes that match the seller values on the database.

```
def stats  
  @seller = Seller.find(params[:id])  
end
```

This returns the seller for the id number from the URL.

This will be the number from the URL, so if the user is asking for /ads/3, this number will be 3.

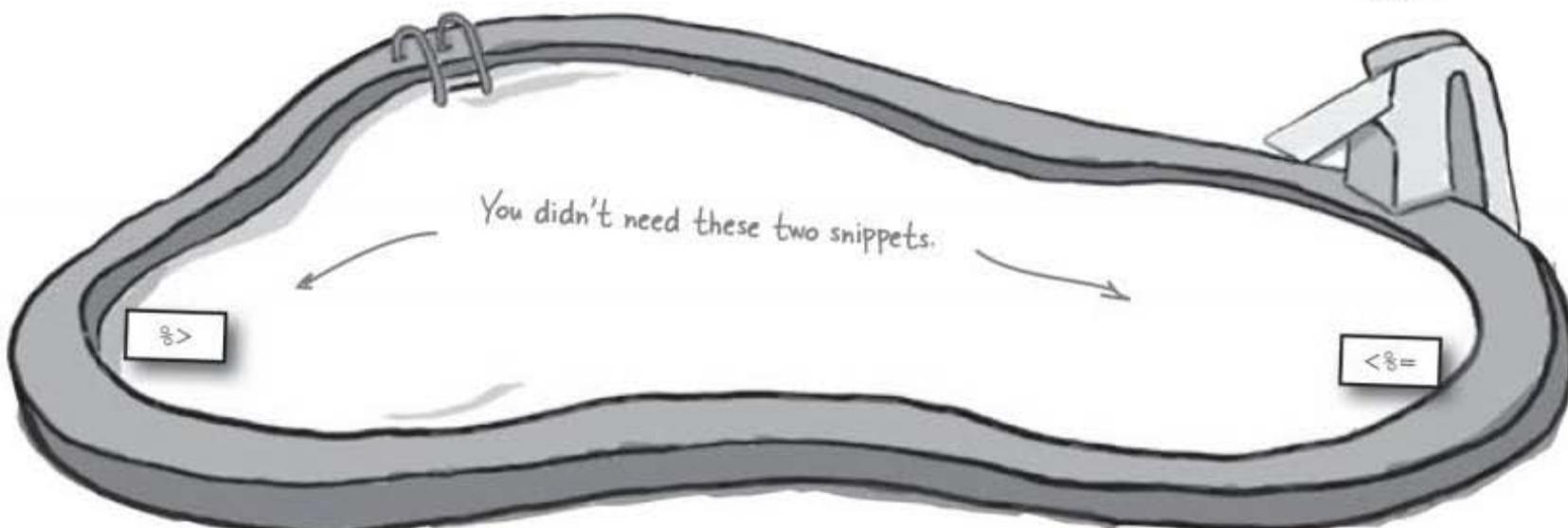
```
<p>  
  <b>Number of sales:</b> ... <%= @seller.num_sales %>  
</p>  
<p>  
  <b>Total sales value:</b> ... <%= @seller.total_sales %>  
</p>  
<p>  
  <b>Average price:</b> ... <%= (@seller.total_sales / @seller.num_sales) %>  
</p>
```

This will read data from the "num_sales" column in the database.

This will return the value from the "total_sales" column in the database.

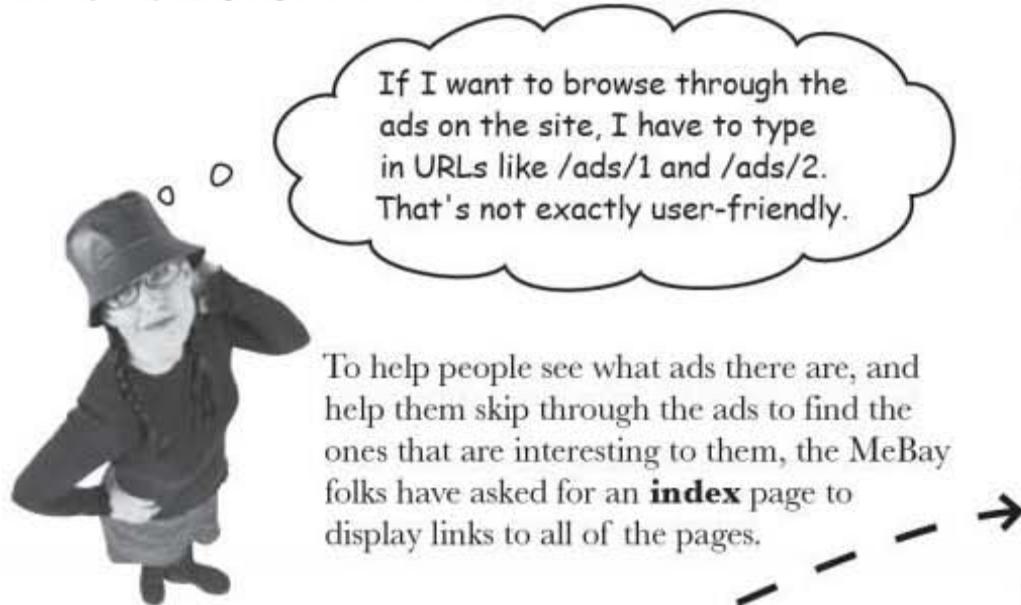
Expressions can include calculations, so this tag will be replaced by the average sale value.

Notice that a single set of tags surround the calculation.

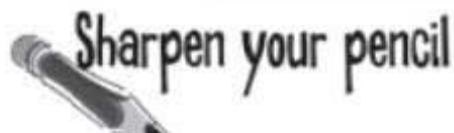
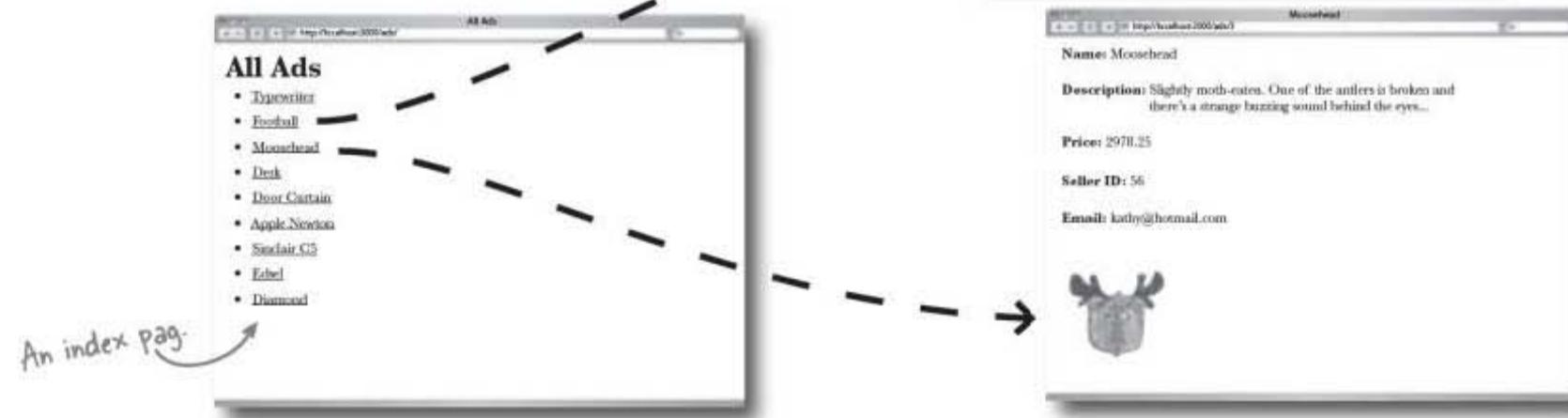
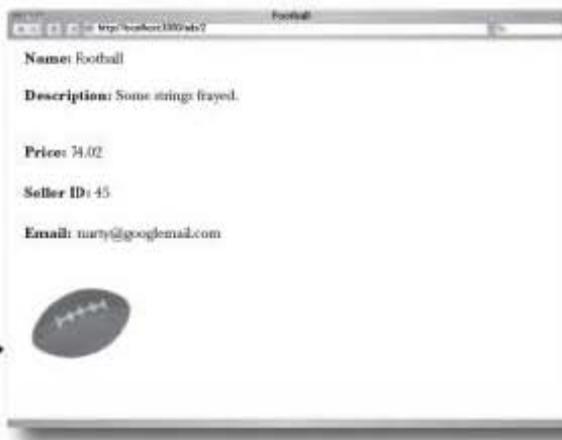


There's a problem — people can't find the pages they want

Even though there are pages for every ad in the database, there's no easy way for people to find them.



To help people see what ads there are, and help them skip through the ads to find the ones that are interesting to them, the MeBay folks have asked for an **index** page to display links to all of the pages.



If you wanted to create a new page called "index", what would the route be if you wanted <http://mebay.com/ads/> to call it?

What would the code in the controller be called?

How about the page template?

Route:

Controller code: Page template:



Sharpen your pencil Solution

If you wanted to create a new page called "index", what would the route be if you wanted `http://mebay.com/ads/` to call it?

What would the code in the controller be called?

How about the page template?

Route: `map.connect '/ads/', :controller=>'ads', :action=>'index'`

Controller code: `index` Page template: `app/views/ads/index.html.erb`

^{there are no} Dumb Questions

Q: What is an action?

A: The action is the **set of operations** that a Rails app carries out in response to a request from a user. The action parameter specifies a name for the action. All of your code (like the method in the controller, and the page template file) uses the action name so that Rails can find them.

Q: Can I use any database with Rails?

A: All of the major databases - like SQLite3, MySQL and Oracle - are supported. Plus, most of the time you don't need to write a lot of database-specific code. That way, you can switch between database systems without breaking your application or rewriting a ton of code.

Q: Languages like Java have primitives as well as objects. Does Ruby or Rails have primitives?

A: No. There are no primitives in Ruby. Everything you deal with in the Ruby language (including things like numbers and even blocks of code) are objects.

Q: Isn't a page template just a fancy name for a page?

A: No. A page template is used to generate pages, but it is not a page itself. Pages are generated from page templates.

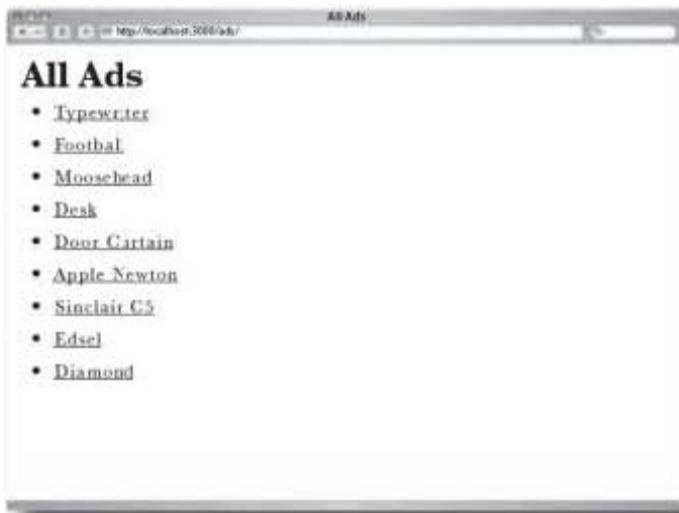


Sharpen your pencil (again)

There are now two routes:

```
map.connect '/ads/:id', :controller=>'ads', :action=>'show'  
map.connect 'ads/', :controller=>'ads', :action=>'index'
```

Which page would be displayed for each of the URLs?



index.html.erb

/ads/something



show.html.erb

Is there a problem? If so, how would you fix it?

Sharpen your pencil (again) Solution

There are now two routes:

```
map.connect '/ads/:id', :controller=>'ads', :action=>'show'  
map.connect 'ads/', :controller=>'ads', :action=>'index'
```

Which page would be displayed for each of the URLs?

/ads/3

/ads/something

/ads/

Is there a problem? If so, how would you fix it?

The "/ads/" path will match both of the routes, it
needs to be changed so it only matches one route.



index.html.erb



show.html.erb

Routes run in priority order

Both of the routes match the /ads path. Rails avoids any ambiguity by only using the first matching route, so the routes need to be re-ordered to get rid of the confusion.

```
map.connect 'ads/', :controller=>'ads', :action=>'index'  
map.connect '/ads/:id', :controller=>'ads', :action=>'show'
```

These are the routes Rails will use. Now you need to complete the code.

Do this!

Add these routes to config/routes.rb.



Routing Exposed

This week's interview:
What's life like at Rails' main traffic intersection?

Head First: Ah, Routing. So kind of you to spare us a few moments of your valuable time.

Routing: No, the ads controller.... ads... Yeah, that's the one.

Head First: Routing?

Routing: Woah - stand aside buddy. Request coming through... [Beep... Beep]

Head First: Clearly you have a very busy job. The thing is, although you hold a very important post within a Rails application, some people are unsure what you do.

Routing: Hey - I ain't in this job for the recognition. To direct and to serve. That's me. I'm like a traffic cop, see? A request comes in through that door over there?

Head First: What - the port?

Routing: Yeah. What is it on this server? Port 3000 over there. The request comes in from a web browser, for—I don't know—let's say /donuts/cream.

Head First: Yes?

Routing: But Rails don't know what piece of code to run to provide an answer to that. So he comes to me and I look at /donuts/cream and I check it against this sheet of routes I got here...

Head First: Oh, there's quite a few.

Routing: Yeah. So I go down the list and look for the first route that looks kinda the same as /donuts/cream. I might find... /donuts/:flavor, say.

Head First: That route's pretty similar. But how does that help you direct the request to the correct code?

Routing: Well every request comes in with paperwork for me to fill out. A set of names and values called the request parameters. See?

Head First: Oh yes. Lots of stuff.

Routing: Yeah. All requests have them. params [...] they're called. So I look at the route, and it tells me that every path that matches /donuts/:flavor needs to use the donuts controller, say, with the display action.

Head First: That makes sense.

Routing: So I add more things to the params [...], like params [:controller] with the value donuts and params [:action] with the value display...

Head First: ...and Rails uses that to choose what code to run.

Routing: Exactly! You learn fast, kid! Rails says, "Oh I see. I need to use a donuts controller. Forsooth I shall create one".

Head First: Forsooth?

Routing: Maybe not forsooth. But whatever he says, he knows he needs to create a donuts controller object. And because params [:action] is set to display, once the donuts controller object exists, he calls the display method on it.

Head First: What about the :flavor you mentioned in the route?

Routing: Oh, that. Yeah. Well if the request was for /donuts/cream and that matches /donuts/:flavor, I just add another parameter with param[:flavor] = 'cream'. So I just record what was asked for in case it's important to the code in the controller later on.

Head First: Thanks, Routing it's been a real...

Routing: Hey, stand back a moment! Sorry. It's the nervous guy who always double-clicks his hyperlinks... One at a time! One at a time!

Head First: Thank...

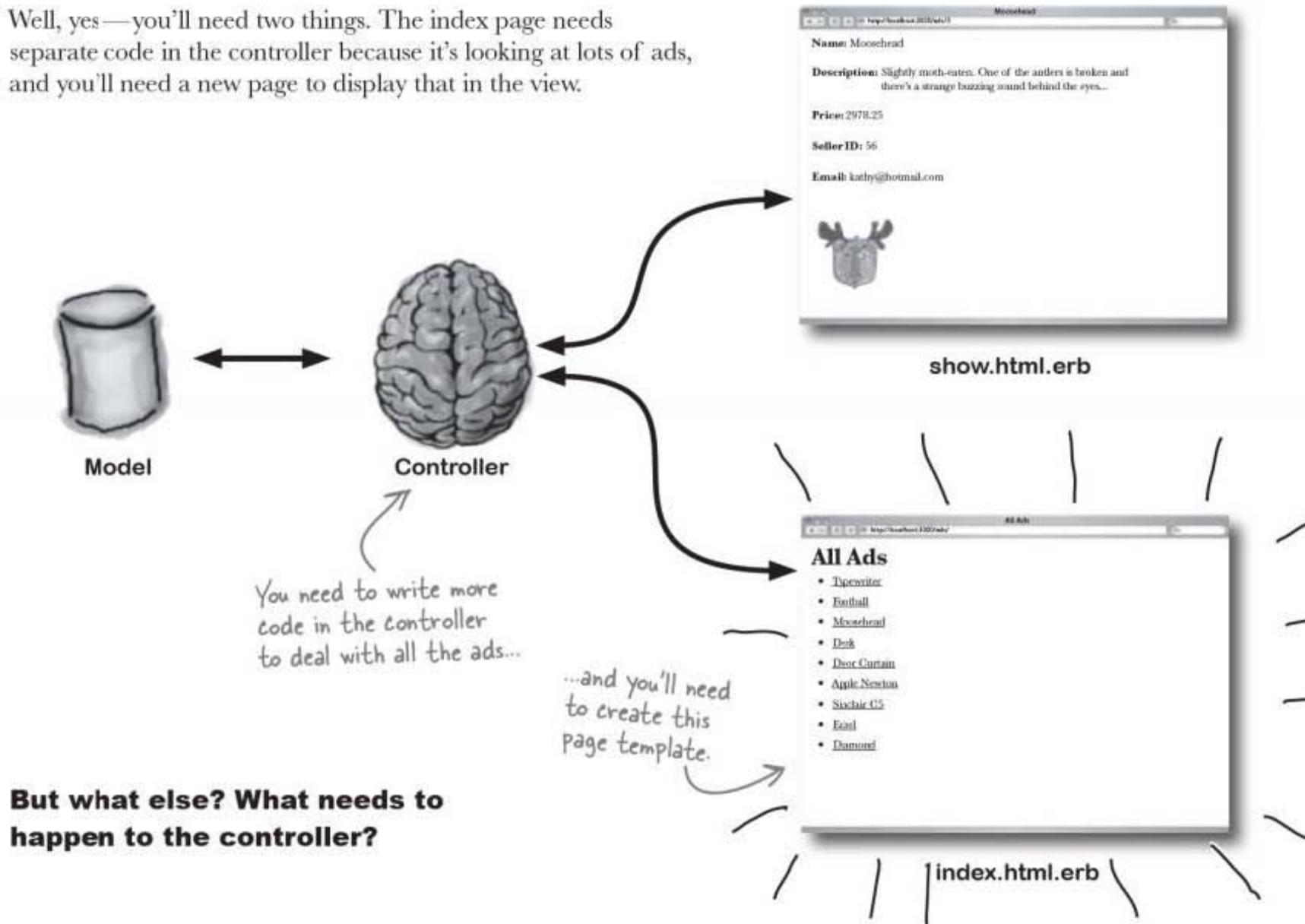
Routing: Don't mention it. Listen, getting a bit busy here now. Why don't you move along and see what happens in the rest of the app. Yeah, just down there on the left... I think there's some new code going into the ads controller...

the controller controls

To get data into the view, you will also need code in the controller

The model's already in place, and there's a route for the new controller code you need. But is there anything else?

Well, yes—you'll need two things. The index page needs separate code in the controller because it's looking at lots of ads, and you'll need a new page to display that in the view.



But what else? What needs to happen to the controller?



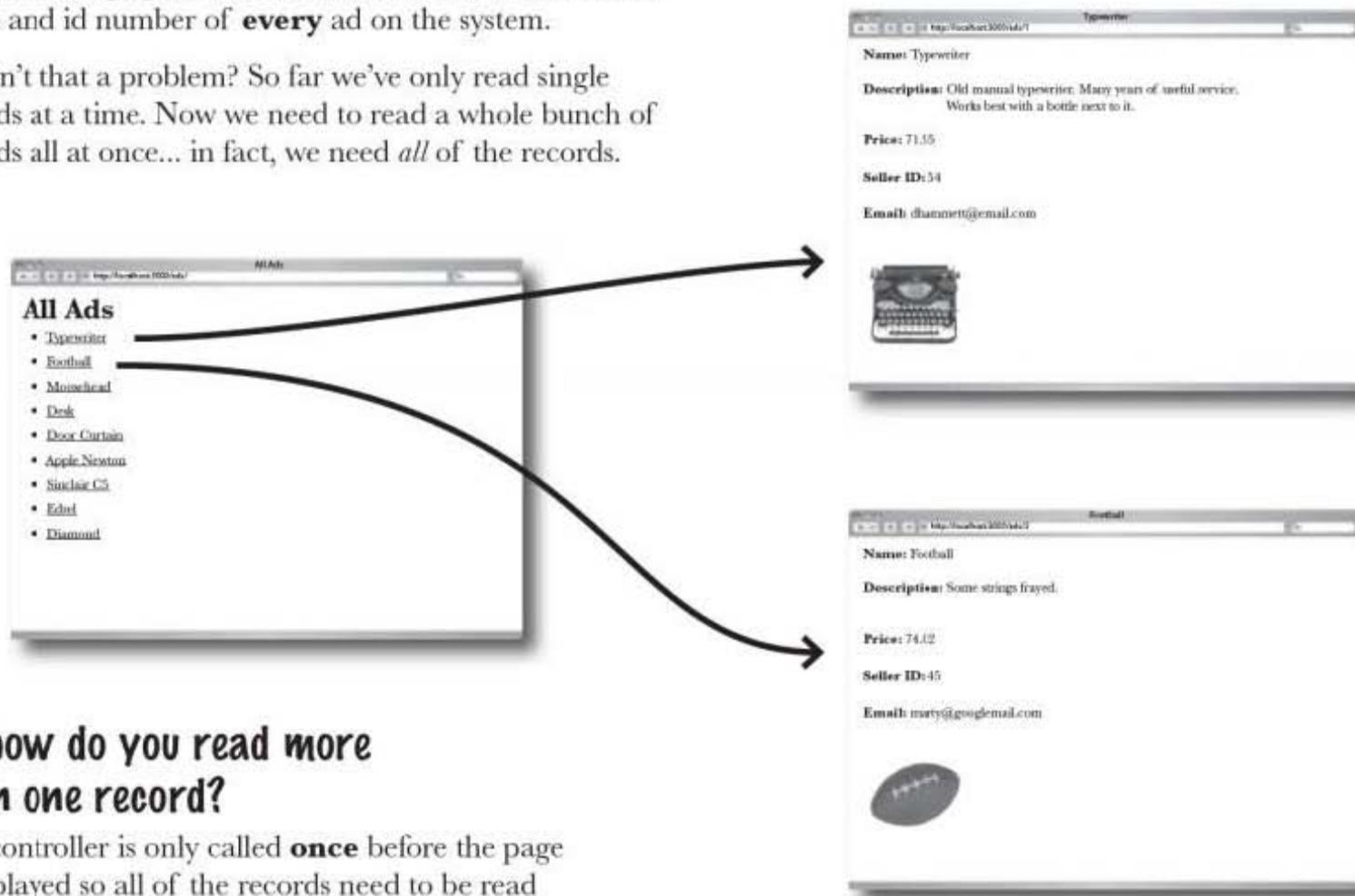
What would the controller have to do for an index page that it *wouldn't* need to do for an ad page?

An index page will need data from ALL of the records

The ad page only needed data from a single record, but what about the index page? That will need to read data from each of the records in the **entire** ads table. But why?

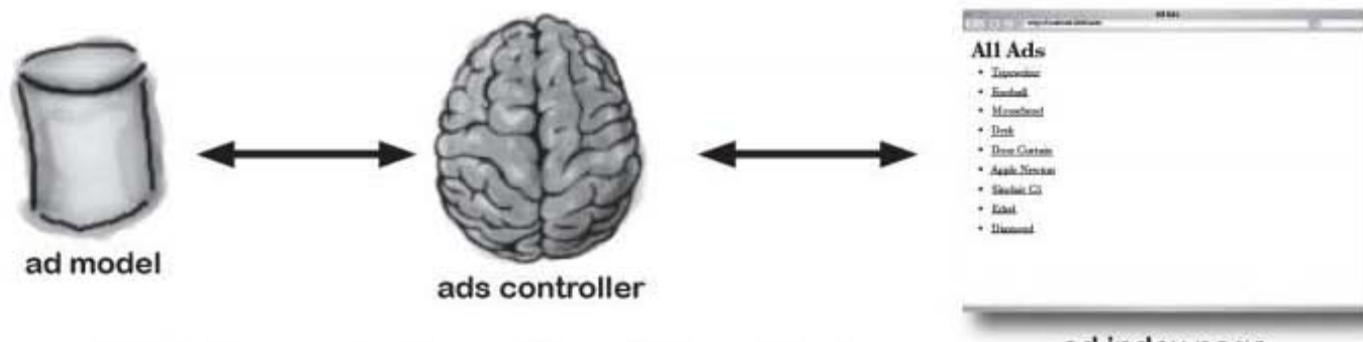
Look at the design for the index. It needs to create links for **all** of the ads pages, which means it will need to know the name and id number of **every** ad on the system.

But isn't that a problem? So far we've only read single records at a time. Now we need to read a whole bunch of records all at once... in fact, we need *all* of the records.



So how do you read more than one record?

The controller is only called **once** before the page is displayed so all of the records need to be read **completely** before the view is called.



How do you think the controller will read the objects from the model and send them to the view?

`find(:all)`

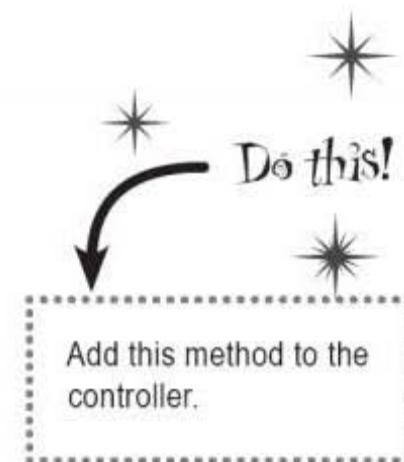
Ad.find(:all) reads the whole table at once

There's another version of the `Ad.find(...)` **finder method**, which returns data about every record in the whole `ads` table:

```

def index
  You need to add      @ads = Ad.find(:all)
  this method to the    end
  controller           ↑
                        This reads all of the
                        records at once

```



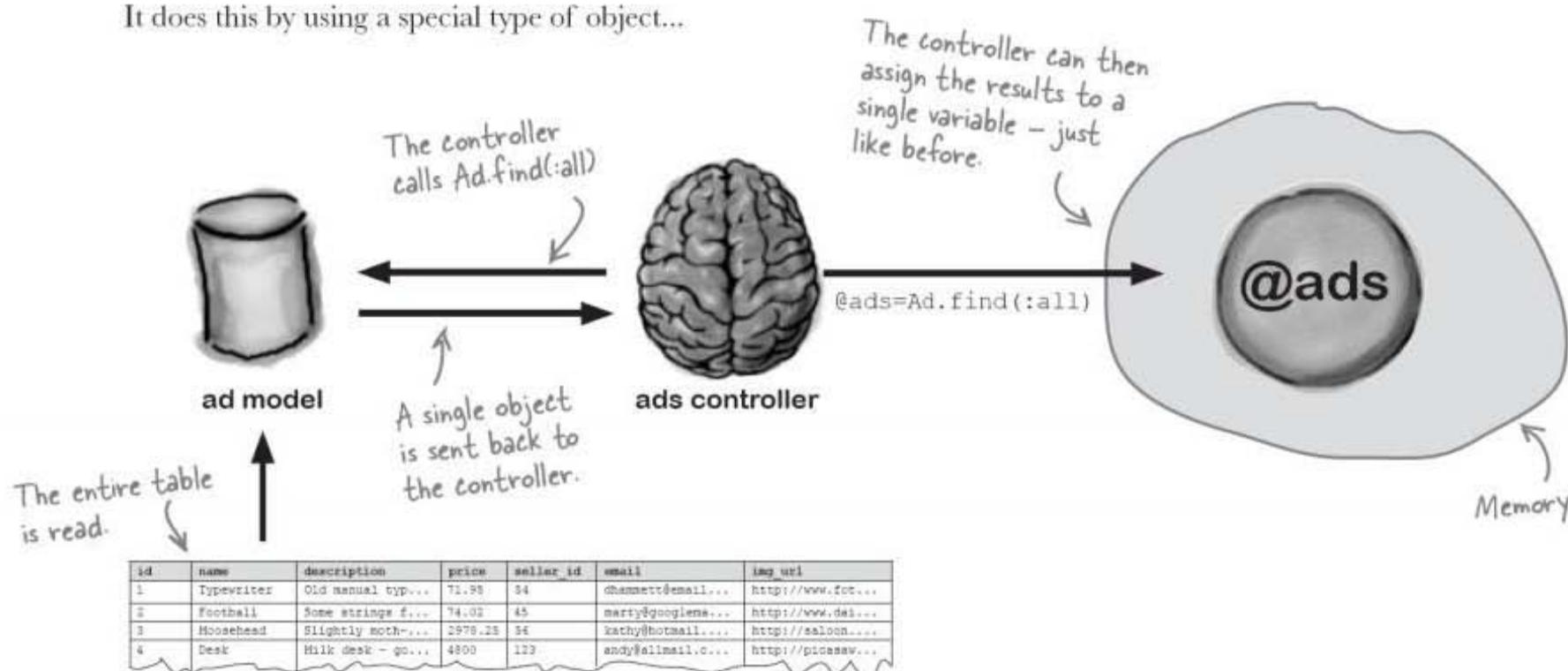
But how can that work? After all, when you were reading a single record, things were fairly simple. You passed the model an id number, and the model returned a single object containing all of the data in the row with the corresponding id.

But now you don't know how many records you're going to read. Won't that mean you need some really *horribly complex* code?

Well, fortunately not. Rails makes reading every record in a table very similar to reading a single object. When you call `Ad.find(:all)`, the model returns a **single object** that contains data for every record in the table. The controller can assign the object to a single variable.

But how can Rails store all of the data for an unknown number of rows inside a single object?

It does this by using a special type of object...

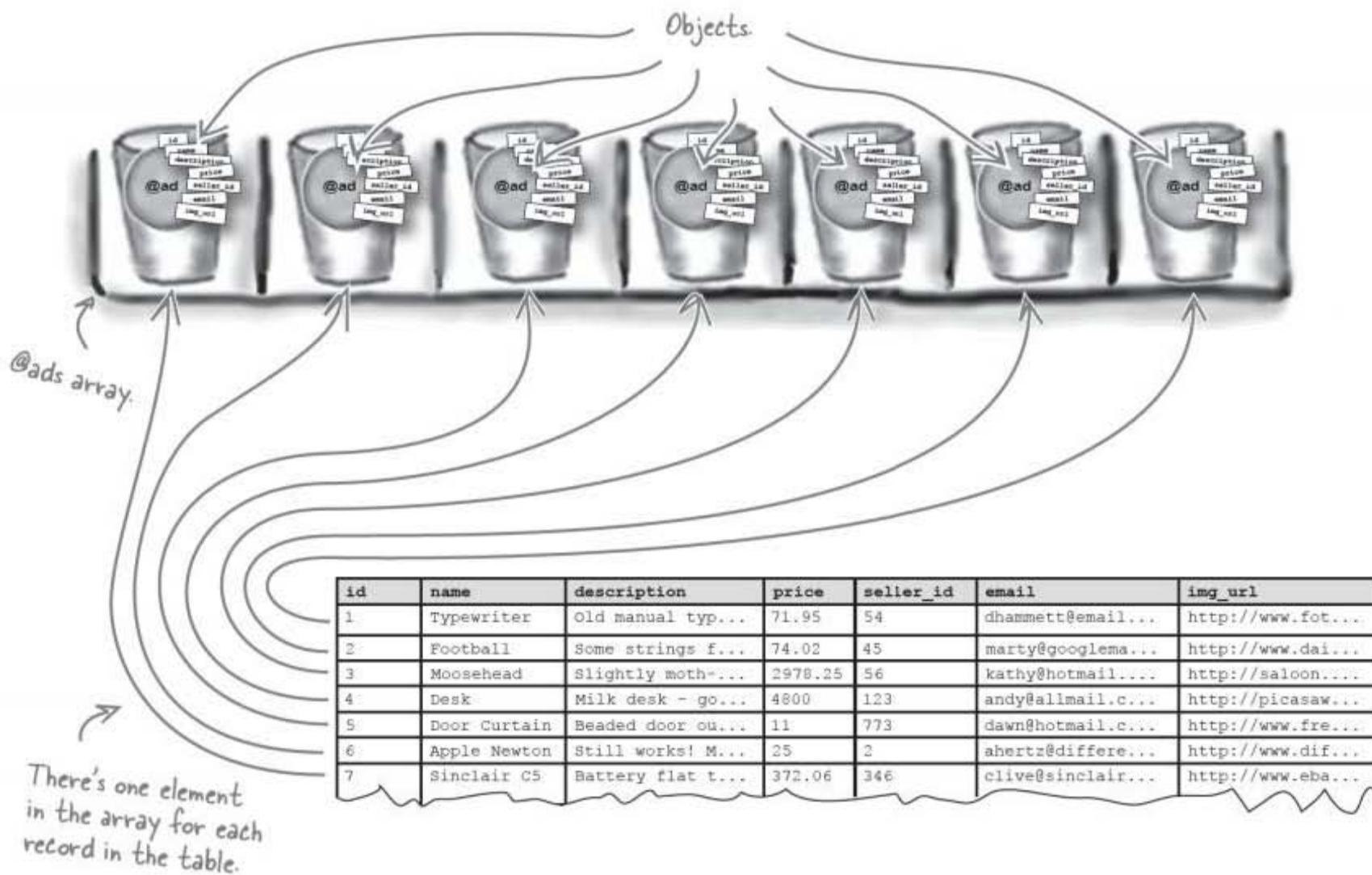


The data is returned as an object called an array

Rather than just return an object containing the data from a single record, the find method creates lots of objects—one for each record—and then wraps them up in an object called an **array**.

The `Ad.find(:all)` finder returns a single array object, that in turn contains as many **model objects** as there are **rows** in the database table.

The controller can store the single array object in memory with the name `@ads`. That makes it simpler for the page template, because instead of looking for an unknown number of model objects in memory, the template only needs to know the name of the array, to get access to all of the model objects.

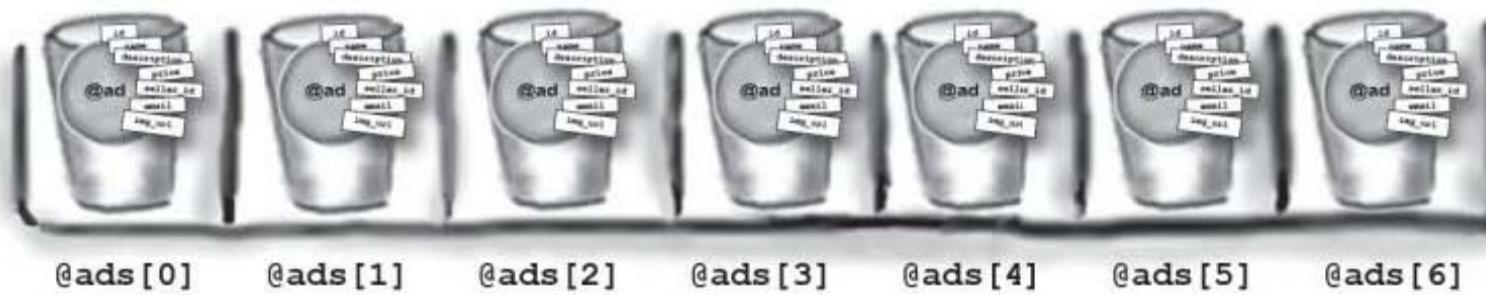


But how do you get access to the objects, once they're stored in the array?

arrays are like trays

An array is a numbered sequence of objects

The `@ads` array stores the model objects in a sequence of numbered slots, beginning with slot 0. The objects that are contained in each of the slots are called the array's *elements*.



You can read the individual elements of the array by using the number of the slot that contains the element.

`@ads[4]`

The object stored in slot 4 of the array is the table row with `id = 5`.

The slots are always numbered upwards from slot 0, and arrays can be as big as needed, so it doesn't really matter how many records there are on the table, they can all be stored inside a single array object.



Watch it!

Arrays start at index 0

That means the position of each element is its index number plus one. So `@ads[0]` contains the first element, `@ads[1]` contains the second, and so on.

Q: Why do arrays start at zero instead of 1?

A: It's historical. Most programming languages have arrays, and in most cases their indexes start at zero.

Q: When you put something into an array, does the array keep a separate copy?

A: No. Arrays just keep references to objects stored in memory. It doesn't keep its own copy of an object, it just remembers where they live.

Q: Is the array really an object?

A: Yes. An array is a full Ruby object.

Q: How big can an array be?

A: There is no limit on the size of an array, so long as it fits in memory.



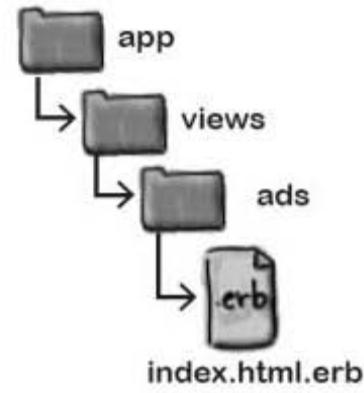
Exercise

Insert the objects into the page, as if there are just these three rows in the database:

id	name	description	price	seller_id	email	img_url
1	Typewriter	Old manual typ...	71.95	54	dhammett@email...	http://www.fot...
2	Football	Some strings f...	74.02	45	marty@googlema...	http://www.dai...
3	Moosehead	Slightly moth-...	2978.25	56	kathy@hotmail...	http://saloon....

Write your
answer here.
↙

Write down what the HTML index.html.erb might look like.



use array indexes



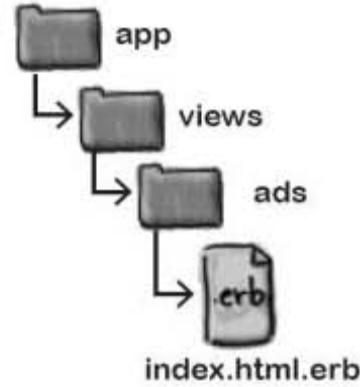
Insert the objects into the page, as if there are just these three rows in the database:

id	name	description	price	seller_id	email	img_url
1	Typewriter	Old manual typ...	71.95	54	dhammett@email...	http://www.fot...
2	Football	Some strings f...	74.02	45	marty@googlema...	http://www.dai...
3	Moosehead	Slightly moth...	2978.25	56	kathy@hotmail....	http://saloon....

Write down what the HTML index.html.erb might look like.

```
<html>
<head>
  <title>All Ads</title>
</head>
<body>
  <h1>All Ads</h1>
  <ul>
    <li><a href="/ads/<%= @ads[0].id %>"><%= @ads[0].name %></a></li>
    <li><a href="/ads/<%= @ads[1].id %>"><%= @ads[1].name %></a></li>
    <li><a href="/ads/<%= @ads[2].id %>"><%= @ads[2].name %></a></li>
  </ul>
</body>
</html>
```

Your HTML may look a little different than this. That's fine. As long as you got roughly the same elements and in the same order as we did, you're golden.



I'm not sure this exercise is quite right. What if there aren't exactly three records in the table?



In practice, you won't know how many ads there are.

The code above will only display 3 ads. But what if there are 4, or 5, or 3,000? You don't want to have to change the template every time an ad is added or removed from the database.

You need some way of writing code that will cope with any number of ads in the database.



Read all of the ads with a **for** loop

A Ruby **for** loop lets you run the same piece of Ruby code over and over again. It can be used to read the elements in an array, one at a time, and then run a piece of code on each element.

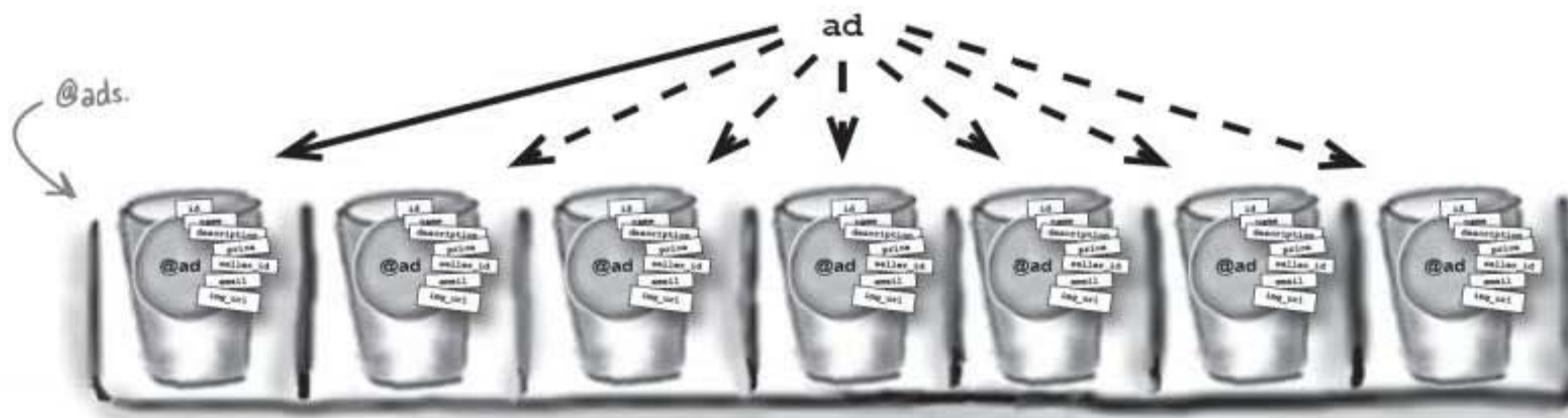
The piece of code that's run each time is called the **loop body**. The loop body will execute for each element of the array, in sequence, starting with element 0:



```
Each element will be  
named ad in the loop.  
  
for ad in @ads  
  # Do something with the 'ad' object  
end  
The indented code  
is the loop body.
```

The diagram shows a hand-drawn style code snippet for a `for` loop. A circular arrow on the left indicates the loop's progression. An annotation above the loop says "Each element will be named ad in the loop." Another annotation to the right of the loop body says "The indented code is the loop body."

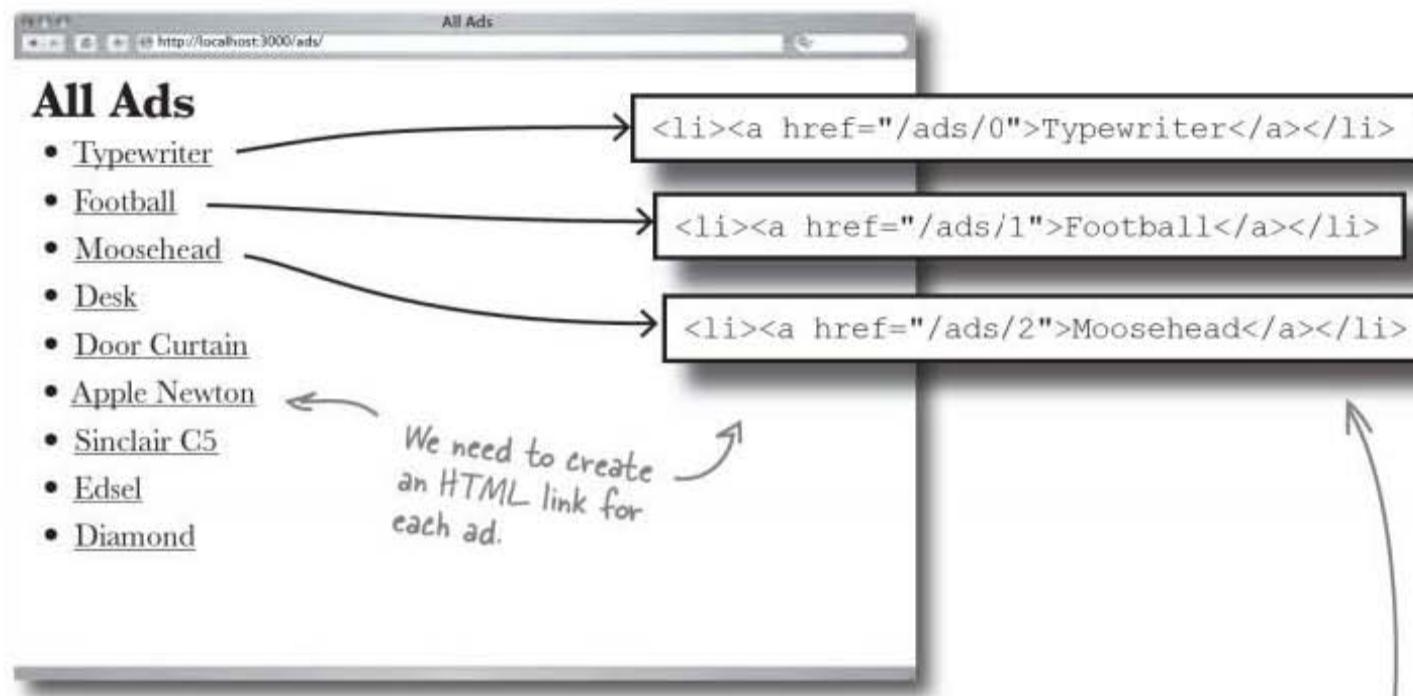
In the above code, each time the body runs, the current element in the array is given the name `ad`. So `ad` refers to each of the Ad model objects, and inside the loop you can access all of the model objects attributes: the details of the ad, such as the name or the description of the thing being sold.



Right now, we need to generate the HTML that will create a link to the ad's web page. But the HTML is generated by the page template. How can we use a `for` loop with that?

We need HTML for each element in the array

For each ad object in the @ads array, we need to generate a hyperlink in HTML.



We can use a `for` loop to do this. The loop would allow us to work through each of the ads, one at a time. If we used the loop body to generate the HTML, we could create links for each of the ads:

```

  for ad in @ads
    <li><a href="/ads/<%= ad.id %>"><%= ad.name %></a></li>
  end
  
```

This would generate a link for each element.

This is not real code.

The problem is that we generate web pages by putting Ruby expressions inside page templates. The *HTML* in the page template controls when the *Ruby expressions* are called. But we want to do things *the other way round*. We want a Ruby `for` loop to control when the HTML is generated.

So how can we combine control statements like `for` loops with page template HTML?

Rails converts page templates into Ruby code

When we wanted to get object values into a page before, we inserted them using `<%= ... %>`:

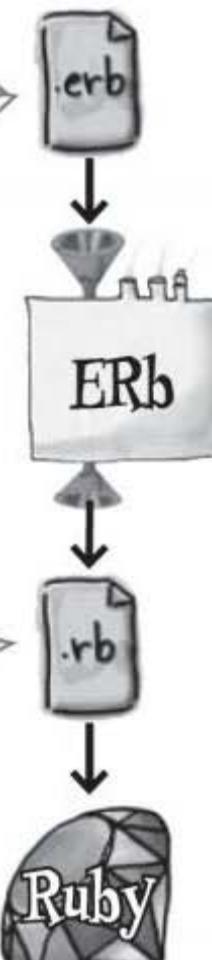
```
<%= @ad.name %>
```

ERb (Embedded Ruby) generates a web page from the template by replacing each of the expressions with their values. ERb does this by converting the entire page into Ruby code.

Imagine this was all you had in a page template:

```
<title><%= @ad.name %></title>
```

Page template tags

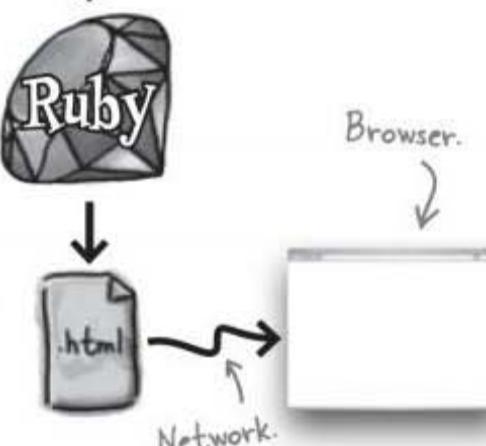


ERb generates Ruby code to print out each expression and each chunk of HTML. So the template code above gets converted into something like this:

```
print "<title>"  
print @ad.name  
print "</title>"
```

This is pseudo-code.
The actual code is a
little more complex.

ERb generated
Ruby code.



The Ruby code is then executed and the output is what gets sent over the network to the browser:

```
<title>Moosehead</title>
```

HTML markup output
by the Ruby code.

If you want a template to generate code for each object in an array, how would you want the Ruby code to look?

Loops can be added to page templates using scriptlets

Let's forget about page templates for the moment. If you were writing a piece of code to print out HTML for each element in an array, what would that code look like? It might look a little like this:

```
for ad in @ads
  print '<li><a href=""'
  print ad.id
  print '">'
  print ad.name
  print '</a></li>'
end
```

We need to loop through the array and print out HTML and expressions for each element. So far we've only seen ERb generating print commands, but the `for` loop isn't a print command. So how can we pass ERb chunks of Ruby code—like the `for` loop?

The solution is to use ***scriptlets***.

A scriptlet is a tag containing a piece of Ruby code. Expression tags are surrounded by `<%= ... %>`, but scriptlets are surrounded by `<% ... %>`. Scriptlets don't have the `=` sign at the start of them.

To see how scriptlets work, let's take a look at a page template to produce the `for` loop code above:

The diagram illustrates the conversion of a Ruby `for` loop into an ERb page template. On the left, the Ruby code is shown:

```
for ad in @ads
  print '<li><a href=""'
  print ad.id
  print '">'
  print ad.name
  print '</a></li>'
end
```

Annotations explain the conversion:

- An arrow points from the first line of the Ruby code to the corresponding ERb code: `<% for ad in @ads %>`. A handwritten note says: "There's no '=' at the start of the scriptlet."
- Annotations point to the expression `ad.id` and the assignment `= ad.name` in the Ruby code, with the note: "Expressions have '='".
- An annotation points to the `<% end %>` line with the note: "There's no '=' at the end of the scriptlet."
- A bracket on the right groups the annotations and contains the text: "Object values are inserted with <%= ... %>".
- A bracket on the right groups the annotations and contains the text: "But code is inserted with <% ... %>".
- A handwritten note "A scriptlet" points to the `<% ... %>` structure.

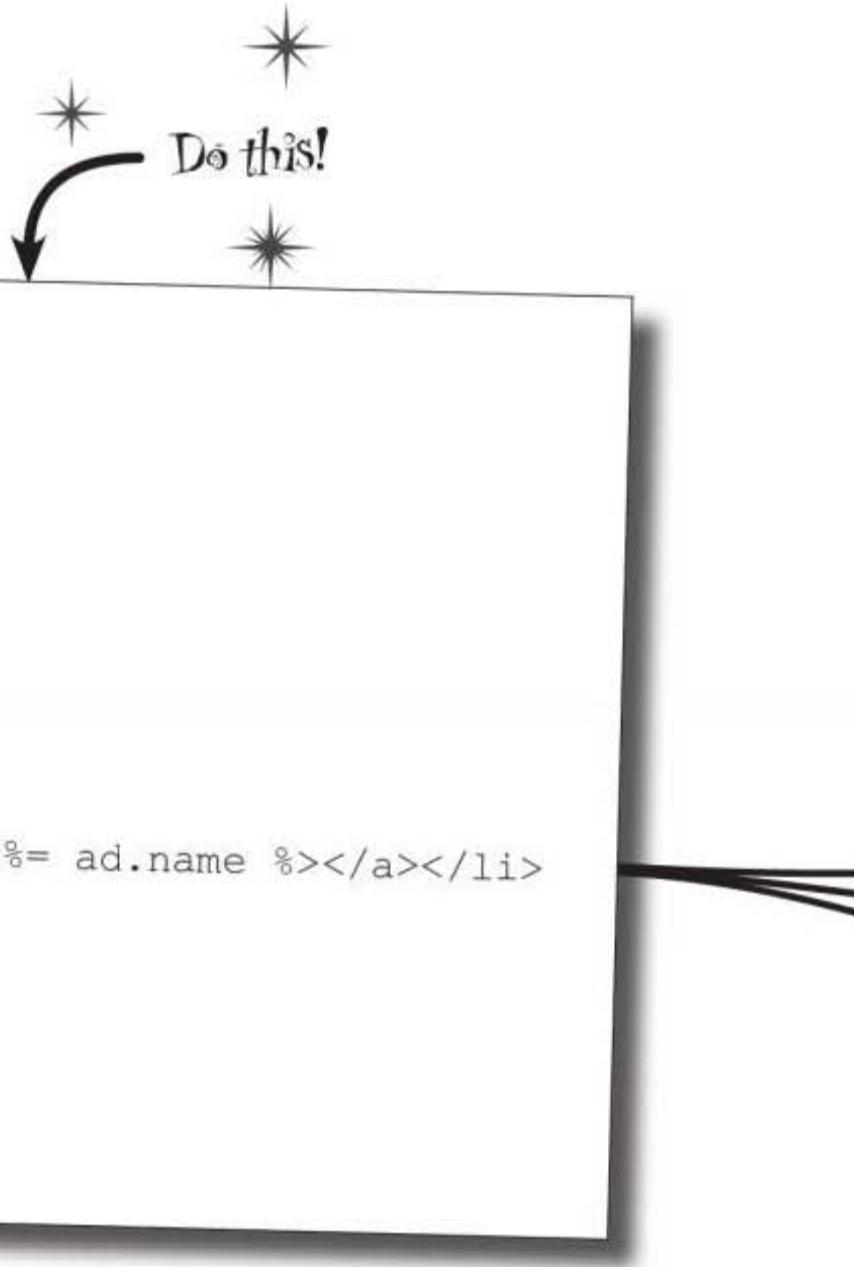
This code uses scriptlets for the looping code and expressions where values will be inserted. Let's see what the index page template will look like if we use scriptlets to loop through the `@ads` array.

 add some scriptlets

On each pass of the loop, the page generates one link

This is the code you'll be using for the `index.html.erb` template:

```
<html>
<head>
  <title>All Ads</title>
</head>
<body>
  <h1>All Ads</h1>
  <ul>
    <% for ad in @ads %>
      <li><a href="/ads/<%= ad.id %>"><%= ad.name %></a></li>
    <% end %>
  </ul>
</body>
</html>
```



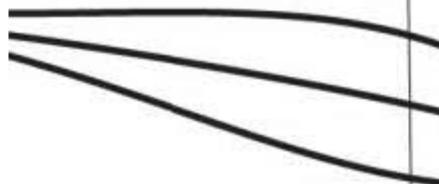
When Rails processes the template, the HTML at the top and the bottom of the file will just be output as you'd expect. The interesting part is in the middle of the page. Each pass of the loop will generate an HTML link to the matching ad page.

So what does the generated HTML look like?

Imagine there are just these three ads in the database.

That means the controller will produce an @ads array containing three model objects. When the page template loops through the @ads array it should produce HTML that looks something like this:

```
<html>
<head>
  <title>All Ads</title>
</head>
<body>
  <h1>All Ads</h1>
  <ul>
    > <li><a href="/ads/1">Typewriter</a></li>
    > <li><a href="/ads/2">Football</a></li>
    > <li><a href="/ads/3">Moosehead</a></li>
  </ul>
</body>
</html>
```



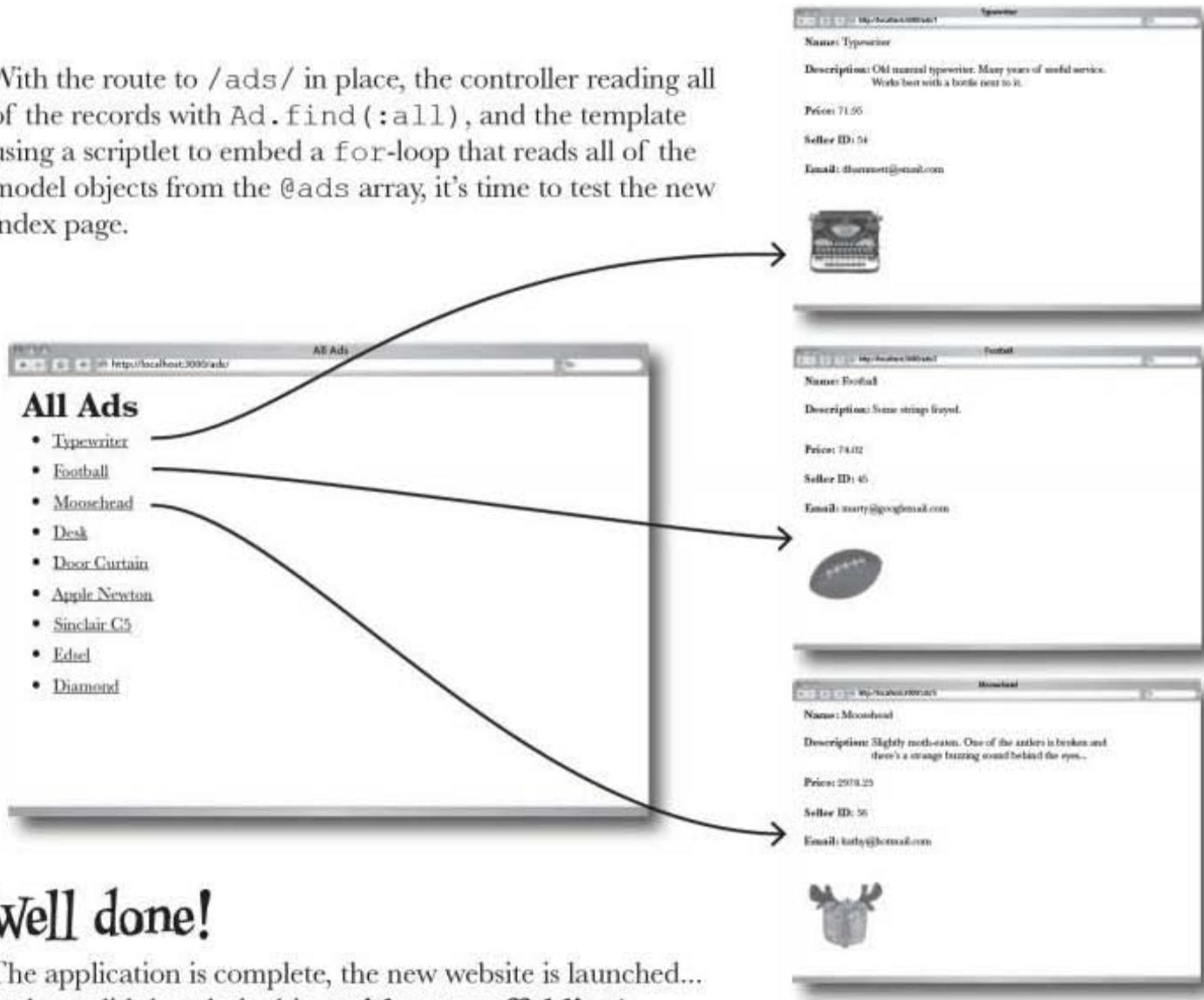
So it looks like this will generate just enough HTML for all of the ads in the database. If there are more ads created in the database, a larger @ads array will be produced, and the template should generate a longer piece of HTML.

That's the theory. Now that the route's been created, the controller action's been written, and the `index.html.erb` template's in place it's time to run the code.



Test Drive

With the route to `/ads/` in place, the controller reading all of the records with `Ad.find(:all)`, and the template using a scriptlet to embed a `for`-loop that reads all of the model objects from the `@ads` array, it's time to test the new index page.



Well done!

The application is complete, the new website is launched... and you did the whole thing **without scaffolding!**



BULLET POINTS

- You can display data for a **single record**.
- You can display data for **all the records** in a table.
- You now have the power to write a ton of read-only applications!

You just got an email from the folks at MeBay...

The functionality of the site now matches exactly what the original spec asked for. Everyone's really pleased. Then, on the morning that the site's due to launch, you get an email:

Dude!

You did an incredible job with the site. We're really pleased at the way you were able to build it to our exact specification. We'd heard that Rails applications always looked and worked the same!

By the way, here's a design for how the site will look. We think this will be the final look of the application, but if there are any changes, we'll send them through later.

Thanks again for all the hard work :-)

There's a sample web page and a set of stylesheets and images attached to the email. It can't be that hard to change the look of the application, can it?

Download this!

Download the stylesheets and images from:
www.headfirstlabs.com/books/hfrails



You could just modify the page templates so they look like the sample web page from the designer. What's the problem in doing that?

But there are two page templates... should we change the code of each one?

There are two page templates, so if you just change the HTML in both templates to match the MeBay sample page, you'll have **duplicated the code**. Is that really a big deal here? After all, there are only *two* types of web pages in the MeBay site. That's not *so* bad, is it?

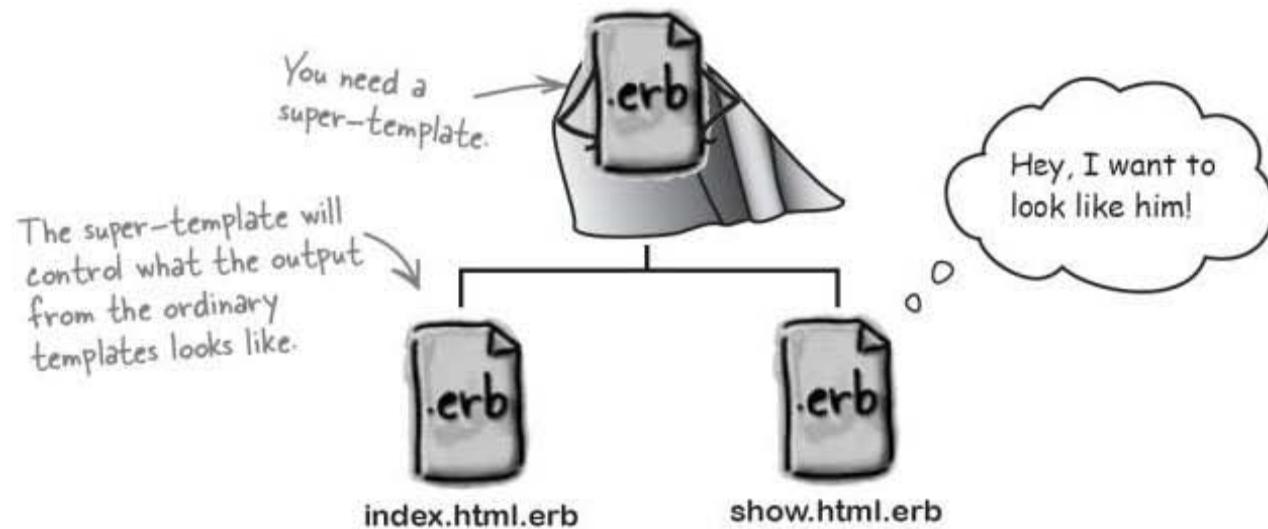
The problem is that the application may grow over time and acquire more features and page templates. And what about that comment about the design possibly changing? The more times you duplicate the look, the more places you have to maintain the same HTML. Over time the application could become hard work to maintain.

So what's the answer? Well, the obvious answer is to remove the duplication. Most web sites have a standardized look across most of their pages. They have standard boilerplate HTML surrounding the main content of each page.

So you need some way of defining a **super-template**: one single template that will control how a group of other templates will look.

Rails Principle:
DRY - Don't Repeat Yourself.

↑
Didn't we say
this already?



A layout defines a STANDARD look for a whole set of page templates

Fortunately, just such a super-template exists in Rails, and it's called a **layout**. A layout defines an HTML wrapper for all of the templates belonging to a particular model.

Let's see how it'll work with the new design.



Ready Bake Super-Template Code

This is the example HTML page from the designer after it's been converted into a layout.

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
  "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
  <title>Ads: <%= controller.action_name %></title>
  <%= stylesheet_link_tag 'default.css' %>
</head>
<body>
  <div id="wrapper">
    <div id="header">
      <div>

        <h1>MeBay</h1>
        <ul id="nav">
          <li><a href="/ads/">All Ads</a></li>
        </ul>
      </div>
    </div>

    <div id="content">
      <%= yield %>
    </div>
    <div id="clearfooter"></div>
  </div>
  <div id="footer"></div>
</body>
</html>
```

You need to put it in the right place by saving it as:

`app/views/layouts/ads.html.erb`

That name tells Rails to apply the layout to all of the page templates belonging to the ad model.

We've put in a couple of expressions to specify a stylesheet and give the page a title based upon the current controller name. But much more importantly, the layout contains this tag:

`<%= yield %>`

Sharpen your pencil



Is there a problem with inserting the output of the current page templates into the layout? If there is, write it below.



Sharpen your pencil Solution

Is there the problem with inserting the output of the current page templates into the layout? Write it down below:

The page templates contain too much – they already have all of the HTML boilerplate in them.

You need to REMOVE the boilerplate from your page templates

Look at the existing `index.html.erb`. It already contains HTML boilerplate elements, like the `<head>` and the `<title>`:

`<title>`: →

```
<html>
<head>
  <title>All Ads</title>
</head>
<body>
  <h1>All Ads</h1>
  <ul>
    <% for ad in @ads %>
      <li><a href="/ads/<%= ad.id %>"><%= ad.name %></a></li>
    <% end %>
  </ul>
</body>
</html>
```

But now that there's a layout providing the boilerplate, you need to cut down the templates so they display just the main page content:

```
<h1>All Ads</h1>
<ul>
  <% for ad in @ads %>
    <li><a href="/ads/<%= ad.id %>"><%= ad.name %></a></li>
  <% end %>
</ul>
```

Do this!

Edit both the `index.html.erb` and `show.html.erb` files to remove the boilerplate HTML.

But what about the new static content MeBay sent over?

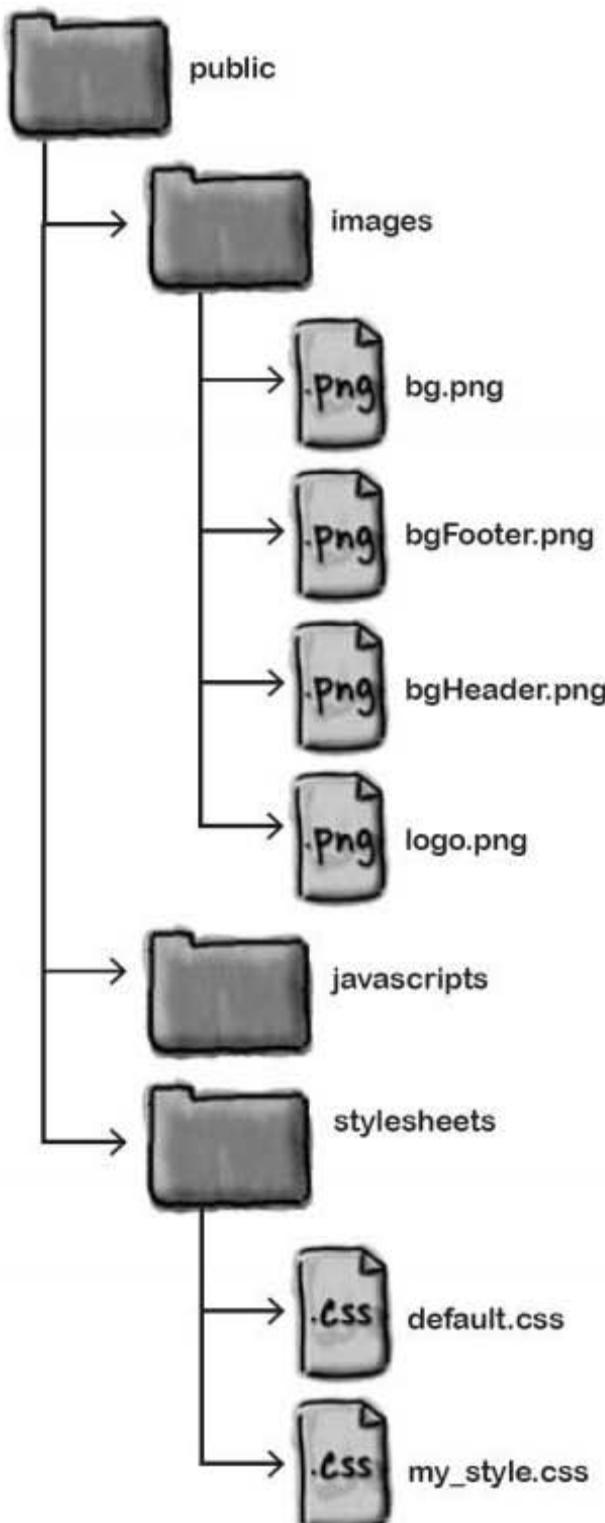
So far you've only generated dynamic content from a Rails app. Pretty much everything has been output page templates. But when you're specifying the cosmetics of a site, you often need **static** content like *stylesheets*, *images*, and *JavaScripts*. But how do you include static content in the application?

Rails sets aside a folder just for static files. It's called **public**.

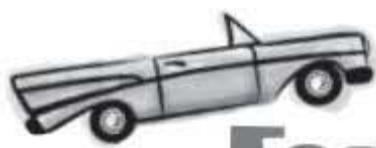
When you create the application, Rails already put quite a few files in the public folder. Remember the first time you started the Rails application and looked at the front page? The files for the standard welcome page all live in the `public` folder.

Most Rails applications store their images, stylesheets and JavaScripts in `public/images`, `public/stylesheets` and `public/javascripts` respectively.

Once you've saved the extra images and stylesheets from the email, we should be good to go.



mebay looks great



—Test Drive—

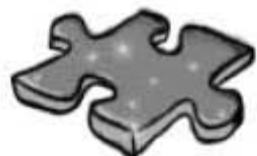
Open up a browser and look at:

<http://localhost:3000/ads>

It's a thing of beauty.
My work here is done...
for now.



As you browse through the site, the standard look will be applied to all of the pages. And if you add more templates later, or if you modify the HTML in the layout, the application will maintain a consistent look.

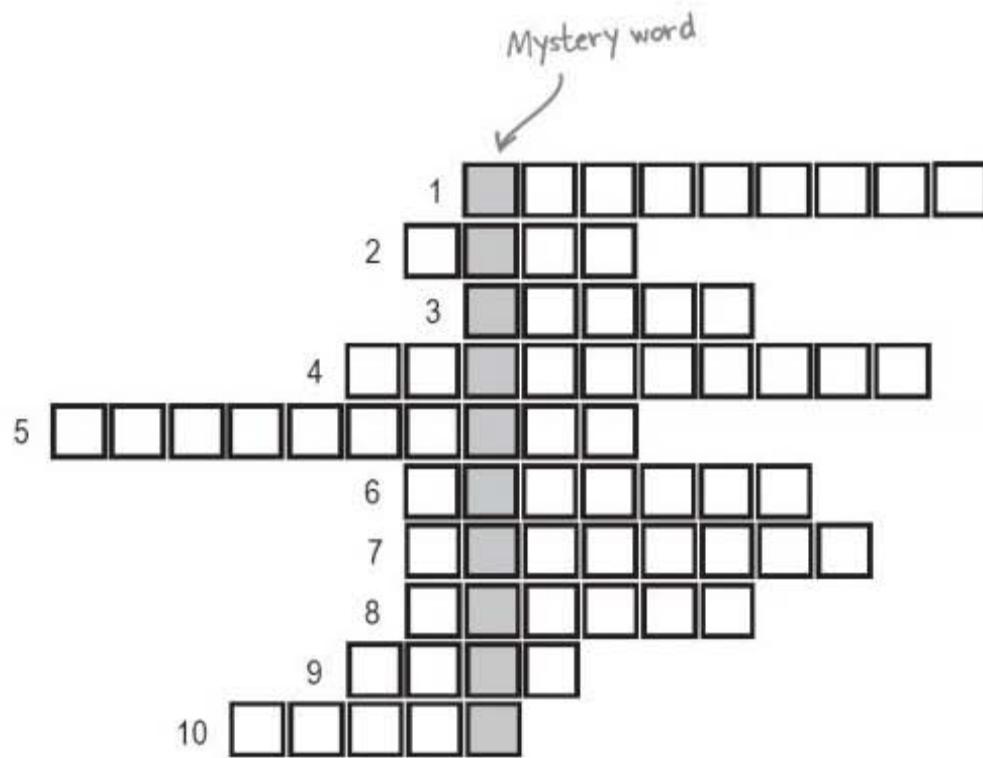


Scaffoldless Grid

Fill in the grid with the answers to each of the clues to reveal the mystery word.

Clue for the mystery word:

A reason you would want to manually create an application instead of using scaffolding.



Clues

1. <% @what.am_i? %>
2. You could use a page template for this
3. Converts the data from the database into Ruby objects
4. <%= @what.am_i? %>
5. Might send data from the model to the view
6. Update the data structure with `rake db:.....`
7. If you are creating a simple application, you might not need this
8. Reads object(s) from a database
9. Every route has a request
10. An object containing many objects



Scaffoldless Grid Solution

Fill in the grid with the answers to each of the clues to reveal the mystery word.

Clue for the mystery word:

A reason you would want to manually create an application instead of using scaffolding.



Clues

1. <% @what.am_i? %>
2. You could use a page template for this
3. Converts the data from the database into Ruby objects
4. <%= @what.am_i? %>
5. Might send data from the model to the view
6. Update the data structure with `rake db:.....`
7. If you are creating a simple application, you might not need this
8. Reads object(s) from a database
9. Every route has a request
10. An object containing many objects



Tools for your Rails Toolbox

You've got Chapter 2 under your belt, and now you've added the ability to manually create read-only applications to your toolbox.

Rails Tools

You can generate a model with:

`ruby script/generate model...`

and a controller with:

`ruby script/generate controller...`

Ruby Tools

If `my_array` is a Ruby array, the first element is given by:

`my_array[0]`

You can loop through all the elements with:

```
for element in my_array  
  # Do stuff with element  
end
```

3 inserting, updating, and deleting



★ **Everything changes** ★



Change is a fact of life—especially for data. So far you've seen how to whip up a quick Rails application with scaffolding, and how to write your own code to publish data from a database. But what if you want users to be able to edit data *your way*? What if scaffolding doesn't do what *you want*? In this chapter, you'll learn how to **insert**, **update**, and **delete** data in exactly the way you want. And while you're doing that, you'll be taken deeper into how Rails *really* works and maybe even learn a little about security along the way.

People want to post new ads online

People love the MeBay site, but there's a problem. Because MeBay was nervous about people having too much access to the data, sellers have to phone in details of their items to MeBay and *wait* while the system administrators create new ads for the sellers. As the number of people sending in ads has grown, so has the wait time. A lot of people are taking their business to other advertising sites now.

So MeBay has relented. After some discussion, they've decided that people should be allowed to **post their own ads** on the site using a page that looks like this:

New ad

Name:

Description:

Price:

Seller ID:

Email:

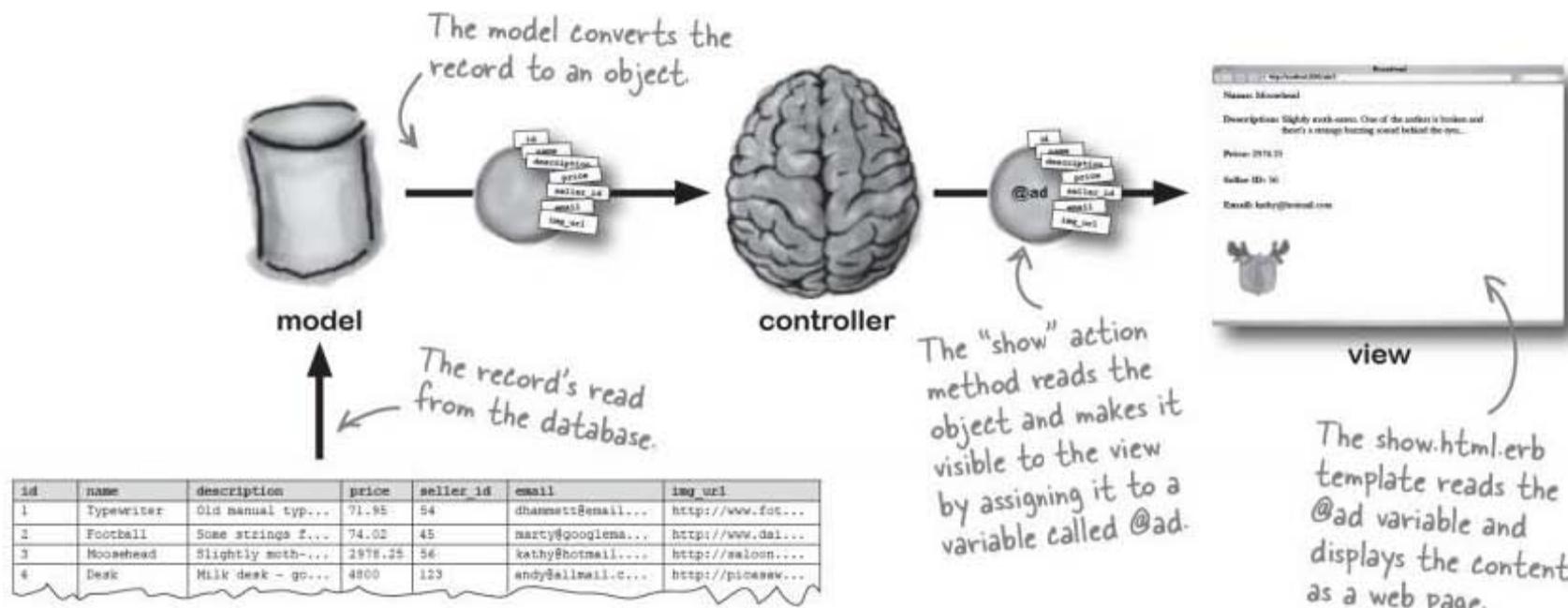
Image URL:

Create

Another design sketch
from MeBay.

You already know how to build an app that publishes data from the database

The ads only go one way in the current application. The ad records are read from the database by the model, which converts them into ad objects that are then sent to the view by the controller. It works like this:



Sharpen your pencil

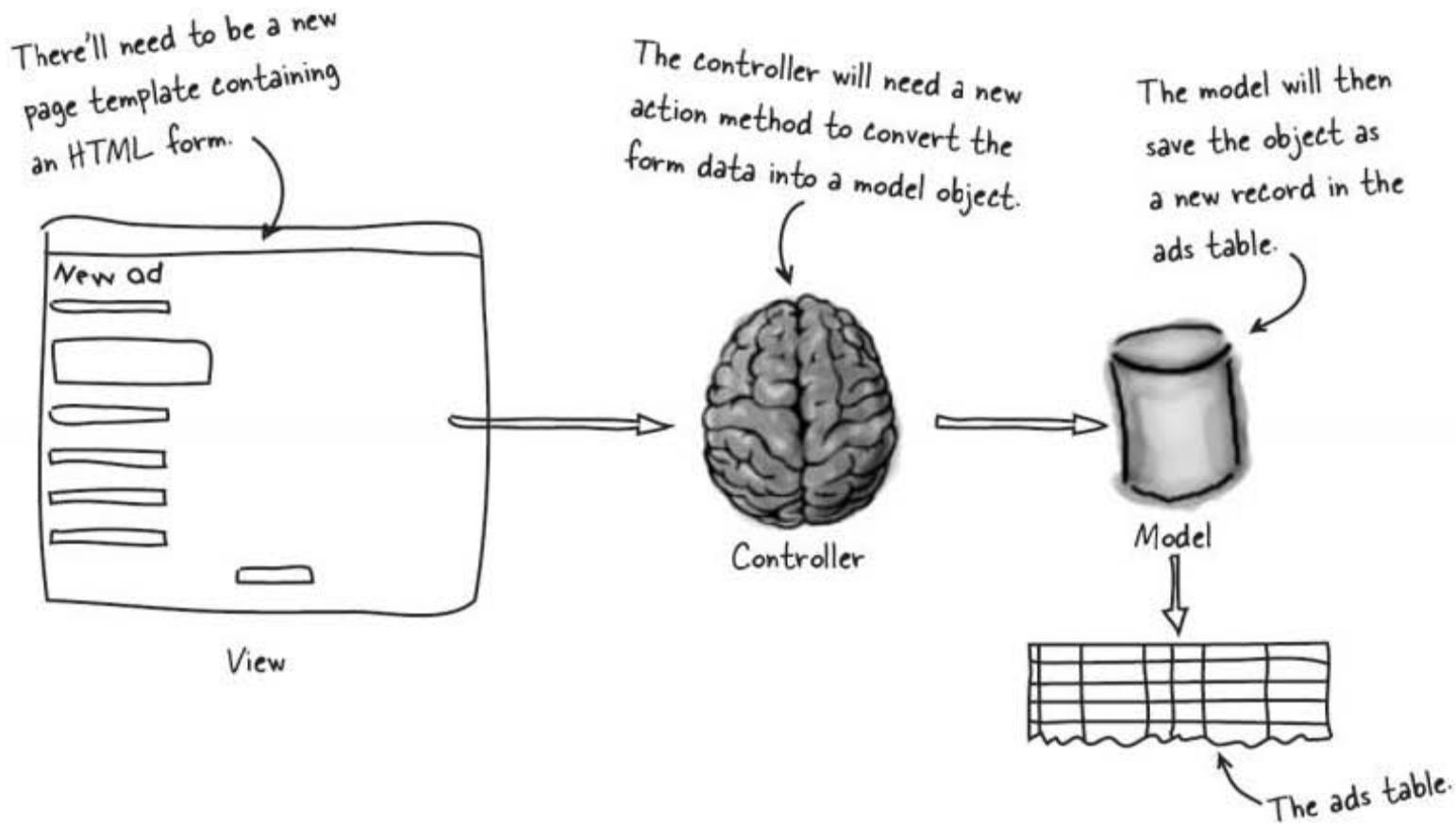
Draw your diagram here.

Draw a diagram to show how you think the new ad-posting feature will work. Be sure to include the main components of the application and add notes to describe what each component will do.



Sharpen your pencil Solution

Draw a diagram to show how you think the new ad-posting feature will work. Be sure to include the main components of the application and add notes to describe what each component will do.



Saving data works just the OPPOSITE of reading data

Saving data to the database is similar to publishing ads from the database, except it works the other way round. Instead of a page template to *display* an ad, you need a page template to **submit** an ad. Instead of a controller action method to send an ad to a page, you need a controller method to read data from a page and turn it into an object. And instead of the model reading a record and converting it into an object, you need the model to convert an object into a new record in the database.

You need a form to submit data and an action method to save it

You need a new page template to create the HTML form. Because it will be used to enter new ads, we'll call this template `new.html.erb`.

The "New ad" page will need to appear at

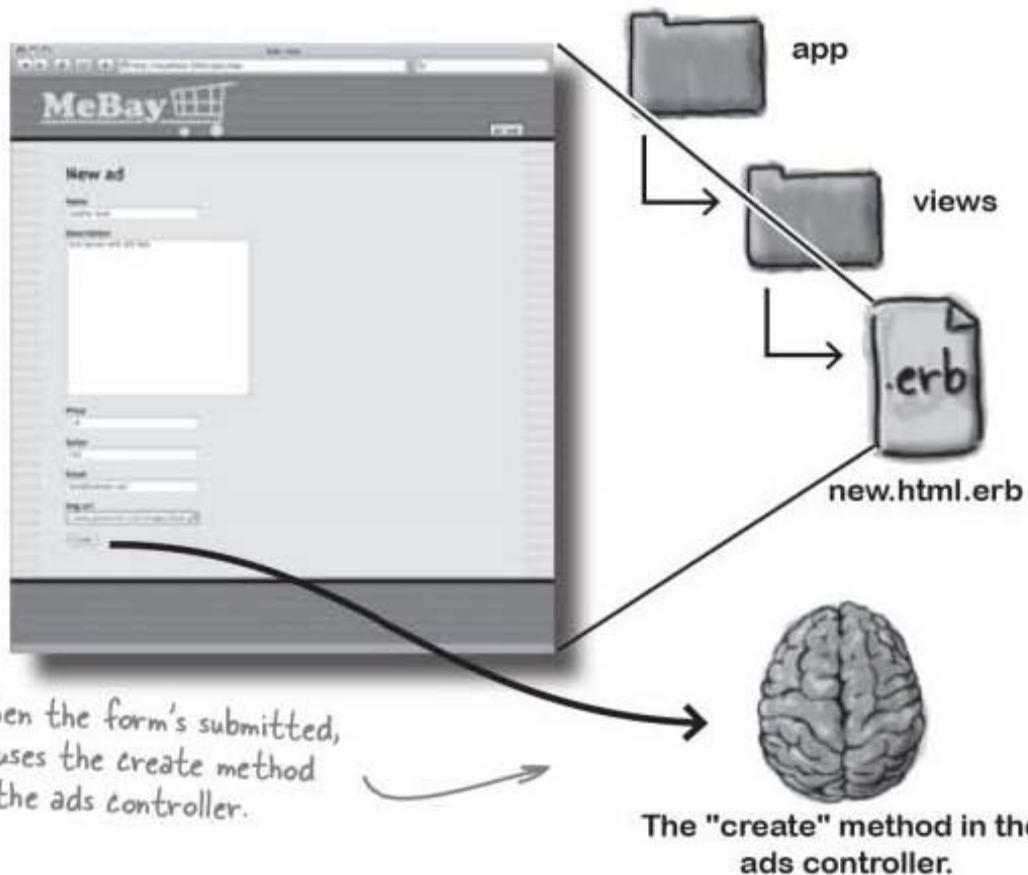
`http://mebay.com/ads/new`

and the form will be submitted to:

`http://mebay.com/ads/create`

So we also need to create a new route in `routes.rb`.

Remember, a route is what tells Rails which pieces of code to use to satisfy a request from a browser.



Sharpen your pencil



The controller method will need to create an ad model object from the data in the form. Can you see an attribute in the model that does not have a field in the form? Why is that?

Missing attribute:

Reason it's missing:

What will the route look like that will connect /ads/new to the new.html.erb file, and /ads/create to the create method in the ads controller?

.....

.....

ids are generated

Sharpen your pencil Solution

The controller method will need to create an ad model object from the data in the form. Can you see an attribute in the model that does not have a field in the form? Why is that?

Missing attribute: The id

Reason it's missing: The user doesn't decide what the id is - it will be automatically generated by the system.

What will the route look like that will connect /ads/new to the new.html.erb file, and /ads/create to the create method in the ads controller?

map.connect '/ads/new', :controller=>'ads', :action=>'new'

Because the method will be called "create" ...
...the file will be called new.html.erb.

map.connect '/ads/create', :controller=>'ads', :action=>'create'

We need to add these routes to our routes.rb.

The top of your config/routes.rb file should now look like this:

```
ActionController::Routing::Routes.draw do |map|
  map.connect '/ads/new', :controller=>'ads', :action=>'new'
  map.connect '/ads/create', :controller=>'ads', :action=>'create'
  map.connect '/ads/', :controller=>'ads', :action=>'index'
  map.connect '/ads/:id', :controller=>'ads', :action=>'show'
```



It looks like forms and objects carry a lot of the same kinds of information. I wonder if there's some deeper relationship between a form and an object?

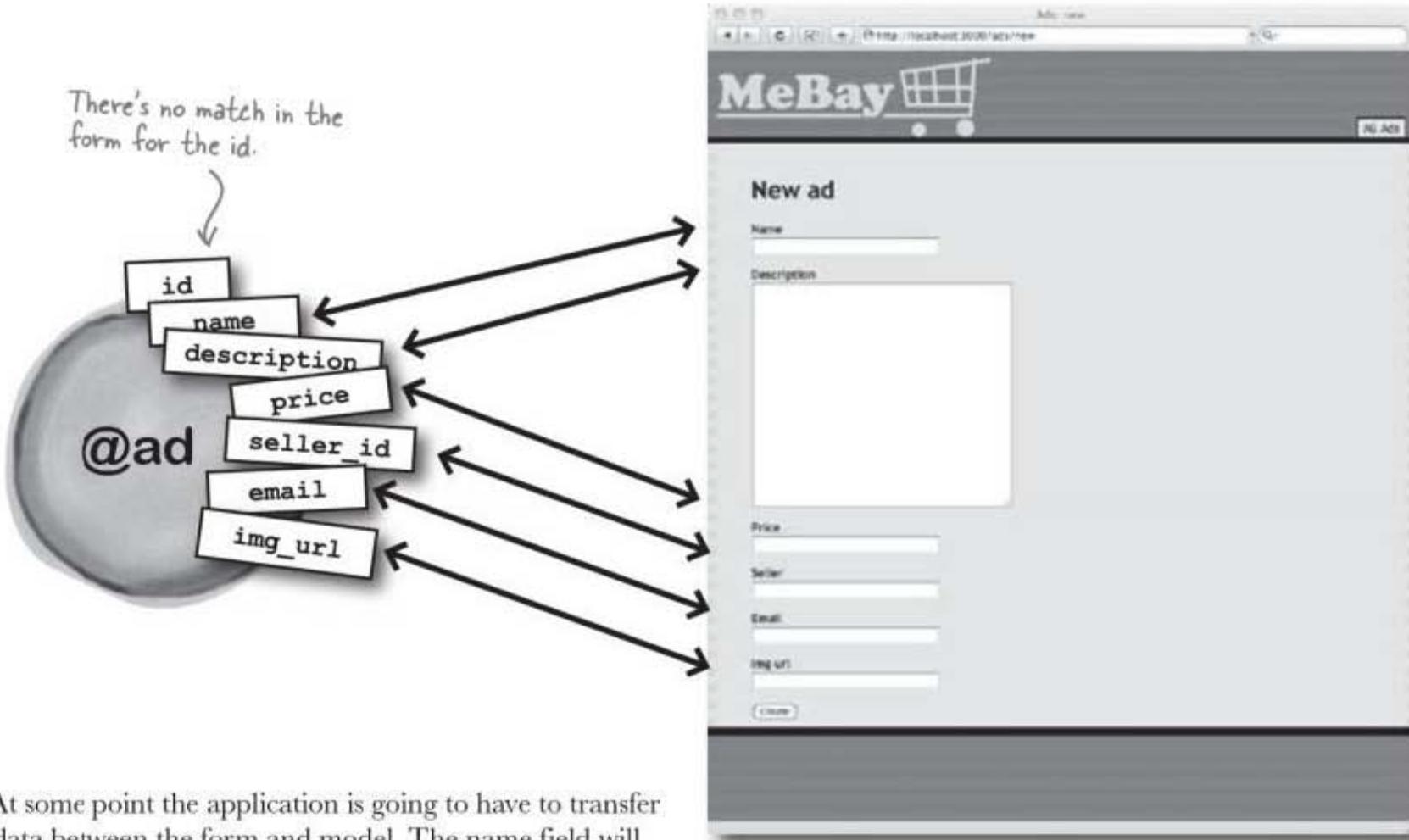
There are close relationships between many parts of a Rails application.

After all, the model contains the data for the application, the view allows the user to access that data, and the controller provides the logical glue that connects everything together.

But is there some special relationship between a form and a model?

Are forms and objects related?

Apart from the generated id, the fields in the form match the attributes of an ad object.



At some point the application is going to have to transfer data between the form and model. The name field will match to a name attribute, the description field will match to a description attribute and so on.

What if the model creates objects with default values in the attributes? Should the code that generates the default values in the form duplicate the model code?

After all, when the data in the form is received by the controller, should the form treat the fields as individual values? Or should all of the field values be associated together, like the attributes of an object?

Could Rails make use of the relationship between form fields and a model object when creating a form?

Rails can create forms that are associated with model objects

Rails can use a model object to help create a form. That means two things:

- ➊ The values in the form fields will be set to the values stored in the attributes of the @ad object. This doesn't make a lot of difference to the ad form because new ads are blank.
- ➋ The form fields will be given names that explicitly associate those fields with a model object.

So how can a name associate a field with an object? Let's look at what it would mean for the ad form. This is the HTML that will be generated for a form that's based on an Ad object:

This would be generated by show.html.erb

```
<b>Name</b><br />
<input id="ad_name" name="ad[name]" type="text" />
<b>Description</b><br />
<textarea id="ad_description" name="ad[description]"></textarea>
<b>Price</b><br />
<input id="ad_price" name="ad[price]" type="text" />
<b>Seller</b><br />
<input id="ad_seller_id" name="ad[seller_id]" type="text" />
<b>Email</b><br />
<input id="ad_email" name="ad[email]" type="text" />
<b>Img url</b><br />
<input id="ad_img_url" name="ad[img_url]" type="text" />
```



BRAIN BARBELL

Comparing the field names and their matching attributes, how do you think Rails will present the form data to the controller?

You have a few pages to think about this...

Field names	Object attributes
ad[name]	name
ad[description]	description
ad[price]	price
ad[seller_id]	seller_id
ad[email]	email
ad[img_url]	img_url



Form Object Magnets

It's time to write the new.html.erb page template.

The `<% form_for %>` tag is used to generate a form using a form object. Complete the fields in the form using the magnets below:

No boilerplate HTML...
we're still using a
super-template.

The object
the form is
based on.

```

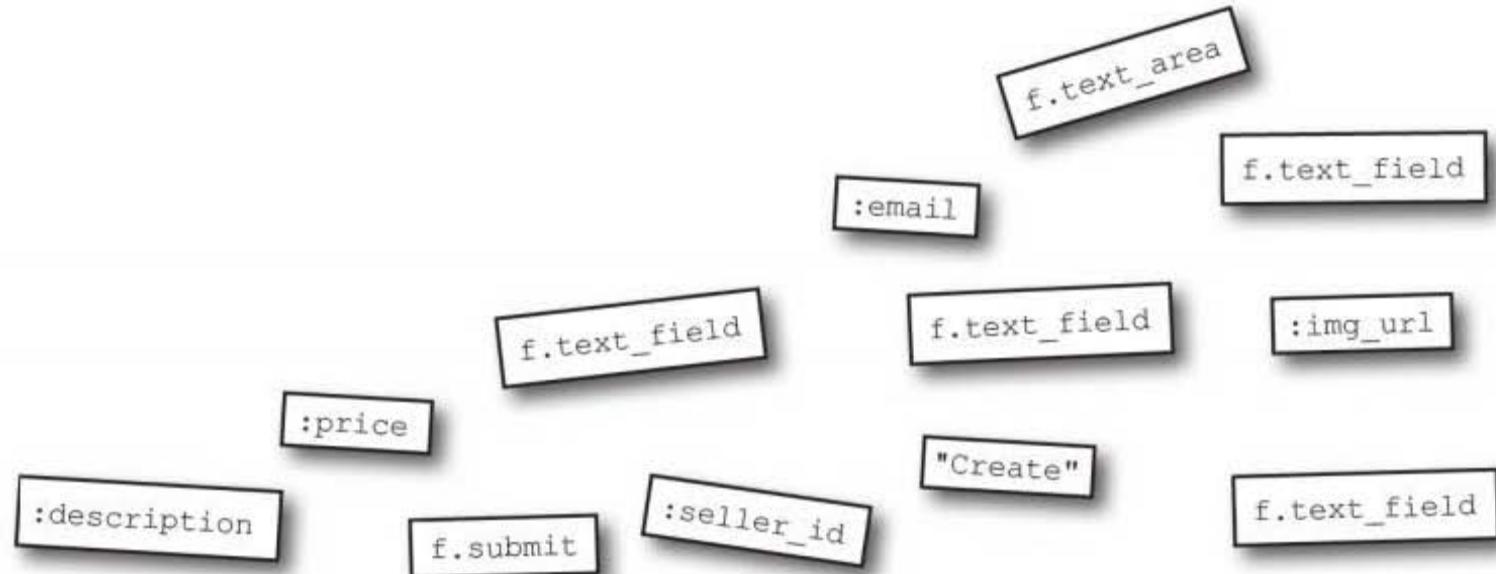
<h1>New ad</h1>
<% form_for(@ad, :url=>{:action=>'create'}) do |f| %>
  <p><b>Name</b><br /><%= f.text_field :name %></p>
  <p><b>Description</b><br /><%= ..... %></p>
  <p><b>Price</b><br /><%= ..... %>
  </p>
  <p><b>Seller</b><br /><%= ..... %></p>
  <p><b>Email</b><br /><%= ..... %></p>
  <p><b>Img url</b><br /><%= ..... %></p>
  <p><%= ..... %></p>
<% end %>

```

Form tags are scriptlets so don't use
= in them. Just use `<%` and `%>`.

The action that the form
will be submitted to.

Form fields are generated
with expressions like this.





Form Object Magnets Solution

It's time to write the new.html.erb page template.

The `<% form_for %>` tag is used to generate a form using a form object. Complete the fields in the form using the magnets below:

```
<h1>New ad</h1>  
  
<% form_for(@ad, :url=>{:action=>'create'}) do |f| %>  
  
  <p><b>Name</b><br /><%= f.text_field :name %></p>  
  
  <p><b>Description</b><br /><%= f.text_area :description %></p>  
  
  <p><b>Price</b><br /><%= f.text_field :price %></p>  
  
  <p><b>Seller</b><br /><%= f.text_field :seller_id %></p>  
  
  <p><b>Email</b><br /><%= f.text_field :email %></p>  
  
  <p><b>Img url</b><br /><%= f.text_field :img_url %></p>  
  
<p><%= f.submit "Create" %></p>  
  
<% end %>
```

Within the `form_for` tags, the form will be called "f".

The description could be longer than the other fields so it needs a `text_area` instead of a `text_field`.

All of the field names are given as symbols—a sequence of characters beginning with a colon.

This is the word that will appear on the button at the bottom of the form that users will press to create the ad.

Do this!

Save this code to a file called `app/views/ads/new.html.erb`

there are no
Dumb Questions

Q: Why doesn't the form contain any fields for the `id`, `updated_at`, and `created_at` columns?

A: Those fields will be automatically filled in by Rails. The `id` will be automatically generated number and the `updated_at` and

`created_at` fields will be given timestamps at the time the record is saved or updated in the database. Those are our magic columns, remember?



Test DRIVE

The page template for the “new” form is in place and it should generate HTML in the same way that we generated the “show” pages. There’s also a route in place that connects the “/ads/new” path to the “new” template. So let’s see if it works by going to:

`http://localhost:3000/ads/new`

Action Controller: Exception caught

`http://localhost:3000/ads/new`

RuntimeError in Ads#new

Showing `ads/new.html.erb` where line #2 raised:

```
Called id for nil, which would mistakenly be 4 -- if you really wanted the id of nil, use object_id
```

Extracted source (around line #2):

```
1: <h1>New ad</h1>
2: <% form_for(@ad,:url=>{:action=>'create'}) do |f| %>
3:   <p><b>Name</b><br /><%= f.text_field :name %></p>
4:   <p><b>Description</b><br /><%= f.text_area :description %></p>
5:   <p><b>Price</b><br /><%= f.text_field :price %>
```

The page crashed!



Something’s gone awry with the form page.
Look at the error message that was produced
and see if you can work out what went wrong.

nil means **no value**

The @ad form object has not been created

The problem is caused by the @ad object. By default, a variable like @ad is set to a special value called **nil**, which means **no value**. If @ad is set to nil, instead of being set to an Ad object, it won't have attributes like @ad.name, @ad.description, and so on.

If @ad doesn't have attributes, does that cause a problem for the form?

You bet! The form is based on the @ad object, and the form accesses each of the object's attributes to generate the initial values of the fields in the form. But as soon as the first attribute is called, nil is returned, and that causes an error.

So how can we avoid this problem?

Rails creates the @ad variable with a default value of nil, or no value. So there are no other attributes available, like @ad.name.

@ad = nil

```
<h1>New ad</h1>
<% form_for(@ad, :url=>{:action=>'create'}) do |f| %>
  <p><b>Name</b><br /><%= f.text_field :name %></p>
  <p><b>Description</b><br /><%= f.text_area :description %></p>
  <p><b>Price</b><br /><%= f.text_field :price %></p>
  <p><b>Seller</b><br /><%= f.text_field :seller_id %></p>
  <p><b>Email</b><br /><%= f.text_field :email %></p>
  <p><b>Img url</b><br /><%= f.text_field :img_url %></p>
<% end %>
```

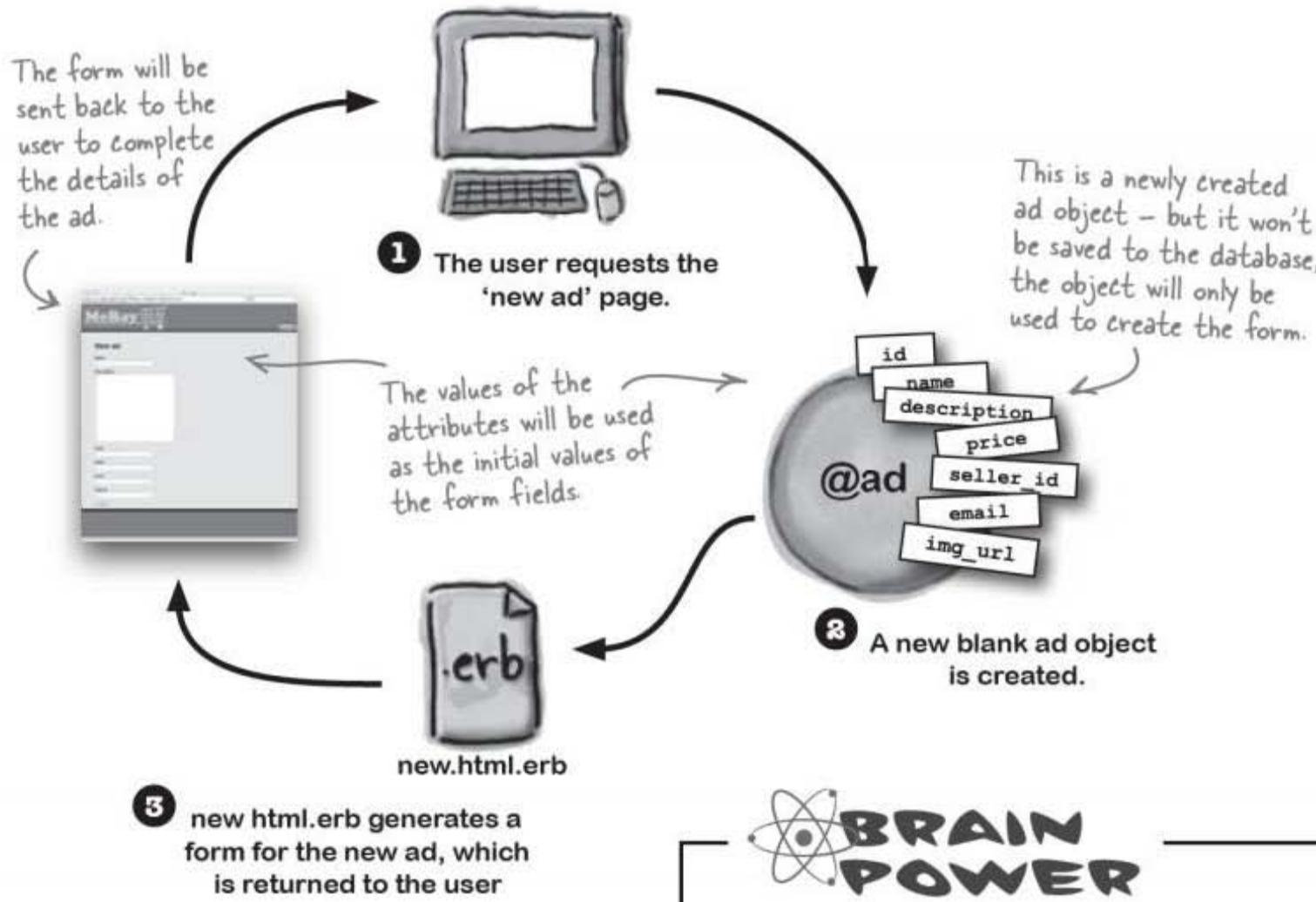
The initial value of each of the fields will access the matching attribute on @ad. But because @ad is set to nil, this causes an error.

The form object needs to be created before the form is displayed

When the page with the form is generated, the initial values of each of the form fields will come from one of the attributes of the associated object.

Can you think what the problem is with that?

The problem is that before the form can be generated, the new ad object *needs to already exist*. Of course, until the user completes the details of the ad, the object won't be saved to the database—but even so, the object needs to be created *before* the page template is called.



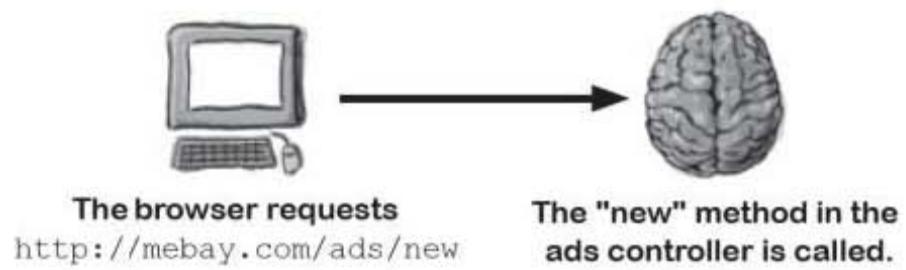
BRAIN POWER

Where in the application would you create the new ad object? If it's a template or method, what would it be called?

The forms ad object will be created in the new action of the controller

- ① The forms ad object needs to be created before the `new.html.erb` page template is run.

If you create the object in a controller method called `new`, this will be run *before* the `new.html.erb` template is called.

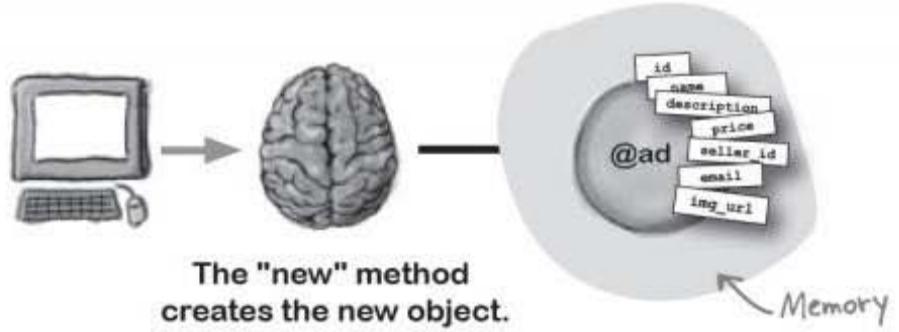


If you create a method called "new" in the controller, the method will be called by Rails before calling the `new.html.erb` template.

```
def new
  ...
end
```

- ② So how do you create a new ad object?

`Ad.new` returns a new object that you can assign to the `@ad` variable. The new object won't be saved automatically to the database, but you only need it in memory where it can be used to generate the HTML form.

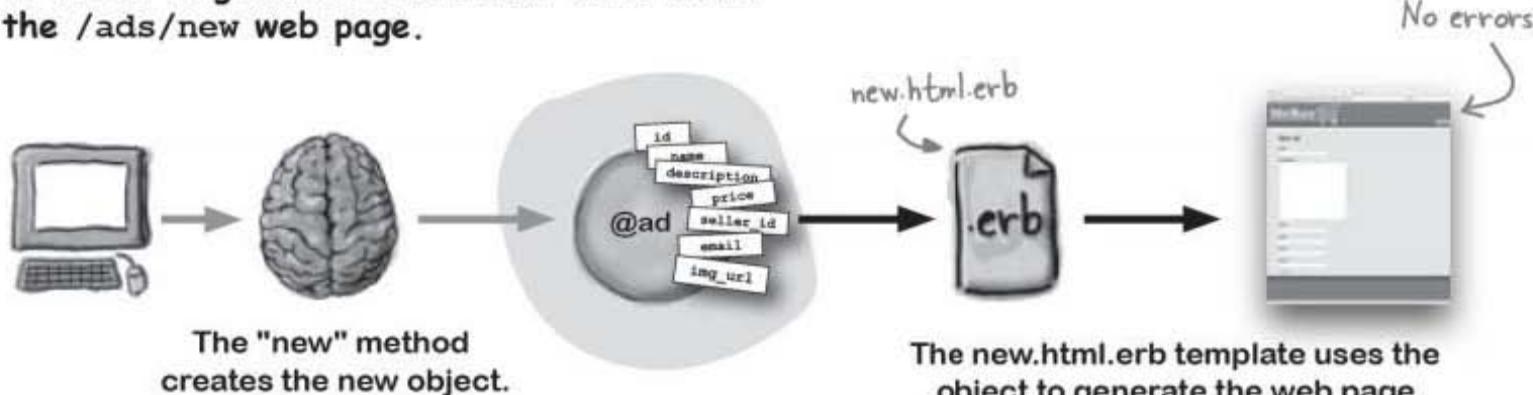


You need to add this code to the controller.

```
def new
  @ad = Ad.new
end
```

The attributes in the new object will all default to nil

- ③ Now that the object is assigned to the `@ad` variable in memory, `new.html.erb` will be able to use it to generate the HTML form within the `/ads/new` web page.



Each page template now has a matching controller method

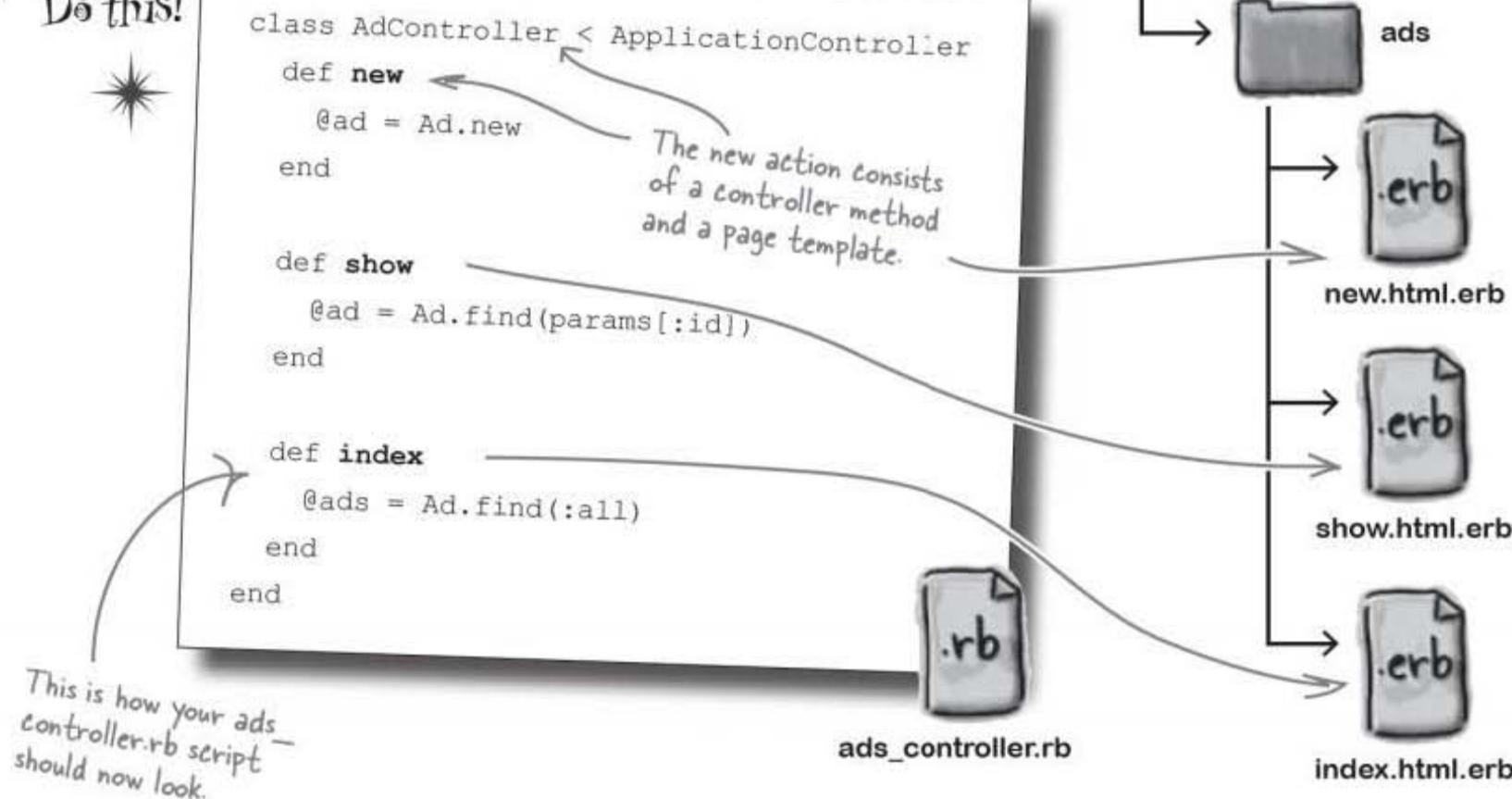
The ads controller now has one method for each of the page template files. Rails will always call the controller method before generating a page from the page template.

It's the **combination** of a controller method and a page template that make up an **action**. That's why the action name appears in the name of the controller method *and* in name of the page template file.

An action is a controller method and a page template.



Do this!



Now you have the controller creating the new ad object before the new.html.erb page template runs, it's time to see if the code works.



Test DRIVE

With the controller code in place, it's time to try the application again by opening a browser at:

`http://localhost:3000/ads/new`

Now enter some data:

The figure consists of two screenshots of a web browser. The left screenshot shows a 'New ad' form with fields for Name, Description, Price, Seller, Email, and Img url. A callout points to the Description field with the text 'So now you can enter data...'. Another callout points to the 'Create' button with the text 'When you've done that, save the ad by clicking the "Create" button.' The right screenshot shows an 'Unknown action' error page with the message 'No action responded to create'. A callout points to the error message with the text 'The page displays perfectly!'.

The form page displays perfectly, but when you enter some data and submit the form, Rails returns an error telling you that you haven't written a create action. The create action? That was the action you decided would receive the ad from the form.

What will this action need to do? It'll read the data from the form and use it to create a new ad.

But what does the form send back to the application?

The form doesn't send an object back, it sends DATA back

The form was generated using an Ad object. But what exactly does the form send back to the server when the form's submitted?

Because the form uses HTTP, it can't send the form object over the network. Instead it sends data.

But how is the data FORMATTED?

Think back to how routing works. When a request arrives, Rails sends the details of the request to the routing system, which inserts values into a data structure called `params [...]`, with values for the action and the controller.

The `params [...]` data structure wasn't created just for routing. It can also be used to store any data submitted to the application by a web form.

A form's fields are recorded in the `params [...]` table along with the name `:ad`. Then, the value of the `:ad` variable is actually *another* table of values, a table that maps a field *name* to a field *value*:

The params "hash" table.

Name	Value														
<code>:controller</code>	'ads'														
<code>:action</code>	'create'														
<code>:ad</code>	<table border="1"> <thead> <tr> <th>Name</th><th>Value</th></tr> </thead> <tbody> <tr> <td><code>:name</code></td><td>Leather boot</td></tr> <tr> <td><code>:description</code></td><td>Suit person with left foot</td></tr> <tr> <td><code>:price</code></td><td>1.0</td></tr> <tr> <td><code>:seller_id</code></td><td>242</td></tr> <tr> <td><code>:email</code></td><td>bert@hotmail.com</td></tr> <tr> <td><code>:img_url</code></td><td>http://www.javaranch.com/images/boot.gif</td></tr> </tbody> </table>	Name	Value	<code>:name</code>	Leather boot	<code>:description</code>	Suit person with left foot	<code>:price</code>	1.0	<code>:seller_id</code>	242	<code>:email</code>	bert@hotmail.com	<code>:img_url</code>	http://www.javaranch.com/images/boot.gif
Name	Value														
<code>:name</code>	Leather boot														
<code>:description</code>	Suit person with left foot														
<code>:price</code>	1.0														
<code>:seller_id</code>	242														
<code>:email</code>	bert@hotmail.com														
<code>:img_url</code>	http://www.javaranch.com/images/boot.gif														

The value of the `:ad` parameter is another hash table.

Actually the data structure is more properly called a Hash, or an Associative Array.

This is the answer to the Brain Barbell exercise a few pages back.

The value of the `:ad` variable is the `params[:ad]` table.

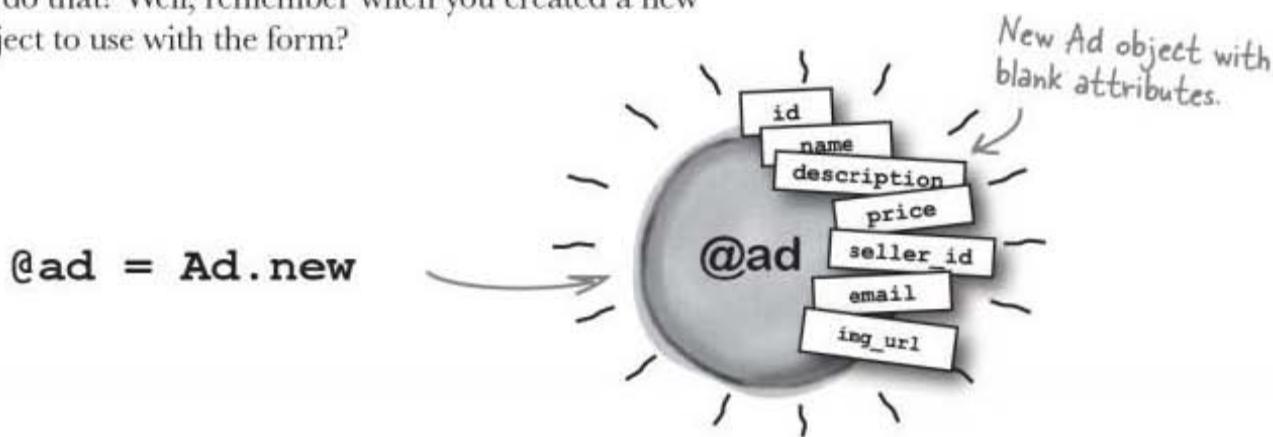
But what happens to this data when the controller receives it? And how can we actually USE this data?

Rails needs to convert the data into an object before it can be saved

Rails can only use objects to talk to the database, so before an ad can be saved to the database, you need to find some way to convert the form data into an Ad object.

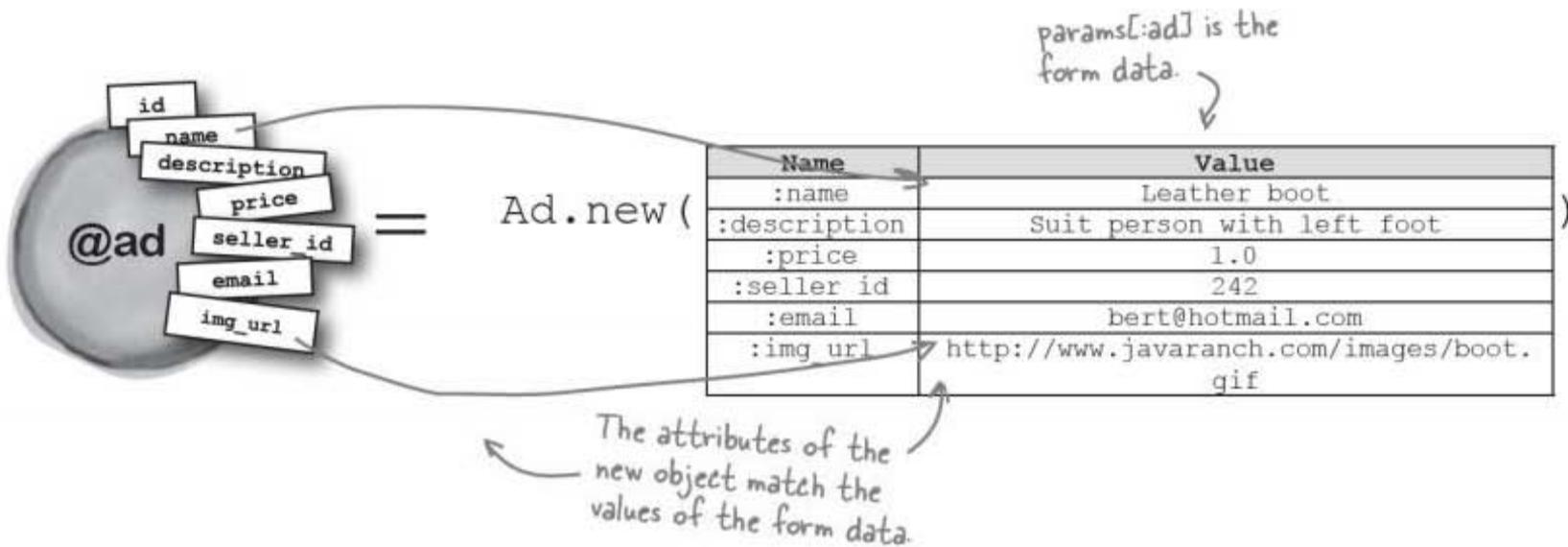
The model can create objects from raw form data

How do you do that? Well, remember when you created a new blank Ad object to use with the form?



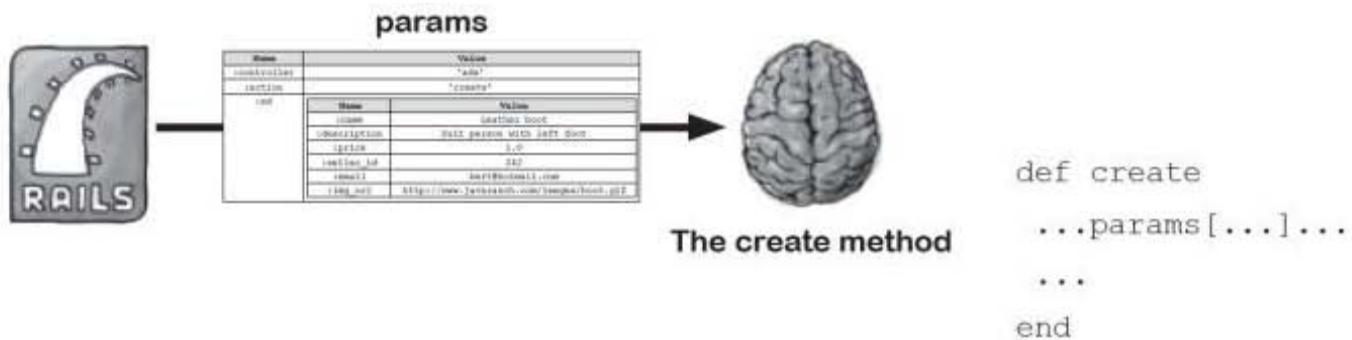
The Ad.new method can also be called with a set of hash table of values that will be used to initialize the attributes of the new Ad object. And the form data just happens to be contained in a hash object:

```
@ad = Ad.new(params[:ad])
```

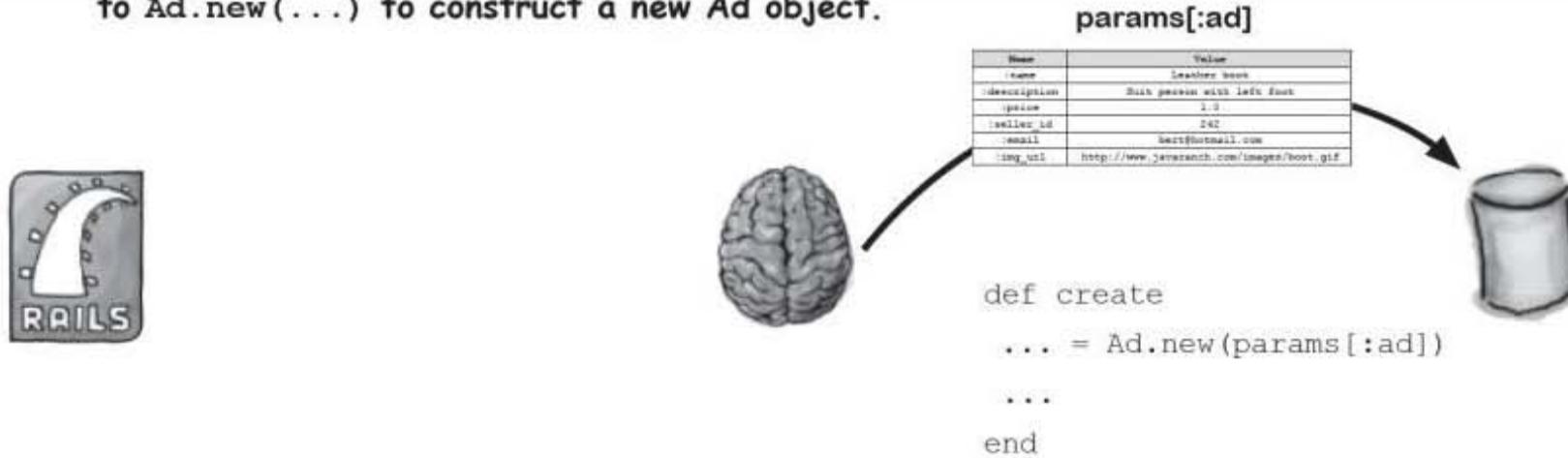


The controller create method, step-by-step

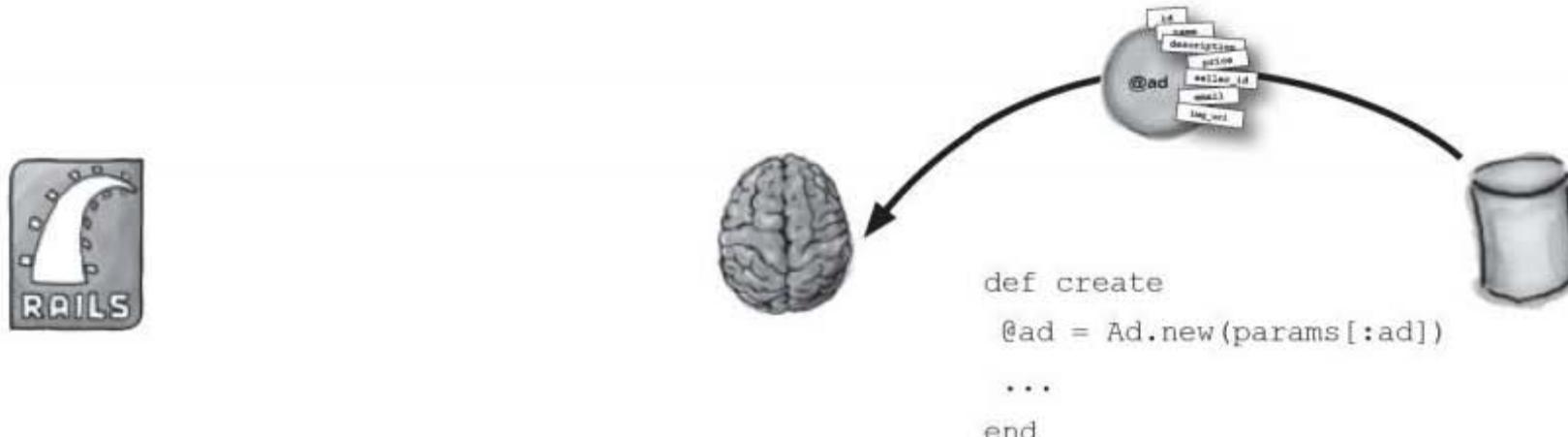
- 1** Rails sends the form data to the controller using the params[...] hash.



- 2** The controller can read the raw form data by looking at params[:ad]. It can then send this value to Ad.new(...) to construct a new Ad object.



- 3** The Ad object that is returned by Ad.new(...) has attributes that match the values in the form fields.



saving the record

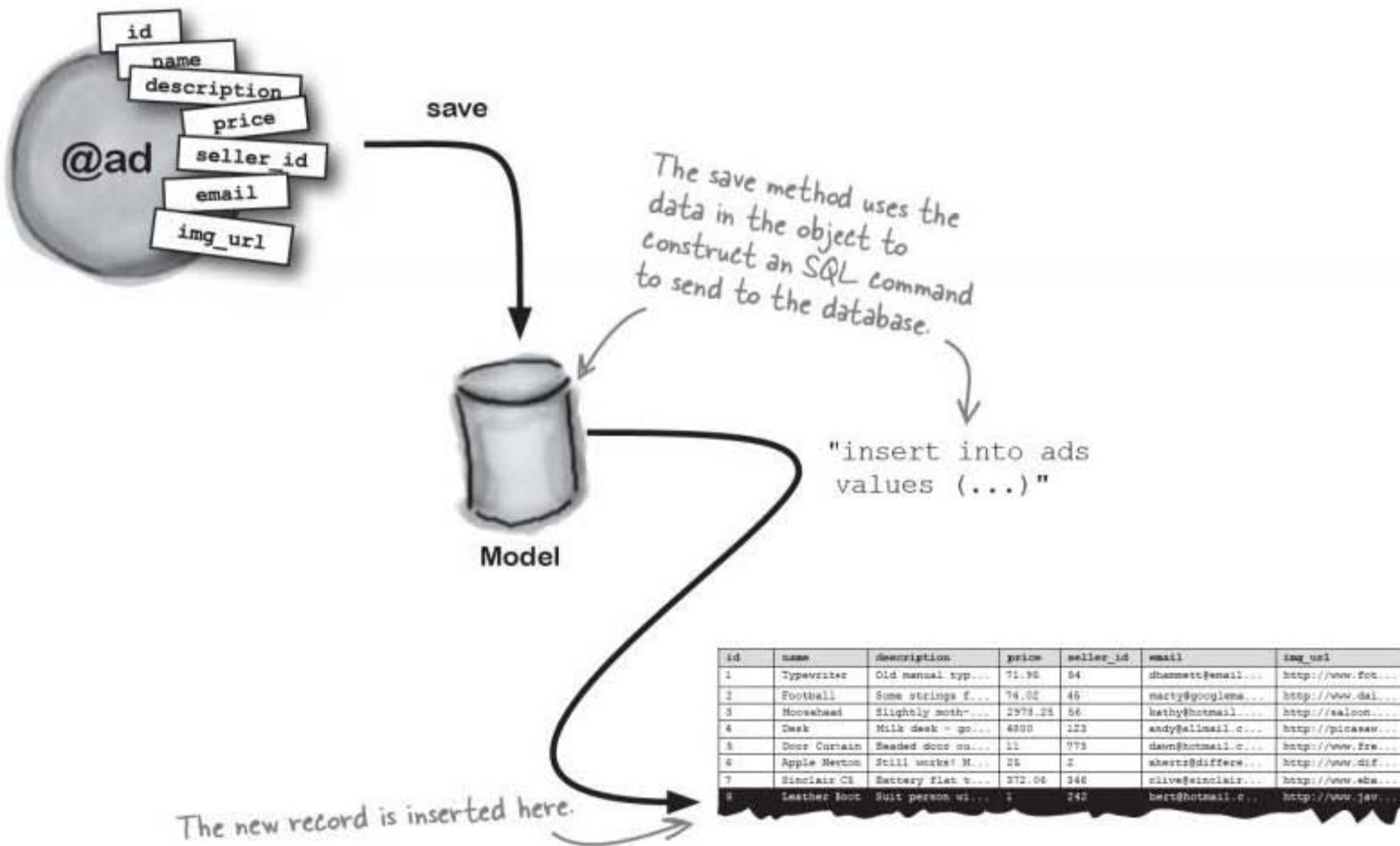
The controller needs to save the record

The whole reason for converting the form data into an object was so you could save it.

How do you do that? With

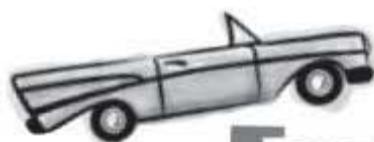
```
@ad.save
```

When save is called on the model object, Rails inspects the attributes and generates a SQL insert statement to update the database:



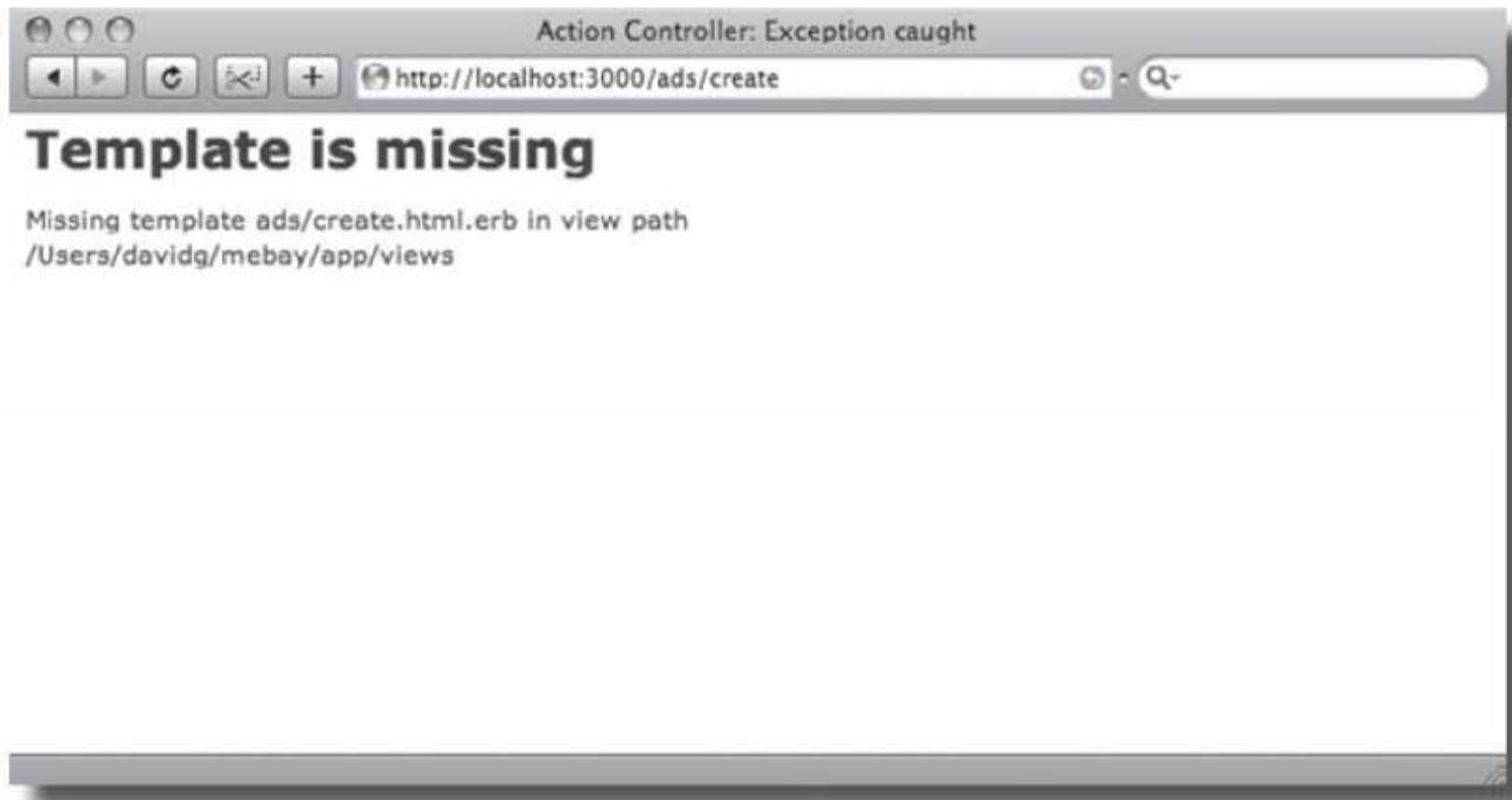
With the save in place, the controller's create method is complete:

```
def create
  @ad=Ad.new(params[:ad])
  @ad.save
end
```



Test DRIVE

Update your controller's create method, and try out the updated ad creation form. When you click Create, an error page is sent back complaining about a missing template:



Sharpen your pencil

1. Was the record you created saved?

.....

2. What do you need to do to fix this new error?

.....

.....

.....



Sharpen your pencil Solution

1. Was the record you created saved?

The data was saved and so the new ad was created.

2. What do you need to do to fix this new error?

*There was no template available to generate a response to
confirm the record was saved - so a create.html.erb page
needs to be created.*

Rails was complaining because it had no way of generating a RESPONSE to your request

HTTP works using **pairs** of requests and responses. For every request, there's got to be a response.

When the controller's create method completed, a new record was created successfully. Then Rails needed to generate a response page, so it looked for the page template that matched the current action. The current action was `create` so it looked for `create.html.erb`. But that template doesn't exist!

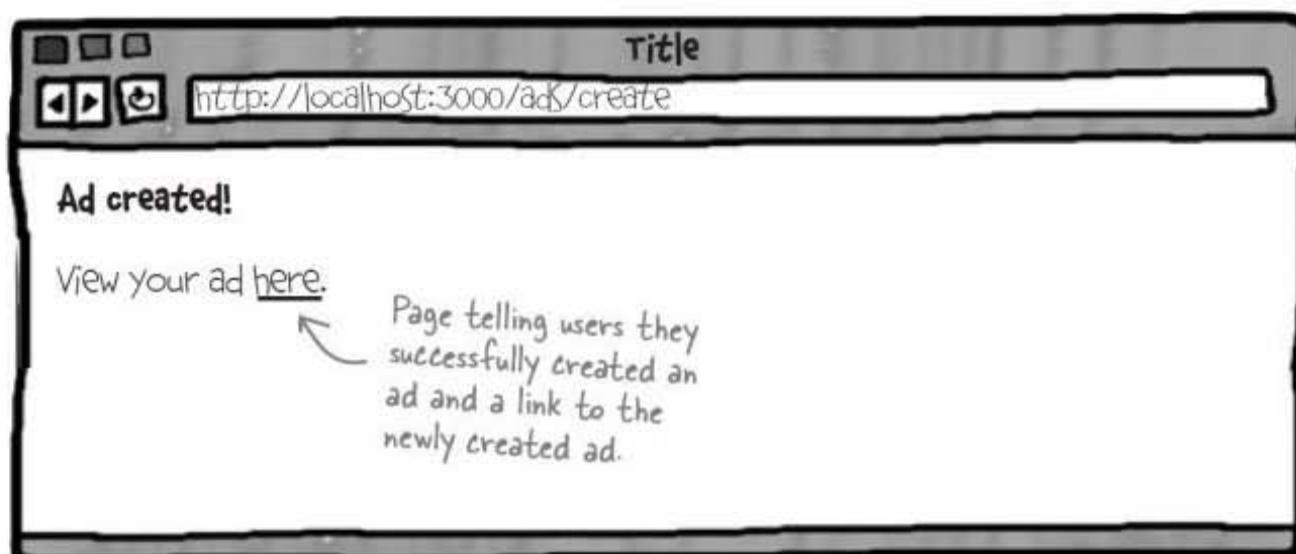


So we need to write a `create.html.erb` page template. But what should the template have in it?



Exercise

Create a `create.html.erb` file to tell users that the record has been created and provide a link to the new record.



here's your response, ma'am



You should have created a `create.html.erb` file to confirm that the record's been created and to provide a link to the new record.



Your HTML may look a little different than this. That's okay as long as you got in the expressions that give the page title and link to the new ad.

`<h1>Ad created!</h1>`

`View your ad <a href="/ads/<%= @ad.id %>">here`

This is painfully simple, because of our super-template that provides most of the formatting and markup.

The variable `@ad` points to the newly inserted object.

Path to the newly created ad.



Test DRIVE

Now that you have the `create.html.erb` page template in place, it's time to try out the application.

The figure consists of three side-by-side screenshots of a web browser displaying the MeBay application. The first screenshot shows a 'New ad' form with fields for Name, Description, Price, Seller, Email, and Img url. A callout bubble says: 'Enter some data, hit the create button and you get...'. An arrow points from the 'Create' button to the second screenshot. The second screenshot shows a confirmation message: 'Ad created! View your ad here' with a link. A callout bubble says: '...a confirmation page generated by create.html.erb.'. An arrow points from the confirmation link to the third screenshot. The third screenshot shows the details of a newly created advertisement: 'Name: Leather boot', 'Description: Black leather boot with left foot', 'Price: 1.0', 'Seller: 10.012', 'Email: deadbeet@hotmail.com', and an image of a boot. A callout bubble says: 'And the confirmation page links to the page for the newly created ad.' An arrow points from the advertisement link back to the confirmation page.

Soon the users have posted dozens of new ads. But even though it's really popular, some people have one small complaint...



Why does it show me a confirmation page with a link to my new ad? Why not go straight to the ad?

BRAIN POWER

Is there a problem showing a link to the new ad in the create page?

If so, what is it?

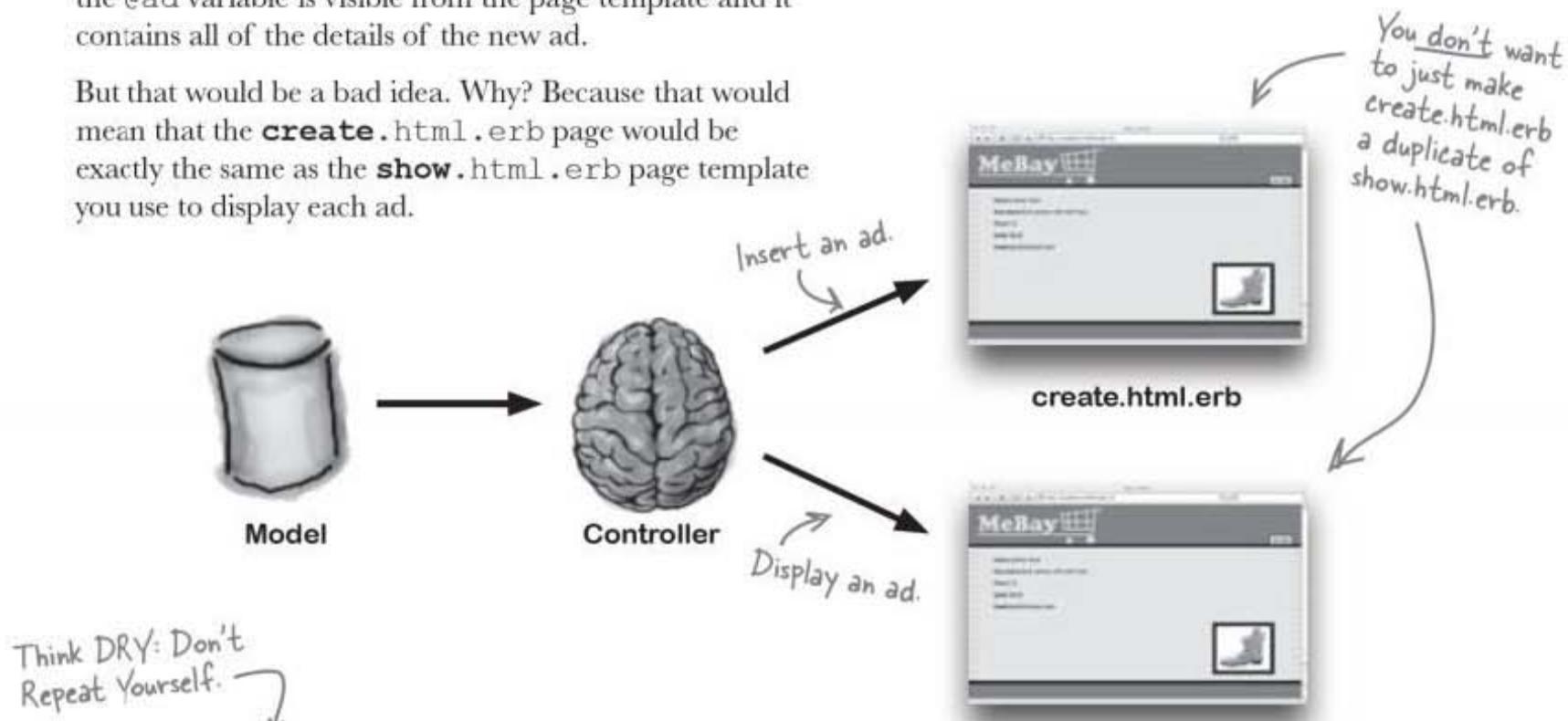
reuse existing templates

Don't create a new page, use an existing one

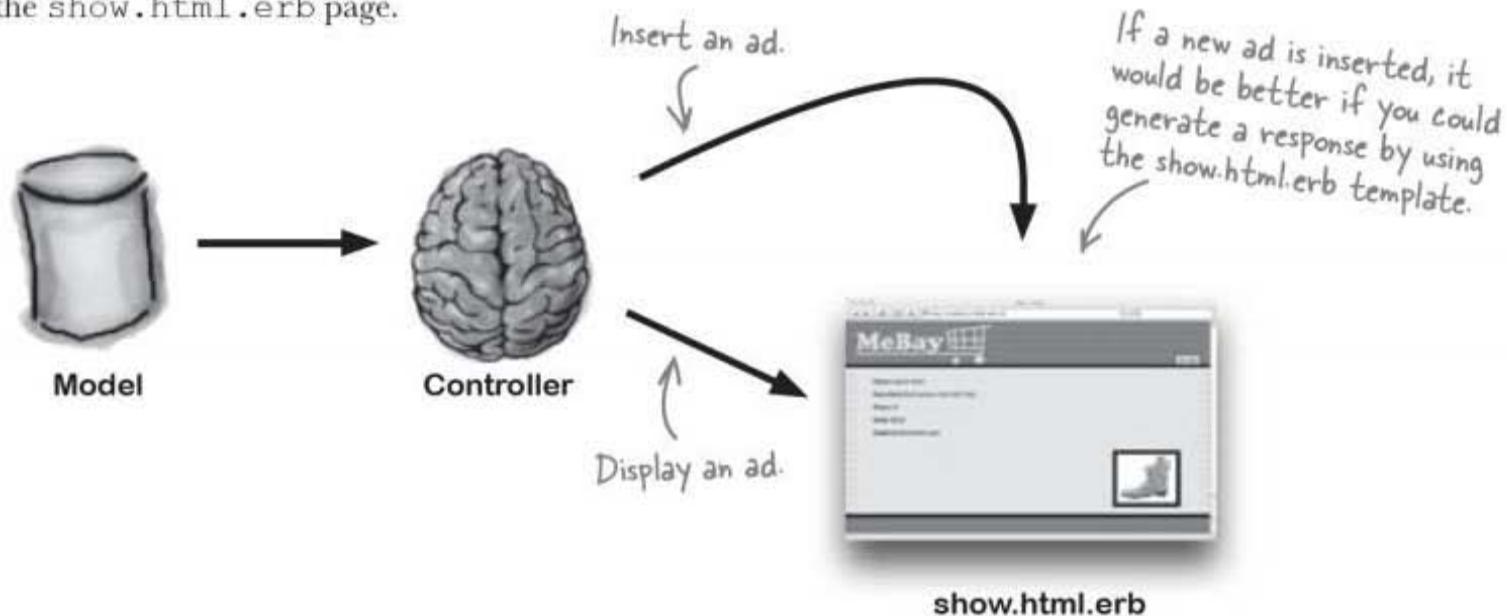
The users don't want to see the intervening confirmation page generated by `create.html.erb`. They just want to go straight to their ad. So what do you do?

You could edit the `create.html.erb` page template so that it displays all of the new ad's details, right? After all, the `@ad` variable is visible from the page template and it contains all of the details of the new ad.

But that would be a bad idea. Why? Because that would mean that the `create.html.erb` page would be exactly the same as the `show.html.erb` page template you use to display each ad.



That's **duplication**, and it would mean you had more code to maintain in the future. It would be much better if the `create` action in the controller can choose to **display** the `show.html.erb` page.



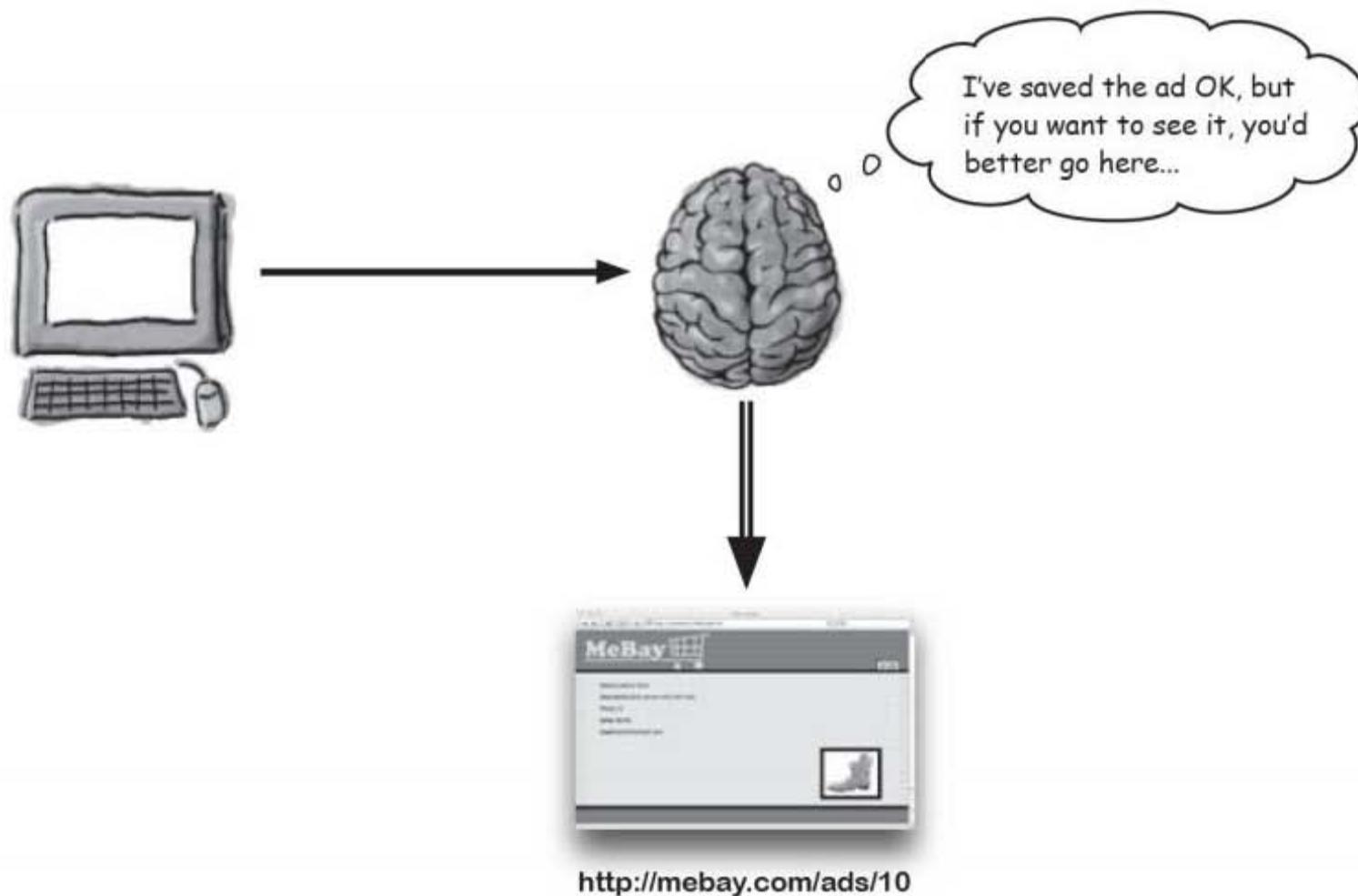
But how can a controller action display ANOTHER action's page?

A **controller method** works together with a template to form an action. In all of the examples you've seen so far, both the controller method and the page template have been exclusively used for one action.

That's why the controller methods and the page templates have included the action name somehow. When you were performing a show action, you used the show method in the ad controller and the show.html.erb page template.

And we still want to use a controller method and a page template to complete the action, but now we want to be able to *choose* which page template gets called with the controller.

**A controller action is
a controller method
and a page template.**

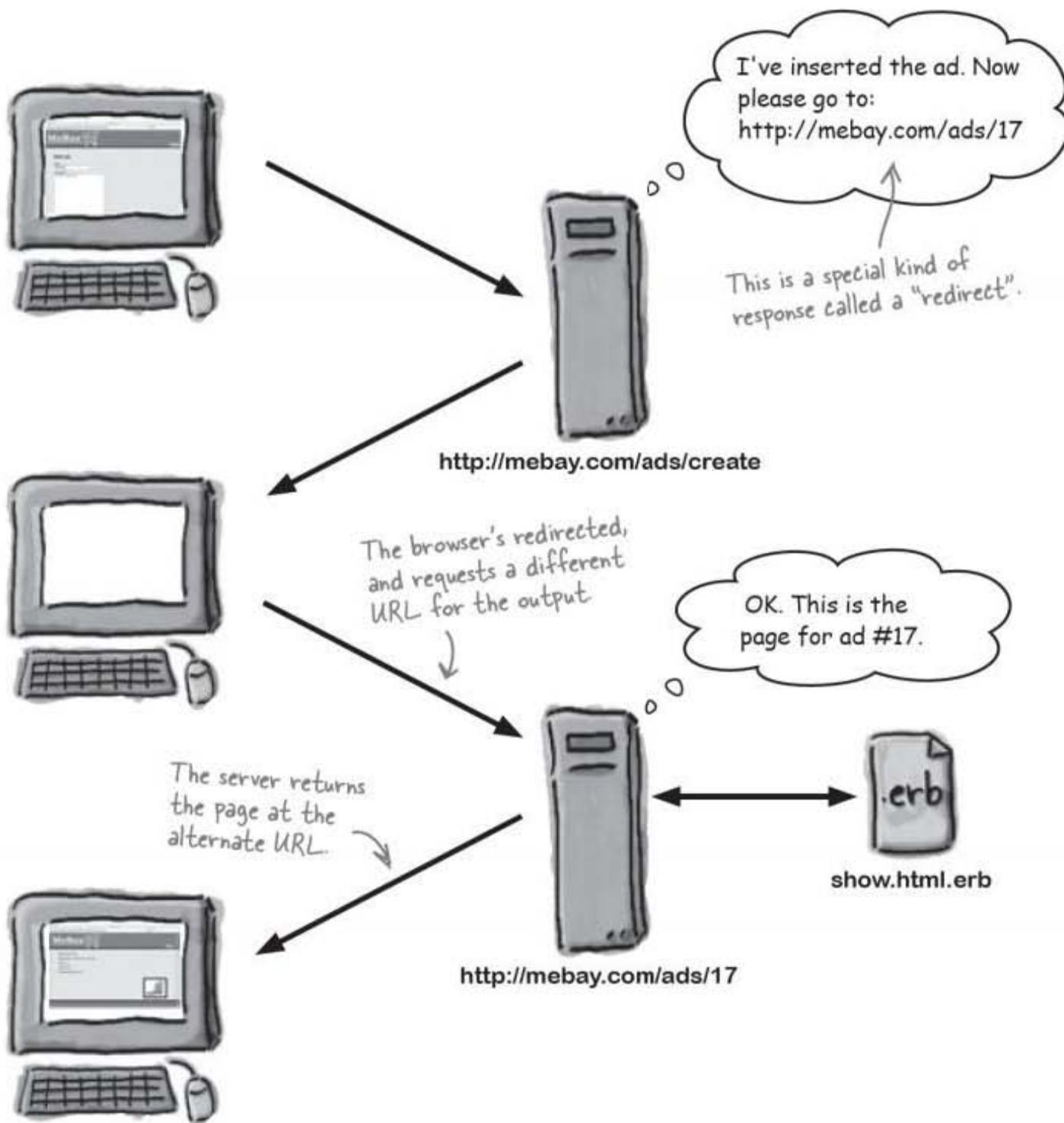


We need a way for the controller to say that the output is found at a different URL.

redirect to another url

Redirects let the controller specify which view is displayed

A **redirect** is a special kind of response from the Rails application to the browser. A redirect tells the browser to go to a *different* URL for output. So even though the browser sent the form data to /ads/create, a redirect sends the browser to ads/17 (for example, if 17 is the id number of the new ad).





Sharpen your pencil

The `redirect` command will forward the browser to the URL of the new ad. Fill in the URL:

```
def create
  @ad = Ad.new(params[:ad])
  @ad.save
  redirect_to "/...../#{.....}"
end
```

there are no Dumb Questions

Q: You said that a `redirect` is a special type of response. Is it really a response?

A: Yes. There are several types of responses. Ordinarily, a response contains information for the browser to display, but other responses—like redirects—contain special instructions for the browser. A redirect is a special instruction that tells a browser to go to a different URL.

Q: So if a browser is redirected, does the URL in its address bar change?

A: You got it. Even though the browser made a request for a particular URL, the address bar will update to show the URL the browser ended up at.

Q: If I make a mistake in my code, could I redirect the browser in some sort of infinite loop of redirects?

A: No, because browsers have limits about the number of redirects they will follow. If your code sent continual redirects, the browser would get bored, stop following the redirects, and display an error message.

Q: If I set `@ad` to an object and then redirect to a different URL, will the new URL see my `@ad` object?

A: Good question! No, it won't. Once you've redirected to another address, none of the variables assigned by your controller will be visible at that new address.

Q: Can I redirect to an address outside my application?

A: Sure. A redirect is simply a command to the browser to go to a specified URL. If you want to redirect to an external website, go for it.

Q: When would I want to do a redirect?

A: You might do a redirect in order to re-use a page that displays information. That's why you're redirecting in the MeBay application. But it's also a good idea to redirect after you've made an amendment to the database.

Q: Why's that?

A: It's a good idea to split actions into two categories: `update` actions and `display` actions. An update action will change what's on the database and then redirect to a display action. That way, if someone enters a record, then clicks refresh on the next page, they will only be refreshing a display page, and not reinserting the record.

Q: What do `#{}` mean in the redirect string?

A: Ruby strings can include Ruby expressions—like Ruby names. By placing them between `#{}` you're telling Ruby to replace the expression with its value.

Q: `params [. . .]` looks a little like an array. Is it?

A: `params` is designed to work like an "associative array"—otherwise known as a "hash". A hash is a special type of array that can be indexed by things other than numbers.

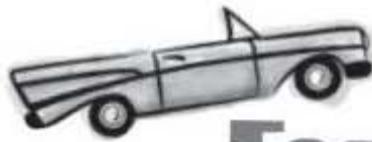
create, read, and now update



The redirect command will forward the browser to the URL of the new ad. Fill in the URL:

```
def create
  @ad = Ad.new(params[:ad])
  @ad.save
  redirect_to "/ads/#{@ad.id}"
end
```

A #-symbol and {} inserts the value of a variable into a string.



Test DRIVE

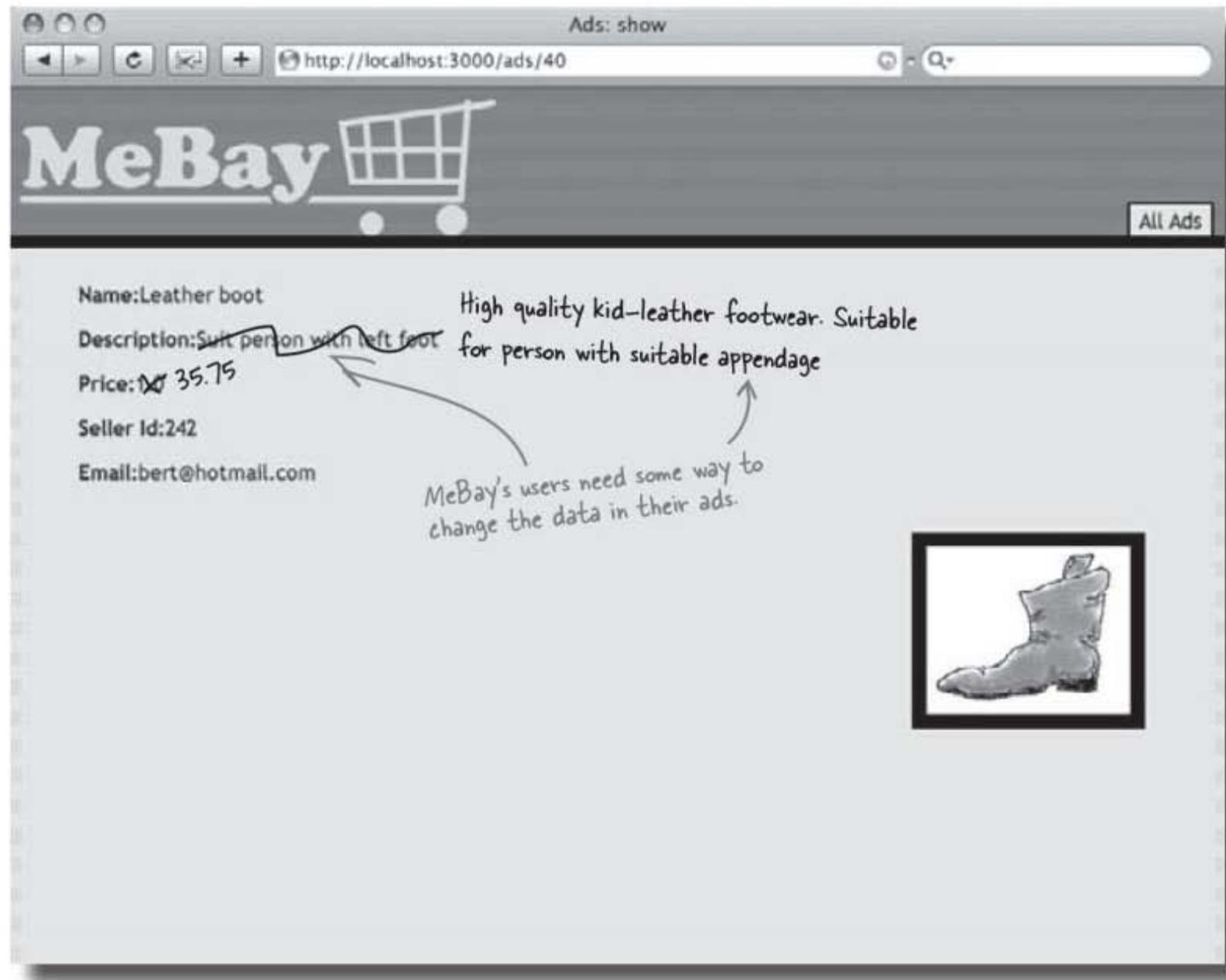
Go ahead and update your controller. Now it's time to see if our redirect sends users to their newly created ads:



When a new ad is created the browser automatically jumps to the new page.

But what if an ad needs to be amended after it's been posted?

Some users have made mistakes in their ad creations, and want to make changes to their ads. So they want more than just display and creation forms. Users now want to be able to **edit** their ads.



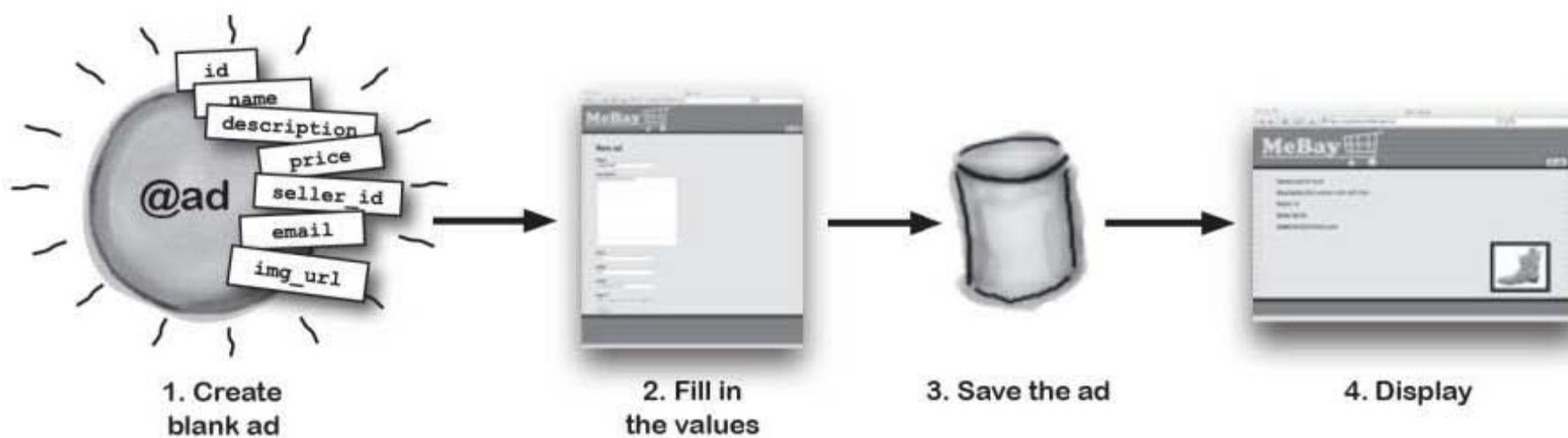
This means the system need to allow updates as well as inserts. Will that be difficult to do?

Updating an ad is just like creating one... only different

Even though the system can't currently edit ads, will it be a lot of work to add an editing feature?

Think for a moment about the sequence the system goes through to insert an ad into the system:

- ➊ A new blank ad object gets **created** and this is used to generate the ad **input** form.
- ➋ The form is sent to the user, who **updates** the field values and submits the form back to the application
- ➌ The data fields are converted back into an Ad object, which is **saved** to the database.
- ➍ The user is forwarded to a page displaying the **new** ad.



Suppose you want to change a page. What would you expect to see? Maybe a form with the ad details that you can re-submit and have the changes saved, which is kind of the same sequence you used to create ads. Let's look at the change sequence in more detail...

Instead of creating an ad, you need to find one; instead of saving it, you need to update the ad

When someone edits an ad, they'll use a form just like before. The user will change the details and the ad data will be saved. So just how similar is the change sequence to the creation sequence?

- 1 An existing ad is **read** from the database, and this ad will be used to generate the **change** form.
- 2 The form is sent to the user, who updates the field values and submits the form back to the application.
- 3 The data fields are converted back into an Ad object, which is used to **update** the database.
- 4 The user is forwarded to a page displaying the **updated** ad.



You can see that the sequence between the two operations barely differs at all. In the **creation** sequence, a **new** ad object is **created** and **saved** to the database. In the **change** sequence an **existing** ad is **read**, **updated**, and **saved** to the database.

So you need to make sure you take the differences between the two operations into account. You'll need to keep track of things like the ad id number in the change sequence.

Do you think you could add an edit feature to the application as it stands?



Long Exercise

Add an edit link on each show page to a URL (like ads/17/edit) that calls a new `edit` action to look up the ad and display it in a form.

```
<p>
  <b>Name:</b><%= @ad.name %>
</p>
<p>
  <b>Description:</b><%= @ad.description %>
</p>
<p>
  <b>Price:</b><%= @ad.price %>
</p>
<p>
  <b>Seller Id:</b><%= @ad.seller_id %>
</p>
<p>
  <b>Email:</b><%= @ad.email %>
</p>
<p>
  
</p>
```

Add the "edit" link here.

Write the two routes here.

The form will submit its data to an action called `update` at a URL like `/ads/17/update`. Create the routes that would connect `/ads/17/edit` to the edit page and `/ads/17/update` to the update action, making sure the ad id number is stored in a request parameter called `:id` in each case.

Now create a new page template, `edit.html.erb`, to allow the user to edit the ad details. It's similar to `new.html.erb` except it displays the ad's name in the page heading and it will use the 'update' action instead of the 'create' action.

Write the edit.html.erb code here.

You'll need two action methods in the ad controller to provide data to the editing form and also to update the ad in the database. The `edit` method will provide data to the edit form, and the `update` method will update the database. Given that:

`@ad.update_attributes(.....)`

Write down the hash data structure containing the field values submitted from the form here.

—will update the `@ad` object on the database, write the code for the `edit` and `update` methods of the ad controller below:

Write the edit method here.

```
.....  
.....  
.....  
.....
```

Write the update method here.

```
.....  
.....  
.....  
.....
```



LONG Exercise Solution

Your job was to add an edit link on each show page to a URL (like ads/17/edit) that calls a new `edit` action to look up the ad and display it in a form.

```
<p>
  <b>Name:</b><%= @ad.name %>
</p>
<p>
  <b>Description:</b><%= @ad.description %>
</p>
<p>
  <b>Price:</b><%= @ad.price %>
</p>
<p>
  <b>Seller Id:</b><%= @ad.seller_id %>
</p>
<p>
  <b>Email:</b><%= @ad.email %>
</p>
<p>
  
</p>
<a href="/ads/<%= @ad.id %>/edit">Edit</a>
```

Add the "edit" link here.

Write the two routes here.

The form submits its data to an action called `update` at a URL like `/ads/17/update`. So you should have created the routes that would connect `/ads/17/edit` to the edit page and `/ads/17/update` to the update action, making sure the ad id number is stored in a request parameter called `:id` in each case:

```
map.connect '/ads/:id/edit', :controller=>'ads', :action=>'edit'
```

Make sure you insert

these routes *above*

```
map.connect '/ads/:id/update', :controller=>'ads', :action=>'update'
```

the other routes in your

config/routes.rb file

Your job was to create a new page template `edit.html.erb` to allow the user to edit the ad details. It's similar to `new.html.erb` except it displays the ad's name in the page heading and it will use the 'update' action instead of the 'create' action:

```
<h1>Editing <%= @ad.name %></h1>

<% form_for(@ad,:url=>{:action=>'update'}) do |f| %>
  <p><b>Name</b><br /><%= f.text_field :name %></p>
  <p><b>Description</b><br /><%= f.text_area :description %></p>
  <p><b>Price</b><br /><%= f.text_field :price %></p>
  <p><b>Seller</b><br /><%= f.text_field :seller_id %></p>
  <p><b>Email</b><br /><%= f.text_field :email %></p>
  <p><b>Img url</b><br /><%= f.text_field :img_url %></p>
  <p><%= f.submit "Update" %></p>
<% end %>
```

Don't worry if you didn't get everything right in this exercise. It was a pretty tough one. But read through the answers and check that you understand what's going on.

You need two action methods in the ad controller to provide data to the editing form and also to update the ad on the database. The `edit` method provides data to the edit form, and the `update` method updates the database. So given that:

```
@ad.update_attributes(...params[:ad]...)
```

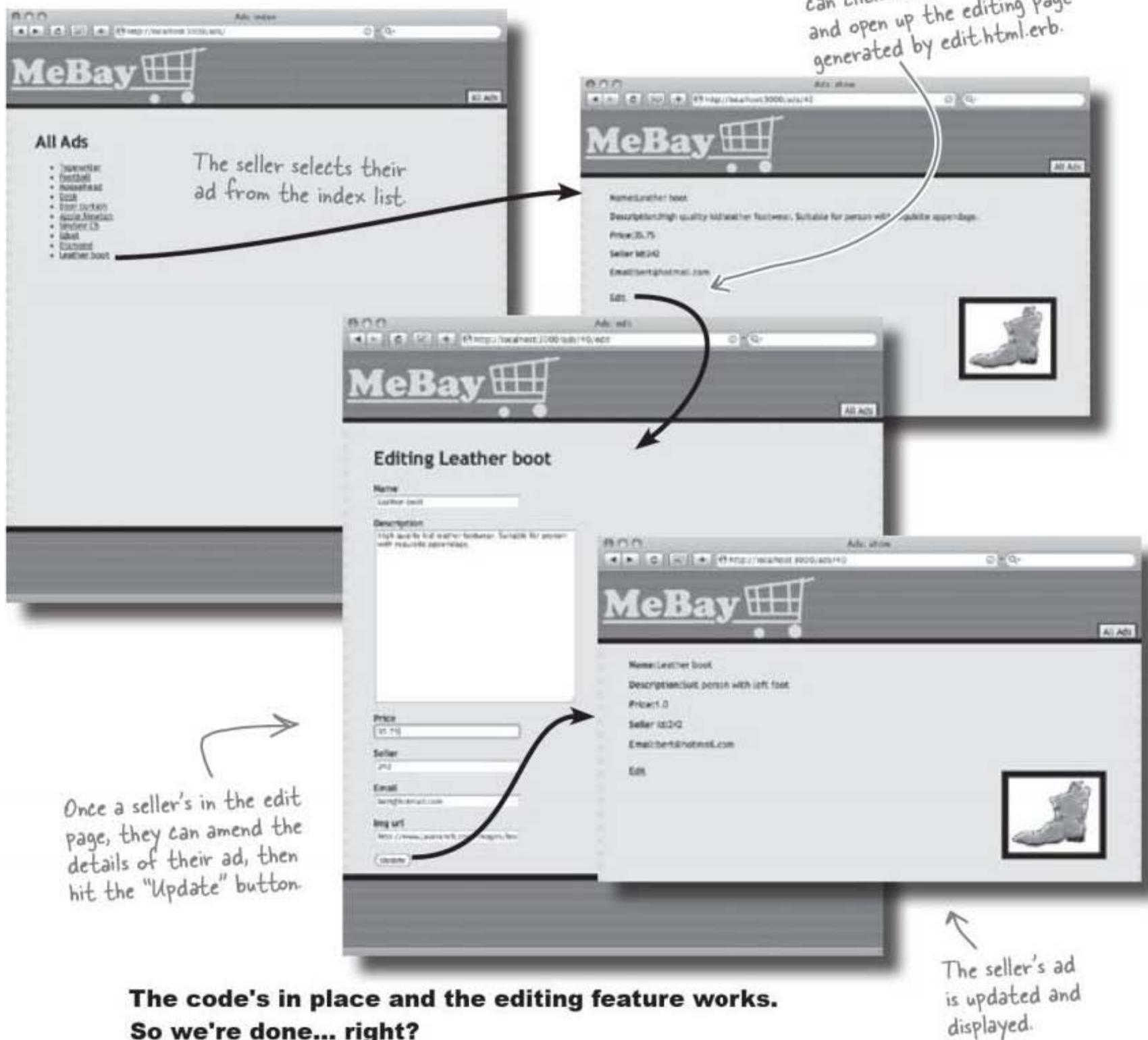
—updates the `@ad` object on the database, you wrote the code for the `edit` and `update` methods of the ad controller:

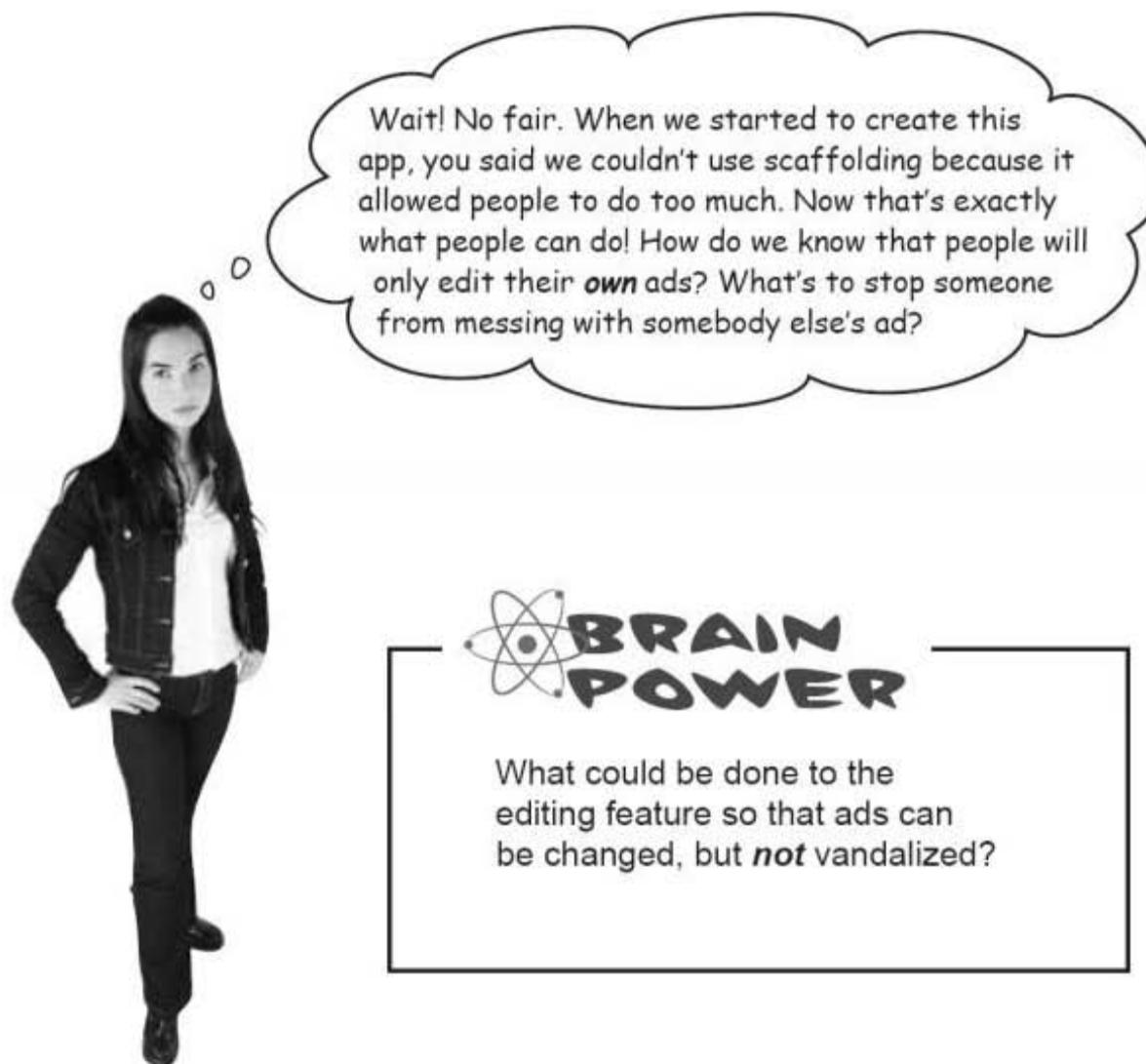
<pre>def edit @ad = Ad.find(params[:id]) end</pre>	<pre>def update @ad = Ad.find(params[:id]) @ad.update_attributes(params[:ad]) redirect_to "/ads/#{@ad.id}" end</pre>
--	--



Test DRIVE

The `edit.html.erb` page template is in place, as well as the routes and the additional methods in the ad controller. So now it's time to test the new editing feature:

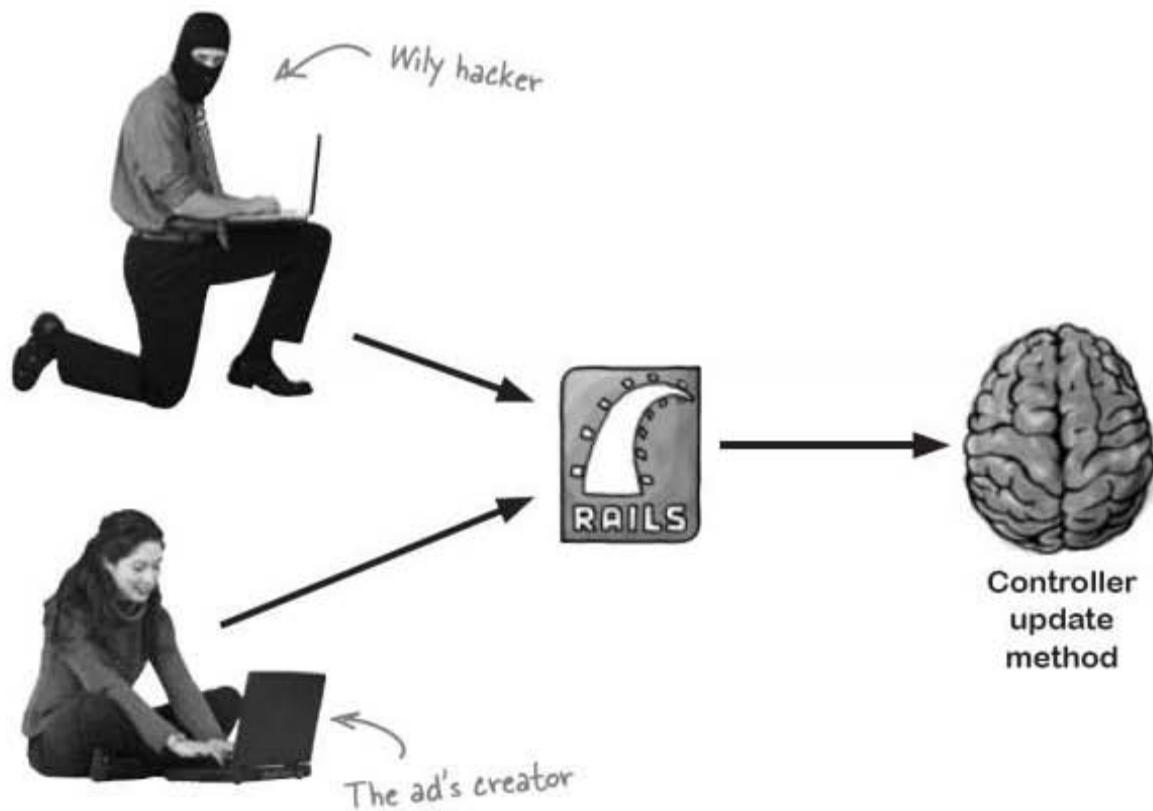




Restricting access to a function

The application can now *create* and *update* data. But that means anyone who can create an ad can update **all** ads. And that's a problem.

The MeBay owners want anyone to be able to create ads, but they don't want *everybody else* to be able to change the ad once it's been posted.



One way of preventing just anyone changing ads is to protect the update function with a username and password.

The guys at MeBay have decided that only *system administrators* will be able to change ads. So they want the new update functionality secured with an admin **username** and **password**.

Fortunately, Rails makes it really easy to drop security right in. We're going to use a special kind of web security called **HTTP Authentication**. This is the kind of security that pops up a dialog box and asks for a *username* and *password* when someone tries to enter a secure area of a web site.



Ready Bake Sign-In Code

To add login security to the application, you need to add **two** pieces of code to the ad controller: a **login method** that checks a username and password, and a **filter** that calls the login method whenever certain methods in the controller are accessed:

```
class AdController < ApplicationController
  before_filter :check_logged_in, :only => [:edit, :update]
  def new
    @ad = Ad.new
  end
  def create
    @ad = Ad.new(params[:ad])
    @ad.save
    redirect_to "/ads/#{@ad.id}"
  end
  def edit
    @ad = Ad.find(params[:id])
  end
  def update
    @ad = Ad.find(params[:id])
    @ad.update_attributes(params[:ad])
    redirect_to "/ads/#{@ad.id}"
  end
  def show
    @ad = Ad.find(params[:id])
  end
  def index
    @ads = Ad.find(:all)
  end
  private
  def check_logged_in
    authenticate_or_request_with_http_basic("Ads") do |username, password|
      username == "admin" && password == "t4k3th3r3dp11"
    end
  end
end
```

This is the controller with the login code added.

This is the filter.

You will only ask people to login if they try to access the "edit" or "update" methods.

The filter calls the check_logged_in method if someone tries to access the "edit" or "update" methods.

This is the name of the secured area of the web site - the "domain".

The username

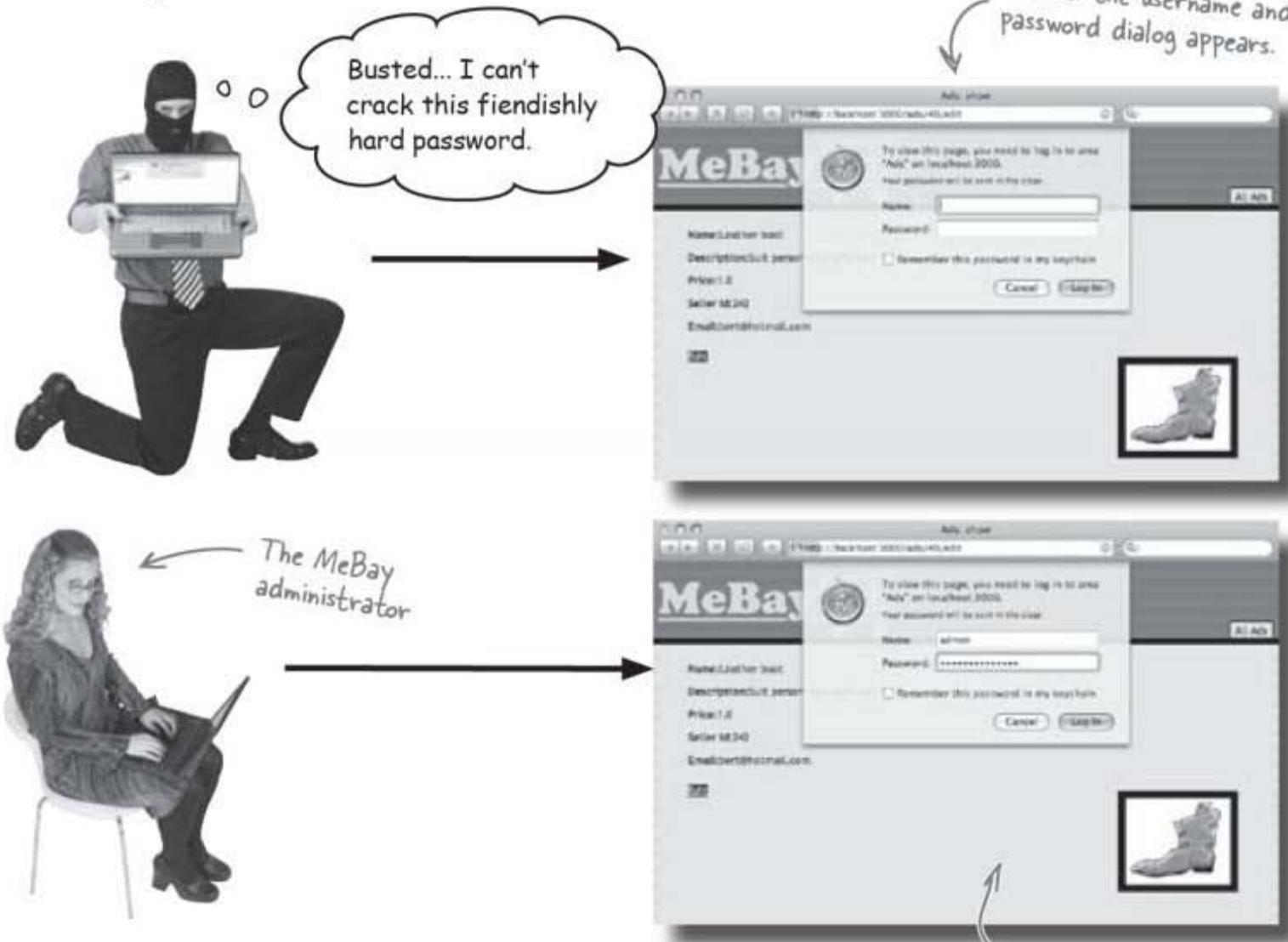
The password

stop the hackers



Test Drive

Now that the security code is in place, it's time to open up your browser and try to edit an ad.



Now only people who know the admin username and password can edit ads on the site. Nobody else can get at the edit page *or* the update function.

Is it important to secure both the page **and** the update function? The edit page should be off limits to prevent people accidentally accessing it and wasting their time entering data. Not only that, but the update function (the code that does the actual database update) also needs to be secure in case a hacker tries to access it directly without using the edit form.

You've manually built a system that can create, read, and update ads... and is secure!

... but now old ads need to be deleted

The site is up and running, and everything's going great, but after not too long there's a problem: even after stuff gets sold, the ads stay there.



Dude, I already sold both copies of my "Lawn Mower Man" DVDs, so why am I still getting requests for it? Is there no way to take my ad down?

MeBay *could* use their own data entry systems to remove ads from the site, but they were so impressed by how simple the change function was, they'd like you to add a delete function to the website.

The feature will only be available to MeBay administrators, so they want the same security that was applied to the change functionality. Also, because there's been a ton of spam as well as some spoof ads posted onto the site, they'd like to make the delete function easily available from the index page. That way they can remove inappropriate content with a single click.

Let's look at what we need to do...



LONG Exercise

Update `index.html.erb` to add a delete link next to each ad. If the ad has `id = 17`, then link to `/ads/17/delete`.

```
h1>All Ads</h1>
<ul>
<% for ad in @ads %>
  <li><a href="/ads/<%= ad.id %>"><%= ad.name %></a>
    [<a href=".....">Delete</a>]</li>
<% end %>
</ul>
```

.....
↑
Add the link here.

Create a route that will connect paths like `/ads/17/delete` to an action called `destroy` in the ad controller. Remember to record the id number as a request parameter.

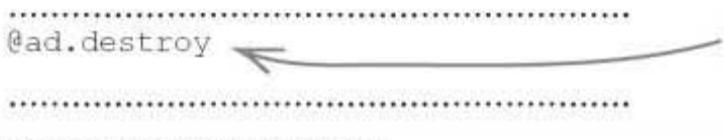
1

Write the route here.

Complete the ad controller code to delete an ad and send the user's browser back to the index listing all the remaining ads.

To do this you will need to use a method we have not seen yet—the “destroy” method. This will delete an ad object from the database.

```
class AdController < ApplicationController
  before_filter :check_logged_in, :only => [:edit, :update, .....]
  def new
    @ad = Ad.new
  end
  def create
    @ad = Ad.new(params[:ad])
    @ad.save
    redirect_to "/ads/#{@ad.id}"
  end
  def edit
    @ad = Ad.find(params[:id])
  end
  def update
    @ad = Ad.find(params[:id])
    @ad.update_attributes(params[:ad])
    redirect_to "/ads/#{@ad.id}"
  end
  def show
    @ad = Ad.find(params[:id])
  end
  def index
    @ads = Ad.find(:all)
  end
  .....
  .....
  .....
  private
  def check_logged_in
    authenticate_or_request_with_http_basic("Ads") do |username, password|
      username == "admin" && password == "t4k3th3r3dp11"
    end
  end
end
```



This will delete the @ad object from the database.

this is the hard one



Long Exercise Solution

You should have updated `index.html.erb` to add a delete link next to each ad.

```
<h1>All Ads</h1>
<ul>
<% for ad in @ads %>
  <li><a href="/ads/<%= ad.id %>"><%= ad.name %></a>
    [<a href="...../ads/<%= ad.id.%>/delete.....">Delete</a>]</li>
<% end %>
</ul>
```

The for loop means the ad is recorded by a variable called "ad".

You also should have created a route that connects paths like `/ads/17/delete` to an action called `destroy` in the ad controller. Record the id number as a request parameter:

```
map.connect '/ads/:id/delete', :controller=>'ads', :action=>'destroy'
```

Remember to insert this route above the other routes in `config/routes.rb` to make sure it doesn't get mixed up with the `"/ads/:id"` route.

This will store the id in a request parameter called `:id`.

This means the method in the controller will need to be called "destroy".

Your job here was to complete the ad controller code to delete an ad and send the user's browser back to the index listing all the remaining ads:

```

class AdController < ApplicationController
  before_filter :check_logged_in, :only => [:edit, :update, .....:destroy.....]
  def new
    @ad = Ad.new
  end
  def create
    @ad = Ad.new(params[:ad])
    @ad.save
    redirect_to "/ads/#{@ad.id}"
  end
  def edit
    @ad = Ad.find(params[:id])
  end
  def update
    @ad = Ad.find(params[:id])
    @ad.update_attributes(params[:ad])
    redirect_to "/ads/#{@ad.id}"
  end
  def show
    @ad = Ad.find(params[:id])
  end
  def index
    @ads = Ad.find(:all)
  end
  def destroy
    @ad = Ad.find(params[:id]) ← You need to read the ad object
    .....from the database using the id given in the path to the action...
    @ad.destroy ← ...then you need to
    redirect_to '/ads/' ← redirect the browser
    .....back to the index page.
  end
  private
  def check_logged_in
    authenticate_or_request_with_http_basic("Ads") do |username, password|
      username == "admin" && password == "t4k3th3r3dpill"
    end
  end
end

```

This will make sure people have to give a username and password if they try to delete an ad

You need to read the ad object from the database using the id given in the path to the action...

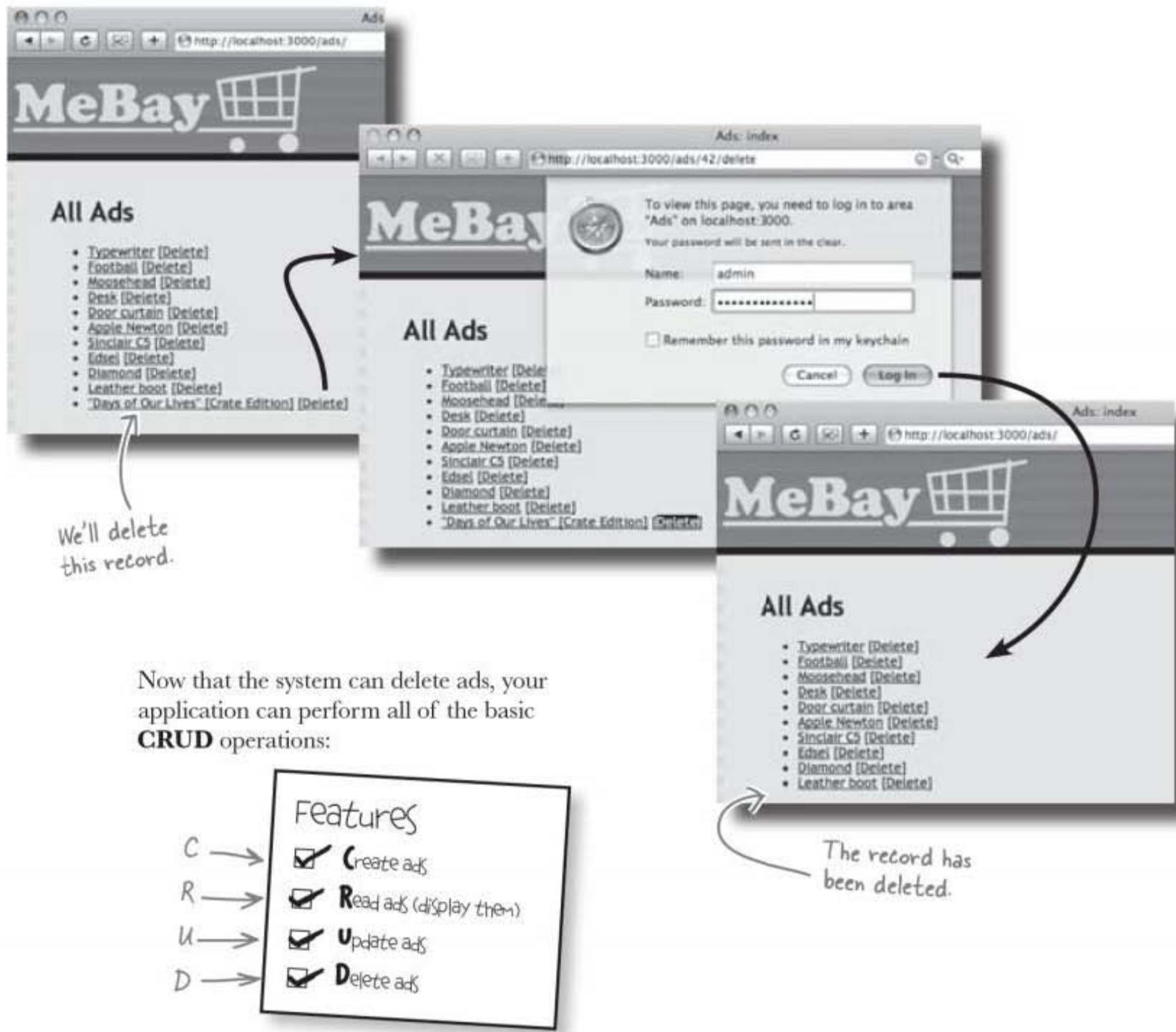
...then you need to redirect the browser back to the index page.

one more test drive

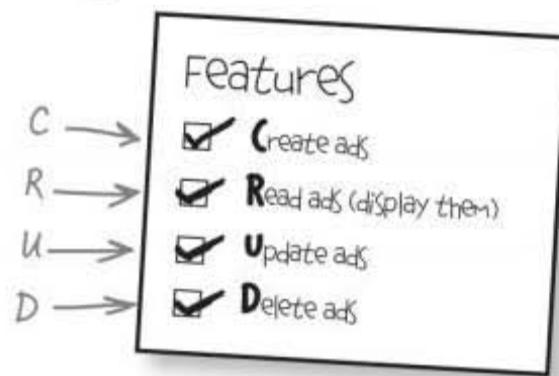


Test Drive

The destroy action means users can delete ads from the site with a single click. It uses the same security as the amend feature, so before anyone can delete an ad, they must first prove that they're an administrator.



Now that the system can delete ads, your application can perform all of the basic **CRUD** operations:



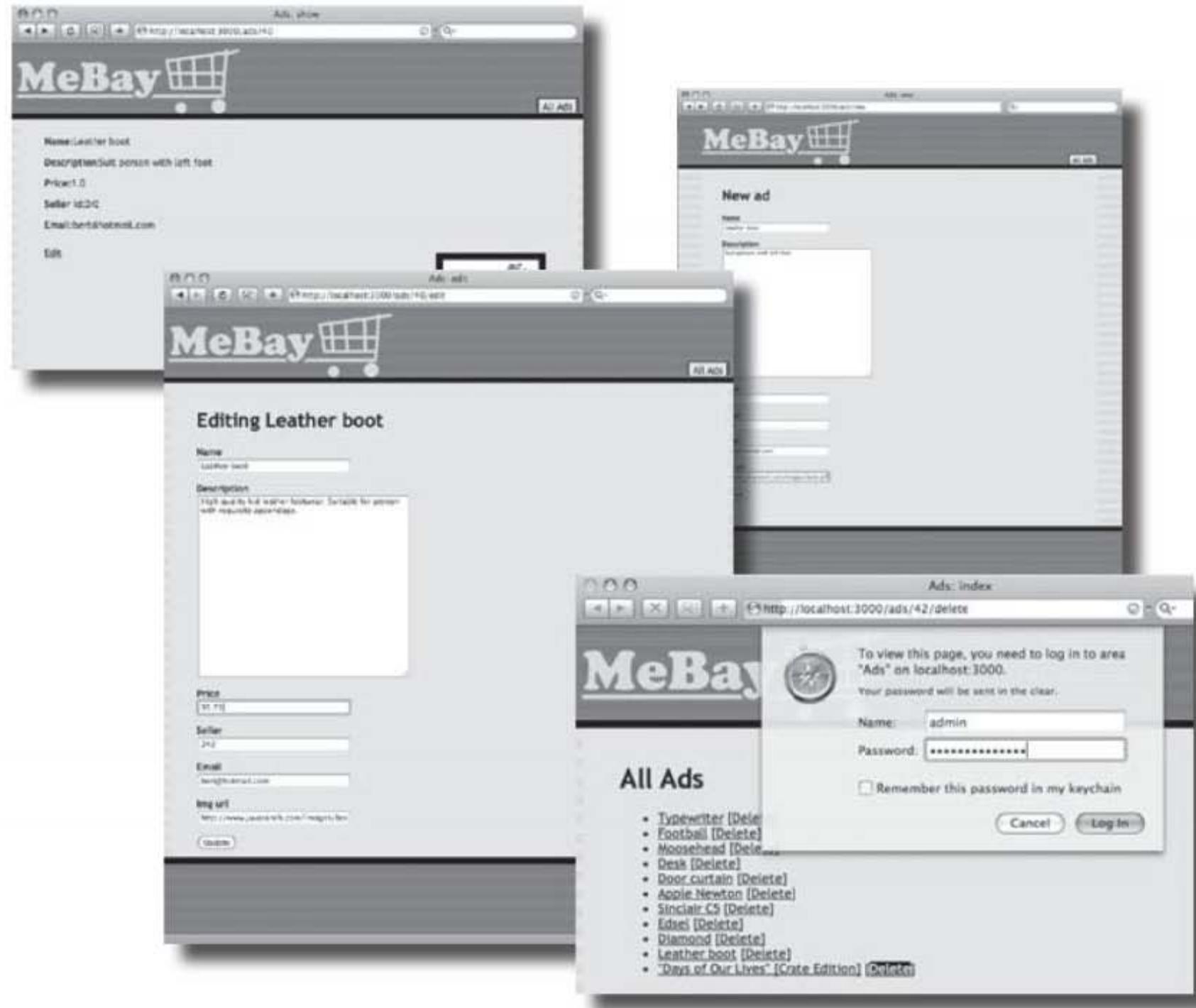
**But then, so could scaffolding...
so why write your own code?**

Doing it yourself gave you the power to do more than scaffolding

You can **choose** what functions are available.

You can **add** additional features like security.

And now you **understand** how to create code that inserts, updates and deletes data, you'll be able to amend the code that scaffolding generates.





Tools for your Rails Toolbox

You've got Chapter 3 under your belt, and now you've added the ability to manually create applications that can insert, update and delete data.

Rails Tools

`@ad.save` saves a model objects

`@ad.update_attributes` updates a model object

`redirect_to` lets the controller send the browser to a different URL

`http_authentication` makes adding security a breeze

Ruby Tools

`params[...]` is a *hash*, which is like an array indexed by *name*

nil is a special default object that means "no value"

Inside Rails, calling methods on a nil object causes errors

"#{ " and " }" can insert expressions into strings like "`l + l = #{l+l}`"

4 database finders

Truth or consequences?



Every decision you make has consequences.

In Rails, knowing how to make **good decisions** can save you both time and effort.

In this chapter, we'll look at how **user requirements** affect the choices you make, right from the very **beginning** of your app. Should you use scaffolding and modify the generated code? Should you create things from scratch? Either way, when it comes time to customize your app further, you need to learn about **finders**: **getting at your data** in a way that makes sense to you and serves your **users' needs**.

Keep fit with the Rubyville Health Club

The Rubyville Health Club prides itself on its ability to find the perfect class for everyone, and recently they've launched a new personal trainer service. Demand for the service is high... so high that the trainers are having trouble keeping track of all their clients. The trainers need you to build an application for them, and fast.

Business is really taking off, but we're having trouble keeping track of all the personal fitness sessions of our clients. Think you can help?

The personal trainers need a web application that enables them to quickly and easily manage the workouts for each of their customers. To start with, they need something that lists basic workout details for each client and allows them to add, update and delete records. Here's a sketch of the main page:

The sketch depicts a web browser window with the title "ClientWorkouts: find" and the URL "http://localhost:3000/client_workouts/find/". The main content area is titled "Listing client workouts for Lenny Goldberg". Below this, there is a table with the following data:

Trainer	Duration mins	Date of workout	Paid amount	Action
Clint	30	2009-07-14 09:14:00 UTC	25.0	Show Edit Destroy
Brad	30	2009-07-19 09:13:00 UTC	25.0	Show Edit Destroy
Sven	90	2009-08-02 09:13:00 UTC	75.0	Show Edit Destroy
Marshall	15	2009-09-29 13:15:00 UTC	15.0	Show Edit Destroy
Clint	30	2009-10-01 09:11:00 UTC	25.0	Show Edit Destroy
Sara	30	2009-10-05 19:00:00 UTC	25.0	Show Edit Destroy

Below the table, there is a link labeled "New client workout". To the right of the table, there is some handwritten text with arrows pointing to specific parts of the interface:

- An arrow points from the text "Lenny is just one of the clients using the personal trainer service." to the title "Listing client workouts for Lenny Goldberg".
- An arrow points from the text "These are all Lenny's workouts." to the list of workouts.





Let's start the application by scaffolding a set of pages for this model:

client_workouts

Column	Type
client_name	string
trainer	string
duration_mins	integer
date_of_workout	date
paid_amount	decimal

What should the scaffold command be? Write your answer below. Go ahead and run this command, too:

.....

.....

Write your
answer here.



Now, look again at what the trainers want to do with the application, and write down any differences between what the application **needs to do** and what the application actually **does** based on the scaffolded version you just created:

.....

.....

.....

.....

.....

to scaffold or not?



Exercise Solution

Remember that you would need to create a new Rails application before running this command...

Let's start the application by scaffolding a set of pages for this model:

client_workouts

Column	Type
client_name	string
trainer	string
duration_mins	integer
date_of_workout	date
paid_amount	decimal

What should the scaffold command be? Write your answer below.

ruby script/generate scaffold client_workout client_name:string trainer:string

duration_mins:integer date_of_workout:date paid_amount:decimal

...and then
"rake db:migrate"
afterwards to
create the tables.

Your job was to figure out the differences between what the application **needs to do** and what the scaffolded application actually **does**.

The trainers want to look at the workout sessions that have been recorded for each client.

The scaffolded application will only show workouts for a single client, or all of the clients together.

The scaffolding isn't right—but do we write our own code or fix the scaffolding?

The scaffolded application doesn't do exactly what we need. We've seen before that it's easier to create **simple** applications manually, without using scaffolding at all. But another approach is to create a scaffolded app, and then either **change** or **add to** the code Rails generates.

So what should we do here?



Test Drive —

If you haven't already, use scaffolding to create the training app. Then we can compare that to what the trainers want, and see how close we are.

The application actually looks pretty close...

There is one part of the generated code that looks *kind of* similar to the page that the trainers want. The index page lists a set of data that is almost the same as what the trainers have asked for:

ClientWorkouts: find
http://localhost:3000/client_workouts/find/

ClientWorkouts: index
http://localhost:3000/client_workouts

List client workouts for Lenny Goldberg

Trainer	Duration mins	Date
Clint	30	2009-07-
Brad	30	2009-07-
Sven	90	2009-08-
Marshall	15	2009-09-
Clint	30	2009-10-
Sara	30	2009-10-

[New client workout](#)

List client_workouts

Client name	Trainer	Duration mins	Date of workout	Paid amount	Action
Kirk Stigwood	Clint	60	2009-10-05	50.0	Show Edit
Lenny Goldberg	Clint	30	2009-07-14	25.0	Show Edit
Lenny Goldberg	Brad	30	2009-07-19	25.0	Show Edit
Lenny Goldberg	Sven	90	2009-08-02	75.0	Show Edit
Lenny Goldberg	Marshall	15	2009-09-29	15.0	Show Edit
Lenny Goldberg	Clint	30	2009-10-01	25.0	Show Edit
Lenny Goldberg	Sara	30	2009-10-05	25.0	Show Edit

[New client workout](#)

...and this is the index page of the scaffolded application.

This is what the trainers want to see...

Not only does the generated page look similar to what we need, we know that a scaffolded application will give us all of the usual operations on the client workout data. In other words, a scaffolded application will, by default, allow us to create, read, update and delete records.

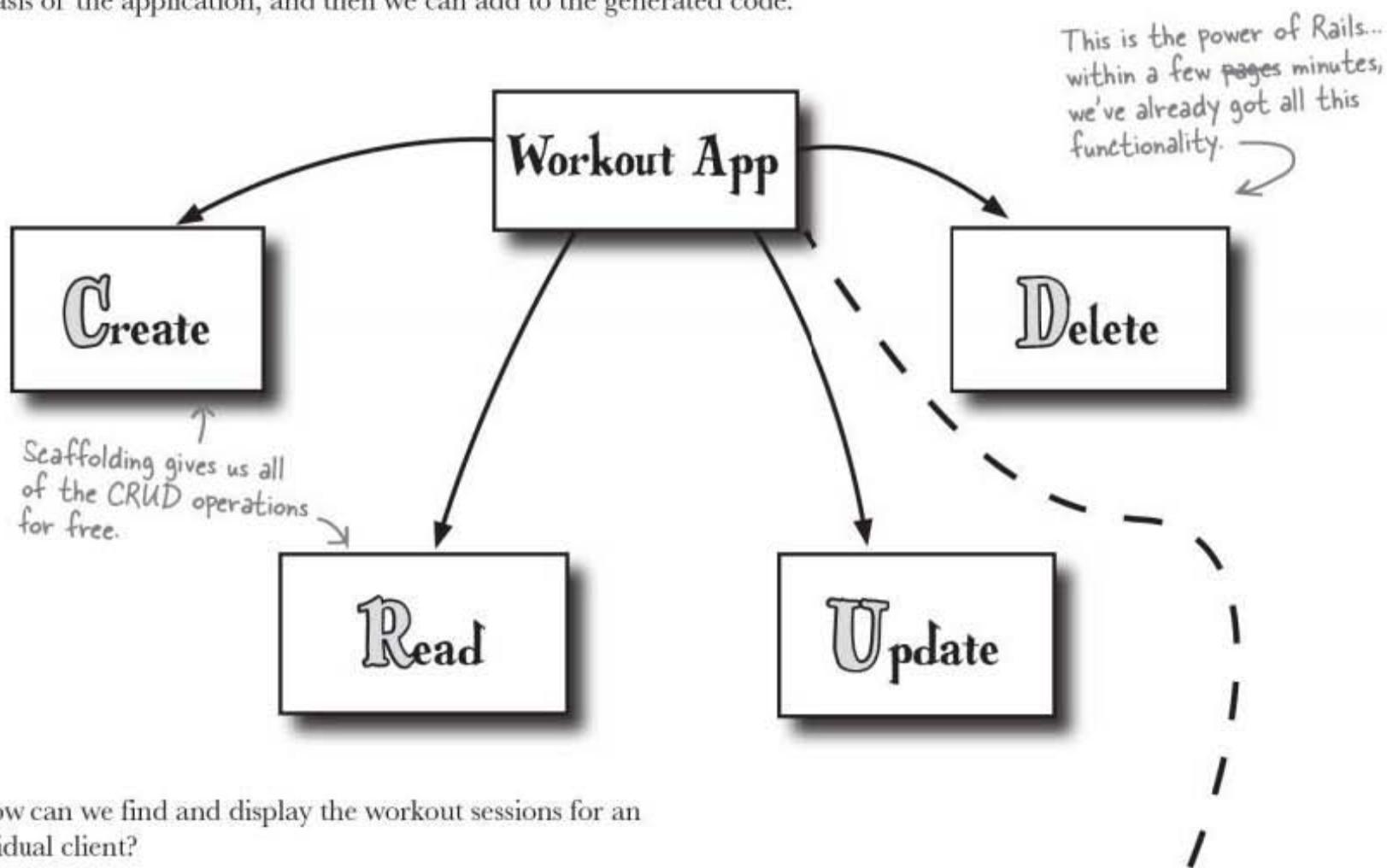
So, in this case, is it better to **fix the scaffold** and make the changes we need, or **start from scratch**, like we did for MeBay?



We're going to fix the scaffolding

When we created the MeBay application, we decided not to use scaffolding. The reason for this was that the clients originally wanted something so simple that it was easier to create the application from scratch. They wanted a lot less functionality than scaffolding provides.

This time around, we need access to *all* of the CRUD operations, plus we need to find the workout sessions for an *individual client*. As we need more functionality, we can do most of the work using scaffolding as the basis of the application, and then we can add to the generated code.

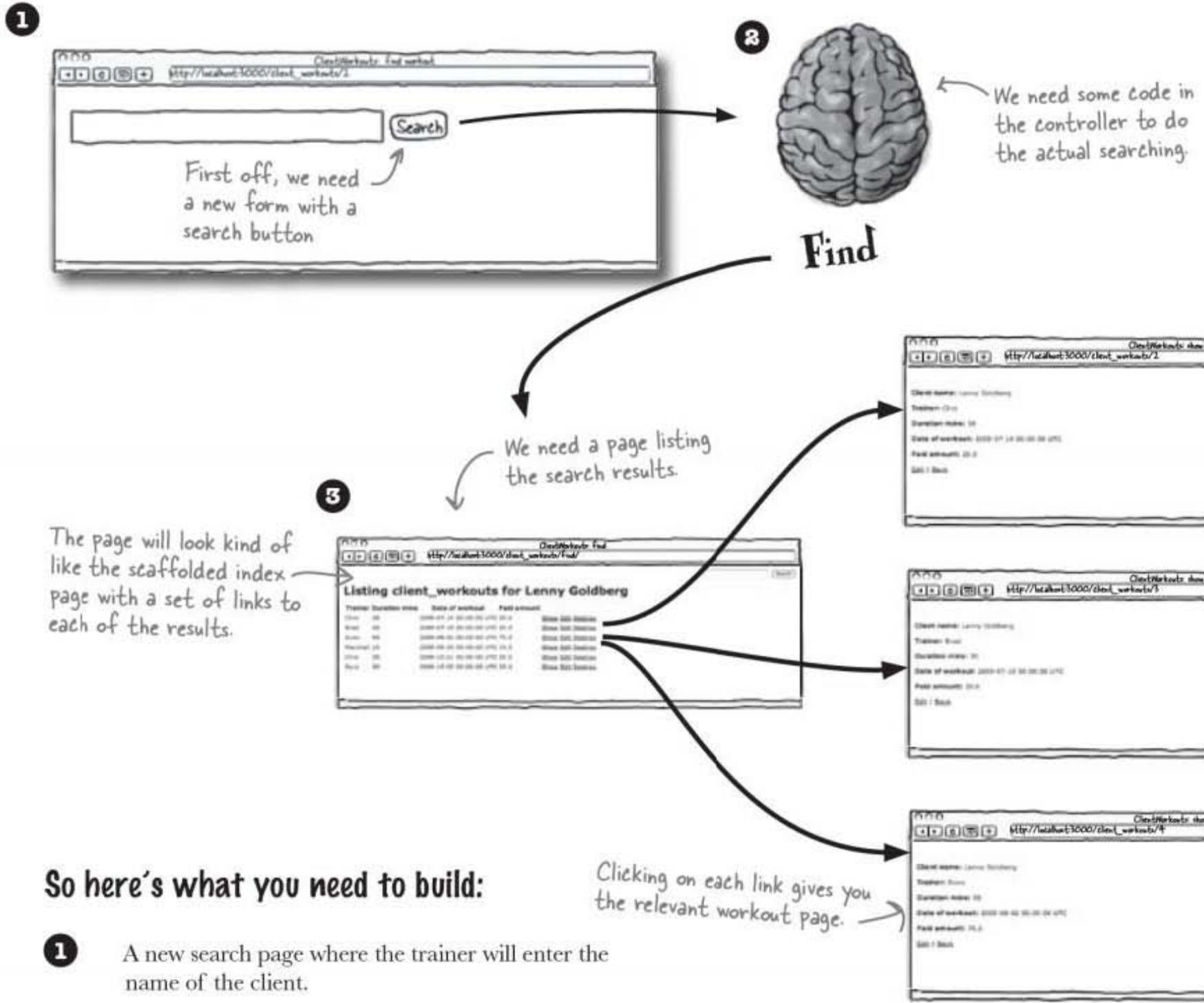


So how can we find and display the workout sessions for an individual client?



Design the search function

Here's what the search function should look like:



So here's what you need to build:

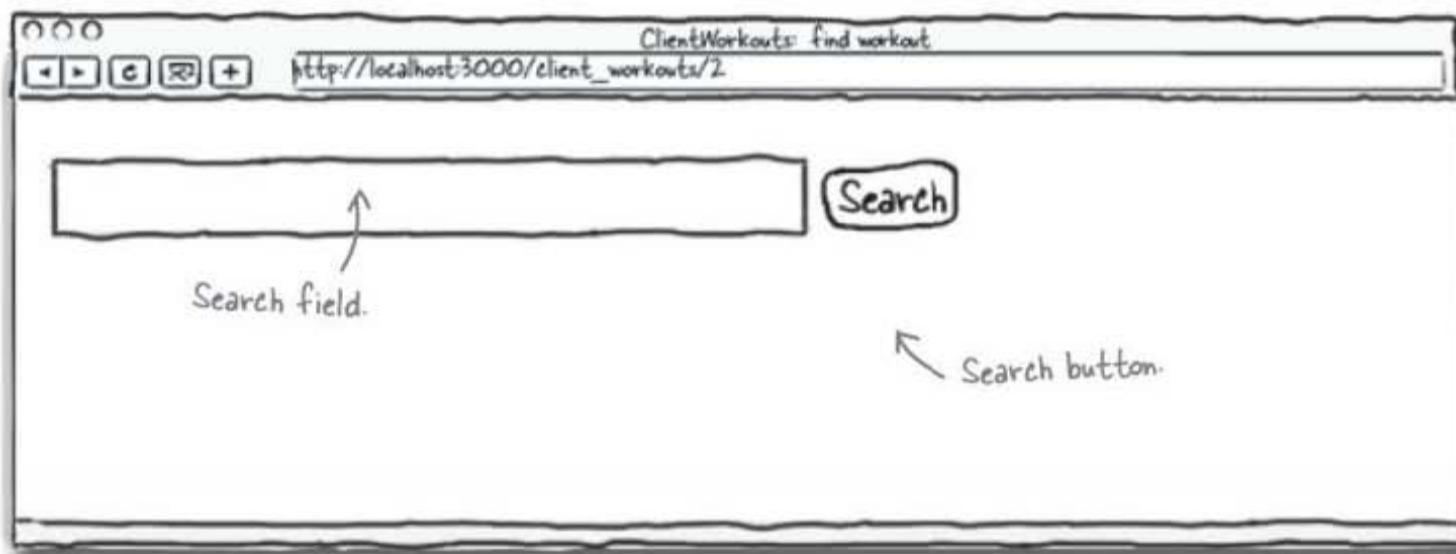
- 1** A new search page where the trainer will enter the name of the client.
- 2** A find action on the controller that will do the actual searching.
- 3** A new results page with a list of links to each of the client's workouts—this will work kind of like the index page already generated by the scaffolding.

So where should we start?

form first

Let's start by building the form

We have a few new components to create, so let's start with the user interface. That way we'll be able to get some early feedback from the trainers. Here's what the search form trainers will use to find clients should look like:



You've built pages with forms before. Can you see anything different about this one?

Take a look at the other forms we just generated for the application, the create and edit forms. They have fields that match the fields of the ClientWorkout model objects. The difference this time is there's no model object that matches the search form. So how do we create a form when there's no model to base the form on?

The search will need a new kind of form

We need to create a form *without* using a model object, but the `form_for` helper we've been using requires needs a model object to work. So what do we do?

Fortunately there is another helper tag that creates model-free forms—just what we need in this situation.



Search Form Magnets

You'll need to create a search page template. Trouble is— after working out the main part of the code on the fridge door somebody slammed the door and the magnets all fell off!

Fortunately the code for a non-model form is pretty similar to a model form.

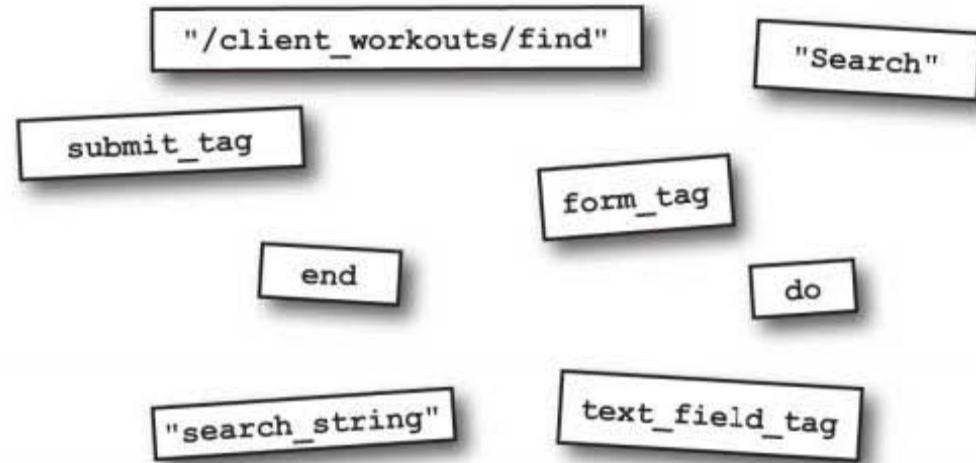
Can you figure out what the code should look like?

<% %>

<%= %>

<%= %>

<% %>

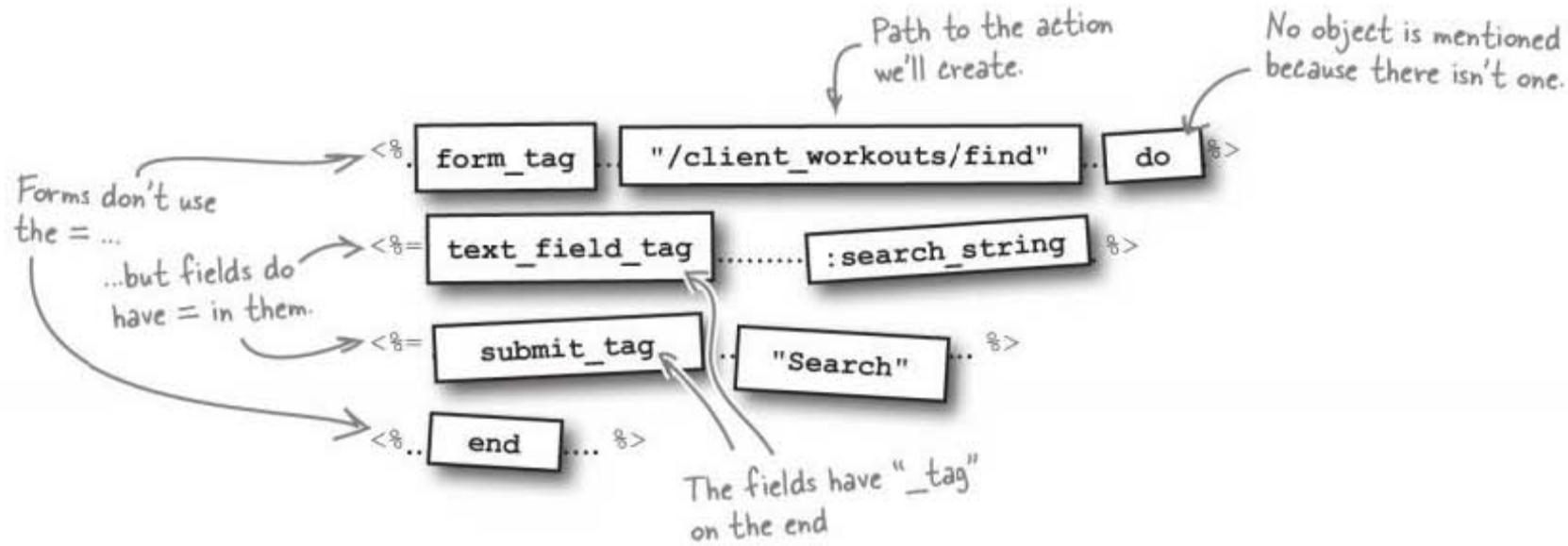




Search Form Magnets Solution

Your job was to take the magnets and assemble them into code to create a search form, without requiring a corresponding model.

Did you figure out what the code should look like?



there are no Dumb Questions

Q: I don't get why we can't just use scaffolding on its own. Doesn't that give us everything?

A: Scaffolding only provides basic Create, Read, Update, and Delete operations. Most applications will need functions that go beyond basic CRUD functionality.

Q: Why didn't we use scaffolding for the MeBay application?

A: We didn't use scaffolding for MeBay because we originally only needed a basic read-only application. For really simple applications it can be easier and more efficient to create your application manually.

Q: Could we still have generated the application using scaffolding, and then removed the operations we didn't want?

A: Yes, we could have done that. You will probably start most applications using scaffolding. Only in cases where you need very little functionality, or where the functionality is very different from scaffolding, will you want to create an app manually.

Q: So sometimes it's best to start from scratch, and other times it's best to fix the scaffolding. Which option should I use when? How can I decide what's best?

A: Go for scaffolding if you're going to use most of the CRUD operations, create, read,

update, and delete. Ask yourself: which will be quicker—creating the code manually, or stripping out the unused scaffolding code?

Q: What is a model form?

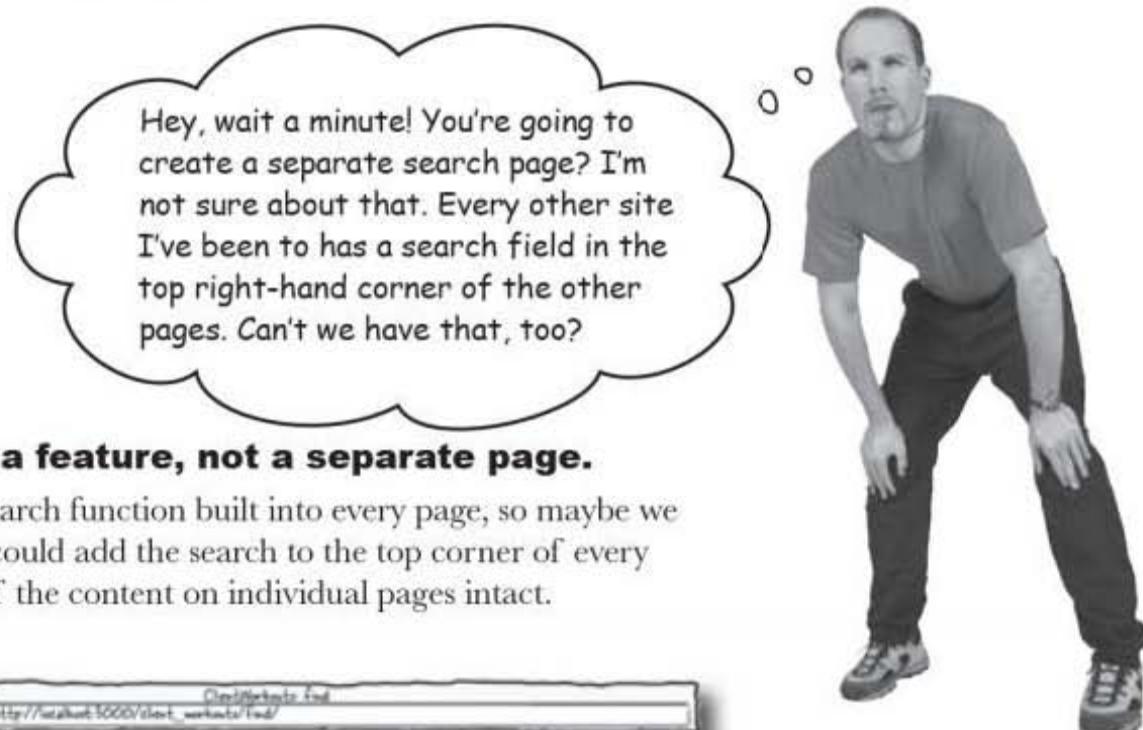
A: A **model form** is a form bound to a model object. When that sort of form is displayed, the field values will come from the attributes of a model object.

Q: And a non-model form?

A: That's a form that isn't bound to a model object. A non-model form is used for a set of individual field values and they are mostly used for things like search forms or other data that won't be saved to the database.

Add the search to the interface

Now that we have the code for the search form, we should probably create a brand new page template for it.



Search is usually a feature, not a separate page.

Most web sites have a search function built into every page; so maybe we could do the same. We could add the search to the top corner of every page, keeping the rest of the content on individual pages intact.

Trainer	Duration min	Date of workout	Paid amount			
Clint	30	2009-07-14 09:14:00 UTC	25.0	Show	Edit	Delete
Brad	30	2009-07-19 09:13:00 UTC	25.0	Show	Edit	Delete
Evan	90	2009-08-02 09:13:00 UTC	75.0	Show	Edit	Delete
Marshall	15	2009-09-29 13:19:00 UTC	15.0	Show	Edit	Delete
Clint	30	2009-10-01 09:11:00 UTC	25.0	Show	Edit	Delete
Sara	30	2009-10-05 19:00:00 UTC	25.0	Show	Edit	Delete

Adding code to every page will mean there's a lot of duplicated code to be maintained, but what if we could add the new search code just to a single file?



Sharpen your pencil

There's a file we can add the search form to so that it will appear in every one of the pages in the application. What's the name of the file? Write your answer below.

layouts are shared

Sharpen your pencil Solution

Did you remember layouts?
They contain markup that
every page template will include.

There's a file we can add the search form to so that it will appear in every one of the pages in the application. What's the name of the file? Write your answer below.

.....
app/views/layouts/client_workouts.html.erb



Ready Bake Code

This is the code you need to save in the
`app/views/layouts/client_workouts.html.erb` layout file.

Download the file from: www.headfirstlabs.com/books/rails

This is a layout file
so it lives in
`app/views/layouts`.

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"  
      "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">  
  
<html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en" lang="en">  
<head>  
  <meta http-equiv="content-type" content="text/html; charset=UTF-8" />  
  <title>ClientWorkouts: <%= controller.action_name %></title>  
  <%= stylesheet_link_tag 'scaffold' %>  
</head>  
<body>  
  
  <span style="text-align: right">  
    <% form_tag "/client_workouts/find" do %>  
      <%= text_field_tag :search_string %>  
      <%= submit_tag "Search" %>  
    <% end %>  
  </span>  
  
  <p style="color: green"><%= flash[:notice] %></p>  
  
  <%= yield %>  
  
</body>  
</html>
```

This adds the stylesheet from
`public/stylesheets/scaffold.css`.

This is our new code
for the search form.

This can be used for sending
messages to the page. Don't
worry about this yet.



Test Drive

Change your app's layout to include the search functionality. If you refresh each of the pages in your application, the search field should appear in the top-right corner.

Our freshly-added search field appears on each of the pages like this.

But how do we get access to the contents of the search field? Here's the HTML that was generated within each page to produce the search form:

```
<form action="/client_workouts/find" method="post">
  <input id="search_string" name="search_string" type="text" />
  <input name="commit" type="submit" value="Search" />
</form>
```

Sharpen your pencil

Given that you know what the HTML for the form will look like, what expression do you think you will be able to use within the controller code to get access to the contents of the search field? Write your answer below:

use the params array



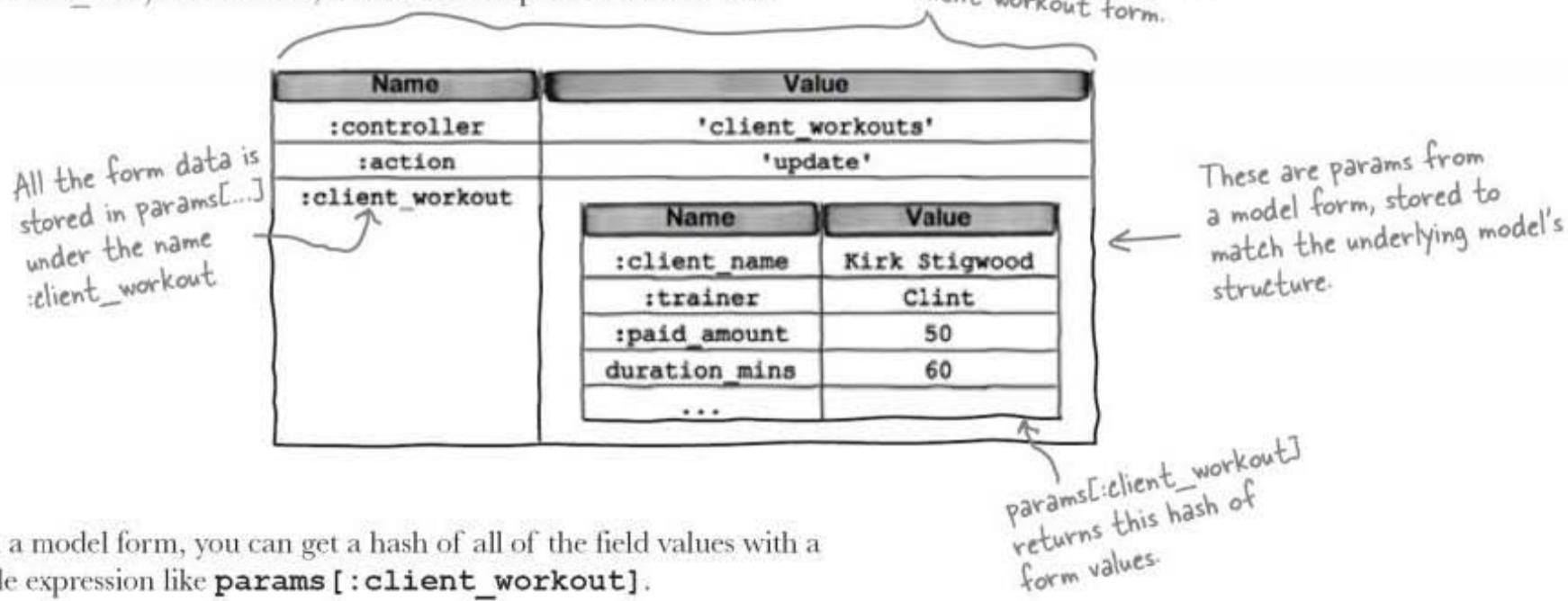
Sharpen your pencil Solution

Given that you know what the HTML for the form will look like, what expression do you think you will be able to use within the controller code to get access to the contents of the search field? Write your answer below:

.....
`params[:search_string]`.....
would also work, but it's better style to use a symbol.

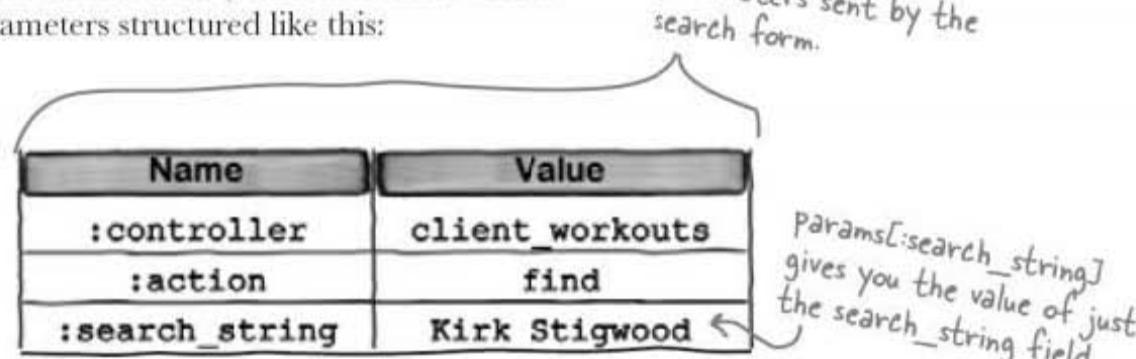
So are the form parameters structured differently?

The `form_for` helper we used in the previous chapter creates a **model form**—that is, an HTML form based upon the attributes of a model object. When a model form is submitted, Rails knows that you are probably going to want to turn the field values back into a model object. For example, when the scaffolded *Edit* form (which is created with `form_for`) is submitted, it structures its parameters like this:



With a model form, you can get a hash of all of the field values with a simple expression like `params[:client_workout]`.

But what about the `form_tag` helper? `form_tag` creates an **non-model form**. That's a form that is used to edit a set of **individual field values**. For that reason, the search form (which is created with a `form_tag`) creates request parameters structured like this:





Now that you know how to retrieve the search string from a form, it's time to build the server-side code in the controller to do the search. To begin with, we will just display the value in the search field on the console. That way we can check that the form is working correctly.

The form is going to be submitted to a path called `/client_workouts/find`. The default routes in `config/routes.rb` will be able to map this route for us. Highlight which of the default routes will be used:

```
map.connect ':controller/:action/:id'  
map.connect ':controller/:action/:id.:format'
```

Next, create a `find` method in the controller to display the contents of the search field. Hint: You can display a string in the console window using the command:

```
puts <string> ↵ This will display the string in the window  
that's running the web server.
```

.....
.....
.....
.....
.....



Now that you know how to retrieve the search string from the form, let's start to build the server-side code in the controller to do the search. To begin with, we will just display the value in the search field on the console. That way we can check that the form is working correctly.

The form is going to be submitted to a path called /client_workouts/find. The default routes in config/routes.rb will be able to map this route for us. Highlight which of the default routes will be used:

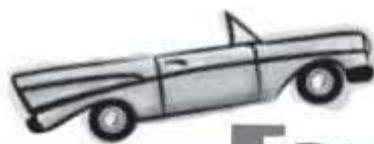
We don't need to → map.connect ':controller/:action/:id'
create a route - this map.connect ':controller/:action/:id.:format'
default one will be used

Next, create a find method in the controller to display the contents of the search field. Hint: You can display a string in the console window using the command

puts <string> ←
This will display the string in the window
that's running the web server.

```
def find  
  puts params[:search_string] ←  
end
```

All we need to do is
write out the correct
parameter name.



Test Drive

Let's try the code out. In any of the pages in the application, enter some search text and click the "Search" button.

This is what happens when you press the search button.

Don't worry if you get an error when you press the search button. It's simply because we haven't created a search results page template yet. The interesting output will be in the console where you are running your web server. Somewhere amidst a set of errors about the missing results template, you should see this:

```
File Edit Window Help EasterEgg
Rendering client_workouts/show
Completed in 9ms (View: 4, DB: 0) | 200 OK [http://localhost/
client_workouts/1]
Lenny Goldberg

Processing ClientWorkoutsController#find (for 127.0.0.1 at
2008-10-13 22:00:40) [POST]
ActionView::MissingTemplate (Missing template client_workouts/
```

Search string →

So we've created a search form on each page, and we have some code on the server that can read the string the user is searching for.

Now we need to actually do the searching.



BULLET POINTS

- Applications often need to do more than create, read, update, and delete records.
- You will need to design your own page sequences sometimes—and the easiest way to start is by considering the user's point of view, and how they'll use your application.
- If you need a form that doesn't match a model object, use `form_tag` instead of `form_for`.
- You need to use `_tag` fields with a `form_` tag form.
- `params[:field_name]` will give you the value of the field called `:field_name` in a non-model form.
- `puts "A string"` will output a string to the console.

there are no Dumb Questions

Q: When would I use a `form_tag` instead of a `form_for`?

A: Use `form_tag` if your form is going to be editing data that is not stored in a model object. We used a `form_tag` for the search form because there was no model object to work with a single `search_string` attribute.

Q: Why are `form_for` and `form_tag` helpers surrounded by `<% ... %>` instead of `<%= ... %>`?

A: The form helpers are used with scriptlets (`<%...%>`) instead of expressions (`<%=...%>`) because they do more than simply generate HTML. Remember that we used scriptlets for `for` loops? That's because a `for` loop controls the contents of the code in its loop body. In a similar way, forms "control" the HTML generation of the field helpers they contain.

Q: That sounds sort of complicated...

A: That's OK—you don't have to understand it all right now. If you just remember to use `form_for` and `form_tag` with scriptlets, everything will work fine.

Q: Can I still read the individual fields in a `form_for` model form?

A: Yes. The form fields for the `client_workout` forms can be retrieved with `params[:client_workout]`—and this is just another hash. So to get the value of the 'trainer' field you would just use `params[:client_workout][:trainer]`.

Q: We used a default route for the "find" action. Couldn't we have used those before?

A: No. The routes that we used before didn't match the default routes closely enough.

Q: How do I know when I need to create a custom route?

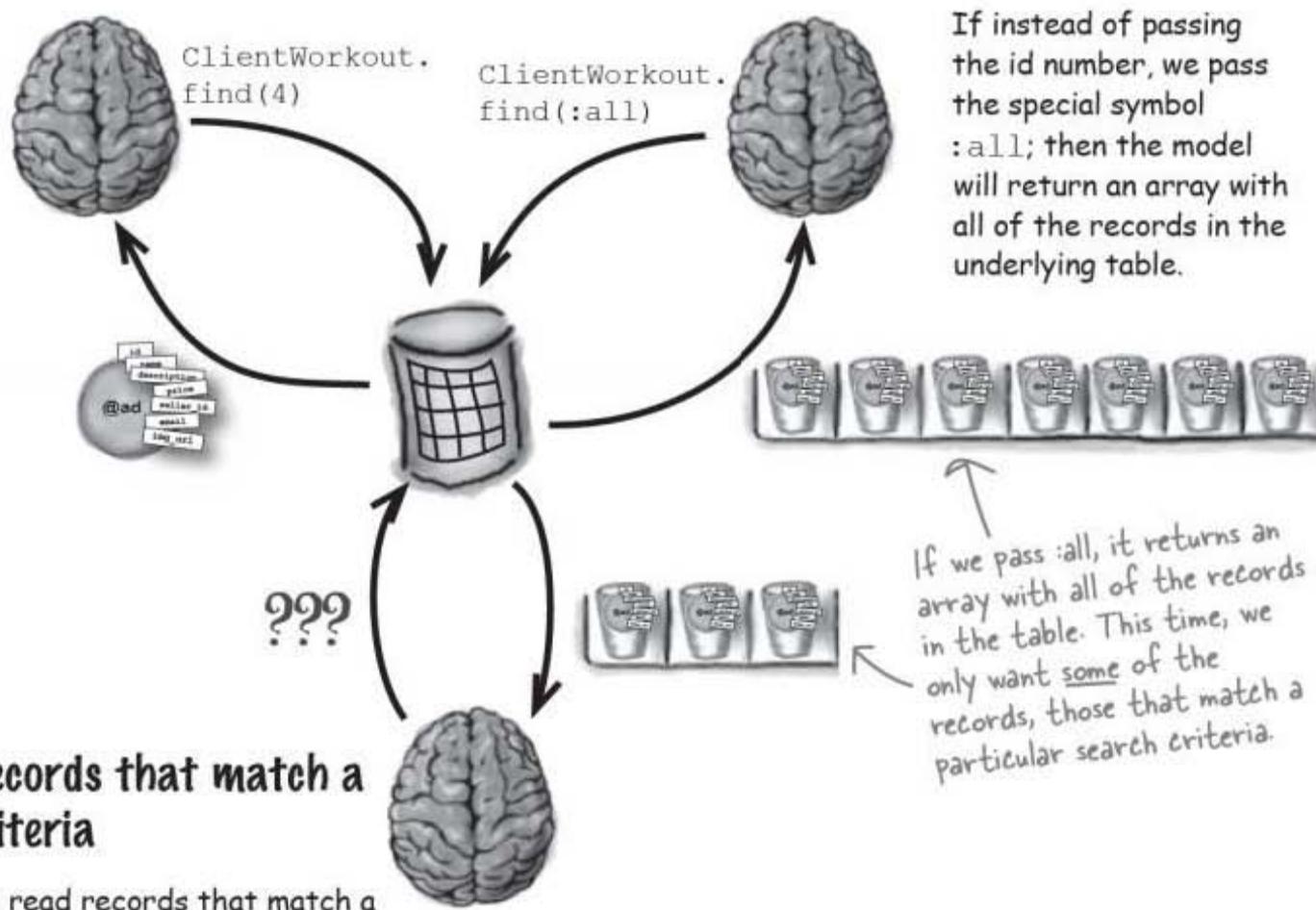
A: If you type `rake routes` at the command line, you will see all of the routes available in your application. If none of them match, or if there's a route that matches the wrong action, then you need to add a custom route.

How do we find client records?

So do we have a problem reading the records for a particular client? When we've read records so far, we've done it by returning a single record, or by finding all the records in a table. But what's different this time?

1 Reading a single record

We can read a single record using the value in the id column. We know that this technique returns just one record because the id number is unique for each record.



2 Reading all the records

If instead of passing the id number, we pass the special symbol `:all`; then the model will return an array with all of the records in the underlying table.

If we pass `:all`, it returns an array with all of the records in the table. This time, we only want some of the records, those that match a particular search criteria.

3 Reading records that match a specific criteria

This time, we want to read records that match a specific search criteria. We may want to return more than one record, so we need something that will return an array of model objects. But we don't want a model object for every record—only those that match the search criteria.



Think about the data in the underlying database table. What does it mean for a record in the table to match the search criteria? Is there something that would be true for matching records and false for the rest?

needle in a haystack

We only need those records where client_name = the search string

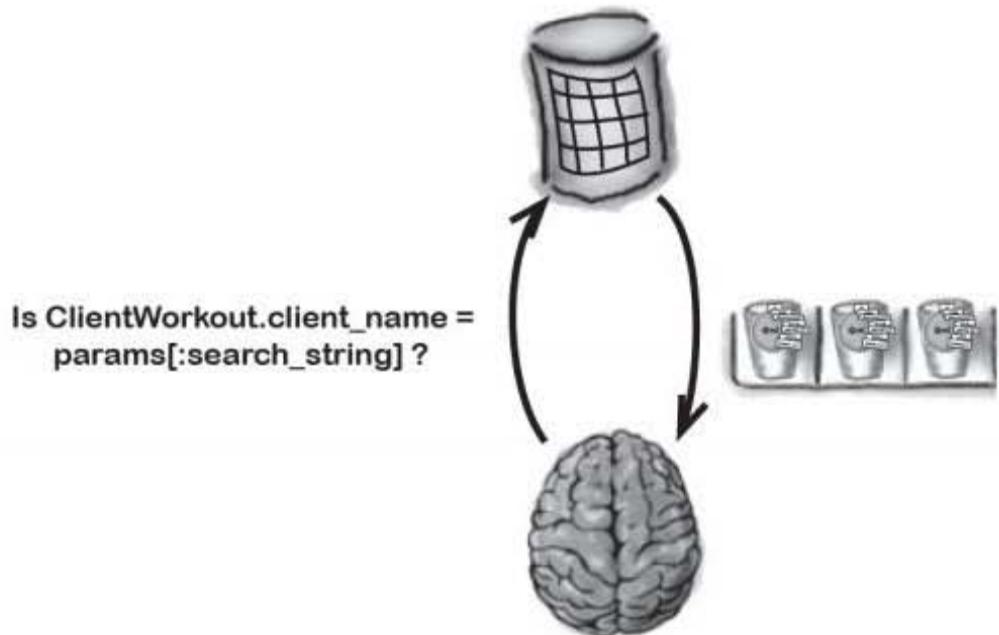
The trainers want to search for all of the workouts for a particular customer. The model will need a simple test that will be true for matching records and false for the rest. Something like this:

Is ClientWorkout.client_name = params[:search_string] ?
This is what was entered in the search field.

If the model can apply that test to each of the records in the table, it will find all of the matching records in the table:

ID	client_name	trainer	duration_mins	date_of_workout	paid_amount	created_at	updated_at
1	Kirk Stigwood	Clint	60	2009-10-05	50	2008-10-05 20:...	2008-10-05 20:...
2	Lenny Goldberg	Clint	30	2009-07-14	25	2008-10-06 09:...	2008-10-06 09:...
3	Lenny Goldberg	Brad	30	2009-07-19	25	2008-10-06 09:...	2008-10-06 09:...
4	Lenny Goldberg	Sven	90	2009-08-02	75	2008-10-06 09:...	2008-10-06 09:...
5	Lenny Goldberg	Marshall	15	2009-09-29	15	2008-10-06 09:...	2008-10-06 09:...
6	Lenny Goldberg	Clint	30	2009-10-01	25	2008-10-06 09:...	2008-10-06 09:...
7	Lenny Goldberg	Sara	30	2009-10-05	25	2008-10-05 20:...	2008-10-05 20:...

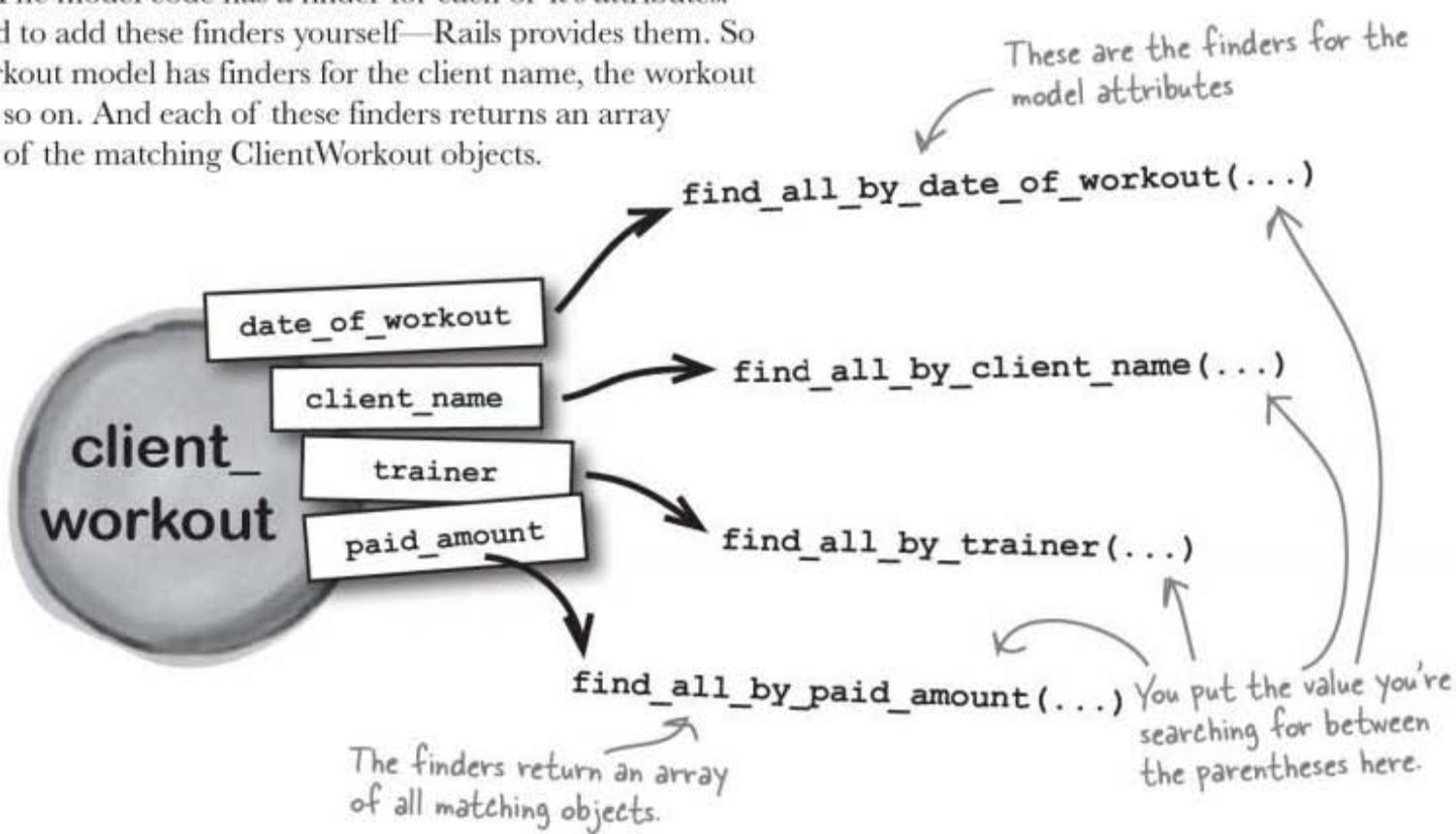
In general terms, then, we need a finder that can find all records that have a particular value in a particular column in the table.



There's a finder for every attribute

Lots of applications need to find all of the records with a certain value in a database column, so Rails makes that really easy to do.

But how? The model code has a finder for each of its attributes. You don't need to add these finders yourself—Rails provides them. So the ClientWorkout model has finders for the client name, the workout duration, and so on. And each of these finders returns an array containing all of the matching ClientWorkout objects.



Remember that an attribute in a model object maps to a database column in the underlying table. So each of these finders can be used to find all of the records with a particular value in a particular column.



Sharpen your pencil

Complete the code for the `find` method.

```
def find
  @client_workouts = .....
end
```



Sharpen your pencil Solution

Complete the code for the find method.

```
def find
  @client_workouts = ClientWorkout.find_all_by_client_name(params[:search_string])
end
```

We're looking for client names,
so we use this finder

This is the name the user entered in the search field.

So what's next?

We now have code that will find all of the records that match the search, so now we need to display the results back to the user. But how?

We need to create a `find.html.erb` page to display the search results.





Exercise

Create a page template for the find method to display the list of workouts displaying:

<Trainer name> <Workout duration> <Date of the workout> <Amount paid>

Hint: The index page scaffolding already generated is similar to what you need to produce.

display the clients



Create a page template for the find method to display the list of work outs displaying:

<Trainer name> <Workout duration> <Date of the workout> <Amount paid>

Hint: The index page is similar to what you need to produce.

Don't worry if your answer
is slightly different

```
<h1>Listing client workouts for <%= params[:search_string] %></h1>

<table>
  <tr>
    <th>Trainer</th>
    <th>Duration mins</th>
    <th>Date of workout</th>
    <th>Paid amount</th>
  </tr>

  <% for client_workout in @client_workouts %>
    <tr>
      <td><%= h client_workout.trainer %></td>
      <td><%= h client_workout.duration mins %></td>
      <td><%= h client_workout.date_of_workout %></td>
      <td><%= h client_workout.paid_amount %></td>
      <td><%= link_to 'Show', client_workout %></td>
      <td><%= link_to 'Edit', edit_client_workout_path(client_workout) %></td>
      <td><%= link_to 'Destroy', client_workout, :confirm => 'Are you sure?', :method => :delete %></td>
    </tr>
  <% end %>
</table>
```

— there are no Dumb Questions —

Q: Could we have re-used index.html.erb for this?

A: The client name is missing from this template, so it isn't quite the same as the index.html.erb template. But it is always a good idea to reuse code where you can... it just wouldn't have worked out in this case.



Test DRIVE

The search function should work great now. Let's check it out...

ClientWorkouts: index

http://localhost:3000/client_workout/

Search

Duration mins	Date of workout	Paid amount	
60	2009-10-05	50.0	Show Edit Destroy
30	2009-07-14	25.0	Show Edit Destroy

ClientWorkouts: find

http://localhost:3000/client_workouts/find

Listing client_workouts for Lenny Goldberg

Trainer	Duration mins	Date of workout	Paid amount	
Clint	30	2009-07-14	25.0	Show Edit Destroy
Brad	30	2009-07-19	25.0	Show Edit Destroy
Sven	90	2009-08-02	75.0	Show Edit Destroy
Marshall	15	2009-09-29	15.0	Show Edit Destroy
Clint	30	2009-10-01	25.0	Show Edit Destroy
Sara	30	2009-10-05	25.0	Show Edit Destroy

I really like the application, but I need to search for workouts by trainer name, too. Did I forget to mention that?

Lenny Goldberg's workouts.

BRAIN POWER

How will this change the search criteria?

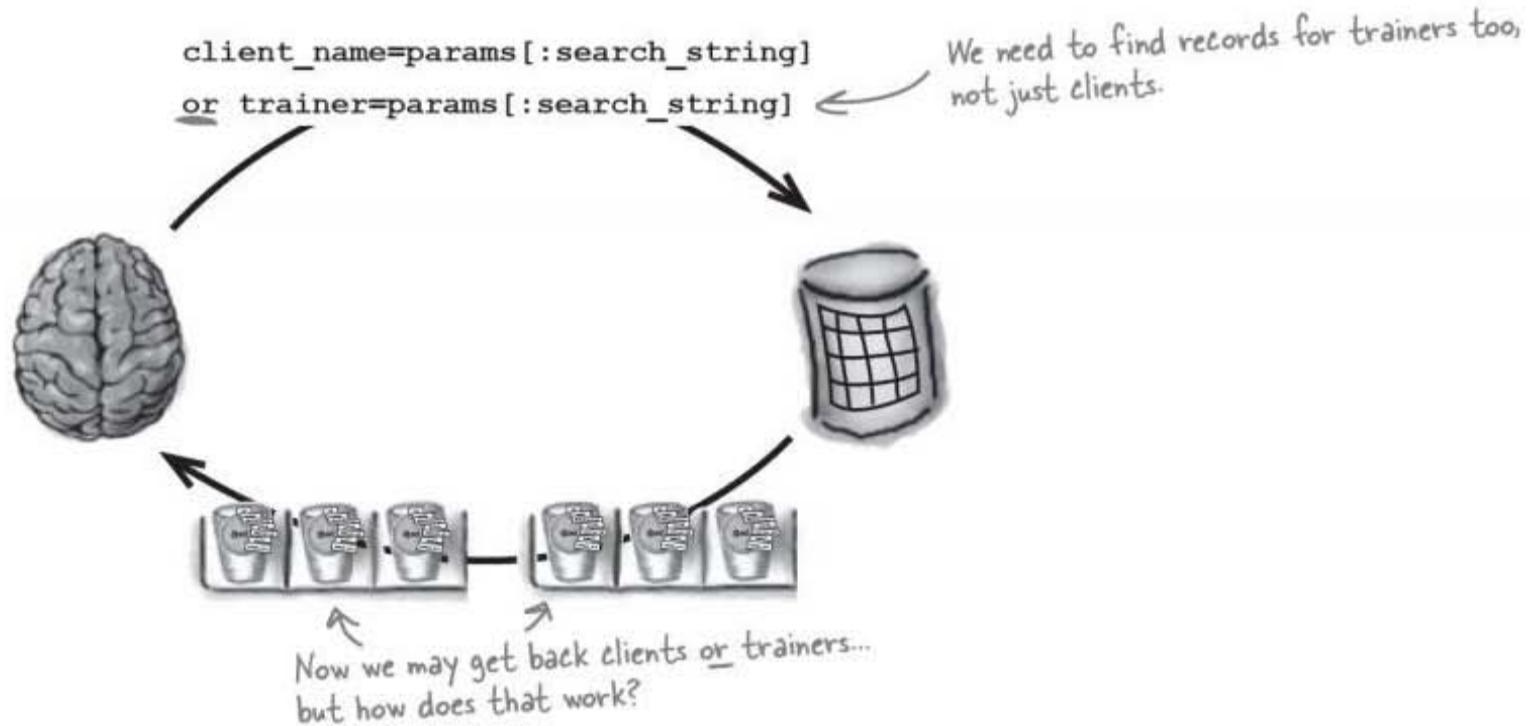
match this OR that...

We need to match either the client name OR the trainer name

The search works by finding all the records with a particular client name. But if the search will also need to find trainers by name, then the logical test it will apply to each record will need to be a little more complicated. Instead of

```
client_name = params[:search_string]
```

the criteria now needs to be:



Can you see a problem here?

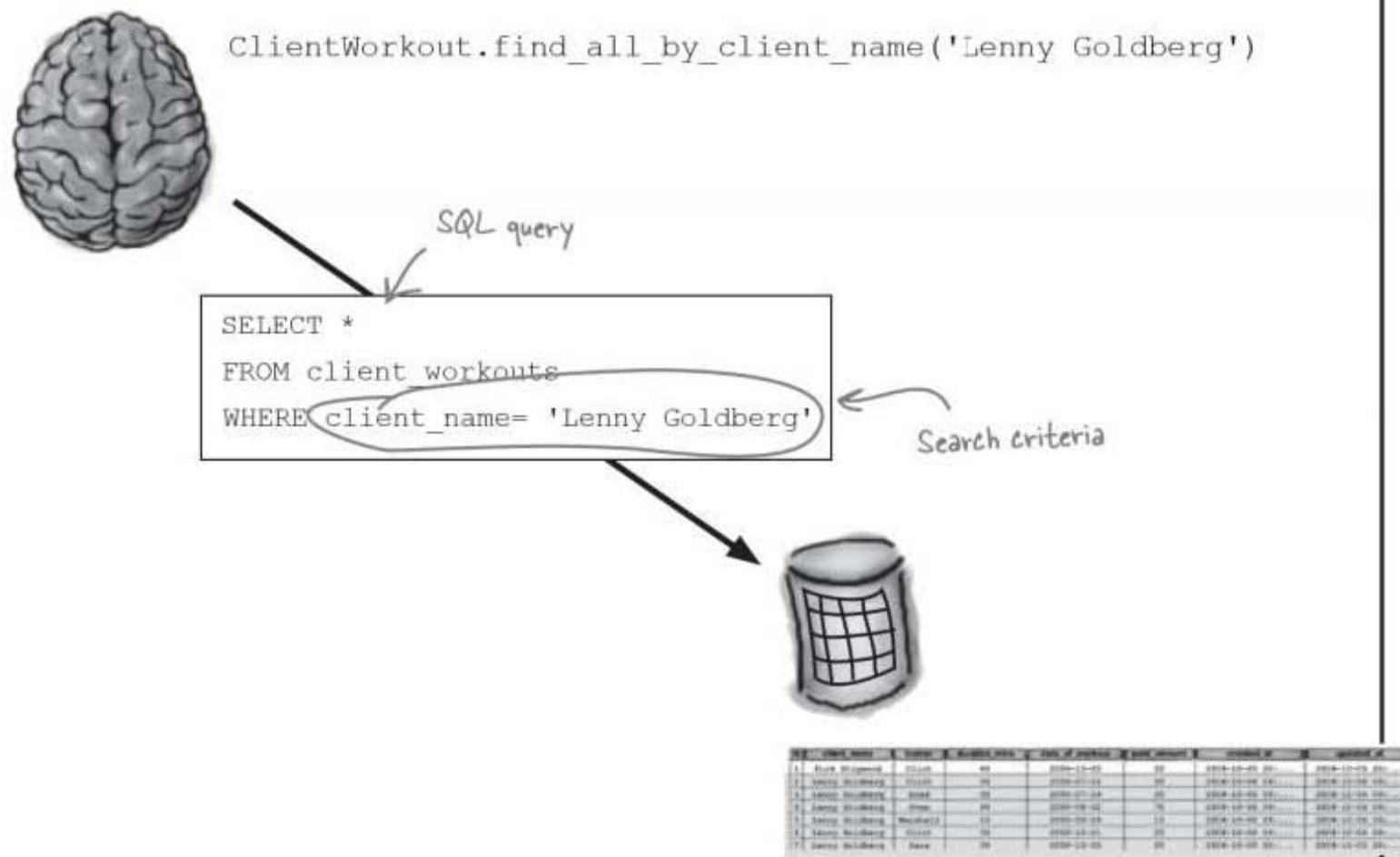
There's a finder for each of the attributes in the model object. And each of these finders has a simple test that it applies to the records in the database, checking a single column in the database against a given value. But the test is more complex now, so is there some way to specify the test that the finder applies to the database records?

Finders Up Close

**Finders write database queries**

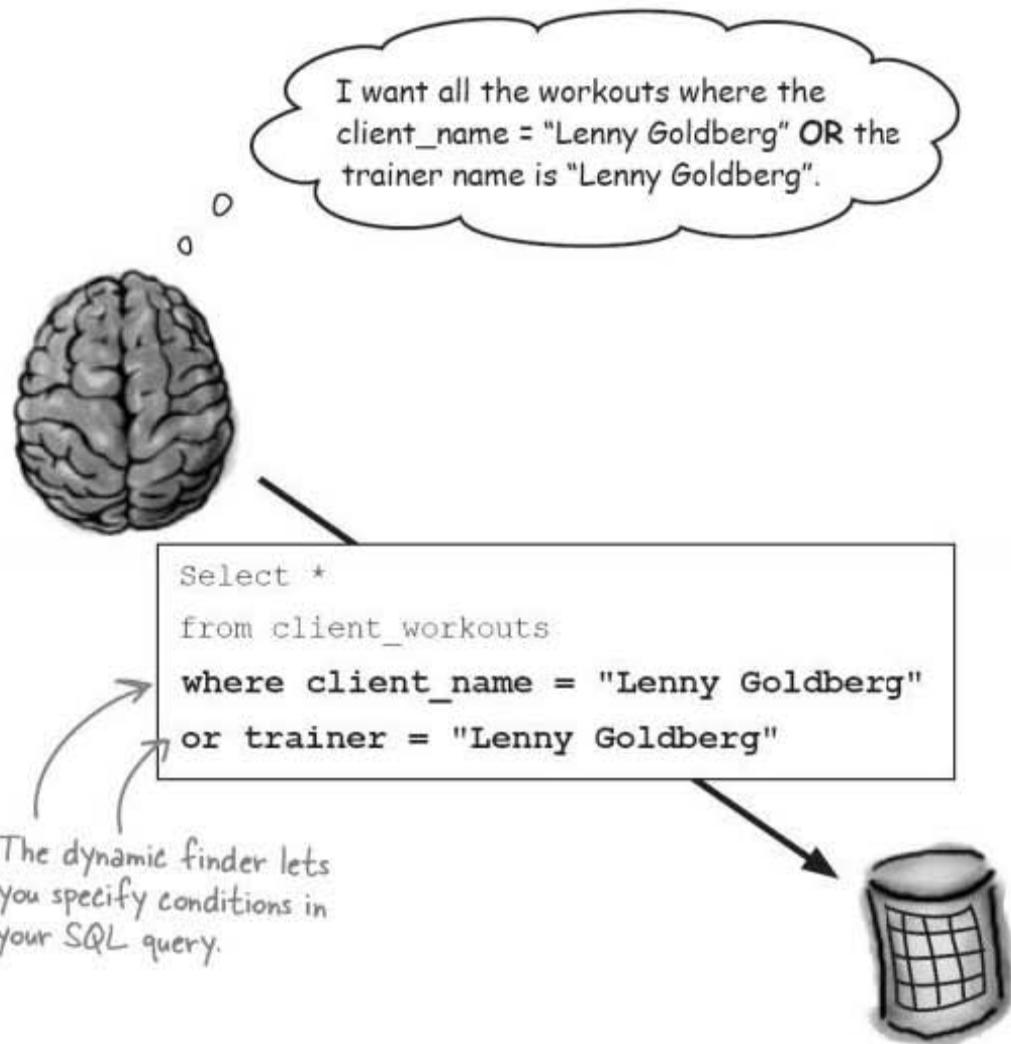
So how exactly does a finder work? What happens when you run one? The finder's job is to talk to the database on your behalf. Remember that when it's called, a finder generates a query for the database in a language called SQL (structured query language).

[Note from Marketing: Make sure you put in a plug for Head First SQL]



We need to be able to modify the conditions used in the SQL query

We need some way of telling the model to generate a SQL query that looks something like this:



But the conditions in the SQL query are generated by the finder method. We are able to pass in strings to the finder (like "Lenny Goldberg") but so far we have not done anything to modify the actual structure of the conditions that become part of the SQL sent to the database.

Will being able to modify the SQL query parameters actually be that big a deal? Well—yes, it will. Finders that look for matching values in particular attributes are useful—but specifying the SQL conditions lets you do so much more. It lets you override the default behavior of a finder, and get complete control over the data that is accessed by the model. That's just what we need here, too: more control over the SQL query.

So how do we modify those conditions?

Use :conditions to supply SQL

The finders that are generated for each of the attributes are simple and easy to use, but the trouble is they're not very flexible. You often need to make more complex queries on the database.

For that reason, all finders allow you to pass a named parameter called :conditions containing extra conditions to be added to the SQL that the finder generates.

Here's one way in which this could work with the trainer/client search:

```
@client_workouts = ClientWorkout.find(:all,
:conditions=>["client_name = 'Lenny Goldberg' OR trainer = 'Lenny Goldberg'"])
The condition parameter is set to an array
```

This version of the finder will return all of the records that have a trainer or client called 'Lenny Goldberg', but can you see what the problem is? What if we want to search for someone **other than** Lenny? What we *really* want is to search for whatever is recorded in the params[:search_string]. But how?

Fortunately, Rails has a way of doing just that. It allows you to parameterize the conditions like this:

```
@client_workouts = ClientWorkout.find(:all,
:conditions=>["client_name = ? OR trainer = ?",
params[:search_string], params[:search_string]])
```

The ?s in the first string in the conditions array are replaced in sequence with the values that follow. This means that the finder will now be able to generate the correct SQL statement for whatever is in the search parameter. The relevant records are returned for whoever the trainer searches for.

Instead of searching for Lenny Goldberg, we can search using whatever's in params[:search_string]. The ? gets replaced by that value.

Because Rails inserts these parameter values into the SQL for us, it will do it safely and avoid a type security attack called "SQL Injection."

So how well does this work?

find me, please



Test Drive

Update your finder code, and reload your application.



I really like
this search!

ClientWorkouts: find
http://localhost:3000/client_workouts/find

Listing client_workouts for Lenny Goldberg

Trainer	Duration	mins	Date of workout	Paid amount
Clint	30		2009-07-14	25.0
Brad	30		2009-07-19	25.0
Sven	90		2009-08-02	75.0
Marshall	15		2009-09-29	15.0
Clint	30		2009-10-01	25.0
Sara	30		2009-10-05	25.0

Search



If I search for a client,
I get their workouts.

ClientWorkouts: find
http://localhost:3000/client_workouts/find

Listing client_workouts for Clint

Trainer	Duration	mins	Date of workout	Paid amount
Clint	60		2009-10-05	50.0
Clint	30		2009-07-14	25.0
Clint	30		2009-10-01	25.0

Search



If I search for
me, I find the
workouts I ran.



WHAT'S MY PURPOSE?

The Fitness Club has started to record all of the games played on their outdoor baseball field. Match up the database finders with how they might be used.

Finder**Purpose**

```
BaseballGame.find(:all,  
:conditions=>[  
'month_no > ? and month_no < ?',  
9, 3])
```

Games played out of season

```
BaseballGame.find(:all,  
:conditions=>[  
'month_no > ? or month_no < ?',  
3, 9])
```

Actually this query will never return anything, so it won't be used

```
BaseballGame.find(:all,  
:conditions=>[  
'month_no > ? and month_no < ?',  
3, 9])
```

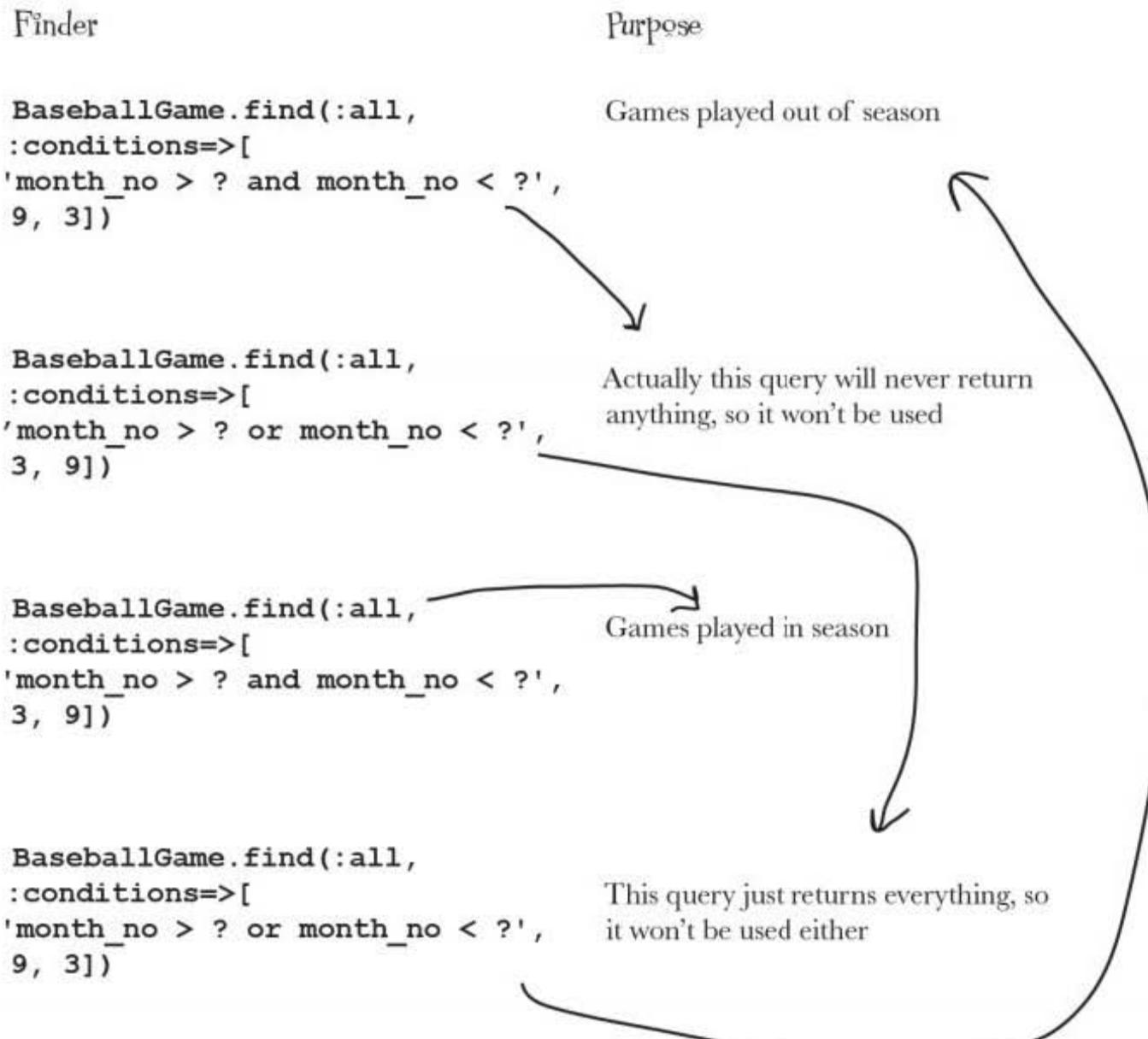
Games played in season

```
BaseballGame.find(:all,  
:conditions=>[  
'month_no > ? or month_no < ?',  
9, 3])
```

This query just returns everything, so it won't be used either

WHAT'S MY PURPOSE? SOLUTION

Your job was to match the finders up with how those finders could be used.



Then there's a knock at the door...

Just as you're demonstrating the system there's a knock at the door.
It's some of the guys from the body building club.



It seems like there's been a problem with the data entered into the system... get ready for the next chapter, where we'll dig deeper into the bodybuilding problem.

rails toolbox



Tools for your Rails Toolbox

You've got Chapter 4 under your belt, and now you've added the ability to choose whether to use scaffolding and how to smartly select the correct data for your application.

Rails Tools

`find(:all, :conditions=>[...])` allows you to specify the SQL used to select records from the database.

`form_tag` generates simple forms that are not bound to model objects.

Ruby Tools

`puts <string>` displays a string on the console (the one running the web server)

5 Validating your data

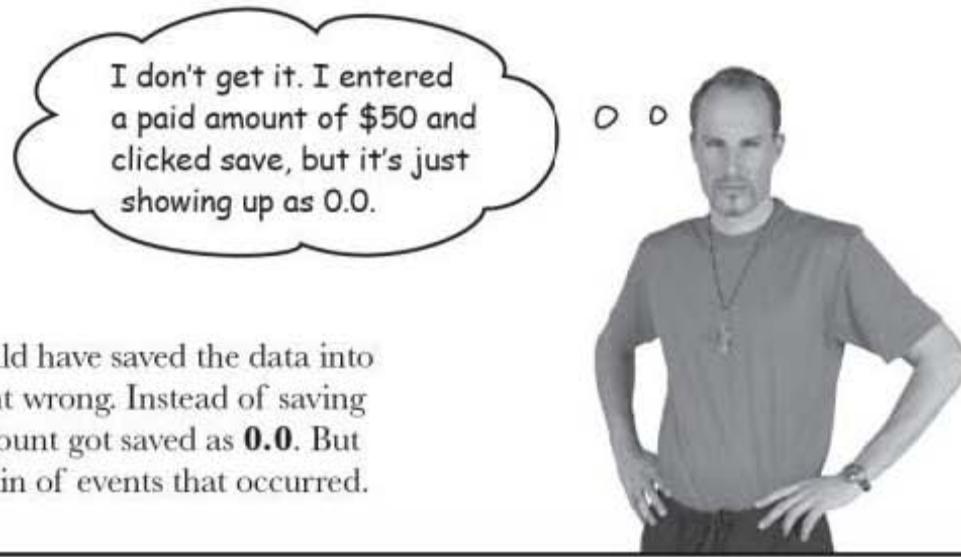


Everyone makes mistakes... but many of them are preventable!

Even with the very best of intentions, your users will still enter bad data into your web app, **leaving you to deal with the consequences**. But just imagine if there was some way of **preventing mistakes** from happening in the first place. That's where **validators** come in. Keep reading, and we'll show you how to add **clever Rails validation** to your web app so that you can **take control** of what data is allowed in—and what needs to be kept out.

Watch out—there's bad data in the room

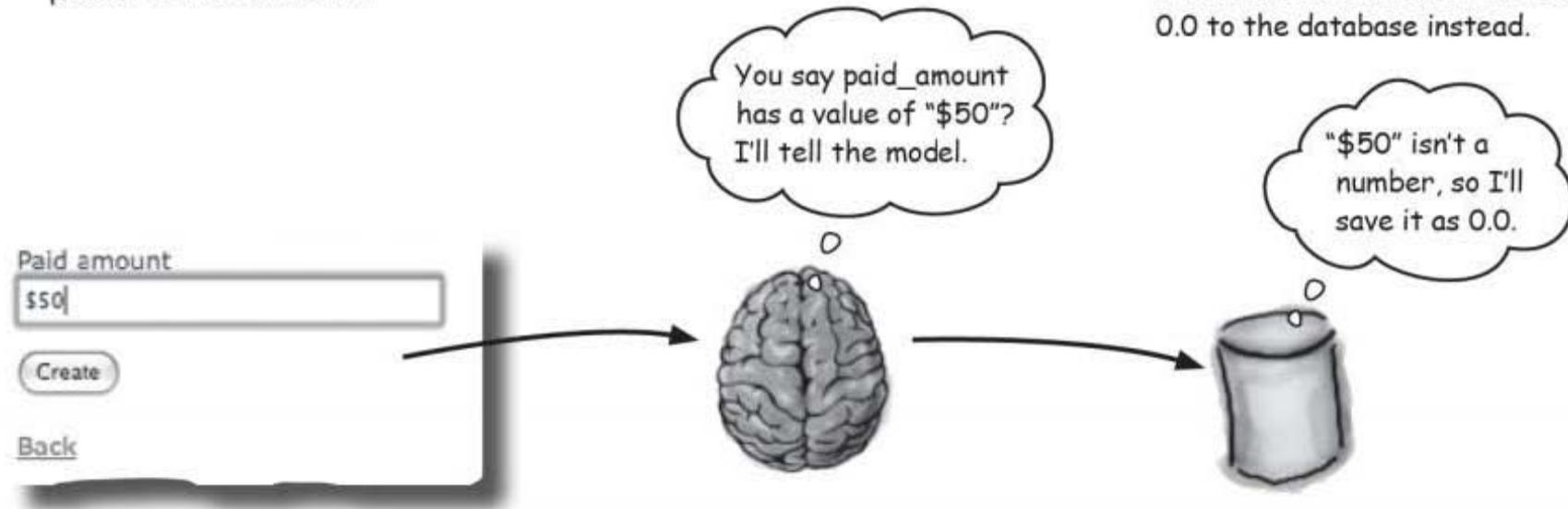
Everything seemed to be going so well with the personal trainers' web app, at least until the body builders showed up. The body builders say they've paid their gym dues, and have the receipts to prove it, but their payments aren't showing up on the system.



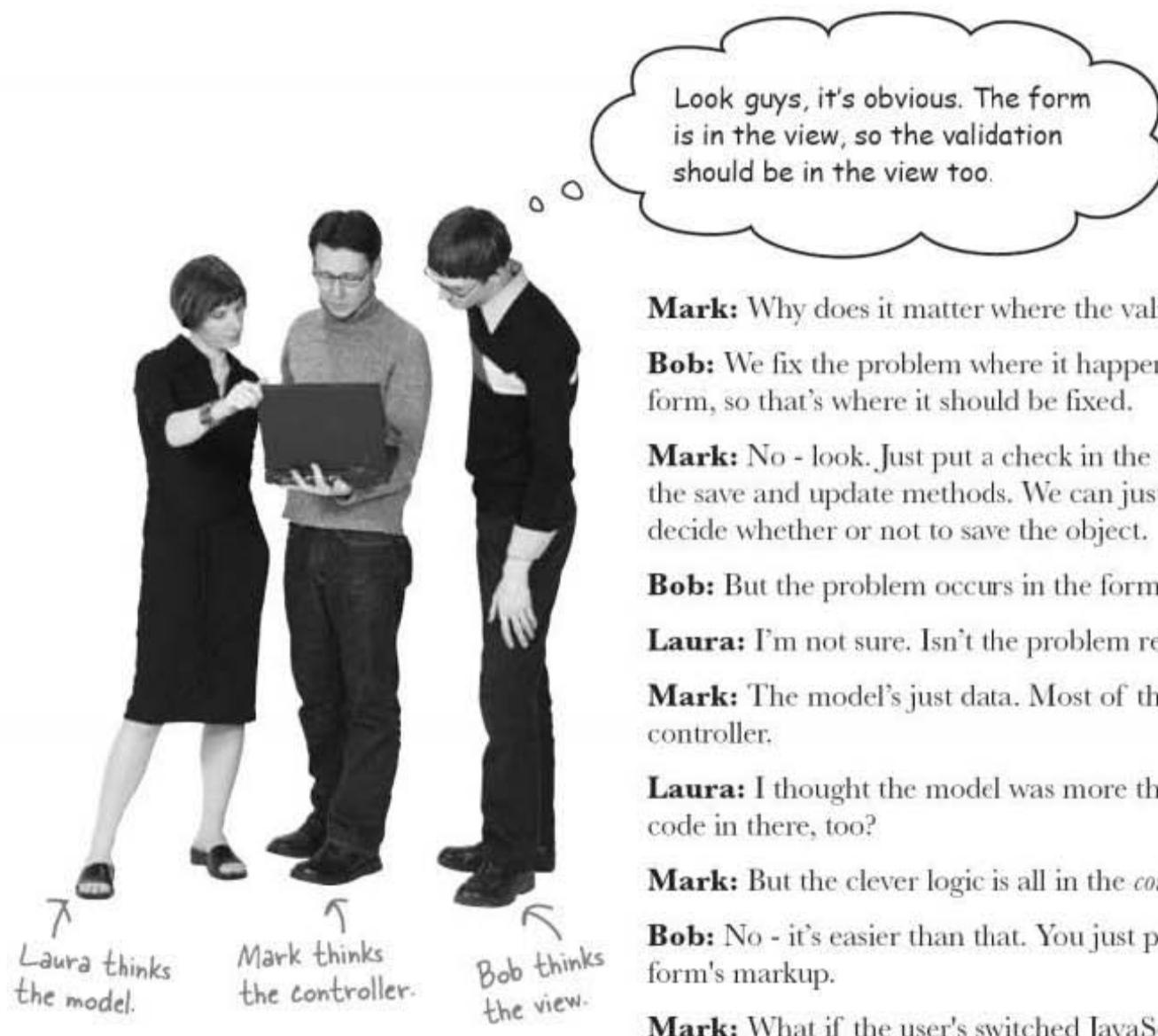
So what went wrong?

Clicking on the save button should have saved the data into the database, but something went wrong. Instead of saving the amount paid as **\$50**, the amount got saved as **0.0**. But how? Let's take a look at the chain of events that occurred.

- ➊ A trainer enters "\$50" into the paid field in the view, and then clicks on the save button. A value of "\$50" is passed to the controller.
- ➋ The controller receives a value of "\$50" for the amount paid, and it passes this along to the model.
- ➌ The model receives the value "\$50," but there's a problem. Since the value contains a \$ symbol, the model can't convert it to a number. It saves the value 0.0 to the database instead.



The problem was caused by the trainer entering the wrong sort of data in the web page, and we need to prevent this happening again. We need to write code to validate the form data before it's written to the database—**but where should validation code go?**



Mark: Why does it matter where the validation is?

Bob: We fix the problem where it happens. The error happens in the form, so that's where it should be fixed.

Mark: No - look. Just put a check in the controller. The controller calls the save and update methods. We can just make the controller able to decide whether or not to save the object.

Bob: But the problem occurs in the form.

Laura: I'm not sure. Isn't the problem really in the model?

Mark: The model's just data. Most of the code we write is in the controller.

Laura: I thought the model was more than just data. Can't we put code in there, too?

Mark: But the clever logic is all in the *controller*.

Bob: No - it's easier than that. You just put a JavaScript check in the form's markup.

Mark: What if the user's switched JavaScript off in their browser?

Bob: Hey, come on, *nobody* switches JavaScript off anymore.

Laura: But how can you rely on that? Particularly when it's obvious where the code should go.

Mark: The controller.

Laura: The model.



Where do you think the validation should go? Why? Write your answer below.

.....
.....
.....

validate in your model



Sharpen your pencil Solution

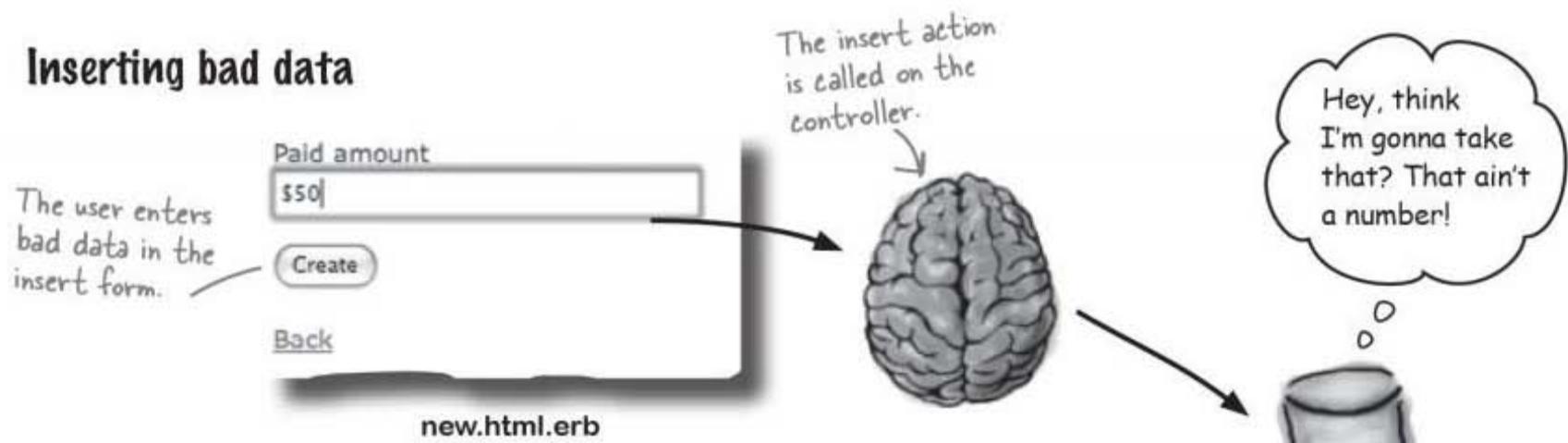
Where do you think the validation should go? Why? Write your answer below.

The data should be validated in the model in case data is saved by different parts of the controller or view.....

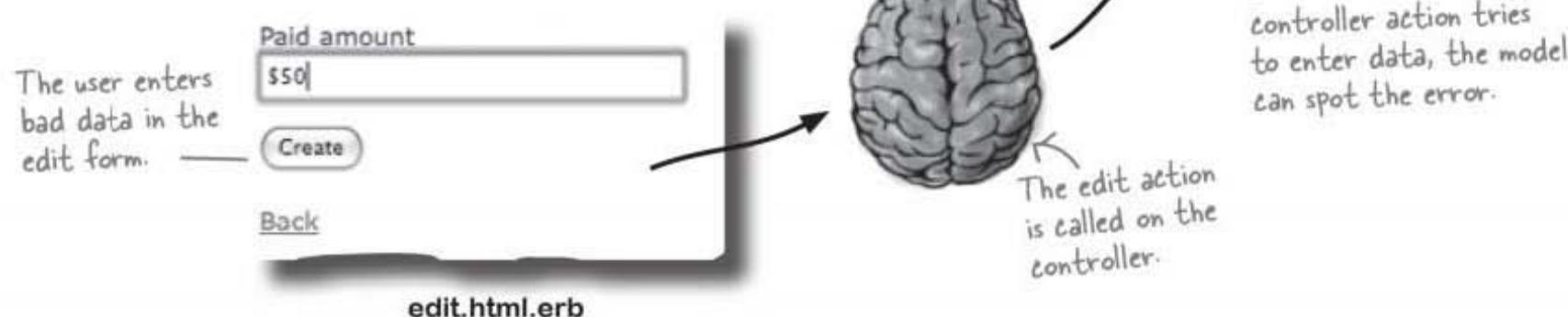
Validation code goes in the MODEL

The trouble with putting validation code in the view or the controller is that two separate bits of code might try to save values to the database. If we have insert and edit methods in the controller, for instance, both of these need validation. If the validation is centralized in the model, it doesn't matter how data gets stored—validation on that data will still occur.

Inserting bad data



Editing bad data



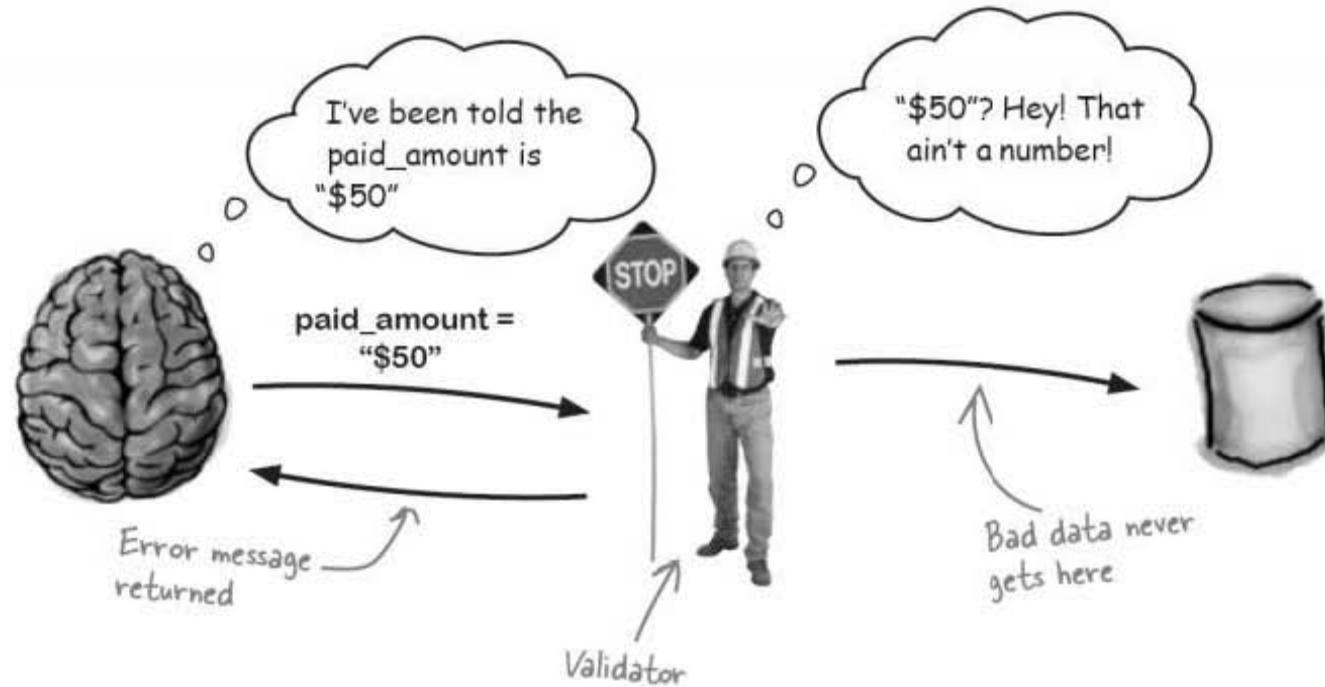
In general, it's a good idea to **validate in the model**. And after all, that's one of the reasons that we *have* a model layer. The model isn't just data. The reason we wrap the database in a layer of code is so that we can add the kind of smarts—like validation—that a database on its own doesn't provide. So how exactly do we add validation to the model?

Rails uses validators for simple validation

Every system needs to perform some kind of check on the data that gets entered into it, and sometimes the checking code can be long and complicated.

So what can Rails do to help? After all, the checks you need to make are pretty customized, aren't they? Well - yes and no. The set of validation rules for **your** data will probably be unique to your system. But the individual rules themselves will probably be checking for a small set of typical errors, like **missing data**, or data in the **wrong format**, or data of the **wrong type**.

That's why Rails comes with a set of built-in standard checks called **validators**. A validator is a Ruby object that looks at the data people have entered and performs a simple check on it. When does it do the check? Whenever someone tries to save or update the data in the database.



Validators are a quick and effective way of improving the quality of your data. They will help you filter what is and isn't allowed into your database. And in the cases where the data is bad, they will even provide a set of error messages to help the user diagnose what went wrong.

But how do validators work?

So how do validators work?

Let's follow a ClientWorkout as it goes through a validation sequence.

1 The user submits the details of a ClientWorkout.

The problem is, the `paid_amount` field contains “\$50” rather than “50”, and “\$50” can't be converted to a numeric value.

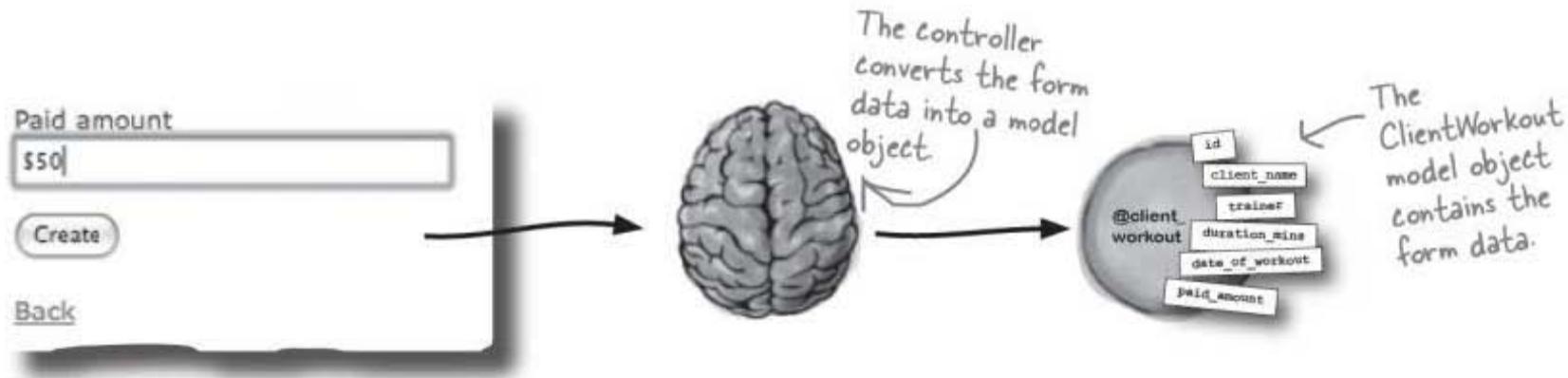
Paid amount
\$50

Create

Back

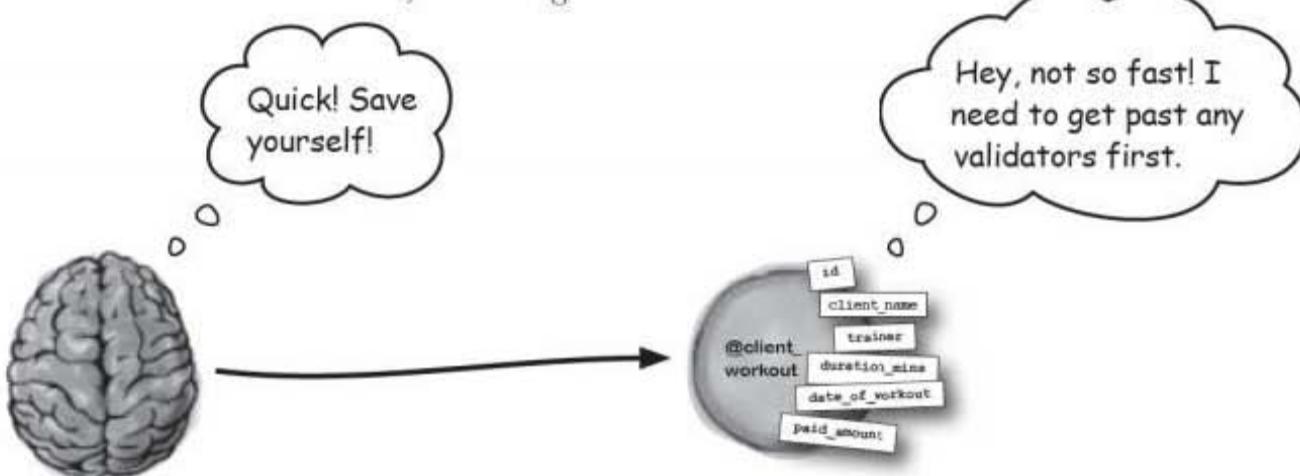
2 The controller converts the form data into a ClientWorkout model object.

The model object stores a copy of the form data, and it uses that to generate the values of its attributes. If you ask the object for the value of its `paid_amount` attribute, it tries to convert the “\$50” to a number, but can't, so the controller says the `paid_amount` is 0.0.



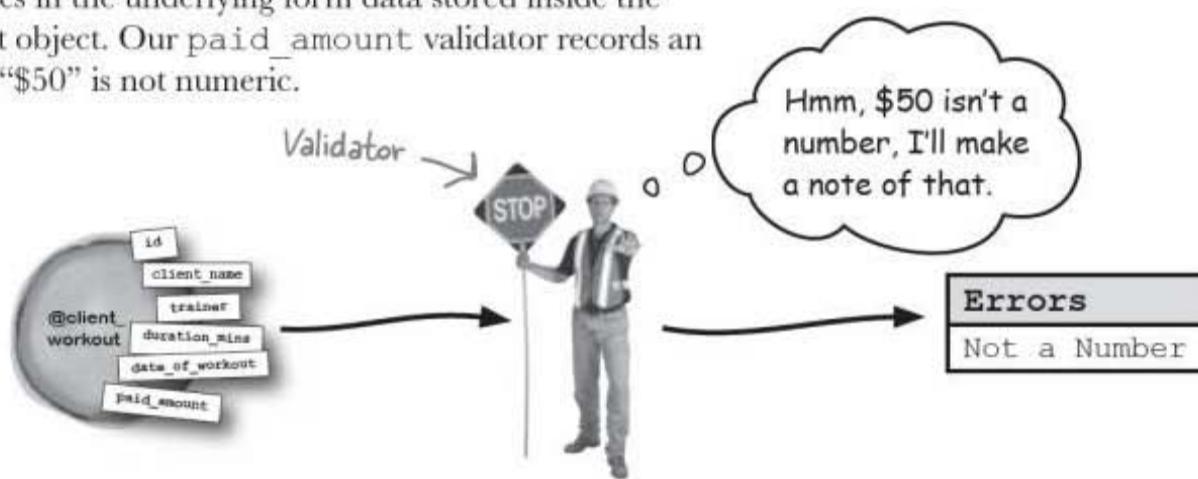
3 The controller tries to save the object.

The controller asks the model object to save itself. Ordinarily the object would save a record of itself to the database with a `paid_amount` value of 0.0. But if there's a validator on the model, then things are a little different...

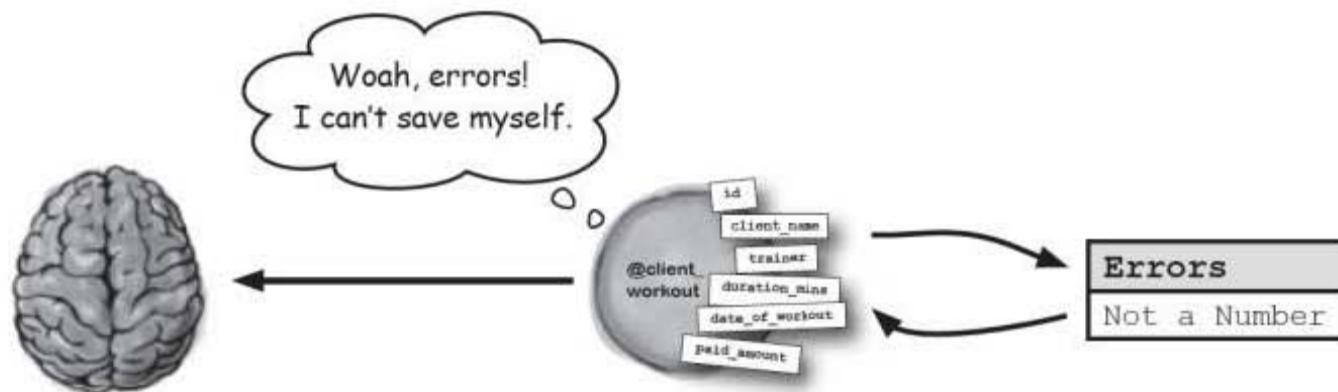


4**The model object runs its validator(s).**

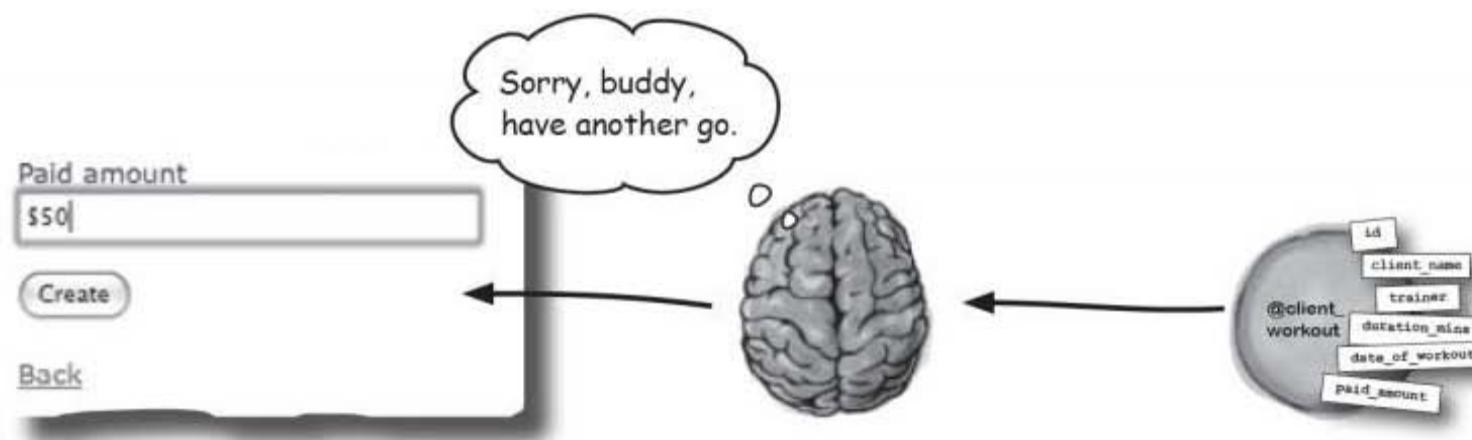
When the model object is asked to insert or update a record to the database, it first runs its validators. The validators check the values in the underlying form data stored inside the ClientWorkout object. Our paid_amount validator records an error because “\$50” is not numeric.

**5****The model object decides whether it's OK to save the record.**

Only after the validator has run will the model object decide if it can save the record to the database. How does it decide? It looks to see if any errors have been created. The paid_amount validator failed so the model skips saving a record and tells the controller that something went wrong.

**6****The controller returns the user to the form.**

The code in the controller knows that something went wrong, so it returns the user to the form page so that the errors can be corrected.



`validate numericality`

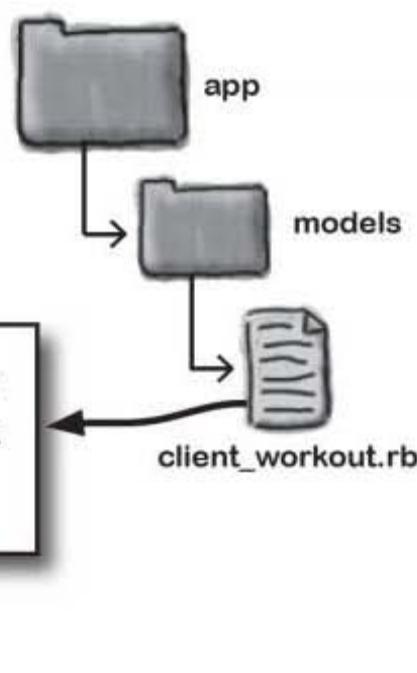
Let's check if something is a number

We'll check the `paid_amount` field with a validator called `validates_numericality_of`. The validator will belong to a model object, so we need to add it to the model code in `client_workout.rb`:

Here's the validator.
It checks to see
whether a given
field is numeric.

```
class ClientWorkout < ActiveRecord::Base
  validates_numericality_of :paid_amount
end
```

This is the field
we're validating.



This will create an *instance* of the validator for each `ClientWorkout` object.

The validator needs the name of the attribute it's going to check. Like pretty much all names in Ruby, the attribute name is given as a *symbol*: `:paid_amount`.

Remember that a *symbol* is a little like a **string**. Symbols always begin with a colon (:) and are generally used to refer to the names of things, like the names of fields and attributes.

So how will this all actually work in our app? Let's say the controller has a `ClientWorkout` model object called `@client_workout`.

Whenever the controller calls `@client_workout.save` or `@client_workout.update_attributes`, the model object will run the `validates_numericality_of` validator.

If the original form data inside the model object has “\$50” recorded against the `paid_amount` field, the validator will generate an error. Rails will spot the error and abort the database update.

That's the theory. Let's see if this all works.



Test Drive

Now that the validator's in place, let's try the page out. Here's what happens now when we try to insert a record with bad data in the `paid_amount` field:

The "\$50" value is not numeric, so an error message is generated, the workout is not saved to the database, and the user is returned to the form to correct the error.

So what about the Edit page? Does the validator work there too? It should, because the model will call exactly the same validator when someone tries to update a record on the database.

validate required fields

Users have been leaving out data on their workout forms

Some people are have been leaving fields blank. For example, one of the trainers has been forgetting to enter his own name on some of the workouts he's entered. Later on, when he searches for all of his own workouts, he can't find the ones where he left his name off.

The image shows two screenshots of a web application. The left screenshot is titled 'ClientWorkouts: new' and shows a 'New client_workout' form. It includes fields for 'Client name' (set to 'David Ferrie'), 'Trainer' (empty), 'Duration mins' (set to '45'), 'Date of workout' (set to '2009-11-22'), and 'Paid amount' (set to '75'). Handwritten notes on this screen say: 'Steve adds a client's workout for David Ferrie...' pointing to the Client name field, and 'Steve keeps forgetting to enter his name.' pointing to the Trainer field. The right screenshot is titled 'ClientWorkouts: find' and shows a list titled 'Listing client_workouts for Steve'. It displays two rows of data:

Trainer	Duration mins	Date of workout	Paid amount	Action
Steve	60	2009-11-08	100.0	Show Edit Destroy
Steve	30	2009-11-22	50.0	Show Edit Destroy

Handwritten notes on this screen say: 'This is what you get when you search for Steve's workouts... but the new David Ferrie one is missing.' pointing to the first row, and '...but now the workout's gone missing.' pointing to the second row.

And not only does the trainer's name need to completed, but the client's name as well. Lenny Goldberg had a couple of sessions where his name wasn't recorded. Lenny normally gets billed at the end of the month, so when they searched for his training sessions to find which ones didn't have payments, they couldn't find them. The personal trainers just can't afford for this to happen!

So can validators help?

So far, we've only used a validator to check and see if an input value is numeric. But there's a whole family of validators that can do anything from checking that a value is in a list, to whether a value is unique in a particular column in a table.

How do we check for mandatory fields?

There's a validator we can use to check for values in mandatory fields. The validator that does this is `validates_presence_of`:

```
validates_presence_of :field_name
```

The name of
the mandatory
field goes here.

Here's the code with the validators in place:

Go ahead and add
this code into your
version of the app.

```
class ClientWorkout < ActiveRecord::Base
  validates_numericality_of :paid_amount
  validates_presence_of :trainer
  validates_presence_of :client_name
end
```

This will make sure
that the names of
the trainer and
client are completed.

there are no Dumb Questions

Q: If a validator fails, does the model object run the other validators anyway?

A: Good question: yes. Even though the model object will know after the first failure that it will be able to abort the save operation, the model still runs the other validators before telling the controller about any failures.

Q: Why's that?

A: Imagine you have made several errors on a form. By running all of the validators, the model objects ensures that you see *all* of the error messages, so that you can fix all of the errors before resubmitting the form. If you only ever saw the first error, you may have to re-submit the form several times.

Q: Why does the model object keep a copy of the form data? Why doesn't it just store the values from the form in ordinary attributes?

A: The model object needs to run validators on the original strings submitted from the form. If, say, it stored the `paid_amount` value in a numeric attribute, it would have to convert the value to something like `0.0`. That would hide the fact that there had been a problem.

Q: So when I ask a `ClientWorkout` object for `@client_workout.paid_amount`, isn't that returning a proper attribute value?

A: What the `@client_workout` object will do is look at the value of the submitted form-field ("\$50") and then return a numeric version of that. It will do that each time you ask for `@client_workout.paid_amount`.

Q: So is that why it saves "\$50" to the database as `0.0`?

A: Yes. If there are no validators, the model constructs a SQL INSERT or UPDATE statement from the attribute-value of the

model object. When it looks at the value of `@client_workout.paid_amount`, the value is `0.0`, and that's what gets sent to the database.

Q: Can I ask the model object to skip validation?

A: Yes. If you call `@client_workout.save(false)` it will save the object without running the validators.

Q: Can I change the error messages?

A: Yes - you can provide your own error messages as an extra string:
`validates_presence_of :trainer, "Where's your name?"`

Q: How do the error messages get displayed?

A: There is a tag in the form called `f.error_messages`. We'll find out more about the process later on.



Test Drive

Let's fire up a browser and try to enter some bad data into the New form.
Hopefully, our new validator code will catch any problems.

New client_workout

Client name
Trainer
Duration mins
Date of workout
Paid amount

Leave these fields empty...
... and put in a non-numeric value here.

New client_workout

3 errors prohibited this client workout from being saved

There were problems with the following fields:

- Client name can't be blank
- Paid amount is not a number
- Trainer name can't be blank





WHAT'S MY PURPOSE?

We only needed to check a couple things for this system, but let's see what other validators are available. See if you can work out what validators were used for what purpose:

```
validates_length_of :field1,  
:maximum=>32
```

Check that a credit card # looks like a credit card #

```
validates_format_of :field1,  
:with=>/regular expression/
```

Check that a mass-mailing will not go to the same person twice

```
validates_uniqueness_of :field1
```

Did they spell the muscle group correctly?

```
validates_inclusion_of :field1,  
:in=>[val1, val2, ..., valn]
```

Check that a username fits into a database column

* WHAT'S MY PURPOSE? SOLUTION *

We only needed to check a couple things for this system, but let's see what other validators are available. See if you can work out what validators were used for what purpose:

```
validates_length_of :field1,  
:maximum=>32
```

Check that a credit card # looks like a credit card #

```
validates_format_of :field1,  
:with=>/regular expression/
```

Check that a mass-mailing will not go to the same person twice

```
validates_uniqueness_of :field1
```

Did they spell the muscle group correctly?

```
validates_inclusion_of :field1,  
:in=>[val1, val2, ..., valn]
```

Check that a username fits into a database column

Validators are simple and work well

The data quality is now much higher, and workout data has stopped mysteriously vanishing. The accountant is happy because she has a record of all the clients who haven't paid and the body builders no longer have to worry about their payments going missing.





BULLET POINTS

- Validators are defined on the **model**.
- Validators check form data which is stored in the **model object**.
- Validators run **before** database inserts or updates.
- A model object may have **several validators**.
- The model object will run **all validators** each time.
- The **controller** should check if the save or update was successful.
- The user will be returned to the form if there are **errors**.
- There are **many validators** available.

Everything was going so well until...

[back to mebay](#)



Hi - this is Sarah from MeBay.
Can you give us a call? We started
to add validators to your code and
they don't seem to be working.

Something strange has happened at MeBay

The folks at MeBay heard about your work with validators so they tried adding them to the code you'd written for them.

But they didn't get such a good result...



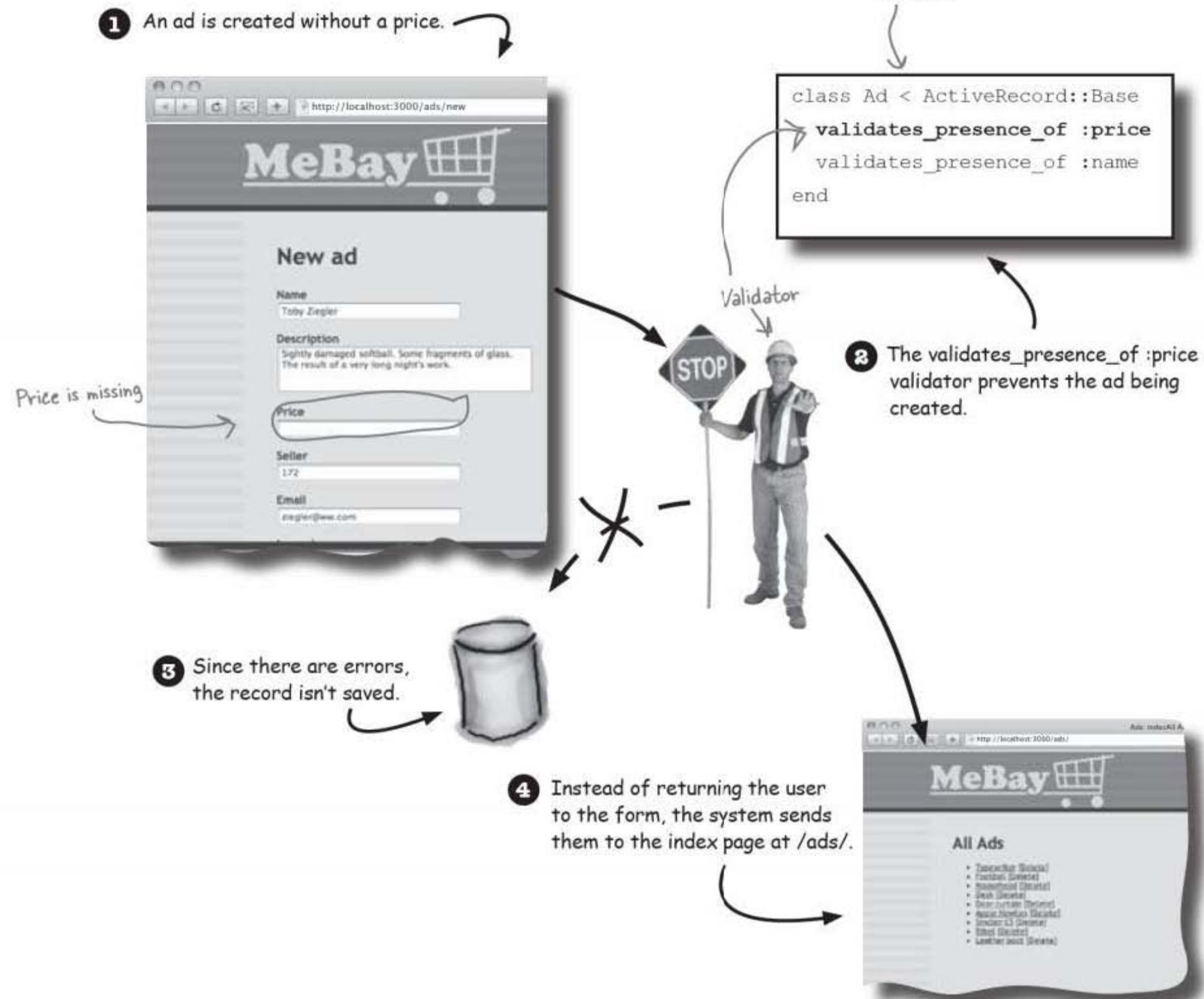
All MeBay did was add validators to check that all the fields on new adds were completed, and that the numeric and email fields were correctly formatted.

Let's look at what's happening in more detail...

The validators work, but they don't display errors

Someone entered an ad with a blank price to see what's wrong with the validators.

This is the Ad model on the MeBay application, with its new validators.



So what went wrong?



Sharpen your pencil

1. If an ad is correctly entered, the next page a person sees is the new ad's page. Why did Rails display the index page at /ads/ instead of the New ad page with errors?

.....
.....
.....
.....
.....
.....
.....
.....
.....

2. The validators worked correctly on the health club application. Why do you think they didn't work on MeBay?

.....
.....
.....
.....
.....
.....
.....
.....
.....

Sharpen your pencil Solution

1. If an ad is correctly entered, the next page a person sees is the new ad's page.
Why did Rails display the index page at /ads/ instead?

A record's ID is blank until it's saved. Normally the app redirects to
`/ads/<id>`

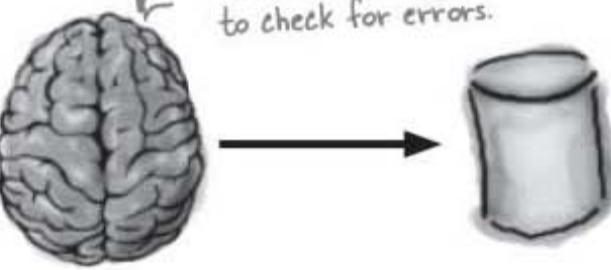
Because the ad wasn't saved, the user got redirected to:
`/ads/<blank>`

2. The validators worked correctly on the health club application. Why do you think they didn't work on MeBay?

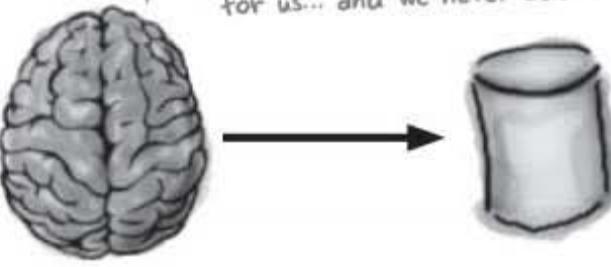
The health club app was created with scaffolding but the MeBay app was created manually...
Scaffolding code checks for errors and displays them... but our custom code doesn't!



The Health Club app was created using scaffolding, so extra code was generated to check for errors.



The MeBay app was created manually without scaffolding, so the code to check for errors wasn't generated for us... and we never added it in.

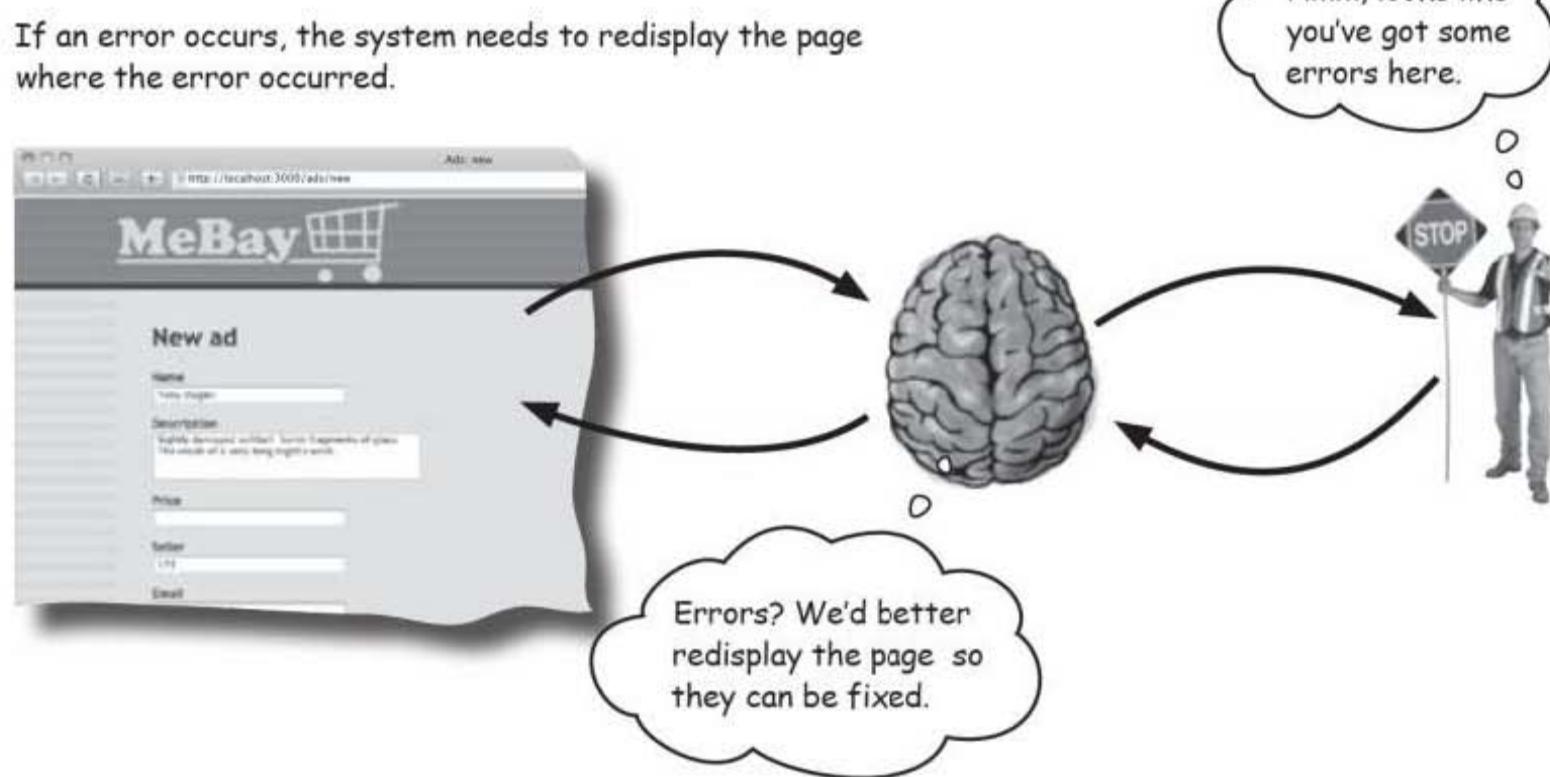


If you build your own pages, you need to write your own error message code

When you scaffold part of an application, Rails generates the code you need to handle errors. But if you are creating code manually, you're pretty much on your own. So we need to change the MeBay code to handle errors.

The code will need to do two things:

- 1 If an error occurs, the system needs to redisplay the page where the error occurred.



- 2 The form page will need to display all of the errors that were generated by the validators.



So what's the first thing the application needs to do?

The controller needs to know if there was an error

If the user enters bad data into a form, Rails needs to send the user back to the form with the error. Page flow like this is handled by the controller. Remember that the controller is in charge of what data is read and written and which pages are displayed.

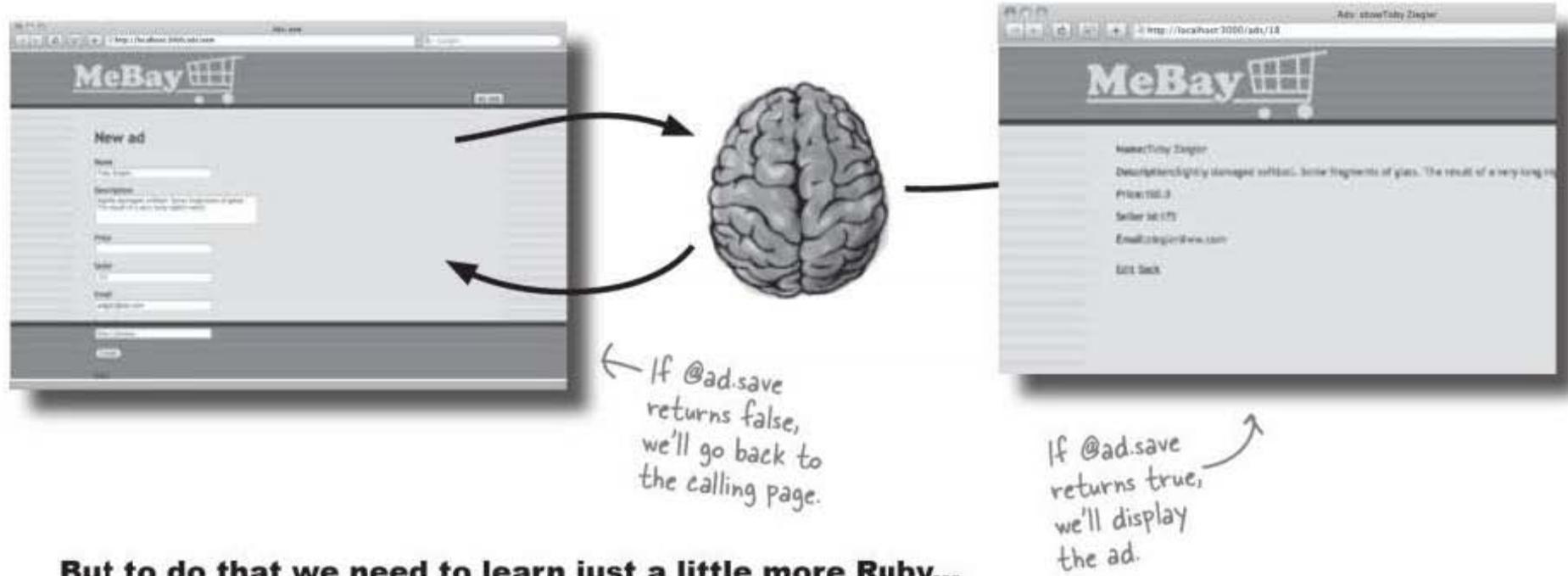
What does the controller code need to do to handle errors in the MeBay application? Here's what the app currently does when a new ad is submitted:

```
def create
  @ad = Ad.new(params[:ad])
  @ad.save
  redirect_to "/ads/#{@ad.id}"
end
```

If there's an error, we don't want to redirect.

The code will always do the same thing—try to save the ad to the database and then go to a page to display the data. It doesn't currently matter if the save *fails*... and that's a big problem

But **how do we tell** if the save method has failed? Well, in Ruby every command has a **return value**. If there's a problem saving an ad, the `@ad.save` command will return **false**. We can use the return value of `@ad.save` to determine whether we should **redisplay the page**... or display the saved ad.



But to do that we need to learn just a little more Ruby...

Pool Puzzle



The code you need to correct the page flow is given here. It uses a Ruby language feature we've not met yet—the `if` statement. Your job is to take code snippets from the pool and construct the code needed to correct the page flow.

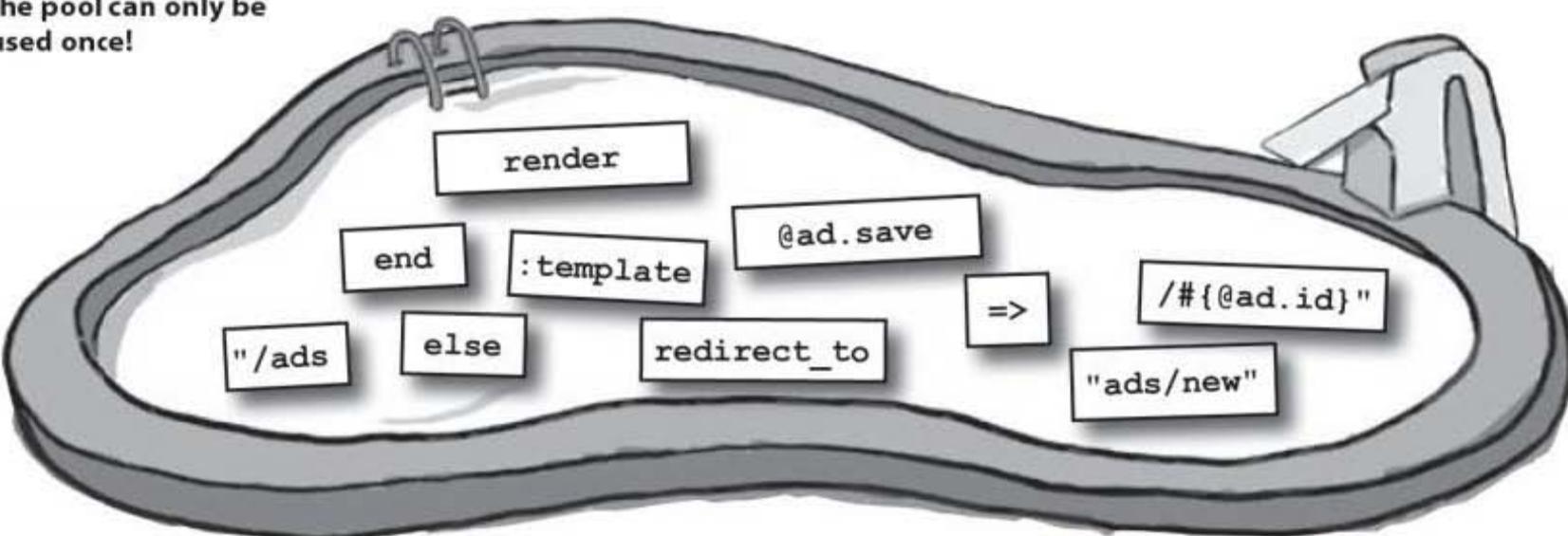
if

If the save works, then redirect to display the new ad.

* * * * *

If it fails, then redisplay the "ad/new" template.

**Note: each thing from
the pool can only be
used once!**



if this, then that

Pool Puzzle Solution



The code you need to correct the page flow is given here. It uses a Ruby language feature we've not met yet—the `if` statement. Your job is to take code snippets from the pool and construct the code needed to correct the page flow.

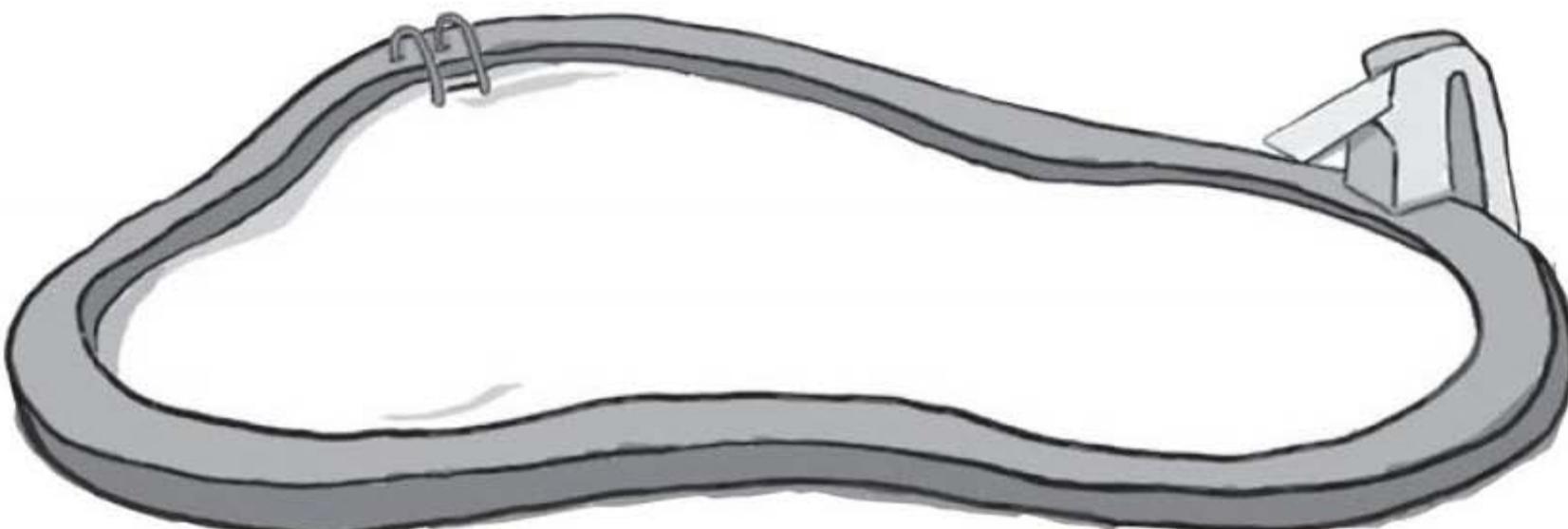
```
if @ad.save
  redirect_to "/ads/#{@ad.id}"
else
  render :template => "ads/new"
end
```

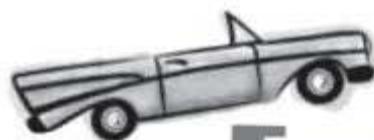
If the save works then redirect to display the new ad.

Rails also lets you call render with an `:action` parameter, so you can rewrite this as:

`render :action=>'new'`

If it fails, then redisplay the "ad/new" template.





Test DRIVE

Update your MeBay code to include some custom page control. Now what happens now if we miss putting a value in the price field?

The figure consists of two screenshots of a web browser displaying the 'MeBay' website. Both screenshots show the 'New ad' form. In the top screenshot, the 'Price' field is empty. In the bottom screenshot, the 'Price' field is now filled with the number '171'. A large curved arrow points from the top screenshot down to the bottom one. To the right of the screenshots, there is explanatory text and arrows:

- A left-pointing arrow above the top screenshot leads to the text: "You may want to re-download MeBay from the Head First Labs website to get all their updates."
- A right-pointing arrow below the bottom screenshot leads to the text: "We're returned to the same form, but no errors are displayed."

Now when the validators run, the controller spots there's a problem with the form data and redisplays the form, so the user can correct the problem. The model doesn't save the record, and the controller is now working correctly.

Except... Isn't there something missing?

We still need to display error messages!

It's good that the app redisplays the form—but **then what?**

To fix form problems, a user needs to know **what went wrong**. They need *error messages* that show them:

- ➊ Which **fields** had a problem
- ➋ Exactly what those **problems** were

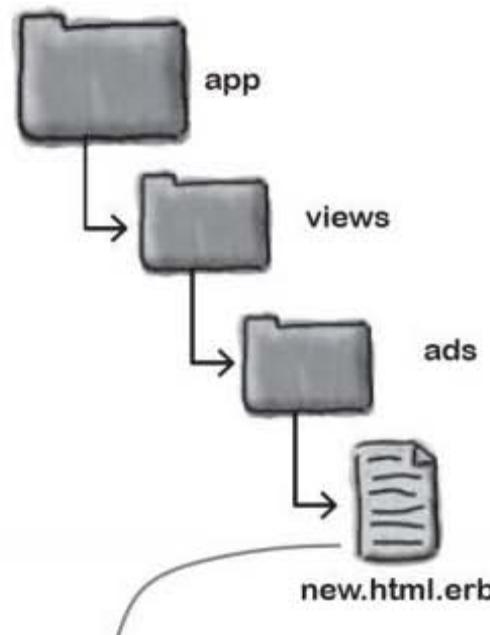
Every time one of the validators *fails*, it stores an error message in the **model**. But we want to display the error messages in the **view**. That means the messages need to be transferred from the model to the view.

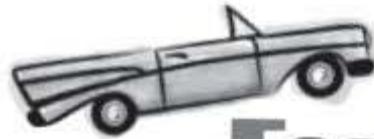
Which part of the **interface** is tightly bound to a model object?

The form! And the form object has a special method that can generate an error block. That method is called **error_messages**:

The error messages are generated by a method of the form object called **error_messages**.

```
<h1>New ad</h1>
<% form_for(@ad,:url=>{:action=>'create'}) do |f| %>
  ><%= f.error_messages %>
    <p><b>Name</b><br /><%= f.text_field :name %></p>
    <p><b>Description</b><br /><%= f.text_area :description %></p>
    <p><b>Price</b><br /><%= f.text_field :price %></p>
    <p><b>Seller</b><br /><%= f.text_field :seller_id %></p>
    <p><b>Email</b><br /><%= f.text_field :email %></p>
    <p><b>Img url</b><br /><%= f.text_field :img_url %></p>
  <% end %>
```





Test Drive

The folks at MeBay are now much happier. The validations keep their data clean and the users can now see straight away what the problems are and how to fix them.



It's time to release the new version of the code to the public and see what they think about it.

The MeBay system is looking pretty sweet

Now that the system is reporting errors correctly, the folks at MeBay are adding more and more validators. The controller checks for the errors and reports back any problems. Before long the data in the system has really great quality, and the number of errors drops dramatically.



There's just one more thing to do. The validators prevent any major data problems, but the errors are only displayed when a **new** ad is posted.

But errors still aren't reported when ads are edited . . .



Exercise

This is the code that runs when the “edit” page is submitted.

```
def update
  @ad = Ad.find(params[:id])
  @ad.update_attributes(params[:ad])
  redirect_to "/ads/#{@ad.id}"
end
```

Returns true if the update worked.

Rewrite it to respond to errors correctly.

Write down the name of the file that needs error message display code.



Exercise Solution

This is the code that runs when the "edit" page is submitted.

Returns true if the update worked.

```
def update
  @ad = Ad.find(params[:id])
  @ad.update_attributes(params[:ad])
  redirect_to "/ads/#{@ad.id}"
end
```

Rewrite it to respond to errors correctly.

```
def update
  @ad = Ad.find(params[:id])
  if @ad.update_attributes(params[:ad])
    redirect_to "/ads/#{@ad.id}"
  else
    render :template=>"/ads/edit"
  end
end
```

Or you could use:
render :action=>:edit

Write down the name of the file that needs error message display code.

app/views/ads/edit.html.erb

```
<h1>Editing <%= @ad.name %></h1>
<% form_for(@ad, :url=>{:action=>'update'}) do |f| %>
  <%= f.error_messages %>
  <p><b>Name</b><br /><%= f.text_field :name %></p>
```



Tools for your Rails Toolbox

You've got Chapter 5 under your belt, and now you've added the ability to use validators.

Rails Tools

`validates_length_of :field1, :maximum=>32` checks the field is no longer than 32 characters

`validates_format_of :field1, :with=>/regular expression/` checks that the field matches the regular expression

`validates_uniqueness_of :field1` checks that no other record in the table has the same value for field1

`validates_inclusion_of :field1, :in=>[val1, val2, ..., valn]` checks that the field has one of the given values

`f.error_messages` displays errors within a form

The `save` and `update_attributes` methods on model objects return true if they work, and false if they don't

`render :template=>"a/template"` renders output using the `app/views/a/template.html.erb` file

`render :action=>'new'` renders the template for the new action

6 making connections

Bringing it all together



Some things are stronger together than apart.

So far you've had a taste of some of the **key Rails ingredients**. You've created entire web applications and taken what Rails generates and **customized** it for your needs. But out in the real world, **life can be more complex**. Read on... it's time to build some **multi-functional web pages**. Not only that, it's time to deal with **difficult data relationships** and take control of your data by writing your own **custom validators**.

Coconut Airways need a booking system

There's no better way of traveling between islands than by seaplane, and Coconut Airways has an entire fleet. They offer scenic tours, excursions, and a handy shuttle service between all the local islands. Their service is proving popular with tourists and locals alike.



Demand for their flights is sky-high, and they need an online reservation system to help them. The system needs to manage flight and seat bookings. Here's the data they need to store:

Maximum allowance in Pounds →

Flight	
id	integer
departure	datetime
arrival	datetime
destination	string
baggage_allowance	decimal
capacity	integer

Here's the flight info...

This is the id of the seat

Remember: Rails will automatically add a column called "id" to every table.

...and here's the seat reservation.

Seat	
id	integer
flight_id	integer
name	string
baggage	decimal

The baggage is recorded in pounds.

Sharpen your pencil

1. Create an app called coconut?

.....
.....
.....

2. Scaffold the flight data?

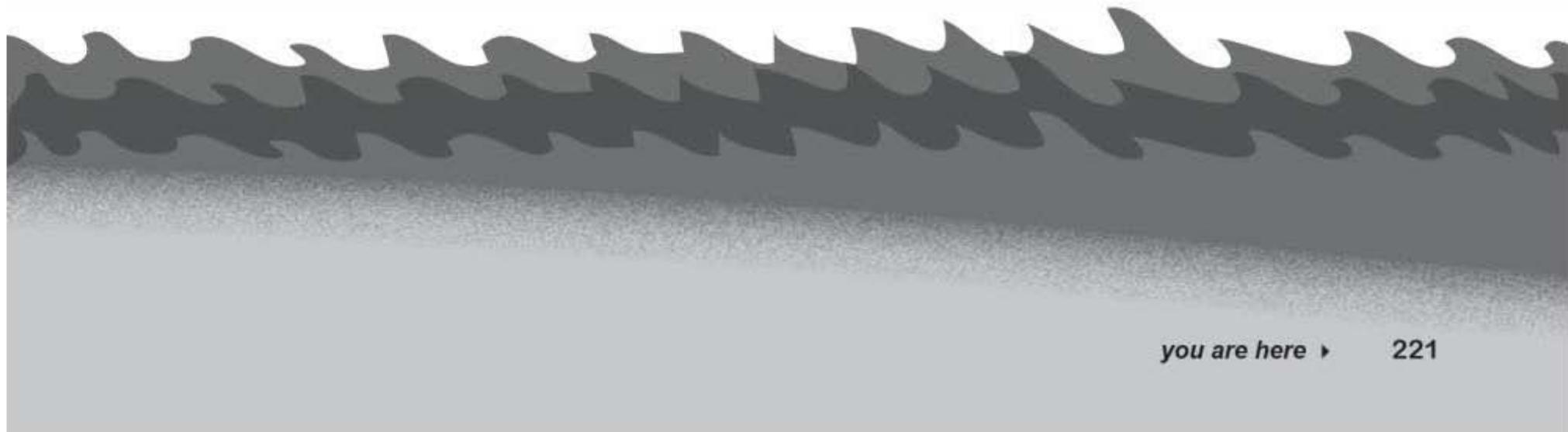
.....
.....
.....

3. Scaffold the seat booking data?

.....
.....
.....

4. What's the problem with just scaffolding the flight and seat data?

.....
.....
.....





Sharpen your pencil Solution

What are the instructions to:

1. Create an app called coconut?

..... rails coconut

You don't need to mention the "id" columns in the scaffold. They'll be added automatically.

2. Scaffold the flight data?

..... ruby script/generate scaffold flight departure:datetime arrival:datetime
..... destination:string baggage_allowance:decimal capacity:integer

Remember: you'll need to use rake db:migrate to create the tables!

3. Scaffold the seat booking data?

..... ruby script/generate scaffold seat flight_id:integer name:string baggage:decimal

4. What's the problem with just scaffolding the flight and seat data?

..... Scaffolding the flight and seat data generates one set of pages for the flights and another for the seats. It doesn't combine the two.

We need to see flights and seat bookings together

If we simply create scaffolding and don't customize the app, it will be hard to use. In order to book a seat on a flight, the user will have to look up the id of the flight from its URL:

Here's the flight page. →

To book a seat on a flight, the user has to look up the flight id.

We need to display a flight together with its seat bookings.

Let's look at what the seat scaffolding gives us

We need the flight page to look something like this:

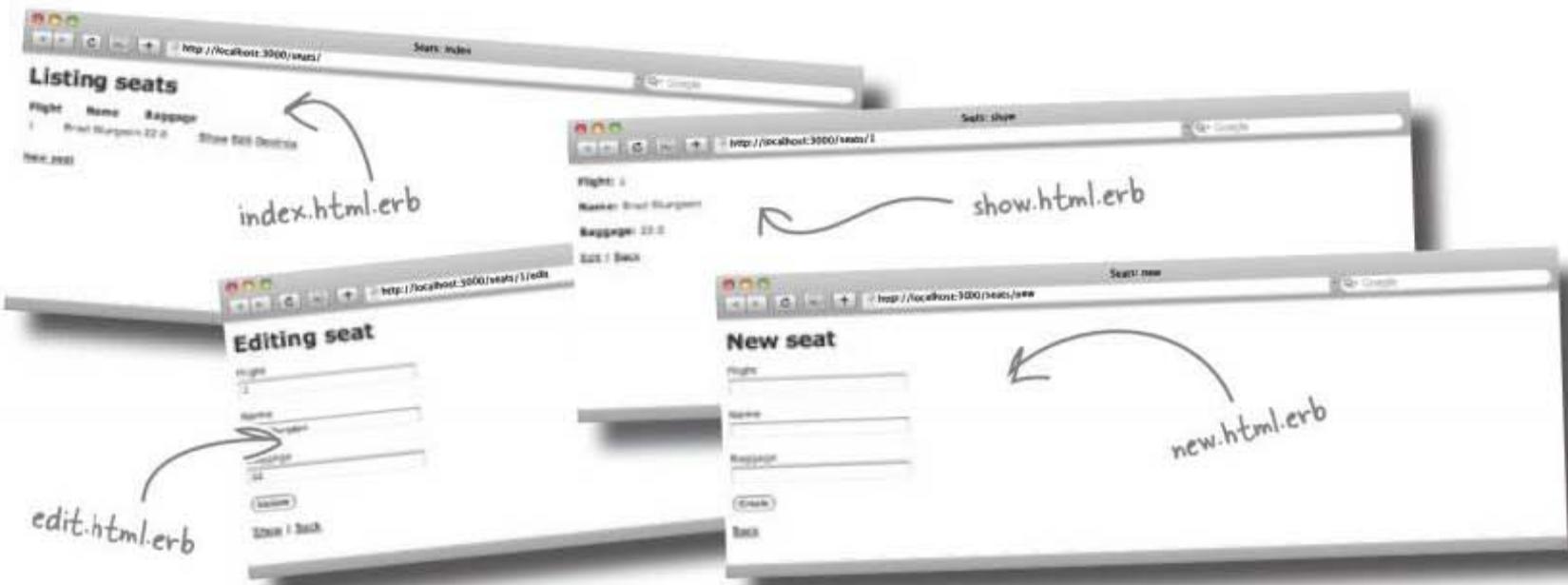
Flight	Name	Baggage	
Brad Margolin	Brad Margolin	22.0	Show Edit Delete
Kat Avery	Kat Avery	15.0	Show Edit Delete
Dave Becker	Dave Becker	16.0	Show Edit Delete
Jesse Blake	Jesse Blake	15.0	Show Edit Delete
Ted Brinkley	Ted Brinkley	25.0	Show Edit Delete
Ted Brinkley	Ted Brinkley	15.0	Show Edit Delete
Jesse Cane	Jesse Cane	16.0	Show Edit Delete
Jack Cane	Jack Cane	24.0	Show Edit Delete

New seat

Name:

Baggage:

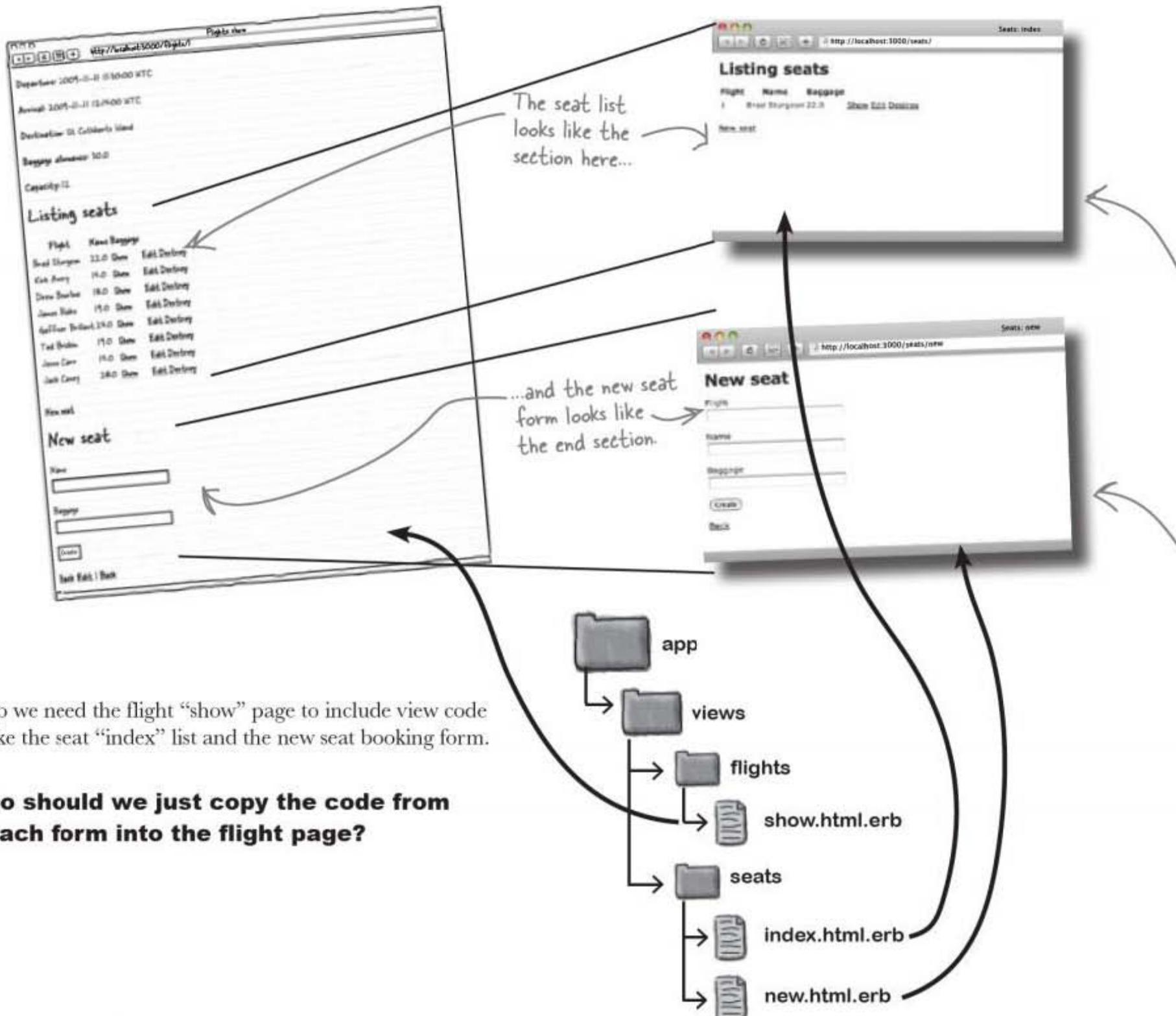
Let's see how this compares with the seat pages generated by the scaffolding:



Can any of these help us generate the flight page?

We need the booking form and seat list on the flight page

Two of the generated pages look pretty similar to what we need on the flight page, the seat list and the booking form. The middle section of the flight page looks like the seat list, and the booking form looks like the end section:





OK - so we've got to copy the form and the seat list code into the page template.

Mark: Woah - wait a minute. How much code is that?

Laura: I dunno. We need the code in the page, though. It's in the design.

Mark: I know we need the seat list and the booking form to *appear* in the page. But does that mean we have to have the code in there?

Laura: Why - what's the problem with that code?

Mark: The seat list and the booking form are doing significantly different things. Can't we break them apart somehow?

Bob: Break them apart? You mean into separate files?

Mark: Yes. That way we could have one file that displays a list of seats, one that displays the booking, and then include or call each page from the main page.

Laura: Oh - like separation of concerns.

Bob: What's that?

Laura: **Separation of concerns.** It means you get one piece of code to do just one thing. Makes it easier to track down bugs.

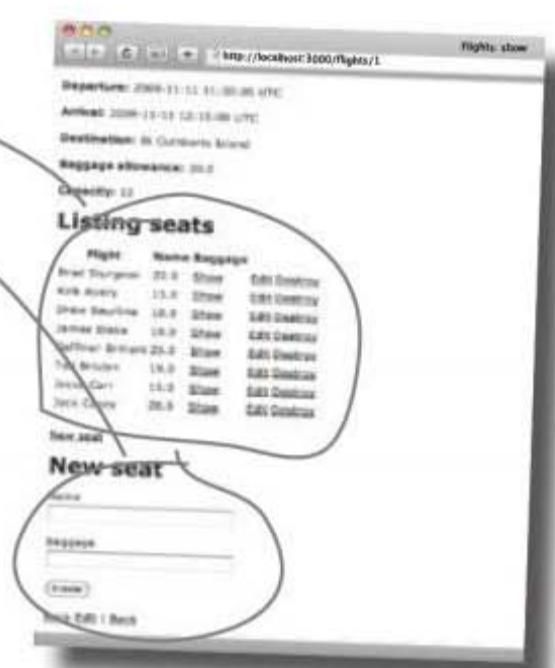
Bob: Sure, sounds great... but how do you actually do that?

How can we split a page's content up into separate files?

If we can split a page into separate files, it will make things more manageable. But how do we do that?

Rails lets us store fragments of pages into separate files called **partial page templates** or—more simply—**partials**. A partial is like a sub-routine that outputs a small part of a page. In our case we can use two partials: one for the seat list and another to add a new seat booking.

Partials are simply embedded Ruby files, just like templates. The only difference is that, unlike templates, partials have names that begin with an underscore (_).



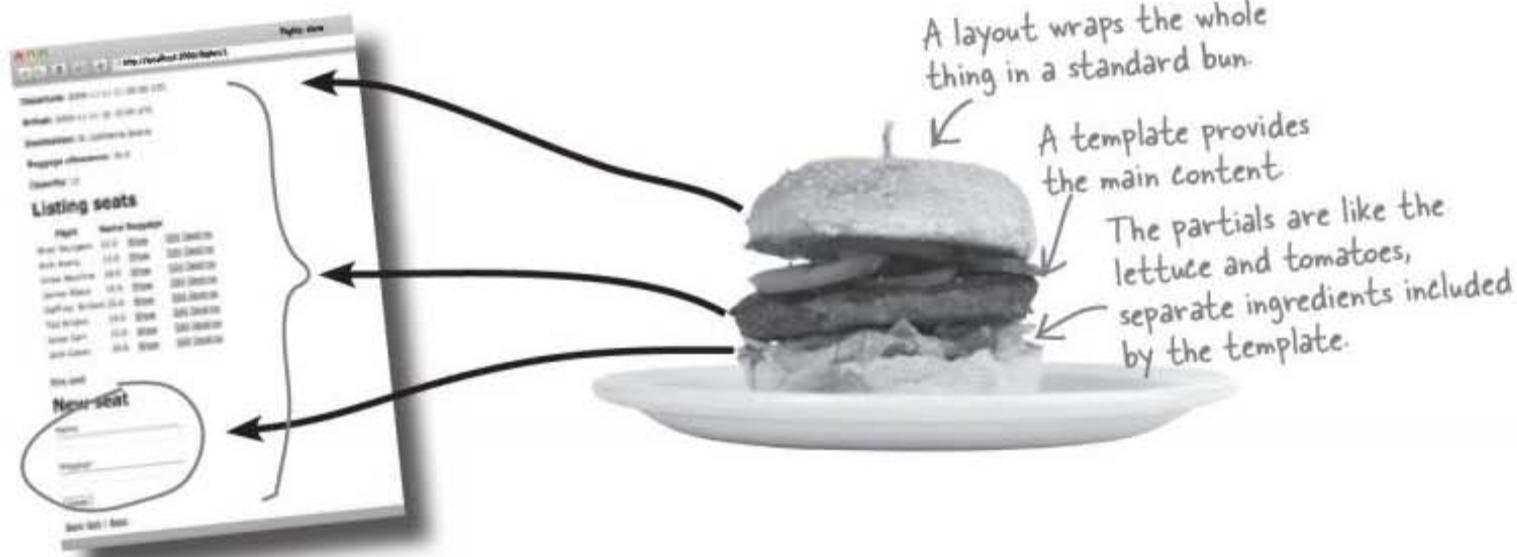
We can use partials for the new seat and seat list parts of the page.



ERb Files Up Close

We now have three kinds of Embedded Ruby (ERb) file: **templates**, **layouts**, and **partials**. But what's the difference between the three, and how does each type of ERb fit in with the other types?

You can assemble a web page with ERb files in the same way that you'd use a pile of ingredients to assemble a burger.



Layouts

A **layout** gives a set of web pages a consistent look, mostly by providing standard pieces of HTML that go at the top and bottom of each page, kind of like a bun wrapping a burger. By default, all the pages associated with a given controller will share the same layout.

Templates

A **template** is the main content of the web page, like the filling in the burger. A template is associated with an action. So there's a template to show the flight details, and another for the "New flight" form.

Partials

A template might call separate **partials** to build a page's main content. Partials are like the sub-ingredients of a burger, like the tomato or the lettuce. Partials allow you to break up a complex template into smaller parts. They also allow you to separate out common content, like menus and navigation bars. Partials can be used by templates, but also by layouts.

A bunch of ERb files, in full costume, are playing a party game, "Who am I?" They'll give you a clue — you try to guess who they are based on what they say. Assume they always tell the truth about themselves. Fill in the blanks to the right to identify the attendees.

Tonight's attendees:

Any of the charming types of ERb files you've seen so far just might show up!

Who am I?



Type of ERb File

I contain the navigation menu.

I include the title that appears in the browser window.

I display a form if someone needs to create a new object.

I display a contact email and a copyright message.

I give a set of pages a standard looking navigation bar.

A bunch of ERb files, in full costume, are playing a party game, "Who am I?" They'll give you a clue — you try to guess who they are based on what they say. Assume they always tell the truth about themselves. Fill in the blanks to the right to identify the attendees.

Tonight's attendees:

Any of the charming types of ERb files you've seen so far just might show up!

This is a page fragment that could be used in several places.

I contain the navigation menu.

That whole HTML <title/> section will be handled by a layout.

I include the title that appears in the browser window.

Templates are used with individual actions, like "new".

→ I display a form if someone needs to create a new object.

This is a partial because it's a page fragment, but it will probably be called by a layout →

I display a contact email and a copyright message.

→ I give a set of pages a standard looking navigation bar.

A layout controls the look of several pages, even though it will probably call the navigation bar in from a separate partial.

Who am I?



Type of ERb File

partial

layout

template

partial

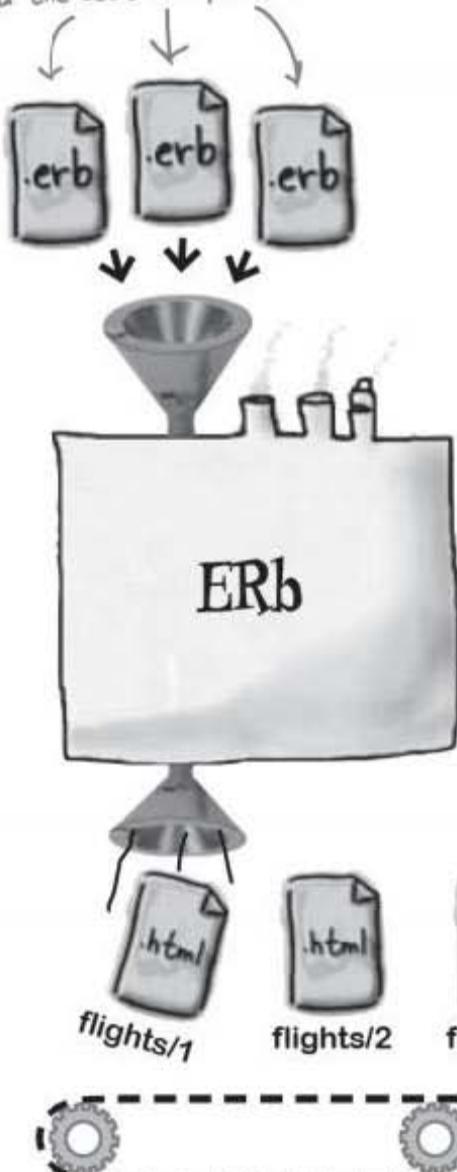
layout

ERb will ASSEMBLE our pages

We need to create partials for the booking form and the seat list, and then Embedded Ruby can process the flight page and call the ←

This allows a separation of concerns: we have separate components dealing with booking and seats, and those components are combined for the user when needed.

ERb will assemble our flight page out of the template show.html.erb, the booking form partial, and the seat list partial.



To Do

- Create a booking form partial
- Add the booking form to the page
- Create a seat list partial
- Add the seat list to the page

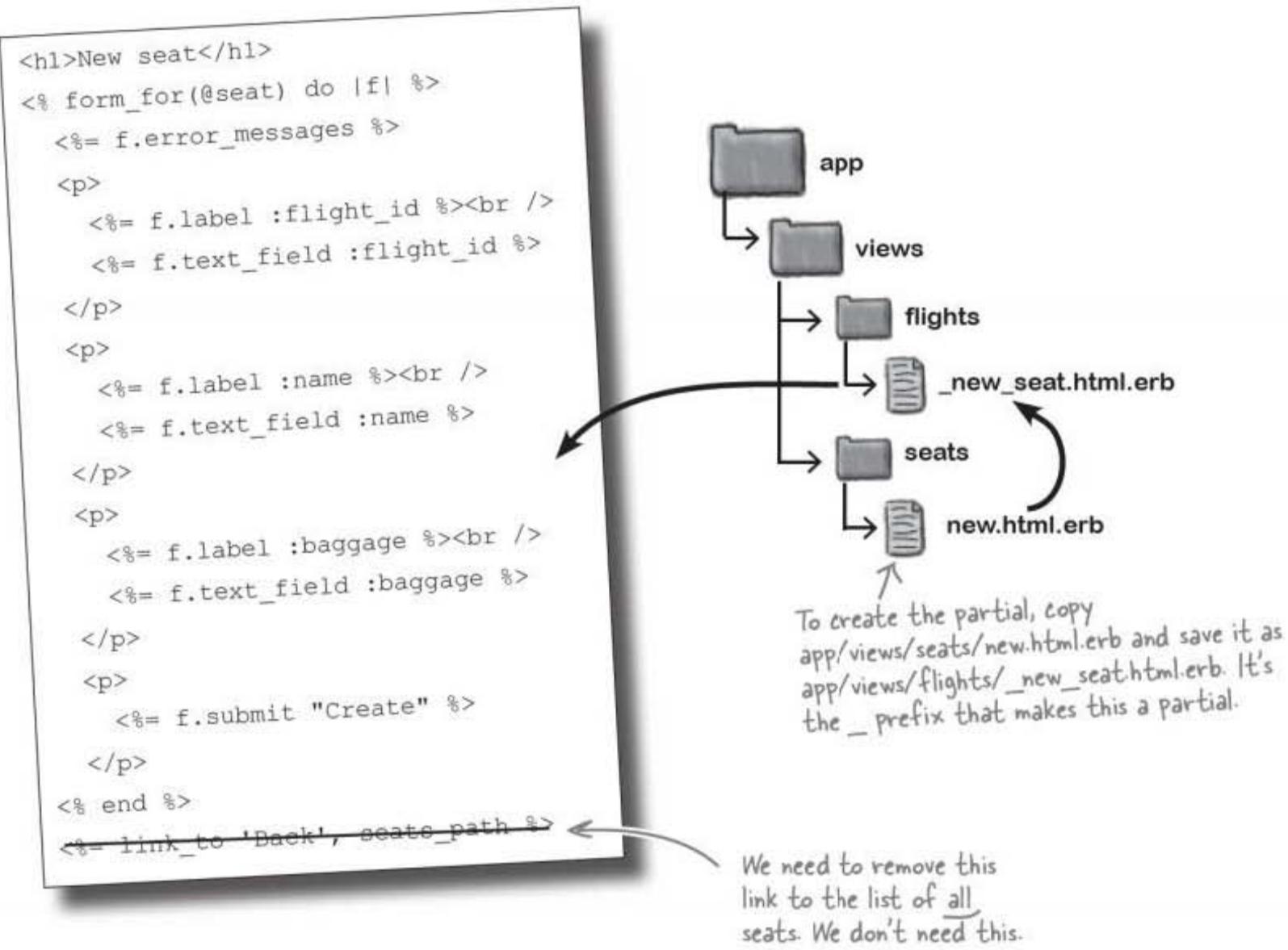
When Rails gets a request for flight information, it will use the partials, templates, and layout with Embedded Ruby to generate a single HTML response.

Let's start by looking at the first thing on the list—the booking form.

partials are just ERb

So how do we create the booking form partial?

Partials are just another kind of ERb file, so they contain the **same kinds of tags** that templates contain. Here's the content of our `_new_seat.html.erb` partial. It contains exactly the same code as the new seat page, which means that all we have to do is copy `app/views/seats/new.html.erb` and save it as `app/views/flights/_new_seat.html.erb`:



We could have left the partial in the “seats” folder, but we move it into the “flights” folder to make it slightly easier to call. It's also really important that the partial begins with the `_` character. The `_` character is used by Rails to distinguish partials from page templates.

Now we need to include the partial in the template

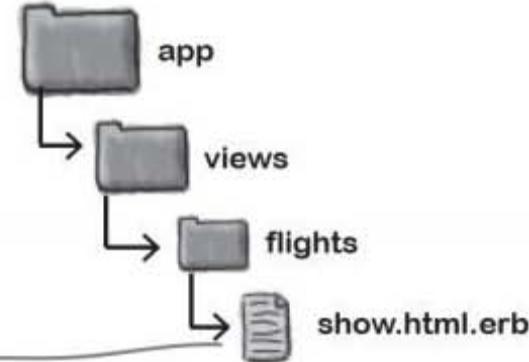
Creating the partial is only half the job. We now need to modify the flight show.html.erb page template to **include** the partial in its output. Partials, like templates, are really just pieces of Ruby code disguised to look like HTML. And in the same way that one piece of Ruby code can call another, the template can easily *call* the partial.

So how do you call a partial? By adding a `render` command to the flight page:

```

<p>
  <b>Departure:</b>
  <%=h @flight.departure %>
</p>
<p>
  <b>Arrival:</b>
  <%=h @flight.arrival %>
</p>
<p>
  <b>Destination:</b>
  <%=h @flight.destination %>
</p>
<p>
  <b>Baggage allowance:</b>
  <%=h @flight.baggage_allowance %>
</p>
<p>
  <b>Capacity:</b>
  <%=h @flight.capacity %>
</p>
<%= render :partial=>"new_seat" %>
<%= link_to 'Edit', edit_flight_path(@flight) %> |
<%= link_to 'Back', flights_path %>

```



You don't use the exact file name in the render call.

Watch it!
Even though partials begin with `_` and end with `.html.erb`, both of these should be omitted when you call a partial with `render`.

The render call tell Embedded Ruby to process the partial and include its output at that point in the file.

The partial should now appear in the flight page.



Test Drive

Let's look at the `show.html.erb` flight page and check that the booking form is appearing correctly. If we enter a few flights into the system and then look at the first by going to:

`http://localhost:3000/flights/1`

we see this:

This is the output generated by the `show.html.erb` flight page.

What happened here?

```
Showing app/views/flights/_new_seat.html.erb where line #3 raised:  
Called id for nil, which would mistakenly be 4 -- if you really wanted the id of nil, use object_id  
Extracted source (around line #3):  
1: <h1>New seat</h1>  
2:  
3: <% form_for(@seat) do |f| %>  
4:   <%= f.error_messages %>  
5:  
6:   <p>
```

Trace of template inclusion: `app/views/flights/show.html.erb`
`RAILS_ROOT: /Users/davidg/data/writing/books/hfror/code/chap6-master_detail/coconut1`
[Application Trace](#) | [Framework Trace](#) | [Full Trace](#)

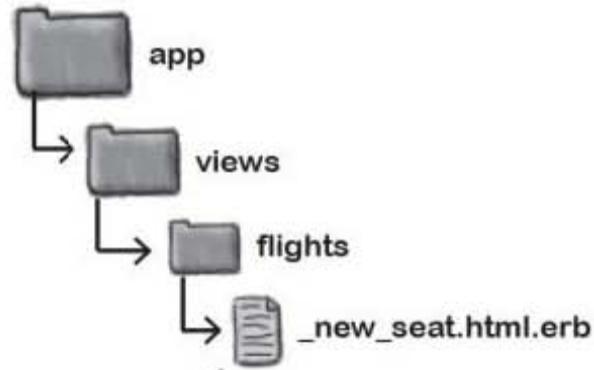
```
vendor/rails/actionpack/lib/action_controller/record_identifier.rb:76:in `dom_id'  
vendor/rails/actionpack/lib/action_view/helpers/form_helper.rb:315:in `dom_id'
```

A strange error has occurred. The flight page was working before we inserted the partial, so what went wrong?



Looking at the errors generated in the test drive and the code from the partial, can you figure out what caused the crash?

```
<h1>New seat</h1>
<% form_for(@seat) do |f| %>
  <%= f.error_messages %>
  <p>
    <%= f.label :flight_id %><br />
    <%= f.text_field :flight_id %>
  </p>
  <p>
    <%= f.label :name %><br />
    <%= f.text_field :name %>
  </p>
  <p>
    <%= f.label :baggage %><br />
    <%= f.text_field :baggage %>
  </p>
  <p>
    <%= f.submit "Create" %>
  </p>
<% end %>
```



partials need data, too

We need to give the partial a seat!

The problem is caused because the ERB code contains a reference to the `@seat` variable. So why is this a problem?

This file used to be a page template associated with the SeatsController. The SeatsController initialized the `@seat` instance variable like this:

```
@seat = Seat.new
```

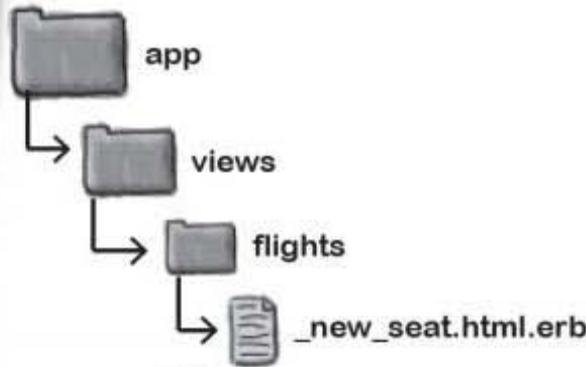
But now the file has become a partial that is going to be used by the FlightsController, and that controller has no `@seat` instance variable. So we need to change `@seat` into a local variable called `seat`:

Instead of using the
`@seat` variable, we
can use the local
variable `seat` instead.

```
<h1>New seat</h1>
<% form_for(seat) do |f| %>
  <%= f.error_messages %>
  <p>
    <%= f.label :flight_id %><br />
    <%= f.text_field :flight_id %>
  </p>
  <p>
    <%= f.label :name %><br />
    <%= f.text_field :name %>
  </p>
  <p>
    <%= f.label :baggage %><br />
    <%= f.text_field :baggage %>
  </p>
  <p>
    <%= f.submit "Create" %>
  </p>
<% end %>
```

```
<h1>New seat</h1>
<% form_for(@seat) do |f| %>
```

The problem is caused by
this reference to the `@seat`
variable.



`seat` is called a **local variable** because nothing outside the partial can read or write to it. But if that's the case, then how do we pass the partial a value for the `seat` variable?

You can pass local variables to a partial

Partials and templates work a lot like Ruby methods or functions. When a template renders a partial, it's a little like one function calling another function.

And since a partial's like a function, you can pass in parameters like this:

```
<%= render :partial=>"new_seat", :locals=>{:seat=>_____} %>
```

The render method can accept a hash called `locals`. Within the hash, you can include a set of values indexed by a variable name. Like pretty much everywhere in Rails, names are expressed as **symbols**.

But what value should we pass in for `seat`? Let's look at what value the original SeatsController used:

```
def new
  @seat = Seat.new
```

Because the form is being used to initialize a seat, we just need to pass the form a freshly created `Seat` object:

```
<%= render :partial=>"new_seat", :locals=>{:seat=>Seat.new} %>
```

So has this fixed the problem with the flight page?

there are no
Dumb Questions

Q: Do I have to make the partial use a local variable?

A: No. Partials can see all the same instance variables (the variables beginning with `@`) that page templates can see. But it is good practice to use local variables in partials.

Q: Why?

A: It makes the partial less dependent upon other code. Page templates are intimately dependent upon the controller, so it's OK for them to look at controller instance variables. But partials are *not* so closely tied to controllers. Many applications use *shared* partials, which are partials used by *more than one* controller. If partials only use local variables, you will find them easier to manage.



Test Drive

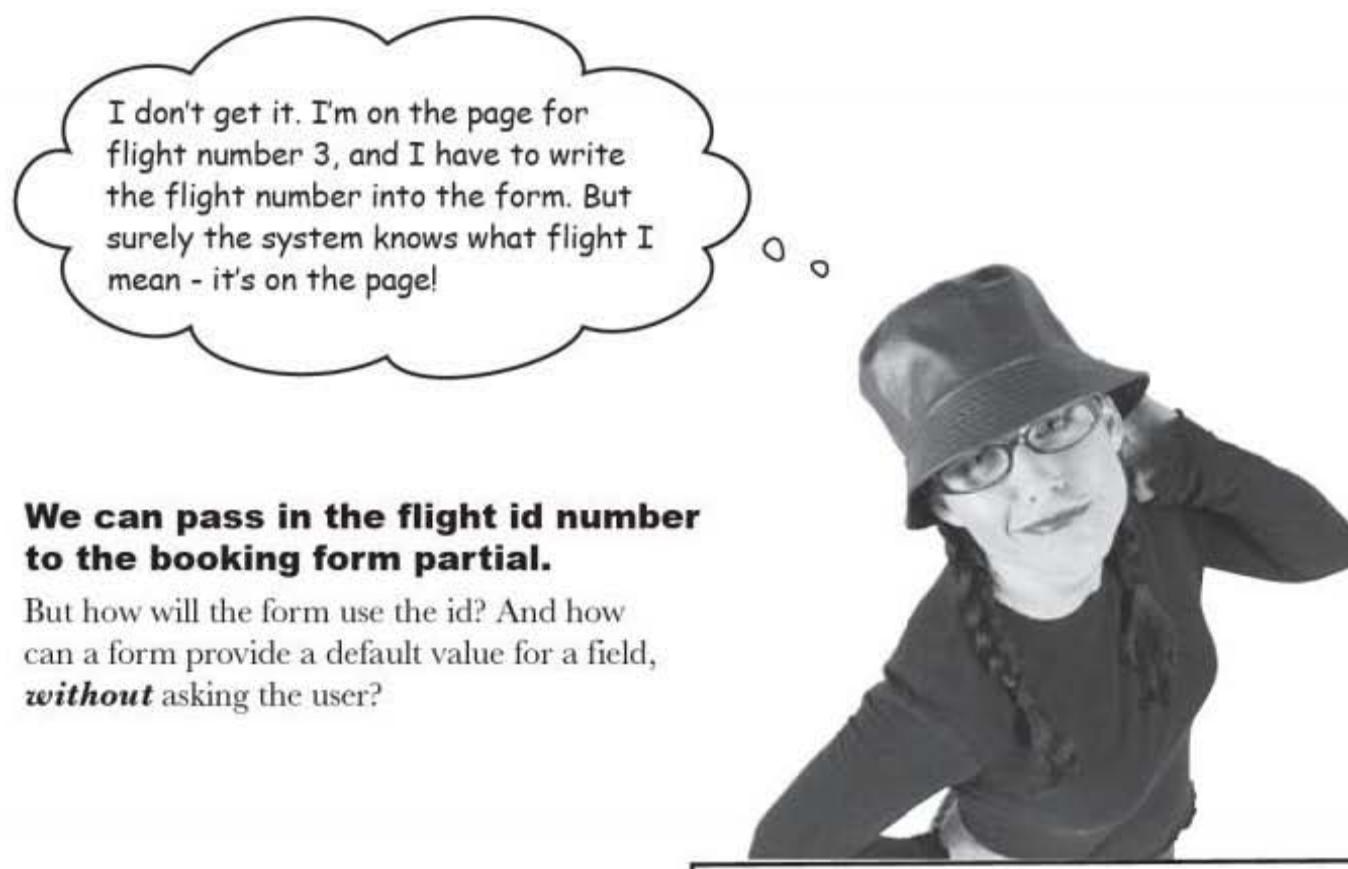
With the seat object correctly initialized, the previous crash should be avoided. Let's try refreshing a flight page:

The image shows two browser windows side-by-side. The left window is titled 'Flights: show' and has the URL 'http://localhost:3000/flights/1'. It displays flight details: Departure: 2009-11-11 11:30:00 UTC, Arrival: 2009-11-11 12:15:00 UTC, Destination: St Cuthberts Island, Baggage allowance: 30.0, Capacity: 12. Below this, a 'New seat' form is shown with fields for Flight (a dropdown menu), Name (empty), and Baggage (empty). A 'Create' button is at the bottom. The right window is titled 'Seats: show' and has the URL 'http://localhost:3000/seats/1'. It displays seat details: Flight: 1, Name: Brad Sturgeon, Baggage: 22.0. There are 'Edit' and 'Back' links at the bottom. A curved arrow points from the 'Create' button in the flight form to the seat detail page.

To Do

- Create a booking form partial
- Add the booking form to the page
- Create a seat list partial
- Add the seat list to the page

This time the form renders correctly. We've got a local seat variable, so no problems with that anymore.



I don't get it. I'm on the page for flight number 3, and I have to write the flight number into the form. But surely the system knows what flight I mean - it's on the page!

We can pass in the flight id number to the booking form partial.

But how will the form use the id? And how can a form provide a default value for a field, **without** asking the user?

Looks like we haven't completed this step yet after all - there's still more to do...

To Do

- create a booking form partial
- Add the booking form to the page
- create a seat list partial
- Add the seat list to the page



Sharpen your pencil

You can specify the flight number when you create the Seat object. Add the code you need in the flights/show.html.erb file:

```
<%= render :partial=>"new_seat", :locals=>{:seat=>Seat.new(.....)} %>
```



Sharpen your pencil Solution

You can specify the flight number when you create the Seat object.

Add the code you need in the flights/show.html.erb file:

```
<%= render :partial=>"new_seat", :locals=>{:seat=>Seat.new(:flight_id=>@flight.id)} %>
```

This code is from
app/views/flights/show.html.erb.

This is flight_id
with an underscore _

We can pass in hashed-values to set
the initial values of the model object.

This is flight.id
with a point .

```
<p>
  <b>Departure:</b>
  <%=h @flight.departure %>
</p>

<p>
  <b>Arrival:</b>
  <%=h @flight.arrival %>
</p>

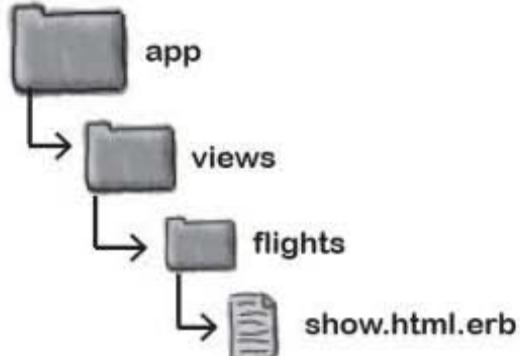
<p>
  <b>Destination:</b>
  <%=h @flight.destination %>
</p>

<p>
  <b>Baggage allowance:</b>
  <%=h @flight.baggage_allowance %>
</p>

<p>
  <b>Capacity:</b>
  <%=h @flight.capacity %>
</p>

<%= render :partial=>"new_seat", :locals=>{:seat=>Seat.new(:flight_id=>@flight.id)} %>
<%= link_to 'Edit', edit_flight_path(@flight) %> |
<%= link_to 'Back', flights_path %>
```

Your show.html.erb page
template should now look
like this:



Pool Puzzle



User shouldn't have to enter a flight number, so we need to store the flight number with a hidden field. Can you assemble the pieces of code to do that?

```
<h1>New seat</h1>
<% form_for(seat) do |f| %>
  <%= f.error_messages %>

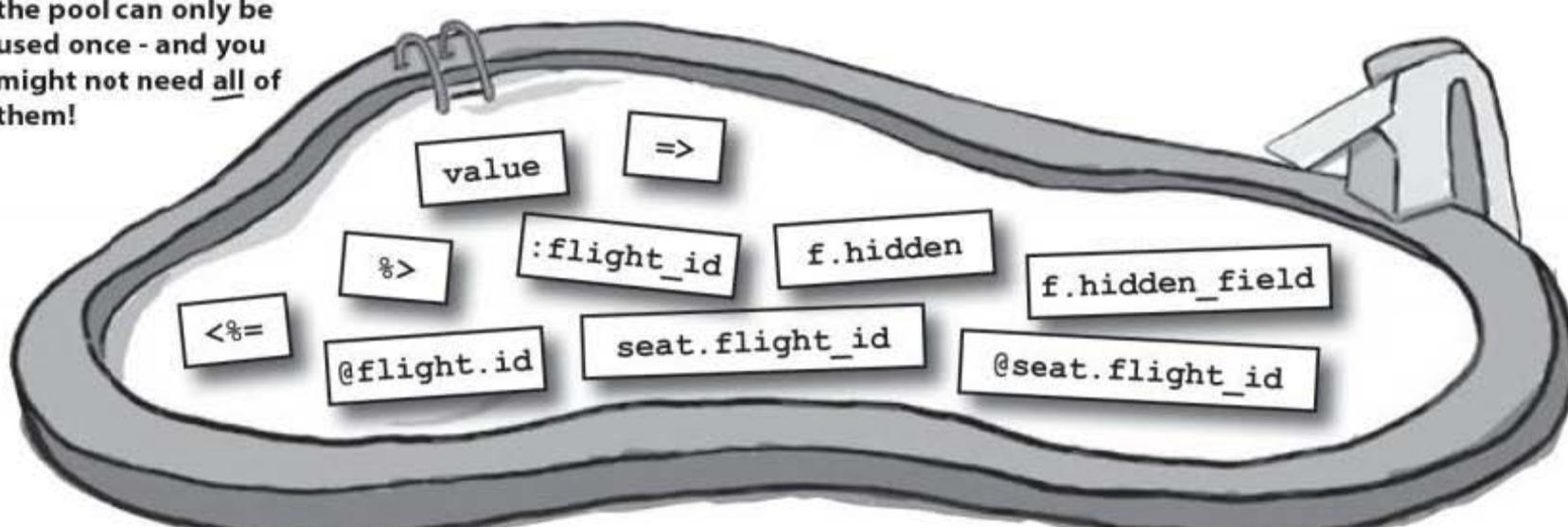
  The code for the hidden field needs to go right here. → .....
  <p>
    <%= f.label :name %><br />
    <%= f.text_field :name %>
  </p>
  <p>
    <%= f.label :baggage %><br />
    <%= f.text_field :baggage %>
  </p>
  <p>
    <%= f.submit "Create" %>
  </p>
<% end %>
```

We've taken the old flight_id field away.



This is
app/views/flights/_new_seat.html.erb

Note: each thing from the pool can only be used once - and you might not need all of them!



Pool Puzzle Solution



We no longer need to enter the flight number so we need to store the flight number with a hidden field. Can you assemble the pieces of code to do that?

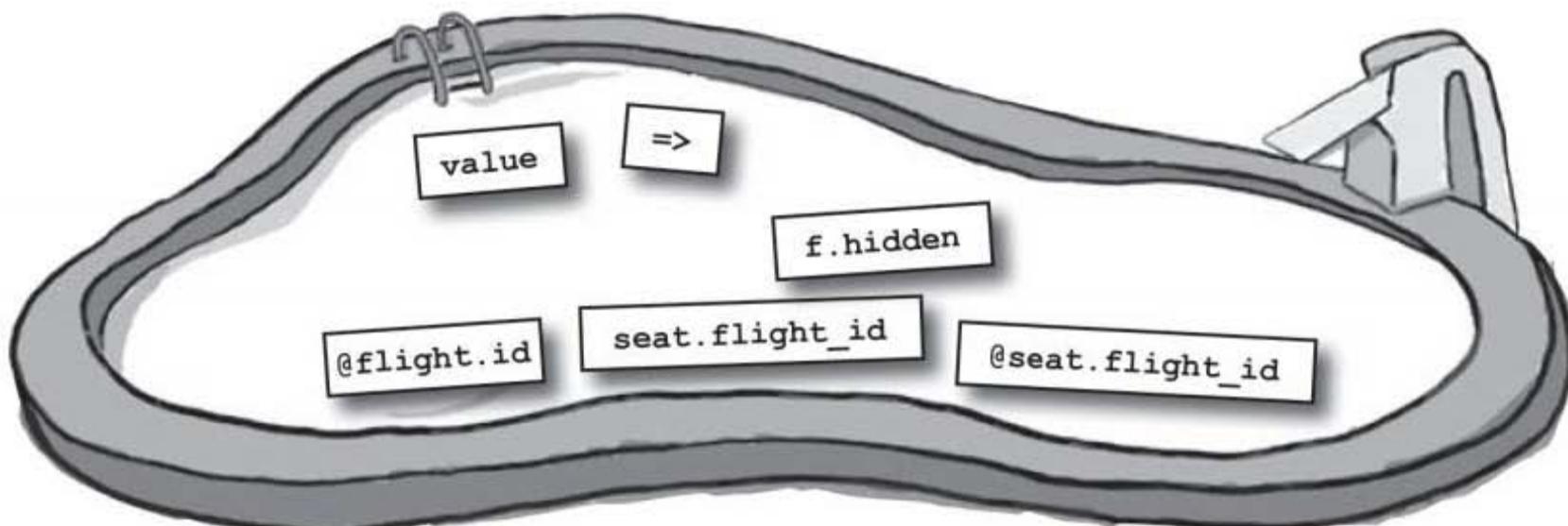
```
<h1>New seat</h1>
<% form_for(seat) do |f| %>
  <%= f.error_messages %>
  <%= f.hidden_field :flight_id %> .....  

  <p>
    <%= f.label :name %><br />
    <%= f.text_field :name %>
  </p>
  <p>
    <%= f.label :baggage %><br />
    <%= f.text_field :baggage %>
  </p>
  <p>
    <%= f.submit "Create" %>
  </p>
<% end %>
```

Bound fields always end in "_field". →

The seat object already has the flight id so we don't need to pass it in.

This is app/views/flights/_new_seat.html.erb





Test Drive

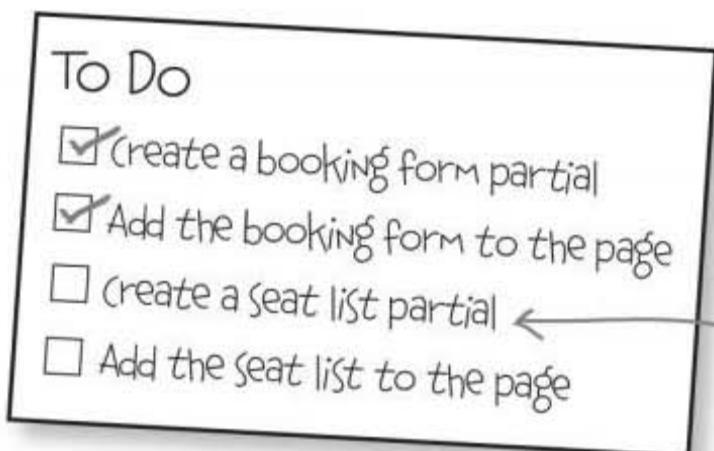
Now when we go to a flight page, the flight number field has disappeared from the form... just like we wanted.

You no longer need to supply the flight id number.

The new seat booking has picked up the correct flight number.

The form works!

The flight number is now automatically picked up from the flight object. So what's next?



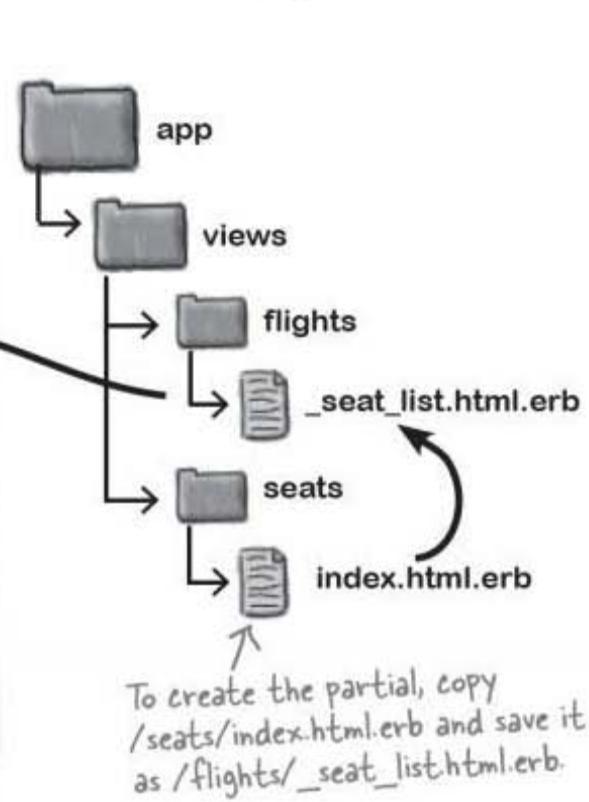
Next we need to create a seat list partial.

We also need a partial for the seat list

We can convert the seat “index” list in more or less the same way that we converted the booking form—by copying the original seat template file to a partial file. Let’s call this new partial `_seat_list.html`:

```
<% for seat in @seats %> You'll need to rename the @seats  
instance variable to seats.  
<tr> You don't need to  
<td><%= h seat.flight_id %></td> display the flight  
<td><%= h seat.name %></td> id as it's part of  
<td><%= h seat.baggage %></td> the flight page.  
<td><%= link_to 'Show', seat %></td>  
<td><%= link_to 'Edit', edit_seat_path(seat) %></td>  
<td><%= link_to 'Destroy', seat, :confirm => 'Are  
you sure?', :method => :delete %></td>  
Remove the list to the  
"New seat" page because  
we don't need it  
</tr>  
<% end %>  
<%= link_to 'New seat', new_seat_path %>
```

This is the bottom part of the file – above it are the table headings and the title.



But the seat-list partial needs an array of seats

The seats “index” page displayed the contents of a SeatsController instance variable called `@seats`. The SeatsController created the instance variable just prior to `index.html.erb` was displayed. But what about now? We copied the `index.html.erb` template to a partial that will be displayed after running the FlightsController... so there’s no `@seats` instance variable containing an array of seats.

That means we need to provide the new `_seat_list.html.erb` partial with an array of seats. So what value should we provide for the array of seats? This is how the SeatsController initialized `@seats`:

```
def index  
  @seats = Seat.find(:all)
```

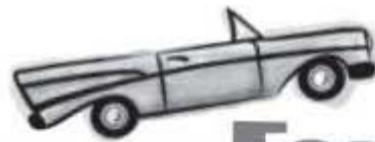
So, for now, let’s call the seat list like this and see how it works:

```
<%= render :partial=>"seat_list", :locals=>{:seats=>Seat.find(:all)} %>
```

We'll add this call to
app/views/flights/show.html.erb

We'll pass this as the value
for the seats array.

Will this work? Let's see...



Test DRIVE

Make all these changes, add the new partial, and try the app out.

Flight	Name	Baggage	
Bret Sturges	22.0	Show	Edit Destroy
Kirk Avery	15.0	Show	Edit Destroy
Drew Bourne	18.0	Show	Edit Destroy
James Blake	19.0	Show	Edit Destroy
Gaffner Brillant	25.0	Show	Edit Destroy
Ted Bristin	19.0	Show	Edit Destroy
Jesse Carr	15.0	Show	Edit Destroy
Jack Casey	38.0	Show	Edit Destroy
Brent Chase	19.0	Show	Edit Destroy
Tom Christie	18.0	Show	Edit Destroy
Ryan Cleary	19.0	Show	Edit Destroy
Julian Colard	16.0	Show	Edit Destroy
Charlie Collins	19.0	Show	Edit Destroy

To Do

- create a booking form partial
- Add the booking form to the page
- create a seat list partial
- Add the seat list to the page

The form *looks* like it's working. **Let's see what the users think.**

lepers, anyone?

People are ending up on the wrong flights

Everyone thinks the system looks great, so the system goes live. Unfortunately, it doesn't take long before someone spots a problem...



So what happened?

The flight page is displaying **all** the seat bookings for **all** the flights!

Flight	Name	Baggage	Action
Brad Sturgeon	22.0	Show	Edit Destroy
Kirk Avery	15.0	Show	Edit Destroy
Drew Beurline	18.0	Show	Edit Destroy
James Blake	19.0	Show	Edit Destroy
Gaffner Brilliant	25.0	Show	Edit Destroy
Ted Brisbin	19.0	Show	Edit Destroy
Jesse Carr	15.0	Show	Edit Destroy
Jack Casey	28.0	Show	Edit Destroy
Brent Chase	19.0	Show	Edit Destroy
Tom Christie	15.0	Show	Edit Destroy
Ryan Cleary	19.0	Show	Edit Destroy
Julien Collard	16.0	Show	Edit Destroy
Charlie Collins	19.0	Show	Edit Destroy

So what's going on? The problem is caused by the `render` command, which calls the seat list partial. Remember, we called the partial like this:

```
<%= render :partial=>"seat_list",
:locals=>{:seats=>Seat.find(:all)} %>
```

This displays the list of all seats in the database. That was fine when the seat list was the index page for the seat data... but now that we're displaying the data against the flight, we need to *restrict* the seats so that only seats belonging to the current flight are displayed.

We could fix the finder... but it would be better to create a **relationship**.

A relationship connects models together

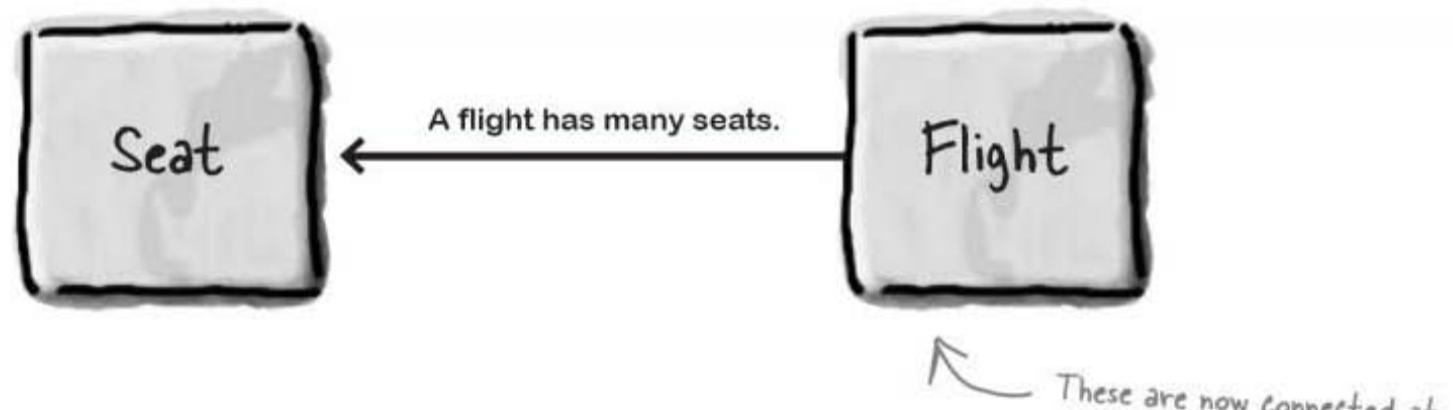
You'll often find that certain model objects are often used together, like flights and seat bookings. You may need to use data from one type—like the flight id—to find the related objects in the other type, like the seats booked on the flight.

You could just use finders to read the related objects. For example, if you had a flight object called `@flight`, you could find the related seat objects like this:

```
Seat.find_all_by_flight_id(@flight.id)
```

Returns an array of seat objects.

But it's actually easier to **connect** the two models together with a **relationship**:



A **relationship** makes objects of one type of object appear to be *attributes* of another type of object. For example, if we create a relationship on the flight model that connects to the seat model, we can refer to the seats associated with a flight like this:

```
@flight.seats
```

This will return the exact same thing as the finder above, but defining a relationship between two models will simplify your code and reduce the chances that you will make a mistake by repeatedly defining finders to jump from one model to another. It will also make your code a lot easier to read.

Sounds good. So how do relationships work?

relationships look like attributes



Relationships Up Close

A relationship will join the data in the seat and flight tables by matching the data in the `seat.flight_id` and `flight.id` columns:



**Names are
IMPORTANT
in Rails.**

`seat.flight_id` ↗
matches `flight.id`

ID	departure	arrival	destination	baggage_allows	capacity	created_at	updated_at
1	2009-11-11 11:...	2009-11-11 12:...	St Cuthberts I...	30	12	2008-11-11 11:...	2008-11-11 12:...
2	2009-11-11 13:...	2009-11-11 14:...	Titchmarsh Isl...	25	22	2008-11-11 12:...	2008-11-11 13:...
3	2009-11-11 08:...	2009-11-11 09:...	St Augustine L...	8	4	2008-11-11 12:...	2008-11-11 13:...

ID	flight_id	name	baggage	created_at	updated_at
1	1	Brad Sturgeon	22	2008-11-11 11:...	2008-11-11 11:...
2	1	Kirk Avery	15	2008-11-11 12:...	2008-11-11 12:...
3	1	Drew Beurline	18	2008-11-11 12:...	2008-11-11 12:...
4	1	James Blake	19	2008-11-11 12:...	2008-11-11 12:...
5	1	Gaffiner Brill...	25	2008-11-11 12:...	2008-11-11 12:...
6	1	Ted Brisbin	19	2008-11-11 12:...	2008-11-11 12:...
7	1	Jesse Carr	15	2008-11-11 12:...	2008-11-11 12:...
8	1	Jack Casey	28	2008-11-11 12:...	2008-11-11 12:...
9	2	Brent Chase	19	2008-11-11 12:...	2008-11-11 12:...
10	2	Tom Christie	15	2008-11-11 12:...	2008-11-11 12:...
11	2	Ryan Cleary	19	2008-11-11 12:...	2008-11-11 12:...
12	2	Julien Collard	16	2008-11-11 12:...	2008-11-11 12:...
13	2	Charlie Collins	19	2008-11-11 12:...	2008-11-11 12:...

For the relationship to work, the field in the `seats` table

must be called `flight_id`, and the field **must** be an *integer*.

With a relationship in place, it means that when Rails sees this:

That's because the matching
id column in the flights table
has to connect with this.

`@flights.seats`

← This looks like an attribute,
but it's really a relationship
between two tables.

It will treat it like this:

`Seat.find_all_for_flight_id(@flight.id)`

But how do we define the relationship?

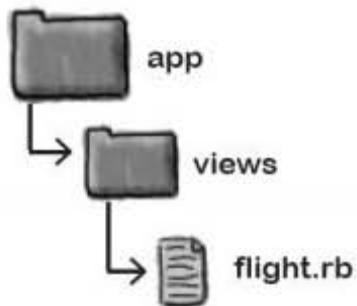
We are going to give the Flight model an extra attribute called `seats`, so it makes sense that the Flight model code is the place where we define the relationship:



```
class Flight < ActiveRecord::Base
  has_many :seats
```

This is the relationship. A flight has many seats.

The `has_many` command accepts the name of a related model and, because it will be used to find arrays of related seats, the name of the model is plural. So the parameter for `has_many` is `:seats` and **not** `:seat` (without the “s” at the end). Once the relationship is in place, you can use your new attribute like this:



`@flight.seats`

The `seats` attribute returns an array of seat objects associated with the flight:



This is the seats attribute, which is actually the result of a finder for matching seats.



Sharpen your pencil

Rewrite this line in the `app/views/flights/show.html.erb` template to use your new relationship:

```
<%= render :partial=>"seat_list", :locals=>{:seats=> ..... } %>
```

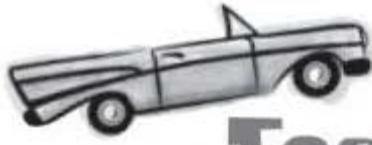
test drive



Sharpen your pencil Solution

Rewrite this line in the app/views/flights/show.html.erb template to use your new relationship:

```
<%= render :partial=>"seat_list", :locals=>{:seats=> @flight.seats..} %>
```



Test Drive

Make all these changes, and reload! The flight pages now only show the seats allocated to the given flight. So when we look at flights number 1 and number 3, they now have different seat lists:

The screenshot shows two browser windows side-by-side. The left window is titled "Flights: show" and has the URL "http://localhost:3000/flights/1". It displays information for Flight 1: Departure: 2009-11-11 11:30:00 UTC, Arrival: 2009-11-11 12:15:00 UTC, Destination: St Cuthberts Island, Baggage allowance: 30.0, Capacity: 12. Below this, under "Listing seats", is a table of passengers with columns: Flight, Name, Baggage, Show, Edit, Destroy. The passengers listed are Brad Surgeon, Kirk Avery, Drew Beurline, James Blake, Gaffiner Brillant, Ted Brisbin, Jesse Carr, and Jack Casey. At the bottom, there's a "New seat" form with fields for Name and Baggage, and a Create button. The right window is also titled "Flights: show" and has the URL "http://localhost:3000/flights/3". It displays information for Flight 3: Departure: 2009-11-11 13:30:00 UTC, Arrival: 2009-11-11 14:30:00 UTC, Destination: Titchmarsh Island, Baggage allowance: 25.0, Capacity: 22. Below this, under "Listing seats", is a table of passengers for Flight 3 with the same columns and passenger names. At the bottom, there's a "New seat" form with fields for Name and Baggage, and a Create button. A handwritten note "Different flights now have different seats." is written between the two windows, with arrows pointing from each window towards the note.

Flight 1

Flight	Name	Baggage	Show	Edit	Destroy
Brad Surgeon	22.0	Show	Edit	Destroy	
Kirk Avery	15.0	Show	Edit	Destroy	
Drew Beurline	18.0	Show	Edit	Destroy	
James Blake	19.0	Show	Edit	Destroy	
Gaffiner Brillant	25.0	Show	Edit	Destroy	
Ted Brisbin	19.0	Show	Edit	Destroy	
Jesse Carr	15.0	Show	Edit	Destroy	
Jack Casey	28.0	Show	Edit	Destroy	

New seat

Name:
Baggage:
Create

Flight 3

Flight	Name	Baggage	Show	Edit	Destroy
Brent Chase	19.0	Show	Edit	Destroy	
Tom Christie	15.0	Show	Edit	Destroy	
Ryan Cleary	19.0	Show	Edit	Destroy	
Julien Collard	16.0	Show	Edit	Destroy	
Charlie Collins	19.0	Show	Edit	Destroy	

New seat

Name:
Baggage:
Create

Edit | Back

But some people have too much baggage

Now there's a problem with the baggage on the flights. Some people are arriving at the airport carrying too much stuff—way more than the allowance for their flight. The flight data records the maximum baggage allowance, but a lot of the passengers are unhappy because they told the airline how much baggage they were bringing with them when they entered the seat booking, and the system didn't complain. The system needs to be modified to prevent people reserving seats with too much baggage... before they show up with a booked seat.

Flight: show
http://localhost:3000/flights/2

Departure: 2009-11-11 13:30:00 UTC
Arrival: 2009-11-11 24:30:00 UTC
Destination: Titchmarsh Island
Baggage allowance: 25.0 ←
Capacity: 22

Listing seats

Flight	Name	Baggage	Actions
Brenda Chase	19.0 Show	25.0	Edit Destroy
Tom Christie	15.0 Show	25.0	Edit Destroy
Ryan Cleary	19.0 Show	25.0	Edit Destroy
Julien Collard	16.0 Show	25.0	Edit Destroy
Charlie Collins	19.0 Show	25.0	Edit Destroy

New seat

Name: Sam Seaborn
Baggage: 110 ←

Create [Edit](#) [Back](#)

Someone is trying to travel with way more baggage than the allowance.



Sharpen your pencil



We check data in Rails with a validator. Which of the following validators do you think you should use to stop people reserving seats with too much baggage?

- None. We'll have to write our own.
- validates_length_of
- validates_format_of
- validates_uniqueness_of
- validates_inclusion_of



Sharpen your pencil Solution

We check data in Rails with a validator. Which of the following validators do you think we should use to stop people reserving seats with too much baggage?

- None. We'll have to write our own.
- validates_length_of
- validates_format_of
- validates_uniqueness_of
- validates_inclusion_of

We need to write our OWN validation

Rails comes with a set of built-in validators that can perform a lot of basic tests, like whether data is entered or if it is correctly formatted. But sometimes you will need to check something that isn't covered by the basic validators.

In the case of baggage, Rails doesn't come with a `validates_too_much_baggage` validator. There's not a maximum value validator, either. So we need to write our own validator.

If you create a method in the `Seat` code called `validate`, that method will **always** be called by the model object just before things get saved or updated to the database:

```
class Seat < ActiveRecord::Base
  def validate ←
    if name == flight_id
      errors.add_to_base("Your name is the same as your flight number")
    end
  end
end
```

Here's another case where naming in Rails is really important. By using a certain name – `validate`, Rails knows what to do with your method.

The `errors.add_to_base(...)` command inserts a message into the list of errors. If there's an error message created, the save or update operation is aborted and the user should be sent back to the form to correct the problem.



Exercise

Write a custom validator to check that a flight booking has baggage under the limit for the flight.

finder? or relationship?



Exercise Solution

Write a custom validator to check that a flight booking has baggage under the limit for the flight

```
class Seat < ActiveRecord::Base  
  def validate  
    if baggage > Flight.find(flight_id).baggage_allowance  
      errors.add_to_base("You have too much baggage")  
    end  
  end
```

Find the baggage allowance from the flight object. You can read the flight object using a finder and the flight id.

We're using a finder to look up the flight object from the seat. Is there a way we can use relationships for that?



Prefer relationships over manual finders.

Instead of using finders to look up the related flight object, you can define a **relationship** between seats and flights. But the question is, what sort of relationship do we need?

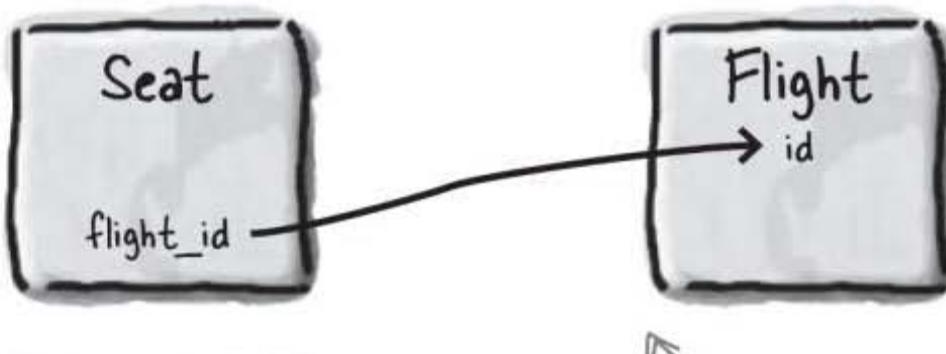
When we created a relationship before, we gave the Flight model a new attribute called `seats`:

```
@flight.seats
```

But what do we need this time? Before, we had a Flight object and we wanted to know what the related seats were. The difference is that now we're checking a seat object, and to do that we need to know about the related flight. So what sort of relationship do we need this time around?

We need the REVERSE relationship

This time we need a relationship that's the ***opposite way*** around to the one we had before. Given a particular seat object, we need to get the related flight:



We want to have an attribute on seats like this:

`@seat.flight`

This time, we're going from Seat to Flight... and we just want one record, the flight for a given seat.

We want to know which flight a seat belongs to. And each seat will have only one flight. How do you think that will be coded?



Rails Magnets

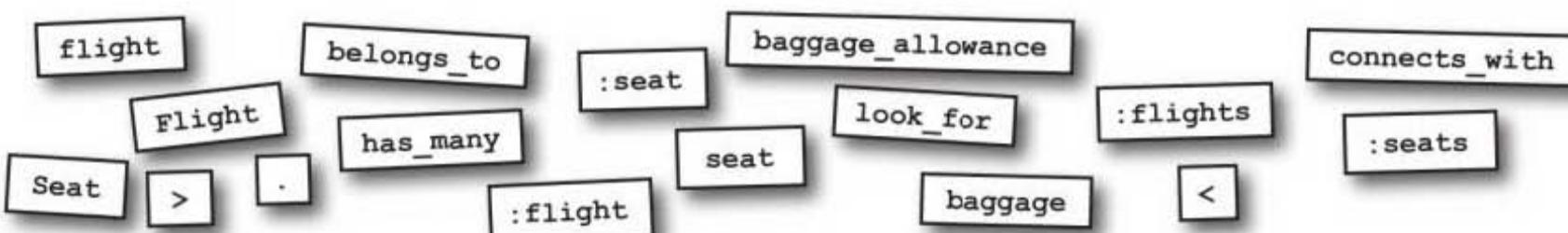
To get related flights from a seat object, you need to add code to a model. But which model and what code? Use the magnets below to fill in the gaps.

The relationship will be defined on the model, and it will be a command that looks like this:

.....

The if condition in the above model that uses the relationship looks like this:

if



reverse the relationship



Rails Magnets Solution

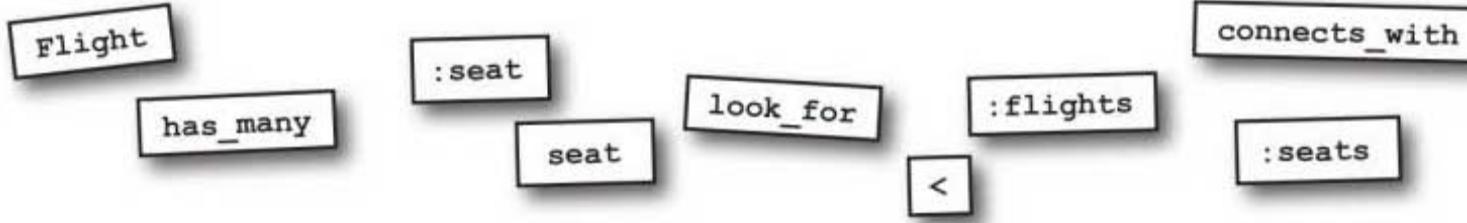
To get related flights from a seat object, you need to add code to a model. But which model and what code? Use the magnets below to fill in the gaps.

The relationship will be defined on the **Seat** model, and it will be a command that looks like this:

..... **belongs_to** **:flight**

The if condition in the above model that uses the relationship looks like this:

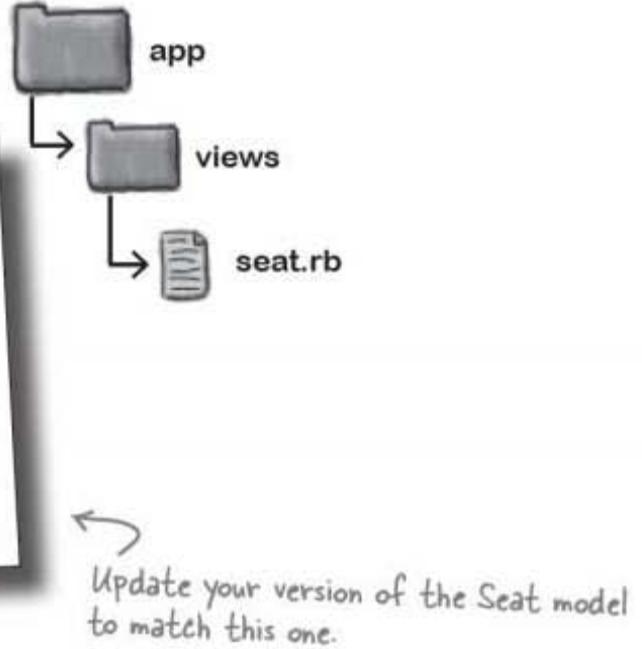
if **baggage** **>** **flight** .. **.** **baggage_allowance**



So what does the Seat model look like now?

Let's make the changes to the Seat model:

```
class Seat < ActiveRecord::Base
  belongs_to :flight
  def validate
    if baggage > flight.baggage_allowance
      errors.add_to_base("You have too much baggage")
    end
  end
end
```





Test DRIVE

So what happens if you try to reserve a seat with baggage in excess of the allowance for the flight now? Try it out and see...

The screenshot on the left shows a 'Listing seats' page for flight 2, with details like Departure: 2009-11-11 13:00 UTC, Arrival: 2009-11-11 14:30 UTC, Destination: Tischmarsh Island, Baggage allowance: 25.0, and Capacity: 22. Below this is a 'New seat' form with fields for Flight (set to 2), Name (Sam Seaborn), and Baggage (110). A red arrow points from the 'Create' button on this form to the right screenshot.

The screenshot on the right shows a 'Seats: create' page titled 'New seat'. It displays an error message: '1 error prohibited this seat from being saved' and 'There were problems with the following fields: * You have too much baggage'. An annotation with a curved arrow points from the text 'The validator and relationship combine to take care of the baggage problem.' to the error message.





BULLET POINTS

- Breaking your page into **partials** will make it easier to maintain.
- Partials, templates, and layouts are the three types of **Embedded Ruby** files.
- Partials are used to generate **fragments** of pages.
- Templates create the **main content** of a page.
- Layouts are used to create standard **HTML wrappers** for pages.
- Partials can be **called by** templates or layouts.
- Partials can be given **local variables**.
- Partials must begin with `_` and end with `.html.erb`
- You call a partial using the `render` function.
- **Relationships** make it easier to find connected data in other models.
- Relationships work like **finders**.
- `has_many` attributes return arrays.
- `belongs_to` attributes return single objects.
- You can create custom validation by adding a method to your model called `validate`.

there are no Dumb Questions

Q: Do I really have to break my page into partials?

A: You don't have to, but a larger number of smaller files is usually easier to maintain.

Q: Why's that?

A: If there's a bug, it will be easier to locate broken code in lots of smaller files.

Q: Why else would I want partials?

A: For reuse. If you have a standard menu or contact section, you can reuse it between different templates and layouts.

Q: How do I call a partial from a layout?

A: Using the `render` method, just like you would from a partial.

Q: So do relationships cause table joins using key fields?

A: Yes. By default, relationships work by connecting the `id` field of one table with another field ending `_id` in the other table. That's why `id` on the flight table connects with `flight_id` on the seat table.

Q: So it matters that the seat table column is called `flight_id`?

A: Yes. If you didn't use that name, Rails wouldn't know to build the relationship.

Q: Did it matter what data type `flight_id` was?

A: Good question. It needs to be an integer, because that's what Rails uses for id fields.



Extend the custom validator to also check that flights are not booked beyond their seat capacity.
[Hint: All arrays have a method called size that returns the number of elements in the array.]

```
class Seat < ActiveRecord::Base
  belongs_to :flight
  def validate
    if baggage > flight.baggage_allowance
      errors.add_to_base("You have too much baggage")
    end
    .....
    .....
    ...
  end
end
```

size returns an array's size



Extend the custom validator to also check that the flight is not booked beyond its seat capacity.

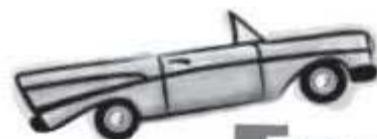
[Hint: All arrays have a method called **size** that returns the number of elements in the array.]

```
class Seat < ActiveRecord::Base
  belongs_to :flight
  def validate
    if baggage > flight.baggage_allowance
      errors.add_to_base("You have too much baggage")
    end
    if flight.seats.size >= flight.capacity.....
      errors.add_to_base("The flight is fully booked")
    end
    ...
  end
end
```

----- *there are no* **Dumb Questions** -----

Q: Hey - wait a minute... Why is that condition ">="? Aren't we checking for when there are *more* seats than allowed?

A: We are, but remember - a relationship works like a finder. When we evaluate `flight.seats`, we are reading the seats from the database. This validation check is running *before* the new seat booking is saved to the database, so the current seat about to be added won't be included. That's why you need `>=`.



Test Drive

Make all the changes from the previous pages, and check out the app again.

Flight	Name	Baggage
Brad Sturges	22.0	Shane
Kira Avery	15.0	Shane
Diane Bourne	18.0	Shane
James Black	13.0	Shane
Geffrey Brant	25.0	Shane
Ted Brink	18.0	Shane
Jesse Carr	15.0	Shane
Jack Clegg	28.0	Shane
Tori Hodge	15.0	Shane
Jack Hampson	18.0	Shane
Snow Hynes	17.0	Shane
Alex Hunt	13.0	Shane

New seat

Name:
Create Button
Baggage: 18

[SBU](#) | [BACK](#)

The page now lists the correct seats for the flight. But what happens if someone tries to book a seat on a full flight?

New seat

1 error prohibited this seat from being saved

There were problems with the following fields:

- The flight is fully booked

Flight: 1
Name: Conor Hynes
Baggage: 19

coconut's rockin'

The system's taken off at Coconut Airways

Life's pretty good at the airline. Tourists and locals find it a breeze to use the system. The planes don't get overloaded with baggage or get overbooked. In fact, the staff are using the time they saved a little more productively...





Tools for your Rails Toolbox

You've got Chapter 6 under your belt, and now you've added the ability to make the most of your connections.

Rails Tools

`render :partial=>"name"` displays `_name.html.erb`

Pass a variable to a partial with

`render :partial=>"name", :locals=>{:var1=>"val1"}`

Custom validation code is in a model method called validate

`errors.add_to_base(...)` creates an error message

`belongs_to` defines a relationship from an object to its parent

`has_many` is the reverse relationship



Avoiding the traffic



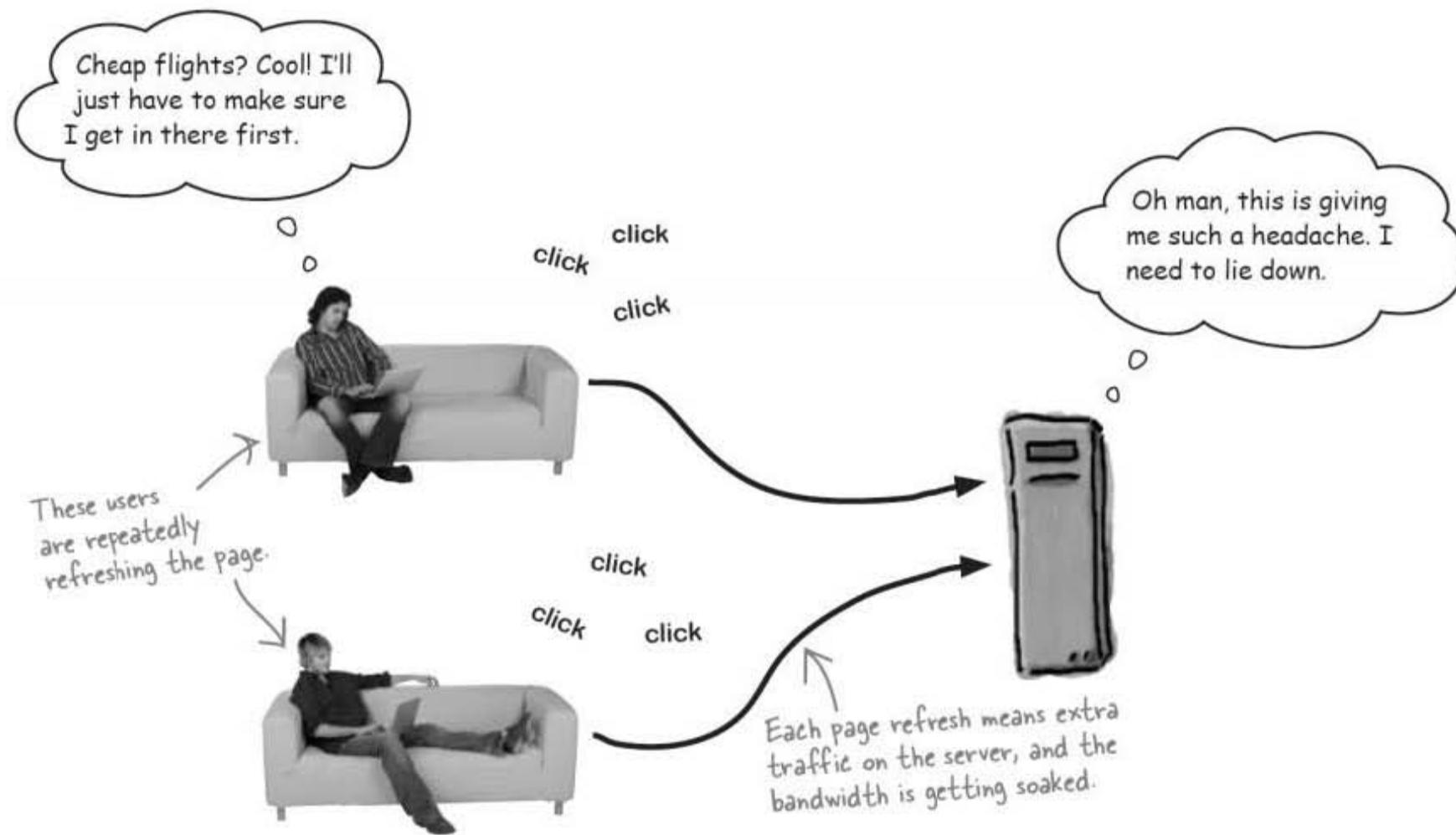
People want the best experiences out of life... and their apps.

No matter how good you are at Rails, there are times when traditional web apps just don't cut it. Sometimes users want something that's more **dynamic** and that responds to their every whim. Ajax allows you to build **fast, responsive web apps**, designed to give your users the **best experience the web has to offer**, and Rails comes complete with its own set of Ajax libraries just waiting for you to use. It's time to **quickly and easily add Ajax goodness** to your web app and please even more users than before.

There's a new offer at Coconut Airways

Coconut Airways has introduced a new promotional offer: the last three seats on every flight are on sale at half price!

But there's a problem. Obviously, everyone wants to grab the final three seats, and so in the last hour or two before the check-in closes, customers are continually hitting the reload buttons on their browser, in the hope of getting a cheap flight. Unfortunately, the increase in traffic is putting enormous pressure on the Coconut Airways server.



The extra requests are causing the Coconut Airways site to slow down. There are so many people requesting info on the flights that are close to departure, that other users are having problems getting through to the web site to book seats on their flights. Coconut Airways needs you to take another look at the application and see if there is some way of reducing the amount of traffic that's flooding into the web server.

Which parts of a page change most?

The majority of the network traffic is coming in to the flight details page—that, after all, is the one that lists the seat bookings on the flight. This is the page generated by the template at `app/views/flights/show.html.erb` and the `_seat_list.html.erb` and `_new_seat.html.erb` partials. There are three major sections to the page:



The flight information

This contains the baggage allowance for the flight and the maximum number of seats available.

The list of seat bookings

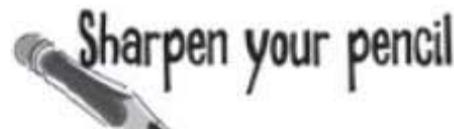
All of the seats currently booked on the flight are shown here.

The seat booking form

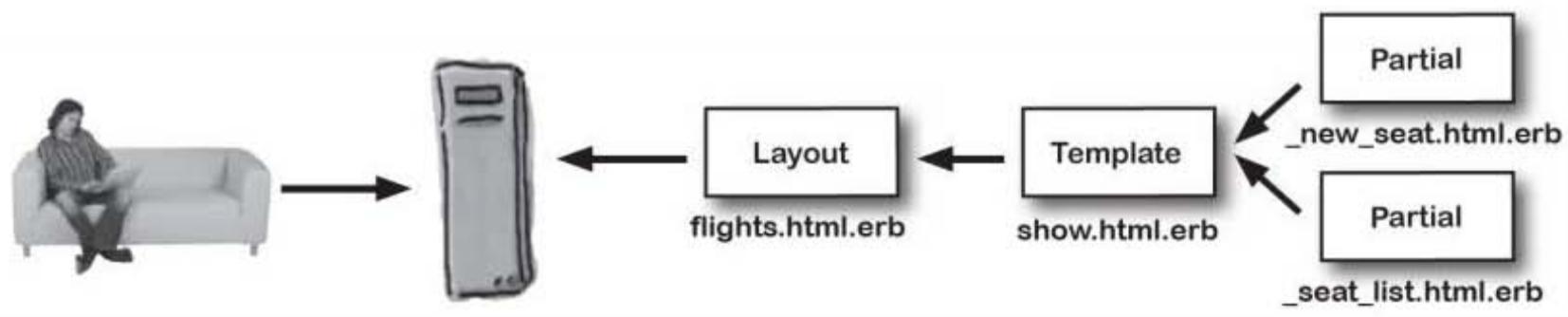
Users need this to actually book a seat.

Whenever a user presses the reload button on their browser, the entire page is requested from the server. This means that the server needs to generate the page again from the template and the partials, and the entire thing has to be wrapped in the flight layout. Now, if there are just one or two requests going on at one time, this really isn't going to cause a problem, but the server is being overwhelmed by the amount of processing it has to do.

Is there some way we can reduce the load on the server?



Here's how the pages are assembled by the server. Highlight which of the Embedded Ruby files you think is generating the updated information that the user is interested in.

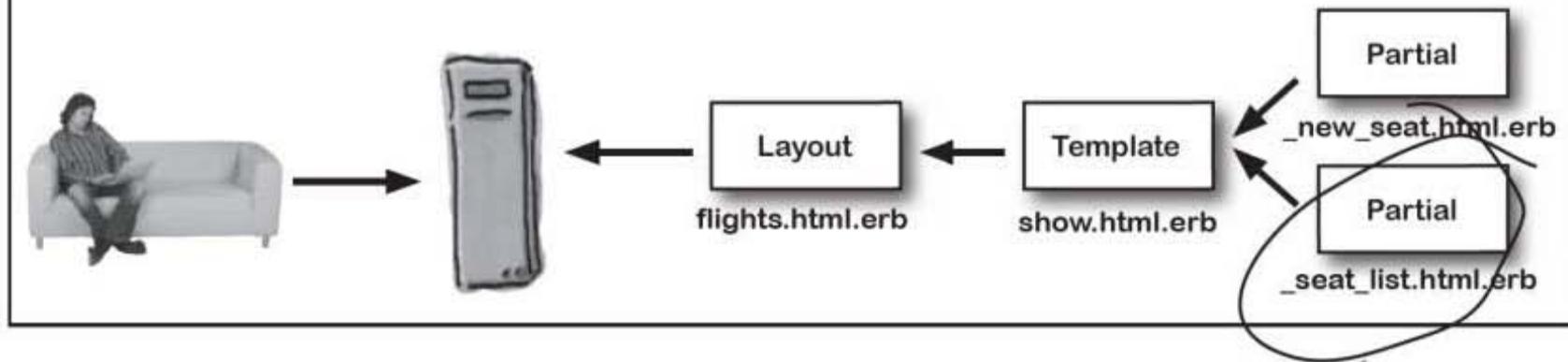


update what changes



Sharpen your pencil Solution

Here's how the pages are assembled by the server. Highlight which of the Embedded Ruby files you think is generating the updated information that the user is interested in.



We need a way to update just the seat list

When people refresh the page, most of it doesn't change. The only part that is ever likely to be different is the section displaying seat bookings.

So what actually happens when a user clicks the reload button on their browser? Well, “Reload” tells a browser to request the entire page again, and that’s because the entire page is the only thing that’s available. The application doesn’t currently allow a browser to request anything smaller. It may be the case that the only interesting part of the page is the list of booked seats, but the browser can *only* get the seat list by requesting the entire page.

The latest information about reservations is generated by the seat list partial.

Reloading the page requests the entire page, but really we only need to request the seat list partial.



The first thing we need to do, then, is modify the application so that the interesting part of the web page—the list of seats—is available by a separate request. We need to allow a browser to request a *particular URL* that will generate *just* the seat list.



Sharpen your pencil

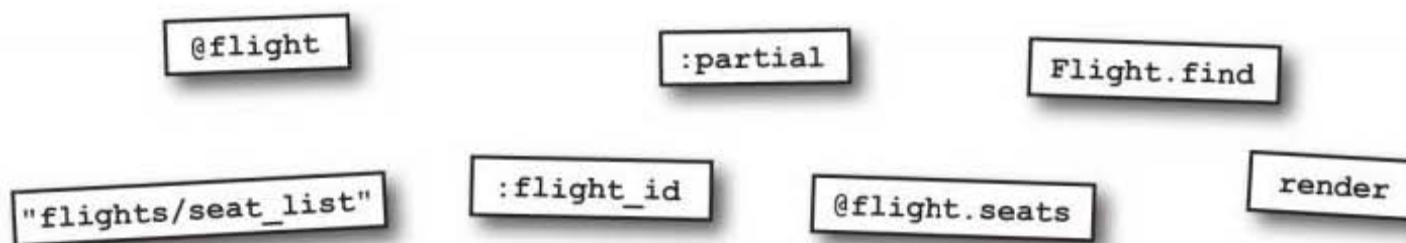
How would you define a route in `routes.rb` that would match a request for `/flights/:flight_id/seats` to an action called `flight_seats` on the `seats` controller?



Code Magnets

Complete the `flight_seats` method in the `seats` controller:

```
def flight_seats
  .... = .....(params[.....])
  .... => ..... , :locals=>{:seats=>.....}
end
```





Sharpen your pencil

How would you define a route in `routes.rb` that would match a request for `/flights/:flight_id/seats` to an action called `flight_seats` on the `seats` controller?

```
map.connect '/flights/:flight_id/seats', :action=>'flight_seats', :controller=>'seats'
```

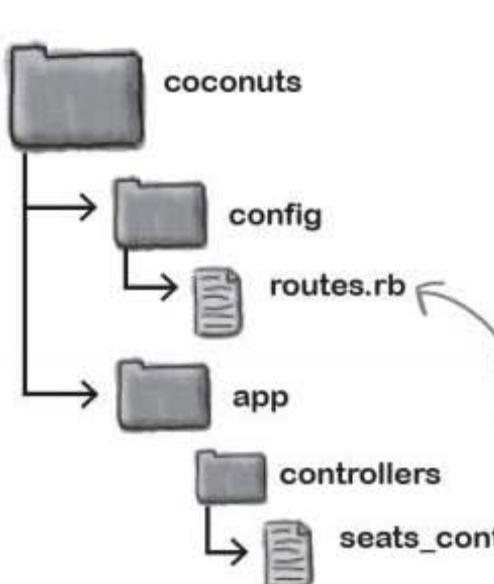
Remember to add this route
above the existing routes in
`config/routes.rb`.



Code Magnets Solution

Complete the `flight_seats` method in the `seats` controller:

```
def flight_seats
  @flight = Flight.find(params[:flight_id])
  render :partial => "flights/seat_list", :locals=>{:seats=>@flight.seats}
end
```



Here's where you can
find the two files.

Do this!

Add the two pieces of code above to `routes.rb` and `seats_controller.rb`.



Test DRIVE

Imagine there are seats already booked on the flight with `id = 2`. If we go to:

`http://localhost:3000/flights/2/seats`

what should we see?

Flight	Name	Baggage
Brad Sturgeon	22.0	Show Edit Destroy
Kirk Avery	15.0	Show Edit Destroy
Drew Beurline	18.0	Show Edit Destroy
James Blake	19.0	Show Edit Destroy
Gaffiner Brillant	25.0	Show Edit Destroy
Ted Brisbin	19.0	Show Edit Destroy
Jesse Carr	15.0	Show Edit Destroy
Jack Casey	28.0	Show Edit Destroy
Tom Halpin	15.0	Show Edit Destroy
Jack Hampson	18.0	Show Edit Destroy
Stew Harris	17.0	Show Edit Destroy

The route that we created should map `/flights/2/seats` to the `flight_seats` action and the `seats` controller, as well as create a new request parameter called `flight_id = 2`. The controller looks up flight number 2 from the database and then generates some HTML from the `seat_list` partial and return it to the browser.

Take a look at the HTML that the controller generates over on the right. What do you notice?

The HTML that gets returned isn't actually a full web page, it's just a web page **fragment**. But what are we going to do with that? We can't just request users look at this page instead of going to the flight page, as that won't look very good. After all, at some point, the users will want to place a booking for a seat, so we want the users to remain on the flight page anyway.

Somehow we need to get the browser to request this page fragment and then use it to update the list of seats on the page.

But how?

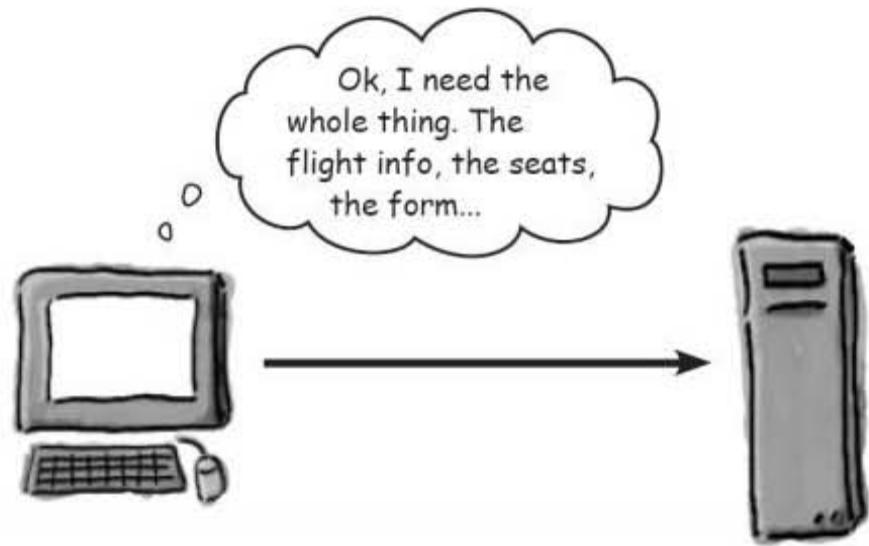
```
<h1>Listing seats</h1>
<table>
  <tr>
    <th>Flight</th>
    <th>Name</th>
    <th>Baggage</th>
  </tr>
  <tr>
    <td>Brent Chase</td>
    <td>19.0</td>
```

Here's the page fragment
that the controller generates
from the `seat_list` partial.

browsers update entire pages

Doesn't the browser always update the entire page?

At the moment when the user hits the “reload” button, the browser requests the **entire** web page:



The bad news is **that's all the browser will ever do**. Full requests are hardwired into the browser's brain. The “reload” button means “reload the entire page,” so that's exactly what happens... no matter what

But why?

Under the hood, browsers only work with entire web pages. There's nothing in HTML that allows a browser to request just a part of a page... it's the all or nothing. It doesn't matter that we've now got a fragment of the page publicly available. There's no way that the browser on its own can ask for, and use, a page fragment.

So how do we get around the problem?

Fortunately for us, there's a trick we can use to get the browser to update just a part of a page. The trick is:

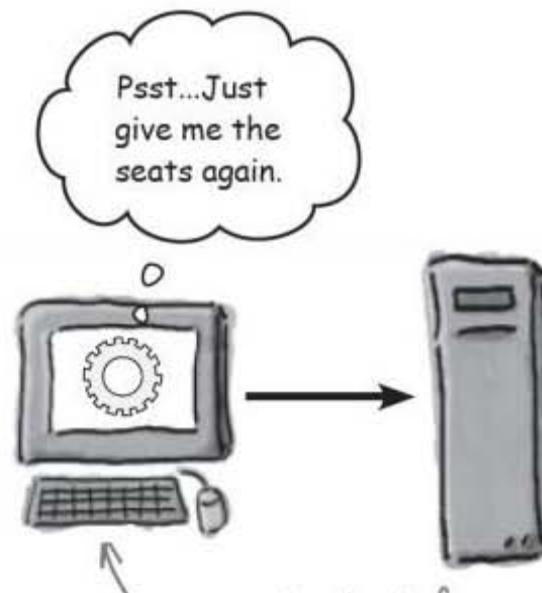
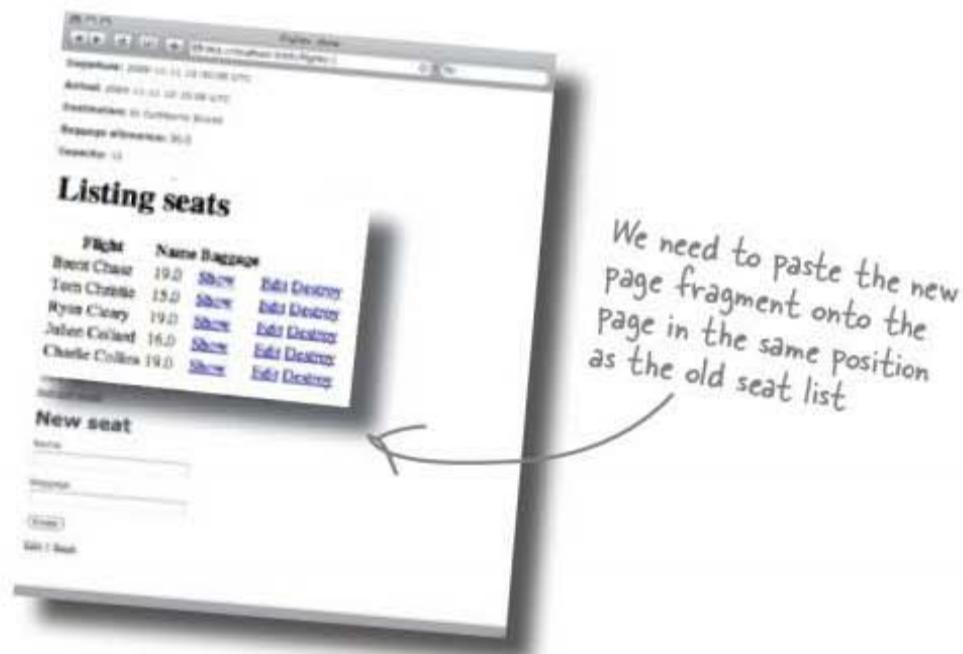
We get something OTHER than the browser to make the request.

So what ELSE can make a request?

Living inside the brain of every browser is a **JavaScript engine**. JavaScript allows you to modify the normal operation of the browser. JavaScript can dynamically change the appearance of a web page, it can update the contents of the HTML that is displayed, and it can respond to events within the page, such as when buttons are pressed. Most importantly, JavaScript can also ***make requests*** independent of the browser.

But what does **independent** really mean here? It's true that JavaScript can tell a browser to go to another page, but it can also do something much more subtle. In the background, JavaScript can quietly make requests to a web server and read the contents of whatever the server sends back. And all this can happen *without taking the browser to a different URL*. JavaScript could make dozens, or even hundreds, of background requests, and you wouldn't notice a thing. The browser would look like it was just displaying a page.

The reason why this is so important is that JavaScript can make a **background request**, or **asynchronous request**, asking for the latest version of the seat list. When the page fragment is returned, JavaScript can use the fragment to update the section of the page displaying the list of booked seats.



We can use JavaScript instead of the browser to make the request. That way we won't need to reload the entire page, and the web page will seem a lot more responsive.

Using JavaScript to update the current page is called **Ajax**, and Rails comes with a lot of Ajax support built right in. But how do we use it?

First we need to include the Ajax libraries...

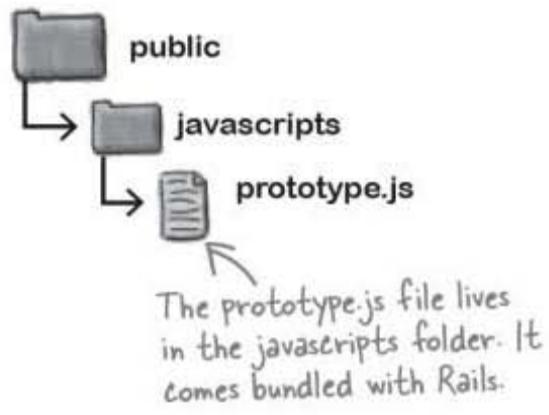
But how do we get JavaScript in the browser to make asynchronous requests? That kind of processing is likely to be quite complex. The truth is that there is a very large amount of JavaScript code that needs to run inside the browser to make Ajax requests. The code will not only need to handle all of the details of the request processing, but it will also need to do it in a way that is compatible with all the major browsers. That would be a nightmare to create and debug, so most Ajax applications use standard JavaScript libraries to make life easier. Rails comes with one such library built in called **Prototype**.

The Prototype library lives in a file named `prototype.js` in the `javascripts` folder. But even though the library is included in the application code, it's not automatically included in the web pages that are generated by an application. To make sure that Prototype is available to the browser, you need to include a reference to it in your layouts:

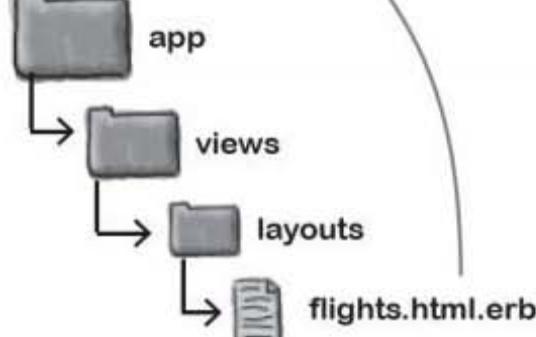
```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
  "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en" lang="en">
<head>
  <meta http-equiv="content-type" content="text/html; charset=UTF-8" />
  <title>Flights: <%= controller.action_name %></title>
  <%= stylesheet_link_tag 'scaffold' %>
  <%= javascript_include_tag 'prototype' %> ← This line here makes sure that
                                                the Prototype Ajax library is
                                                available to web browsers.
</head>
<body>
  <p style="color: green"><%= flash[:notice] %></p>
  <%= yield %>
</body>
</html>
```

The `javascript_include_tag` helper makes sure the browser downloads the Prototype library from the correct URL.

Once you've got the Ajax library installed in your web pages, you're ready to create some custom Ajax code.



The `prototype.js` file lives in the `javascripts` folder. It comes bundled with Rails.



...then we need to add an Ajax “Refresh” link

The Ajax library makes it easier to make asynchronous requests to the server, but what the library *won't* do is write the custom Ajax code for you. So what custom code do we need?

The network problem is caused by users hitting the reload button on their browsers, which is making the system slower for them and for other users. We can get around this is by giving the users a link in the web page labeled “Refresh.” This link will just update the seat bookings on the page, and because it’s downloading less HTML, it will be faster for the user than the browser’s “Reload.” It will also reduce the load on the server, making life easier for other customers, too.

So how will the “Refresh” link work? Ajax is run entirely by JavaScript, so we need the link to generate a JavaScript event. The link’s event will call the Prototype library and tell it to make a request for the latest `seat_list` section of the page. When the HTML is returned from the browser, JavaScript will dynamically replace the seats on the page with the new HTML.

So what should the code look like?



Sharpen your pencil

This is the code to add a JavaScript link to the `Flight show.html.erb` template. Write down what you think each part of the code does.

```
<div id="seats"> .....  
<%= render :partial=>"seat_list", :locals=>{:seats=>@flight.seats} %>  
</div>  
  
<%= link_to_remote( .....  
  "Refresh seats", .....  
  :url=>"/flights/#{@flight.id}/seats", .....  
  :method=>"get", .....  
  :update=>"seats") %> .....  
  
<%= render :partial=>"new_seat", :locals=>{:seat=>  
  Seat.new(:flight_id=>@flight.id)} %>
```

Sharpen your pencil Solution

This is the code to add a JavaScript link to the Flight show.html.erb template. Write down what you think each part of the code does.

```
<div id="seats">← We're naming the part of the page that's changing:  
<%= render :partial=>"seat_list", :locals=>{:seats=>@flight.seats} %>  
</div>  
  
<%= link_to_remote( ← Create a JavaScript button to update the seats.  
  "Refresh seats", ← This is caption for the button.  
  :url=>"/flights/#{@flight.id}/seats", ← The URL where the new seat list will come from...  
  :method=>"get", ← This means we are just reading, not updating data.  
  :update=>"seats" ) %> ← This is the id of the part of the page we're updating.  
  
<%= render :partial=>"new_seat", :locals=>{:seat=>  
  Seat.new(:flight_id=>@flight.id)} %>
```

When Embedded Ruby processes the show.html.erb template, it generates an HTML link that calls the Ajax libraries when it's clicked:

The link calls the Prototype Ajax library on its onclick event.

```
</div>  
  
<a href="#" onclick="new Ajax.Updater('seats', '/flights/1/  
seats', {asynchronous:true, evalScripts:true, method:'get',  
parameters:'authenticity_token=' + encodeURIComponent('7cb578  
0328778ef35ee9d26689784bba0d562170')); return false;">Refresh  
seats</a>  
  
<h1>New seat</h1>
```

This helper generates this HTML.

there are no
Dumb Questions

Q: What's an asynchronous request?

A: An asynchronous request is a request that runs in the *background*. Asynchronous requests are generated by JavaScript.

Q: So how does that differ from normal requests?

A: Normal requests are generated when a person clicks on a link or types in a URL. Asynchronous requests are generated by JavaScript in response to an event.

Q: Does reloading the page really use up that much bandwidth?

A: It can if large amounts of HTML are required for the rest of the page. Also, the browser may attempt to reload images on the page, which can also take up a significant amount of bandwidth. Plus some parts of the page may take a lot of processing to create. Ajax allows you to leave those parts of the page to remain unchanged, reducing the load on the server.

Q: Do I need to know JavaScript in order to write Ajax code?

A: Rails will generate Ajax code for you, so you don't need to learn JavaScript. If you know JavaScript, however, you will have greater control over how the Ajax calls are made, and be better able to understand how your application works.

Q: The generated JavaScript creates a parameter called "authenticity-token". What's that for?

A: An **authenticity token** is used by Rails to ensure that a request comes from a Rails-generated page. Without the authenticity token, Rails will reject the request.

Q: How does that token work?

A: It's a value generated by Rails. The presence of the value in a request show that a request is from a page that Rails created and not from some third-party application that is trying to access your system.

Q: You say that Ajax requests are sent out by JavaScript instead of the browser, but isn't JavaScript just part of the browser?

A: Yes, but the JavaScript engine can make requests that are not part of the normal browsing sequence—and that's the point. Ajax requests allow you to update parts of a page without making full page requests and without modifying the browser page history.

Q: Why did we use the `javascript_include_tag` helper instead of just entering the HTML to load the JavaScript?

A: If you want to write HTML for yourself, straight HTML will work, but Rails developers tend to use helpers whenever possible. Helpers are usually a little shorter than the literal HTML, and they also fill in some application specific configuration for you. For example, the `javascript_include_tag` will fill in the path to the standard javascript path: `"/javascripts/..."`.

Q: That doesn't sound like that big of a deal.

A: The helper also adds a random number to the end of the JavaScript location.

Q: What use is that?

A: It means that if someone refreshes the page in the browser, the browser will also download a new copy of the JavaScript library. That way, if you change anything in the library, the browser will always request the latest version.



Test Drive

Now that the JavaScript button is in place, it's time to see how the application's looking. Reload your app and try things out.

1

The first user goes to the flight page to book a seat.

He sees details of the flight as well as the list of seats already booked and a booking form. Sitting between the seat list and booking form is the new Ajax button.

Flight	Name	Baggage
Brent Chase	19.0	Show Edit Destroy
Tom Christie	15.0	Show Edit Destroy
Ryan Cleary	19.0	Show Edit Destroy
Julien Collard	16.0	Show Edit Destroy
Charlie Collins	19.0	Show Edit Destroy

Refresh seats

New seat

Name

Baggage

[Edit](#) | [Back](#)



2

A second user visits the page and books a seat.

When the form is submitted her page is refreshed and she sees her new booking. So will everyone who now goes to the page. But what about the first user?

Flight	Name	Baggage
Brent Chase	19.0	Show Edit Destroy
Tom Christie	15.0	Show Edit Destroy
Ryan Cleary	19.0	Show Edit Destroy
Julien Collard	16.0	Show Edit Destroy
Charlie Collins	19.0	Show Edit Destroy

Refresh seats

New seat

Name

Baggage

[Edit](#) | [Back](#)





The screenshot shows a web browser window titled "Flights: show" with the URL "http://localhost:3000/flights/2". The page displays a table of flight bookings:

Flight	Name	Baggage	Action
Brent Chase	19.0	Show	Edit Destroy
Tom Christie	15.0	Show	Edit Destroy
Ryan Cleary	19.0	Show	Edit Destroy
Julien Collard	16.0	Show	Edit Destroy
Charlie Collins	19.0	Show	Edit Destroy
Jesse James Garrett	12.0	Show	Edit Destroy

Below the table is a link "Refresh seats". Underneath, there is a form titled "New seat" with fields for "Name" and "Baggage", and a "Create" button.

3

The first user can see the new booking by hitting the refresh button.

The button fires off a JavaScript event that will call the Ajax library and refresh the seat list, showing the new booking.



But why do I have to click
refresh to see the changes?
Can't the system update the
page automatically?

The system works great, but a few users are wondering why they have to sit there repeatedly clicking a button just to see if there are new bookings. It would be much more convenient if the page could somehow discover when there are new bookings automatically.

But is that possible?

gimme more, gimme more

The browser needs to ask for an update

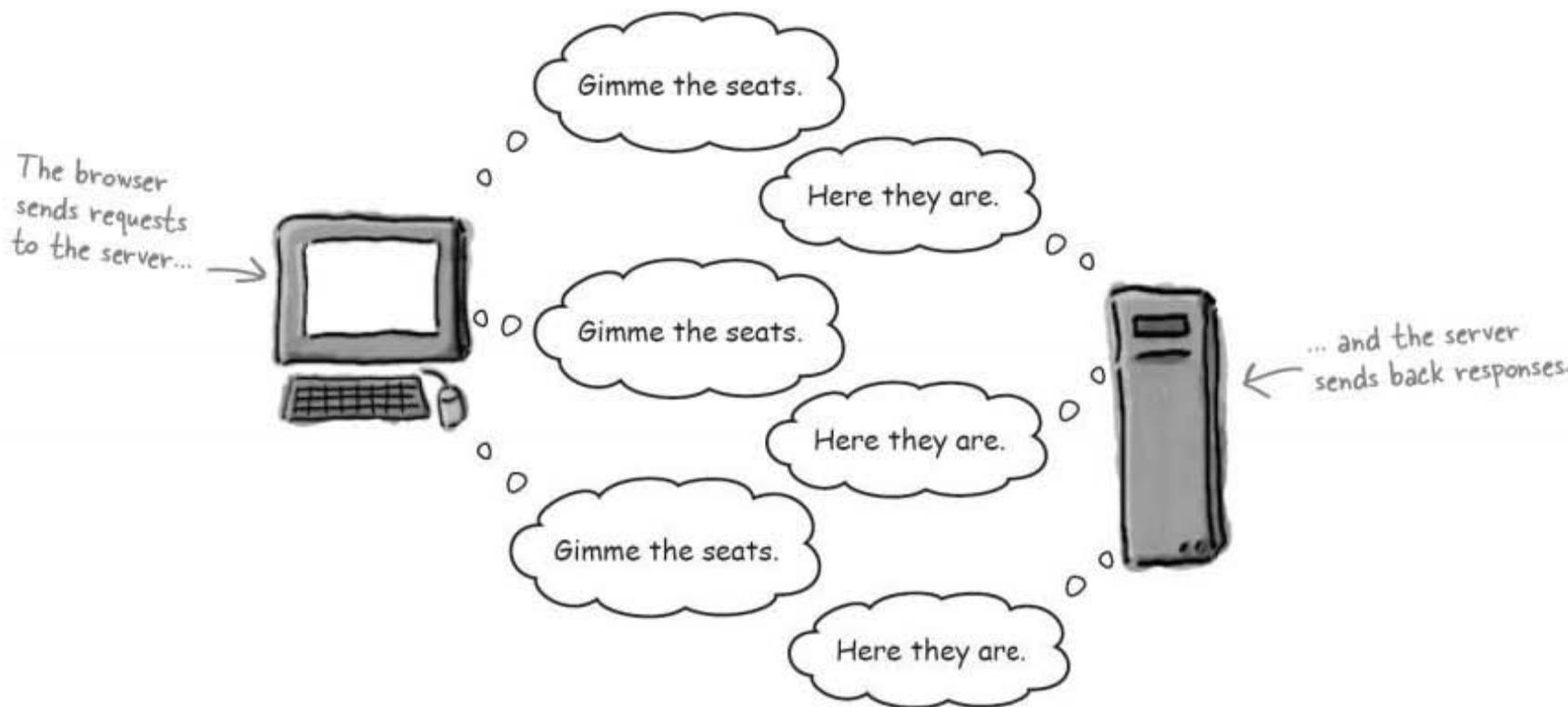
But there's a problem with automatically updating the page, and it comes from the way that the web works.

In a perfect world, the web application would be able to tell the user whenever the list of booked seats changes. Unfortunately, web servers don't work like that. They only speak when they're spoken to.



The server will only send a **response** if it gets a **request**. If the server has new information that it wants to let the browser know about, it can't do anything. It has to wait for the browser to *ask* for the new information.

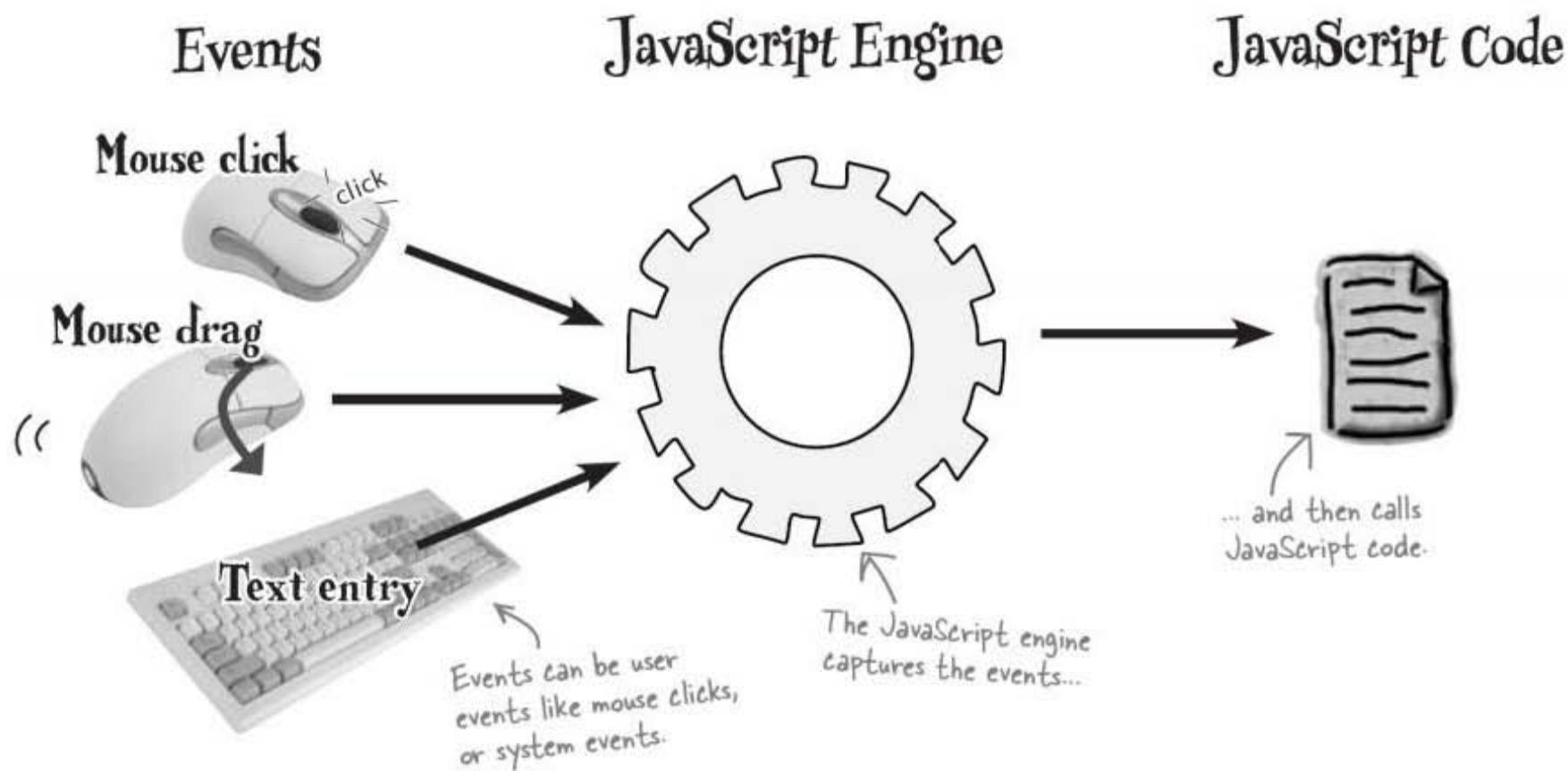
That means if we want the browser to automatically be told whenever the seat list changes, we're going to be disappointed. Instead we need the browser to just keep asking. And asking. And asking...



But SHOULD we make the browser ask over and over again?

Think back to the way the Ajax refresh link works. When someone clicks on it, the link generates a JavaScript event, which in turn calls the Prototype library, asking it download a new version of the seat list.

The key point is that whole thing begins with an *event*, something that happens outside of JavaScript.



A piece of JavaScript can register itself with an event, meaning that when the event occurs, the JavaScript runs.

In our situation, we need to run the same piece of JavaScript over and over again. So what kind of event can do that? Well, it won't be an event generated by a human action. Instead, we need to register JavaScript with a **timer** event.

A timer is a system event that occurs at regular intervals, usually every few seconds. We need to create a timer, then register the “Update the seat list” JavaScript with it.

Fortunately, Rails can help us.

You listen to a timer like you listen to a button

The only real difference between running a piece of Ajax code when a button is pressed and running it over and over again every few seconds, really just comes down to exactly what kind of event you are listening to.

For that reason, the Ruby code we place into the page template is actually quite similar to the code we used to create the JavaScript button:

```
<%= periodically_call_remote(  
  :url=> "_____", ← The URL where the new seat list will come from  
  :method=>"get", ← This means we're just reading, not updating data.  
  :update=>"_____", ← This is the id of the part of the page we're updating.  
  :frequency=>"__") %> ← The number of seconds between timer events
```

A helper to create JavaScript to listen to a timer

This code will create JavaScript to make a request for a new seat list every few seconds. It will then update the specified part of the page with the HTML that's returned by the server. The only real difference between this helper and the code that created the JavaScript button is:

- ➊ The button needs caption text.
- ➋ The timer needs to be given a frequency.



Sharpen your pencil

The flight page should still contain the "Refresh button," but it also needs the timer code. Write the timer code to add to `app/views/flights/show.html.erb` to make the seat list update 3 times a minute:

.....
.....
.....
.....

there are no Dumb Questions

Q: Is there really no way that the browser can be contacted by the server?

A: The browser could maintain an open connection with the server but that would require a large number of connections for even minimally popular applications. Polling the server is a much more popular approach.

Q: Is the frequency of a timer always in seconds?

A: Yes, the frequency is always in seconds. It might seem odd that it's called frequency because it doesn't give the frequency (how many times it fires a minute). Instead it gives the "period", which is the amount of time *between* firings.

Q: What's the default frequency?

A: By default, the frequency is 10 seconds.

Q: Where does the id of the part of the page come from?

A: Each tag in HTML can be given an id. That's a unique reference to mark a part of a web page. Usually Ajax apps wrap some part of the page in a `<div>` tag with an id. That allows you to give an id to a single tag, or to a group of HTML tags all at once.

clicked refresh or timed events?



Sharpen your pencil Solution

The flight page should still contain the “Refresh button,” but it also needs the timer code. Write the timer code to add to app/views/flights/show.html.erb to make the seat list update 3 times a minute:

```
<%= periodically_call_remote(
  :url=>"/flights/#{@flight.id}/seats",
  :method=>"get",
  :update=>"seats",
  :frequency=>"20") %>
```

Your show.html.erb template should contain code looking like this:

```
<%=h @flight.baggage_allowance %>
</p>
<p>
  <b>Capacity:</b>
  <%=h @flight.capacity %>
</p>
<div id="seats">
<%= render :partial=>"seat_list", :locals=>{:seats=>@flight.seats} %>
</div>
<%= link_to_remote
  "Refresh seats", :url=>/flights/#{@flight.id}/seats",
  :method=>"get", :update=>"seats" %>
<%= periodically_call_remote(
  :url=>/flights/#{@flight.id}/seats",
  :method=>"get", :update=>"seats", :frequency=>"20") %>
<%= render :partial=>"new_seat", :locals=>{:seat=>Seat.new(:flight_id=>@flight.id)} %>
```

This is the bottom part of the show.html.erb file.



Test Drive

Now the timer code has been added, the system should automatically update the list of seat bookings without the user doing anything to refresh the page.

- The first user goes to the flight page to book a seat.

He sees details of the flight.

Flight	Name	Baggage	
Brent Chase	19.0	Show	Edit Destroy
Tom Christie	15.0	Show	Edit Destroy
Ryan Cleary	19.0	Show	Edit Destroy
Julien Collard	16.0	Show	Edit Destroy
Charlie Collins	19.0	Show	Edit Destroy

Refresh seats

New seat

Name:

Baggage:

[SIT BACK](#)



- While he's booking the seat, a second user visits the page.

She quickly books a seat on the flight and submits the data.

New seat

Name: Jesse James Garrett

Baggage: 12



- The first user automatically sees the new booking.

Even though the first user doesn't touch the keyboard, the page automatically updates the seat list within 20 seconds.

New booking automatically appears.

Flight	Name	Baggage	
Brent Chase	19.0	Show	Edit Destroy
Tom Christie	15.0	Show	Edit Destroy
Ryan Cleary	19.0	Show	Edit Destroy
Julien Collard	16.0	Show	Edit Destroy
Charlie Collins	19.0	Show	Edit Destroy
Jesse James Garrett	12.0	Show	Edit Destroy

Refresh seats

New seat





Ajax Exposed

This week's interview:
Getting Up To Speed With Ajax.

Head First: Hello, Ajax, and welcome. It's good of you...

Ajax: My pleasure.

Head First: ...to be interviewed today.

Ajax: Oh, I interrupted you.

Head First: That's quite...

Ajax: I do that a lot. I'm sorry. I can be a little—you know—hyper.

Head First: You're a busy technology?

Ajax: See that? I just updated the data table! What - technology? I'm not technology. I'm a way of life, baby! Or at least a way of writing web apps.

Head First: How do you mean?

Ajax: Well, Rails, JavaScript, Prototype—those dudes are software. Nothin' wrong with that. It's cool, but I'm way beyond that. Prototype is just a support library for me.

Head First: So what are you?

Ajax: I'm a design technique. If you make asynchronous JavaScript requests to update a web page, you're using me.

Head First: Asynchronous? That means your requests...

Ajax: ... interrupt the normal browser stuff, yeah. The requests happen in the background while the user sits on the page.

Head First: And almost anything can trigger Ajax requests?

Ajax: Oh yeah. XHRs can be generated by almost anything—any kind of JavaScript event.

Head First: I'm sorry—XH...?

Ajax: XHRs. Sorry, XHRs are my little Ajax request buddies. "XML HTTP Requests" is the proper name.

Head First: Now you say you're not software, but people do install Ajax libraries, don't they?

Ajax: You can write your own code from the ground up, but sure, most people use Ajax libraries, like the Prototype library. Libraries handle creating requests and dealing with the stuff that comes back.

Head First: And what sort of data is returned by an Ajax request?

Ajax: Whatever floats your boat, baby. Page fragments in HTML. Data in XML or JavaScript format. Even JavaScript itself.

Head First: I see. Tell me more, JavaScript...

Ajax: What's that little buddy? Hey, sorry dude—gotta go.

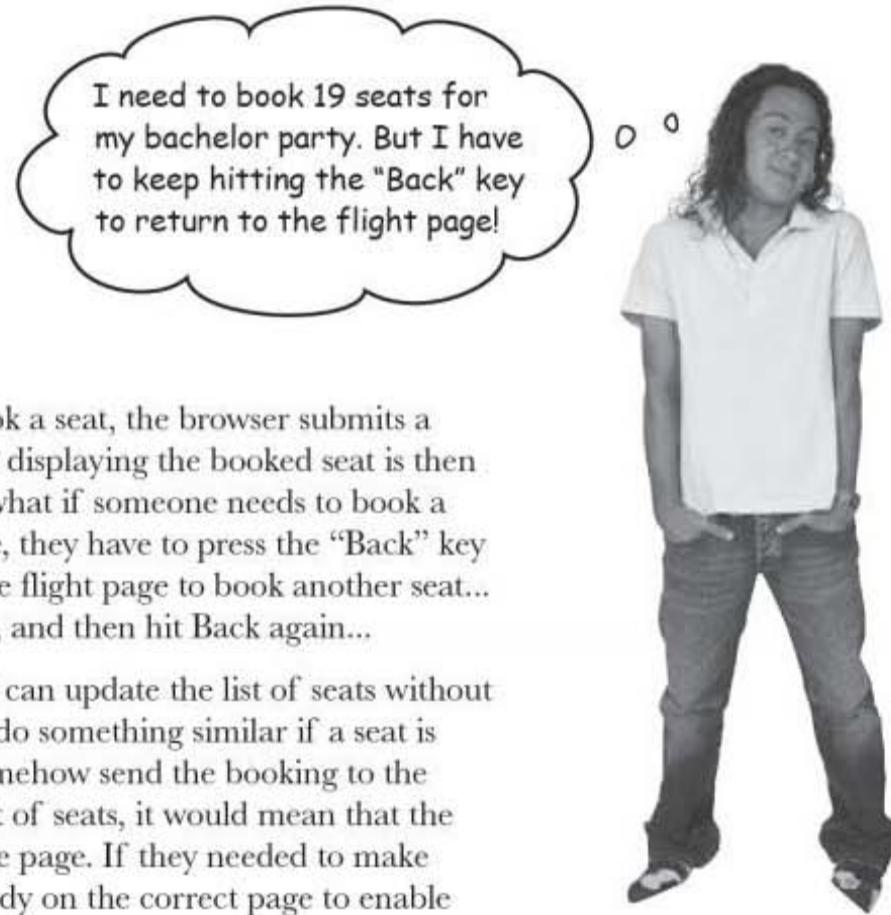
Head First: Excuse me?

Ajax: Someone just hit a JavaScript button. I got an on-click event with my name on it. Catch you later...

Head First: Ajax, thank...

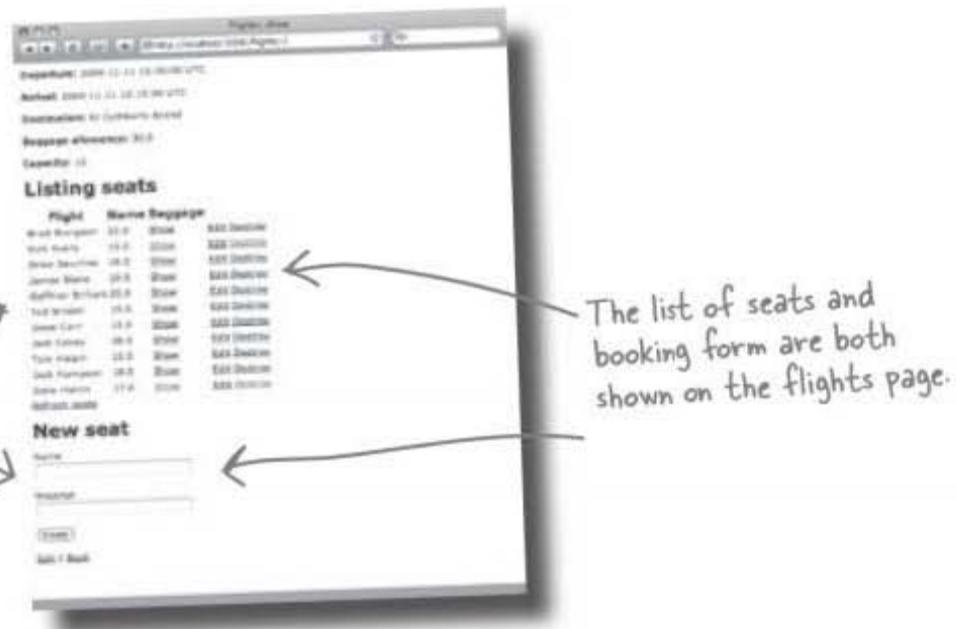
Ajax: Don't mention it.

Someone's having trouble with their bachelor party



At the moment, when you book a seat, the browser submits a form to the server, and a page displaying the booked seat is then returned to the browser. But what if someone needs to book a whole set of seats? In this case, they have to press the "Back" key on the browser to return to the flight page to book another seat... and get another confirmation, and then hit Back again...

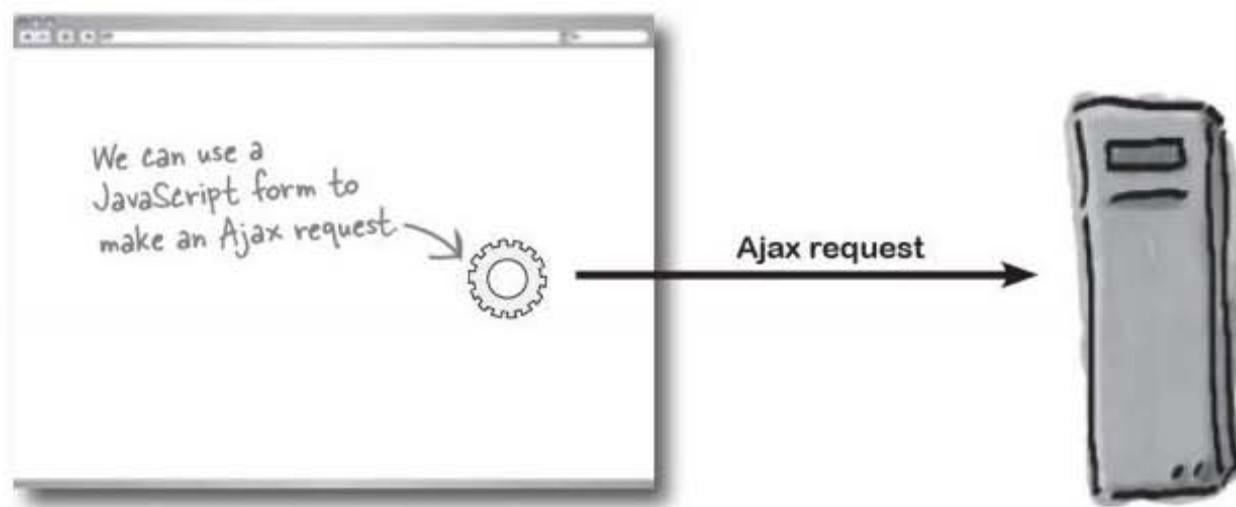
So far we've written code that can update the list of seats without going to a new page. Can we do something similar if a seat is booked? If the form could somehow send the booking to the server and then update the list of seats, it would mean that the user could remain on the same page. If they needed to make another booking, they're already on the correct page to enable them to do that.



The form needs to make an Ajax request

If we let the browser submit the form we know that we'll be sent to another page. It's just like the problem we had when the user hit the browser "Reload" button—it's built-in browser behavior that we can't modify.

So what do we do? We need to use a different kind of form. Instead of using a standard HTTP form, we need to use a JavaScript form and use that to make a request.



Instead of simply asking the browser to submit the form data, we need the submit button to generate a JavaScript event that will submit the form data using an Ajax request. So why is that so important? It means that the act of booking the seat **won't** cause the browser to switch to another page.

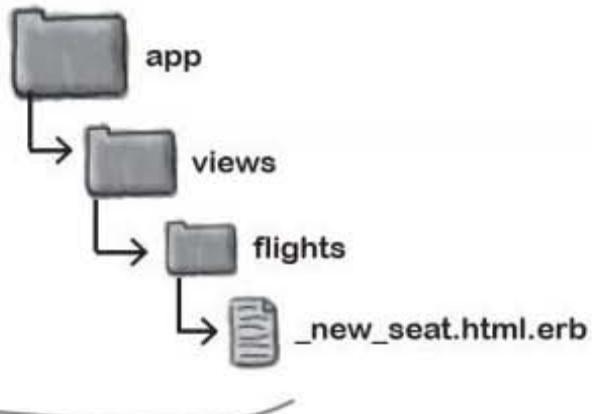
The form needs to be under the CONTROL of JavaScript

So we need to convert the form from a simple HTTP form into one that generates JavaScript events and dynamically updates the current page rather than moving the browser to a different URL. Here is the contents of the booking form partial:

```
<% form_for(seat) do |f| %>
<%= f.error_messages %>

<%= f.hidden_field :flight_id %>

<p>
  <%= f.label :name %><br />
  <%= f.text_field :name %>
</p>
<p>
  <%= f.label :baggage %><br />
  <%= f.text_field :baggage %>
</p>
<p>
  <%= f.submit "Create" %>
</p>
<% end %>
```



But how do we make this the form work in this completely different way?
We need to change this:

```
<% form_for(seat) do |f| %>
```

to this:

```
<% remote_form_for(seat, :update=>'seats' ) do |f| %>
```

It's a fairly small change, but behind the scenes the form will work in a very different way...

remember the controller?



Test Drive

When a user goes to a flight page (`http://localhost:3000/flights/2`), the booking form looks exactly as it did before:

The screenshot shows a browser window with the URL `http://localhost:3000/flights/2`. At the top, there's a table listing flight bookings:

Flight	Name	Baggage	
Brent Chase	19.0	Show	Edit Destroy
Tom Christie	15.0	Show	Edit Destroy
Ryan Cleary	19.0	Show	Edit Destroy
Julien Collard	16.0	Show	Edit Destroy
Charlie Collins	19.0	Show	Edit Destroy

Below the table is a 'New seat' form:

New seat

Name:

Baggage:

[Edit](#) [Back](#)

But, of course, behind the scenes the HTML is very different. So what happens when a new seat is booked?

The screenshot shows a browser window with the URL `http://localhost:3000`. It displays the following information:

Departure: 2009-11-11 13:30:00 UTC
Arrival: 2009-11-11 14:30:00 UTC
Destination: Titchmarsh Island
Baggage allowance: 25.0
Capacity: 22

Seat was successfully created.

Flight: 2
Name: Jesse James Garrett
Baggage: 12.0

[Refresh seats](#)

New seat

Name:

Baggage:

[Edit](#) [Back](#)

Something's not quite right. Look in your database... the seat was booked correctly, but the flight page becomes corrupted. Why?

We've changed the code in the view, but the controller code—the code on the server—is still doing the same thing it did before; it sends back HTML with details of the newly booked seat. What we need is a new version of the seat list

Let's fix the controller code.

Where did our list of seat bookings go???????

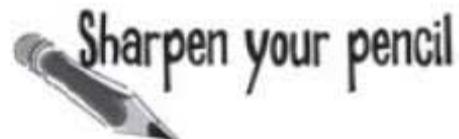
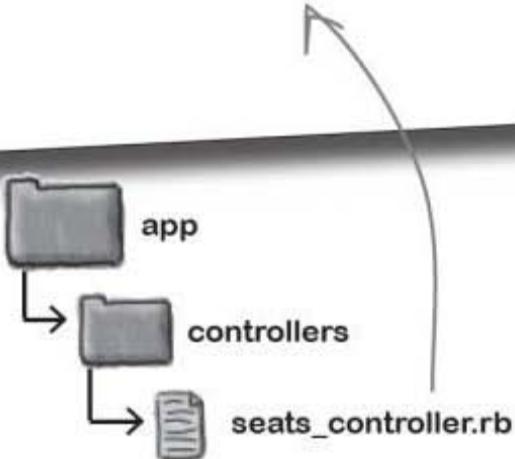
We need to replace the create method

The existing create method in the seats controller looks like this:

```
def create
  @seat = Seat.new(params[:seat]) ← Don't worry if you don't get what all this code
  respond_to do |format|
    if @seat.save
      flash[:notice] = 'Seat was successfully created.'
      format.html { redirect_to(@seat) }
      format.xml { render :xml => @seat, :status => :created,
                    :location => @seat }

    else
      format.html { render :action => "new" }
      format.xml { render :xml => @seat.errors,
                    :status => :unprocessable_entity }
    end
  end
end
```

We need to replace this with code that creates a Seat object, saves the object to the database, and then renders a new copy of the seat list. But what should this code look like?



Write a new `create` method that will always create a `Seat` object based on the form data, ask the new object to save itself to the database, and render the contents of the `seat_list` partial.

Sharpen your pencil Solution

Create a seat object exactly as you did before.

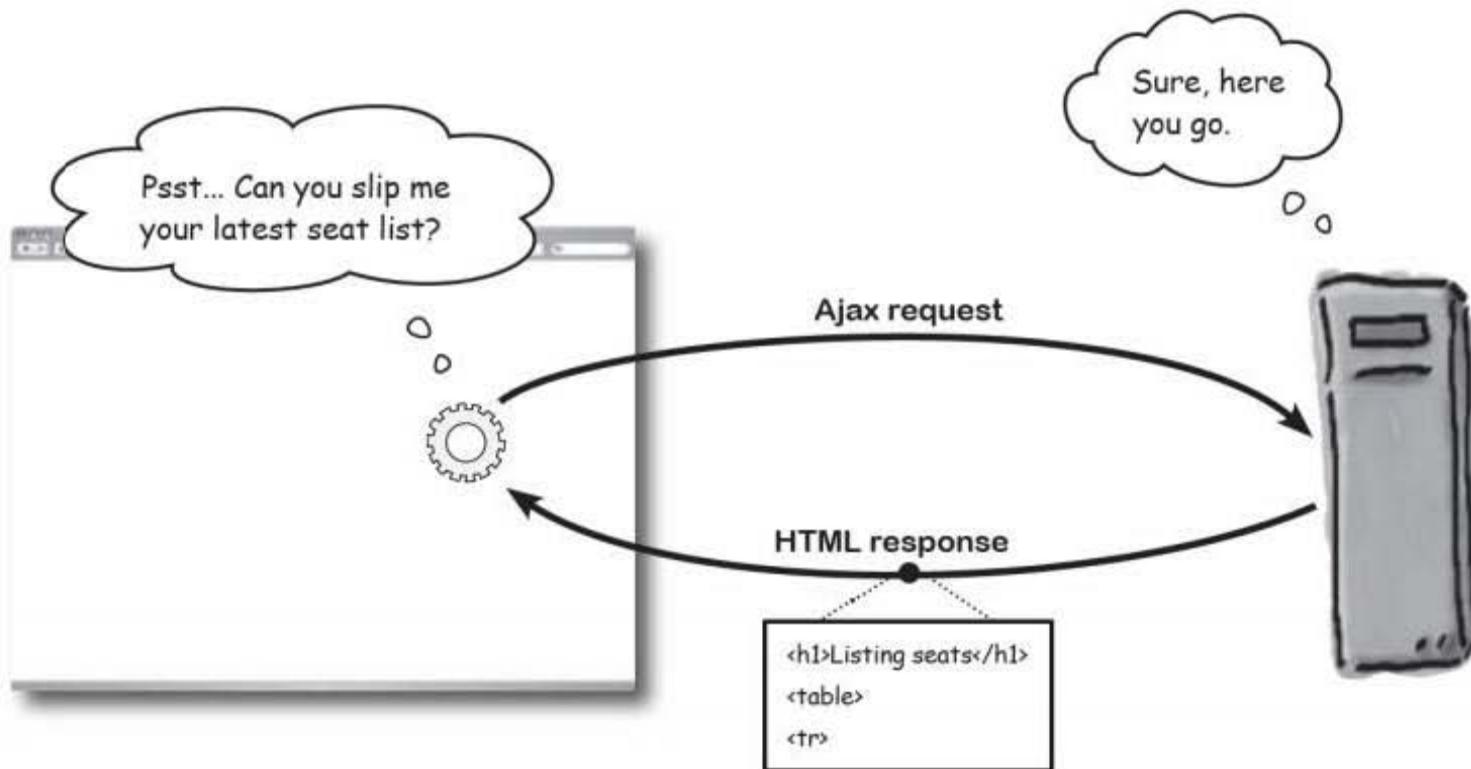
This allows you to render the seat list for all of the seats on the flight.

```
def create
  @seat = Seat.new(params[:seat])
  @seat.save ← Don't bother checking if the save is successful.
  render :partial => 'flights/seat_list', :locals => { :seats => @seat.flight.seats }
end
```

Write a new `create` method that will always create a `Seat` object based on the form data, ask the new object to save itself to the database, and render the contents of the `seat_list` partial.

So what effect does this code have?

The new `create` method means that when the Ajax form submits a new booking, it should receive a new copy of the seat list from the server:





Test Drive

Suppose a user goes to a flight page and submits a new booking request:

The system works! Now when a booking is made, the browser stays on the same page and the new booking record appears immediately.

Flight	Name	Baggage	Show	Edit	Destroy
Brent Chase	19.0	Show	Edit	Destroy	
Tom Christie	15.0	Show	Edit	Destroy	
Ryan Cleary	19.0	Show	Edit	Destroy	
Julien Collard	16.0	Show	Edit	Destroy	
Charlie Collins	19.0	Show	Edit	Destroy	
Jesse James Garrett	12.0	Show	Edit	Destroy	

That's awesome!
Now I can get to
booking the other 18
seats I need.





BULLET POINTS

- JavaScript can make **background requests** to a server.
- JavaScript can use the HTML returned to update **only part of a page**.
- Updating the page using background requests is called **Ajax**.
- The requests are called **XML HTTP Requests** (XHRs).
- JavaScript can be run when **events** occur.
- Events can be the result of **user actions** (like mouse clicks) or **system events** (like timers).
- If you don't want a form to move the browser to a new page, you need to convert it to an **Ajax form**.
- To make a form an Ajax form, you need to change `form_for` to `remote_form_for`.
- The **controller code** that handles the form request can send back HTML to update the page.
- If you give the form an `:update` parameter, it will know where in a page to put returned HTML.

there are no Dumb Questions

Q: How come we only need to amend the form helpers and not all of the fields in the form?

A: The fields in the form stay the same because they just contain data fields as they did before. The only real difference between an Ajax form and a "normal" HTML form, is that the `onsubmit` event for an Ajax form calls the Prototype libraries instead of submitting the form. Everything else remains the same.

Q: I saw elsewhere that Ajax forms are generated by "`form_remote_for`". Is that different?

A: No - `form_remote_for` is just an alias for `remote_form_for`. They will both do exactly the same thing.

Q: What if I need to convert an unbound `form_tag`?

A: There is an Ajax `form_remote_tag` that can be used as a replacement.

Q: I don't get it. The `*form*` can replace HTML in the `*page*`???

A: Not quite. The form calls a JavaScript function to make an Ajax request. It is the JavaScript function that replaces the HTML in the page.

Q: When the server receives the form request will it still look the same?

A: The request will be the same as if it had been sent from an HTML form. Prototype will construct the request so that will appear to be a perfectly normal HTTP request.

Q: What HTTP method does the Ajax form use?

A: Just like an HTML form, the Ajax form uses the POST method by default.

Q: But I can change the method, right?

A: You can change the HTTP method by providing a `:method=>` parameter in the helper.

Who am I?



A bunch of members of the Ajax Club, in full costume, are playing a party game, "Who am I?" They'll give you a clue, and you'll try to guess who they are based on what they say. Assume they always tell the truth about themselves. Fill in the blanks to the right to identify the attendees.

Tonight's attendees:

Any of the charming Ajax buddies you've seen so far just might show up!

Name

I am a library that Rails uses to generate Ajax requests from a browser.

.....

I am a language that runs inside the browser.

.....

I am a request used in Ajax apps, and my friends call me XHR.

.....

I am an event, but I'm not a user event.

.....

I am used to generate an Ajax form based on an object.

.....

I can call browser code that is registered with me.

.....

A bunch of members of the Ajax Club, in full costume, are playing a party game, "Who am I?" They'll give you a clue, and you'll try to guess who they are based on what they say. Assume they always tell the truth about themselves. Fill in the blanks to the right to identify the attendees.

Tonight's attendees:

Any of the charming Ajax buddies you've seen so far just might show up!

Who am I?



Name

I am a library that Rails uses to generate Ajax requests from a browser.

.....Prototype.....

I am a language that runs inside the browser.

.....JavaScript.....

I am a request used in Ajax apps, and my friends call me XHR.

.....XML Http Request....

I am an event, but I'm not a user event.

.....System event.....

I am used to generate an Ajax form based on an object.

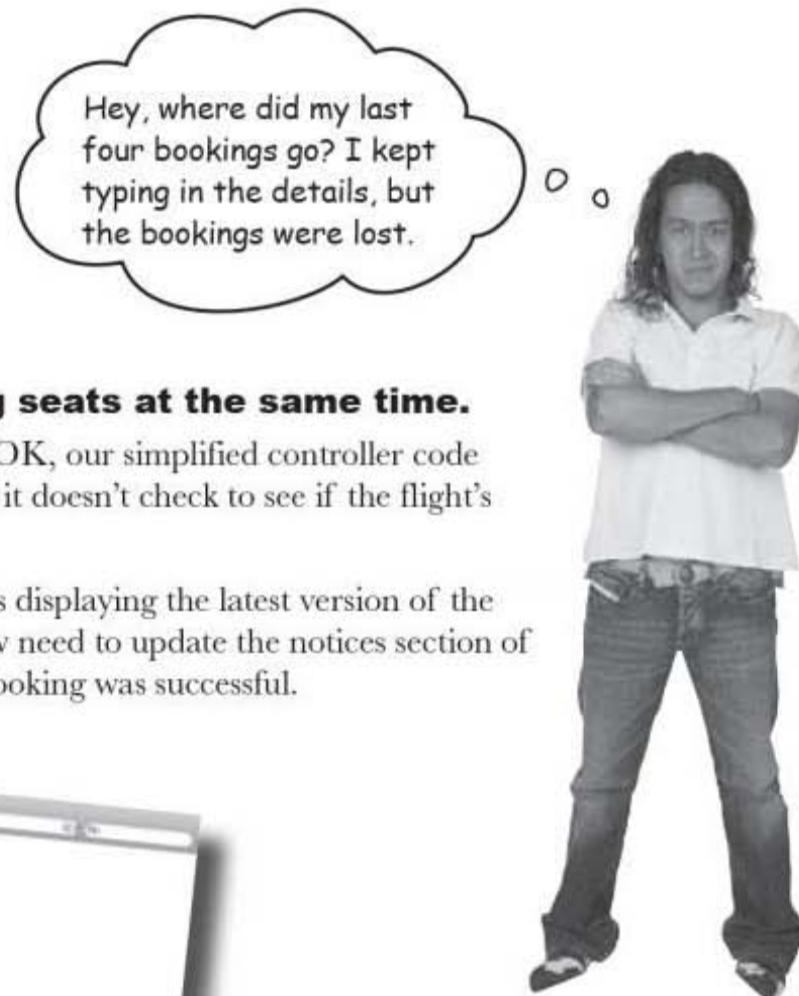
.....remote_form_for.....

I can call browser code that is registered with me.

.....Event.....

There's a problem with the flight bookings

The bachelor party organizer was booking his bachelor party trip when he hit a problem. There was plenty of space on the flight when he started booking seats, but then...



Someone else was booking seats at the same time.

While the Ajax form can book seats OK, our simplified controller code doesn't check if there's an error, and it doesn't check to see if the flight's already been booked up.

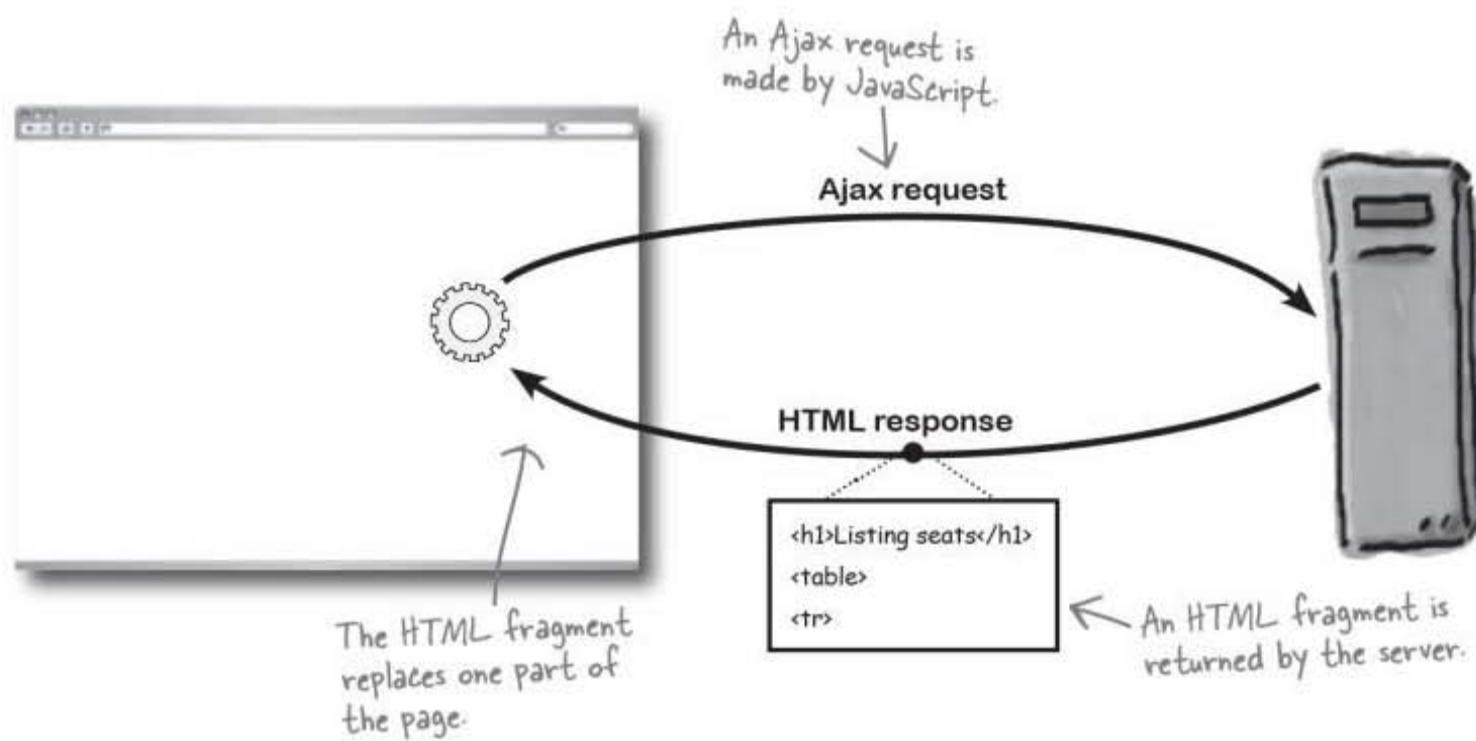
So what do we need to do? As well as displaying the latest version of the seat list, the controller code somehow need to update the notices section of the page to say whether or not the booking was successful.

This sounds straightforward, but what problem can you see with this?

synchronous *asynchrony*?

We only know how to update one part of the page at a time

So far, when we've made an Ajax request, we have always updated just one part of the page with the HTML returned by the server:



So what's different this time?

The difference this time is that we need to update the seat list *and* the notices section at the top of the page. That's two completely separate pieces of HTML that need to be replaced.

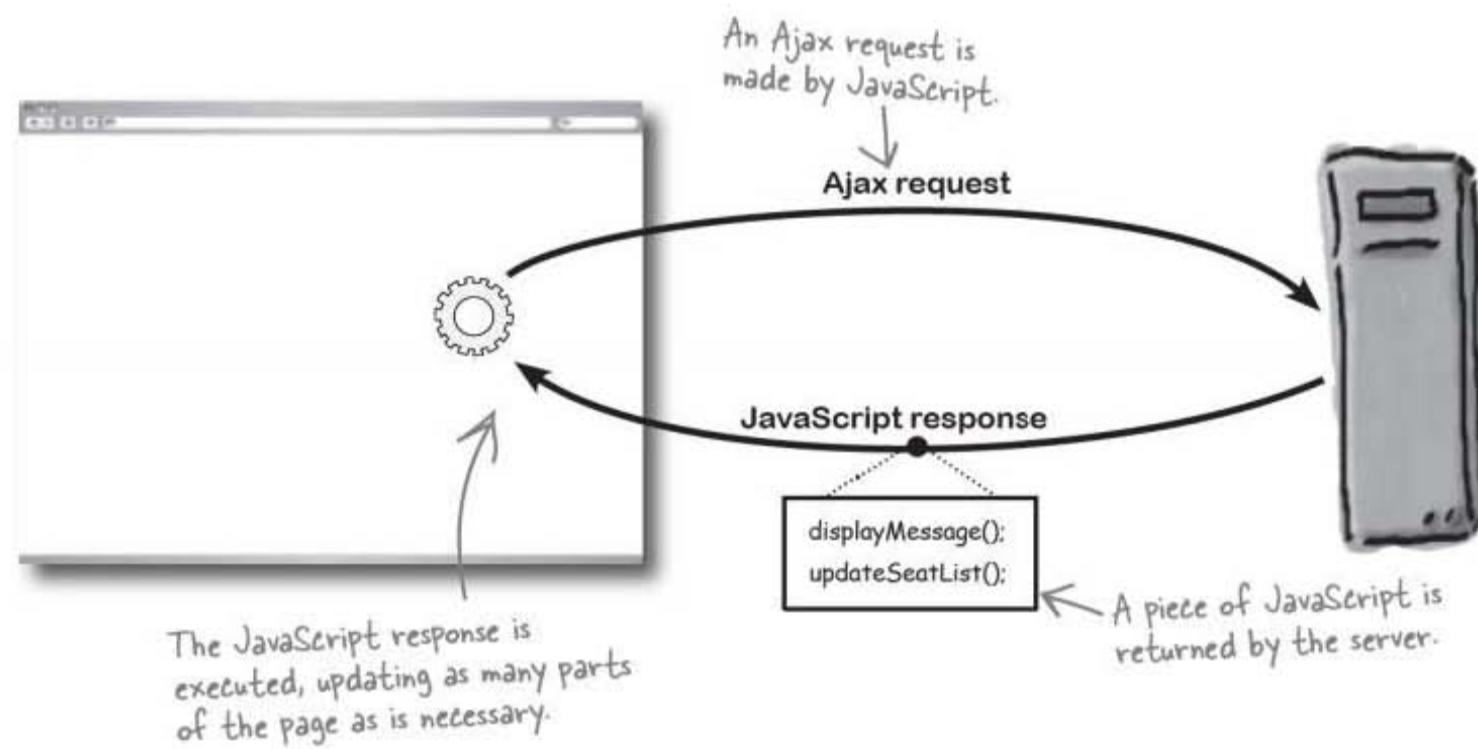
So how can we use a single response from the server to make multiple changes to a page? Should we make multiple requests? Or send several pieces of HTML?

There's actually a much neater way of doing several operations as the result of a single request.

The trick is to send something other than HTML back in the response.

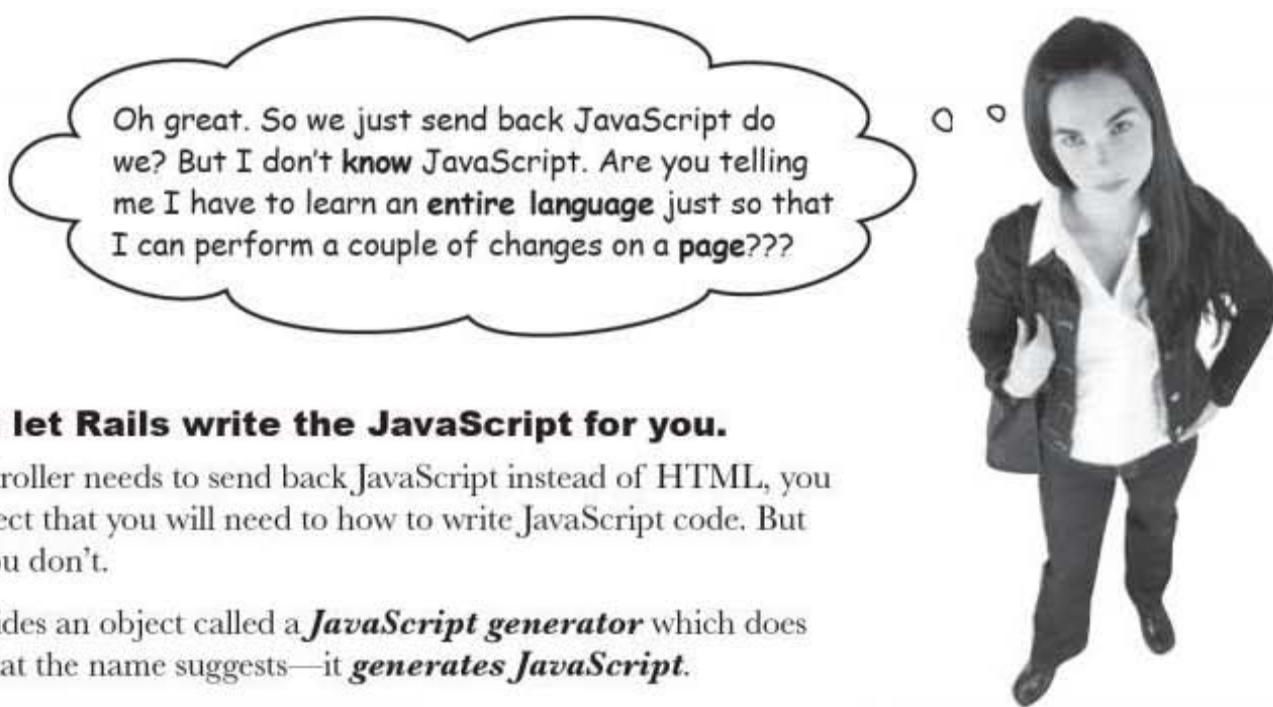
The controller needs to return JavaScript instead of HTML

If the controller sends HTML data back to the browser, then JavaScript will normally do something simple with it, like use it to replace part of the page. But if the controller sends JavaScript code back to the browser, that code can do as many things as the controller needs it to do.



So if the controller wants to update the list of seats on the page, then display a confirmation message, then perform some sort of fancy animation that turns the entire page upside down, all it needs to do is send back the appropriate JavaScript code. Whatever is in the JavaScript will get executed.

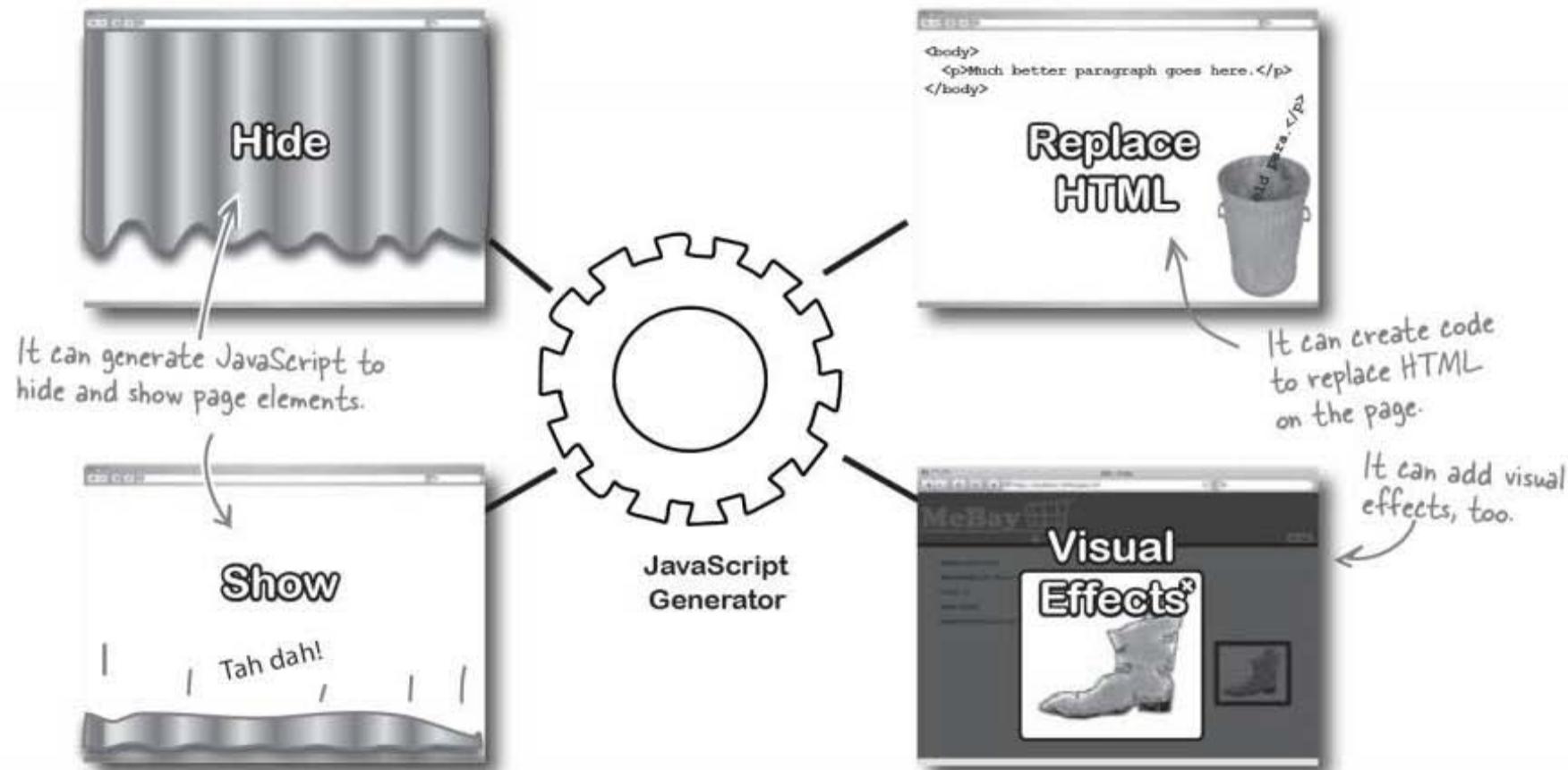
[Note from the Good Taste police:
You really don't want to do this.]



You can let Rails write the JavaScript for you.

If the controller needs to send back JavaScript instead of HTML, you might expect that you will need to how to write JavaScript code. But actually you don't.

Rails provides an object called a **JavaScript generator** which does exactly what the name suggests—it **generates JavaScript**.



The thing is, that while knowing JavaScript can be an advantage, most of the time, the JavaScript code you will be sending back to the browser will be doing some fairly standard things, like replacing a piece of HTML, or hiding part of the page, or calling some JavaScript library function to do an animation. And a JavaScript generator can write the code to do each of those things for you.

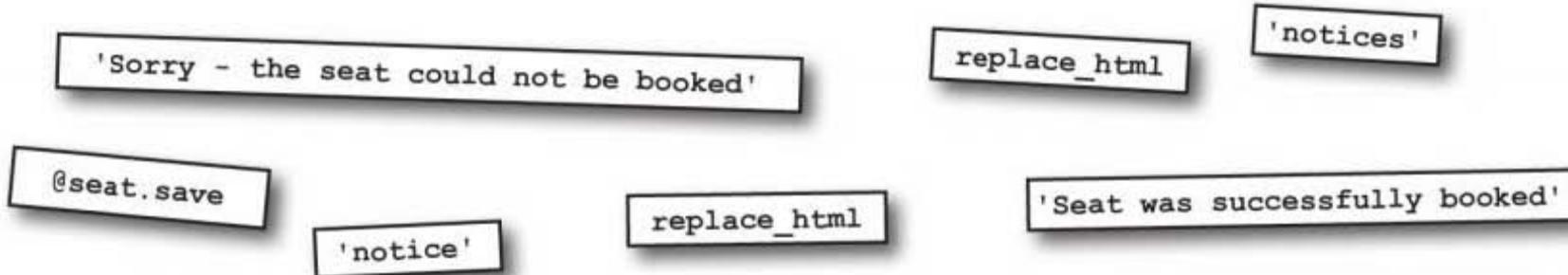
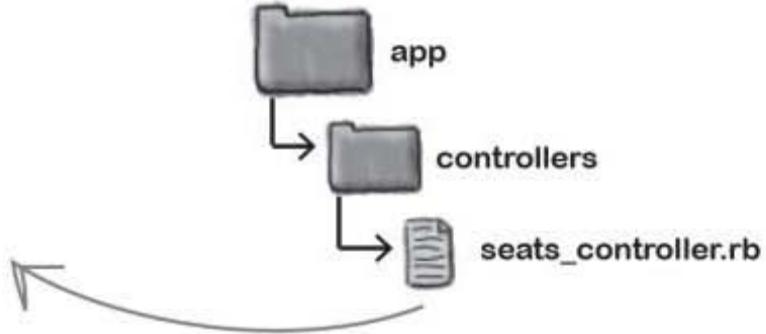
All you need to do is call it the right way.



Code Magnets

Complete the controller code to generate JavaScript to replace the HTML in the 'notices' <div> to say that the seat was booked.

```
def create
  @seat = Seat.new(params[:seat])
  render :update do |page|
    if .....
      page.replace_html('.....', '.....')
    else
      page.replace_html('.....', '.....')
    end
  end
end
```



write code to generate code



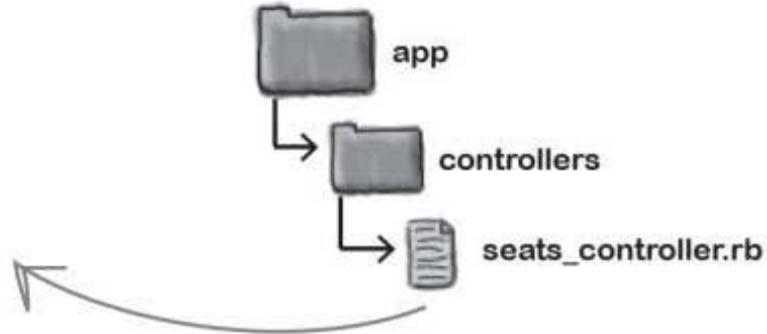
Code Magnets Solution

Complete the controller code to generate JavaScript to replace the HTML in the 'notices' <div> to say that the seat was booked.

```
def create

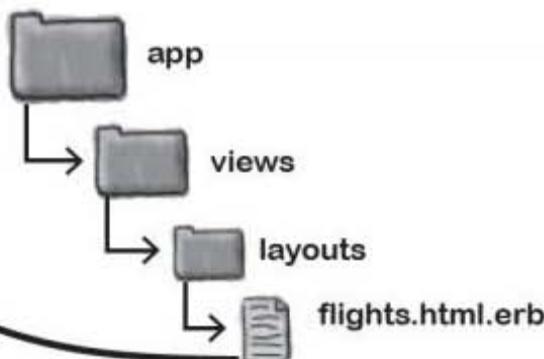
  @seat = Seat.new(params[:seat])

  render :update do |page|
    if .. @seat.save ..
      page. [replace_html] 'notice' .., .. 'Seat was successfully booked'
    else
      page. [replace_html] 'notice' .., .. 'Sorry - the seat could not be booked'
    end
  end
end
```



The controller code generates JavaScript to update a section of the web page with id='notice'. So which part of the web page will that be? Well - the layout for the flights pages contains a special output area at the top of each page for notices. You need to edit the flights layout and add an id to the <p> element like this:

```
<p style="color: green" id="notice">
  =<%= flash[:notice] %>
</p>
```



So what does Rails generate?

The page JavaScript generator creates the following JavaScript:

```
try {
  Element.update("notice", "Seat was successfully booked");

  Element.update("seats", "<h1>Listing seats</h1>\n\n<table>\n<tr>\n  <th>Flight</th>\n  <th>Name</th>\n  <th>Baggage</th>\n</tr>\n<tr>\n  <td>Brad Sturgeon</td>\n  <td>22.0</td>\n  <td><a href=\"/seats/1\">Show</a></td>\n  <td><a href=\"/seats/1/edit\">Edit</a></td>\n  <td><a href=\"/seats/1\" onclick=\"if(confirm('Are you sure?')) { var f = document.createElement('form');\n    f.style.display = 'none'; this.parentNode.appendChild(f); f.method = 'POST'; f.action = this.href; var m = document.createElement('input');\n    m.setAttribute('type', 'hidden'); m.setAttribute('name', '_method'); m.setAttribute('value', 'delete'); f.appendChild(m); var s = document.createElement('input'); s.setAttribute('type', 'hidden'); s.setAttribute('name', 'authenticity_token'); s.setAttribute('value', 'aec87b235224924109e33b3207d464c64207e733'); f.appendChild(s); f.submit(); }>Destroy</a></td>\n</tr>\n<tr>\n  <td>Kirk Avery</td>\n  <td>15.0</td>\n  <td><a href=\"/seats/2\">Show</a></td>\n  <td><a href=\"/seats/2/edit\">Edit</a></td>\n  <td><a href=\"/seats/2\" onclick=\"if (confirm('Are you sure?')) { var f = document.createElement('form'); f.style.\n    display = 'none'; this.parentNode.appendChild(f); f.method = 'POST';\n    f.action = this.href; var m = document.createElement('input');\n    m.setAttribute('type', 'hidden'); m.setAttribute('name', '_method'); m.setAttribute('value', 'delete'); f.appendChild(m); var s = document.createElement('input'); s.setAttribute('type', 'hidden'); s.setAttribute('name', 'authenticity_token'); s.setAttribute('value',\n      'aec87b235224924109e33b3207d464c64207e733'); f.appendChild(s); f.submit(); }>Destroy</a></td>\n</tr>\n</table>\n");
}
```

*There's *no way* you want to write this yourself...*

This will be returned to the browser when the Ajax booking form is submitted to the controller. Previously, the browser would take the contents of the controller response and use it to replace some part of the page. But now, we want the browser to *execute* the response. We want it to run our generated JavaScript.

But how do we tell the form to execute the JavaScript response?

are we done yet?

If you don't say where to put the response, it will be executed

Let's look at the Embedded Ruby code that generates the Ajax form:

```
<% remote_form_for(seat, :update=>'seats') do |f| %>
  <%= f.error_messages %>

  <%= f.hidden_field :flight_id %>
  <p>
    <%= f.label :name %><br />
    <%= f.text_field :name %>
  </p>
  <p>
    <%= f.label :baggage %><br />
    <%= f.text_field :baggage %>
  </p>
  <p>
    <%= f.submit "Create" %>
  </p>
<% end %>
```

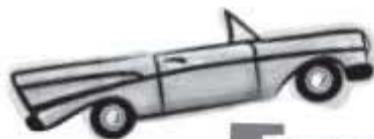
This code creates all of the JavaScript that's necessary to fire off an Ajax request when the form's Create button is pressed. The form then takes whatever is returned by the server and uses it to replace the part of the page labeled with id = 'seats'.

Now that was fine when the server was sending HTML back to the browser. But now it's sending JavaScript and we don't want the form to put that just anywhere. We want it to execute it, and that's a very different deal.

The change we actually need to make to the page template is very small. All we need to do to make the form execute the code is remove the update parameter:

The update parameter has
been removed.

```
<% remote_form_for(seat) do |f| %>
```



Test DRIVE

Now, when a seat is booked, the form displays a success or failure message.

The confirmation message appears.

But the new booking hasn't appeared in the list...

But the page doesn't update the seat list. We need to generate extra JavaScript to update the seat list.



Sharpen your pencil

You need to write an extra call to update the seat list with the contents of the appropriate partial.

```
page.replace_html '.....', :partial => '.....',
:locals => { ..... => ..... }
```



Sharpen your pencil Solution

You need to write an extra call to update the seat list with the contents of the appropriate partial.

```
This is the <div>  
we are updating  
page.replace_html 'seats', :partial => 'flights/seat_list'  
:locals => { :seats => @seat.flight.seats }
```

This will use the
app/view/flights/_seat_list.html.erb
partial

The array of
seats in the flight

The completed code can will now do several things

Here's what the completed code should look like:

```
def create  
  @seat = Seat.new(params[:seat])  
  render :update do |page|  
    if @seat.save  
      page.replace_html 'notice', 'Seat was successfully booked'  
    else  
      page.replace_html 'notice', 'Sorry - the seat could not be booked'  
    end  
    page.replace_html 'seats', :partial => 'flights/seat_list',  
      :locals => { :seats => @seat.flight.seats }  
  end  
end
```

We can call methods on the page JavaScript generator as often as we like. So if the seat is saved correctly, the page object will generate code to updates the notice and it creates JavaScript to update the seat list.



Test DRIVE

Now when a new seat is booked, not only does the confirmation message appear, but the seat list gets updated too:

Flight	Name	Baggage
Brent Chase	19.0	Show
Tom Christie	15.0	Show
Ryan Cleary	19.0	Show
Julien Collard	16.0	Show
Charlie Collins	19.0	Show
Edit Delete		

Flight	Name	Baggage
Brent Chase	19.0	Show
Tom Christie	15.0	Show
Ryan Cleary	19.0	Show
Sugar Dallas	18.0	Show
Charlie Collins	19.0	Show
Jesse James Garrett	12.0	Show
Edit Delete		

The system goes live and people are able to quickly book multiple seats.





Tools for your Rails Toolbox

You've got Chapter 7 under your belt, and now you've added the ability to add Ajax to your applications.

Rails Tools

Ajax applications make background requests using JavaScript. The Prototype library provides you with most of the functions to do Ajax.

There are several Ajax helpers provided by Rails:

- `<%= link_to_remote %>` will create an Ajax link.
- `<%= periodically_call_remote %>` starts an Ajax timer.
- `<%= remote_form_for %>` creates an Ajax form.

If the Ajax helpers are given `:update` parameters, they will replace the part of the web page with a matching id.

If the `:update` parameter is omitted, they will execute the JavaScript the controller returns.

8 XML and multiple representations



You can't please everyone all of the time. Or can you?

So far we've looked at how you can use Rails to quickly and easily develop web apps that **perfectly fit one set of requirements**. But what do you do when **other requirements come along**? What should you do if some people want **basic web pages**, others want a **Google mashup**, and yet more want your app available as an **RSS feed**? In this chapter you'll create **multiple representations** of the same basic data, giving you the **maximum flexibility** with **minimum effort**.

Climbing all over the world

Head First Climbers is a web site for mountaineers all over the world. Climbers report back from expeditions to record the locations and times of mountains they have climbed, and also to report dangerous features they've discovered, like rock slides and avalanches.

The information is obviously very important for the safety of other climbers, and many climbers use mobile phones and GPS receivers to read and record information straight from the rock face. Used in the right way, the system will save lives and yet—somehow—the web site's not getting a lot of traffic.



So why isn't it popular?

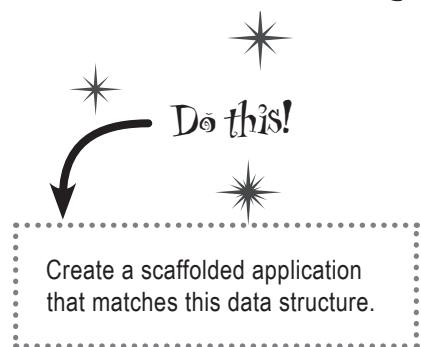
The application is very basic. It's simply a scaffolded version of this data structure:

Incident	
mountain	<i>string</i>
latitude	<i>decimal</i>
longitude	<i>decimal</i>
when	<i>datetime</i>
title	<i>string</i>
description	<i>text</i>

id	mountain	latitude	longitude	when	title	description
1	Mount Rushless	63.04348055...	-150.993963...	2009-11-21 11:...	Rock slide	Rubble on the ...
2	Mount Rushless	63.07805277...	-150.977869...	2009-11-21 17:...	Hidden crev...	Ice layer cove...
3	Mount Lotopaxo	-0.683975	-78.4365055...	2009-06-07 12:...	Ascent	Living only on...
4	High Kanuklma	11.123925	72.72135833...	2009-05-12 18:...	Altitude si...	Overcome by th...

As you've noticed by now, scaffolding is a great way to *start* an application, but you'll almost always need to modify the code to change the generic scaffolding code into something that's more appropriate for the problems your users are trying to solve.

So what needs to change about this application?



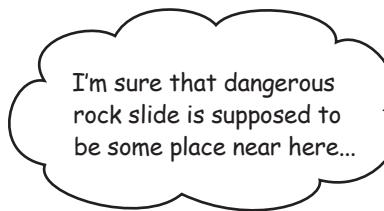
The users hate the interface!

It doesn't take too long to find out why the web site isn't popular: **the user interface**.

The system is used to manage ***spatial*** data—it records incidents that happen at particular places and times around the world. The location information is recorded using two numbers:

- The ***latitude***. This is how far North or South the location is.
- The ***longitude***. This is a measure of how far West or East a location is.

The users can record their data OK: they just read the latitude and longitude from GPS receivers. But they have a lot of trouble *reading* and *interpreting* the information from other climbers.

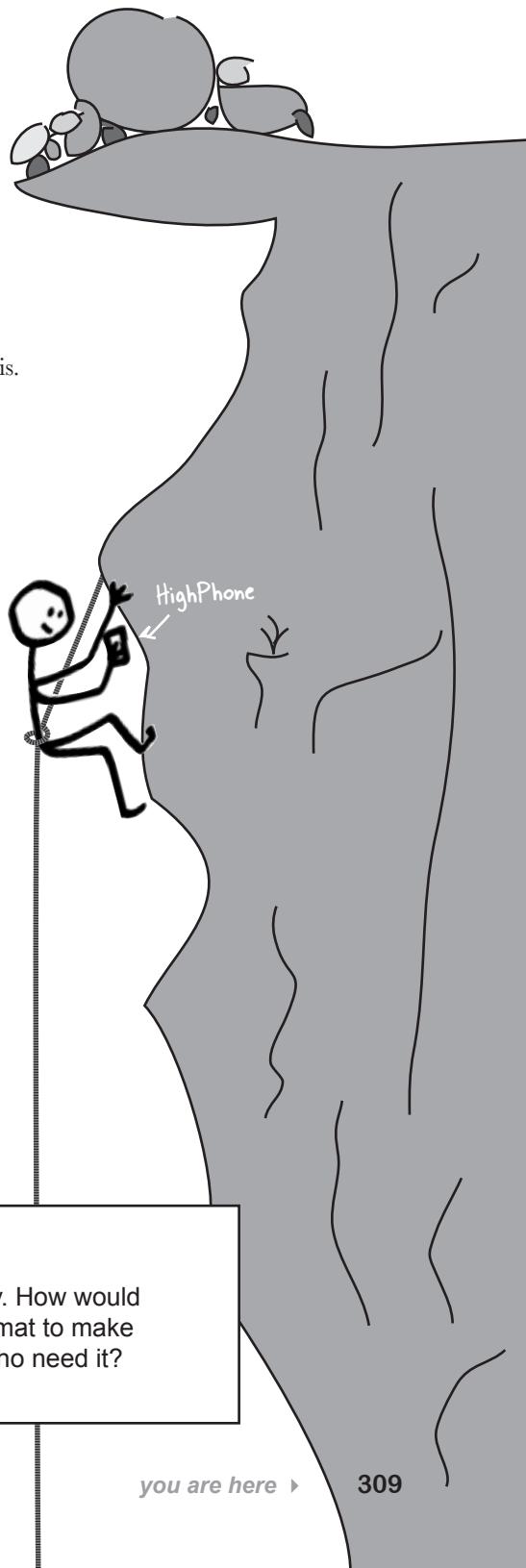


So people can add data to the application, but they can't understand the data they get from it. That's cutting the number of visitors, and the fewer visitors there are the less information is getting added... which causes even less people to use the app. It's a real downward spiral.

Something needs to be done or the web site will lose so much business it has to close down.



Think about the data that the application needs to display. How would **you** display the information? What would be the best format to make the information easily comprehensible for the climbers who need it?

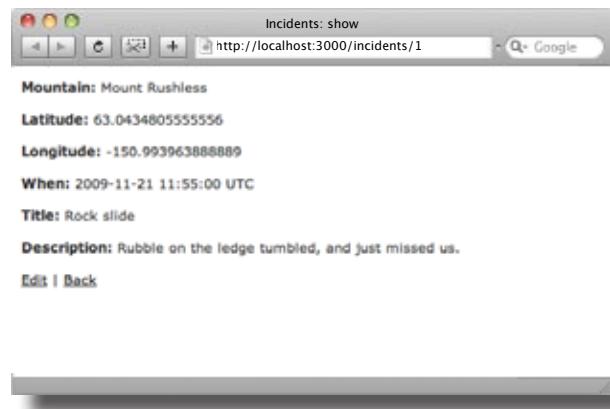


The data needs to be on a map

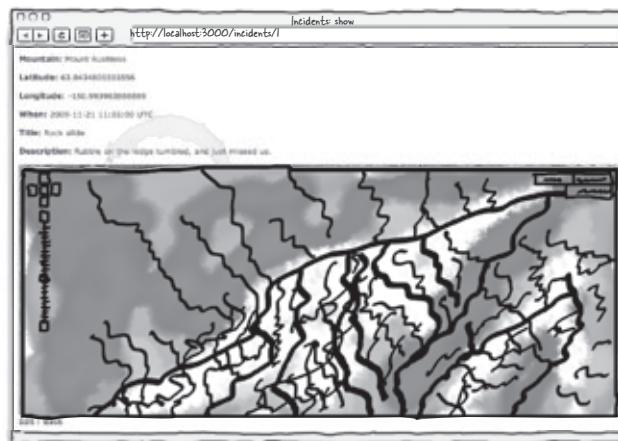
The system records geographic data and it should be displayed on a map.

The correct data is being stored, and the basic functions (create, read, update, and delete) are all available. The problem is **presentation**. The location is *stored* as two numbers—the latitude and longitude—but that doesn't mean it has to be *displayed* that way.

Instead of seeing this...



...climbers need to see something like this:



Now this is obviously going to be a pretty big change to the interface, so the web site guys have decided that rather than change the whole application, they are going to run a small pilot project to create a version of the page that displays an incident and get it to display a map. But they have no idea what to do, and need your help.

What's the first thing YOU would do?

We need to create a new action

We don't want to *change* the existing code—we only want to *add* to it. Until we are sure that the new interface works, we don't want to upset any of the existing users. After all, there aren't that many left...

So we'll add a new action called `show_with_map`. At the moment, someone can see one of the incidents using a URL like this:

```
http://localhost:3000/incidents/1
```

We'll create a new version of the page at:

```
http://localhost:3000/incidents/map/1
```

This way, the pilot users only need to add `/map` to get the new version of the page. We'll use this for the route:

```
map.connect 'incidents/map/:id', :action=>'show_with_map', :controller=>'incidents'
```

Remember to add this as the first route in your config/routes.rb file.



We can create the page template by copying the `app/views/incidents/show.html.erb` file. What will the new file be called?

The incidents controller will need a new method to read the appropriate `Incident` model object and store it in an instance variable called `@incident`. Write the new method below:

.....



We can create the page template by copying the app/views/incidents/show.html.erb file. What will the new file be called?

app/views/incidents/show with map.html.erb

The incidents controller will need a new method to read the appropriate Incident model object and store it in an instance variable called @incident. Write the new method below:

show with map is the → def show_with_map

name of the action.

`@incident = Incident.find(params[:id])` ← This will be the id number from the URL.

end

The new action seems to work...

If you now look at the two versions of the incidents page, we see that they both display the correct data. What do you notice?

Mountain: Mount Rushless

Latitude: 63.043480555556

Longitude: -150.993963888889

When: 2009-11-21 11:55:00 UTC

Title: Rock slide

Description: Rubble on the ledge tumbled, and just missed us.

[Edit](#) | [Back](#)

↙This is the original scaffolded page.

Create the page template and the new controller method now.

This version has a different URI

Both versions show
the same data

Mountain: Mount Rushless

Latitude: 63.0434805555556

Longitude: -150.9939638888889

When: 2009-11-21 11:55:00 UTC

Title: Rock slide

Description: Rubble on the ledge tumbled, and just missed us.

[Edit](#) | [Back](#)

← This is the version
that calls the new
show_with_map
action.

Both versions of the incidents page look identical—and that's a problem.

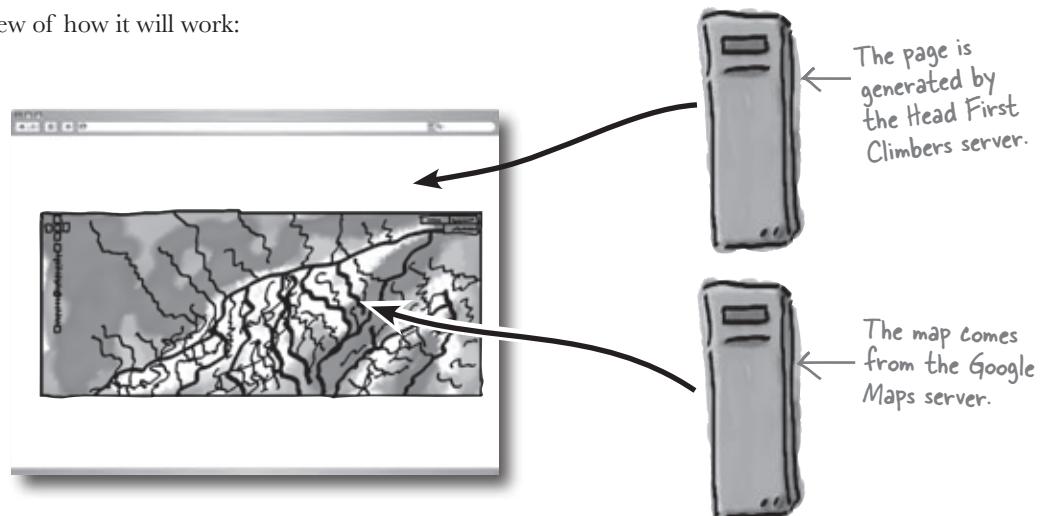
The new page needs a map... that's the point!

But of course we *don't* want the new version of the page to look the same. We want to add a map.

So how will we do that? There's no way we're going to build our own mapping system. Instead we'll create a **mashup**. A mashup is a web application that integrates data and services from other places on the web.

Most of the mapping services allow you to embed maps inside your own web application, but we'll use the one provided by Google. Google Maps give you a lot of flexibility. Not only can you embed a map in a web page, but you can also, without too much work, add your own data onto the map and program how the user interacts with the map and data.

Here's a high-level view of how it will work:



The map will be displayed at the approximate location of the recorded incident, and a symbol mark the exact point.

The Head First Climbers application will generate the code to call the map, and the data to display on it, but the map itself, and the bulk of the code that allows the user to do things like drag the map or zoom in and out, will come from the Google Maps server. Even though Google will provide the bulk of the code, we still need to provide two things:

- The HTML and JavaScript to call the map. This will be a little complex, so we will put the HTML and JavaScript we need in a separate partial that we can call from our page template.
- The data we need to display on the map. To begin with we will use an example data file to make sure the map's working.

So what will the map code look like?

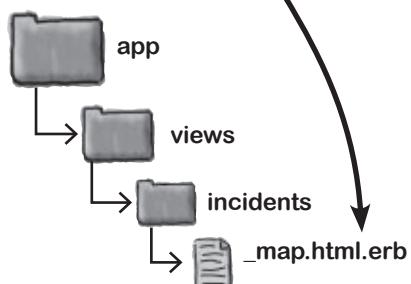
So what code do we need?

We need to have the following code in a partial called `map.html.erb`:

```
<%
  google_key='ABQIAAAAnfs7bKE82qgb3Zc2YyS-oBT2yXp_ +
    'ZAY8_ufC3CFXhHIE1NvwkxSySz_REpPq-4WZA270wgbtyR3VcA'
    full_page ||= false
    show_action ||= nil
    new_action ||= nil
    data ||= nil
    %>
<div id="map"
  align="right"
  style="border: 1px solid #979797;
         min-width: 400px;
         <% if full_page -%>
             min-height: 800px;
             height: 800px;
         <% else -%>
             min-height: 400px;
             height: 400px;
         <% end -%>
         background-color: #FFFFFF;
         border: 1px solid #999999;
         padding: 10px;"></div>
```

Download It!

There's not enough space to display all of the partial code here, but you can download the file at <http://tinyurl.com/hfrailsmap>



So what does this code do? First of all it calls some JavaScript on the Google Maps server that will generate a map on the web page. The map will have all of the basic drag and zoom functions built in.

But the basic Google code doesn't do *everything* we need. It doesn't load and display any of our local data. So the code in the `_map.html.erb` partial also loads location data from a file, which it uses to move the map to the correct place and display an icon at a given point.

But there's a little complication with the code...

The code will only work for localhost

Google places a restriction on the use of the code. They insist that you say which host you're going to use it on. That means before you can use it on www.yourowndomain.com, you need to tell Google about it. In order to make sure that people comply with this condition, the code will only run if you provide it with a **Google Maps key**. The key is generated for a particular host name, and if you try to embed a Google map into a page coming from anywhere else, the map will refuse to run.

But for now, there's not a problem. The `_map.html.erb` partial we're going to use has the Google Maps key for localhost—so as long as you run the code on your own machine it will be fine. But remember, you'll need to apply for your own key before running the code anywhere else.



Geek Bits

If you want to embed Google Maps in your own web apps, you need to sign up with Google. To do this, visit the following URL:
<http://tinyurl.com/mapreg>



Sharpen your pencil

You need to include the map partial in the `show_with_map.html.erb` template. We need to pass a local variable called `data` containing the path to the map data. We'll use a test file for this at `/test.xml`.

Write the code to call the partial.

.....

Sharpen your pencil Solution

You need to insert this line of code in the show_with_map.html.erb file

```
<%= render (:partial=>'map', :locals=>{:data=>'/test.xml'}) %>
```

You need to include the map partial in the show_with_map.html.erb template. We need to pass a local variable called data containing the path to the map data. We'll use a test file for this at /test.xml.

Write the code to call the partial.

Now we need the map data

Before we can try out the embedded map, we need to provide it with map data. To begin with we will just use the test.xml test file. This is what it looks like:



```
<data>
  <description>This is an example description</description>
  <latitude>63.04348055555556 </latitude>
  <longitude>-150.993963888889</longitude>
  <title>Test Data</title>
</data>
```



To save you typing in the long numbers, you can download the test.xml file from <http://tinyurl.com/maptest>

The mapping data provides the latitude and longitude of the test incident. When the Google map loads, our map partial will pass it the contents of this file and the incident should be displayed and centered.



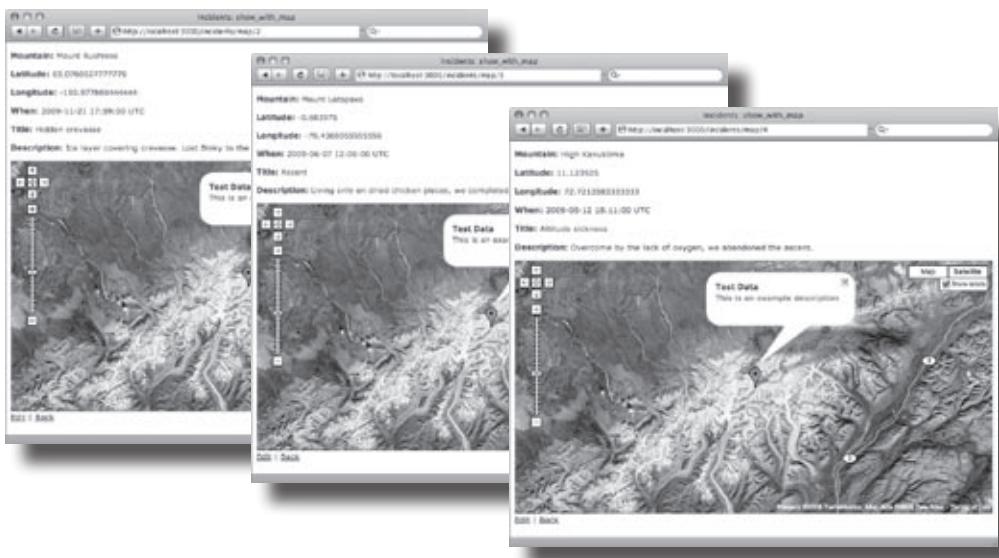
Test Drive

So what happens if we go to a URL like:

`http://localhost:3000/incidents/map/1`



The map works! But what if we go to a different URL?



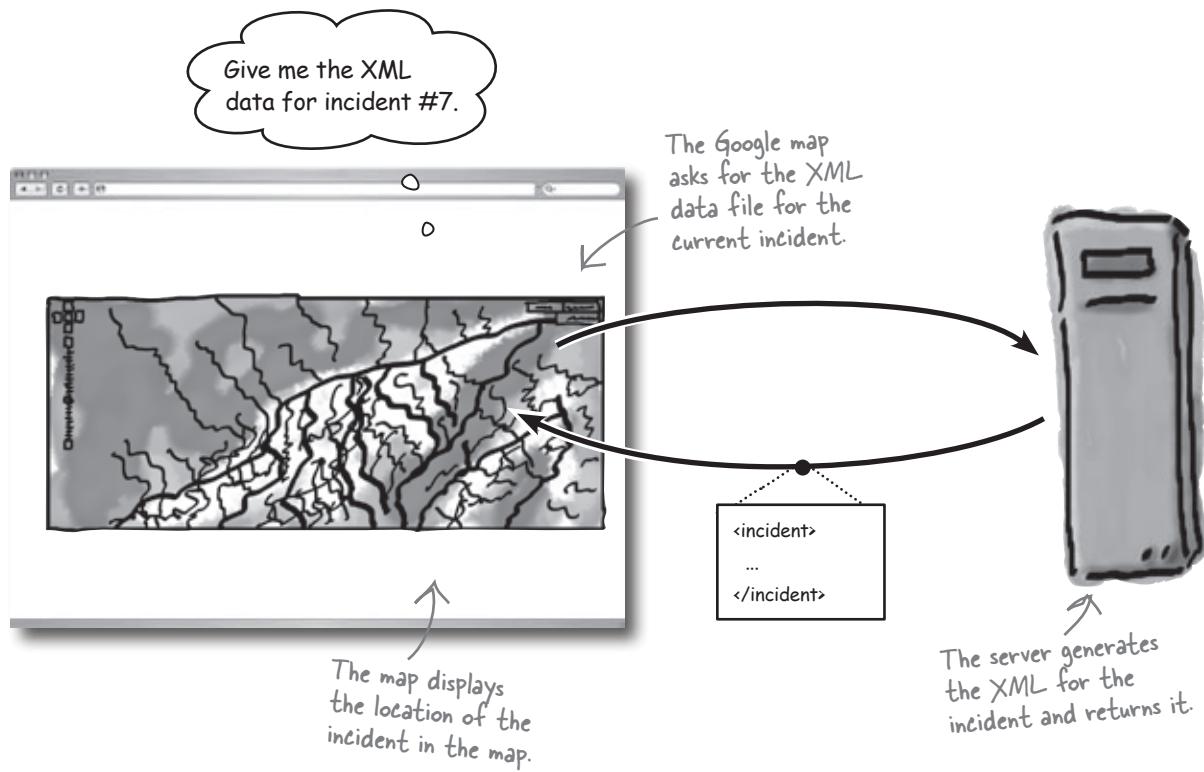
Every map looks exactly the same, regardless of the data. That's because each map is using the same data: the contents of the test.xml file.

In order to make the map display the location of a given incident, we need to generate a data file for each page.

What do we need to generate?

We're passing XML data to the map, and the XML data describes the location of a single incident. The location is given by the latitude, the longitude, the title, and the description. We need to generate XML like this for *each* incident.

So the system will work something like this:

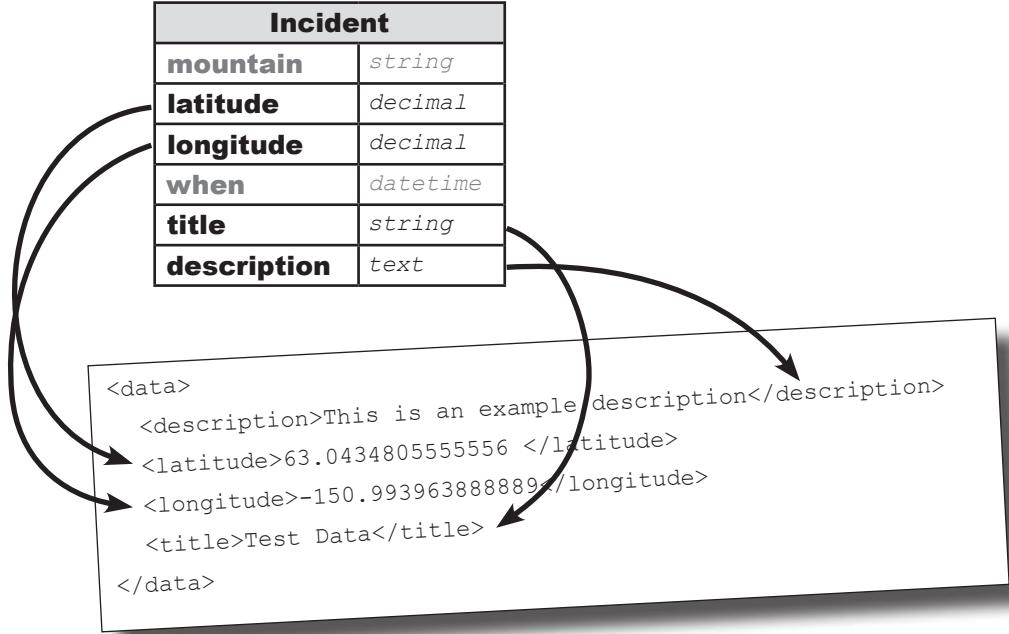


If this is starting to feel familiar, good! The Google Map is actually using Ajax to work. Remember how we used Ajax to download new version of the seat list in the previous chapter? In the same way, the Google Map will request XML data for the location of an incident.

So the next thing is to generate the data. Where will we get the data from?

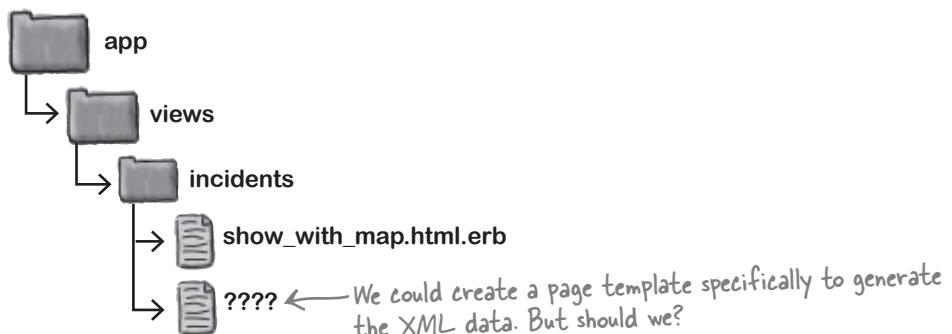
We'll generate XML from the model

The data for the generated XML will come from the Incident model. We'll be using just four of the attributes, the latitude, longitude, title, and description.



But how do we generate the XML? In a way, this is a little like generating a web page. After all, XML and HTML are very similar. And just as web pages contain data from the model, our XML files will also contain data from the model.

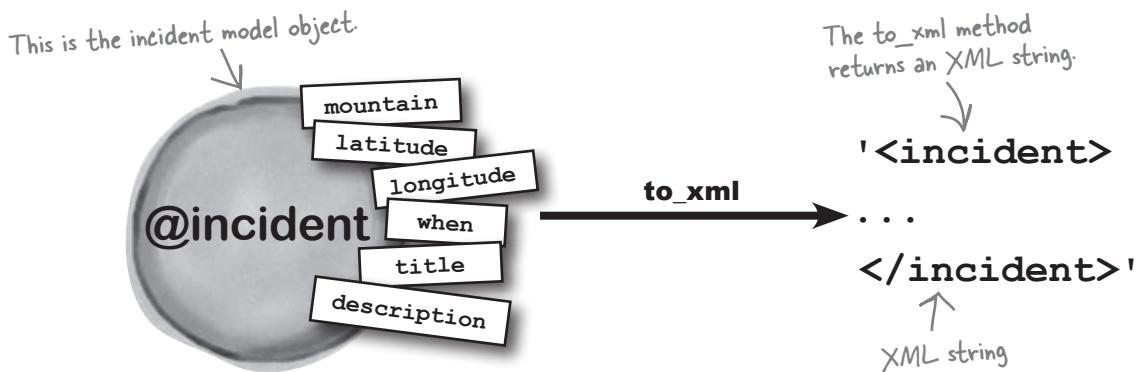
So one option would be to create a page template containing XML tags instead of HTML tags:



That way *would* work, but there's a better way...

A model object can generate XML

Model objects contain data. XML files contain data. So it kind of makes sense that model objects can generate XML versions of themselves. Each model object has a method `to_xml` that returns an XML string:



`@incident.to_xml`

The to_xml method returns an XML string representing the model object.

But creating the XML is only half the story. The other half is returning that XML to the browser. We're not using a page template, so the whole job will have to be handled by the controller rendering the XML...

What will the controller code look like

We can amend the `show_with_map` method to output the XML:

```
def show_with_map
  @incident = Incident.find(params[:id])
  render :text=>@incident.to_xml
end
```

This is the incident object we were already reading.

The render method returns the XML.

The text parameter says what we'll be returning to the browser.

This will create an XML string that describes the incident object.

The `render` method returns the XML to the browser. We've seen the `render` method before, but this is a slightly different version. Most of the time you use `render` to generate a web page from a template or partial. But you can also just pass it a string object—and that's what we're doing here.



Geek Bits

To make your life simpler, the Rails folks also allow you to pass a parameter to the `render` method called `:xml`

```
render :xml=>@incident
```

If the `render` method is passed an object using the `:xml` parameter, it will call the `to_xml` method on the object and send that back to the browser. The `:xml` version of the `render` command will generate the same content as the `render` command in our controller, but it will also set the mime-type of the response to `text/xml`. But for now, we will use the `:text` version above.

there are no Dumb Questions

Q: Remind me, what does the `render` method do again?

A: `render` generates a response for the browser. When your browser asks for a page, that's a request. `render` generates what gets sent back.



Test Drive

So what do we get now if we go to:

<http://localhost:3000/incidents/map/1>

The screenshot shows a web browser window with the title "Source of: http://localhost:3000/incidents/map/1". The content of the browser is the XML code:

```
<?xml version="1.0" encoding="UTF-8"?>
<incident>
  <created-at type="datetime">2009-11-21T11:59:31Z</created-at>
  <description>Rubble on the ledge tumbled, and just missed us.</description>
  <id type="integer">1</id>
  <latitude type="decimal">63.0434805555556</latitude>
  <longitude type="decimal">-150.993963888889</longitude>
  <mountain>Mount Rushless</mountain>
  <title>Rock slide</title>
  <updated-at type="datetime">2009-11-21T11:59:31Z</updated-at>
  <when type="datetime">2009-11-21T11:55:00Z</when>
</incident>
```

The controller is now returning XML containing the data from the incident object with `id = 1`.

But is there a problem? The XML we're generating looks *sort* of the same as the example XML, but there are a few differences:

● We're generating too many attributes. The example data file only contained information about the latitude, longitude, title, and description. But this piece of XML contains **everything** about an incident, even the date and time that the incident record was created.

● The root of the XML file has the wrong name. The generated XML takes its root name from the variable we were using, `<incident>`. But we need the XML to have a root named `<data>`.

The screenshot shows a web browser window with the title "Source of: http://localhost:3000/incidents/map/1". The content of the browser is the XML code, with a callout box highlighting the root element `<data>`:

```
<data>
  <description>This is an example
  description</description>
  <latitude>63.0434805555556 </latitude>
  <longitude>-150.993963888889</longitude>
  <title>Test Data</title>
</data>
```

The XML is *almost* in the right format, but *not quite*.

We need to modify the XML that `to_xml` produces.



Code Magnets

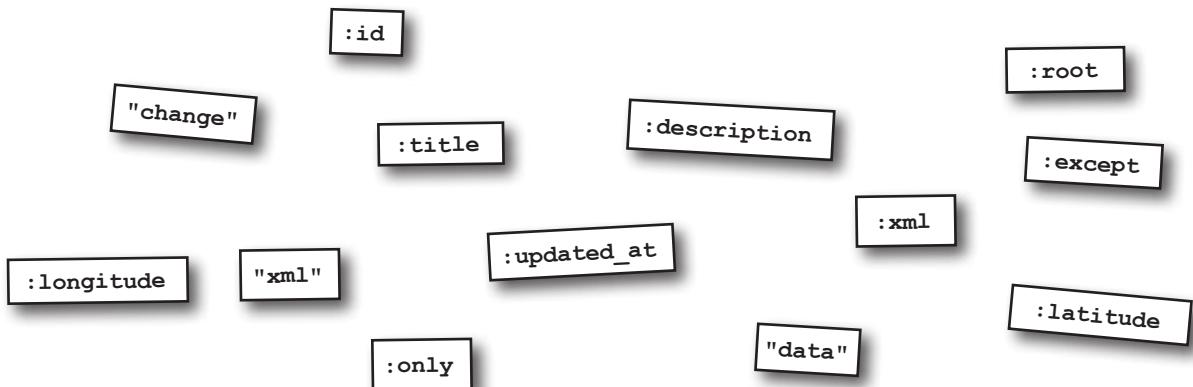
The `to_xml` method has some optional parameters that let us modify the XML that it returns. See if you can work out what the values of the parameters should be:

```
def show_with_map

  @incident = Incident.find(params[:id])

  render :text=>@incident.to_xml(
    =>[ ..... , ..... , ..... , ..... ],
    => ..... )
  .....

end
```





Code Magnets Solution

The `to_xml` method has some optional parameters that let us modify the XML that it returns. See if you can work out what the values of the parameters should be:

```
def show_with_map

  @incident = Incident.find(params[:id])

  render :text=>@incident.to_xml(
    :only => [ :latitude, :longitude, :title, :description ],
    :root => "data"
  )

end
```

:id
"change"

"xml"

:updated_at

:xml

:except

Because we're using the
render :text=>...
version of the render command we
can use the options in to_xml and
modify the output.

there are no
Dumb Questions

Q: Shouldn't we generate the XML in the model?

A: You could, but it's not a good idea. You may need to generate different XML in different situations. If you added code to the model for each of those XML formats, the model would quickly become overloaded.



Test Drive

Now when we go to:

`http://localhost:3000/incidents/map/1`

we get XML that looks a little different.

The screenshot shows a web browser window with a title bar that reads "Source of: http://localhost:3000/incidents/map/1". The main content area displays the following XML code:

```
<?xml version="1.0" encoding="UTF-8"?>
<data>
  <description>Rubble on the ledge tumbled, and just missed us.</description>
  <latitude type="decimal">63.0434805555556</latitude>
  <longitude type="decimal">-150.993963888889</longitude>
  <title>Rock slide</title>
</data>
```

You've managed to modify the XML so that it only displays the data we need and has a properly named root element. It looks a lot closer to the example XML file.

The `to_xml` method doesn't allow you to make a lot of changes to the XML it produces, but it's good enough for most purposes... including sending the XML to Google for some custom mapping.

With very little work, `to_xml` gave us exactly the XML we wanted.

Meanwhile, at 20,000 feet...



Some people on the pilot program have a problem.

The web pages have disappeared! Before the last amendment a URL like:

`http://localhost:3000/incidents/map/1`

generated a web page. The trouble is, now that URL just returns XML, instead of a nice Google map.

Before your latest changes:



Before the amendment, we had a web page showing our data on a Google map.

After your latest changes:

A screenshot of a web browser window titled "Source of: http://localhost:3000/incidents/map/1". The page displays a block of XML code. The XML is as follows:

```
<?xml version="1.0" encoding="UTF-8"?>
<data>
  <description>Rubble on the ledge tumbled, and just missed us.</description>
  <latitude type="decimal">63.043480555556</latitude>
  <longitude type="decimal">-150.993963888889</longitude>
  <title>Rock slide</title>
</data>
```

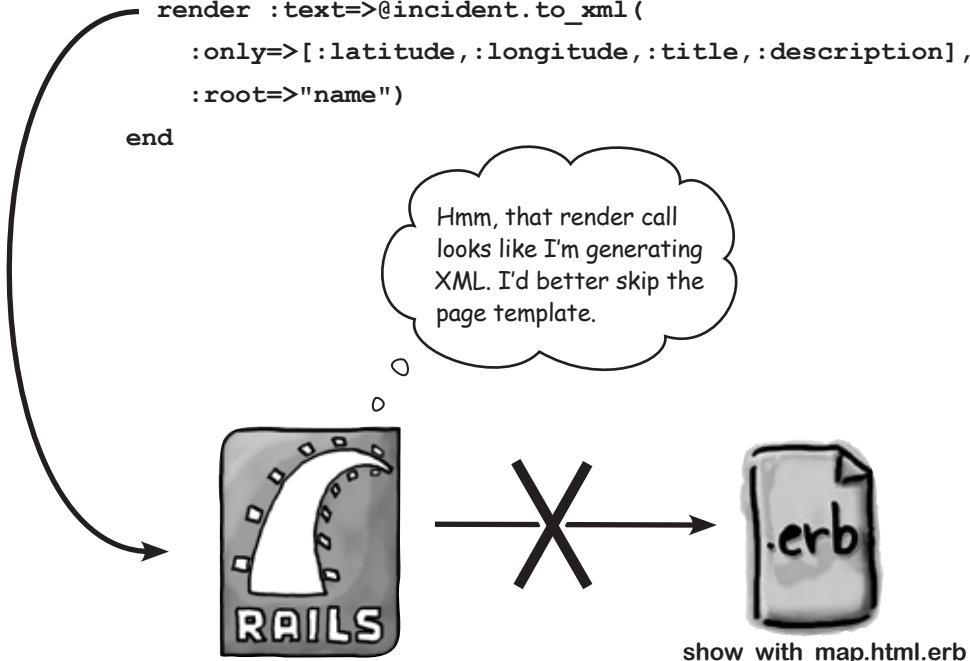
After the amendment, all we got back was this XML.

We need to generate XML and HTML

The `show_with_map` action originally generated a web page with the `show_with_map.html.erb` page template. But once we added a `render` call to the controller method, Rails ignored the template and just generated the XML:

```
def show_with_map
  @incident = Incident.find(params[:id])
  render :text=>@incident.to_xml(
    :only=>[:latitude,:longitude,:title,:description],
    :root=>"name")
end
```

Hmm, that render call looks like I'm generating XML. I'd better skip the page template.



Of course, that makes sense, because there's no way an action can generate XML and HTML ***at the same time***.

But we still need a web page to display the map, and the map still needs XML map data. So what do we do?

We need some way of calling the controller in one way to generate HTML, and calling the controller in another way to generate XML.



Mark: Another action?

Bob: Sure. One to generate XML and another to generate HTML.

Laura: Well that's not a great idea.

Bob: Why not?

Laura: That would mean duplicating code. Both methods would have code to read an incident object.

Bob: Whatever. It's only one line.

Laura: Well now it is. But what if we change things in the future?

Mark: You mean like if the model changes?

Laura: Or if we get the data from somewhere else, like a web service.

Bob: It's not such a big deal. Let's worry about the problems we have right now, okay?

Mark: I don't know. Laura, what would you do?

Laura: Simple. I'd pass a parameter to the action. Tell it what format we want.

Mark: That might work.

Bob: Come on, too much work.

Laura: Less work than creating another action.

Mark: But one thing...

Laura: Yes?

Mark: Doesn't the URL identify the information we want?

Laura: So?

Mark: Shouldn't we use the same URL for both formats?

XML and HTML are just representations

Although the HTML and XML look very different, they are really visual representations of the *same thing*. Both the HTML web page and the XML map data are both describing the same Incident object data. That incident is the core data, and it's sometimes called the **resource**.

A **resource** is the data being presented by the web page. And the web page is called a **representation** of the resource. Take an Incident object as an example. The Incident object is the resource. The incident web page and the map data XML file are both representations of the resource.



Thinking about the web as a set of resources and representations is part of a design architecture called **REST**. REST is the **architecture of Rails**. And the more RESTful your application is, the better it will run on Rails.

But how does this help us? Well, to be strictly RESTful, both the XML data and the web page should have the same URL (Uniform Resource Locator) because they both represent the same resource. Something like this:

`http://localhost:3000/incidents/maps/1`

But to simplify things, we can compromise the REST design (a little bit) and use these URLs for the two representations:

`http://localhost:3000/incidents/maps/1.xml` ← One URL returns the XML data; the
`http://localhost:3000/incidents/maps/1.html` ← other returns the HTML.

How should we decide which format to use?

If we add an extra route that includes the format in the path:

```
map.connect 'incidents/map/:id.:format', :action=>'show_with_map',  
:controller=>'incidents'
```

we will be able to read the requested format from the XML and then make decisions in the code like this:

```
if params[:format] == 'html'  
  # Generate the HTML representation  
else  
  # Generate the XML representation  
end
```

http://localhost:3000/incidents/map/1.html

http://localhost:3000/incidents/map/1.xml

This will record the format from the extension.

This extension will be stored in the :format field.

But that's not how most Rails applications choose the format to generate.

Instead they call a method called `respond_to do` and an object called a **responder**:

```
respond_to do |format|  
  format.html {  
    _____ }  
  format.xml {  
    _____ }  
end
```

format is a 'responder' object.

The code to generate a web page goes here.

The code to generate the XML goes here.

This code does more or less the same thing. The `format` object is a responder. A responder can decide whether or not to run code, dependent upon the format required by the request. So if the user asks for HTML, the code above will run the code passed to `format.html`. If the user asks for XML, the responder will run the code passed to `format.xml`.

So why don't Rails programmers just use an `if` statement? After all, wouldn't that be simpler code? Well, the responder has **hidden powers**. For example, it sets the mime type of the response. The mime type tells the browser what data-type the response is. In general, it is much better practice to use `respond_to do` to decide what representation format to generate.



The `show_with_map` method in the controller needs to choose whether it should generate XML or HTML. Write a new version of the method that uses a responder to generate the correct representation.

Hint: If you need to generate HTML, other than reading a model object, what else does the controller need to do?

The `show_with_map.html.erb` page template currently calls the map partial and passes it the `/test.xml` file. What will the partial call look like if it is going to call the generated XML file?

.....



Exercise Solution

The `show_with_map` method in the controller needs to choose whether it should generate XML or HTML. Write a new version of the method that uses a responder to generate the the correct representation.

Hint: If you need to generate HTML, other than reading a model object, what else does the controller need to do?

Nothing! When generating HTML we can leave Rails to call the `show_with_map.html.erb` template

```
def show_with_map
  @incident = Incident.find(params[:id])
  respond_to do |format|
    format.html {
      }
    format.xml {
      render :text=>@incident.to_xml(
        :only=>[:latitude,:longitude,:title,:description],
        :root=>"name")
      }
  end
end
```

We can leave this empty - Rails will call the template for us

The `show_with_map.html.erb` page template currently calls the map partial and passes it the `/test.xml` file. What will the partial call look like if it is going to call the generated XML file?

```
<%= render(:partial=>'map', :locals=>{:data=>#{@incident.id}.xml}) %>
```

there are no
Dumb Questions

Q: If the `format.html` section doesn't need any code, can we just skip it?

A: No. You still need to include `format.html`, or Rails won't realize that it needs to respond to requests for HTML output.



Test Drive

If we look at the XML version of the page at:

<http://localhost:3000/incidents/map/1.xml>

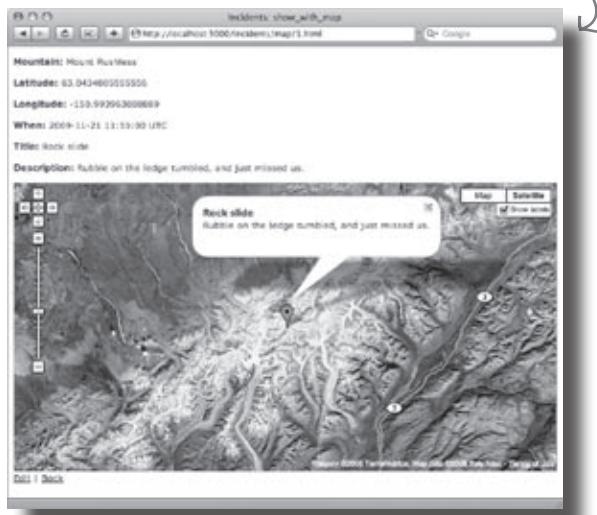
we get an XML version of the incident:

Source of: <http://localhost:3000/incidents/map/1.xml>

```
<?xml version="1.0" encoding="UTF-8"?>
<data>
  <description>Rubble on the ledge tumbled, and just missed us.</description>
  <latitude type="decimal">63.043480555556</latitude>
  <longitude type="decimal">-150.993963888889</longitude>
  <title>Rock slide</title>
</data>
```

So what about the HTML version:

<http://localhost:3000/incidents/map/1.html>



It works. Now different incidents show different maps. But before we replace the live version of the code, we better make sure we understand exactly how the code works.

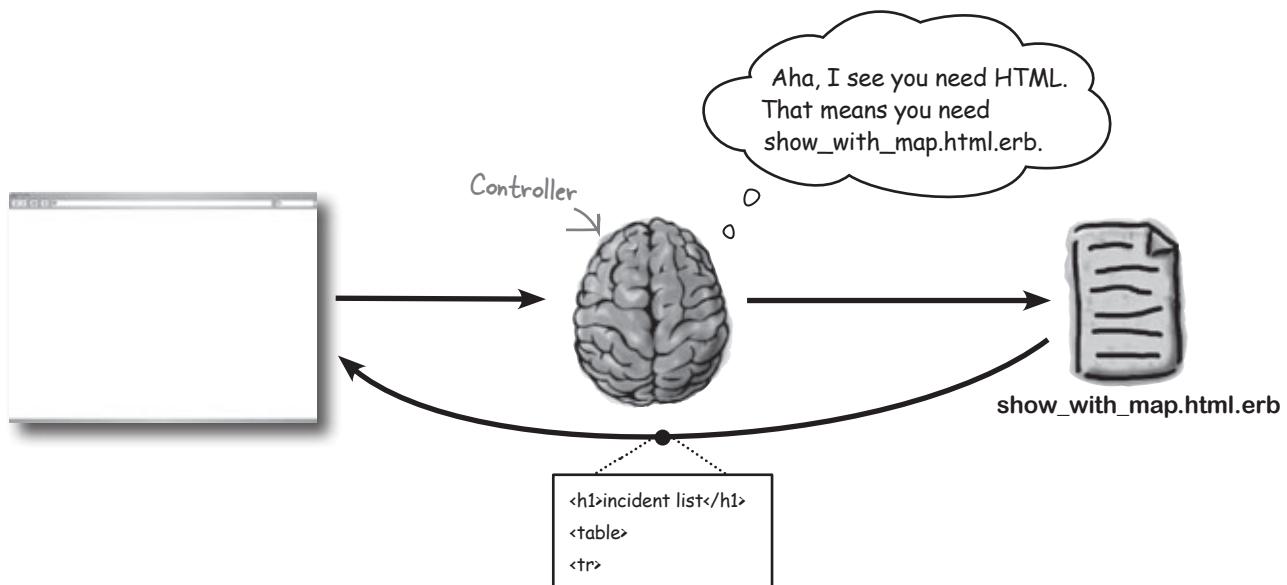
So what really went on here?

How does the map page work?

Let's take a deeper look at what just happened and how the HTML page is rendered.

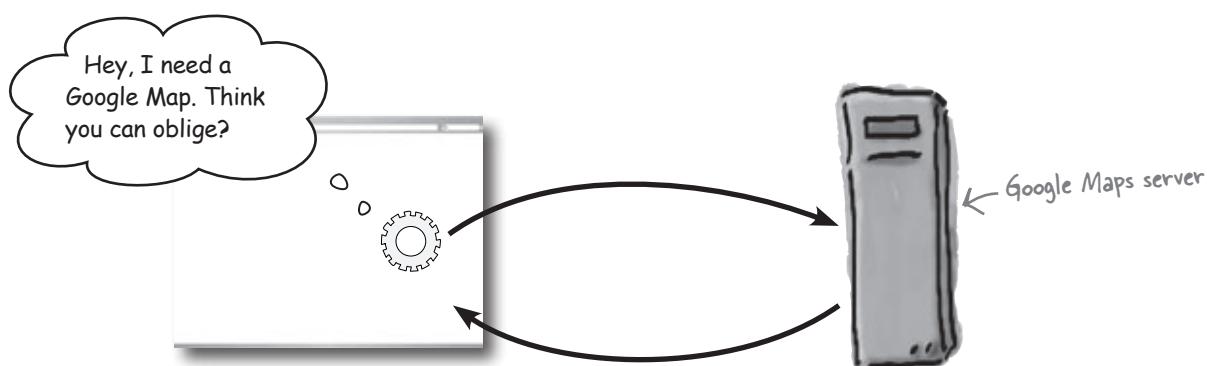
① The controller spots that an HTML page is needed.

The browser points to the HTML version of the page. The controller realizes that HTML rather than XML is required, and so calls `show_with_map.html.erb`. HTML is sent back to the client browser.



② JavaScript requests the Google Map.

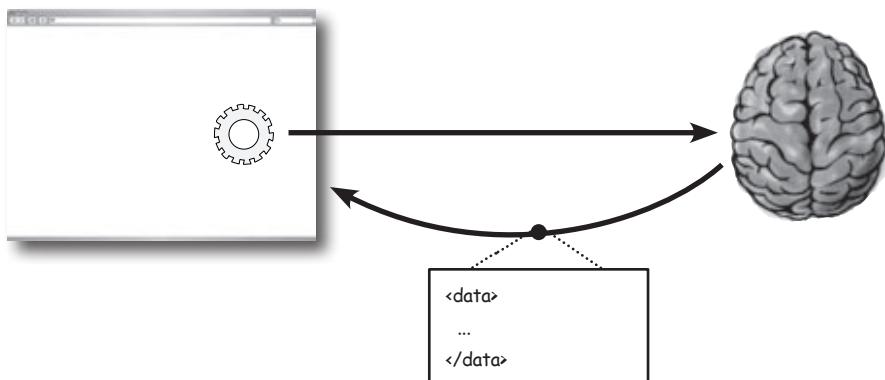
JavaScript within the web page requests map data from the Google Maps server. The Google Maps server returns it.



3

JavaScript requests the incident XML.

JavaScript within the page requests XML for the incident from the controller. It then displays it on the map.



*there are no
Dumb Questions*

Q: You say that a resource should always have the same URL. Why is that?

A: It doesn't *have to*, but REST—Rails' main design principle—says it should.

Q: But if the format is in the URL, doesn't that mean that different URLs are used for the same resource?

A: Yes, sure does. Adding the format to the URL compromises the RESTfulness of the design... a little bit. But it's a common trick. It's simple, and works well.

Q: So there's no way to use the same URL for different formats?

A: There is a way to do it. If the request contains an "Accepts:" header say—for example—that the request is for "text/xml", the responder will run the code for the XML format.

Q: Is there a way of listing the attributes you *don't* want to include in to_xml output?

A: Yes. Instead of using the :only parameter, you can use the :except parameter. Rails is remarkably consistent and you will find several places where calls in Rails have optional :only parameters. In all cases you can switch them for :except parameters to say which things you *don't* want.

Q: Is there some way that the controller can tell the difference between an Ajax request from JavaScript and a browser request?

A: Sort of. The expression `request.xhr?` usually returns 'true' for Ajax requests and 'false' for simple browser requests. The problem is that while it works for the requests generated by the Prototype library, it doesn't work with *all* Ajax libraries.

Q: Why do I have to call render sometimes and not others?

A: If you are happy to run the default template (the one whose name matches the action), you can omit the `render` call.

Q: You say that the generated XML and the HTML are different representations, but they don't contain the same information, do they?

A: That's true—they don't. The XML generated for a single incident contains a smaller amount of data than the HTML representation. But they both present information about the same resource, so they are both representations of the same thing.

The code is ready to go live

Our new version of the location page works well, so let's replace the scaffolded show action with the show_with_map code.

1 Remove the routes.

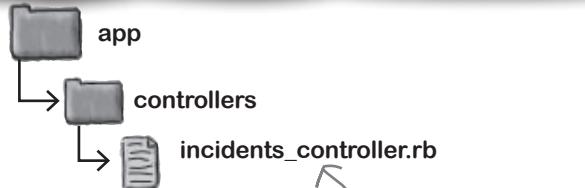
We created custom routes for the test code, so we need to remove them from the routes.rb file:



```
ActionController::Routing::Routes.draw do |map|
  map.connect 'incidents/map/:id', :action=>'show_with_map', :controller=>'incidents'
  map.connect 'incidents/map/:id.:format', :action=>'show_with_map', :controller=>'incidents'
  map.resources :incidents
```

2 Rename the show_with_map method in the controller.

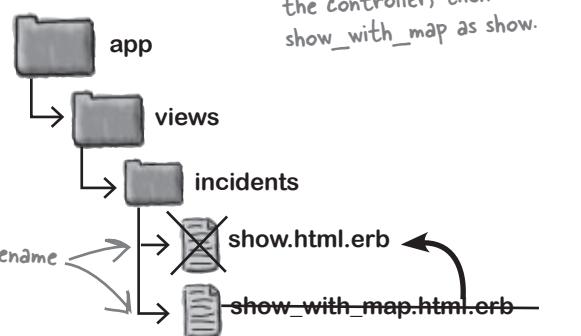
show_with_map is going to become our new show method. So delete the existing show method and rename show_with_map to show.



3 Then rename the show_with_map.html.erb template.

That means we need to delete the existing show.html.erb and replace it with the show_with_map.html.erb template.

Delete show.html.erb, and rename show_with_map.html.erb as show.html.erb.



there are no
Dumb Questions

Q: If the route disappeared, how did the right format get chosen?

A: The map.resource route sets up a whole set of routes. These routes all include the format.

Q: How come the index page went to "/incidents/1" instead of "/incidents/1.html"? How did Rails know it was going to be HTML?

A: If the format isn't given, Rails assumes HTML... which we used to our advantage.

Q: What does map.resources mean?

A: That generates the standard set of routes used by scaffolding.



Test DRIVE

Now the the mapped pages have replaced the default “show” action. So now the main index page links to the mapping pages, not the text versions.

Incidents: index

Listing incidents

Mountain	Latitude	Longitude	When	Title	Description	Action
Mount Rushless	63.0434805555556	-150.993963886689	2009-11-21 11:55:00 UTC	Rock slide	Rubble on the ledge tumbled, and just missed	Show Edit Destroy
Mount Rushless	63.0780527777778	-150.9778694444444	2009-11-21 17:59:00 UTC	Hidden crevasse	Ice layer covering crevasses. Los	Show Edit Destroy
Mount Loepakao	-0.683975	78.43650255556	2009-06-07 12:06:00 UTC	Ascent	Living only on dried chicken pieces, we	Show Edit Destroy
High Karuklma	11.123925	72.3135633333333	2009-05-12 18:11:00 UTC	Altitude sickness	Overcome by the lack of oxygen, we abandoned the ascent.	Show Edit Destroy

New incident

Incidents: show

Incidents: show_with_map

Incidents: map/4.html

Mountain: Mount Rushless
Latitude: 63.0434805555556
Longitude: -150.993963886689
When: 2009-11-21 11:55:00 UTC
Title: Rock slide
Description: Rubble on the ledge tumbled, and just missed

Mountain: Mount Rushless
Latitude: 63.0780527777778
Longitude: -150.9778694444444
When: 2009-11-21 17:59:00 UTC
Title: Hidden crevasse
Description: Ice layer covering crevasses. Los

Mountain: Mount Rushless
Latitude: 63.0780527777778
Longitude: -150.9778694444444
When: 2009-11-21 17:59:00 UTC
Title: Altitude sickness
Description: Overcome by the lack of oxygen, we abandoned the ascent.

Longitude: 72.3135633333333
When: 2009-05-12 18:11:00 UTC
Title: Altitude sickness
Description: Overcome by the lack of oxygen, we abandoned the ascent.

Altitude sickness
Overcome by the lack of oxygen, we abandoned the ascent.

Imagery ©2006 TerraMetrics, NASA, Map-data ©2009 AND, Europe Technogeographica Ltd. of UK

One thing though - isn't that index page kind of... boring? Especially compared to all those nice visual map pages!



Long Exercise

The users have asked if the index page can display a whole set of all the incidents that have been recorded, and fortunately the `_map.html.erb` partial can generate multiple points if it is given the correct XML data.

This is the existing index method in the incidents controller. Rewrite the method to generate XML from the array of all incidents. You only need to change the root element to "data".

```
def index
  @incidents = Incident.find(:all)

  respond_to do |format|
    format.html # index.html.erb
    format.xml { render :xml => @incidents }
  end
end
```

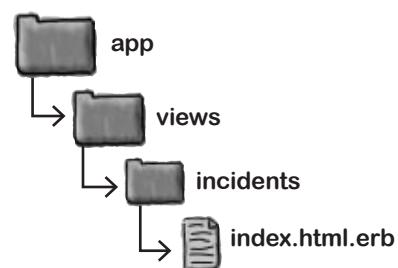


The index page will need to include a map. Write the code to insert the map at the given point. You will need to pass the path of the XML version of the index page as data for the map.

```
<h1>Listing incidents</h1>


```

```
<br />
<%= link_to 'New incident', new_incident_path %>
```





LONG Exercise SOLUTION

The users have asked if the index page can display a whole set of all the incidents that have been recorded and fortunately the `_map.html.erb` partial can generate multiple points if it is given the correct XML data.

This is the existing index method in the incidents controller. Rewrite the method to generate XML from the array of all incidents. You only need to change the root element to “data”.

```
def index
  @incidents = Incident.find(:all)

  respond_to do |format|
    format.html # index.html.erb
    format.xml { render :xml => @incidents }
  end
end

def index
  @incidents = Incident.find(:all)

  respond_to do |format|
    format.html # index.html.erb
    format.xml {
      render :text=>@incidents.to_xml(:root=>"data")
    }
  end
end
```



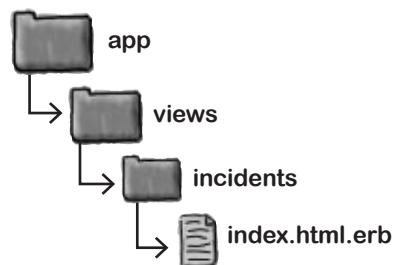
The index page will need to include a map. Write the code to insert the map at the given point. You will need to pass the path of the XML version of the index page as data for the map.

```

<h1>Listing incidents</h1>
<table>
  <tr>
    <th>Mountain</th>
    <th>Latitude</th>
    <th>Longitude</th>
    <th>When</th>
    <th>Title</th>
    <th>Description</th>
  </tr>
  <% for incident in @incidents %>
  <tr>
    <td><%= h incident.mountain %></td>
    <td><%= h incident.latitude %></td>
    <td><%= h incident.longitude %></td>
    <td><%= h incident.when %></td>
    <td><%= h incident.title %></td>
    <td><%= h incident.description %></td>
    <td><%= link_to 'Show', incident %></td>
    <td><%= link_to 'Edit', edit_incident_path(incident) %></td>
    <td><%= link_to 'Destroy', incident, :confirm => 'Are you sure?', :method => :delete %></td>
  </tr>
  <% end %>
</table>

<%= render (:partial=>'map', :locals=>{:data=>"/incidents.xml"}) %>
.....
```


<%= link_to 'New incident', new_incident_path %>





Test DRIVE

Now when users go to the front page, they see the incidents in a list and on the map. When an incident is clicked, the details are displayed, as well as a link to the incident's own page.

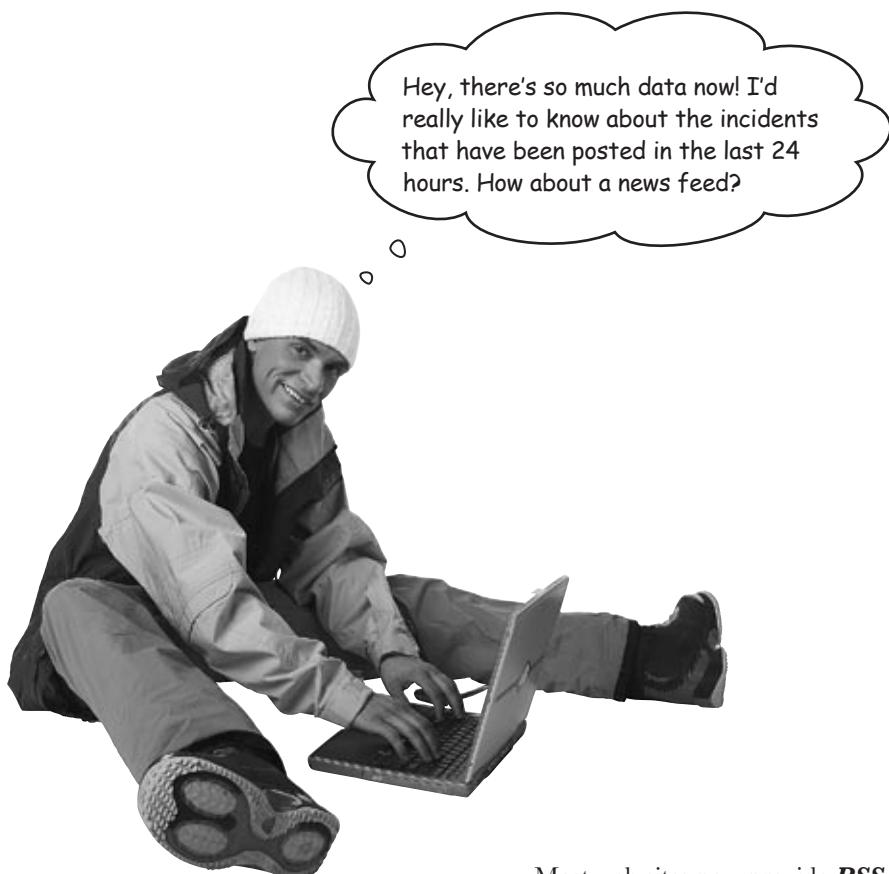
Listing incidents

Mountain	Latitude	Longitude	When	Title	Description	Actions
Mount Rushmore	63.0434805555556	-150.993963888889	2009-11-21 11:35:00 UTC	Rock slide	Rubble on the ledge tumbled, and just missed us.	Show Edit Delete
Mount Rushmore	63.0200527777778	-150.977309444444	2009-11-21 17:59:00 UTC	Hidden crevasses	Ice layer covering crevasses. Lost Slinky to the elements.	Show Edit Delete
Mount Lotopaxo	-0.683975	-78.4365055555556	2009-06-07 12:06:00 UTC	Ascent	Living only on dried chicken pieces, we completed our 4 day...	Show Edit Delete
High Kanuklima	11.123925	72.7215583333333	2009-05-12 18:11:00 UTC	Altitude sickness	Overcome by the lack of oxygen, we abandoned the ascent...	Show Edit Delete

All of the incidents are now plotted on the map.

The information window contains a link to the incident's own "show" page.

The map uses the XML generated by the index method of the controller to create the points.



Hey, there's so much data now! I'd really like to know about the incidents that have been posted in the last 24 hours. How about a news feed?

Most web sites now provide **RSS news feeds** to provide easy links to the main resources on a site.

But what does an RSS news feed look like?

RSS feeds are just XML

This is what an RSS feed file would look like for the climbing site:

```
<rss version="2.0">
  <channel>
    <title>Head First Climbers News</title>
    <link>http://localhost:3000/incidents/</link>
    <item>
      <title>Rock slide</title>
      <description>Rubble on the ledge tumbled, and just missed us.</description>
      <link>http://localhost:3000/incidents/1</link>
    </item>
    <item>
```

This is just an XML file. If you use an RSS news reader, or if your browser can subscribe to RSS news feeds, they will download a file just like this, which contains a list of links and descriptions to news stories.

So how can WE generate an RSS feed like this?



Do any of the tags in the RSS look particularly surprising or unclear? What do you think channel does? What about link?

We'll create an action called news

Let's create a new route as follows:

```
map.connect '/incidents/news', :action=>'news', :controller=>'incidents', :format=>'xml'
```



Sharpen your pencil

Write the controller method for the new action. It needs to find all incidents with `updated_at` in the last 24 hours. It should then render the default XML by calling `to_xml` on the array of matching incidents.

Hint: The Ruby expression `Time.now.yesterday` returns a date-time value from exactly 24 hours ago.



Sharpen your pencil Solution

Write the controller method for the new action. It needs to find all incidents with `updated_at` in the last 24 hours. It should then render the default XML by calling `to_xml` on the array of matching incidents.

Hint: The Ruby expression `Time.now.yesterday` returns a date-time value from exactly 24 hours ago.

```
def news
```

```
  @incidents = Incident.find(:all, :conditions=>['updated_at > ?', Time.now.yesterday])
```

```
  render :xml=>@incidents
```

```
end
```

You could have also used `:text=>@incidents.to_xml`.



Test Drive

This is the XML that is generated by the news action:

```

<incidents type="array">
  <incident>
    <created-at type="datetime">2008-11-21T11:59:31Z</created-at>
    <description>Rubble on the ledge tumbled, and just missed us.</description>
    <id type="integer">1</id>
    <latitude type="decimal">63.0434805555556</latitude>
    <longitude type="decimal">-150.993963888889</longitude>
    <mountain>Mount Rushless</mountain>
    <title>Rock slide</title>
    <updated-at type="datetime">2008-11-21T11:59:31Z</updated-at>
    <when type="datetime">2009-11-21T11:55:00Z</when>
  </incident>
  <incident>
    <created-at type="datetime">2008-11-21T12:03:52Z</created-at>
    <description>Ice layer covering crevasse. Lost Binky to the elements.</description>
  </incident>

```

We've generated XML for the correct data, but it's not the sort of XML we need for an RSS news feed. That's OK though, we had that problem before. When we were generating XML data for the location data it was in the wrong format, and we were able to adjust it then.

Remember – this is time dependent so incidents will only appear if they've been modified in the last 24 hours

We just need to modify this XML in the same way... don't we?



Is there a problem converting the XML to match the structure of the RSS news feed?

We have to change the structure of the XML

The `to_xml` method allows us to make a few simple changes to the XML it produces. We can swap names and choose which data items to include. But will it give us enough power to turn the XML we *have* into the XML we *want*?

This is what we have...

```
<?xml version="1.0" encoding="UTF-8"?>
<incidents type="array">
  <incident>
    <created-at type="datetime">2008-11-21T11:59:31Z</created-at>
    <description>Rubble on the ledge tumbled, and just missed us.</description>
    <id type="integer">1</id>
    <latitude type="decimal">63.043480555556</latitude>
    <longitude type="decimal">-150.993963888889</longitude>
    <mountain>Mount Rushless</mountain>
    <title>Rock slide</title>
  </incident>
<rss version="2.0">
  <channel>
    <title>Head First Climbers News</title>
    <link>http://localhost:3000/incidents/</link>
    <item>
      <title>Rock slide</title>
      <description>Rubble on the ledge tumbled, and just missed us.</description>
      <link>http://localhost:3000/incidents/1</link>
    </item>
    <item>
```

... but this is what we want.

We need more XML POWER

The news feed XML can't be generated by the `to_xml` method. While `to_xml` can modify XML output slightly, it can't radically change XML structure. For instance, `to_xml` can't move elements between levels. It can't group elements within other elements. `to_xml` is designed to be quick and easy to use, but that also makes it a bit inflexible.

For true XML power, we need something more...

So we'll use a new kind of template: an XML builder

If we created another HTML page template, we could generate whatever XML output we like. After all, HTML is similar to XML:

```
<rss version="2.0">
  <channel>
    <title>Head First Climbers News</title>
    <link>http://localhost:3000/incidents/</link>
    <% for incident in @incidents %>
      <item>
        <title><%= h incident.title %></title>
        <description><%= h incident.description %></description>
```

This actually looks a whole lot like HTML...

But Rails provides a special type of template that is specifically designed to generate XML; it's called an **XML Builder Template**.

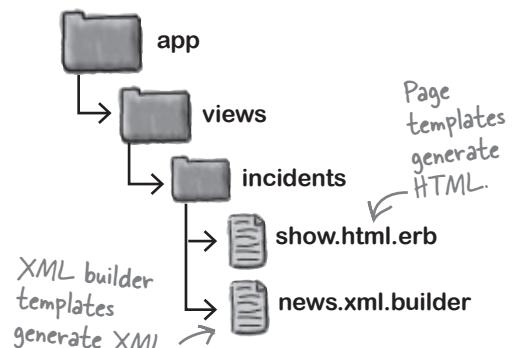
XML Builders live in the same directory as page templates, and they are used in a similar way. If someone has requested an XML response (by adding .xml to the end of the URL), the controller only needs to read the data from the model, and Rails will automatically call the XML builder template. That means we can lose a line from the **news** action:

```
def news
  @incidents = Incident.find(:all, :conditions=>['updated_at > ?', Time.now.yesterday])
  render :xml => @incidents
end
```

This is the "new" method from the incidents controller.

This code will now just read the data from the model and the XML builder template will do the rest.

So what does an XML builder look like?





XML Builders Up Close

Page templates are designed to look like HTML files with a little Ruby sprinkled in. XML builders are different. They are pure Ruby but are designed to have a structure similar to XML. For example, this:

```
xml.sentence(:language=>'English') {  
  for word in @words do  
    xml.word(word)  
  end  
}
```

might generate something that looks like this:

```
<sentence language="English"> ← Attribute  
  <word>XML</word>  
  <word>Builders</word>  
  <word>Kick</word> ← Elements  
  <word>Ass!</word>  
</sentence>
```

So why did the Rails folks make a different kind of template? Why doesn't XML Builder work just like a Page Template? Why doesn't it use Embedded Ruby?

Even though XML and HTML are very similar—and in the case of XHTML, they are technically equal—the ways in which people use HTML and XML are subtly different.

- Web pages usually contain a lot of **HTML** markup to make the page look nice, and just a *little* data from the database.
- Most of the content of the **XML**, on the other hand, is likely to come from the data and conditional logic and far less from the XML markup.

Using Ruby—instead of XML—as the main language, makes XML Builders more concise and easier to maintain.

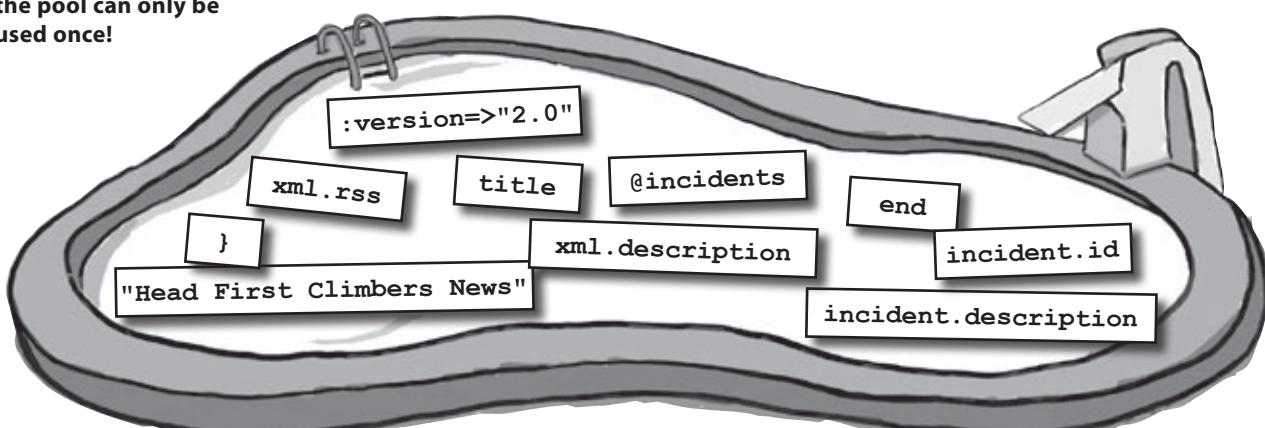
Pool Puzzle



Your **job** is to take code snippets from the pool and place them into the blank lines in the code. You may **not** use the same snippet more than once, and you won't need to use all the snippets. Your **goal** is to complete the XML builder template that will generate RSS.

```
.....(.....) {
    xml.channel {
        xml.title(.....)
        xml.link("http://localhost:3000/incidents/")
        for incident in .....
            xml.item {
                xml.....(incident.title)
                .....(.....)
                xml.link("http://localhost:3000/incidents/#{.....}")
            }
        .....
    }
}
```

Note: each thing from the pool can only be used once!

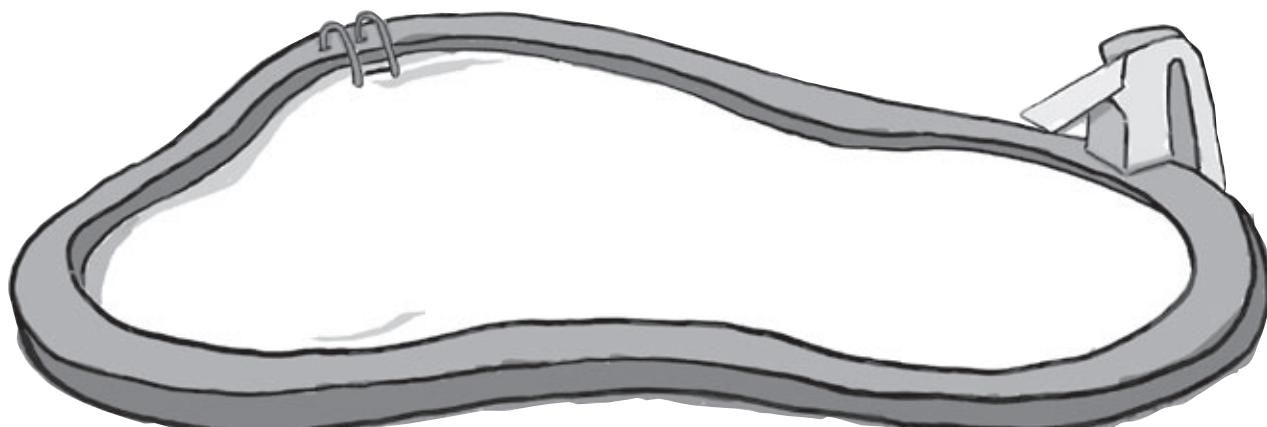
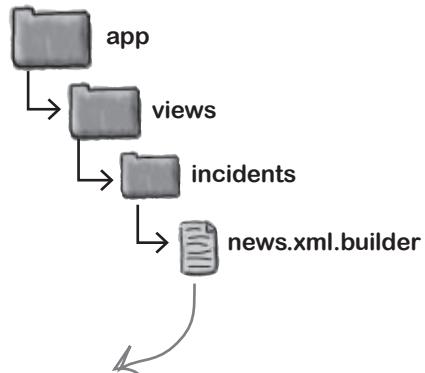


Pool Puzzle Solution



Your **job** is to take code snippets from the pool and place them into the blank lines in the code. You may **not** use the same snippet more than once, and you won't need to use all the snippets. Your **goal** is to complete the XML builder template that will generate RSS.

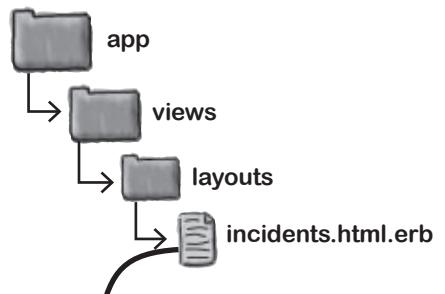
```
xml.rss ( .... :version=>"2.0" ..) {  
    xml.channel {  
        xml.title( ... "Head First Climbers News" )  
        xml.link("http://localhost:3000/incidents/")  
        for incident in . @incidents ...  
            xml.item {  
                xml. title (incident.title)  
                xml.description .... ( incident.description ..)  
                xml.link("http://localhost:3000/incidents/#{{ incident.id }}")  
            }  
    }  
    end  
}
```



Now let's add the feed to the pages

But how will users find the feed? Browsers sense the presence of a news feed by looking for a `<link... />` reference within a page.

The folks at Head First Climbers want the news feed to appear on every page, so we will add a reference to the RSS feed in the `incidents` layout file, using the `auto_discovery_link_helper`:



```

<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
  "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">

<html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en" lang="en">
<head>
  <meta http-equiv="content-type" content="text/html; charset=UTF-8" />
  <title>Incidents: <%= controller.action_name %></title>
  <%= stylesheet_link_tag 'scaffold' %>
  <%= auto_discovery_link_tag(:rss, { :action=>'news' }) %>
</head>
<body>

<p style="color: green"><%= flash[:notice] %></p>

<%= yield %>

</body>
</html>

```

This should create a link like this:

```

<link href="http://localhost:3000/incidents/news.xml"
  rel="alternate" title="RSS" type="application/rss+xml" />

```

But to see if it works, we need to fire up our web browser again.



Test Drive

Now, when a user goes to the web site, an RSS feed icon appears in their browser:

Different browsers have different ways of showing they have found a news feed.

The screenshot displays two instances of a web browser window titled "Incidents: index". Both windows show the URL <http://localhost:3000/incidents/>. The content of both windows is identical, showing a table titled "Listing incidents" with three rows of data:

Mountain	Latitude	Longitude	When	Title	Description	Action
Mount Rushless	63.04348055555556	150.993963888889	2009-11-21 11:55:00 UTC	Rock slide	Rubble on the ledge tumbled, and just missed us.	Show Edit Destroy
Mount	63.0780522777278		2009-11-21	Hidden	Ice layer covering crevasse. Lost Binky to the elements.	Show Edit Destroy

And if they subscribe to the feed, or simply read it, they will see links to incidents that have been posted in the previous 24 hours.

The screenshot shows a web browser window titled "Head First Climbers News" with the URL <feed: http://localhost:3000/incidents/news.xml>. The browser's status bar indicates "4 Total". The main content area displays four news items:

- Rock slide** Today, 6:27 PM
Rubble on the ledge tumbled, and just missed us. [Read more...](#)
- Hidden crevasse** Today, 6:27 PM
Ice layer covering crevasse. Lost Binky to the elements. [Read more...](#)
- Ascent** Today, 6:27 PM
Living only on dried chicken pieces, we completed our 4 day... [Read more...](#)
- Altitude sickness** Today, 6:27 PM
Overcome by the lack of oxygen, we abandoned the ascent... [Read more...](#)

A sidebar on the right provides filtering options:

- Search Articles:
- Article Length:
- Sort By:
 - Date
 - Title
 - Source
 - New
- Recent Articles:
 - All
 - Today
 - Yesterday
 - Last Seven Days

On top of the world!

One of the first news items on the web site is posted by our intrepid climber, and thousands of climbers hear of the good news.





Tools for your Rails Toolbox

You've got Chapter 8 under your belt, and now you've added the ability to use XML to represent your pages in multiple ways.

Rails Tools

`to_xml` generates an XML for any model object
:`only` and `:root` parameters allow you to modify the
`to_xml` format

`respond_to` creates a `_responder_` object that will help
you generate multiple representations for a resource

XML builder templates are like page templates for
creating XML

XML builder templates give you more flexibility than by
simply using `to_xml`

responders set the response mime-type and also
decide whether to call page templates or XML builder
templates



Taking things further



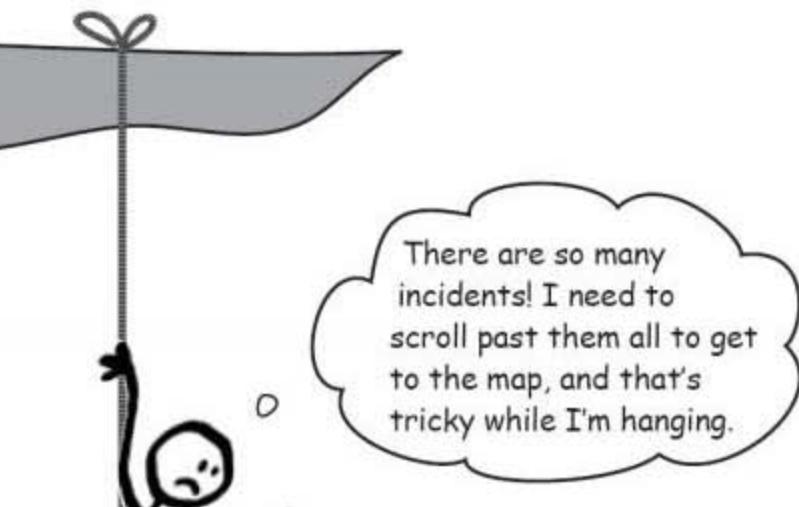
It's time to consolidate your mash-up skills.

So far you've seen how you can add **Google Maps** to your web apps to clearly show spatial data. But what if you want to **extend the functionality that's already there**? Keep reading, and we'll show you how you can add more **advanced Ajax goodness** to your **mash-ups**. And what's more, you'll learn a bit more about **REST** along the way.

landslide, anyone?

Too many incidents!

With the improved user interface, the number of visitors to the Head First Climbers site has soared. The trouble is, so many incidents are being logged that there are too many for people to easily read through them.



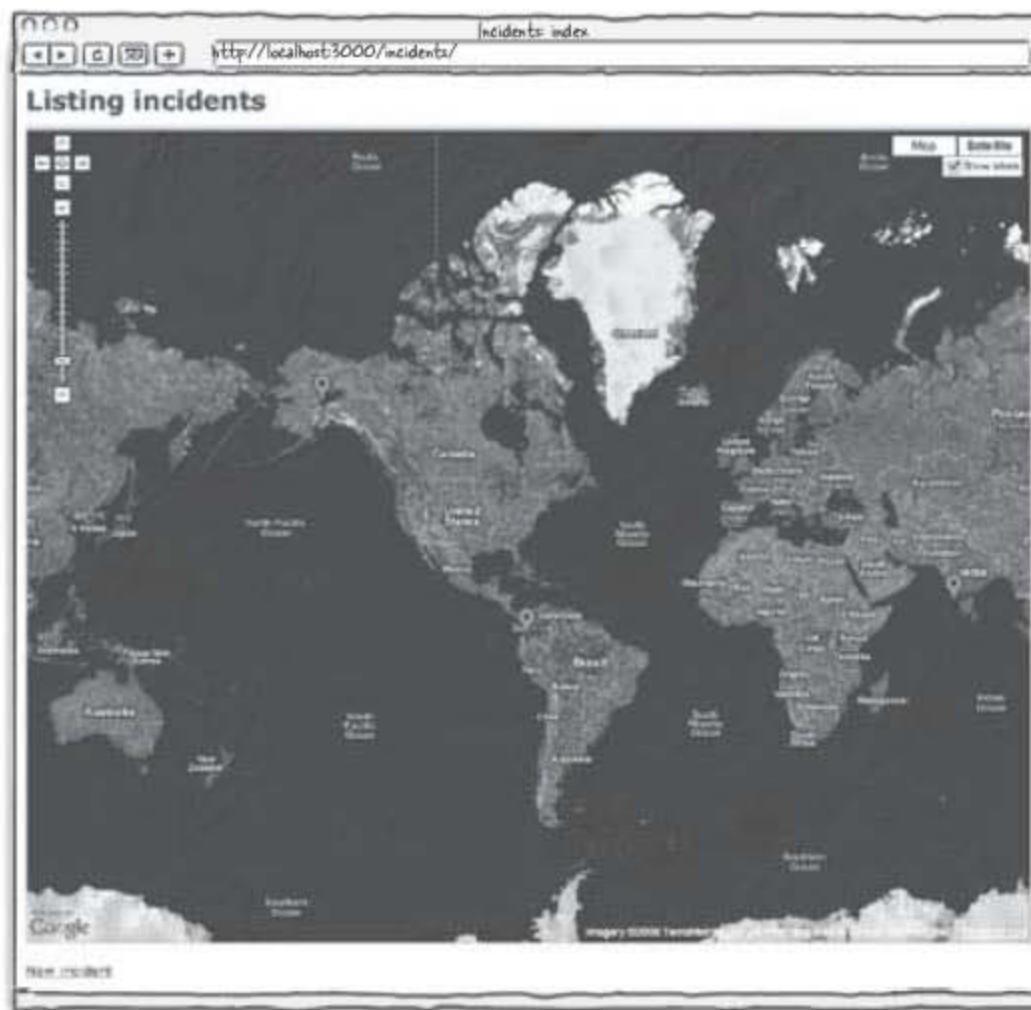
The index page of the site displays the information in two ways.

- ➊ At the top of the page is a detailed list of incidents with latitudes and longitudes. The trouble is, lots of people scroll past this to get to the map at the end of the page.
- ➋ On a map showing a cut-down amount of detail when you click on an incident. The problem here is not all the data is shown on the map.

Neither of these are entirely satisfactory. It's hard to locate the incidents from the list, and that's why we added a map. But the map doesn't display all of the data available. So what should we do?

The map could show more details

The ideal solution would be to make the map *do more*. If it could be changed to display more useful information about the incidents, we could probably just remove the the list of incidents and make the front page one big multi-functional map. That would mean we wouldn't need to go to separate pages in order to enter more data, for example.



We could show all the data on
one big multi-functional map
like this.

There's just one problem: the map partial was **downloaded**. It's simple enough to *use*, but should we really change the code? Fortunately, there's a development technique the map partial uses that means we don't need to touch the downloaded code itself. But what is it?



How do you think we could go about making changes to
the map without changing the downloaded code?

We can extend the map using Ajax

The people who wrote the map partial figured that pretty soon people would want to extend the way the map worked. And because the map partial calls Google Maps, and Google Maps is built using Ajax, it made sense that the way to extend the map is with Ajax.

At the moment, the map works by making a request back to the server asking for an XML file containing the details of all of the mountaineering incidents recorded on the system. By default, the map displays the title and description contained in the XML.

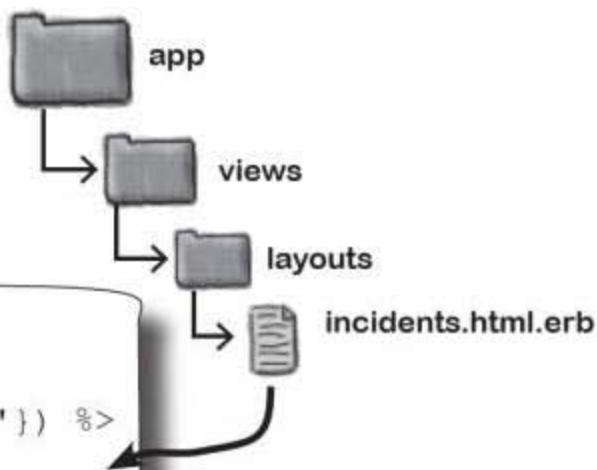
But the map partial also allows you to pass it the name of an **action** that will display the information for an incident. And that action can be whatever you like, so if you wanted, you could generate something that looked like the original version of the incident show page.

We need to display this output in the information window on the map.



We need the `_map.html.erb` partial to make Ajax requests, so this means it will need access to the Prototype library. We can allow this in the same way we did before, by adding a reference to the JavaScript library in the layout file like this:

```
<%= stylesheet_link_tag 'scaffold' %>
<%= auto_discovery_link_tag(:rss, {:action=>'news'}) %>
<%= javascript_include_tag 'prototype' %>
</head>
```



But how do we convert the index page?

The first thing we need to do to change the front page is remove the list of incidents and make the map larger:



We also need to tell the map partial the name of the action that will display the incident information. That's quite a few changes, but it will actually make the `index.html.erb` template a lot simpler than it was before.

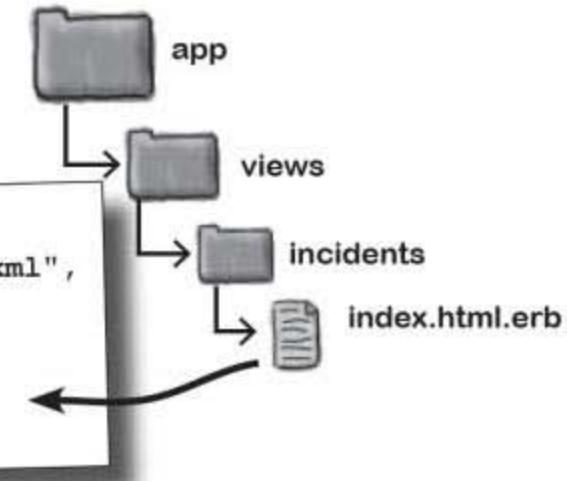
In fact, this is all we'll be left with:

This means we will generate a larger map to fill the page.

```
<h1>Listing incidents</h1>
<%= render (:partial=>'map', :locals=>{:data=>"/incidents.xml",
  :full_page=>true, :show_action=>'show'}) %>
<br />
<%= link_to 'New incident', new_incident_path %>
```

When the map partial is called like this, it **changes its behavior**. Before, when an incident was clicked, the partial ran a piece of default JavaScript that displayed the title and description in the pop-up information window. Making this change means that when an incident is clicked on the map, the partial calls the show action and displays the action's response in the window.

Or at least it will, once we make the show action generate the correct output.



We're going to modify the 'show' action to generate the contents of the information window.

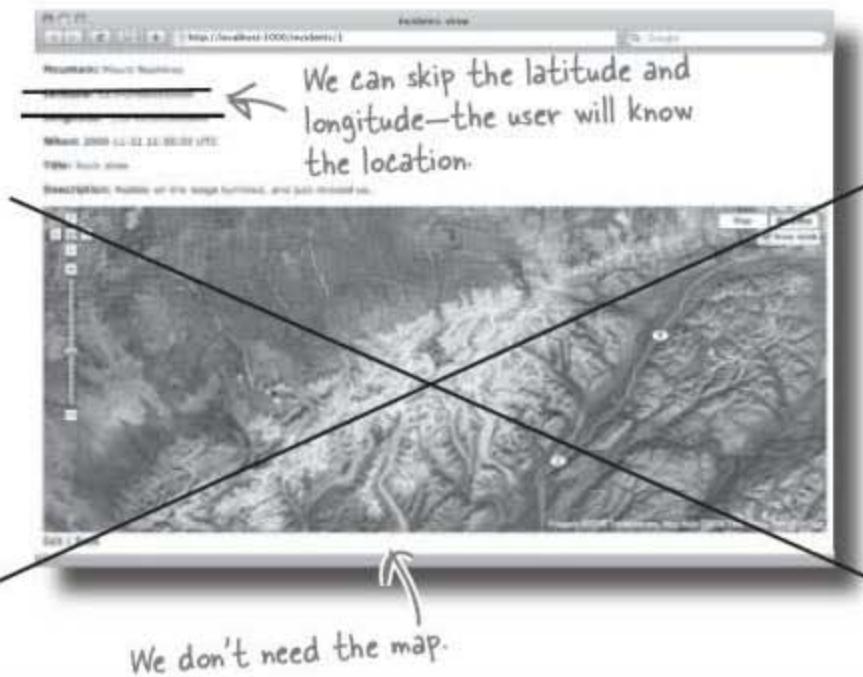
[show more](#)

What will the “show” action need to generate?

We already have a `show` action, and this generates a web page containing the details of an incident and a map with the incident’s location.

But that’s *way more* than we need now. The `show` action only needs to generate the text details of an incident, and because the information is going to be displayed next to a point on a map, we won’t need to display the latitude and longitude either.

There’s one other thing that’s different: we only need a **page fragment**. We don’t want the standard HTML boilerplate that will be produced by a *page template*. So this means our action will need to generate from a partial template. We’ll call this `_show.html.erb`.



Sharpen your pencil

Complete the line in the “show” method of the controller to call the `_show.html.erb` partial:

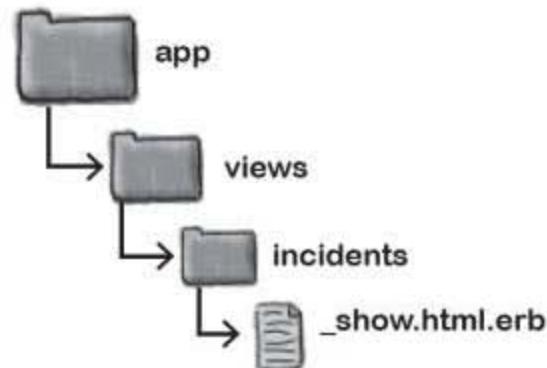


```
def show
  @incident = Incident.find(params[:id])
  respond_to do |format|
    format.html {
      .....
    }
    format.xml {
      render :text=>@incident.to_xml(
        :only=>[:latitude,:longitude,:title,:description],
        :root=>"data")
    }
  end
end
```



Code Magnets

Complete the code for the new _show.html.erb partial. Remember - you won't need to display all of the information.



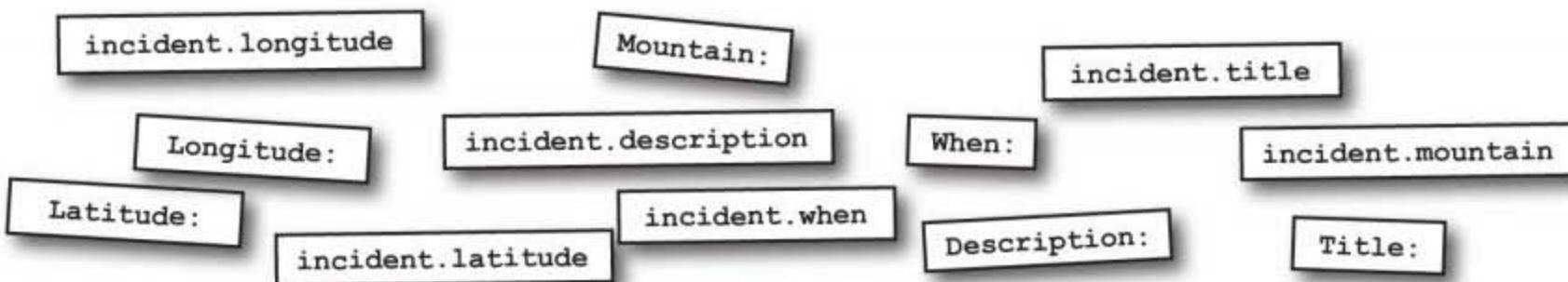
```

<p>
  <b>.....</b>
  <%=h .....%>
</p>

<p>
  <b>.....</b>
  <%=h .....%>
</p>

<p>
  <b>.....</b>
  <%=h .....%>
</p>

<p>
  <b>.....</b>
  <%=h .....%>
</p>
  
```





Sharpen your pencil Solution

Complete the line in the "show" method of the controller to call the _show.html.erb partial:



```
def show
  @incident = Incident.find(params[:id])
  respond_to do |format|
    format.html {
      ...render :partial=>'show', :locals=>{@incident}.....
    }
    format.xml {
      render :text=>@incident.to_xml(
        :only=>[:latitude, :longitude, :title, :description],
        :root=>"data")
    }
  end
end
```



Code Magnets Solution

Complete the code for the new _show.html.erb partial. Remember - you won't need to display all of the information.

```

<p>
  <b>..... Mountain: ..... </b>
  <%=h ..... incident.mountain ..... %>

</p>

<p>
  <b>..... When: ..... </b>
  <%=h ..... incident.when ..... %>

</p>

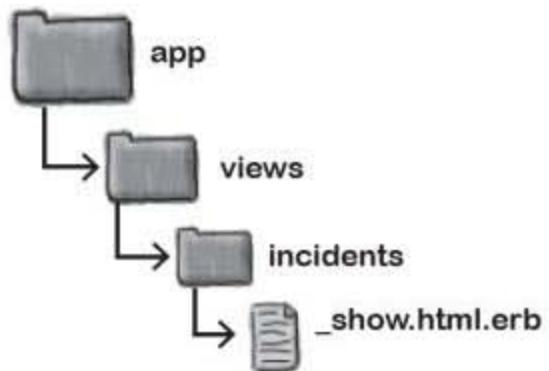
<p>
  <b>..... Title: ..... </b>
  <%=h ..... incident.title ..... %>

</p>

<p>
  <b>..... Description: ..... </b>
  <%=h ..... incident.description ..... %>

</p>

```



incident.longitude

Latitude:

Longitude:

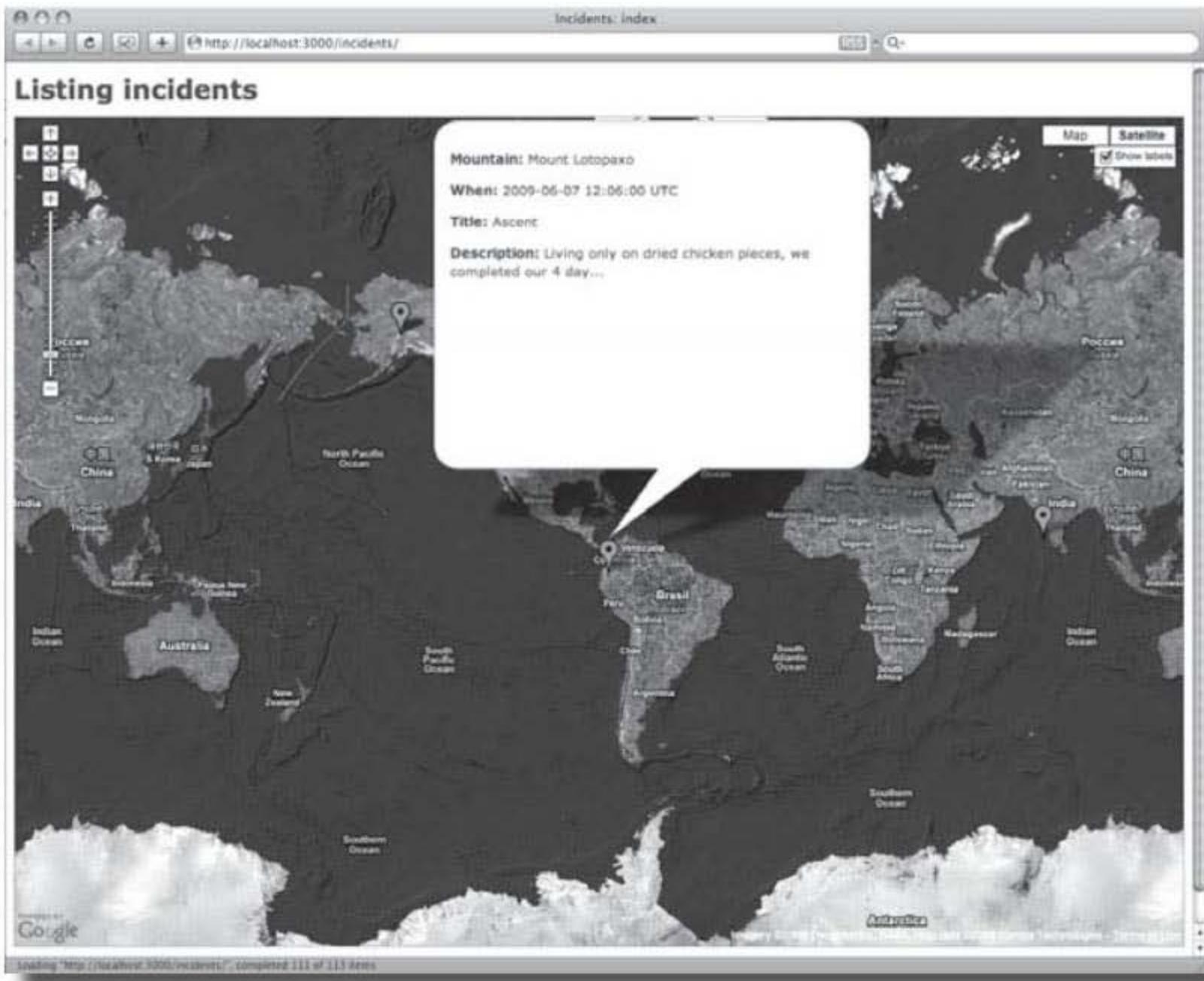
incident.latitude

hurrah for big maps



Test Drive

Now if we go along to the index page, sure enough—the list of incidents has disappeared and the map is much larger. But more important is what happens when the user clicks on one of the incidents on the map:



When the map detects a mouse click on an incident, it generates an Ajax request to the `show` action, and this generates the details in HTML for the incident. The map receives the HTML and uses it to replace the content of the incident's information window. This then gets displayed to the user.

The new map functionality is a success!

The new map functionality is greeted enthusiastically by the climbers. They no longer need to scroll past a long list of incidents to get to the map. Now they can get all the information they need direct from the map itself. There's just one thing...

If only I could enter
new incidents on the
map itself, rather than go
through all these pages...

Climbers want to report new incidents using the map.

They can use GPS units to find their latitude and longitude and type that in, but the site would be a lot easier for them if they could simply plot a point on the map and fill in the other details right there. That would make data-entry quicker for the climbers.

So how does entering data on the map compare with what we're currently doing?

rest and ajax

you are here ▶

367

request asynchronously

We need to create requests using Ajax, too

If someone wants to create a new incident report, they currently have to go through the following steps:

- 1 **Click on the New Incident link on the front page.**
You can't enter data directly on the front page, you need to follow a link to the "new" page instead.



- 2 **Manually enter the latitude and longitude on the New page.**
There's no map on this page, so you need to enter the latitude and longitude manually and save the record.

New Incident

Mountain:

Latitude:

Longitude:

When: -

Title:

Description:

Users have to enter the latitude and longitude manually.

5

The incident you've created is displayed.

Once you've clicked on the save button, you're to the cut-down "show" page we've just created. And if you need to create a second incident or get back to the main map, you need to hit the back button a couple of times to the front page—where you begin all over again.

A screenshot of a web browser window displaying a form titled "edit". The URL in the address bar is "http://localhost:3000/incidents/5/edit". The form fields are as follows:

- Mountain: K9
- When: 2009-11-26 15:24
- Title: Yeti spotted
- Description:
Dropped by camp looking for food. Played cards for a while. Lost \$4 to him.

An "Update" button is located at the bottom of the form.

So what needs to change?

Rather than go through all these steps, the users want the interface to be much simpler. They just want to click on the map and fill in the details using a form in the pop-up window.



To make that change, we need to generate the "new" form using Ajax. We also need the map to call the form when someone clicks on a new spot. But how?

one render can have multiple actions

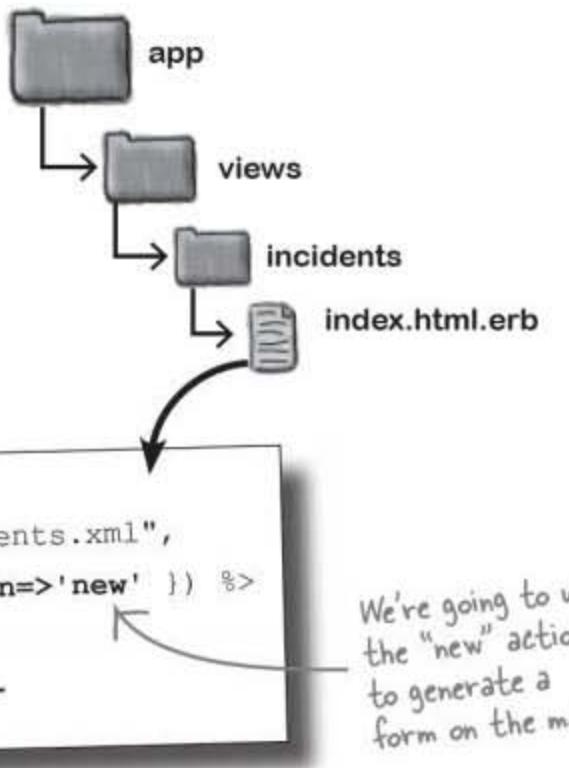
The map partial lets us specify a “new” action

So far we've looked at showing the incident details on the map. But how do we go about creating new incidents?

The `_map.html.erb` partial lets us specify an action to handle new incidents, in the same way it lets us specify an action for showing incident details. This means that we can add a “new” action to the `index.html.erb` file like this:

```
<h1>Listing incidents</h1>
<%= render (:partial=>'map', :locals=>{:data=>"/incidents.xml",
  :full_page=>true, :show_action=>'show', :new_action=>'new' }) %>
<br />
<%= link_to 'New incident', new_incident_path %>
```

We won't need a link on the front page to create new incidents, so we can ditch these lines.



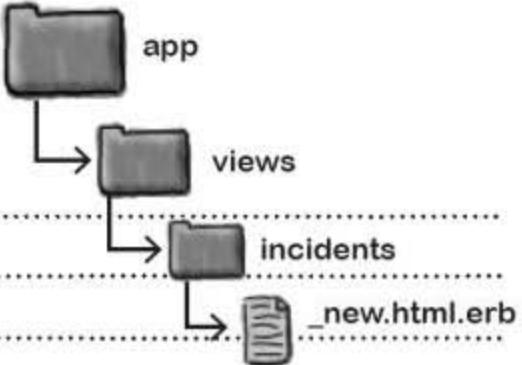
If someone clicks a new spot on the map, the `_map.html.erb` will create a new marker and pop up an information window containing whatever is returned by the “new” action.

We already have a “new” action defined for the application, but it's generating a full web page. Rather than display a full web page, we need the “new” action to create a page fragment that will be displayed inside the pop-up information window. Also, we need to make sure that when the user submits the “new” form, it stays on the map.

So we'll create a partial called `_new.html.erb` that generates an Ajax form.



You need to create a `_new.html.erb` partial for the form. Complete the code for the form. Remember - people won't need to enter values for the latitude and longitude, but the form will still need to record them.



When the map calls the “new” action, it sends the location of the new incident as request parameters. Complete the code in the incidents_controller.rb new method so that it calls the partial correctly:

```
format.html {  
    @incident.latitude= params['latitude']  
    @incident.longitude= params['longitude']  
    .....  
}
```



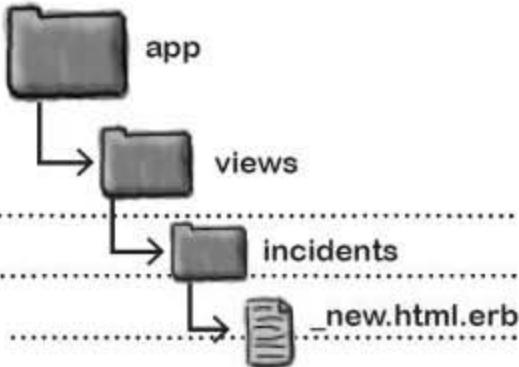


You need to create a _new.html.erb partial for the form. Complete the code for the form. Remember - people won't need to enter values for the latitude and longitude, but the form will still need to record them.

```
<h1>New incident</h1>
<% remote_form_for(incident) do |f| %>
  <p>
    <%= f.label :mountain %> <%= f.text_field :mountain %>
  </p>
  <%= f.hidden_field :latitude %> ← We still need to record the
  <%= f.hidden_field :longitude %> ← latitude and longitude in the
                                         form, but only as hidden fields
  <p>
    <%= f.label :when %> <%= f.datetime_select :when %>
  </p>
  <p>
    <%= f.label :title %> <%= f.text_field :title %> ← Your code might look a little different
  </p>
  <p>
    <%= f.label :description %><br/>
    <%= f.text_area :description, :rows=>3 %>
  </p>
  <p>
    <%= f.submit "Create" %>
  </p>
<% end %>
```

When the map calls the “new” action it sends the location of the new incident as request parameters. Complete the code in the incidents_controller.rb new method so that it calls the partial correctly:

```
format.html {
  @incident.latitude= params['latitude']
  @incident.longitude= params['longitude']
  render :partial=>'new', :locals=>{ :incident=>@incident}
}
```





Test DRIVE

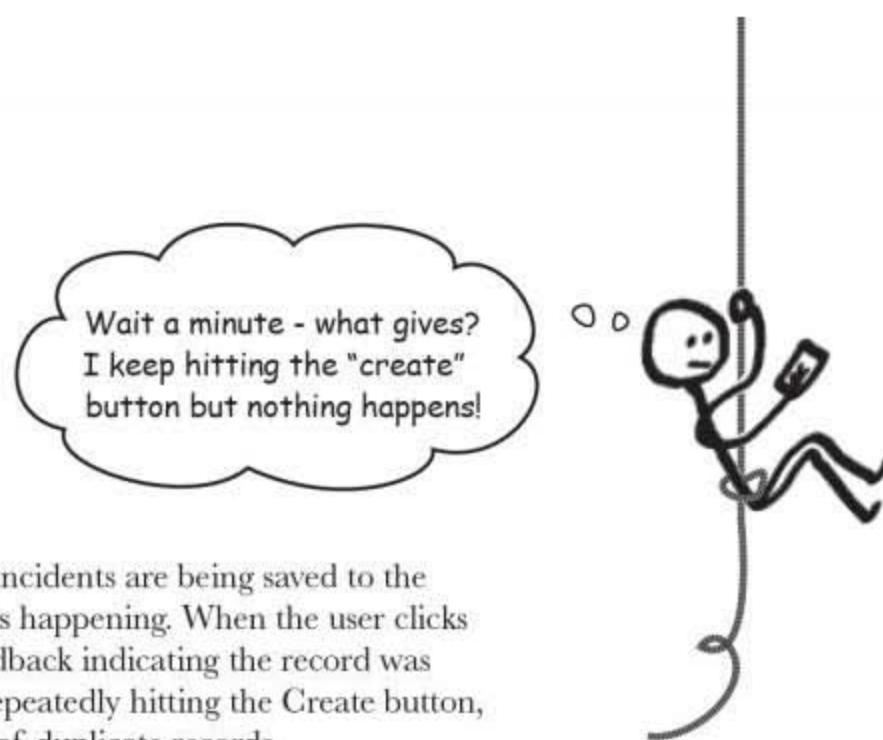
Now if a user goes to the front page and clicks on a fresh point on the map, they can enter details for the incident using a pop-up form. When the “Create” button is clicked, the form remains on the screen, but a new record is displayed on the database.

The figure consists of two screenshots of a web application. The top screenshot shows a map with a 'New incident' dialog box overlaid. The dialog has fields for 'Mountain' (set to 'Mount Rushless'), 'When' (set to '2009-11-21 11:00:00'), 'Title' (set to 'Rock slide'), and 'Description' (set to 'Caused by early melting of snow. Project needs to be cancelled now')). The bottom screenshot shows the same map with the dialog still open, and a new row has been added to the database table below, corresponding to the new incident entry.

id	mountain	latitude	longitude	when	title	description
1	Mount Rushless	63.04348055...	-150.993963...	2009-11-21 11:00:00	Rock slide	Rubble on the...
2	Mount Rushless	63.07805277...	-150.977869...	2009-11-21 17:00:00	Hidden crev...	Ice layer core...
3	Mount Lotopaxo	-0.683975	-78.4365055...	2009-06-07 12:00:00	Ascent	Living only on...
4	High Kanuklima	11.123925	72.72135833...	2009-05-12 18:00:00	Altitude si...	Overcome by th...
5	K9	28.38535964...	84.48623657...	2009-11-26 15:00:00	Yeti spotted	Dropped by cam...

So is everything OK?

confusion is the enemy



The climbers are confused.

Even though the form works fine and incidents are being saved to the database, it actually *looks* like nothing is happening. When the user clicks on the “Create” button, there’s no feedback indicating the record was saved. This means that the users are repeatedly hitting the Create button, and the database is starting to get lots of duplicate records.

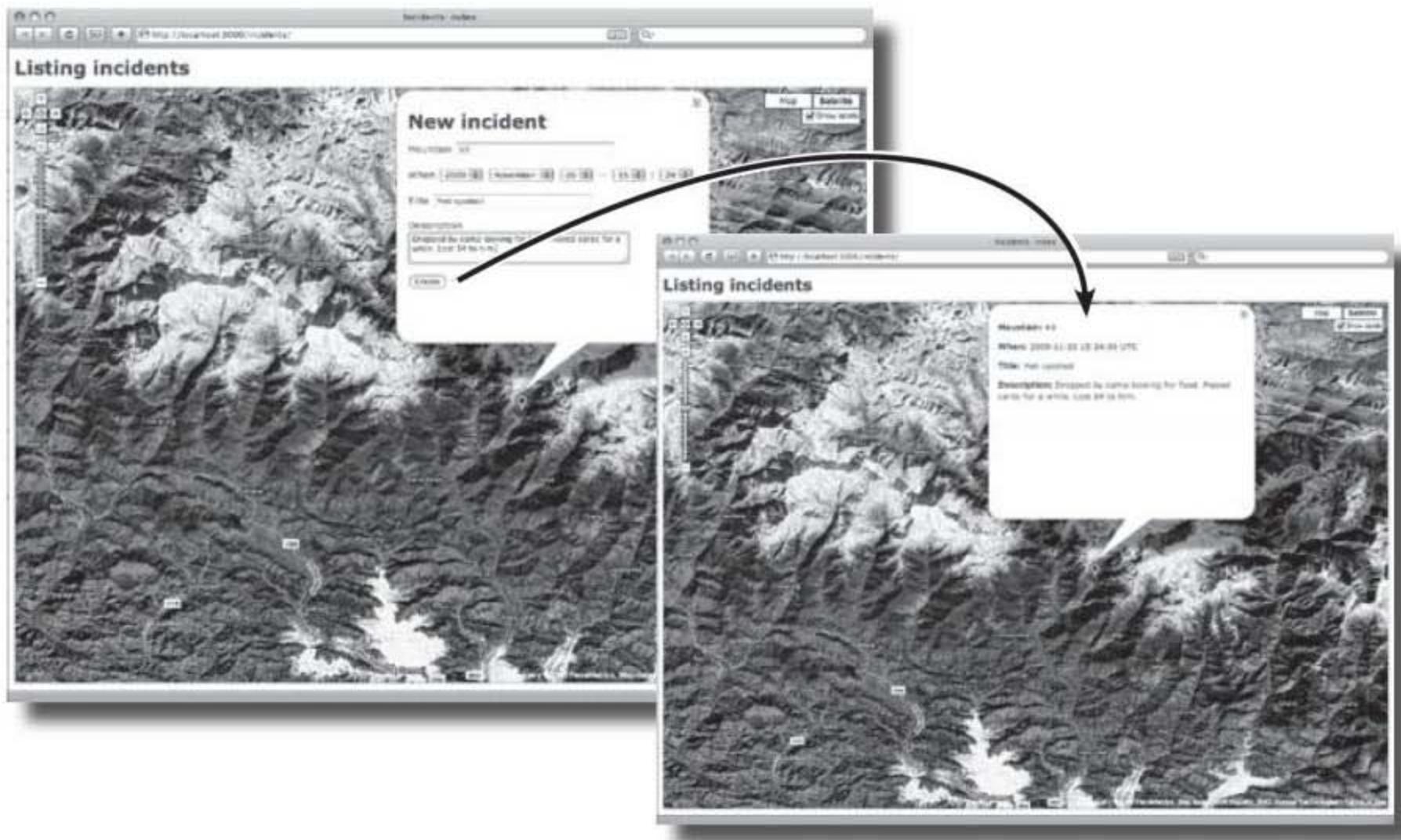
Something needs to be done. Back in the old days when we just had scaffolding, when a user reported an incident with the “new” page, the browser would immediately switch to the “show” page. This confirmed that the data was saved to the database.

The image shows two screenshots of a web application. The top screenshot is titled "Incidents: new" and shows a "New incident" form with fields for "Mountain", "Latitude", "Longitude", "When" (a date and time selector), "Title", and "Description". A "Create" button is at the bottom. The bottom screenshot is titled "Incidents: show" and displays the details of a saved incident: Mountain: Mount Rushless, Latitude: 63.04348055555556, Longitude: -150.9939638888889, When: 2009-11-21 11:55:00 UTC, Title: Rock slide, and Description: Rubble on the ledge tumbled, and just missed us. There is an "Edit | Back" link at the bottom. Handwritten annotations include "The original 'new' form." pointing to the top window, and "The system displayed the 'show' page to confirm the record was saved." with an arrow pointing to the bottom window.

Could we have something like that in the Ajax app?

How do we PROVE an incident was saved?

The system really needs to show the created record in the pop-up window using the “show” action. So if someone enters details of an incident, the pop-up should change to show a *read-only* version of the incident.



That way, the pop-up information window will work like a little browser, forwarding to the new information. Except of course, our code can't just *forward* the browser to the new information. We need to keep climbers on the same page... just with new information showing.



The Ajax form needs to be replaced with the contents of the “show” action for the incident. How do you think you could do that?

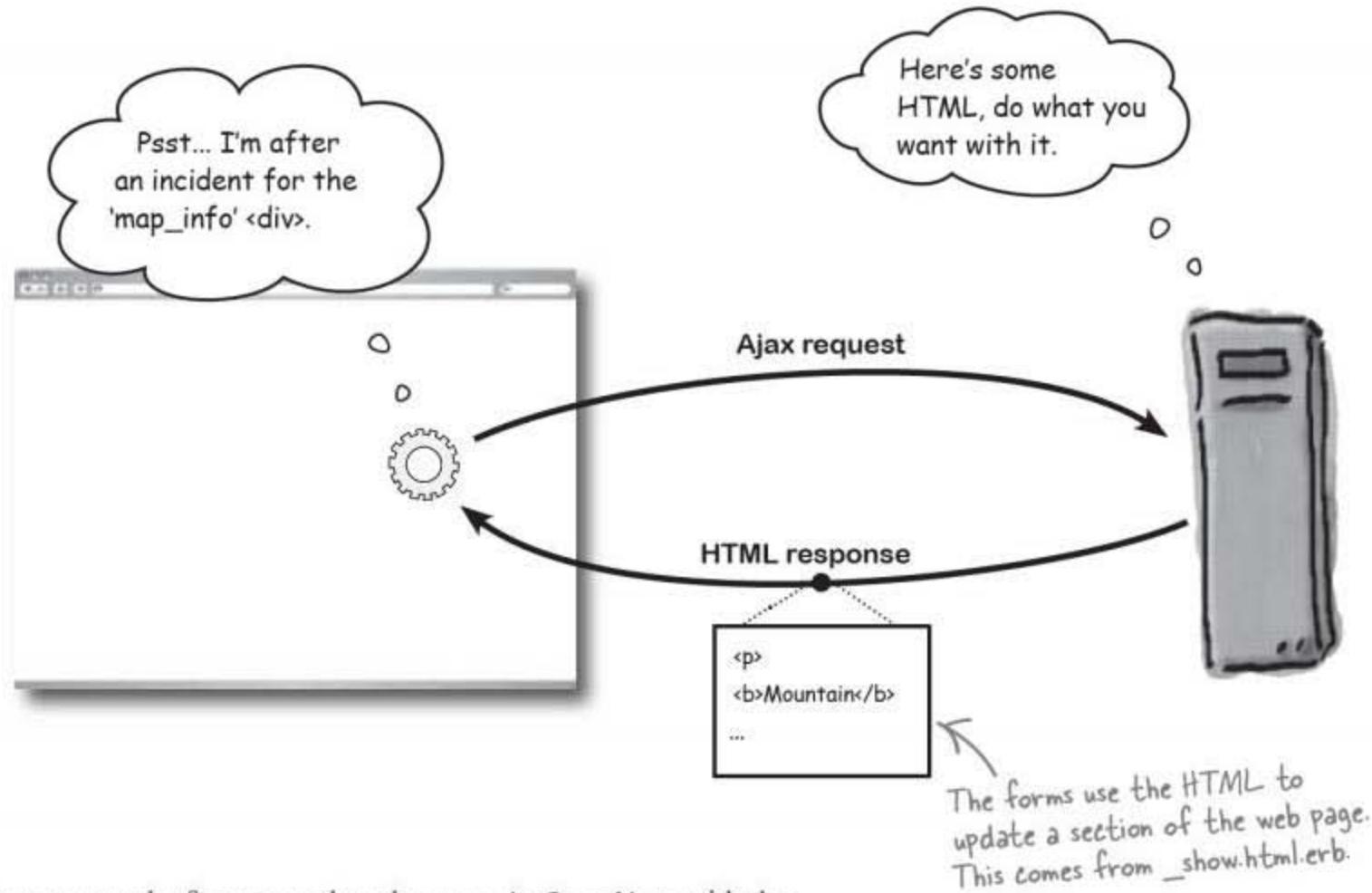
The form needs to update the contents of the pop-up's <div>

Even though it looks almost like a desktop application, Google Maps basically boils down to just HTML and JavaScript. It's just a web page. That means that the pop-up information window—and everything else—are just pieces of HTML.

The contents of the pop-up window are defined in a <div> element with:

```
id='map_info'
```

This is important because we're using an Ajax form to create a new incident report, and Ajax forms can be used to dynamically update parts of a web page **using their ids**.

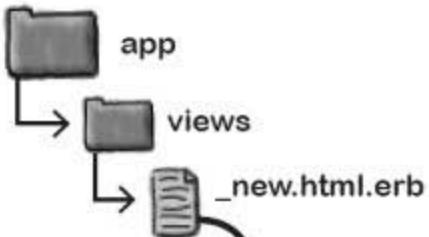


So if we can get the form to update the `map_info` <div> with the contents of the “show” action for the incident, it should give the users the feedback they need.



Sharpen your pencil

This is part of the code for the “new” form. Bearing in mind that the form will need to update the page with the form response, complete the code:



```

<% remote_form_for(incident, ..... ) do |f| %>
<p>
  <%= f.label :mountain %> <%= f.text_field :mountain %>
</p>
  
```

The “new” form submits itself to the “create” action. This is the create method on the controller. Mark any changes you think are needed.

```

def create
  @incident = Incident.new(params[:incident])

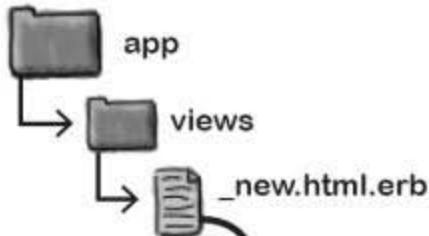
  respond_to do |format|
    if @incident.save
      flash[:notice] = 'Incident was successfully created.'
      format.html { redirect_to(@incident) }
      format.xml { render :xml => @incident, :status => :created,
                   :location => @incident }
    else
      format.html { render :action => "new" }
      format.xml { render :xml => @incident.errors,
                   :status => :unprocessable_entity }
    end
  end
end
  
```



nothing changes!



Sharpen your pencil Solution



This is part of the code for the “new” form. Bearing in mind that the form will need to update the page with the form response, complete the code:

```
<% remote_form_for(incident, :update=>'map_info') do |f| %>
<p>
  <%= f.label :mountain %> <%= f.text_field :mountain %>
</p>
```

The “new” form submits itself to the “create” action. This is the create method on the controller. Mark any changes you think are needed.

```
def create
  @incident = Incident.new(params[:incident])

  respond_to do |format|
    if @incident.save
      flash[:notice] = 'Incident was successfully created.'
      format.html { redirect_to(@incident) }
      format.xml { render :xml => @incident, :status => :created,
        :location => @incident }
    else
      format.html { render :action => "new" }
      format.xml { render :xml => @incident.errors,
        :status => :unprocessable_entity }
    end
  end
end
```



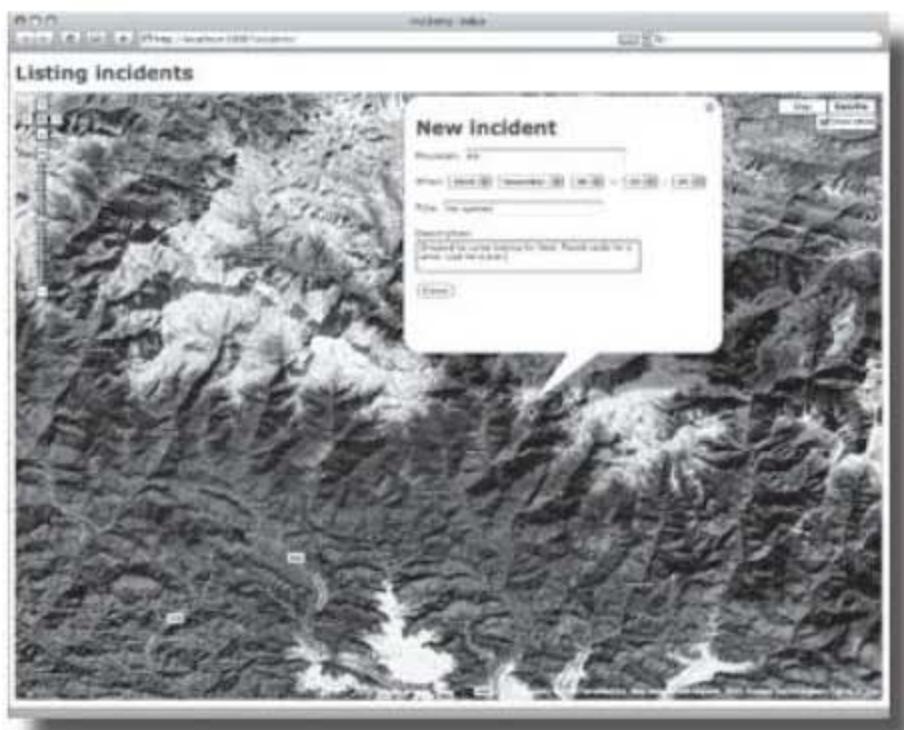
↑
NOTHING needs to change in the create action. When the form is submitted, the create action inserts the record into the database and then redirects the request to the “show” action. But the “show” action now generates an HTML fragment displaying the details of the new incident. This is just what we want.



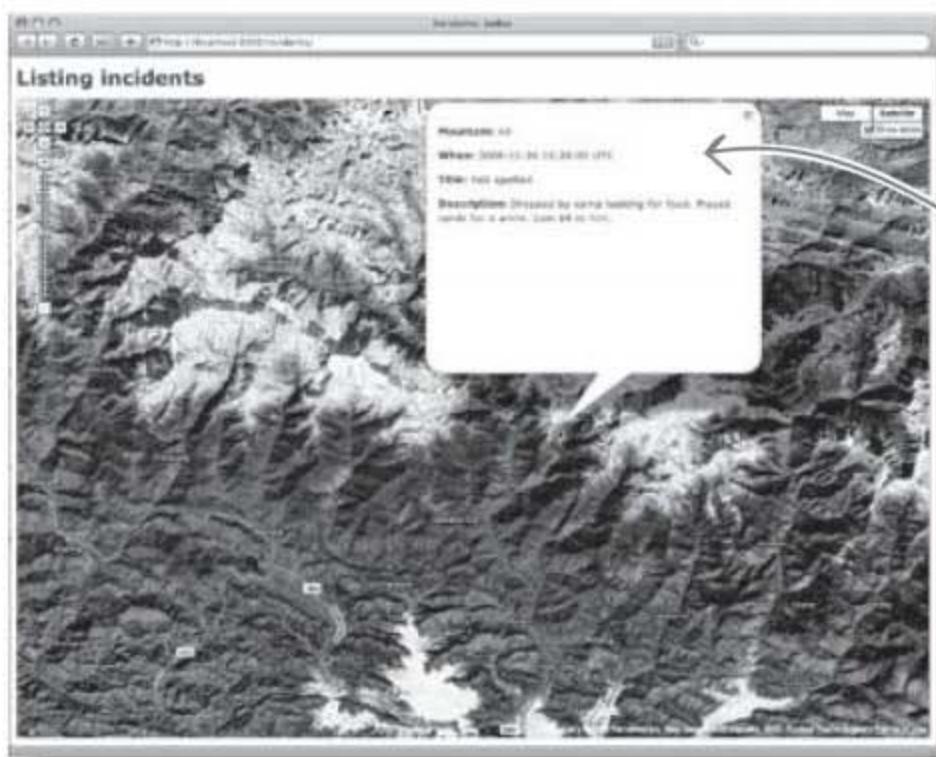
Test DRIVE

So now what happens when the user creates an incident?

Clicking on a new point on the map displays the Ajax form, just like before:



But when they hit the “Create” button, not only does the system save the record to the database, it also returns a page fragment containing the incident details, which the Ajax form now uses to update the `map_info <div>` inside the pop-up window.



there are no
Dumb Questions

Q: What happens if the user's browser doesn't have JavaScript enabled?

A: The application map won't run. Ajax applications, like Google Maps, require JavaScript.

Q: If Google Maps is an Ajax application, how come we didn't have to include the Prototype library in the last chapter?

A: Google Maps calls all of its own Ajax libraries from the Google servers, so it doesn't need the Prototype library.

Q: So why do we have to pull the Prototype library in this time?

A: If you pass action names to the map partial, the partial will need to make Ajax requests to the server. For that it needs the Prototype library... independent of what Google Maps is doing.

Q: Is there a way of making the application work without the map if someone's disabled JavaScript?

A: You could if you modified your controller. The controller decides which views to display, so it could run different templates and partials if there was no JavaScript.

Q: I still don't get how `respond_to` works. If `format.html` is some kind of method call, how come there's code between `{...}` following it?

A: In Ruby, methods can accept pieces of code between `{...}` (or `do...end`) as parameters. So the code between `{` and `}` is passed for `format.html`, and it decides whether or not to run it.

Q: How does the map partial work?

A: It's not that complicated, but it's mostly JavaScript, so we don't get into much detail here. You could check out *Head First JavaScript* for a lot more on those sorts of details, though!

Q: But I really want to know how it works!

A: It's worth looking through the `_map.html.erb` file. If you want to know more about JavaScript did we mention, *Head First JavaScript* is a great book :-)

Avalanche!

So far we've allowed users to see more detailed information on the map, and also create new incidents onto it direct. But what about edits?



what about editing?

How things works now...

There are two places where scaffolding gives you an edit option.

On the original scaffolded version of the “index” page, you could click the “Edit” link next to any of the records and jump to the edit form. But we can’t do anything like that now because the list of incidents on the index page has been replaced by the map. And we know that the map partial doesn’t have any “Edit” functions built in.

Mountain	Latitude	Longitude	When	Title	Description
Mount Rushless	63.0434805555556	-150.993963888889	2009-11-21 11:55:00 UTC	Rock slide	Rubble on the ledge tumbled, and just missed us.
Mount Rushless	63.0780527777778	-150.977869444444	2009-11-21 17:59:00 UTC	Hidden crevasse	Ice layer covering crevasse. Lost Binky to the elements.
Mount Lotopaxo	-0.683975	78.4365055555556	2009-06-07 12:06:00 UTC	Ascent	Living only on dried chicken pieces, we completed our 4 day...
High Kanuklima	11.123925	72.7213583333333	2009-05-12 18:11:00 UTC	Altitude sickness	Overcome by the lack of oxygen, we abandoned the ascent.

New incident

So where else could we edit things in the original scaffolding? Well, another place is in the incident “show” page. In the scaffolded version of the application, there was an “Edit” link on the “show” page.

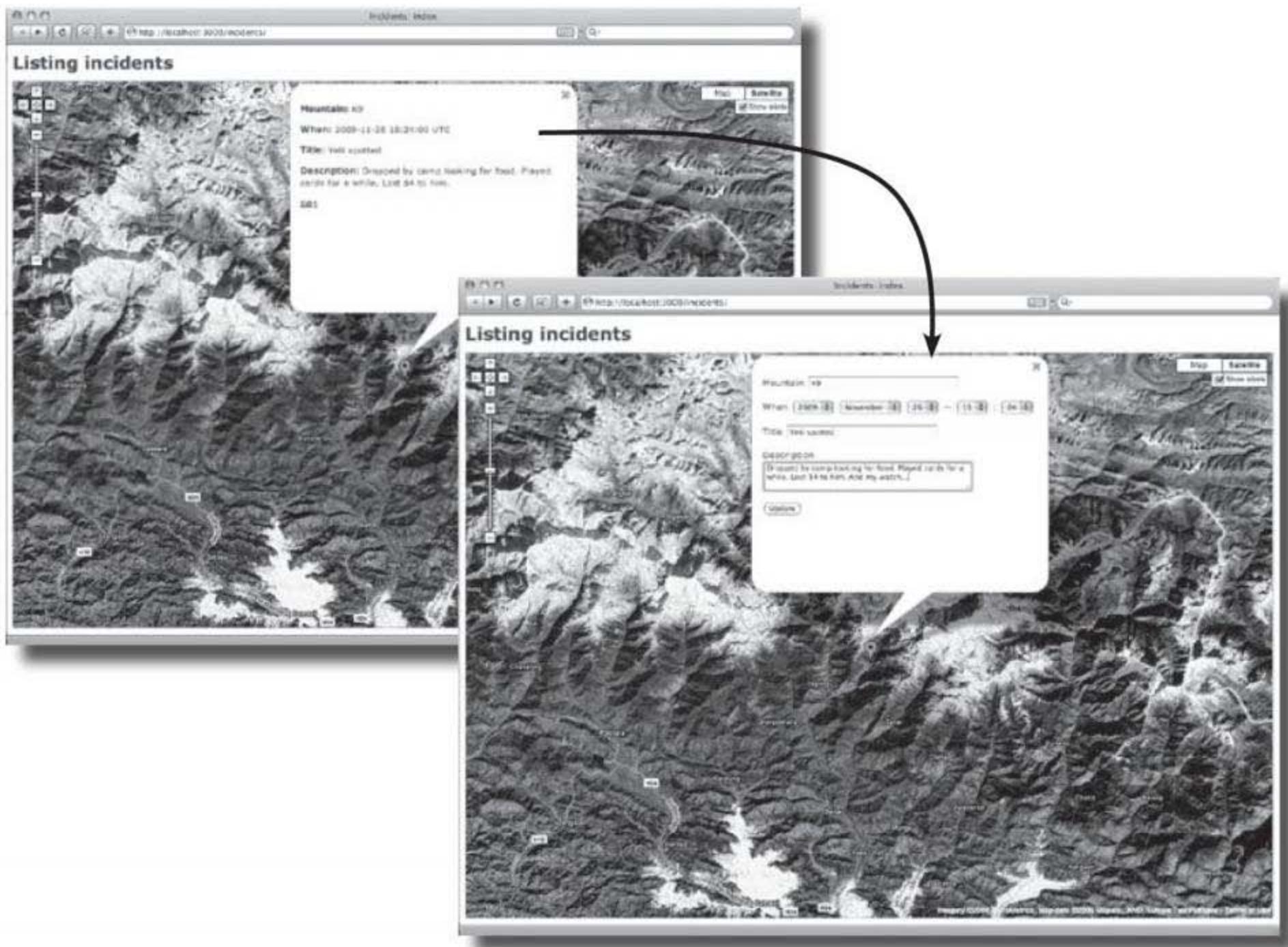
Mountain: Mount Rushless
Latitude: 63.0434805555556
Longitude: -150.993963888889
When: 2009-11-21 11:55:00 UTC
Title: Rock slide
Description: Rubble on the ledge tumbled, and just missed us.
Edit | Back

So could we do something like that? How about if we add an “Edit” link to the set of details that are displayed in the pop-up window.

Would that work?

We could have an “Edit” link in the pop-up

We need to add an “edit” link to the details that appear when someone selects an incident from the map. When someone clicks on the “edit” link, we switch the contents of `map_info <div>` to display an edit form and then use that to amend the record.



We already have the “show” function built. The “edit” form should be similar to the “new” form, and we already have the back-end code in the controller to amend the record.

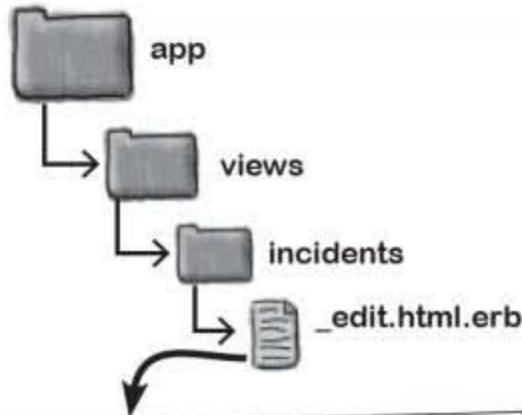
How hard can it be?

two partials?

We'll start by modifying the "edit" action

We need some way of generating an edit form that will appear in the pop-up window. We'll create a partial called `_edit.html.erb`. The partial looks pretty similar to the `_new.html.erb`:

```
<% remote_form_for(incident, :update=>'map_info') do |f| %>
  <p><%= f.label :mountain %> <%= f.text_field :mountain %></p>
  <%= f.hidden_field :latitude %>
  <%= f.hidden_field :longitude %>
  <p><%= f.label :when %> <%= f.datetime_select :when %></p>
  <p><%= f.label :title %> <%= f.text_field :title %></p>
  <p><%= f.label :description %><br/><%= f.text_area :description, :rows=>3 %></p>
  <p>
    <%= f.submit "Update" %>
  </p>
<% end %>
```

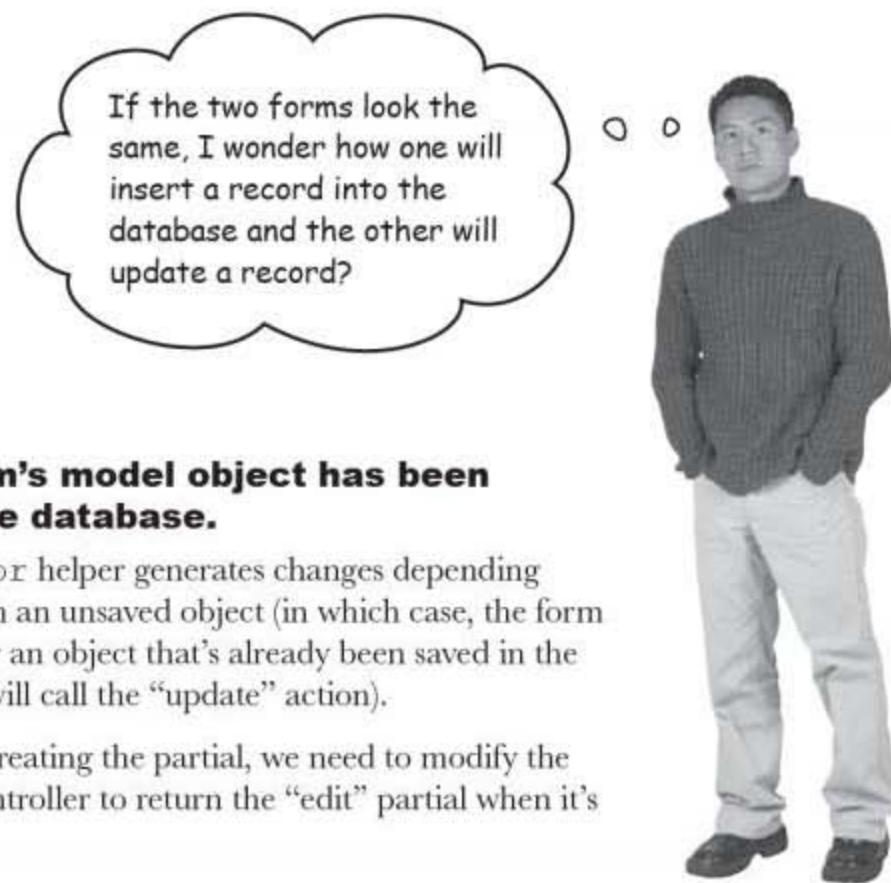


So why have two partials?

The two partials are basically the same code, but it's a good idea to keep them separate. At the moment they both look the same, but that might not always be the case.

As an example, we might want to change what functionality is available through the "new" and "edit" pages. We might decide that we need users to insert the date of an incident, but we may want to stop them editing it afterwards. Another possibility is that we might want to make the two pages look different from each other.

The code in `_edit.html.erb` and `_new.html.erb` are the same, but in this case we'll keep them in separate files.



Rails knows if the form's model object has been previously saved to the database.

So the code that the `form_for` helper generates changes depending upon whether it is dealing with an unsaved object (in which case, the form will call the “create” action) or an object that’s already been saved in the past (in which case, the form will call the “update” action).

Talking of actions, as well as creating the partial, we need to modify the “edit” action method in the controller to return the “edit” partial when it’s called:

```
def edit
  @incident = Incident.find(params[:id])
  render :partial=>'edit', :locals=>{:incident=>@incident}
end
```

there are no Dumb Questions

Q: How does Rails know if an object has already been saved?

A: It calls a method called “`new_record?`”. That returns true if the object has never been saved.

Q: Why does “`new_record?`” have a question mark at the end?

A: It’s a Ruby convention. Most methods returning true or false, have a question-mark in their name.

Q: Why do we have to have hidden fields for latitude and longitude?

A: We don’t want people to edit them.

Q: Yeah - I know that. But why even mention them at all?

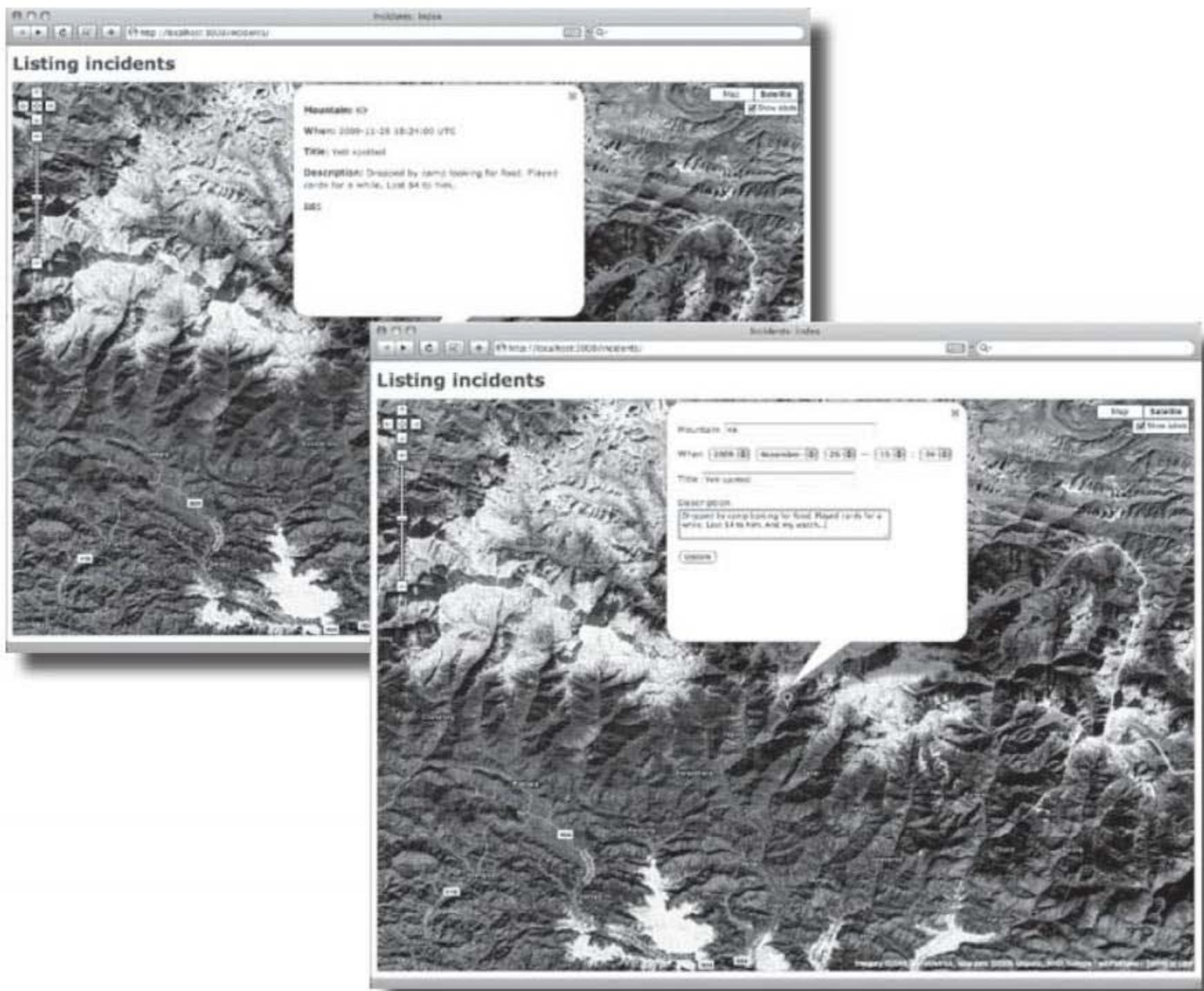
A: The form object gets converted into the fields in the form. If they weren’t mentioned in the form fields, they would disappear.

Q: But we don’t have fields for `id`, `created_at` and `updated_at` fields?

A: No - but Rails knows that they’re needed, so the `form_for` helper will create them for you.

And we'll also need a new link on the show page

We should now be able to generate an edit form, but how will the user get to it? We need an “Edit” link to appear when the user looks at the details of the incident. The link will need to be added to the `_show.html.erb` partial.



To generate the link, we'll use the `link_to` helper.

So how do we use the link_to helper?

The link_to helper takes two parameters: the name of the text in the link and the place we're going to.

```
<p><%= link_to "Edit", "/incidents/#{incident.id}/edit" %></p>
```





RESTful Routes Up Close

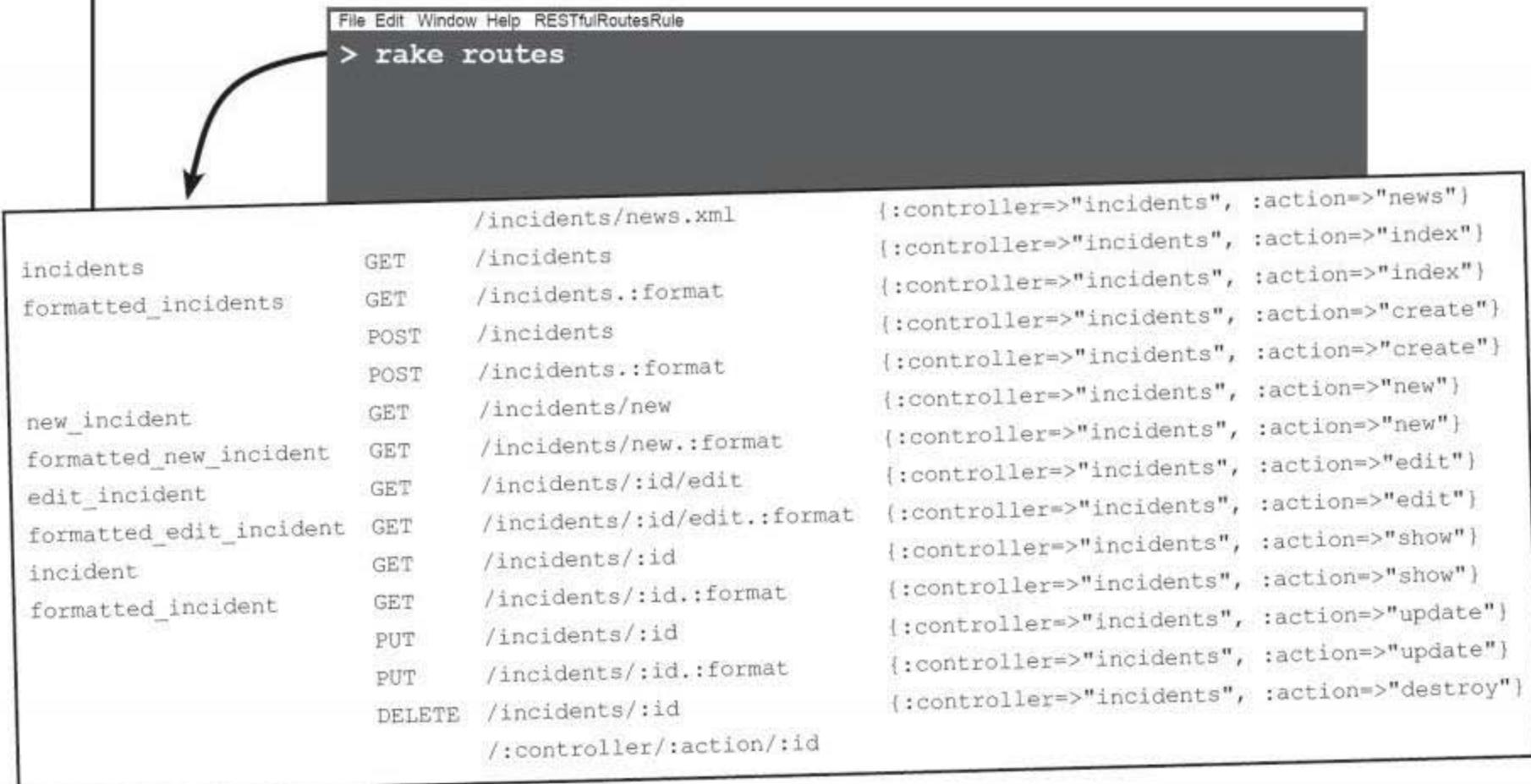
So far we've created individual routes in config/routes.rb using the map.connect command:

```
map.connect 'incidents/map/:id', :action=>'show_with_map', :controller=>'incidents'
```

But you may have noticed when you were editing the routes.rb file that Rails scaffolding generates its routes with a different command:

```
map.resources :incidents
```

This single command generates a set of standard routes called the **RESTful routes**. The routes provide access to the standard CRUD operations with the application. You can examine the routes from the console using the rake tool:



```
File Edit Window Help RESTfulRoutesRule
> rake routes
```

		/incidents/news.xml	(:controller=>"incidents", :action=>"news")
incidents	GET	/incidents	(:controller=>"incidents", :action=>"index")
formatted_incidents	GET	/incidents.:format	(:controller=>"incidents", :action=>"index")
	POST	/incidents	(:controller=>"incidents", :action=>"create")
	POST	/incidents.:format	(:controller=>"incidents", :action=>"create")
new_incident	GET	/incidents/new	(:controller=>"incidents", :action=>"new")
formatted_new_incident	GET	/incidents/new.:format	(:controller=>"incidents", :action=>"new")
edit_incident	GET	/incidents/:id/edit	(:controller=>"incidents", :action=>"edit")
formatted_edit_incident	GET	/incidents/:id/edit.:format	(:controller=>"incidents", :action=>"edit")
incident	GET	/incidents/:id	(:controller=>"incidents", :action=>"show")
formatted_incident	GET	/incidents/:id.:format	(:controller=>"incidents", :action=>"show")
	PUT	/incidents/:id	(:controller=>"incidents", :action=>"update")
	PUT	/incidents/:id.:format	(:controller=>"incidents", :action=>"update")
	DELETE	/incidents/:id	(:controller=>"incidents", :action=>"destroy")
			:controller/:action/:id

Each of these lines is a single route, and in some cases, the routes are named. So edit_incident is the name of the "/incidents/:id/edit" route.

But how does that help us tidy the path in the code?

Rails provides helpers for each named route

Those RESTful route names are important, because they help you refer to a route **from inside your code**. They let you turn this:

```
"/incidents/#{incident.id}/edit"
```

into this:

```
edit_incident_path(@incident)
```

For every named route, Rails gives you helpers to generate paths on the local server and complete URLs.

Paths on the local server

`edit_incident_path(@incident)` returns `/incidents/3/edit` if `@incident` has `id = 3`

Complete URLs

`edit_incident_url(@incident)` returns `http://localhost:3000/incidents/3/edit`

They're called **RESTful** route helpers because they can accept **resources**, or model objects, as parameters. Remember - one of the principles of REST design is to think of web applications as containers for resources.

The helpers for `incidents` and `new_incident` are called without resources—for example, as `incidents_url` or `incidents_path`.

The route helpers will not only remove redundant path formats from your code, but they are also easier to read and reduce the chances of you making an error in a path description.

So what does that do to our code? It changes from this:

```
<p><%= link_to "Edit", "/incidents/#{incident.id}/edit" %></p>
```

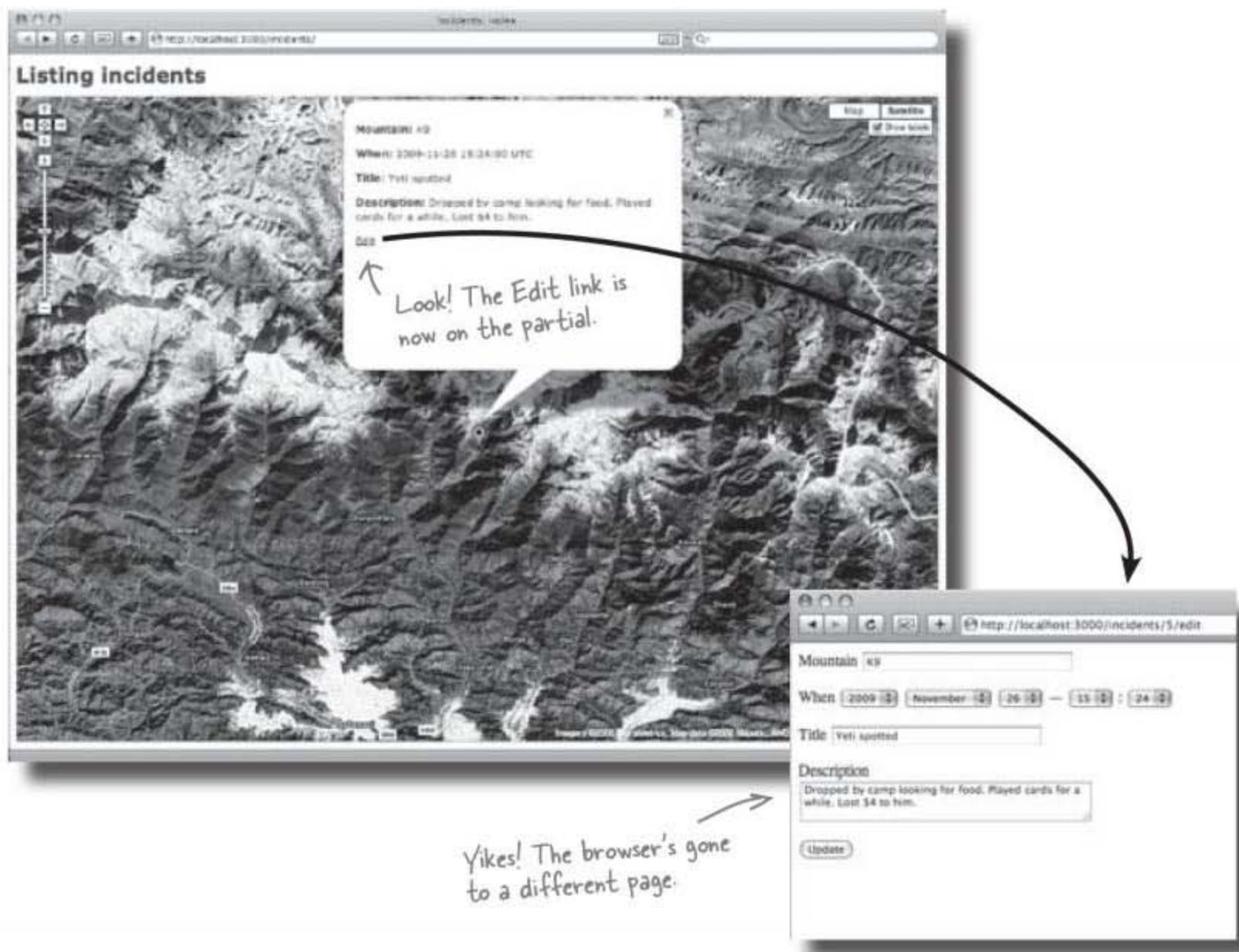
into this:

```
<p><%= link_to "Edit", edit_incident_url(incident) %></p>
```



Test Drive

So once the “Edit” link has been added to the “show” partial, what happens when we click on an existing incident on the map?



The link simply took the browser to:

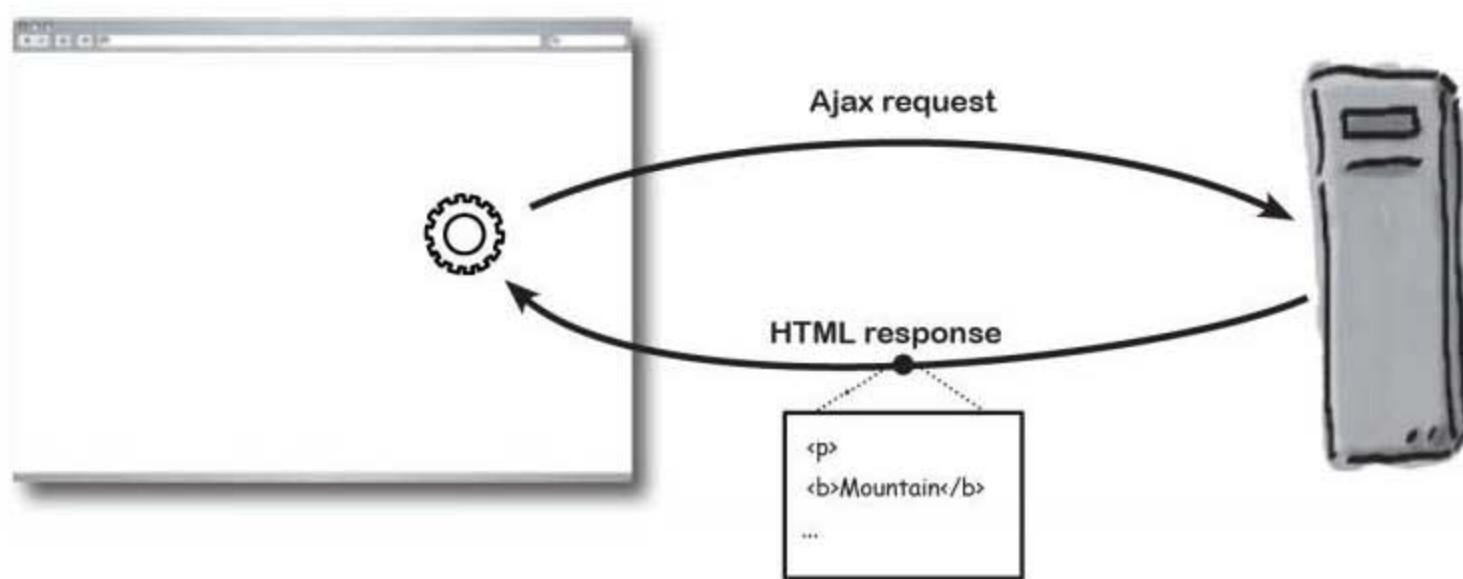
`http://localhost:3000/incidents/5/edit`

The trouble is, this now sends the contents of the `_edit.html.erb` partial back to the browser like it was another page.

We really need to stay on the same page in the browser, so how do we fix it?

Ajax links to the rescue

The “new” form we created earlier was able to replace the contents of the pop-up information window because it made an Ajax call to the server. It used the server response to replace the contents of the `map_info` `<div>`.



But the link we just added didn’t do that. It just told the browser to link to another page. If we create an Ajax link instead of a browser link, we can get around the problem.

An Ajax link works a lot like an Ajax form. When you click on an Ajax link, it doesn’t tell the browser to go to a different page, instead it generates an Ajax request to the server and uses the response to update part of the page. If this sounds familiar, it’s because Ajax links are almost identical to the Ajax buttons we used earlier on to refresh the seating list at Coconut Airways.

To convert the link into an Ajax link, we have to change this:

```
<p><%= link_to "Edit", edit_incident_url(incident) %></p>
```

to this:

```
<p><%= link_to_remote "Edit", :update => "map_info",
                      :url=>edit_incident_url(incident) %></p>
```

This is the part of the page we want
 the link to update.

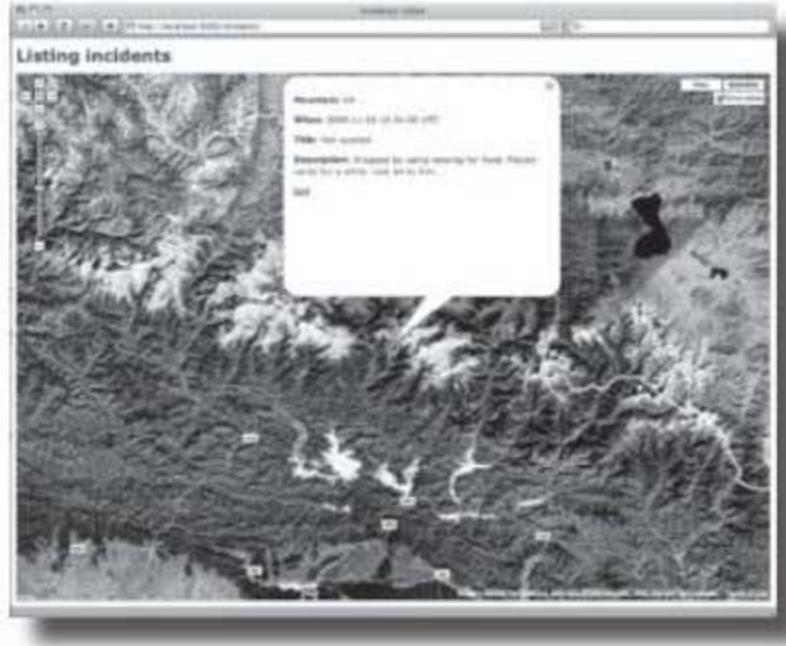
This is the URL that will generate the HTML
 for the update.

The link should now generate an edit form from the server and display it in the pop-up window. Let’s see how it works now.

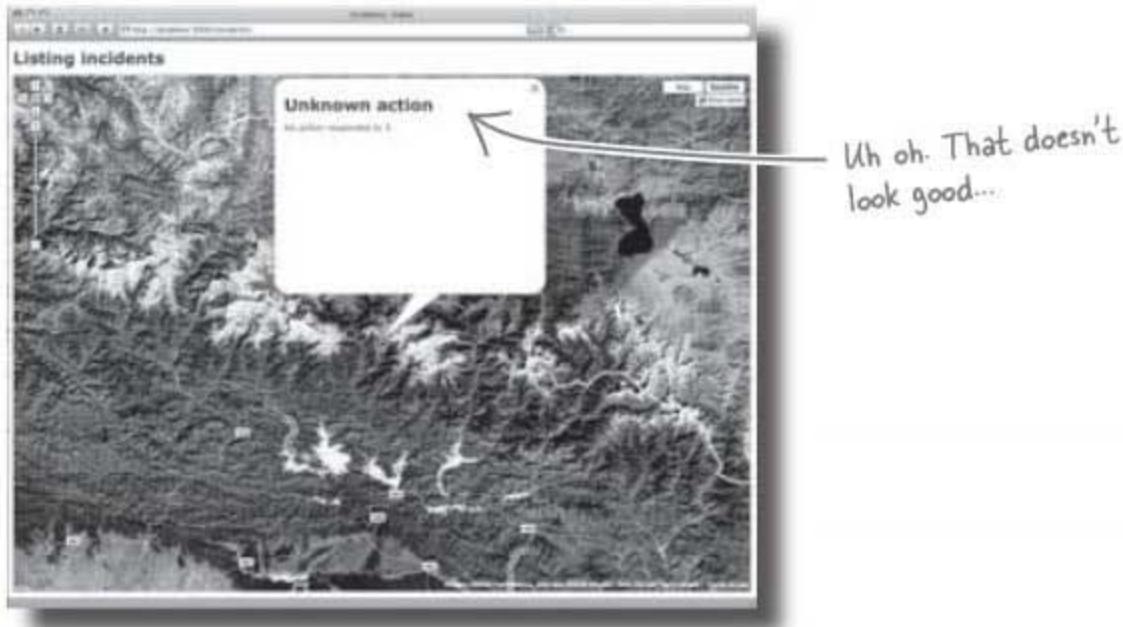


Test Drive

When we click on an incident, the information window looks exactly the same as before.



The link looks the same, but remember that behind the scenes, it's no longer a simple link. Instead there's a whole lot of JavaScript mojo going on, waiting to generate an Ajax request when the link is clicked. So what happens when we click it?



Instead of displaying the edit form, we get this weird “Unknown action” error. So what the heck happened?

We need to dig a little deeper into the routes...

We're using the wrong route!

When Rails receives the Ajax request from the link, the Ajax link sends out a request correctly to:

`http://localhost:3000/incidents/5/edit`

Instead of matching the request to the `edit_incident` route, it matches to one of the default routes:

			/incidents/news.xml	
incidents		GET	/incidents	<code>(:controller=>"incidents", :action=>"news")</code>
formatted_incidents		GET	/incidents.:format	<code>(:controller=>"incidents", :action=>"index")</code>
		POST	/incidents	<code>(:controller=>"incidents", :action=>"index")</code>
		POST	/incidents.:format	<code>(:controller=>"incidents", :action=>"create")</code>
new_incident		GET	/incidents/new	<code>(:controller=>"incidents", :action=>"new")</code>
formatted_new_incident		GET	/incidents/new.:format	<code>(:controller=>"incidents", :action=>"new")</code>
edit_incident		GET	/incidents/:id/edit	<code>(:controller=>"incidents", :action=>"edit")</code>
formatted_edit_incident		GET	/incidents/:id/edit.:format	<code>(:controller=>"incidents", :action=>"edit")</code>
incident		GET	/incidents/:id	<code>(:controller=>"incidents", :action=>"show")</code>
formatted_incident		GET	/incidents/:id.:format	<code>(:controller=>"incidents", :action=>"show")</code>
		PUT	/incidents/:id	<code>(:controller=>"incidents", :action=>"update")</code>
		PUT	/incidents/:id.:format	<code>(:controller=>"incidents", :action=>"update")</code>
		DELETE	/incidents/:id	<code>(:controller=>"incidents", :action=>"destroy")</code>
				<code>(:controller/:action/:id)</code>

Routing matches it to this route here,
and not the `edit_incident` route
further up.

Rails tries to match it to the default route near the bottom, and it sets the `:action` parameter to '5' and the `:id` parameter to 'edit'. There's no action called '5', so it fails.

But how can that be? Our URL (`http://localhost:3000/incidents/5/edit`) is the same path format as the `edit_incident` route (`/incidents/:id/edit`). So why didn't it match? After all, the link worked fine before we converted it to Ajax.



Look at the list of routes again. The original link and the Ajax link are both going to the same URL. Why do you think the Ajax link was matched to the wrong route?

The HTTP method affects the route that's chosen

There's one column in the routes that we've not really looked at:

Look what's here...

incidents	GET	/incidents/news.xml	(:controller=>"incidents", :action=>"news")
formatted_incidents	GET	/incidents.:format	(:controller=>"incidents", :action=>"index")
	POST	/incidents	(:controller=>"incidents", :action=>"index")
	POST	/incidents.:format	(:controller=>"incidents", :action=>"create")
	GET	/incidents/new	(:controller=>"incidents", :action=>"create")
new_incident	GET	/incidents/new.:format	(:controller=>"incidents", :action=>"new")
formatted_new_incident	GET	/incidents/:id/edit	(:controller=>"incidents", :action=>"edit")
edit_incident	GET	/incidents/:id/edit.:format	(:controller=>"incidents", :action=>"edit")
formatted_edit_incident	GET	/incidents/:id	(:controller=>"incidents", :action=>"show")
incident	GET	/incidents/:id.:format	(:controller=>"incidents", :action=>"show")
formatted_incident	PUT	/incidents/:id	(:controller=>"incidents", :action=>"update")
	PUT	/incidents/:id.:format	(:controller=>"incidents", :action=>"update")
	DELETE	/incidents/:id	(:controller=>"incidents", :action=>"destroy")
		/:controller/:action/:id	

So what are those GET, POST, PUT and DELETE words about?

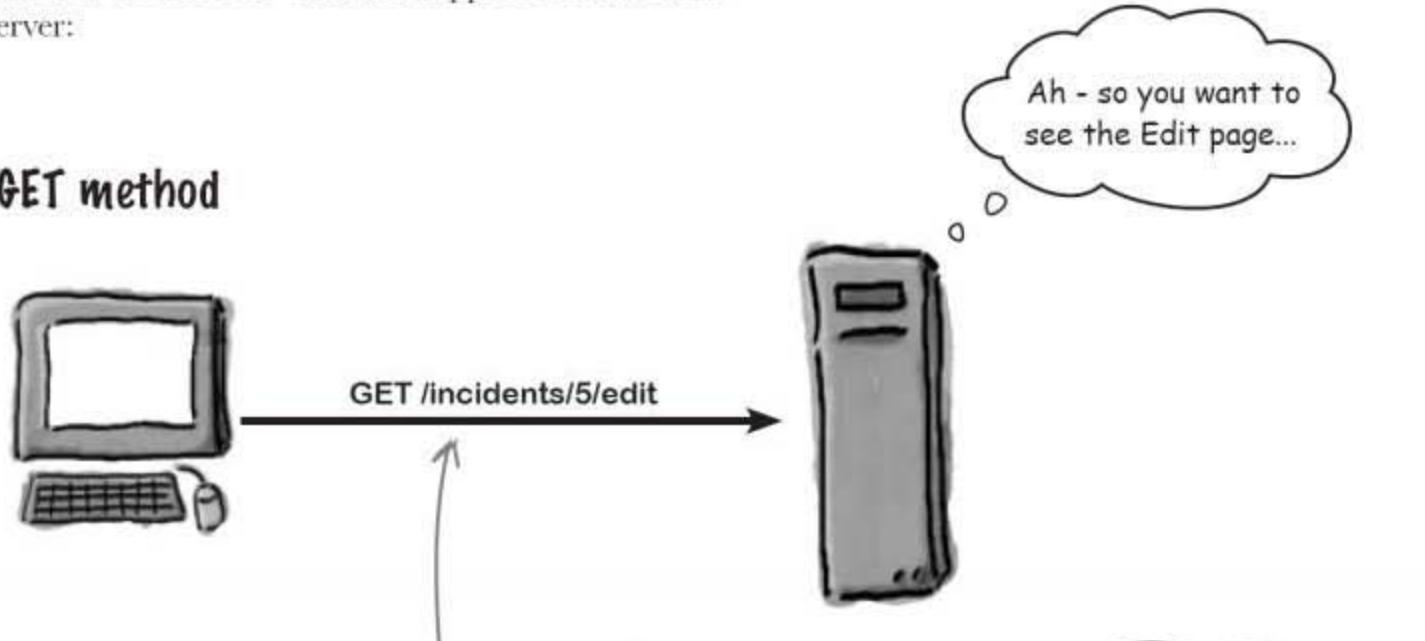
They are the **HTTP methods**—also called the **HTTP verbs**. Every request uses a particular HTTP method, and Rails uses the method as well as the path to decide *which* route to use.

But what exactly are they?

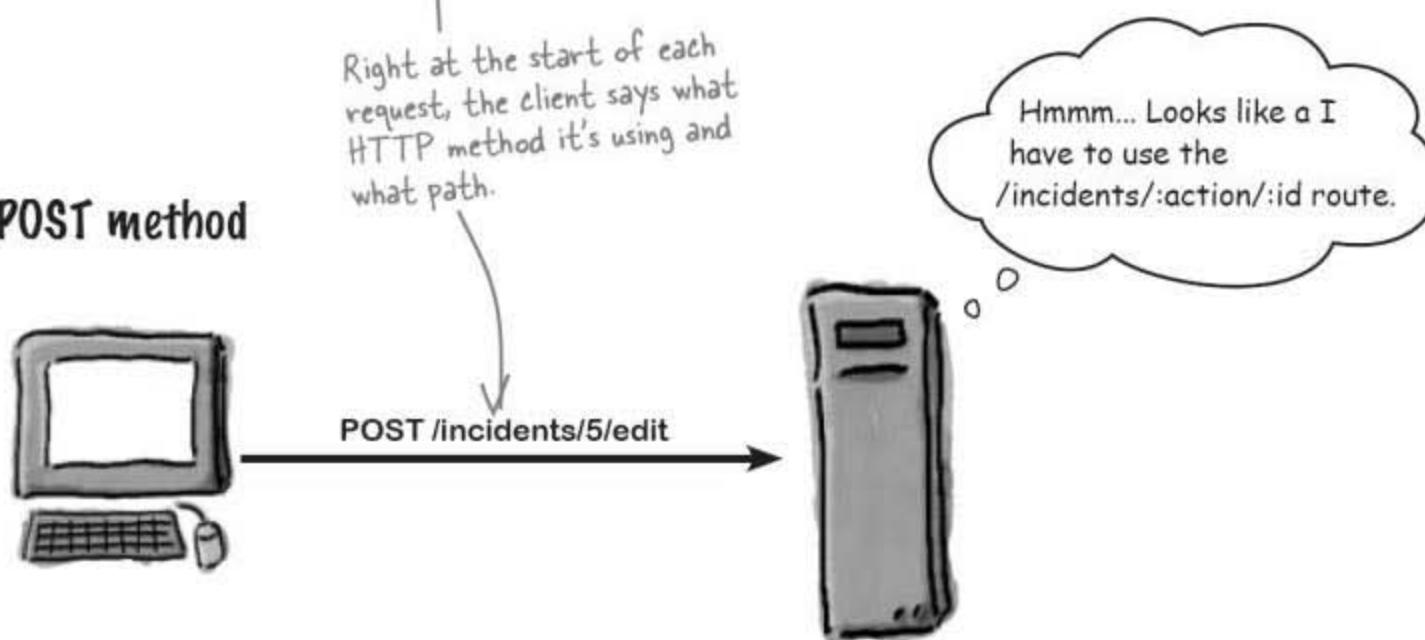
So what's an HTTP method?

Despite the name, HTTP methods are really nothing like the Ruby methods you find in, say, a controller. Instead, an HTTP method is mentioned in the low-level HTTP-talk that happens when a client contacts the server:

With the GET method



With the POST method



So why did the two versions of the link do different things? Well - ordinary HTML hyperlinks send **GET** requests to the server. But, by default, Ajax links send **POST** requests.

So to make the link work, we *also* need to tell the link what HTTP method to use like this:

```
<p><%= link_to_remote "Edit", :update => "map_info",
  :url=>edit_incident_url(incident), :method=>'get' %></p>
```

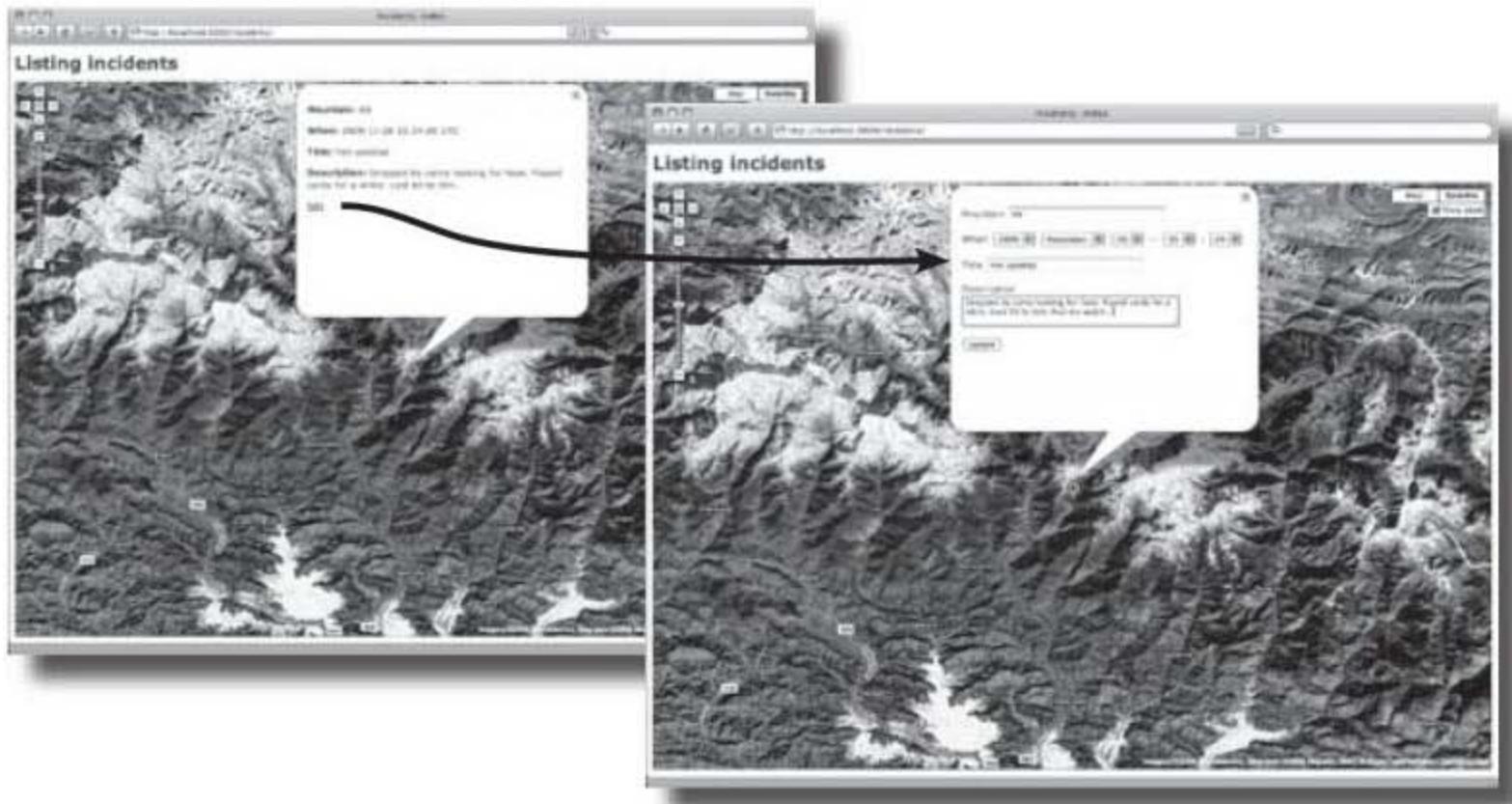
(one more) test drive



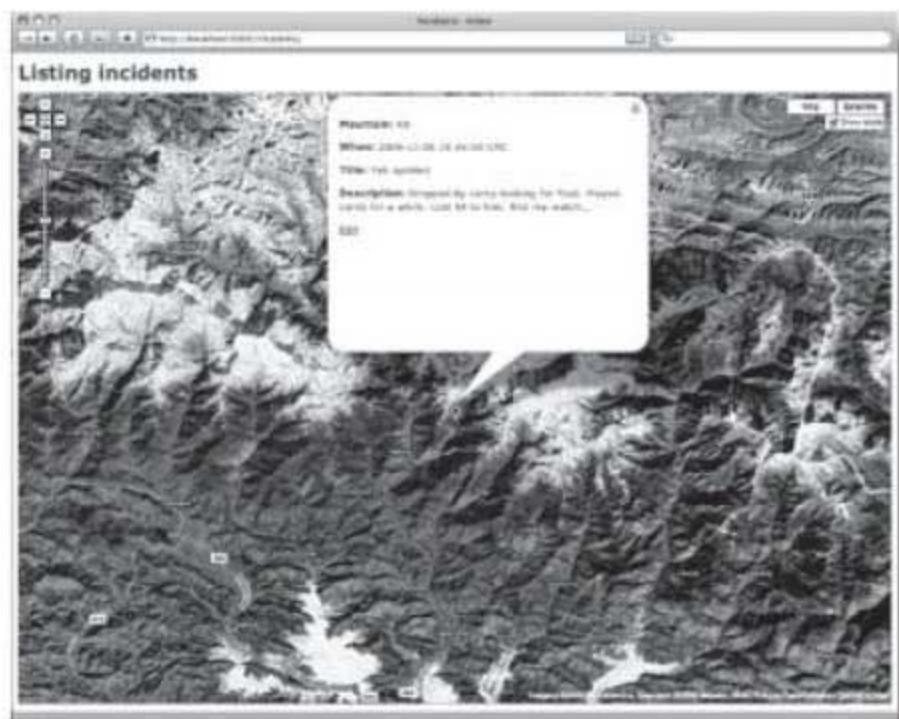
Test DRIVE

It works!

When we click on an incident link, we see the information displayed with an “Edit” link. When we click on the link, it creates an Ajax request for the edit form, which is used to replace the contents of the pop-up.



And what about the form? Well that works pretty like the “new” form did. It updates the incident and then redisplays it:



there are no
Dumb Questions

Q: Is it really that bad to use strings as paths?

A: Strings will work, but they will be harder to reader and more prone to errors than using the helpers.

Q: Why more prone to errors?

A: If you mis-type the name of a route helper, Rails will create an error and tell you. If you mis-type a path in a string, the system will either not report an error, or report some other error caused by the bad path.

Q: Why does link_to_remote create a POST request, but link_to just creates a GET?

A: link_to creates a simple HTML hyperlink. Browsers always use GET for simple hyperlinks. But link_to_remote creates an Ajax request and Ajax requests are always submitted as POSTs by default.

Q: Why does HTTP even bother having GET and POST? What good do they do?

A: GET requests are designed to be repeatable. So it shouldn't matter how many times you make the same GET request. GETs are commonly used for request that just read information. But POST requests are used for requests that might change the data on the server each time, so they're normally used for requests that update the database.

Q: So what about PUT and DELETE?

A: PUT is used for requests that will create new records in the database. And DELETE is used for database deletes.

Q: Is that true for all web applications?

A: It's true for Rails apps. Using the correct HTTP method is very important part of RESTful design.

Q: So is this how form_for is able to use the same code to generate forms that can update or insert?

A: Yes. If the object has already been saved, then form_for generates a form that will use the POST action. If the object is new, then it will generate a form that uses PUT.

Q: Someone told me that browsers can't use PUT and DELETE. Is that true?

A: Very few browsers support PUT and DELETE. So to make sure that things still work, Rails adds another hidden field called "_method" which stores the name of the HTTP action. If a request is received with _method="PUT", Rails will treat it as a PUT request, even if it was actually submitted with a POST.

Q: But what is RESTful design?

A: It's a way of designing web applications that tries to stay truer to the original design of the web. You can find out more about it at <http://tinyurl.com/28nguu>.

it's a contest!

Head First Climbers needs you!

The mountaineers are loving the application. But we think you can do a better job.

It's time to lay your thing down and seriously pimp this application. Add more details, add more widgets, add more eye candy. Here are some ideas:

They can create, they can read and they can update the incidents. But what - no delete??? How about fixing that?

How about animating the incidents from the expedition?

How about... something else?

How about mashing up the mash-up with another Web 2.0 application? Why can't we Twitter straight from the top of K2?

Why can't people post extra files? Photos, links, videos, commentaries?

How about connecting the incidents together with some sort of expedition object?

How about letting people drag the points around on the map? (You may need to learn a little of the Google Maps API for this one. See <http://tinyurl.com/2bfbm2>)

Build your best version of the Head First Climbers app, then submit your URL in the Head First Labs "Head First Rails" forum. You stand the chance of winning a bunch of O'Reilly goodness and the World Wide Fame of being featured on Head First Labs!

Visit us here for details on how to enter the contest.

The screenshot shows the Head First Labs website interface. At the top, there's a navigation bar with the O'REILLY logo and the text "Brain Friendly Guides from O'Reilly Media, Inc.". Below the navigation, the main title "Head First Labs" is displayed, with a brain icon to its left. A circular arrow graphic is positioned between the brain icon and the title. To the right of the title is a portrait of a man. The menu bar includes links for "Home", "Books", "Forums", "Blog", "About", and "write for us". On the left side, there are three sidebar items: "Algebra and Rails now available", "Wireside Chat with Rebecca", and "Call for technical review". The central content area features a "Forum Main Page" with links to "Book News, Info, and Discussion", "Polls and Surveys", "Head First Ajax", "Head First C#", "Head First Design Patterns", and "HEAD FIRST HTML WITH CSS & XHTML". On the right side, there are links for "Search Head First Labs O'Reilly.com", "Search Tips", "Subscribe to our RSS FEED", and "FOLLOW US ON TWITTER".



Tools for your Rails Toolbox

You've got Chapter 9 under your belt, and now you've added the ability to add more advanced Rails functionality to your web apps.

Rails Tools

`rake routes` displays the routes for the application
`<route name>.path(object)` returns the path for the given named path, using the id from the given object

`edit_<model_name>.path(object)` returns the path to the editor for the object

`new_<model_name>.path` returns the path to the new editor

Changing `_path` to `_url` returns a full URL instead of just the local path

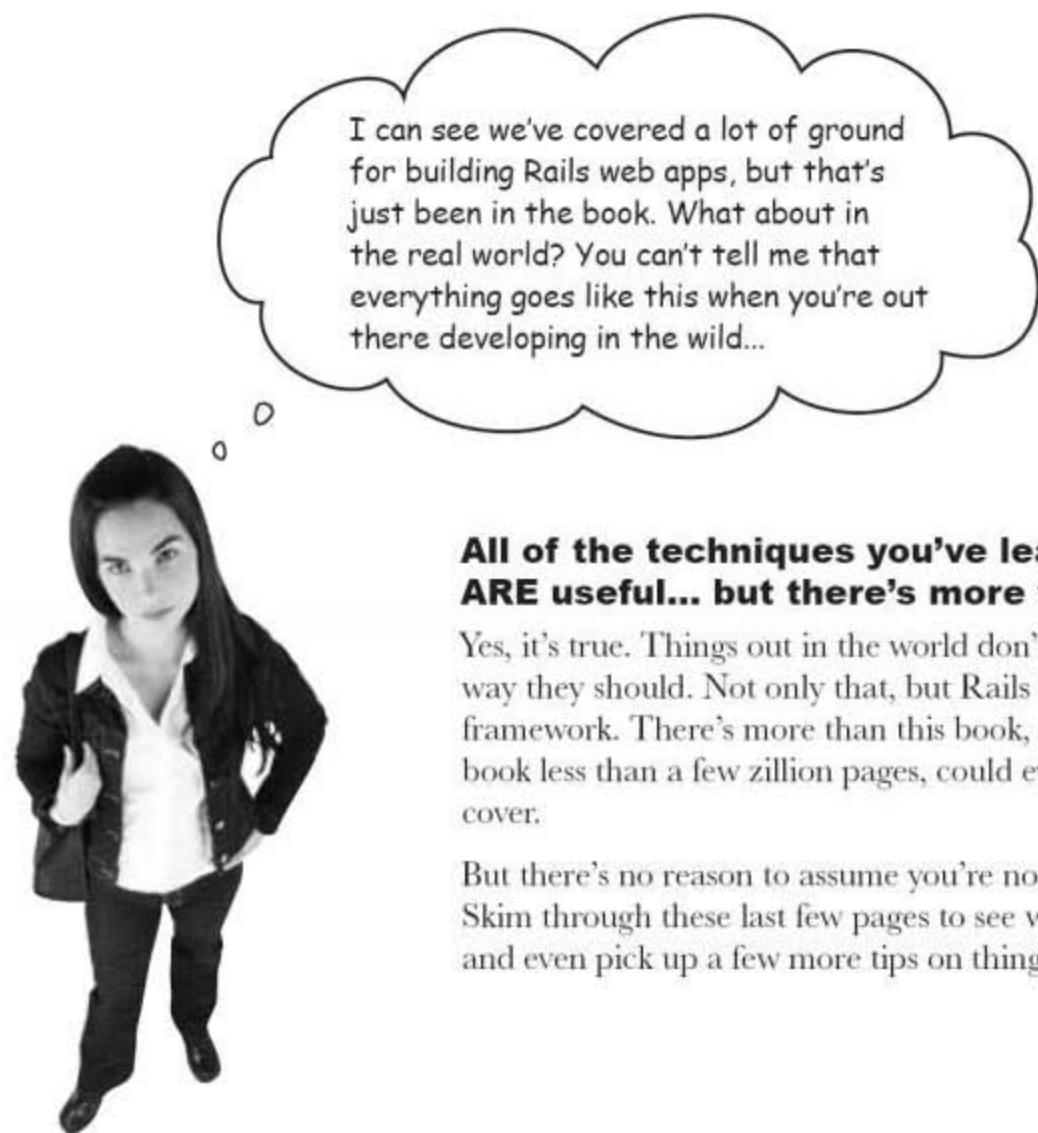
10 real-world applications

Rails in the real world



You've learned a lot about Ruby on Rails.

But to apply your knowledge to **the real world**, there are a number of things you need to think about. How do you connect your application to **another database**? How do you **test** Rails apps? How do you make the most out the Rails and the **Ruby language**? And where do you find out the latest on **what's happening** with Rails? Keep reading, and we'll put you on the inside track that will take your development skills to the next level.



I can see we've covered a lot of ground for building Rails web apps, but that's just been in the book. What about in the real world? You can't tell me that everything goes like this when you're out there developing in the wild...

**All of the techniques you've learned so far
ARE useful... but there's more to learn.**

Yes, it's true. Things out in the world don't always go the way they should. Not only that, but Rails is a pretty big framework. There's more than this book, or any other book less than a few zillion pages, could ever hope to cover.

But there's no reason to assume you're not prepared! Skim through these last few pages to see what you know, and even pick up a few more tips on things you don't.



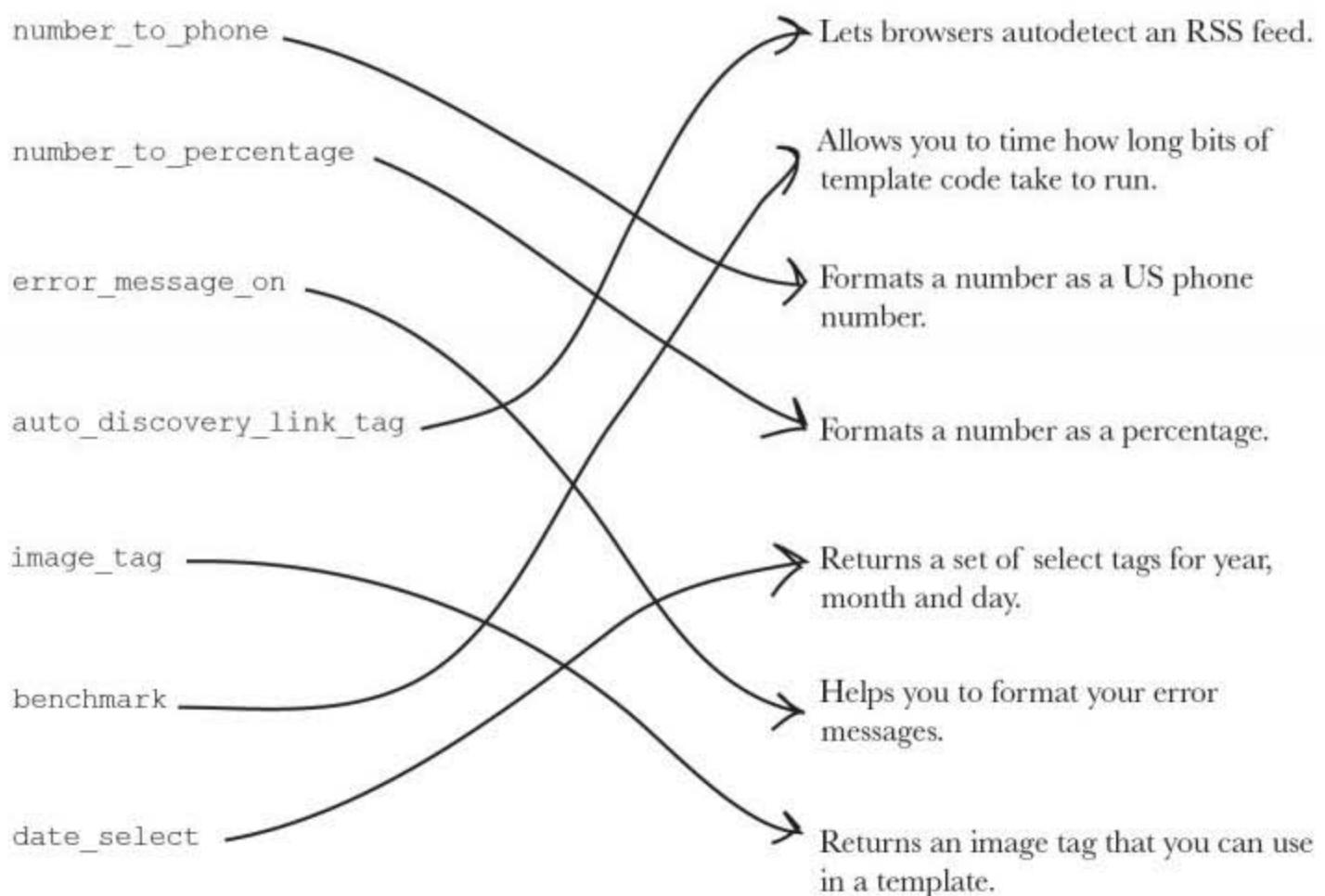
WHAT'S MY PURPOSE?

We only covered a handful of the many helpers that are available in Rails, but there are plenty more to choose from. See if you can match each of the helpers below to what it actually does.

<code>number_to_phone</code>	Lets browsers autodetect an RSS feed.
<code>number_to_percentage</code>	Allows you to time how long bits of template code take to run.
<code>error_message_on</code>	Formats a number as a US phone number.
<code>auto_discovery_link_tag</code>	Formats a number as a percentage.
<code>image_tag</code>	Returns a set of select tags for year, month and day.
<code>benchmark</code>	Helps you to format your error messages.
<code>date_select</code>	Returns an image tag that you can use in a template.

WHAT'S MY PURPOSE? SOLUTION

We only covered a handful of the many helpers that are available in Rails, but there are plenty more to choose from. See if you can match each of the helpers below to what it actually does.

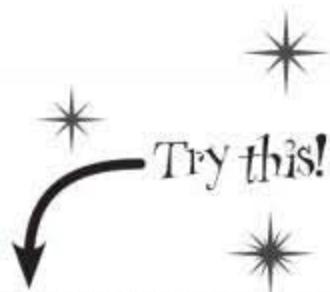


Geek Bits

To find out more about the helpers that are available in the current version of Rails see <http://tinyurl.com/railshelpers>

Look! It's a big Ruby "Try this" page

Did you notice how little Ruby you had to know in order to develop cool Rails web apps? Even so, knowing a bit more Ruby can sometimes be useful. Here are some sample bits of Ruby you might want to experiment with. Just type them in and see what happens...



Read the lines of a file into an array called "a"	Create a string with 50 ==-signs
<code>a=File.readlines("filename.txt")</code>	<code>"==" * 50</code>
Sort an array	Get an array of words from a string
<code>a.sort</code>	<code>"to be or not to be".split</code>
Reverse a string	Return the class (datatype) of an object
<code>"Bass ackwards".reverse!</code>	<code>o.class</code>
Return a copy of a string that is reversed	Round a Float to the nearest whole number
<code>"Bass ackwards".reverse</code>	<code>(3.14).round</code>
Does the String s contain "Waldo"?	Find a square-root
<code>/Waldo/ =~ s</code>	<code>Math.sqrt(16)</code>
Is the String a zip code?	Delete a file
<code>/^\d{5}\$/ =~ "90210"</code>	<code>File.delete("filename.txt")</code>
Converting a string to a Fixnum	The current date and time
<code>"12345".to_i</code>	<code>Time.now</code>
Convert a String to a float	The current year
<code>"3.1415".to_f</code>	<code>Time.now.year</code>
Convert an object to a string	Give a method another name
<code>a.to_s</code>	<code>alias my_method</code>
Pretty-print the contents of an array	Return an array of files in a directory
<code>[1, 2, 3, 4, 5].inspect</code>	<code>Dir.entries("directoryName")</code>
Pretty-print the contents of an array	
<code>({:a=>1, :b=>"c"}).inspect</code>	

Web apps need testing too

Automated testing is one of the most important parts of software development, and yet until now, we haven't mentioned it. So why not? Testing a piece of software relies on a thorough understanding of the tools you are using, and designing tests can be far more difficult (and enjoyable) than writing the code itself. That's why this book has concentrated on giving you the skills to understand how Rails works and thinks. Only once you understand that can you start to think about how you will test applications.

But that doesn't mean that you do testing long after you have finished writing a system. Far from it. The best tests are written **before** you write your main code.

Rails comes with a ton of testing support, far more than almost any other framework. Every application contains a set of test scripts (in the test directory), and every time you generate scaffolding, Rails also generates a set of standard tests for you. So, if you go into the folder where you wrote the scaffolded tickets application in chapter 1 and type:



```
File Edit Window Help TestsAreGood
> rake test
```

For more information, see
"Extreme Programming Explained,"
ISBN-13: 978-0321278654.

Rails will run a whole suite of tests for you. Does that mean that you never need to write your own? Actually, no. A lot of your time as a Rails developer will be spent writing and maintaining tests.

So what kinds of tests are available?

There are three main types of test:

Unit tests

Rails sometimes uses terms that are not quite the same as you'll find elsewhere. In most systems, a "unit test" is a test of any standalone piece of code. But Rails is more specific than that. In Rails, a "unit test" means a test of a model class. Rails creates standard unit tests for you in the `test/unit` directory whenever you generate a model either directly, or via scaffolding.

Functional tests

What Rails means by a functional test is a test of an individual controller. Functional tests check that if you make a particular kind of request, you get a particular kind of response. You can find functional tests in `test/functional`. Again, Rails creates functional tests whenever you generate controllers, either directly or via scaffolding.

Integration tests

This are high-level tests that read a little like the sort of test-scripts that manual testers use. Integration tests test the system as a whole. So they automate the set of actions that a typical user might perform on your system. There is a special folder for integration tests (`test/integration`), but they are not generated automatically. They are very specific to what you need your system to do and so you need to create them yourself.

Finally, the test data for all of these tests is stored in data files in `test/fixtures`. A fixture is just a fancy name for a set of test data. Rails will store the data from the fixtures in a special, separate test database to make sure that your development (or live data) does not get mixed up with data required for your tests.

For more information on testing in rails see <http://tinyurl.com/railstest>

Going live

Your application won't stay in development all its life, and at some point, you'll need to send it live. So what do you do then? It's not a good idea if your application has code in it that specifies the location of the database and so on. After all, you don't want the live and test versions of the code to do different things. You just want them to use different databases.

That's why Rails lets you specify ***environments***. An environment sets the location and type of your database as well as a few other settings, such as how log messages will be recorded.

By default, an application is set up to use three different environments:

➊ **development**

This is the environment that is used by default. It's the environment that we have been using all the way through the book. The development environment uses the db/development.sqlite3 database.

➋ **test**

This environment is set aside for the use of the automated testing scripts.

➌ **production**

This is your live environment.

But how do you switch between environments?

When you start the server, Rails looks for an environment variable called RAILS_ENV. This will tell it which environment to run. If you want to switch from the development environment to the production environment, you need to set the RAILS_ENV variable:

The image shows two side-by-side terminal windows. Both windows have a menu bar at the top with 'File', 'Edit', 'Window', and 'Help'. The left terminal window contains the command: > `set RAILS_ENV=production`
> `ruby script/server`. A callout bubble points to the first line with the text: 'This is what you need to type in if you're using Windows...'. The right terminal window contains the command: > `RAILS_ENV=production`
> `ruby script/server`. A callout bubble points to the first line with the text: '...and this is what you need for Linux, Unix, or a Mac.'

So how do you change the database?

If you look at the config/database.yml file, you will find the database details for each environment.

For example, your original **SQLite** production environment might be set like this:

```
development:  
  adapter: sqlite3  
  database: db/development.sqlite3  
  timeout: 5000
```



But if you wanted to change the production environment to use an **Oracle** database, it would probably look something like this:

```
development:  
  adapter: oracle  
  host: mydatabaseserver  
  username: scott  
  password: tiger
```



Or, if you want the live environment to use a **MySQL** database hosted on the same machine as Rails, you would change it to:

```
production:  
  adapter: mysql  
  database: my_db_name  
  username: root  
  password:  
  host: localhost
```



What's REST?

We've heard a lot in this book about REST. How Rails uses REST. How REST design is the new guiding principle of Rails. How if you use REST, your teeth will be brighter, your life will be happier, and all will be goodness and sunshine with the world.

Let's start with the basics. **REST** stands for **Representational State Transfer**, and it's a way of structuring how people work with computer systems. Obviously, the most important computer system around is the World Wide Web, and it's significant that the guy who came up with REST—Roy Fielding—was also one of the authors of the HTTP spec.

So why does it matter that the HTTP guy is also the REST guy? Well, because RESTful design really means designing your applications to work the way the web was originally meant to look.

So what are the main principles of REST?

1 All the important stuff is a resource.

What this means is that all the important data in your system is separately identifiable things that you can do stuff to. If you have a web site that sells donuts, then the donuts are resources.

2 Every resource has a proper name.

On the web, this means that everything has a URL.

3 You can perform a standard set of operations on the resources.

The CRUD (Create, Read, Update and Delete) operations are a fairly typical set of operations, and they are supported by Rails and the web.

4 The client and server talk to each other statelessly

This means that when a client (like a browser) talks to a RESTful application, it is as a distinct set of requests and responses. The client talks to the server. The server answers. Then the conversation ends.

All of these things seem pretty obvious, don't they? They are a pretty good description of how the web works.

And they were a good description of how the web worked. Before it went wrong...

The web application that went astray

Imagine there was a web application that allowed somebody to sell spare parts for rockets:

They might create a system that displays a rocket component like this:

`http://www.boosters-r-us.com/airframes/472`

The web site is about rocket components and this is a URL that can be used as the name of the component.

But look at what happens when someone updates the details of the component, like—say—it's price. The web form in the system submits the details to this URL:

`http://www.boosters-r-us.com/airframes/472/update`

The trouble with this is it's not RESTful. Why? Well URLs in a RESTful system are supposed to be names of resources. And this second URL doesn't represent a **thing** it represents an **action**.

Why is not being RESTful a problem?

Have you ever revisited a URL in your browser and been asked if you want to **repost data**? The browser history is just a list of URLs and that should mean that it is a list of names. But if a web application uses URLs that represent activities then when you go back through your history, the browser won't know whether you intend to redo the actions.

HTTP verbs are the only verbs you need

But how do we get around this problem? The third principle of REST says that there should a well defined list of actions available. A RESTful application uses HTTP methods to define the activity and leaves the URL to name the resource:

These are the used in the RESTful routes in a scaffolded application.

CRUD operation	HTTP method	URL
Create a component	POST	<code>http://www.boosters-r-us.com/airframes/</code>
Read a component	GET	<code>http://www.boosters-r-us.com/airframes/472</code>
Update a component	PUT	<code>http://www.boosters-r-us.com/airframes/472</code>
Delete a component	DELETE	<code>http://www.boosters-r-us.com/airframes/472</code>

yes, there's even more

Living on the Edge

Rails is changing all the time, but how will you stay up with all the latest and greatest features that have been added? One way is to run on the **Edge**.

Rails make it really easy to run on the very latest build of Rails (called Edge Rails) by downloading and installing the latest version of the framework directly into your application.

Now in some other application frameworks, changing to the latest version of the framework would be incredible difficult. You would have go to a web browser. Download the files. Read the latest install instructions. Play with paths. Set up the configuration so that it matches your system. And so on. It would be so complicated that very few people would bother.

But lots of people run on Edge Rails. Why? Well it's not just because they want to use the latest features. Rails is in furious development all the time, and you may find that even a small upgrade might break some piece of your application. So to make sure that their apps will keep working as Rails evolves, they don't wait for weeks or months to upgrade, some of them update to the Edge every day.

But how do you install Edge Rails in your application? It's simple. You do this:



```
File Edit Window Help LifeOnTheEdge
> rake rails:freeze:edge
```

That single command is all you need. The rake tool will connect to the Rails development servers and download the latest version of the rails scripts and install them in the vendor/plugins directory of your application. Every time you start the Rails server, the code in the vendor directory is used before going to the main Rails install on the machine. That means that Edge Rails will be used for that single application.

Life can be pretty hairy on the Edge. But sometimes it's better to find version compatibility issues, one at a time...

Getting more information

Even though Rails allows you to create fully-functional web applications fast and safely, there's no doubt that to really master Rails can take a really long time. There's simply so much of it.

This means you need a pretty good reference. And the best references are online. Rails is changing all the time. Every day new things are checked into the Rails source code, and the only way to keep up with it is to go online. Here are some great web sites to get you started:

➊ **<http://www.rubyonrails.org/>**

The home of Rails itself. It's not only the place for software but also presentations, screencasts and links for further reading.

➋ **<http://wiki.rubyonrails.org/rails>**

This gives detailed instructions on installation and troubleshooting, as well as providing links to further online resources.

➌ **<http://ryandaigle.com/>**

Ryan's blog contains a wealth of information on the latest cool tricks you can do in Rails.

➍ **<http://www.ruby-lang.org/en/>**

The latest information on the Ruby language.

Built-in documentation

As well as a plethora of online material, your Ruby on Rails contains most of the things you'll need, right out of the box. The two most important command line tools are:

```
ri <something>
```

Where <something> is a Ruby class that you need to know more about. For example, “ri Array” will tell you all about the Array class.

Another source of useful information is through the gem server. Gem is the most commonly used package management tool for Ruby and it is probably the command you used to install Rails. Gem has a built in server that provides the same kind of API documentation you find at the <http://api.rubyonrails.org> site. To start it type:

```
gem server
```

and then open a browser at:

```
http://localhost:8808/
```

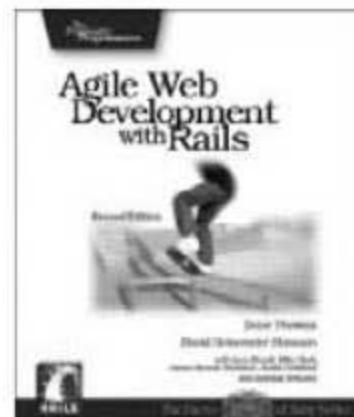
A little light reading...

Of course, here at Head First Labs, we're book people. And it's doesn't matter how great the online material is, there's nothing to beat having an actual real book with pages and everything to help you absorb the material. Now that you've got to the end of this book, and your brain is feeling fit and full of new Ruby on Rails expertise, you might want to take the chance to try out these other tripendericular tomes:



The Ruby Way

We love this book at Head First. It's a big, meaty work, but it's beautifully written by Hal Fulton. This is a book that will take you on a deep journey into the Ruby language. The great thing is that it doesn't just give you the details of the language, but it also explains the philosophy behind the language design. Many of the things that make Rails so great come directly from Ruby. And many of those things are mentioned in this book.



Agile Web Development with Rails

This is a great book to take you further into Rails development. An interesting thing about it is that it is written like a development project. So a few months before a new version is released, a beta version is released online for people to try out and comment on.

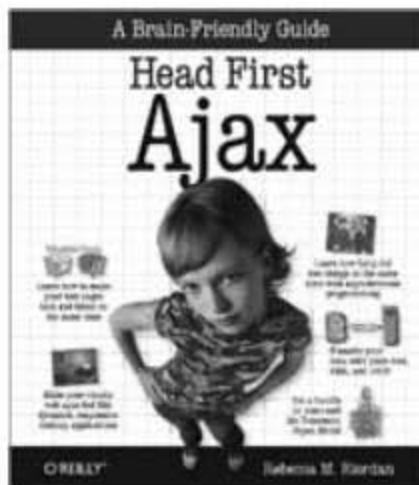


Rails Cookbook

Once you get up and running with Rails, you will probably need to solve the same kinds of problems that many, many other people have had to deal with before you. Fear not! *Rails Cookbook* gives you a delicious set of pre-written pieces of code to get you through your difficulties.

Head First books on related topics

Now, as well as books on Ruby and Rails, you might find it useful to read up on the related topics. And what's the best way to bootstrap your brain in a new subject? With Head First books, of course!



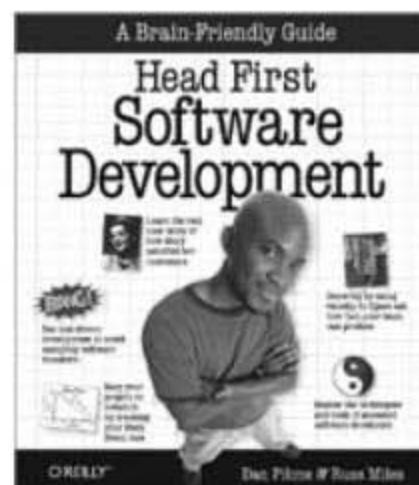
Head First Ajax

Rails comes with a ton of built in support for Ajax development, but to really make the most out of it, you need to get to grips with how Ajax really works. And what better way than with *Head First Ajax*?



Head First JavaScript

Ajax is built on JavaScript, and if you know in detail how to hack JavaScript, you'll really make your application sing. *Head First JavaScript* is a great way into the language.



Head First Software Development

In this book, you've learned about how to program in the Ruby on Rails framework. If you want to move from *programming* to *development*, then pick up this book. It will teach you how the real pros do it, from how to run the planning in your project, to automated testing and continuous integration.

rails toolbox



Tools for your Rails Toolbox

You've got Chapter 10 under your belt, and now you've added some real world things you need to think about.

Rails Tools

Rails contains a bunch of extra helpers that you can use in your applications

The Ruby language is pretty powerful. While you can create cool web apps without much Ruby knowledge, knowing a bit more Ruby is useful.

`rake test` – runs the automated tests in your application

`rake rails:freeze:edge` – installs the latest version of Rails into your application

`RAILS_ENV=production` – runs your system against a *live* database

`ri <something>` – gives you information about the methods of a Ruby object

`gem server` – starts the Ruby documentation server

Your brain – this is most powerful development tool you have

Leaving town...



It's been great having you here in Railsville!

We're sad to see you leave, but there's nothing like taking what you've learned and putting it to use. You're just beginning your Rails journey, and we've put you in the driving seat. We're dying to hear how things go, so **drop us a line** at the Head First Labs web site, www.headfirstlabs.com, and let us know how Rails is paying off for YOU!