

Building

Android Apps

with HTML, CSS, and JavaScript

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Jonathan Stark

Building Android Apps with HTML, CSS, and JavaScript

If you know HTML, CSS, and JavaScript, you already have the tools you need to develop Android applications. This hands-on book shows you how to use these open source web standards to design and build apps that can be adapted for any Android device—without having to learn Java.

You'll learn how to create an Android-friendly web app on the platform of your choice, and then convert it to a native Android app with the free PhoneGap framework. Discover why device-agnostic mobile apps are the wave of the future, and start building apps that offer greater flexibility and a broader reach.

TOPICS INCLUDE:

- Learn the basics for making a web page look great on the Android web browser
- Convert a website into a web application, complete with progress indicators and more
- Add animation with jQTouch to make your web app look and feel like a native Android app
- Take advantage of client-side data storage with apps that run even when the Android device is offline
- Use PhoneGap to hook into advanced Android features—including the accelerometer, geolocation, and alerts
- Test and debug your app on the Web under load with real users, and then submit the finished product to the Android Market

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Previous programming experience is recommended.

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The mobile web is increasingly important: mobile devices are eclipsing traditional desktop access to the internet. Jonathan's books provide the quickest path for getting a mobile web app off the ground and into an app store. They've been the great gateway drug for the PhoneGap project but, more importantly, are demonstrating the power, utility, and simplicity of modern mobile web development.

—Brian LeRoux
Nitobi Software

Jonathan Stark is a mobile application consultant and an expert on publishing desktop data to the Web. He is the author of three books on web application programming.

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Jonathan Stark

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by Jonathan Stark

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To Erica & Cooper

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Preface

Thanks to mobile phones, we have moved from virtually no one having access to information to virtually everyone having access to the vast resources of the Web. This is arguably the most important achievement of our generation. Despite its overarching importance, mobile computing is in its infancy. Technical, financial, and political forces have created platform fragmentation like never before, and it's going to get worse before it gets better.

Developers who need to engage large and diverse groups of people are faced with a seemingly impossible challenge: "How do we implement our mobile vision in a way that is feasible, affordable, and reaches the greatest number of participants?" In many cases, the answer is web technologies. The combination of advances in HTML5 and mobile devices has created an environment in which even novice developers can build mobile apps that improve people's lives on a global scale.

Google's Android operating system is a compelling addition to the mobile computing space. In true Google fashion, the platform is open, free, and highly interoperable. The development tools are full-featured and powerful, if a bit geeky, and run on a variety of platforms.

Carriers and handset manufacturers have jumped on the Android bandwagon. The market is beginning to flood with Android devices of all shapes and sizes. This is a double-edged sword for developers. On one hand, more devices means a bigger market. On the other hand, more devices means more fragmentation. As with the fragmentation in the general mobile market, fragmentation on Android can often be addressed by building apps with HTML, CSS, and JavaScript.

I'm the first to admit that not all apps are a good fit for development with web technologies. That said, I see a lot of apps written with native code that could have just as easily been done with HTML. When speaking to developers who aren't sure which approach to take, I say this:

If you can build your app with HTML, CSS, and JavaScript, you probably should.

Using open source, standards-based web technologies gives you the greatest flexibility, the broadest reach, and the lowest cost. You can easily release it as a web app, then debug and test it under load with thousands of real users. Once you are ready to rock, you can use PhoneGap to convert your web app to a native Android app, add a few device-specific features if you like, and submit to the Android Market—or offer it for download from your website. Sounds good, right?

Who Should Read This Book

I'm going to assume you have some basic experience reading and writing HTML, CSS, and JavaScript (jQuery in particular). [Chapter 5](#) includes some basic SQL code, so a passing familiarity with SQL syntax would be helpful but is not required.

What You Need to Use This Book

This book avoids the Android SDK wherever possible. All you need to follow along with the vast majority of examples is a text editor and the most recent version of Google Chrome (a cutting-edge web browser that's available for both Mac and Windows at <http://www.google.com/chrome>). You do need to have the Android SDK for the PhoneGap material in [Chapter 7](#), where I explain how to convert your web app into a native app that you can submit to the Android Market.

Conventions Used in This Book

The following typographical conventions are used in this book:

Italic

Indicates new terms, URLs, email addresses, filenames, and file extensions.

Constant width

Used for program listings, as well as within paragraphs to refer to program elements such as variable or function names, databases, data types, environment variables, statements, and keywords.

Constant width bold

Shows commands or other text that should be typed literally by the user.

Constant width italic

Shows text that should be replaced with user-supplied values or by values determined by context.



This icon signifies a tip, suggestion, or general note.



This icon indicates a warning or caution.

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CHAPTER 1

Getting Started

Before we dive in, I'd like to quickly establish the playing field. In this chapter, I'll define key terms, compare the pros and cons of the two most common development approaches, and give a crash course on the three core web technologies used in this book.

Web Apps Versus Native Apps

First, I'd like to define what I mean by *web app* and *native app* and consider their pros and cons.

What Is a Web App?

To me, a web app is basically a website that is specifically optimized for use on a smartphone. The site content can be anything from a standard small business brochure site to a mortgage calculator to a daily calorie tracker—the content is irrelevant. The defining characteristics of a web app are that the user interface (UI) is built with web standard technologies, it is available at a URL (public, private, or perhaps behind a login), and it is optimized for the characteristics of a mobile device. A web app is not installed on the phone, it is not available in the Android Market, and it is not written with Java.

What Is a Native App?

In contrast, native apps are installed on the Android phone, they have access to the hardware (speakers, accelerometer, camera, etc.), and they are written with Java. The defining characteristic of a native app, however, is that it's available in the Android Market—a feature that has captured the imagination of a horde of software entrepreneurs worldwide, me included.

Pros and Cons

Different applications have different requirements. Some apps are a better fit with web technologies than others. Knowing the pros and cons of each approach will help you make a better decision about which path is appropriate for your situation.

Here are the pros of native app development:

- Millions of registered credit card owners are one click away
- You can access all the cool hardware features of the device

Here are the cons of native app development:

- You have to pay to become an Android developer
- Your app will run only on Android phones
- You have to develop using Java
- The development cycle is slow (develop, compile, deploy, repeat)

Here are the pros of web app development:

- Web developers can use their current authoring tools
- You can use your current web design and development skills
- Your app will run on any device that has a web browser
- You can fix bugs in real time
- The development cycle is fast

Here are the cons of web app development:

- You cannot access the all cool hardware features of the phone
- You have to roll your own payment system if you want to charge for the app
- It can be difficult to achieve sophisticated UI effects

Which Approach Is Right for You?

Here's where it gets exciting. The always-online nature of the Android phone creates an environment in which the lines between a web app and a native app get blurry. There are even some little-known features of the Android web browser (see [Chapter 6](#)) that allow you to take a web app offline if you want. What's more, several third-party projects—of which PhoneGap is the most notable—are actively developing solutions that allow web developers to take a web app and package it as a native app for Android and other mobile platforms.

For me, this is the perfect blend. I can write in my native language, release a product as a pure web app (for Android and any other devices that have a modern browser), and use the same code base to create an enhanced native version that can access the device hardware and potentially be sold in the Android Market. This is a great way to

create a “fremium” model for your app—allow free access to the web app and charge for the more feature-rich native version.

Web Programming Crash Course

The three main technologies we will use to build web apps are HTML, CSS, and JavaScript. We’ll quickly cover each to make sure we’re all on the same page before plowing into the fancy stuff.

Introduction to HTML

When you are browsing the web, the pages you are viewing are just text documents sitting on someone else’s computer. The text in a typical web page is wrapped in HTML tags, which tell your browser about the structure of the document. With this information, the browser can decide how to display the information in a way that makes sense.

Consider the web page snippet shown in [Example 1-1](#). On the first line, the string `Hi there!` is wrapped in a pair of `h1` tags. Notice that the *open tag* and the *close tag* are slightly different: the close tag has a slash (/) as the second character, while the open tag does not have a slash.

Wrapping text in `h1` tags tells the browser that the words enclosed are a heading, which will cause it to be displayed in large bold text on its own line. There are also `h2`, `h3`, `h4`, `h5`, and `h6` heading tags. The lower the number, the more important the header, so text wrapped in an `h6` tag will be smaller (i.e., less important-looking) than text wrapped in an `h3` tag.

After the `h1` tag in [Example 1-1](#), there are two lines wrapped in `p` tags. These are called paragraph tags. Browsers will display each paragraph on its own line. If the paragraph is long enough to exceed the width of the browser window, the text will bump down and continue on the next line. In either case, a blank line will be inserted after the paragraph to separate it from the next item on the page.

Example 1-1. HTML snippet

```
<h1>Hi there!</h1>
<p>Thanks for visiting my web page.</p>
<p>I hope you like it.</p>
```

You can also put HTML tags inside other HTML tags. [Example 1-2](#) shows an unordered list (`ul`) tag that contains three list items (`li`). In a browser, this appears as a bulleted list with each item on its own line. When you have a tag or tags inside another tag, the inner tags are called *child elements*, or children, of the parent tag. So in this example, the `li` tags are children of the `ul` parent.

Example 1-2. Unordered list

```
<ul>
  <li>Pizza</li>
  <li>Beer</li>
  <li>Dogs</li>
</ul>
```

The tags covered so far are all *block tags*. The defining characteristic of block tags is that they are displayed on a line of their own, with no elements to the left or right of them. That is why the heading, paragraphs, and list items progress down the page instead of across it. The opposite of a block tag is an *inline tag*, which, as the name implies, can appear in a line. The emphasis tag (`em`) is an example of an inline tag, and it looks like this:

```
<p>I <em>really</em> hope you like it.</p>
```

The granddaddy of the inline tags—and arguably the coolest feature of HTML—is the `a` tag. The “`a`” stands for anchor, but at times I’ll also refer to it as a link or hyperlink. Text wrapped in an anchor tag is clickable, such that clicking on it causes the browser to load a new HTML page.

To tell the browser which new page to load, we have to add what’s called an *attribute* to the tag. Attributes are named values that you insert into an open tag. In an anchor tag, you use the `href` attribute to specify the location of the target page. Here’s a link to Google’s home page:

```
<a href="http://www.google.com/">Google</a>
```

That might look like a bit of a jumble if you are not used to reading HTML, but you should be able to pick out the URL for the Google home page. You’ll be seeing a lot of `a` tags and `href` attributes throughout the book, so take a minute to get your head around this if it doesn’t make sense at first glance.



There are a couple of things to keep in mind regarding attributes. Different HTML tags allow different attributes. You can add multiple attributes to an open tag by separating them with spaces. You never add attributes to a closing tag. There are hundreds of possible combinations of attributes and tags, but don’t sweat it—we only have to worry about a dozen or so in this entire book.

The HTML snippet that we’ve been looking at would normally reside in the `body` section of a complete HTML document. An HTML document is made up of two sections: the head and the body. The body is where you put all the content that you want users to see. The head contains information about the page, most of which is invisible to the user.

The body and head are always wrapped in an `html` element. [Example 1-3](#) shows the snippet in the context of a proper HTML document. For now the `head` section contains a `title` element, which tells the browser what text to display in the title bar of the window.

Example 1-3. A proper HTML document

```
<html>
  <head>
    <title>My Awesome Page</title>
  </head>
  <body>
    <h1>Hi there!</h1>
    <p>Thanks for visiting my web page.</p>
    <p>I hope you like it.</p>
    <ul>
      <li>Pizza</li>
      <li>Beer</li>
      <li>Dogs</li>
    </ul>
  </body>
</html>
```

Normally, when you are using your web browser you are viewing pages that are hosted on the Internet. However, browsers are perfectly good at displaying HTML documents that are on your local machine as well. To show you what I mean, I invite you to crack open a text editor and enter the code in [Example 1-3](#).

Picking the Right Text Editor

Some text editors are not suited for authoring HTML. In particular, you want to avoid editors that support rich text editing, like Microsoft WordPad (Windows) or TextEdit (Mac OS X). These types of editors can save their files in formats other than plain text, which will break your HTML. If you must use TextEdit, save in plain text by choosing Format→Make Plain Text. In Windows, use Notepad instead of WordPad.

If you are in the market for a good text editor, my recommendation on the Mac is [TextMate](#). There is a clone version for Windows called [E Text Editor](#).

If free is your thing, you can download [Text Wrangler](#) for Mac. For Windows, [Notepad2](#) and [Notepad++](#) are highly regarded. Linux comes with an assortment of text editors, such as vi, nano, emacs, and gedit.

When you are finished entering the code from [Example 1-3](#), save it to your desktop as `test.html` and then open it with Chrome by either dragging the file onto the Chrome application icon or opening Chrome and selecting File→Open File. Double-clicking `test.html` will work as well, but it could open in your text editor or another browser, depending on your settings.



Even if you aren't running Mac OS X, you should use Chrome when testing your Android web apps on a desktop web browser, because Chrome is the closest desktop browser to Android's mobile browser. Chrome is available for Mac and Windows from <http://google.com/chrome>.

Introduction to CSS

As you've seen, browsers render certain HTML elements with distinct styles (for example, headings are large and bold, paragraphs are followed by a blank line, and so forth). These styles are very basic and are primarily intended to help the reader understand the structure and meaning of the document.

To go beyond this simple structure-based rendering, you use Cascading Style Sheets (CSS). CSS is a stylesheet language that you use to define the visual presentation of an HTML document. You can use CSS to define simple things like the text color, size, and style (bold, italic, etc.), or complex things like page layout, gradients, opacity, and much more.

Example 1-4 shows a CSS rule that instructs the browser to display any text in the body element using the color red. In this example, `body` is the *selector* (this specifies what is affected by the rule) and the curly braces enclose the *declaration* (the rule itself). The declaration includes a set of *properties* and their *values*. In this example, `color` is the property, and `red` is the value of the `color` property.

Example 1-4. A simple CSS rule

```
body { color: red; }
```

Property names are predefined in the CSS specification, which means that you can't just make them up. Each property expects an appropriate value, and there can be lots of appropriate values and value formats for a given property.

For example, you can specify colors with predefined keywords like `red`, or by using HTML color code notation, which uses a hexadecimal notation: a hash/pound sign (#) followed by three pairs of hexadecimal digits (0–F) representing (from left to right) red, green, and blue values (red is represented as `#FF0000`). Properties that expect measurements can accept values like `10px`, `75%`, and `1em`. **Example 1-5** shows some common declarations. The color code shown for `background-color` corresponds to the CSS "gray."

Example 1-5. Some common CSS declarations

```
body {
    color: red;
    background-color: #808080;
    font-size: 12px;
    font-style: italic;
    font-weight: bold;
```

```
    font-family: Arial;
}
```

Selectors come in a variety of flavors. If you want all of your hyperlinks (the `a` element) to display in italics, add the following to your stylesheet:

```
a { font-style: italic; }
```

If you want to be more specific and only italicize the hyperlinks that are contained somewhere within an `h1` tag, add the following to your stylesheet:

```
h1 a { font-style: italic; }
```

You can also define your own custom selectors by adding `id` and/or `class` attributes to your HTML tags. Consider the following HTML snippet:

```
<h1 class="loud">Hi there!</h1>
<p>Thanks for visiting my web page.</p>
<p>I hope you like it.</p>
<ul>
  <li class="loud">Pizza</li>
  <li>Beer</li>
  <li>Dogs</li>
</ul>
```

If we add `.loud { font-style: italic; }` to the CSS for this HTML, `Hi there!` and `Pizza` will show up italicized because they both have the `loud` class. The dot in front of the `.loud` selector is important—it's how the CSS knows to look for HTML tags with a class of `loud`. If you omit the dot, the CSS will look for a `loud` tag, which doesn't exist in this snippet (or in HTML at all, for that matter).

Applying CSS by `id` is similar. To add a yellow background fill to the `highlight` paragraph tag, use the following rule:

```
#highlight { background-color: yellow; }
```

Here, the `#` symbol tells the CSS to look for an HTML tag with the ID `highlight`.

To recap, you can opt to select elements by tag name (e.g., `body`, `h1`, `p`), by class name (e.g., `.loud`, `.subtle`, `.error`), or by ID (e.g., `#highlight`, `#login`, `#promo`). And, you can get more specific by chaining selectors together (e.g., `h1 a`, `body ul .loud`).



There are differences between `class` and `id`. Use `class` attributes when you have more than one item on the page with the same `class` value. Conversely, `id` values have to be unique to a page.

When I first learned this, I figured I'd just always use class attributes so I wouldn't have to worry about whether I was duping an ID value. However, selecting elements by ID is much faster than by class, so you can hurt your performance by overusing class selectors.

Applying a stylesheet

So now you understand the basics of CSS, but how do you apply a stylesheet to an HTML page? Quite simple, actually! First, you save the CSS somewhere on your server (usually in the same directory as your HTML file, though you can put it in a subdirectory). Next, link to the stylesheet in the head of the HTML document, as shown in [Example 1-6](#). The `href` attribute in this example is a relative path, meaning it points to a text file named `screen.css` in the same directory as the HTML page. You can also specify absolute links, such as the following:

`http://example.com/screen.css`



If you are saving your HTML files on your local machine, you'll want to keep things simple: put the CSS file in the same directory as the HTML file and use a relative path as shown in [Example 1-6](#).

Example 1-6. Linking to a CSS stylesheet

```
<html>
  <head>
    <title>My Awesome Page</title>
    <link rel="stylesheet" href="screen.css" type="text/css" />
  </head>
  <body>
    <h1 class="loud">Hi there!</h1>
    <p>Thanks for visiting my web page.</p>
    <p>I hope you like it.</p>
    <ul>
      <li class="loud">Pizza</li>
      <li>Beer</li>
      <li>Dogs</li>
    </ul>
  </body>
</html>
```

[Example 1-7](#) shows the contents of `screen.css`. You should save this file in the same location as the HTML file:

Example 1-7. A simple stylesheet

```
body {
  font-size: 12px;
  font-weight: bold;
  font-family: Arial;
}

a { font-style: italic; }
h1 a { font-style: italic; }

.loud { font-style: italic; }
#highlight { background-color: yellow; }
```



It's worth pointing out that you can link to stylesheets that are hosted on domains other than the one hosting the HTML document. However, it's considered very rude to link to someone else's stylesheets without permission, so please only link to your own.

For a quick and thorough crash course in CSS, I highly recommend [CSS Pocket Reference: Visual Presentation for the Web](#) by Eric Meyer (O'Reilly). Meyer is the last word when it comes to CSS, and this particular book is short enough to read during the typical morning carpool (unless you are the person driving, in which case it could take considerably longer—did I say “crash” course?).

Introduction to JavaScript

At this point you know how to structure a document with HTML and how to modify its visual presentation with CSS. Now we'll add some JavaScript to make it do stuff.

JavaScript is a scripting language that you can add to an HTML page to make it more interactive and convenient for the user. For example, you can write some JavaScript that will inspect the values typed in a form to make sure they are valid. Or, you can have JavaScript show or hide elements of a page depending on where the user clicks. JavaScript can even contact the web server to execute database changes without refreshing the current web page.

Like any modern scripting language, JavaScript has variables, arrays, objects, and all the typical control structures (e.g., `if`, `while`, `for`). [Example 1-8](#) shows a snippet of JavaScript that illustrates several core concepts of the language.

Example 1-8. Basic JavaScript syntax

```
var foods = ['Apples', 'Bananas', 'Oranges']; ①
for (var i=0; i<foods.length; i++) { ②
    if (foods[i] == 'Apples') { ③
        alert(foods[i] + ' are my favorite!'); ④
    } else {
        alert(foods[i] + ' are okay.'); ⑤
    }
}
```

Here's an explanation of what's happening here:

- ➊ Define an `array` (a list of values) named `foods` that contains three elements.
- ➋ Open a typical `for` loop that initializes a variable named `i` to 0 and specifies an exit criteria—in this case, exit when `i` is greater than the length of the `foods` array, and increment `i` by 1 each time through the loop (`i++` is shorthand for “add 1 to the current value of `i`”).
- ➌ A garden variety `if` that checks to see if the current element of the array is equal to `Apples`.

- ④ Displayed if the current element of the array is equal to Apples.
- ⑤ Displayed if the current element of the array is *not* equal to Apples.

Here are some points about JavaScript's syntax that are worth noting:

- Statements are terminated with semicolons (;
- Code blocks are enclosed in curly braces ({})
- Variables are declared using the var keyword
- Array elements can be accessed with square bracket notation ([])
- Array keys are assigned beginning at 0
- The single equals sign (=) is the assignment operator (assigns a value to a variable)
- The double equals sign (==) is the equivalence logical operator (compares two values and evaluates to true if they are equivalent)
- The plus sign (+) is the string concatenation operator (combines two strings together)

For our purposes, the most important feature of JavaScript is that it can interact with the elements of an HTML page (the cool kids call this “manipulating the DOM”). Example 1-9 shows a simple bit of JavaScript that changes some text on the page when the user clicks on the h1.



DOM stands for Document Object Model and in this context it represents the browser's understanding of an HTML page. You can read more about the DOM here: http://en.wikipedia.org/wiki/Document_Object_Model.

Example 1-9. Simple onclick handler

```
<html>
  <head>
    <title>My Awesome Page</title>
    <script type="text/javascript" charset="utf-8"> ❶
      function sayHello() { ❷
        document.getElementById('foo').innerHTML = 'Hi there!'; ❸
      } ❹
    </script> ❺
  </head>
  <body>
    <h1 id="foo" onclick=❻="sayHello()">Click me!</h1>
  </body>
</html>
```

Here's an explanation:

- ❶ A script block at the head of the HTML document.
- ❷ This line defines a single JavaScript function named `sayHello()` inside the script block.
- ❸ The `sayHello()` function contains a single statement that tells the browser to look through the document for an element that has the ID `foo`, and set its inner HTML contents to `Hi there!` The effect of this in the browser is that the text "Click me!" will be replaced with "Hi there!" when the user clicks the `h1` element.
- ❹ End of the `sayHello()` function.
- ❺ End of the script block.
- ❻ The `onclick` attribute of the `h1` element tells the browser to do something when the user clicks the `h1` element, namely, to run the `sayHello()` function.

Back in the bad old days of web development, different browsers had different support for JavaScript. This meant that your code might run in Safari 2 but not in Internet Explorer 6. You had to take great pains to test each browser (and even different versions of the same browser) to make sure your code would work for everyone. As the number of browsers and browser versions grew, it became impossible to test and maintain your JavaScript code for every environment. At that time, web programming with JavaScript was hell.

Enter jQuery. jQuery is a relatively small JavaScript library that allows you to write your JavaScript code in a way that will work the same in a wide variety of browsers. What's more, it greatly simplifies a number of common web development tasks. For these reasons, I use jQuery in most of my web development work, and I'll be using it for the JavaScript examples in this book. [Example 1-10](#) is a jQuery rewrite of [Example 1-9](#).

Example 1-10. jQuery onclick handler

```
<html>
  <head>
    <title>My Awesome Page</title>
    <script type="text/javascript" src="jquery.js"></script> ❶
    <script type="text/javascript" charset="utf-8">
      function sayHello() {
        $('#foo').text('Hi there!'); ❷
      }
    </script>
  </head>
  <body>
    <h1 id="foo" onclick="sayHello()">Click me!</h1>
  </body>
</html>
```

- ❶ This line includes the *jquery.js* library. It uses a relative path, meaning the file exists in the same directory as the page that is using it (this example won't function correctly unless the jQuery library, *jquery.js*, is there). However, you can include it directly from a variety of places where it's available.
- ❷ Notice the reduction in the amount of code we need to write to replace the text in the *h1* element. This might not seem like a big deal in such a trivial example, but I can assure you that it's a lifesaver in complex solutions.

We'll be seeing plenty of real-world jQuery examples later on, so I'm going to leave it at that for the moment.



jQuery downloads, documentation, and tutorials are available at <http://jquery.com>. To use jQuery as shown in [Example 1-9](#), you will need to download it from there, rename the file you downloaded (such as *jquery-1.4.2.min.js*) to *jquery.js*, and put a copy of it in the same directory as your HTML document.

CHAPTER 2

Basic Styling

Ultimately, we are going to build a native Android app using HTML, CSS, and JavaScript. The first step on this journey is to get comfortable styling HTML to look like a mobile app. In this chapter, I'll show you how to apply CSS styles to a bunch of existing HTML pages so that they are easily navigable on an Android phone. So, in addition to moving closer to building a native app, you'll be learning a practical (and valuable) skill that you can use immediately.

Don't Have a Website?

If you've been testing all your web pages locally on your personal computer, you won't be able to view them on your Android phone without setting up a server. You have a couple choices:

- Host your web pages on a web server and connect to that server from your Android phone. Chances are good that your Internet Service Provider (ISP) offers complimentary web hosting, but this usually only supports basic features such as HTML. By the time we get to [Chapter 6](#), we're going to need to use PHP, a scripting language that runs on the web server, so you should look into an inexpensive hosting service. Many companies, such as [Laughing Squid](#), offer entry-level hosting with PHP for under \$10 a month.
- Host them on a web server running on your computer and connect to the web server running on your computer from your Android phone. This only works when your Android phone and computer are on the same WiFi network.

This chapter is set up so you can try the examples as you go through it. So, no matter which option you choose for viewing the web pages, try reloading them in a browser (preferably the Android browser) each time you add something new to one of the samples. However, be sure to save your file in your text editor before you reload it in the browser or you won't see your changes.

Running a Web Server Locally

All current mainstream operating systems (Linux, Windows, Mac OS X) include some sort of web server. On Mac OS X, open System Preferences, choose Sharing, and enable Web Sharing. Once you've started Web Sharing, the Web Sharing preferences will display the URL of your personal website (this includes anything you've put in the *Sites* directory in your home directory). It will be of the form `http://local-hostname/~your-username.`

On some versions of Linux, such as Ubuntu, you will need to go through some additional steps to install and enable a web server. First, install Apache at the command line with `sudo aptitude install apache2`. Next, enable the user directory module with `sudo a2enmod userdir`. Once that's done, restart Apache with this command: `sudo /etc/init.d/apache2 restart`. After you've done that, you can create a directory called `public_html` in your home directory and access any files in there with a URL such as `http://local-hostname/~your-username.`

On Windows, things are a little more involved. You need to be running a version of Windows that includes Internet Information Services (IIS) and enable it by going into the Control Panel and making your way to Turn Windows Features On or Off. After you've done this, put your web documents in your IIS document root, which is typically located at `C:\inetpub\wwwroot`. If you'd prefer to run Apache on Windows, check out a prepackaged solution such as [EasyPHP](#), or check out the Wikipedia page on this topic at http://en.wikipedia.org/wiki/Comparison_of_WAMPs.

First Steps

Theory is great, but I'm a "show me, don't tell me" kinda guy so let's dive in.

Imagine you have a website that you want to "mobile-ize" ([Figure 2-1](#)). In this scenario, there are a number of easy things you can do to optimize a site for Android. I'll go over your options in this chapter.

[Figure 2-2](#) shows what this web page looks like on the Android phone. It's usable, but far from optimized for Android.

[Example 2-1](#) shows an abbreviated version of the website shown in [Figure 2-2](#). This is the HTML you'll be working with in this chapter. You can download it from [this book's website](#) if you'd like to try styling it as you go through the chapter. The desktop stylesheet (`screen.css`) is not shown as it is not essential, but you can use the stylesheet from the previous chapter if you'd like to have something to play with.

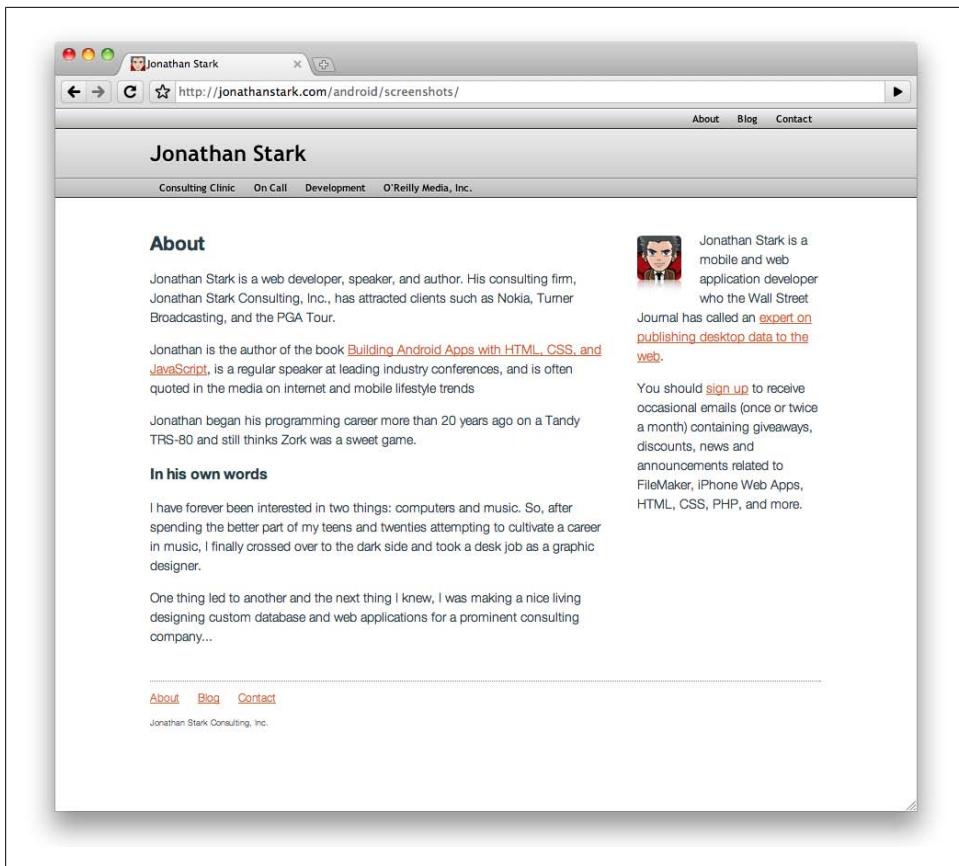


Figure 2-1. Desktop version of a typical website looks fine in Chrome on a desktop

Example 2-1. The HTML document we'll be styling

```
<html>
<head>
  <link rel="stylesheet" href="screen.css" type="text/css" />
  <title>Jonathan Stark</title>
</head>
<body>
  <div id="container">
    <div id="header">
      <h1><a href="./">Jonathan Stark</a></h1>
      <div id="utility">
        <ul>
          <li><a href="about.html">About</a></li>
          <li><a href="blog.html">Blog</a></li>
          <li><a href="contact.html">Contact</a></li>
        </ul>
      </div>
    </div>
    <div id="nav">
```

```

<ul>
    <li><a href="consulting-clinic.html">Consulting Clinic</a></li>
    <li><a href="on-call.html">On Call</a></li>
    <li><a href="development.html">Development</a></li>
    <li><a href="http://www.oreilly.com">O'Reilly Media, Inc.</a></li>
</ul>
</div>
</div>
<div id="content">
    <h2>About</h2>
    <p>Jonathan Stark is a web developer, speaker, and author. His
        consulting firm, Jonathan Stark Consulting, Inc., has attracted
        clients such as Staples, Turner Broadcasting, and the PGA Tour.
        ...
    </p>
</div>
<div id="sidebar">
    
    <p>Jonathan Stark is a mobile and web application developer who the
        Wall Street Journal has called an expert on publishing desktop
        data to the web.</p>
</div>
<div id="footer">
    <ul>
        <li><a href="services.html">Services</a></li>
        <li><a href="about.html">About</a></li>
        <li><a href="blog.html">Blog</a></li>
    </ul>
    <p class="subtle">Jonathan Stark Consulting, Inc.</p>
</div>
</body>
</html>

```



For years, web developers used tables to lay out elements in a grid. Advances in CSS and HTML have rendered that approach not only obsolete, but undesirable. Today, we primarily use the `div` element (along with a variety of attributes) to accomplish the same thing, but with more control. Although a complete explanation of div-based layouts is well outside the scope of this book, you'll see plenty of examples of it as you read through the book. To learn more, please check out *Designing with Web Standards* by Jeffrey Zeldman (New Rider Press), which covers the issue in greater detail.

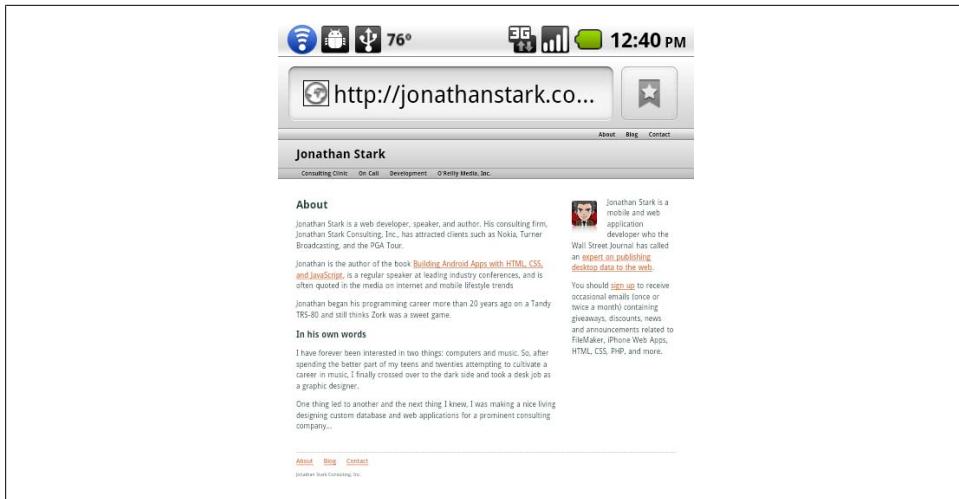


Figure 2-2. Desktop version of a typical website looks all right on an Android phone, but we can do a lot better

Prepare a Separate Android Stylesheet

I'm as DRY as the next guy, but in the real world you're better off making a clean break between your desktop browser stylesheet and your Android stylesheet. Take my word for it and just make two completely independent files; you'll sleep better. The alternative is to wedge all of your CSS rules into a single stylesheet, which is a bad idea for a number of reasons, the most obvious of which is that you'd be sending a bunch of irrelevant desktop style rules to the phone, which is a waste of precious bandwidth and memory.



DRY stands for “don’t repeat yourself,” and is a software development principle that states, “Every piece of knowledge must have a single, unambiguous, authoritative representation within a system.” The term was coined by Andrew Hunt and David Thomas in their book *The Pragmatic Programmer* (Addison-Wesley Professional).

To specify a stylesheet specifically for Android, replace the stylesheet link tag in the sample HTML document with ones that use the following expressions:

```
<link rel="stylesheet" type="text/css"
      href="android.css" media="only screen and (max-width: 480px)" />
<link rel="stylesheet" type="text/css"
      href="desktop.css" media="screen and (min-width: 481px)" />
```



I specifically used `max-width` and `min-width` here so that you can resize your desktop browser and see the mobile version of the page. If you would prefer to serve the `desktop.css` stylesheet to desktop users regardless of their browser window size, use `max-device-width` and `min-device-width` instead.

The Wireless Universal Resource File (WURFL) contains information you can use to identify a huge number of wireless devices, including Android devices. If you need to detect Android devices with a width greater than 480px (such as a tablet) or if you don't want the mobile version of the site to appear when users resize their browser window below 480px, you can use WURFL's PHP API to precisely detect specific browsers. See the [Appendix](#) for more information on WURFL.

Here, `desktop.css` refers to your existing desktop stylesheet, and `android.css` is a new file that we'll be discussing in detail in a bit. The `desktop.css` file is not essential, but you can use the stylesheet from the previous chapter if you'd like.



If you're following along using the sample HTML document shown in [Example 2-1](#), you'll need to rename `screen.css` to `desktop.css`, but since we're focused on the Android stylesheet, you can ignore the desktop stylesheet completely. If it fails to load, your browser won't get too upset.

However, if you'd like to use Chrome to test the Android-optimized version of the site, you should replace the reference to `desktop.css` with a reference to `android.css`. That way, you'll get to run the Android version of your site whether you load it from a phone or the desktop browser.

Regrettably, Internet Explorer will not understand these expressions, so we have to add a conditional comment (shown in bold) that links to the desktop version of the CSS:

```
<link rel="stylesheet" type="text/css"
      href="android.css" media="only screen and (max-width: 480px)" />
<link rel="stylesheet" type="text/css"
      href="desktop.css" media="screen and (min-width: 481px)" />
<!--[if IE]>
<link rel="stylesheet" type="text/css" href="explorer.css" media="all" />
<![endif]-->
```

So now it's time to edit the HTML document (if you haven't already done that as you were following along): delete the existing `link` to the `screen.css` file, and replace it with the lines just shown. This way, you will have a clean slate for the Android-specific CSS in this chapter.

Control the Page Scaling

Unless you tell it otherwise, the Android browser will assume your page is 980px wide ([Figure 2-3](#)). In the majority of cases, this works great. However, you are going to format the content specifically for the smaller dimensions of the Android phone, so you must let the mobile browser know about it by adding a viewport `meta` tag to the `head` element of the HTML document:

```
<meta name="viewport" content="user-scalable=no, width=device-width" />
```



Desktop browsers will ignore the viewport `meta` tag, so you can include it without worrying about the desktop version of your site.

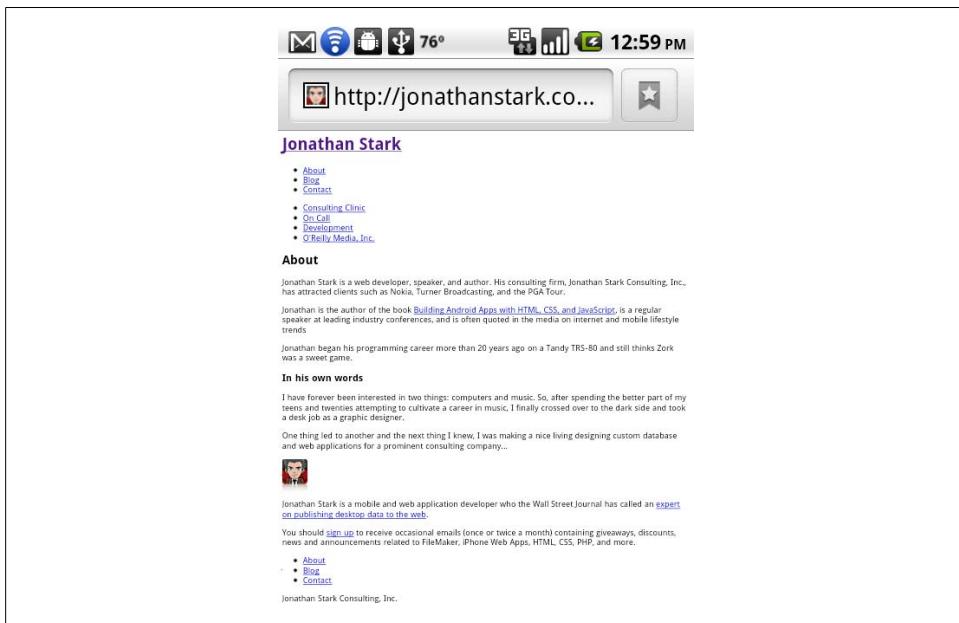


Figure 2-3. Android assumes a normal web page is 980px wide

Merely by suppressing the desktop stylesheet and configuring your viewport, you will have already given your Android users an enhanced experience ([Figure 2-4](#)). To really impress them, let's start building the `android.css` stylesheet.

Jonathan Stark

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About

Jonathan Stark is a web developer, speaker, and author. His consulting firm, Jonathan Stark Consulting, Inc., has attracted clients such as Nokia, Turner Broadcasting, and the PGA Tour.

Jonathan is the author of the book [Building Android Apps with HTML, CSS, and JavaScript](#), is a regular speaker at

Figure 2-4. Setting the viewport to the width of the device makes your pages a lot more readable on Android



If you don't set the viewport width, the page will be zoomed out when it first loads. It's tough to say exactly what the zoom level will be because the Android browser includes a setting that allows users to set the default zoom. The options are Far, Medium (the default), or Close. Even if you do set the viewport width, these user-defined settings will affect the zoom level of your app.

Adding the Android CSS

There are a number of UI conventions that make an Android app look like an Android app. In the next section, we'll add the distinctive title bar, lists with rounded corners, finger-friendly links that look like glossy buttons, etc. With the text editor of your choice, create a file named `android.css` and add the code shown in [Example 2-2](#) to it, then save the file in the same directory as your HTML document.

Example 2-2. Setting some general site-wide styles on the HTML body element

```
body {
    background-color: #ddd; /* Background color */
    color: #222;           /* Foreground color used for text */
    font-family: Helvetica;
    font-size: 14px;
    margin: 0;             /* Amount of negative space around the
                           outside of the body */
    padding: 0;             /* Amount of negative space around the
                           inside of the body */
}
```



All text on Android is rendered using a custom font named Droid. The Droid font family was specifically built for mobile devices, has excellent character set support, and contains three variants: Droid Sans, Droid Sans Mono, and Droid Serif. Therefore, specifying a font family of Helvetica as we've done here will only have an effect on devices other than Android.

Now let's attack the header `div` that contains the main home link (i.e., the logo link) and the primary and secondary site navigation. The first step is to format the logo link as a clickable title bar. Add the following to the *android.css* file:

```
#header h1 {
    margin: 0;
    padding: 0;
}
#header h1 a {
    background-color: #ccc;
    border-bottom: 1px solid #666;
    color: #222;
    display: block;
    font-size: 20px;
    font-weight: bold;
    padding: 10px 0;
    text-align: center;
    text-decoration: none;
}
```

We'll format the primary and secondary navigation `ul` blocks identically, so we can just use the generic tag selectors (i.e., `#header ul`) as opposed to the tag IDs (i.e., `#header ul#utility, #header ul#nav`):

```
#header ul {
    list-style: none;
    margin: 10px;
    padding: 0;
}
#header ul li a {
    background-color: #FFFFFF;
    border: 1px solid #999999;
    color: #222222;
```

```

display: block;
font-size: 17px;
font-weight: bold;
margin-bottom: -1px;
padding: 12px 10px;
text-decoration: none;
}

```

Pretty simple so far, right? With this little bit of CSS, we have already made a big improvement on the Android page design ([Figure 2-5](#)). Next, add some padding to the content and sidebar `divs` to indent the text from the edge of the screen a bit ([Figure 2-6](#)):

```

#content, #sidebar {
    padding: 10px;
}

```



You might be wondering why we’re adding padding to the content and sidebar elements instead of setting it globally on the body element itself. The reason is that it’s very common to have elements displayed edge to edge (as with the header in this example). Because of this, padding applied to the body or some other element that’s wrapped around lots of others can become more trouble than it’s worth.

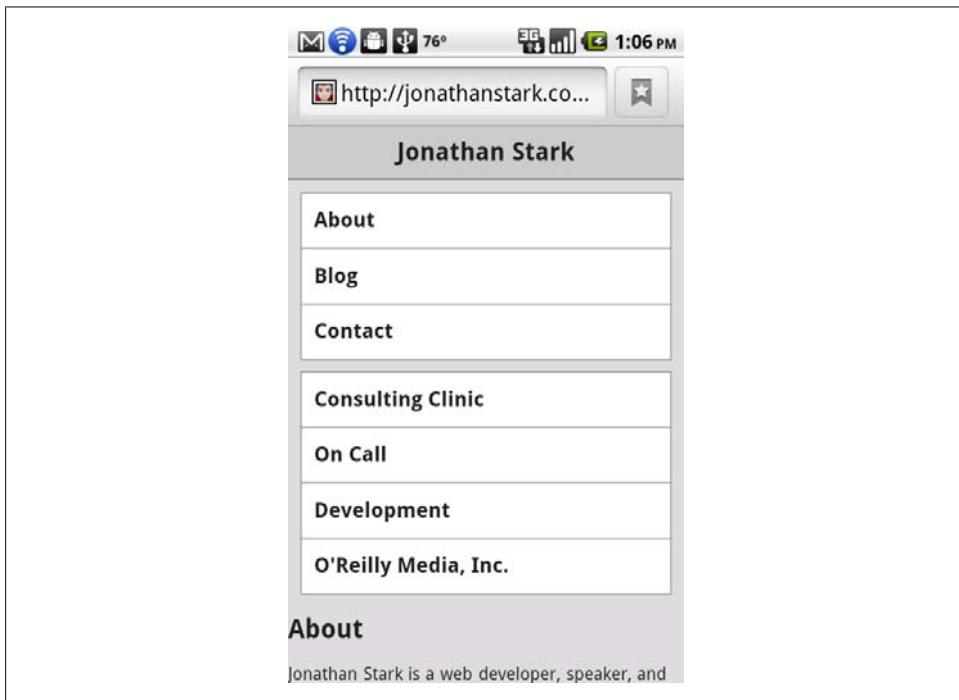


Figure 2-5. A little bit of CSS can go a long way toward enhancing the usability of your Android app

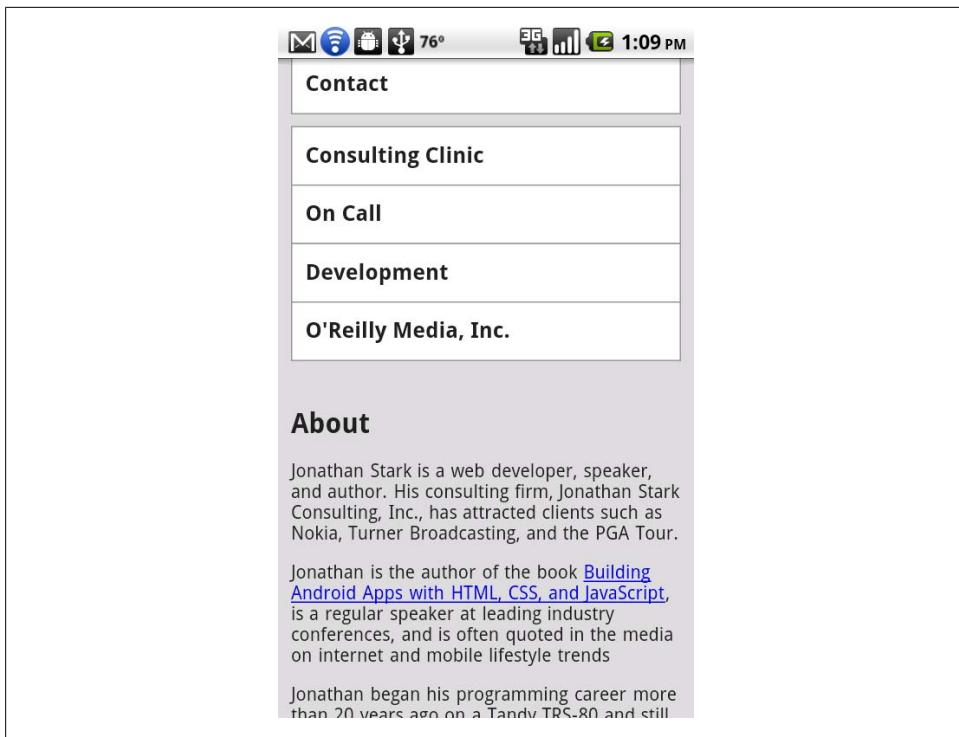


Figure 2-6. Indenting text from the edges

The content in the footer of this page is basically a rehash of the navigation element (the `ul` element with the ID `nav`) at the top of the page, so you can remove the footer from the Android version of the page by setting the `display` to `none`, as follows:

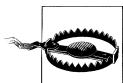
```
#footer {
    display: none;
}
```

Adding the Android Look and Feel

Time to get a little fancier. Starting from the top of the page, add a 1-pixel white drop shadow to the header text and a CSS gradient to the background:

```
#header h1 a {
    text-shadow: 0px 1px 1px #fff;
    background-image: -webkit-gradient(linear, left top, left bottom,
                                    from(#ccc), to(#999));
}
```

In the `text-shadow` declaration, the parameters from left to right are: horizontal offset, vertical offset, blur, and color. Most of the time, you'll be applying the exact values shown here to your text because that's what usually looks good on Android, but it is fun to experiment with `text-shadow` because it can add a subtle but sophisticated touch to your design.



On most browsers, it's fine to specify a blur radius of 0px. However, Android requires you to specify a blur radius of at least 1px. If you specify a blur of 0, the text shadow will not show up on Android devices.

The `-webkit-gradient` line deserves special attention. It's an instruction to the browser to generate a gradient image on the fly. Therefore, you can use a CSS gradient anywhere you would normally specify a `url()` (e.g., background image, list style image). The parameters from left to right are as follows: the gradient type (can be `linear` or `radial`), the starting point of the gradient (can be `left top`, `left bottom`, `right top`, or `right bottom`), the end point of the gradient, the starting color, and the ending color.



You cannot reverse the horizontal and vertical portions of the four gradient start and stop point constants (i.e., `left top`, `left bottom`, `right top`, or `right bottom`). In other words, top left, bottom left, top right, and bottom right are invalid values.

The next step is to add the traditional rounded corners to the navigation menus:

```
#header ul li:first-child a {
    -webkit-border-top-left-radius: 8px;
    -webkit-border-top-right-radius: 8px;
}
#header ul li:last-child a {
    -webkit-border-bottom-left-radius: 8px;
    -webkit-border-bottom-right-radius: 8px;
}
```

As you can see, we're using corner-specific versions of the `-webkit-border-radius` property to apply an 8-pixel radius to both the top two corners of the first list item and the bottom two corners of the last list item ([Figure 2-7](#)).

It would be cool if you could just apply the border radius to the enclosing `ul`, but it doesn't work. If you try it you'll see that the square corners of the child list items will overflow the rounded corners of the `ul`, thereby negating the effect.

Technically, we could achieve the rounded list effect by applying the radius corners to the `ul`, if we set the background color of the `ul` to white and set the background of its child elements to transparent. However, when users click the first or last items in the list, the tap highlight will show up squared-off and it looks terrible. Your best bet is to apply the rounding to the `a` tags themselves as I've demonstrated here.

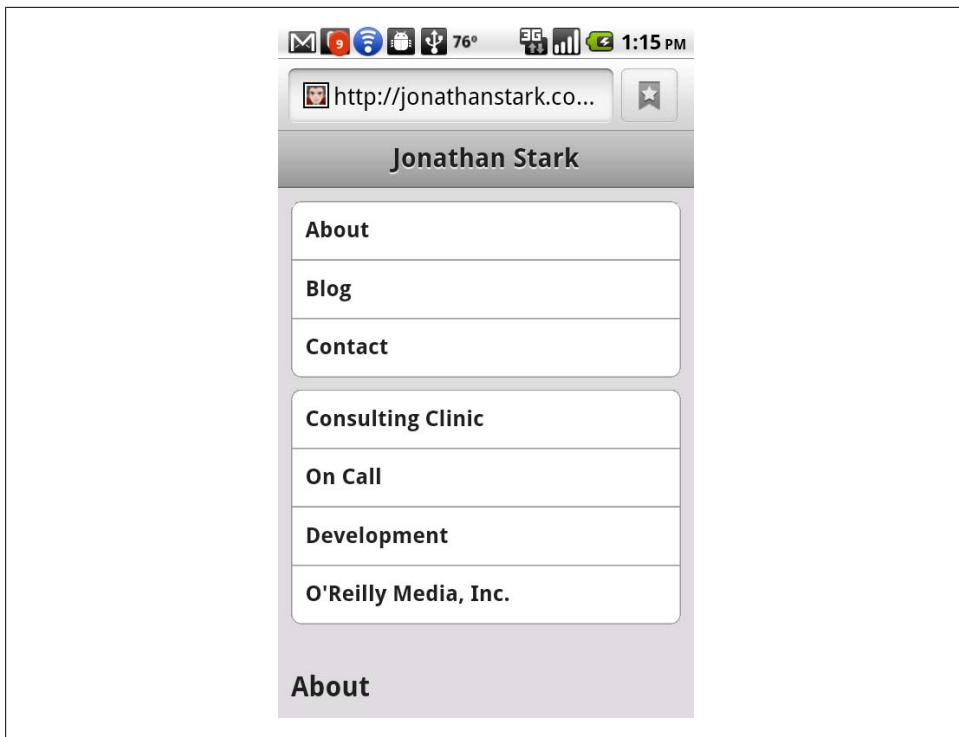
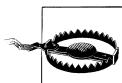


Figure 2-7. Gradients, text shadows, and rounded corners start to transform your web page into a native-looking Android app



The occurrences of `:first-child` and `:last-child` above are called *pseudoclasses*. Pseudoclasses are a special type of CSS selector that allow you to target elements that meet certain implicit contextual criteria. In other words, you can style things based on characteristics—such as where they are in a list, whether they have cursor focus, or if they have been clicked—without having to manually update your markup. For example, `li:first-child` will select the first `li` that is the child of its `ul` parent. Without the code pseudoclass, we'd have to manually add a class to the first `li` to let the browser know that it was the first one.

Adding Basic Behavior with jQuery

The next step is to add some JavaScript to the page to support some basic dynamic behavior. In particular, we will allow users to show and hide the big honking navigation section in the header so that they only see it when they want to. To make this work, we'll write some new CSS and use some JavaScript to apply the new CSS to the existing HTML.

First, let's take a look at the new CSS. Step 1 is to hide the `ul` elements in the header so they don't show up when the user first loads the page. If you are following along at home, open your `android.css` file and add the following:

```
#header ul.hide {
    display: none;
}
```

This won't actually hide anything until you add the `hide` class to the `ul` elements (you'll do this shortly with some JavaScript). Next, define the styles for the button that will show and hide the menu. We haven't created the HTML for the button yet. For your information, it's going to look like this:

```
<div class="leftButton" onclick="toggleMenu()">Menu</div>
```

I'll describe the button HTML in detail in the section “[Adding Basic Behavior with jQuery](#)” on page 28, so don't add the preceding line of code to your HTML file. The important thing to understand is that it's a `div` with the class `leftButton` and it's going to be in the header.

Here is the CSS style for the button (you can go ahead and add this to the `android.css` file):

```
#header div.leftButton {
    position: absolute;❶
    top: 7px;
    left: 6px;
    height: 30px;❷
    font-weight: bold;❸
    text-align: center;
    color: white;
    text-shadow: rgba(0,0,0,0.6) 0px -1px 1px;
    line-height: 28px;❹
    border-width: 0 8px 0 8px;❺
    -webkit-border-image: url(images/button.png) 0 8 0 8;❻
}
```



For the graphics used in this chapter, you can download the example files from <http://examples.oreilly.com/catalog/9781449383268> and copy them from the `images` directory. Put these copies into an `images` sub-directory beneath the directory that contains your HTML document (you'll probably need to create the `images` directory). We'll be talking about jQTouch in detail in [Chapter 4](#).

- ❶ Taking it from the top, set the position to absolute to remove the `div` from the document flow. This allows you to set its top and left pixel coordinates.
- ❷ Set the height to 30px so it's big enough to tap easily.
- ❸ Style the text bold, white with a slight drop shadow, and centered in the box.

- ④ In CSS, the `rgb` function is an alternative to the familiar hex notation typically used to specify colors (e.g., `#FFFFFF`). `rgb(255, 255, 255)` and `rgb(100%, 100%, 100%)` are both the same as `#FFFFFF`. More recently, the `rgba()` function has been introduced, which allows you to specify a fourth parameter that defines the *alpha value* (i.e., opacity) of the color. The range of allowable values is 0 to 1, where 0 is fully transparent and 1 is fully opaque; decimal values between 0 and 1 will be rendered translucent.
- ⑤ The `line-height` declaration moves the text down vertically in the box so it's not flush against the top border.
- ⑥ The `border-width` and `-webkit-border-image` lines require a bit of explanation. These two properties together allow you to assign portions of a single image to the border area of an element. If the box resizes because the text increases or decreases, the border image will stretch to accommodate it. It's really a great thing because it means fewer images, less work, less bandwidth, and shorter load times.

The `border-width` line tells the browser to apply a 0 width border to the top, an 8px border to the right, a 0 width border to the bottom, and an 8px width border to the left (i.e., the four parameters start at the top of the box and work their way around clockwise). You don't need to specify a color or style for the border.

- ⑦ With the border widths in place, you can apply the border image. The five parameters from left to right are: the URL of the image, the top width, the right width, the bottom width, and the left width (again, clockwise from top). The URL can be absolute (`http://example.com/myBorderImage.png`) or relative. Relative paths are based on the location of the stylesheet, not the HTML page that includes the stylesheet.



When I first encountered the border image property, I found it odd that I had to specify the border widths when I had already done so with the `border-width` property. After some painful trial and error, I discovered that the widths in the `border-image` property are not border widths; they are the widths *to slice* from the image. Taking the right border as an example, I'm telling the browser to take the left 8px of the image and apply them to the right border, which also happens to have an 8px width.

It is possible to do something irrational such as applying the right 4 pixels of an image to a border that is 20px wide. To make this work properly, you have to use the optional parameters of `webkit-border-image` that instruct the image what to do with the slice in the available border space (repeat, stretch, round, etc.). In three years of trying, I have failed to come up with any sane reason to do this, so I won't waste space here describing this confusing and impractical option of an otherwise killer feature.

Okay, time for some JavaScript. In preparation for the JavaScript you’re about to write, you need to update your HTML document to include *jquery.js* and *android.js*. Add these lines to the head section of your HTML document:

```
<script type="text/javascript" src="jquery.js"></script>
<script type="text/javascript" src="android.js"></script>
```

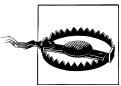


jQuery downloads, documentation, and tutorials are available at <http://jquery.com>. To use jQuery, you will need to download it from there, rename the file you downloaded (such as *jquery-1.3.2.min.js*) to *jquery.js*, and put a copy of it in the same directory as your HTML document.

The primary duty of the JavaScript in *android.js* is to allow users to show and hide the nav menus. Copy the following JavaScript into a file called *android.js* and save it in the same folder as the HTML file:

```
if (window.innerWidth && window.innerWidth <= 480) { ①
    $(document).ready(function(){ ②
        $('#header ul').addClass('hide'); ③
        $('#header').append('<div class="leftButton"
            onclick="toggleMenu()">Menu</div>'); ④
    });
    function toggleMenu() {
        $('#header ul').toggleClass('hide'); ⑤
        $('#header .leftButton').toggleClass('pressed'); ⑥
    }
}
```

- ① The entire block of code is wrapped in an `if` statement that checks to make sure the `innerWidth` property of the `window` object exists (it doesn’t exist in some versions of Internet Explorer) and that the width is less than or equal to 480px (a reasonable maximum width for the most phones). By adding this line, we ensure that the code executes only when the user is browsing the page with a typical Android phone or some other similarly sized device.



If you are testing your Android web pages using the desktop version of Chrome as described in “[Don’t Have a Website?](#)” on page 13, the `if` statement here will fail if your browser’s window width is too large. Manually resize your window to be as narrow as possible and refresh the page.

- ② Here we have the so-called “document ready” function. If you are new to jQuery, this can be a bit intimidating, and I admit that it took me a while to memorize the syntax. However, it’s worth taking the time to commit it to memory, because you’ll be using it a lot. The document ready function basically says, “When the document is ready, run this code.” More on why this is important in a sec.

- ③ This is typical jQuery code that begins by selecting the `ul`s in the header and adding the `hide` CSS class to them. Remember, `hide` is the selector we used in the CSS above. The net effect of executing this line is to, well, “hide” the header `ul` elements.



Had we not wrapped this line in the document ready function, it would have most likely executed before the `ul`s were even finished loading. This means the JavaScript would load, and this line would fail because the `ul`s wouldn’t exist yet. Then, the page would continue loading, the `ul`s would appear, and you’d be scratching your head (or smashing your keyboard), wondering why the JavaScript wasn’t working.

- ④ Here is where we append a button to the header that will allow the user to show and hide the menu ([Figure 2-8](#)). It has a class that corresponds to the CSS we wrote previously for `.leftButton`, and it has an `onclick` handler that calls the function `toggleMenu()` that comes next.

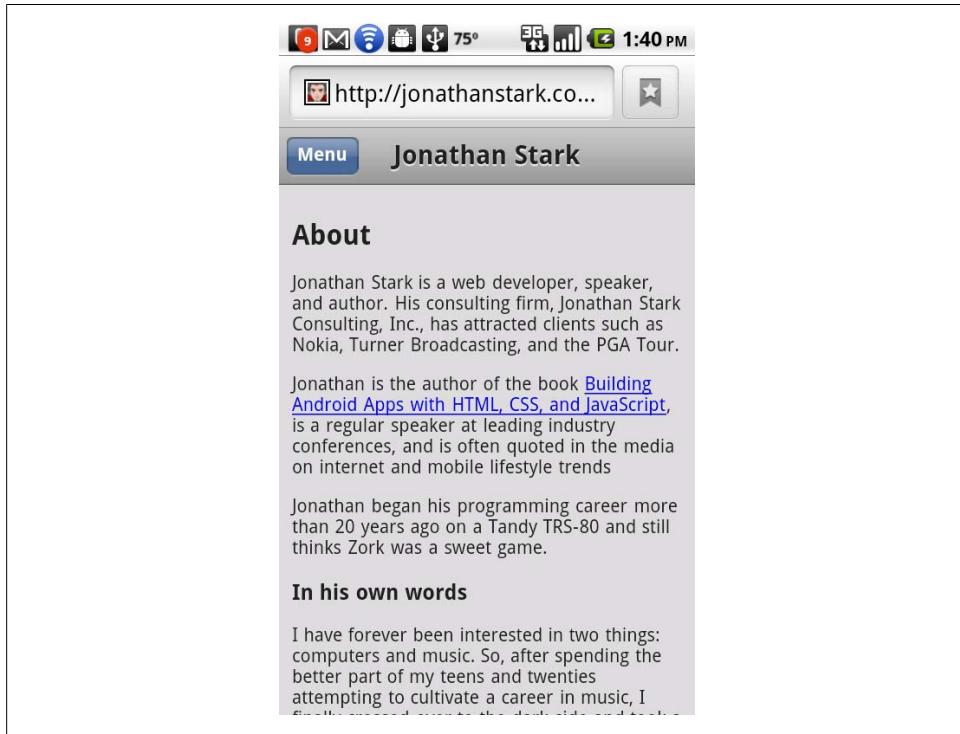


Figure 2-8. The Menu button has been added to the toolbar dynamically using jQuery

- ⑤ The `toggleMenu()` function uses jQuery’s `toggleClass()` function to add or remove the specified class to the selected object. On this line, we toggle the `hide` class on the header `ul`s.

- ❶ Here, we toggle the `pressed` class on the header `leftButton`.

Come to think of it, we haven't written the CSS for the `pressed` class yet, so let's do so now. Go back to `android.css` and insert the following:

```
#header div.pressed {  
    -webkit-border-image: url(images/button_clicked.png) 0 8 0 8;  
}
```

As you can see, we're simply specifying a different image for the button border (it happens to be slightly darker). This will add a two-state effect to the button that should make it evident to the user that the button can both show and hide the menu ([Figure 2-9](#)). [Figure 2-10](#) shows a stretched-out view of the page showing both the menu and some of the text.

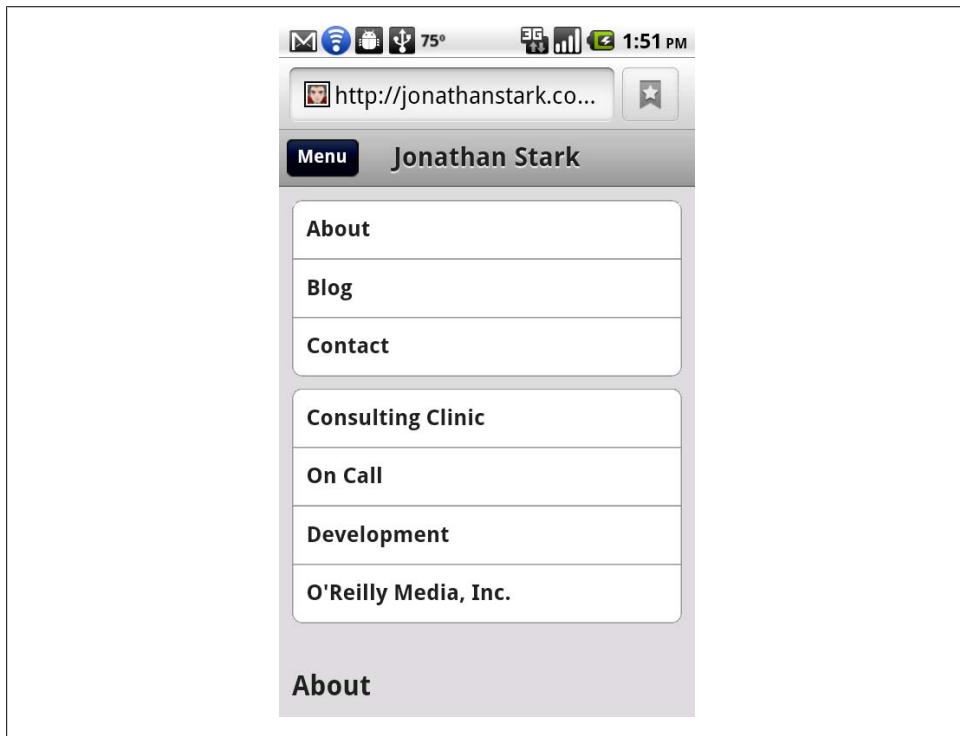


Figure 2-9. The Menu button displays darker when it has been pressed

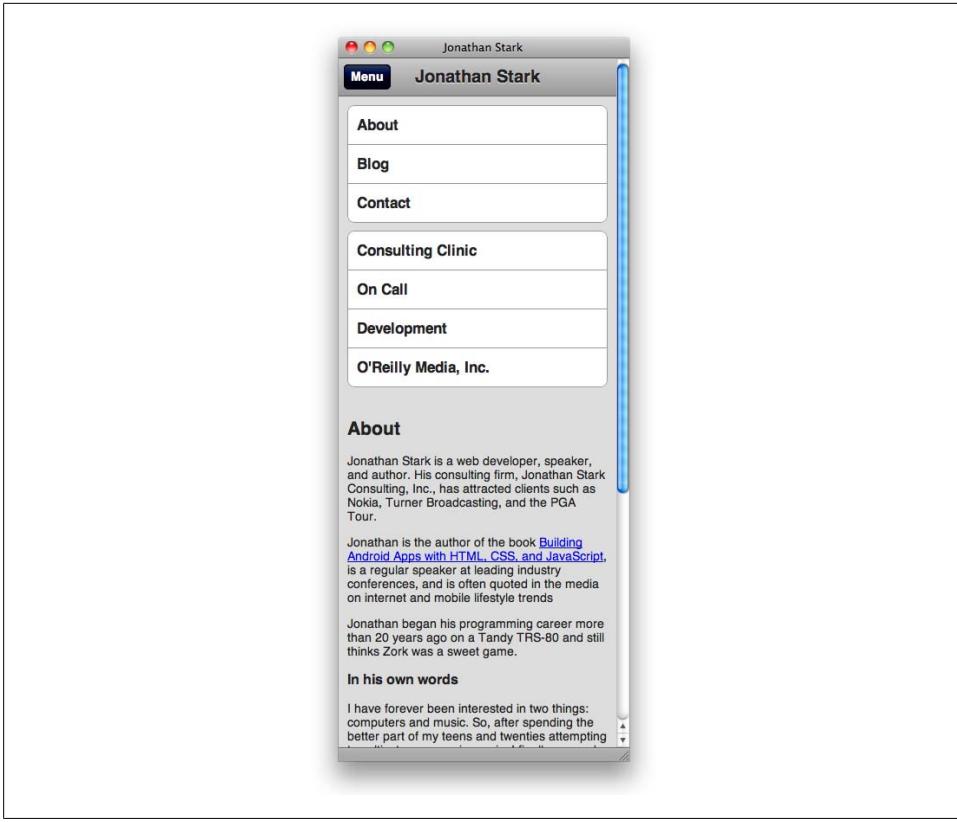


Figure 2-10. A tall view of the completed basic Android CSS

What You've Learned

In this chapter, we covered the basics of converting an existing web page to a more Android-friendly format. We even used a bit of dynamic HTML to show and hide the navigation panels. In the next chapter, we'll build on these examples while exploring some more advanced JavaScript concepts; in particular, some yummy Ajax goodness.

CHAPTER 3

Advanced Styling

In our quest to build an Android app without Java, we've discussed how to use CSS to style a collection of HTML pages to *look* like an Android app. In this chapter, we'll lay the groundwork to make those same pages *behave* like an Android app. Specifically, we'll discuss:

- Using Ajax to turn a full website into a single-page app.
- Creating a Back button with history using JavaScript.
- Saving the app as an icon on the home screen.

Adding a Touch of Ajax

The term Ajax (Asynchronous JavaScript and XML) has become such a buzzword that I'm not even sure I know what it means anymore. For the purposes of this book, I'm going to use the term Ajax to refer to the technique of using JavaScript to send requests to a web server without reloading the current page (e.g., to retrieve some HTML, submit a form). This approach makes for a very smooth user experience, but does require that you reinvent a lot of wheels.

For example, if you are loading external pages dynamically, the browser will not give any indication of progress or errors to the users. Furthermore, the Back button will not work as expected unless you take pains to support it. In other words, you have to do a lot of work to make a sweet Ajax app. That said, the extra effort can really pay off, because Ajax allows you to create a much richer user experience.

Traffic Cop

For the next series of examples, we'll write a single page called *android.html* that will sit in front of all the site's other pages. Here's how it works:

1. On first load, *android.html* will present the user with a nicely formatted version of the site navigation.

2. We'll then use jQuery to "hijack" the `onclick` actions of the `nav` links, so when the user clicks a link, the browser page will *not* navigate to the target link. Rather, jQuery will load a portion of the HTML from the remote page and deliver the data to the user by updating the current page.

We'll start with the most basic functional version of the code and improve it as we go along.

The HTML for the `android.html` wrapper page is extremely simple (see [Example 3-1](#)). In the `head` section, set the `title` and `viewport` options and include links to a stylesheet (`android.css`) and two JavaScript files: `jquery.js` and a custom JavaScript file named `android.js`.



You must put a copy of `jquery.js` in the same directory as the HTML file. For more information on where to get `jquery.js` and what to do with it, see "[Introduction to JavaScript](#)" on page 12. You should do this now before proceeding further.

The body has just two `div` containers: a header with the initial title in an `h1` tag and an empty `div` container, which will end up holding HTML snippets retrieved from other pages.

Example 3-1. This simple HTML wrapper markup will sit in front of the rest of the site's pages

```
<html>
<head>
  <title>Jonathan Stark</title>
  <meta name="viewport" content="user-scalable=no, width=device-width" />
  <link rel="stylesheet" href="android.css" type="text/css" media="screen" />
  <script type="text/javascript" src="jquery.js"></script>
  <script type="text/javascript" src="android.js"></script>
</head>
<body>
  <div id="header"><h1>Jonathan Stark</h1></div>
  <div id="container"></div>
</body>
</html>
```

Let's move on to the `android.css` file. As you can see in [Example 3-2](#), we're going to shuffle some of the properties from previous examples in [Chapter 2](#) (e.g., some of the `#header h1` properties have been moved up to `#header`), but overall everything should look familiar (if not, please review [Chapter 2](#)).

Example 3-2. The base CSS for the page is just a slightly shuffled version of previous examples

```
body {
  background-color: #ddd;
  color: #222;
  font-family: Helvetica;
  font-size: 14px;
```

```
margin: 0;
padding: 0;
}
#header {
background-color: #ccc;
background-image: -webkit-gradient(linear, left top, left bottom,
from(#ccc), to(#999));
border-color: #666;
border-style: solid;
border-width: 0 0 1px 0;
}
#header h1 {
color: #222;
font-size: 20px;
font-weight: bold;
margin: 0 auto;
padding: 10px 0;
text-align: center;
text-shadow: 0px 1px 1px #fff;
}
ul {
list-style: none;
margin: 10px;
padding: 0;
}
ul li a {
background-color: #FFF;
border: 1px solid #999;
color: #222;
display: block;
font-size: 17px;
font-weight: bold;
margin-bottom: -1px;
padding: 12px 10px;
text-decoration: none;
}
ul li:first-child a {
-webkit-border-top-left-radius: 8px;
-webkit-border-top-right-radius: 8px;
}
ul li:last-child a {
-webkit-border-bottom-left-radius: 8px;
-webkit-border-bottom-right-radius: 8px;
}
ul li a:active,ul li a:hover {
background-color:blue;
color:white;
}
#content {
padding: 10px;
text-shadow: 0px 1px 1px #fff;
}
#content a {
color: blue;
}
```

Setting Up Some Content to Work With

This JavaScript loads a document called *index.html*, and will not work without it. Before you proceed, copy the HTML file from [Example 2-1](#) into the same directory as *android.html*, and be sure to name it *index.html*. However, none of the links in it will work unless the targets of the links actually exist. You can create these files yourself or download the example code from [this book's website](#).

If you want a couple functioning links to play with, you can create *about.html*, *blog.html*, and *consulting-clinic.html*. To do so, just duplicate *index.html* a few times and change the filename of each copy to match the related link. For added effect, you can change the content of the *h2* tag in each file to match the filename. For example, the *h2* in *blog.html* would be <*h2*>Blog</*h2*>.

At this point, you should have the following files in your working directory:

android.html

You created this in [Example 3-1](#).

android.css

You created this in [Example 3-2](#).

index.html

A copy of the HTML file in [Example 2-1](#).

about.html

A copy of *index.html*, with the *h2* set to “About”.

blog.html

A copy of *index.html*, with the *h2* set to “Blog”.

consulting-clinic.html

A copy of *index.html*, with the *h2* set to “Consulting Clinic”.

Routing Requests with JavaScript

The JavaScript in *android.js* is where all the magic happens in this example. Create this file in the same directory as your *android.html* file. Please refer to [Example 3-3](#) as we go through it line by line.

Example 3-3. This bit of JavaScript in *android.js* converts the links on the page to Ajax requests

```
$(document).ready(function(){ ❶
    loadPage();
});
function loadPage(url) {❷
    if (url == undefined) {
        $('#container').load('index.html #header ul', hijackLinks);❸
    } else {
        $('#container').load(url + ' #content', hijackLinks);❹
    }
}
```

```
function hijackLinks() {❸
  $('#container a').click(function(e){❹
    e.preventDefault();❺
    loadPage(e.target.href);❻
  });
}
```

- ❶ Here we're using jQuery's document ready function to have the browser run the `loadPage()` function when the browser has finished constructing the page.
- ❷ The `loadPage()` function accepts a single parameter called `url` and then checks (on the next line) whether a value has been sent.
- ❸ If a value is not sent into the function (as will be the case when it is called for the first time from the document ready function), `url` will be undefined and this line will execute. This line and the following are examples of jQuery's `load()` function. The `load()` function is excellent for adding quick and dirty Ajax functionality to a page. If this line were translated into English, it would read, "Get all of the `ul` elements from the `#header` element of `index.html` and insert them into the `#container` element of the current page. When you're done, run the `hijackLinks()` function."



`index.html` refers to the home page of the site. If your home page is named differently, you'd use that filename here instead. If you've been following along, you used `index.html`.

- ❹ This line is executed if the `url` parameter has a value. It says, in effect, "Get the `#content` element from the `url` that was passed into the `loadPage()` function and insert it into the `#container` element of the current page. When you're done, run the `hijackLinks()` function."
- ❺ Once the `load()` function has completed, the `#container` element of the current page will contain the HTML snippet that was retrieved. Then, `load()` will run the `hijackLinks()` function.
- ❻ On this line, `hijackLinks()` finds all of the links in that new snippet of HTML and binds a click handler to them using the lines of code that follow. Click handlers are automatically passed an event object, which we're capturing as the function parameter `e`. The event object of a clicked link contains the URL of the remote page in `e.target.href`.
- ❽ Normally, a web browser will navigate to a new page when the user clicks a link. This navigation response is called the *default behavior* of the link. Since we are handling clicks and loading pages through JavaScript, we need to prevent this default behavior. On this line, which (along with the next line) is triggered when a user clicks one of the links, call the built-in `preventDefault()` method of the event object. If we leave that line out, the browser will dutifully leave the current page and navigate to the URL of clicked link.

- ⑧ When the user clicks, pass the URL of the remote page to the `loadPage()` function, and the cycle starts all over again.



One of my favorite things about JavaScript is that you can pass a function as a parameter to another function. Although this looks weird at first, it's extremely powerful and allows you to make your code modular and reusable. If you'd like to learn more, you should check out *JavaScript: The Good Parts* by Douglas Crockford (O'Reilly). In fact, if you are working with JavaScript, you should check out everything by Douglas Crockford; you'll be glad you did.

Click handlers do not run when the page first loads; they run when the user actually clicks a link. Assigning click handlers is like setting booby traps; you do some initial setup work for something that may or may not be triggered later.



It's worth taking a few minutes to read up on the properties of the event object that JavaScript creates in response to user actions in the browser. A good reference is located at http://www.w3schools.com/html/dom_obj_event.asp.

When testing the code in this chapter, be sure you point your browser at the *android.html* page. Web servers will typically default to displaying *index.html* if you just navigate to the directory that the files are in. Normally this is helpful, but in this case it will cause a problem.

Simple Bells and Whistles

With this tiny bit of HTML, CSS, and JavaScript, we have essentially turned an entire website into a single-page application. However, it still leaves quite a bit to be desired. Let's slick things up a bit.

Progress Indicator

Since we are not allowing the browser to navigate from page to page, the user will not see any indication of progress while data is loading (Figure 3-1). We need to provide some feedback to users to let them know that something is, in fact, happening. Without this feedback, users may wonder if they actually clicked the link or missed it, and will often start clicking all over the place in frustration. This can lead to increased server load and application instability (i.e., crashing).

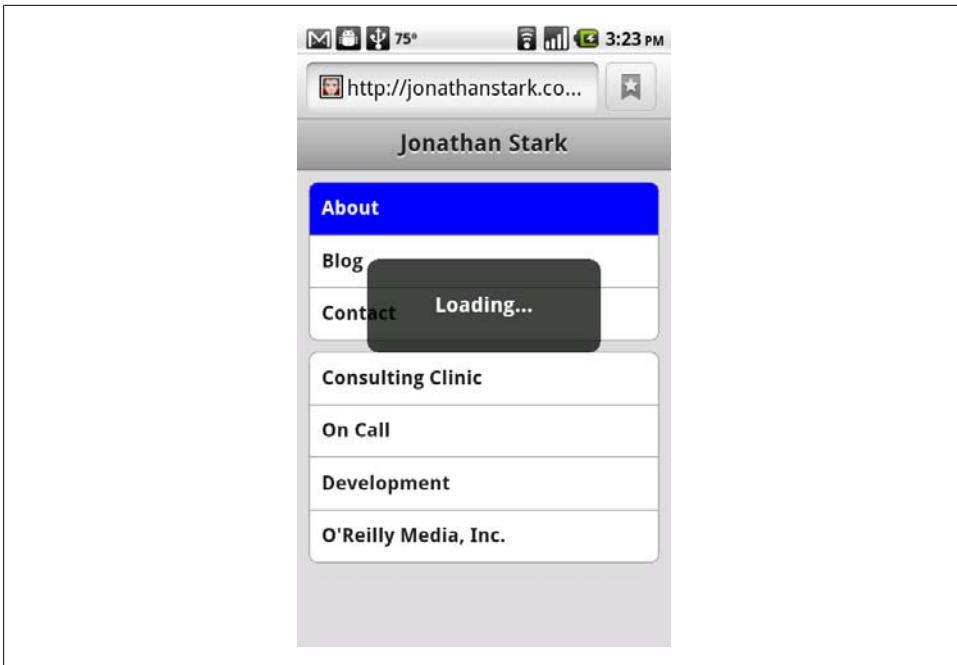


Figure 3-1. Without a progress indicator of some kind, your app will seem unresponsive and your users will get frustrated

Thanks to jQuery, providing a progress indicator only takes two lines of code. We'll just append a loading div to the body when `loadPage()` starts and remove the loading div when `hijackLinks()` is done. [Example 3-4](#) shows a modified version of [Example 3-3](#). The lines you need to add to `android.js` are shown in bold.

Example 3-4. Adding a simple progress indicator to the page

```

$(document).ready(function(){
    loadPage();
});

function loadPage(url) {
    $('body').append('<div id="progress">Loading...</div>');
    if (url == undefined) {
        $('#container').load('index.html #header ul', hijackLinks);
    } else {
        $('#container').load(url + ' #content', hijackLinks);
    }
}

function hijackLinks() {
    $('#container a').click(function(e){
        e.preventDefault();
        loadPage(e.target.href);
    });
    $('#progress').remove();
}

```

Simulating Real-World Network Performance

If you are testing this web application on a local network, the network speeds will be so fast you won't ever see the progress indicator. If you are using Mac OS X, you can slow all incoming web traffic by typing a couple of `ipfw` commands at the terminal. For example, these commands will slow all web traffic to 4 kilobytes per second:

```
sudo ipfw pipe 1 config bw 4KByte/s
sudo ipfw add 100 pipe 1 tcp from any to me 80
```

You should use your computer's hostname or external IP address in the URL (for example, `mycomputer.local` rather than `localhost`). When you're done testing, delete the rule with `sudo ipfw delete 100` (you can delete all custom rules with `ipfw flush`).

You can do similar things on Linux and Windows as well. For Linux, check out the following links:

- <http://linux-ip.net/articles/Traffic-Control-HOWTO/classless-qdiscs.html>
- <http://lartc.org/howto/lartc.ratelimit.single.html>

If you are using Windows, see the following:

- <http://blogs.msdn.com/b/wndp/archive/2006/06/30/653047.aspx>
- <http://www.netlimiter.com>

If you are using the Android emulator (see “[Create an Android Virtual Device](#)” on page 117), you can configure it to limit its speed using the `-netspeed` command-line option. For example, invoking the emulator with the arguments `-netspeed edge` will simulate real-world EDGE network speeds (118.4 kilobits per second upstream, 236.8 kilobits per second downstream). Run `emulator -help-netspeed` at the command line to see a list of all supported speeds.

See [Example 3-5](#) for the CSS you need to add to `android.css` to style the progress `div`.

Example 3-5. CSS added to android.css used to style the progress indicator

```
#progress {
    -webkit-border-radius: 10px;
    background-color: rgba(0,0,0,.7);
    color: white;
    font-size: 18px;
    font-weight: bold;
    height: 80px;
    left: 60px;
    line-height: 80px;
    margin: 0 auto;
    position: absolute;
    text-align: center;
    top: 120px;
    width: 200px;
}
```

Setting the Page Title

Our site happens to have a single `h2` at the beginning of each page that would make a nice page title (see [Figure 3-2](#)). You can see this in the HTML source shown in [Chapter 2](#). To be more mobile-friendly, we'll pull that title out of the content and put it in the header (see [Figure 3-3](#)). Again, jQuery to the rescue: you can just add three lines to the `hijackLinks()` function to make it happen. [Example 3-6](#) shows the `hijackLinks` function with these changes.

Example 3-6. Using the `h2` from the target page as the toolbar title

```
function hijackLinks() {
    $('#container a').click(function(e){
        e.preventDefault();
        loadPage(e.target.href);
    });
    var title = $('h2').html() || 'Hello!';
    $('h1').html(title);
    $('h2').remove();
    $('#progress').remove();
}
```

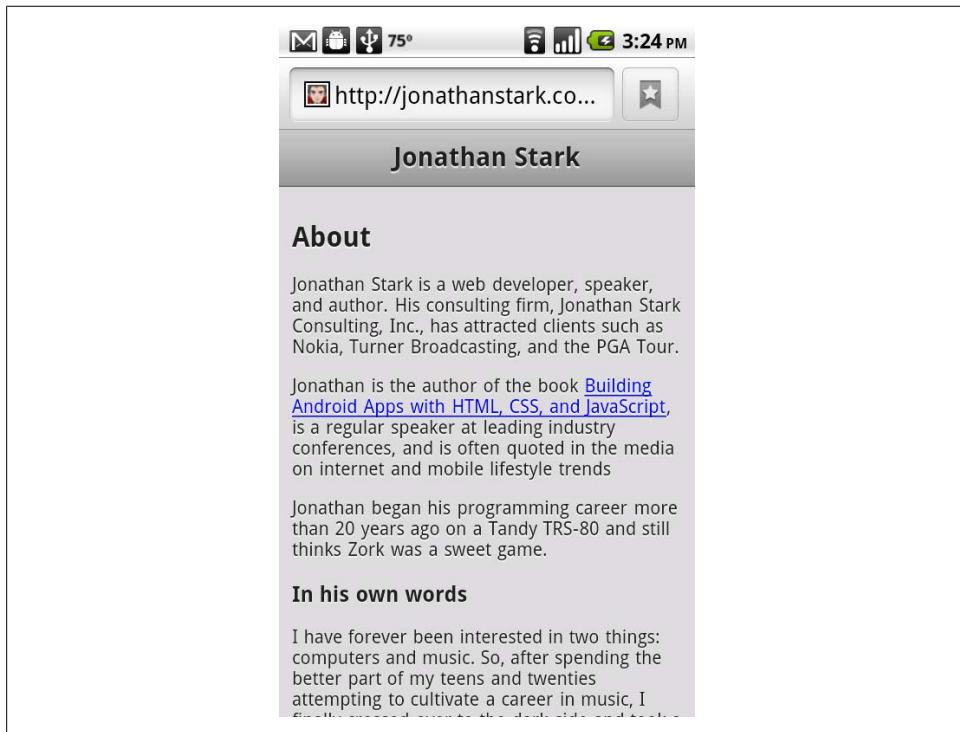


Figure 3-2. Before moving the page heading to the toolbar...

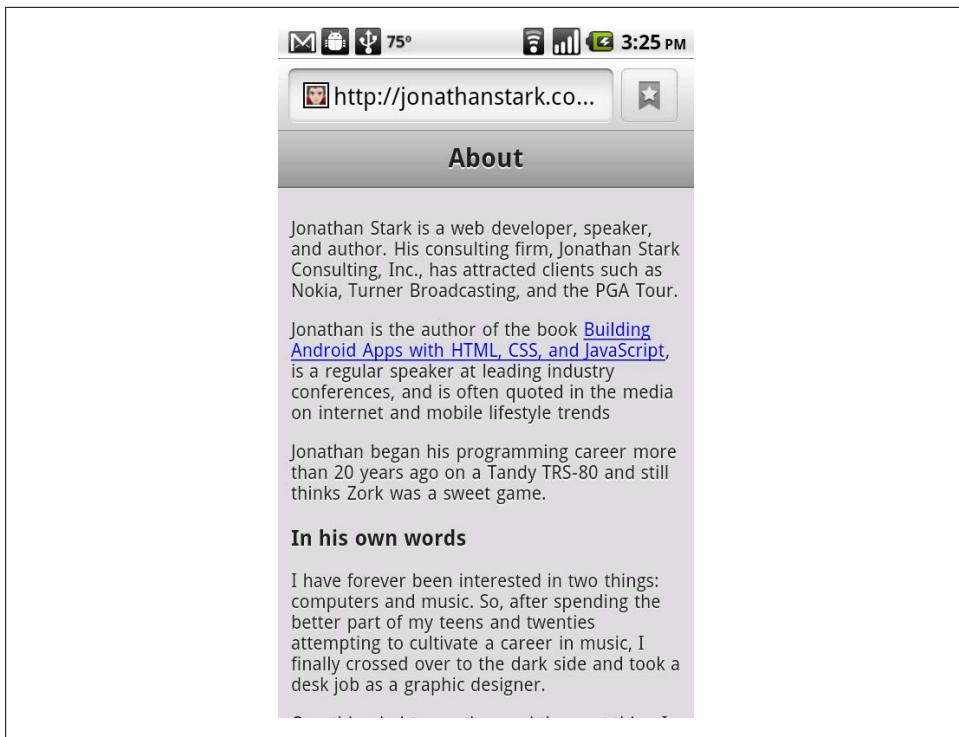


Figure 3-3. ...and after moving the page heading to the toolbar



I added the title lines before the line that removes the progress indicator. I like to remove the progress indicator as the very last action because I think it makes the application feel more responsive.

The double pipe (||) in the first line of inserted code (shown in bold) is the JavaScript logical operator OR. Translated into English, that line reads, “Set the title variable to the HTML contents of the h2 element, or to the string ‘Hello!’ if there is no h2 element.” This is important because the first page load won’t contain an h2 because we are just grabbing the nav uls.



This point probably needs some clarification. When users first load the `android.html` URL, they are only going to see the overall site navigation elements, as opposed to any site content. They won’t see any site content until they tap a link on this initial navigation page.

Handling Long Titles

Suppose we had a page on our site with a title too long to fit in the header bar (Figure 3-4). We could just let the text break onto more than one line, but that would not be very attractive. Instead, we can update the `#header h1` styles such that long text will be truncated with a trailing ellipsis (see Figure 3-5 and Example 3-7). This might be my favorite little-known CSS trick.

Example 3-7. Adding an ellipsis to text that is too long for its container

```
#header h1 {
    color: #222;
    font-size: 20px;
    font-weight: bold;
    margin: 0 auto;
    padding: 10px 0;
    text-align: center;
    text-shadow: 0px 1px 1px #fff;
    max-width: 160px;
    overflow: hidden;
    white-space: nowrap;
    text-overflow: ellipsis;
}
```

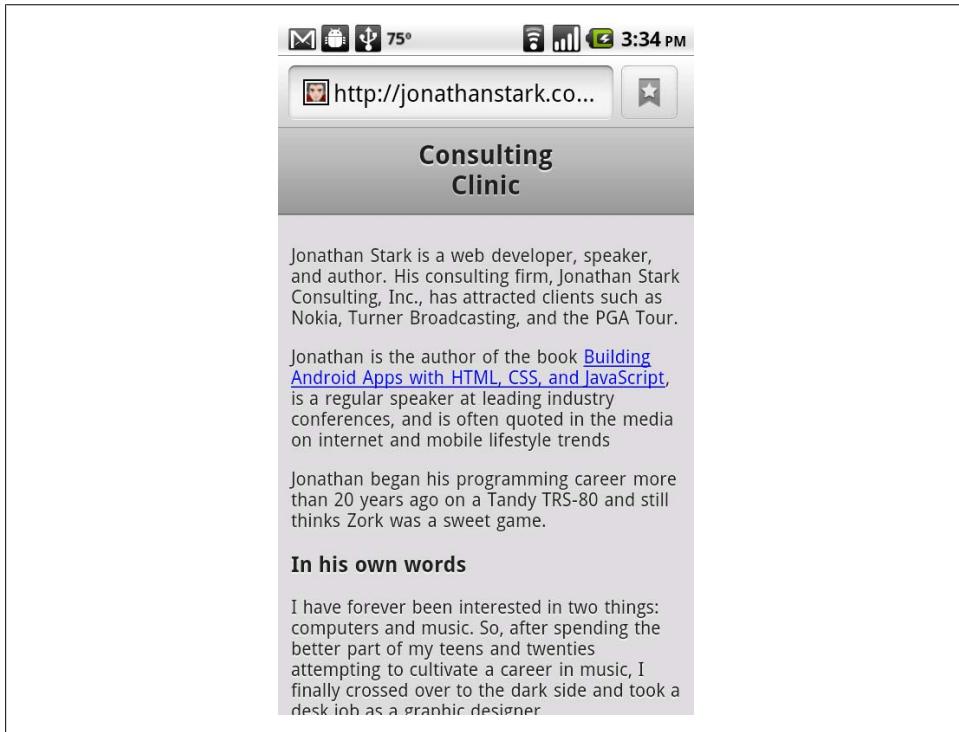


Figure 3-4. Text wrapping in the toolbar is not very attractive...

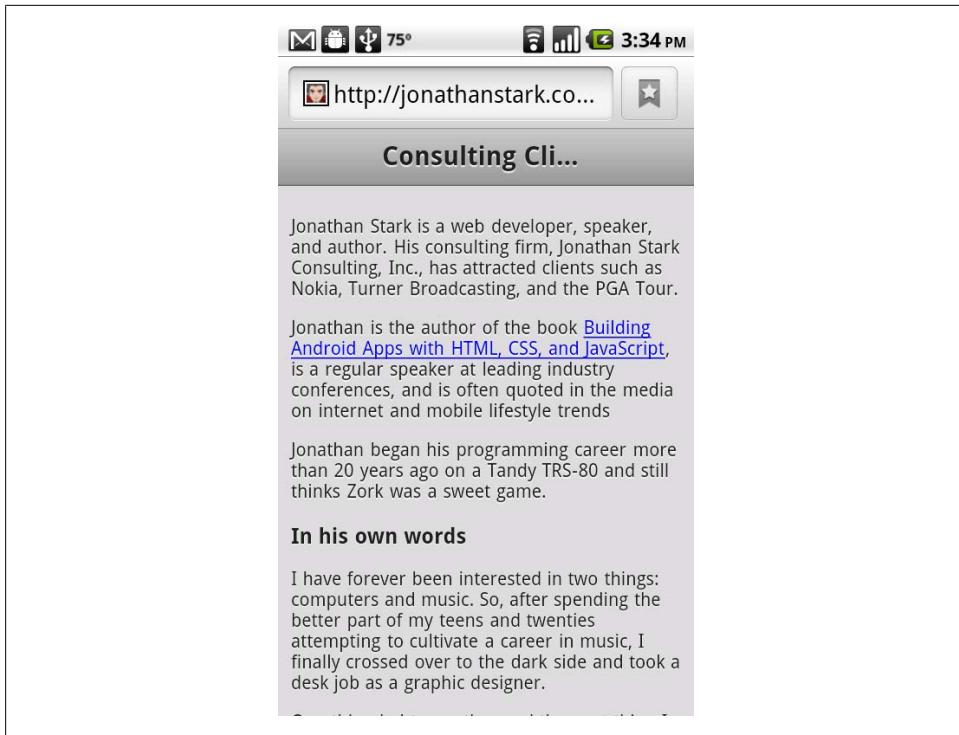


Figure 3-5. ...but we can beautify it with a CSS ellipsis

Here's the rundown: `max-width: 160px` instructs the browser not to allow the `h1` element to grow wider than `160px`. Then, `overflow: hidden` instructs the browser to chop off any content that extends outside the element borders. Next, `white-space: nowrap` prevents the browser from breaking the line into two. Without this line, the `h1` would just get taller to accommodate the text at the defined width. Finally, `text-overflow: ellipsis` appends three dots to the end of any chopped-off text to indicate to the user that she is not seeing the entire string.

Automatic Scroll-to-Top

Let's say you have a page that is longer than the viewable area on the phone. The user visits the page, scrolls down to the bottom, and clicks on a link to an even longer page. In this case, the new page will show up "prescrolled" instead of at the top as you'd expect.

Technically, this makes sense because we are not actually leaving the current (scrolled) page, but it's certainly a confusing situation for the user. To rectify the situation, we can add a `scrollTo()` command to the `loadPage()` function ([Example 3-8](#)).

Whenever a user clicks a link, the page will first jump to the top. This has the added benefit of ensuring the loading graphic is visible if the user clicks a link at the bottom of a long page.

Example 3-8. It's a good idea to scroll back to the top when a user navigates to a new page

```
function loadPage(url) {
    $('body').append('<div id="progress">Loading...</div>');
    scrollTo(0,0);
    if (url == undefined) {
        $('#container').load('index.html #header ul', hijackLinks);
    } else {
        $('#container').load(url + ' #content', hijackLinks);
    }
}
```

Hijacking Local Links Only

Like most sites, ours has links to external pages (i.e., pages hosted on other domains). We shouldn't hijack these external links, because it wouldn't make sense to inject their HTML into our Android-specific layout. As shown in [Example 3-9](#), we can add a conditional that checks the URL for the existence of our domain name. If it's found, the link is hijacked and the content is loaded into the current page (i.e., Ajax is in effect). If not, the browser will navigate to the URL normally.



You must change `jonathanstark.com` to the appropriate domain or hostname for your website, or the links to pages on your website will no longer be hijacked.

Example 3-9. You can allow external pages to load normally by checking the domain name of the URL

```
function hijackLinks() {
    $('#container a').click(function(e){
        var url = e.target.href;
        if (url.match(/jonathanstark.com/)) {
            e.preventDefault();
            loadPage(url);
        }
    });
    var title = $('h2').html() || 'Hello!';
    $('h1').html(title);
    $('h2').remove();
    $('#progress').remove();
}
```



The `url.match` function uses a language, regular expressions, that is often embedded within other programming languages such as JavaScript, PHP, and Perl. Although this regular expression is simple, more complex expressions can be a bit intimidating, but are well worth becoming familiar with. My favorite regex page is located at <http://www.regular-expressions.info/javascriptexample.html>.

Roll Your Own Back Button

The elephant in the room at this point is that the user has no way to navigate back to previous pages (remember that we've hijacked all the links, so the browser page history won't work). Let's address that by adding a Back button to the top left corner of the screen. First, we'll update the JavaScript, and then we'll do the CSS.

Adding a standard toolbar Back button to the app means keeping track of the user's click history. To do this, we'll have to:

- store the URL of the previous page so we know where to go back to, and
- store the title of the previous page so we know what label to put on the Back button

Adding this feature touches on most of the JavaScript we've written so far in this chapter, so I'll go over the entire new version of `android.js` line by line (see [Example 3-10](#)). The result will look like [Figure 3-6](#).

Example 3-10. Expanding the existing JavaScript example to include support for a Back button

```
var hist = [];①
var startUrl = 'index.html';②
$(document).ready(function(){③
    loadPage(startUrl);
});
function loadPage(url) {
    $('body').append('<div id="progress">Loading...</div>');④
    scrollTo(0,0);
    if (url == startUrl) {⑤
        var element = '#header ul';
    } else {
        var element = '#content';
    }
    $('#container').load(url + element, function(){⑥
        var title = $('h2').html() || 'Hello!';
        $('h1').html(title);
        $('h2').remove();
        $('.leftButton').remove();⑦
        hist.unshift({'url':url, 'title':title});⑧
        if (hist.length > 1) {⑨
            $('#header').append('<div class="leftButton">' + hist[1].title + '</div>');⑩
            $('#header .leftButton').click(function(){⑪
                var thisPage = hist.shift();⑫
                var previousPage = hist.shift();
                loadPage(previousPage.url);
            });
        }
    });
}
```

```

        });
    }
    $('#container a').click(function(e){⑬
        var url = e.target.href;
        if (url.match(/jonathanstark.com/)) {⑭
            e.preventDefault();
            loadPage(url);
        }
    });
    $('#progress').remove();
});
}

```

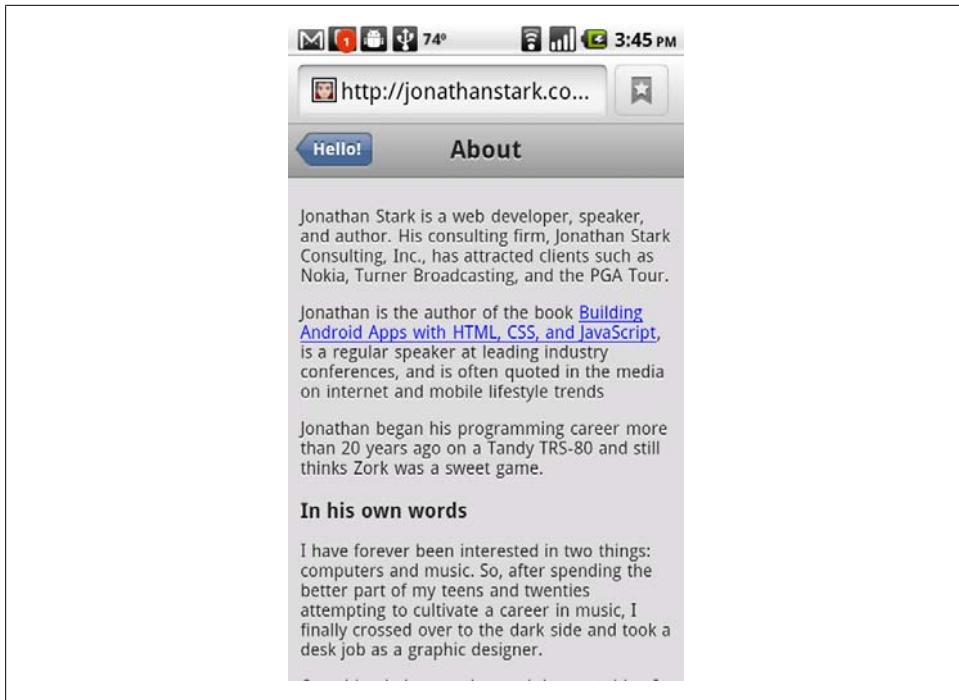


Figure 3-6. It wouldn't be a mobile app without a glossy, left-arrow Back button

- ➊ This line initializes a variable named `hist` as an empty array. Since it is defined outside of any functions, it exists in the global scope and will be available everywhere in the page. Notice that it doesn't use the full word `history` as the variable name, because that is a predefined object property in JavaScript and you should avoid it in your own code.
- ➋ This line defines the relative URL of the remote page to load when the user first visits `android.html`. You might recall that earlier examples checked for `url == undefined` to handle the first page load, but in this example we are using the start page in a few places. Therefore, it makes sense to define it globally.

- ❸ This line and the next make up the document ready function definition. Unlike previous examples, we're passing the start page to the `loadPage()` function.
- ❹ On to the `loadPage()` function. This line and the next are verbatim from previous examples.
- ❺ This `if...else` statement determines which elements to load from the remote page. For example, if we want the start page, we grab the `uls` from the header; otherwise, we grab the content `div`.
- ❻ On this line, the `url` parameter and the appropriate source element are concatenated as the first parameter passed to the `load` function. As for the second parameter, we're passing an *anonymous function* (an unnamed function that is defined inline) directly. As we go through the anonymous function, you'll notice a strong resemblance to the `hijackLinks()` function, which has been replaced by this anonymous function. For example, the following three lines are identical to previous examples.
- ❼ On this line, we remove the `.leftButton` object from the page. This might seem weird because we haven't yet added it to the page; we'll be adding it a couple steps down.
- ❽ Here we use the built-in `unshift` method of the JavaScript array to add an object to the beginning of the `hist` array. The object has two properties: `url` and `title`—the two pieces of information we need to support the Back button display and behavior.
- ❾ This line includes the built-in `length` method of the JavaScript array to find out how many objects are in the history array. If there is only one object in the history array, it means the user is on the first page. Therefore, we don't need to display a Back button. However, if there is more than one object in the `hist` array, we need to add a button to the header.
- ❿ This line adds the `.leftButton` I mentioned above. The text of the button will be the same as the title of the page before the current page, which is what we're accessing with the `hist[1].title` code. JavaScript arrays are zero-based, so the first item in the array (the current page) has an index of 0. In other words, index 0 is the current page, index 1 is the previous page, index 2 is the page before that, and so on.
- ⓫ This block of code binds an anonymous function to the click handler of the Back button. Remember, click handler code executes when the user clicks, not when the page loads. So, after the page loads and the user clicks to go back, the code inside this function will run.
- ⓬ This line and the next use the built-in `shift` method of the array to remove the first two items from the `hist` array, then the last line in the function sends the URL of the previous page to the `loadPage()` function.
- ⓭ The remaining lines were copied exactly from previous examples, so I won't rehash them here.

- ⑯ This is the URL-matching code introduced earlier in this chapter. Remember to replace `jonathanstark.com` with part of your website's domain or hostname, or none of the local links will be hijacked and loaded into the page.



Please visit http://www.hunlock.com/blogs/Mastering_Javascript_Arrays for a full listing of JavaScript array functions with descriptions and examples.

Now that we have our Back button, all that remains is to party it up with some CSS (see [Example 3-11](#)). We'll start off by styling the text with `font-weight`, `text-align`, `line-height`, `color`, and `text-shadow`. We'll continue by placing the `div` precisely where we want it on the page with `position`, `top`, and `left`. Then, we'll make sure that long text on the button label will truncate with an ellipsis using `max-width`, `white-space`, `overflow`, and `text-overflow`. Finally, we'll apply a graphic with `border-width` and `-webkit-border-image`. Unlike the earlier border image example, this image has a different width for the left and right borders because the image is made asymmetrical by the arrowhead on the left side.



Don't forget that you'll need an image for this button. You'll need to save it as `back_button.png` in the `images` folder underneath the folder that holds your HTML file. See "[Adding Basic Behavior with jQuery](#)" on page 26 for tips on finding or creating your own button images.

Example 3-11. Add the following to android.css to beautify the Back button with a border image

```
#header div.leftButton {
    font-weight: bold;
    text-align: center;
    line-height: 28px;
    color: white;
    text-shadow: 0px -1px 1px rgba(0,0,0,0.6);
    position: absolute;
    top: 7px;
    left: 6px;
    max-width: 50px;
    white-space: nowrap;
    overflow: hidden;
    text-overflow: ellipsis;
    border-width: 0 8px 0 14px;
    -webkit-border-image: url(images/back_button.png) 0 8 0 14;
}
```

By default, Android displays an orange highlight to clickable objects that have been tapped (Figure 3-7). This may appear only briefly, but removing it is easy and makes the app look much better. Fortunately, Android supports a CSS property called `-webkit-tap-highlight-color`, which allows you to suppress this behavior. We can do this here by setting the tap highlight to a fully transparent color (see Example 3-12).

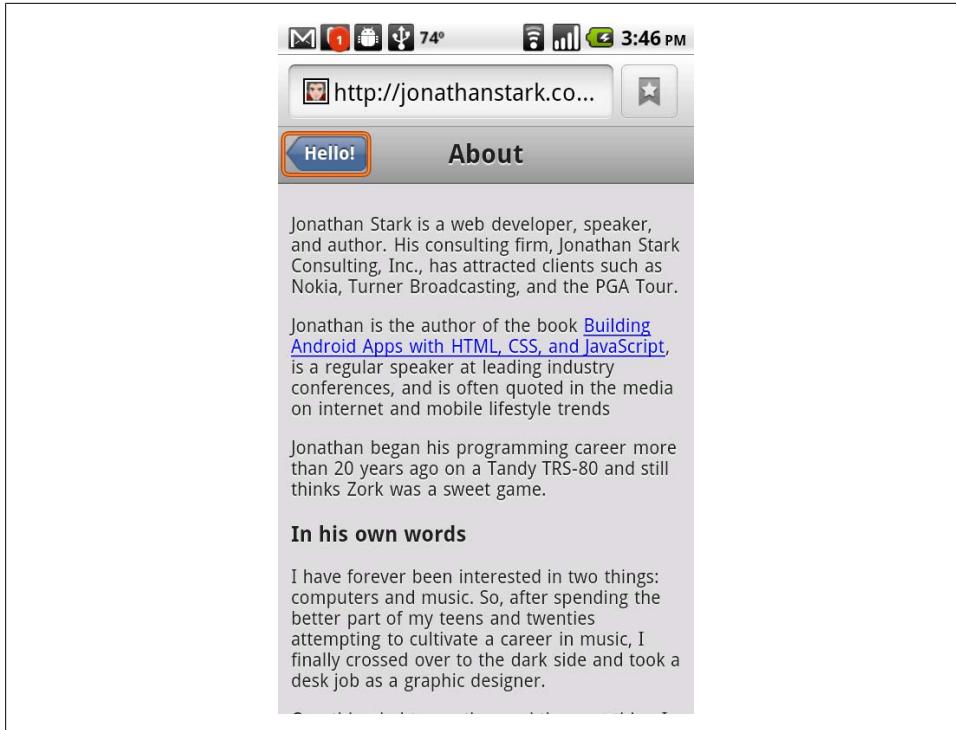


Figure 3-7. By default, Android displays an orange highlight to clickable objects that have been tapped

Example 3-12. Add the following to android.css to remove the default tap highlight effect

```
#header div.leftButton {
    font-weight: bold;
    text-align: center;
    line-height: 28px;
    color: white;
    text-shadow: 0px -1px 1px rgba(0,0,0,0.6);
    position: absolute;
    top: 7px;
    left: 6px;
    max-width: 50px;
    white-space: nowrap;
    overflow: hidden;
    text-overflow: ellipsis;
    border-width: 0 8px 0 14px;
    -webkit-border-image: url(images/back_button.png) 0 8 0 14;
    -webkit-tap-highlight-color: transparent;
}
```

```
-webkit-tap-highlight-color: rgba(0,0,0,0);
}
```

In the case of the Back button, there could be at least a second or two of delay before the content from the previous page appears. To avoid frustration, we can configure the button to look clicked the instant it's tapped. In a desktop browser, this is a simple process: you just add a declaration to your CSS using the `:active` pseudoclass to specify an alternate style for the object that the user clicked. I don't know if it's a bug or a feature, but this approach does not work on Android; the `:active` style is ignored.

I toyed around with combinations of `:active` and `:hover`, which brought me some success with non-Ajax apps. However, with an Ajax app like the one we are using here, the `:hover` style is sticky (i.e., the button appears to remain "clicked" even after the finger is removed).

Fortunately, the fix is pretty simple—use jQuery to add the class `clicked` to the button when the user taps it. I've opted to apply a darker version of the button image to the button in the example (see [Figure 3-8](#) and [Example 3-13](#)). You'll need to make sure you have a button image called `back_button_clicked.png` in the `images` subfolder. See "[Adding Basic Behavior with jQuery](#)" on page 26 for tips on finding or creating your own button images.

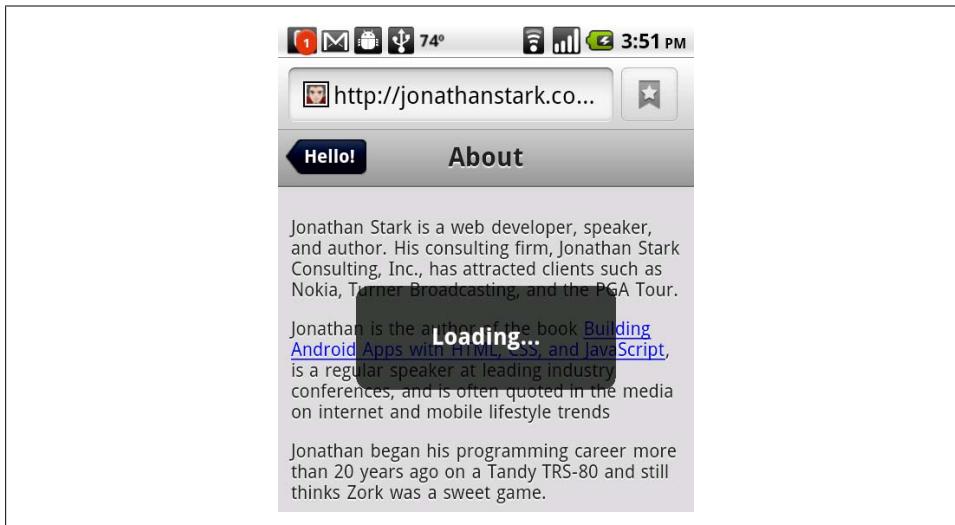


Figure 3-8. It might be tough to tell in print, but the clicked Back button is a bit darker than the default state

Example 3-13. Add the following to android.css to make the Back button looked clicked when the user taps it

```
#header div.leftButton.clicked {
    -webkit-border-image: url(images/back_button_clicked.png) 0 8 0 14;
}
```



Since we're using an image for the clicked style, it would be smart to preload the image. Otherwise, the unclicked button graphic will disappear the first time it's tapped while the clicked graphic downloads. I'll cover image preloading in the next chapter.

With the CSS in place, we can now update the portion of the *android.js* that assigns the click handler to the Back button. First, we add a variable, *e*, to the anonymous function to capture the incoming click event. Then, we wrap the event target in a jQuery selector and call jQuery's *addClass()* function to assign the clicked CSS class to the button:

```
$('#header .leftButton').click(function(e){
  $(e.target).addClass('clicked');
  var thisPage = hist.shift();
  var previousPage = hist.shift();
  loadPage(lastUrl.url);
});
```



A special note to any CSS gurus in the crowd: the CSS Sprite technique—popularized by A List Apart—is not an option in this case because it requires setting offsets for the image. The *-webkit-border-image* property does not support image offsets.

Adding an Icon to the Home Screen

Hopefully, users will want to add an icon for your webapp to their home screens (this is called a “launcher icon”). They do this by bookmarking your app and adding a bookmark shortcut to their home screens. This is the same process they use to add any bookmark to their home screens. The difference is that we’re going to specify a custom image to display in place of the default bookmark icon.

First, upload a *.png* image file to your website. To maintain a consistent visual weight with other launcher icons, it’s recommended that the file be 56px × 56px if its visible area is basically square, and 60px × 60px otherwise. You’ll have to experiment with your specific graphic to settle on the perfect dimensions.



Because Android is built to run on many different devices with a variety of screen sizes and pixel densities, creating icons that look good everywhere is fairly involved. For detailed instructions and free downloadable templates, please visit the Icon Design page on the Android developer site (http://developer.android.com/guide/practices/ui_guidelines/icon_design.html#launcherstructure).

Next, add the following line to the `head` section of the “traffic cop” HTML document, `android.html` (replace `myCustomIcon.png` with the absolute or relative path to the image):

```
<link rel="apple-touch-icon-precomposed" href="myCustomIcon.png" />
```



As you might have noticed, this is an Apple-specific directive that has been adopted by Android.

What You've Learned

In this chapter, you've learned how to convert a normal website into an Ajax application, complete with progress indicators and a native-looking Back button. In the next chapter, you'll learn how to make your app come alive by adding native UI animations. That's right; here comes the fun stuff!

CHAPTER 4

Animation

Android apps have a number of distinctive animation characteristics that add context and meaning for the user. For example, pages slide left as users drill down through links, and slide right as they navigate back. In this chapter, you'll learn how to add characteristic behaviors like sliding, page flip, and more to your web app. These changes will make your web app almost indistinguishable from a native application.

With a Little Help from Our Friend

I'll be honest: making a web page animate like a typical native app is hard. Fortunately, an enterprising young lad named David Kaneda has created a JavaScript library called jQTouch that makes mobile web development a whole heckuva lot easier. jQTouch is an open source jQuery plug-in that handles virtually everything we learned in the previous chapter, as well as a boatload of much more complex stuff that would be truly painful to write from scratch.



You can download the latest version of jQTouch at <http://jqtouch.com>. In the interest of full disclosure, you should know David recently asked me to be the official maintainer for jQTouch—an honor I happily accepted.

Sliding Home

We are going to build a simple calorie-tracking application called Kilo that allows the user to add and delete food entries for a given date. All told, there will be five panels: Home, Settings, Dates, Date, and New Entry. We'll start off with two panels and work our way up as we go.



We will be assigning CSS classes to some of the HTML elements (e.g., `toolbar`, `edgetoedge`, `arrow`, `button`, `back`). In every case, these classes correspond to predefined CSS class selectors that exist in the default jQTouch theme. Bear in mind that you can create and use your own classes by modifying existing jQTouch themes or creating your own from scratch; we're just using the defaults in the examples here.

We're going to start from scratch here, so you can put aside the files you created in the preceding chapters. To begin, let's create a file named `index.html` and add the HTML given in [Example 4-1](#) for the Home and About panels.

Example 4-1. HTML for the Home and About panels in index.html

```
<html>
  <head>
    <title>Kilo</title>
  </head>
  <body>
    <div id="home">❶
      <div class="toolbar">❷
        <h1>Kilo</h1>
      </div>
      <ul class="edgetoedge">❸
        <li class="arrow"><a href="#about">About</a></li>❹
      </ul>
    </div>
    <div id="about">
      <div class="toolbar">
        <h1>About</h1>
        <a class="button back" href="#">Back</a>❺
      </div>
      <div>
        <p>Kilo gives you easy access to your food diary.</p>
      </div>
    </div>
  </body>
</html>
```

The HTML here basically amounts to a head with a title and a body with two children, both `div`s:

- ❶ This `div` (as well as the `about` `div` that appears a few lines down) will become a panel in the application by virtue of the fact that they are direct descendants of the `body`.
- ❷ Inside each panel `div`, there is a `div` with a class of `toolbar`. This `toolbar` class is specifically predefined in the jQTouch themes to style an element like a traditional mobile phone toolbar.
- ❸ This unordered list tag has the class `edgetoedge`. The `edgetoedge` class tells jQTouch to stretch the list all the way from left to right in the viewable area.

- ④ On this line there is an `li` that contains a link with its `href` pointing at the About panel. Including the `arrow` class on the `li` is optional; doing so will add a chevron to the right side of the item in the list.
- ⑤ The toolbar elements each contain a single `h1` element that will become the panel title. On this line, there are links with the classes `button` and `back`, which tell jQTouch to make the button look and act like a Back button.



The `href` on the Back button is set to `#`. Normally, this would tell the browser to return to the top of the current document. But when using jQTouch, it navigates back to the previous panel instead. In more advanced scenarios, you might want to use a specific anchor, such as `#home`, which instructs the Back button to navigate to a particular panel regardless of what the previous panel was.

With the basic HTML in place, it's time to add jQTouch to the party. Once you've downloaded jQTouch and unzipped it into the same directory as the HTML document, just add a few lines of code to the head of your page ([Example 4-2](#)).



For this and other examples in this book, you will need to download jQTouch at <http://www.jqtouch.com>, unzip it, and move the `jqtouch` and `themes` directories into the same directory as your HTML document. You will also need to go into the `jqtouch` directory and rename the jQuery JavaScript file (such as `jquery.1.3.2.min.js`) to `jquery.js`.

Example 4-2. Adding these lines to the head of your document will activate jQTouch

```
<link type="text/css" rel="stylesheet" media="screen" href="jqtouch/jqtouch.css">❶
<link type="text/css" rel="stylesheet" media="screen" href="themes/jqt/theme.css">❷
<script type="text/javascript" src="jqtouch/jquery.js"></script>❸
<script type="text/javascript" src="jqtouch/jqtouch.js"></script>❹
<script type="text/javascript">❺
  var jQT = $.jQTouch({
    icon: 'kilo.png'
  });
</script>
```

- ❶ This line includes the `jqtouch.css` file. This file defines some hardcore structural design rules that are very specific to handling animations, orientation, and other Android-specific minutiae. This file is required and there should be no reason for you to edit it.
- ❷ This line specifies the CSS for the selected theme, in this case, the “`jqt`” theme, which comes with jQTouch. The classes that we've been using in the HTML correspond to CSS selectors in this document. jQTouch comes with two themes available by default. You can also make your own by duplicating a default theme and making changes to it or writing a new one from scratch.

- ❸ jQTouch requires jQuery, so it is included here. jQTouch comes with its own copy of jQuery (which you need to rename to *jquery.js*, as described earlier), but you can link to another copy if you prefer.
- ❹ This is where we include jQTouch itself. Notice that you have to include jQTouch after jQuery or ain't nothin' gonna work.
- ❺ This brings us to the script block where we initialize the jQTouch object and send in a property value: `icon`.

jQTouch exposes several properties that allow you to customize the behavior and appearance of your app. You'll see several throughout the course of this book, and they are all optional. However, you'll pretty much always be using at least a few of them.

In this case, `icon` tells jQTouch where to look for the custom home screen icon.

The difference between the application before jQTouch ([Figure 4-1](#)) and after ([Figure 4-2](#)) is dramatic, but the truly astonishing change is that you've just added gorgeous left/right sliding to your app with 10 lines of code. jQTouch is awesome, and we're just getting started.

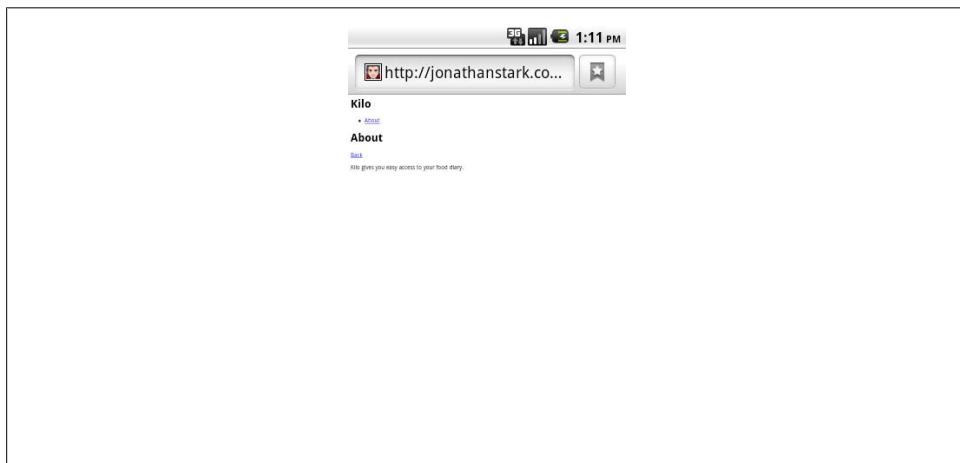


Figure 4-1. Kilo before jQTouch...

Adding the Dates Panel

Let's add the Dates panel. The Dates panel will have a list of relative dates beginning with today and going back to five days ago ([Figure 4-3](#)). Add the HTML for the Dates panel (shown in [Example 4-3](#)) right after the About panel, just before the closing `</body>` (in a moment, I'll show you how to add a link to this from the Home panel).

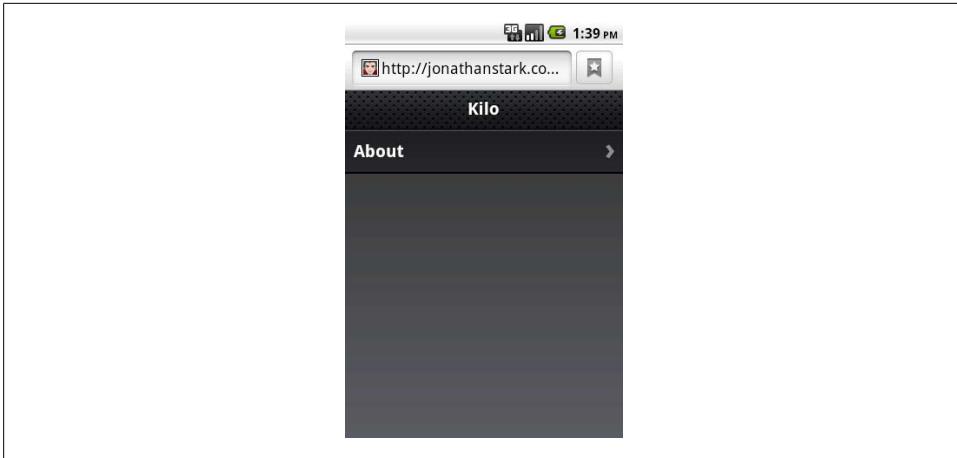


Figure 4-2. ...and Kilo after jQTouch

Example 4-3. The HTML for the Dates panel

```
<div id="dates">
  <div class="toolbar">
    <h1>Dates</h1>
    <a class="button back" href="#">Back</a>
  </div>
  <ul class="edgetoedge">
    <li class="arrow"><a id="0" href="#date">Today</a></li>
    <li class="arrow"><a id="1" href="#date">Yesterday</a></li>
    <li class="arrow"><a id="2" href="#date">2 Days Ago</a></li>
    <li class="arrow"><a id="3" href="#date">3 Days Ago</a></li>
    <li class="arrow"><a id="4" href="#date">4 Days Ago</a></li>
    <li class="arrow"><a id="5" href="#date">5 Days Ago</a></li>
  </ul>
</div>
```

Like the About panel, the Dates panel has a toolbar with a title and Back button. After the toolbar, there is an unordered `edgetoedge` list of links. Notice that all of the links have unique IDs (i.e., 0 through 5) but the same `href` (i.e., `#date`)—more on that in a bit.

Next, you have to update the Home panel with a link to the Dates panel. Add the line shown in bold to the Home panel in `index.html`:

```
<div id="home">
  <div class="toolbar">
    <h1>Kilo</h1>
  </div>
  <ul class="edgetoedge">
    <li class="arrow"><a href="#dates">Dates</a></li>
    <li class="arrow"><a href="#about">About</a></li>
  </ul>
</div>
```

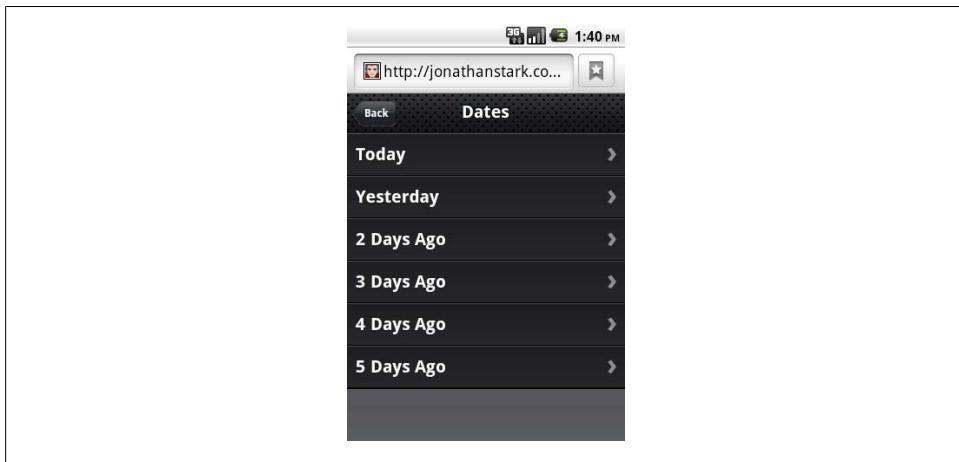


Figure 4-3. The Dates panel consists of a toolbar with a Back button and a clickable list of relative dates

And just like that, we've added a new panel to the app (Figure 4-4). Clicking on an item on the Dates panel doesn't do anything yet. Let's rectify that situation by adding a panel to display a date item (the Date panel).

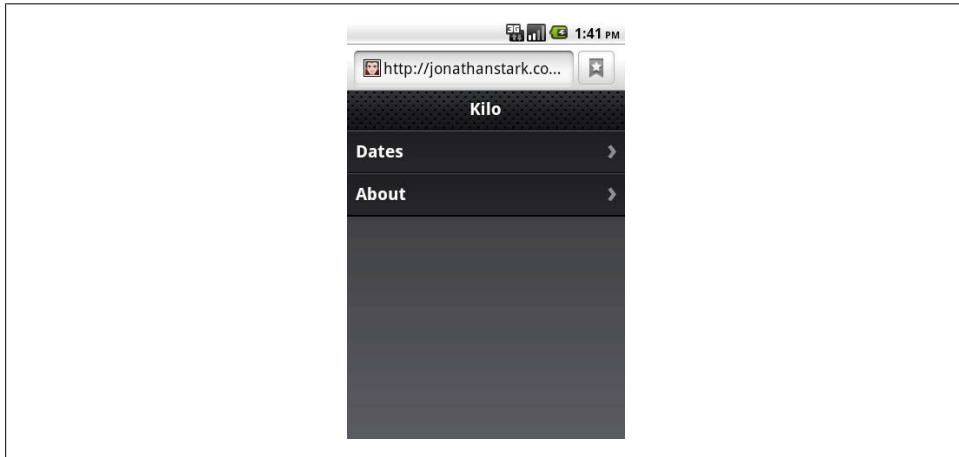


Figure 4-4. The Home panel now has a link to the Dates panel

Adding the Date Panel

The Date panel looks a lot like the previous panels, with a couple of exceptions (refer to Example 4-4). Add the HTML for the Date panel right after the Dates panel, just before the closing `</body>`.

Example 4-4. The HTML for the Date panel

```
<div id="date">
  <div class="toolbar">
    <h1>Date</h1>
    <a class="button back" href="#">Back</a>
    <a class="button slideup" href="#createEntry">+</a>①
  </div>
  <ul class="edgetoedge">
    <li id="entryTemplate" class="entry" style="display:none">②
      <span class="label">Label</span>
      <span class="calories">000</span>
      <span class="delete">Delete</span>
    </li>
  </ul>
</div>
```

- ①** The Date panel toolbar has an additional button. When clicked, this button will display the New Entry panel (which we have not yet built). The link has a class of `slideup`, which tells jQTouch that we want the target panel to slide up from the bottom of the screen, rather than in from the left or right like normal navigation.
- ②** The other unusual aspect of this panel is that we define a list item with the style set to `display:none`, effectively making it invisible.

As you'll see in a bit, we'll use this invisible list item as a template to display entries once they are created. At this point, there are no entries, so the panel will be empty aside from the toolbar.

Now that you've added the Date panel, clicking any item on the Dates panel will slide the empty Date panel ([Figure 4-5](#)) into view.

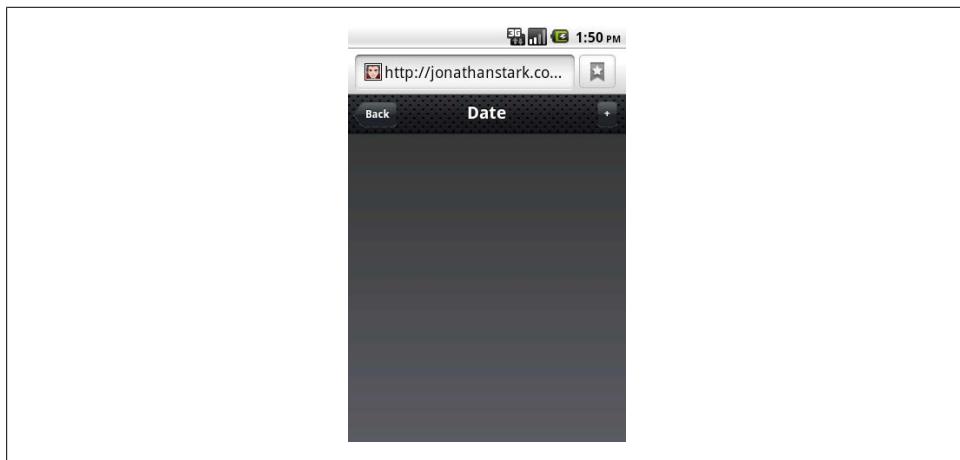


Figure 4-5. Other than the toolbar, the Date panel is empty to begin with

Adding the New Entry Panel

[Example 4-5](#) shows the source code for the New Entry panel. Add this code to the end of `index.html`, before the closing `</body>`.

Example 4-5. The HTML for the New Entry panel

```
<div id="createEntry">
    <div class="toolbar">
        <h1>New Entry</h1>
        <a class="button cancel" href="#">Cancel</a>①
    </div>
    <form method="post">②
        <ul class="rounded">
            <li><input type="text" placeholder="Food" name="food" id="food"
                autocapitalize="off" autocorrect="off" autocomplete="off" /></li>
            <li><input type="text" placeholder="Calories" name="calories" id="calories"
                autocapitalize="off" autocorrect="off" autocomplete="off" /></li>
            <li><input type="submit" class="submit" name="action"
                value="Save Entry" /></li>③
        </ul>
    </form>
</div>
```

- ①** The first thing to point out about the New Entry panel is that rather than having a Back button, it has a Cancel button.



Cancel buttons in jQTouch behave just like back buttons: they remove the current page from view with the reverse animation that it came into view. However, cancel buttons are not shaped like a left arrow the way back buttons are.

I used a Cancel button here for the New Entry panel because it slides up on the way in and will therefore slide down on the way out. It would be counterintuitive to click a left-pointing Back button and then have the panel slide down.

- ②** This HTML form contains an unordered (bulleted) list of three items: two text fields and a submit button. Embedding form controls in an `li` allows the jqt theme to style the form as shown in [Figure 4-6](#).

Each of the text inputs has quite a few attributes defined:

`type="text"`

Defines the form control to be a single line text entry field.

`placeholder`

A string of text to display in the form input when the input is empty.

`name`

The name that will be associated with the value provided by the user when the form is submitted.

id

A unique identifier for the element in the context of the entire page.

autocapitalize

Allows you to control the autocapitalization feature in Mobile Safari on the iPhone. Has no effect on Android.

autocorrect

Allows you to control the spelling correction feature in Mobile Safari on the iPhone. Has no effect on Android.

autocomplete

Allows you to control the autocomplete feature in Mobile Safari on the iPhone. Has no effect on Android.

- ③ The `class` attribute of the submit input button needs explanation. The Android phone will display a keyboard whenever the user's cursor is in a field. The keyboard has a Go button in the bottom right-hand corner that submits the form when clicked. When you are hijacking the submit function as we are doing here, submitting from the Go button on the keyboard does not remove the cursor from the active field and therefore, the keyboard does not slide out of view. To remedy this, jQTouch offers a convenience method that automatically removes the cursor from the active field when a form is submitted. To take advantage of this feature, add the `submit` class to the submit element of the form.

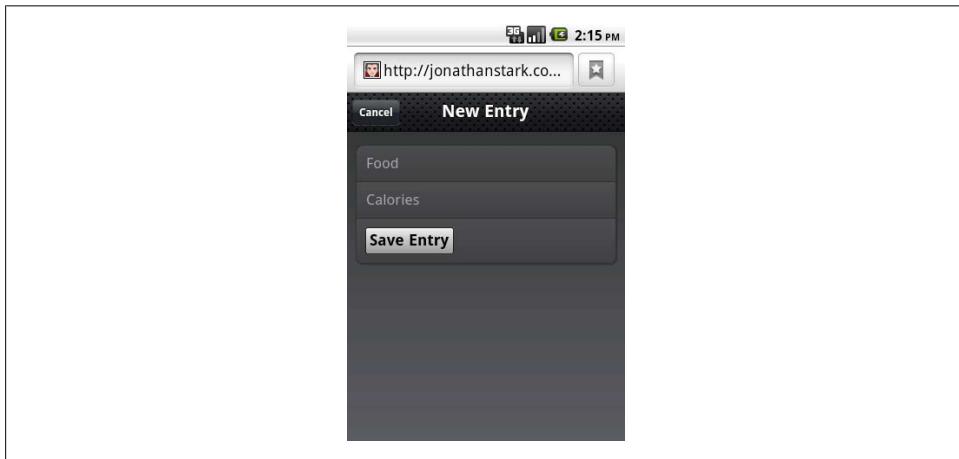


Figure 4-6. The jqt theme does a nice job styling form elements

[Figure 4-7](#) shows the New Entry form in action. At this point, we've done nothing to actually save the entry when the user clicks Save Entry. We'll cover that in [Chapter 5](#).



Figure 4-7. Keyboard data entry with the New Entry form

Adding the Settings Panel

We haven't yet created a button that will allow users to navigate to a Settings panel, so let's add one to the toolbar on the Home panel. All it takes is a single line of HTML, shown in bold:

```
<div id="home">
  <div class="toolbar">
    <h1>Kilo</h1>
    <a class="button flip" href="#settings">Settings</a>①
  </div>
  <ul class="edgetoedge">
    <li class="arrow"><a href="#dates">Dates</a></li>
    <li class="arrow"><a href="#about">About</a></li>
  </ul>
</div>
... remaining HTML not shown ...
```

- ①** This is the line of HTML that adds the button (Figure 4-8). Notice that we've assigned the `flip` class to the link. The `flip` class instructs jQTouch to transition from the Home panel to the Settings panel by rotating the page on its vertical axis. To give an added dimension to the process, the page actually zooms out a bit during the animation. Fancy, no?



Unfortunately, support for 3D animations is spotty across mobile platforms, including Android. Therefore flip, swap, cube, and any other 3D animations will failover to 2D animations when 3D is not supported.

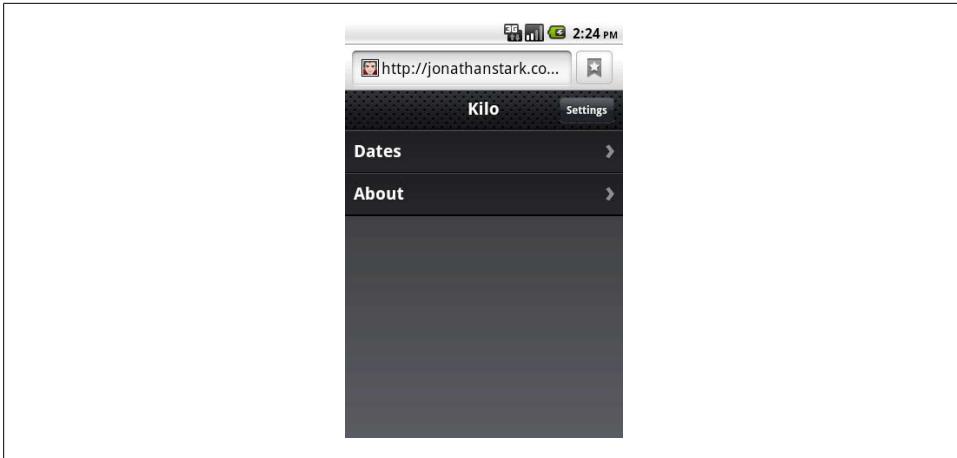


Figure 4-8. The Settings button added to the toolbar on the Home panel

After working on the New Entry panel, the HTML for the Settings panel is going to look pretty similar ([Example 4-6](#)). There is one more text input and some of the attributes have been omitted or have different values, but conceptually they are identical. Add this to your HTML document just as you've done with the HTML for the other panels.

As with the New Entry form, the Settings form does not currently save any of the information associated with it (see [Figure 4-9](#)). Its submission handler will be described in the next chapter.

Example 4-6. The HTML for the Settings Panel

```
<div id="settings">
    <div class="toolbar">
        <h1>Settings</h1>
        <a class="button cancel" href="#">Cancel</a>
    </div>
    <form method="post">
        <ul class="rounded">
            <li><input placeholder="Age" type="text" name="age" id="age" /></li>
            <li><input placeholder="Weight" type="text" name="weight" id="weight" /></li>
            <li><input placeholder="Budget" type="text" name="budget" id="budget" /></li>
            <li><input type="submit" class="submit" name="action"
                value="Save Changes" /></li>
        </ul>
    </form>
</div>
```

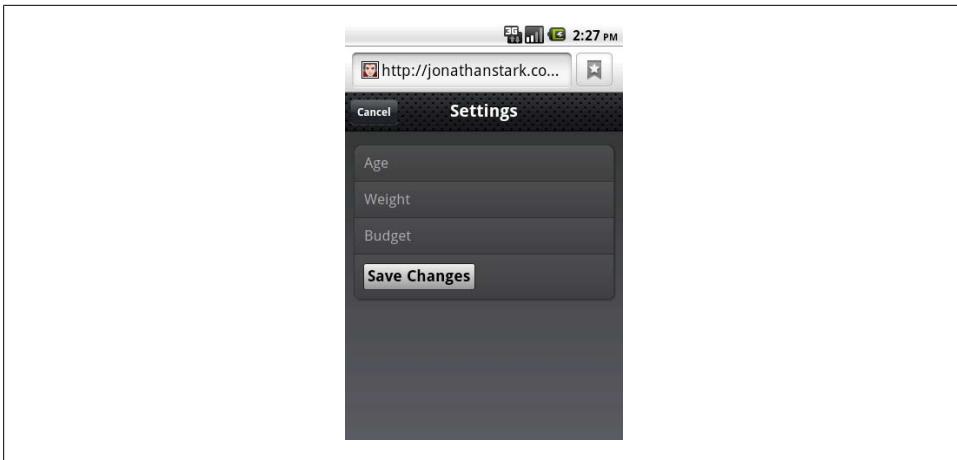


Figure 4-9. The Settings panel

Putting It All Together

So, there you have it. With fewer than 100 lines of code, we've created a native-style UI for a five-panel application complete with three different page transition animations. See [Example 4-7](#) for a complete listing of the final HTML. Not too shabby, right?

Example 4-7. The complete HTML listing for the five-panel UI

```
<html>
  <head>
    <title>Kilo</title>
    <link type="text/css" rel="stylesheet" media="screen" href="jqtouch/jqtouch.css">
    <link type="text/css" rel="stylesheet" media="screen"
          href="themes/jqt/theme.css">
    <script type="text/javascript" src="jqtouch/jquery.js"></script>
    <script type="text/javascript" src="jqtouch/jqtouch.js"></script>
    <script type="text/javascript">
      var jQT = $.jQTouch({
        icon: 'kilo.png'
      });
    </script>
  </head>
  <body>
    <div id="home">
      <div class="toolbar">
        <h1>Kilo</h1>
        <a class="button flip" href="#settings">Settings</a>
      </div>
      <ul class="edgetoedge">
        <li class="arrow"><a href="#dates">Dates</a></li>
        <li class="arrow"><a href="#about">About</a></li>
      </ul>
    </div>
    <div id="about">
```

```

<div class="toolbar">
    <h1>About</h1>
    <a class="button back" href="#">Back</a>
</div>
<div>
    <p>Kilo gives you easy access to your food diary.</p>
</div>
<div id="dates">
    <div class="toolbar">
        <h1>Dates</h1>
        <a class="button back" href="#">Back</a>
    </div>
    <ul class="edgetoedge">
        <li class="arrow"><a id="0" href="#date">Today</a></li>
        <li class="arrow"><a id="1" href="#date">Yesterday</a></li>
        <li class="arrow"><a id="2" href="#date">2 Days Ago</a></li>
        <li class="arrow"><a id="3" href="#date">3 Days Ago</a></li>
        <li class="arrow"><a id="4" href="#date">4 Days Ago</a></li>
        <li class="arrow"><a id="5" href="#date">5 Days Ago</a></li>
    </ul>
</div>
<div id="date">
    <div class="toolbar">
        <h1>Date</h1>
        <a class="button back" href="#">Back</a>
        <a class="button slideup" href="#createEntry">+</a>
    </div>
    <ul class="edgetoedge">
        <li id="entryTemplate" class="entry" style="display:none">
            <span class="label">Label</span>
            <span class="calories">000</span>
            <span class="delete">Delete</span>
        </li>
    </ul>
</div>
<div id="createEntry">
    <div class="toolbar">
        <h1>New Entry</h1>
        <a class="button cancel" href="#">Cancel</a>
    </div>
    <form method="post">
        <ul class="rounded">
            <li><input type="text" placeholder="Food" name="food" id="food" autocomplete="off" autocorrect="off" autocomplete="off" /></li>
            <li><input type="text" placeholder="Calories" name="calories" id="calories" autocomplete="off" autocorrect="off" autocomplete="off" /></li>
            <li><input type="submit" class="submit" name="action" value="Save Entry" /></li>
        </ul>
    </form>
</div>
<div id="settings">
    <div class="toolbar">

```

```

<h1>Settings</h1>
<a class="button cancel" href="#">Cancel</a>
</div>
<form method="post">
  <ul class="rounded">
    <li><input placeholder="Age" type="text" name="age" id="age" /></li>
    <li><input placeholder="Weight" type="text" name="weight" id="weight" /></li>
    <li><input placeholder="Budget" type="text" name="budget" id="budget" /></li>
    <li><input type="submit" class="submit" name="action" value="Save Changes" /></li>
  </ul>
</form>
</div>
</body>
</html>

```

Customizing jQTouch

You can customize the jQTouch default behavior by sending a variety of property settings into the constructor. You saw this previously with the `icon` property, but there are several others that you should be aware of ([Table 4-1](#)).

Table 4-1. jQTouch customization options

| Property | Default | Expects | Notes |
|-------------------------------|--|---|--|
| <code>addGlossToIcon</code> | <code>true</code> | <code>true</code> or <code>false</code> | If set to <code>true</code> , gloss will be added to the home screen icon on iPhone. Has no effect on Android. |
| <code>backSelector</code> | <code>'.back, .cancel, .goback'</code> | Any valid CSS selector; separate multiple values with a comma | Defines elements that will trigger the "back" behavior of jQTouch when tapped. When the back behavior is invoked, the current panel moves off screen with a reverse animation and is removed from history. |
| <code>cacheGetRequests</code> | <code>true</code> | <code>true</code> or <code>false</code> | If set to <code>true</code> , automatically caches GET requests, so subsequent clicks reference the already-loaded data. |
| <code>cubeSelector</code> | <code>'.cube'</code> | Any valid CSS selector; separate multiple values with a comma | Defines elements that will trigger a cube animation from the current panel to the target panel. |
| <code>dissolveSelector</code> | <code>'.dissolve'</code> | Any valid CSS selector; separate multiple values with a comma | Defines elements that will trigger a dissolve animation from the current panel to the target panel. |
| <code>fadeSelector</code> | <code>'.fade'</code> | Any valid CSS selector; separate multiple values with a comma | Defines elements that will trigger a fade animation from the current panel to the target panel. |

| Property | Default | Expects | Notes |
|-----------------|--------------|---|---|
| fixedViewport | true | true or false | If set to true, prevents users from being able to zoom in or out of the page. |
| flipSelector | '.flip' | Any valid CSS selector; separate multiple values with a comma | Defines elements that will trigger a flip animation from the current panel to the target panel. |
| formSelector | 'form' | Any valid CSS selector; separate multiple values with a comma | Defines elements that should receive the onsubmit handler. |
| fullScreen | true | true or false | iPhone only; has no effect on Android. When set to true, your app will open in full-screen mode when launched from the user's home screen. Has no effect on the display if the app is running in Mobile Safari. |
| fullScreenClass | 'fullscreen' | String | iPhone only; has no effect on Android. Class name that will be applied to the body when the app is launched in full-screen mode. Allows you to write custom CSS that only executes in full-screen mode. |
| icon | null | null or a relative or absolute path to a .png image file | The home screen icon for your app. This is the image that will be displayed when a user adds a bookmark for your app to his home screen. |
| popSelector | '.pop' | Any valid CSS selector; separate multiple values with a comma | Defines elements that will trigger a pop animation from the current panel to the target panel. |
| preloadImages | false | An array of image paths | Defines images that will be loaded before the page loads. For example: ['images/link_over.png', 'images/link_select.png'] |
| slideInSelector | 'ul li a' | Any valid CSS selector; separate multiple values with a comma | Defines elements that will trigger a slide left animation from the current panel to the target panel. |
| slideupSelector | '.slideup' | Any valid CSS selector; separate multiple values with a comma | Defines elements that will cause the target panel to slide up into view in front of the current panel. |
| startupScreen | null | null or a relative or absolute path to an image file | iPhone only; has no effect on Android. Pass a relative or absolute path to a 320px × 460px startup screen for full-screen apps. Use a 320px × 480px image if you set statusBar to black-translucent. |

| Property | Default | Expects | Notes |
|----------------|-----------|---|--|
| statusBar | 'default' | default, black-translucent, black | iPhone only; has no effect on Android. Defines the appearance of the 20-pixel status bar at the top of the window in an app launched in full-screen mode. |
| submitSelector | '.submit' | Any valid CSS selector; separate multiple values with a comma | Selector that, when clicked, will submit its parent form (and close keyboard if open). |
| swapSelector | '.swap' | Any valid CSS selector; separate multiple values with a comma | Defines elements that will cause the target panel to swap into view in front of the current panel. |
| useAnimations | true | true or false | Set to false to disable all animations. |

What You've Learned

In this chapter, you've learned how to add native-looking animations to a web app using jQTouch. In the next chapter, you'll learn how to use the new local storage and client-side database features of HTML5 to add persistent data storage to your app.

CHAPTER 5

Client-Side Data Storage

Most software applications need to store data in some sort of persistent fashion in order to be useful. When it comes to web apps, this task has traditionally been handled with either a server-side database or cookies set in the browser. With the advent of HTML5, web developers now have a couple more options: Web Storage, and Web SQL Database.

Web Storage

Web Storage comes in two flavors—`localStorage` and `sessionStorage`—and are very similar to cookies in that they allow you to use JavaScript to set name/value pairs that you can retrieve across multiple page reloads.

Unlike cookies, however, Web Storage data is not sent across the wire with the browser request—it lives entirely in the client. Therefore, it's feasible to store much more data than you would want to with cookies.



At the time of this writing, browser size limits for Web Storage are still in flux. However, my most recent tests indicate that the limit is right around 2.5 MB.

Functionally, `localStorage` and `sessionStorage` are the same. They differ only in terms of persistence and scope:

`localStorage`

Data is saved even after the window is closed and is available to all windows (or tabs) that are loaded from the same source (must be the same domain name, protocol, and port). This is useful for things like application preferences.

sessionStorage

Data is stored with the window object. Other windows/tabs are not aware of the values, and the data is discarded when the window/tab is closed. Useful for window-specific state like active tab highlight or the sort order of a table.



In any of the following examples, you can substitute `sessionStorage` anywhere you see `localStorage`, but remember that `sessionStorage` goes away when you close the window or tab.

Setting a value is as simple as the following:

```
localStorage.setItem('age', 40);
```

Accessing a stored value is equally simple:

```
var age = localStorage.getItem('age');
```

You can delete a specific key/value pair from storage like so:

```
localStorage.removeItem('age');
```

Or, you can delete all key/value pairs like so:

```
localStorage.clear();
```

Assuming your keys are valid JavaScript tokens (e.g., no spaces, no punctuation other than underscores) you can use this alternate syntax:

```
localStorage.age = 40 // Set the value of age
var age = localStorage.age; // Get the value of age
delete localStorage.age; // Remove age from storage
```



The `localStorage` and `sessionStorage` keys are stored separately. If you use the same key name for each, they will not conflict with each other.

Saving User Settings to Local Storage

On to a practical example. Let's update the Settings panel of the example app you started working on in [Chapter 4](#) so that it stores the form values in `localStorage`.

We are going to be writing a fair amount of JavaScript in this chapter, and I don't want to jam it all in the head section of our HTML document. To keep our code organized, create a file called `kilo.js` in the same directory as your HTML document, and update the head of your HTML document with a reference to `kilo.js`:

```
<head>
  <title>Kilo</title>
  <link type="text/css" rel="stylesheet" media="screen"
    href="jqtouch/jqtouch.css">
```

```

<link type="text/css" rel="stylesheet" media="screen"
      href="themes/jqt/theme.css">
<script type="text/javascript" src="jqtouch/jquery.js"></script>
<script type="text/javascript" src="jqtouch/jqtouch.js"></script>
<script type="text/javascript" src="kilo.js"></script>
</head>

```

Alert readers will notice that I've also removed the jQT constructor from the head of the HTML document. It's not gone, though; I just moved it into *kilo.js*. Be sure you remove that from your main HTML file and create the *kilo.js* file in the same directory with the following contents, then reload the main HTML document in your browser to make sure it's still working:

```

var jQT = $.jQT({
  icon: 'kilo.png'
});

```

With that little bit of code reorganization out of the way, it's time to add the code needed to save the settings. You need to override the submit action of the Settings form and replace it with a custom function called `saveSettings()`. Thanks to jQuery, you can accomplish this with a single line of code, which you must place in the document ready function. Add the following to *kilo.js*:

```

$(document).ready(function(){
  $('#settings form').submit(saveSettings);
});

```

The net result of this is that when the user submits the settings form, the `saveSettings()` function will run instead of the form actually getting submitted.

When the `saveSettings()` function is called, it grabs the values from the three form inputs using jQuery's `val()` function and saves each in a `localStorage` variable of the same name. Add this function to *kilo.js*:

```

function saveSettings() {
  localStorage.age = $('#age').val();
  localStorage.budget = $('#budget').val();
  localStorage.weight = $('#weight').val();
  jQT.goBack();
  return false;
}

```

Once the values are stored, use the jQuery `goBack()` function (on the second-to-last line) to dismiss the panel and return to the previous page. Next, return `false` to prevent the default action of the submit event that triggers this function. Had we omitted this line, the current page would reload, which is not what we want.

At this point, a user can launch the app, navigate to the Settings panel, enter her settings, and submit the form to save the settings to `localStorage`.

Since we are not clearing the fields when the form is submitted, the values that the user enters will still be there when she navigates back to the Settings panel. However, this is not because the values have been saved to `localStorage`; it's because they are still sitting there after having been typed in.

Therefore, the next time the user launches that app and navigates to the Settings panel, the fields will be empty, even though they have been saved.

To remedy this, we need to load the settings using the `loadSettings()` function, so add the following function to `kilo.js`:

```
function loadSettings() {
    $('#age').val(localStorage.age);
    $('#budget').val(localStorage.budget);
    $('#weight').val(localStorage.weight);
}
```

The `loadSettings()` function is the opposite of the `saveSettings()` function; it uses jQuery's `val()` function to set the three fields of the Settings form to the corresponding values saved in `localStorage`.

Now that we have a `loadSettings()` function, we need to trigger it. The most obvious time to do this is when the app launches. To make this happen, simply add a line to the document ready function in `kilo.js`:

```
$(document).ready(function(){
    $('#settings form').submit(saveSettings);
    loadSettings();
});
```

Unfortunately, loading the settings only at startup leaves a loophole that occurs if the user navigates to the Settings panel, changes some values, and taps the Cancel button without submitting the form.

In this case, the newly changed values will still be sitting there the next time the user visits the Settings panel; not because the values were saved (they weren't), but because they are still just sitting there. If the user closes and reopens the app, the displayed values will revert to the saved values because the `loadSettings()` function will refresh them at startup.

There are several ways to rectify this situation, but I think the most appropriate is to refresh the displayed values whenever the Settings panel begins to move, either into or out of view.

Thanks to jQTouch, this is a simple matter of binding the `loadSettings()` function to the `pageAnimationStart` event of the Settings panel. Replace the line you just added with the code shown in bold:

```
$(document).ready(function(){
    $('#settings form').submit(saveSettings);
    $('#settings').bind('pageAnimationStart', loadSettings);
});
```

The JavaScript contained in the *kilo.js* file now provides persistent data support for the Settings panel. When you view the code we've written to make this happen, there's really not much to it. Here is everything in *kilo.js* so far:

```
var jQT = $.jQTouch({
    icon: 'kilo.png'
});
$(document).ready(function(){
    $('#settings form').submit(saveSettings);
    $('#settings').bind('pageAnimationStart', loadSettings);
});
function loadSettings() {
    $('#age').val(localStorage.age);
    $('#budget').val(localStorage.budget);
    $('#weight').val(localStorage.weight);
}
function saveSettings() {
    localStorage.age = $('#age').val();
    localStorage.budget = $('#budget').val();
    localStorage.weight = $('#weight').val();
    jQT.goBack();
    return false;
}
```

Saving the Selected Date to Session Storage

Ultimately, what we want to do is set up the Date panel so that when it's displayed, it will check the database for any records entered for that date and display them as an edge-to-edge list. This requires that the Date panel know which date the user tapped on the Dates panel.

We also want to allow the user to add and delete entries from the database, so we'll have to add support for the + button that already exists on the Date panel, and for the Delete button in the Date panel entry template (more on this later).

The first step is to let the Date panel know which item the user clicked when she navigated to it from the Dates panel. With this piece of information, you can calculate the appropriate date context. To do so, you need to add some lines to the document ready function in *kilo.js*:

```
$(document).ready(function(){
    $('#settings form').submit(saveSettings);
    $('#settings').bind('pageAnimationStart', loadSettings);
    $('#dates li a').click(function(){❶
        var dayOffset = this.id;❷
        var date = new Date();❸
        date.setDate(date.getDate() - dayOffset);
        sessionStorage.currentDate = date.getMonth() + 1 + '/' +
            date.getDate() + '/' +
            date.getFullYear();❹
        refreshEntries();❺
    });
});
```

- ❶ On this line, jQuery's `click()` function binds the JavaScript code that follows to the `click` event of the links on the Dates panel.
- ❷ This line of code grabs the ID of the clicked object and stores it in the `dayOffset` variable. As you may recall, the links on the Dates panel have IDs ranging from 0 to 5, so the ID of the clicked link will correspond to the number of days needed to calculate the clicked date (i.e., 0 days in the past equals today, 1 day in the past equals yesterday, 2 days in the past equals the day before yesterday).



In this context, the `this` keyword will contain a reference to the object that was the target of the click event.

- ❸ This line creates a new JavaScript Date object and stores it in a variable named `date`. Initially, this date will be set to the particular moment in time that it was created, so on the next line, we subtract the `dayOffset` from the result of the `getDate()` function and use `setDate()` to change the date to the selected date (a `dayOffset` of 0 would be today, 1 would be yesterday, and so on).
- ❹ This code builds a MM/DD/YYYY-formatted date string and saves it to `sessionStorage` as `currentDate`.



The `getMonth()` method of the Date object returns values from 0–11, January being 0. Therefore, we have to add 1 to generate the correct value for the formatted string.

- ❺ Finally, we call the `refreshEntries()` function. The job of the `refreshEntries()` function is to update the incoming Date panel appropriately based on the date the user tapped on the Dates panel. For now, we'll just set it to update the toolbar title of the Dates panel with the selected date so you can see it's working. Without it, you'd just see the word "Date," as shown in [Figure 5-1](#). [Figure 5-2](#) shows the `refreshEntries()` function in action. Add the following function to `kilo.js`:

```
function refreshEntries() {
  var currentDate = sessionStorage.currentDate;
  $('#date h1').text(currentDate);
}
```

Next, we'll move on to a more powerful and complex client-side data storage method that we'll use to store the user's food entries on the Date panel.

Web SQL Database

Of all the exciting features of HTML5, the one that rocks my world the most is the Web SQL Database. The Web SQL Database spec gives developers a simple but powerful JavaScript database API to store persistent data in a local SQLite database.



Figure 5-1. Before the `refreshEntries()` function, the title just says “Date”...

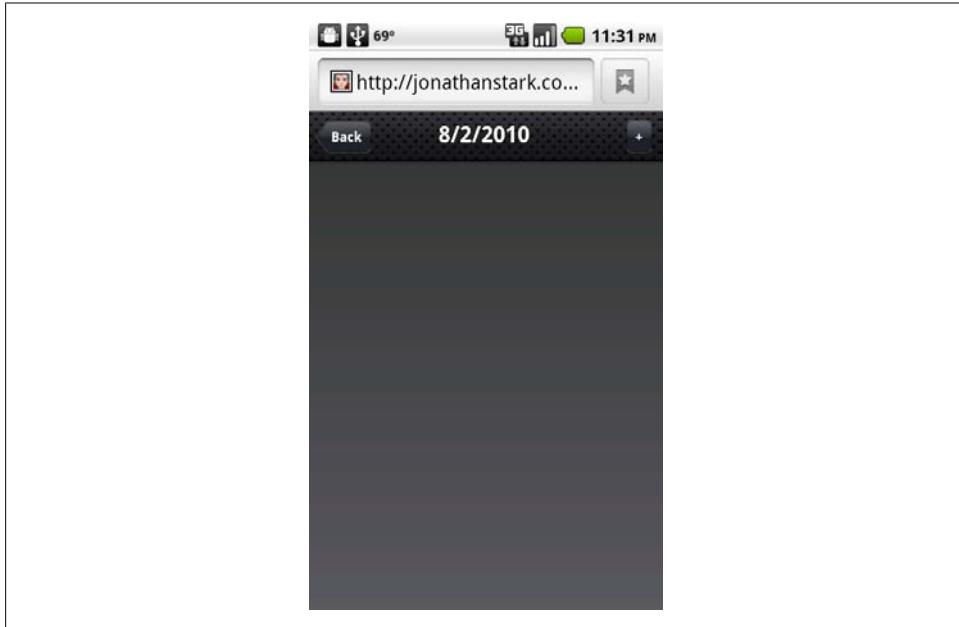


Figure 5-2. ...and after the `refreshEntries()` function, the title reflects the selected date



Technically, the Web SQL Database spec is not part of HTML5. It was broken out of the original HTML5 spec into its own spec, but in casual conversation it's often still referred to as an "HTML5 feature."

Developers can use standard SQL statements to create tables and to insert, update, select, and delete rows. The JavaScript database API even supports transactions. We're talking about SQL here, so there is an inherent complexity. Regardless, this is a game-changing feature, so time spent getting your head around it will be well rewarded.

Creating a Database

Now that our Date panel knows which date the user has selected, we have all the information we need to allow the user to create entries. Before we can write the `createEntry()` function, we need to set up a database table to store the submitted data (this is a one-time operation). We'll add some lines to `kilo.js` to do so:

```
var db;❶
$(document).ready(function(){
    $('#settings form').submit(saveSettings);
    $('#settings').bind('pageAnimationStart', loadSettings);
    $('#dates li a').click(function(){
        var dayOffset = this.id;
        var date = new Date();
        date.setDate(date.getDate() - dayOffset);
        sessionStorage.currentDate = date.getMonth() + 1 + '/' +
                                      date.getDate() + '/' +
                                      date.getFullYear();
        refreshEntries();
    });
    var shortName = 'Kilo';❷
    var version = '1.0';
    var displayName = 'Kilo';
    var maxSize = 65536;
    db = openDatabase(shortName, version, displayName, maxSize);❸
    db.transaction(❹
        function(transaction) {❺
            transaction.executeSql(❻
                'CREATE TABLE IF NOT EXISTS entries ' +
                '(id INTEGER NOT NULL PRIMARY KEY AUTOINCREMENT, ' +
                ' date DATE NOT NULL, food TEXT NOT NULL, ' +
                ' calories INTEGER NOT NULL );'
            );
        }
    );
});
```

- ❶ The first thing to note is there is a variable named `db` in the global scope of the application. This variable is to hold a reference to the database connection once we've established it. It is defined in the global scope because we're going to have to refer to it all over the place.

- ❷ These four lines define some vars for the `openDatabase` call:

`shortName`

A string that will refer to the database file on disk.

`version`

A number for managing upgrades and backward compatibility when you need to change your database schema (i.e., check the database version on app launch—if it's old, create the new database and migrate the data from one to the other).

`displayName`

A string that will be presented in the interface to the user. For example, the display name appears in the Storage tab of the Developer Tools in Chrome desktop (View→Developer→Developer Tools).

`maxSize`

The maximum number of kilobytes to which you will allow your database to grow.



Database size limits are still being implemented by browser vendors at this time, but the W3C recommends an arbitrary 5 MB limit per origin. If your database grows beyond the limit, the user will automatically be asked to allow or deny the size increase. If he allows the increase, the database size limit will be upped to 10 MB. If he denies the increase, a `QUOTA_ERR` error will be returned. See [Table 5-1](#) for a list of database error codes.

- ❸ With the parameters set, this line calls `openDatabase` and stores the connection in the `db` variable. If the database doesn't already exist, it will be created.
- ❹ All database queries must take place in the context of a transaction, so we begin one here by calling the `transaction` method of the `db` object. The remaining lines make up a function that is sent to the transaction as the sole parameter.
- ❺ This line begins an anonymous function and passes the transaction object into it. To be perfectly honest, I think passing the transaction object into its own callback function is weird (why not just use `this`?), but that's what you have to do.
- ❻ Once inside the function, we call the `executeSql` method of the transaction object to execute a standard `CREATE TABLE` query. The `IF NOT EXISTS` clause prevents the table from being created if it already exists.

If you were to launch the app as is, it would create a database named Kilo on the Android phone.

In the desktop version of Chrome, you can actually view and interact with your client-side databases by navigating to View→Developer→Developer Tools, and clicking the Storage tab.

The Developer Tools included in desktop Chrome are extremely helpful when debugging. By default, it appears as a pane of your current browser window. If you click the undock icon (hover over the icons at the bottom left to see what they do), it will appear in a separate window, as shown in [Figure 5-3](#). The interface even allows you to send arbitrary SQL queries to the database by clicking on the database name (see [Figure 5-4](#)).

The screenshot shows the Storage tab in Chrome's Developer Tools. The left sidebar lists databases, local storage, session storage, and cookies. The main area displays a table of test records from a database named 'Kilo'. The table has columns: id, date, food, and calories. The data is as follows:

| | id | date | food | calories |
|--|-----------|-------------|-------------|-----------------|
| | 3 | 7/15/2010 | Noodles | 325 |
| | 4 | 7/15/2010 | Salad | 75 |
| | 5 | 7/15/2010 | Banana | 100 |

Figure 5-3. The Storage tab in Chrome's Developer Tools with some test records displayed

Inserting Rows

Now that we have a database set up to receive some entries, we can set about building the `createEntry()` function. First, you have to override the submit event of the `#createEntry` form. You can do so by binding the `createEntry()` function to the submit event in the document ready function in `kilo.js` (here I just show the first few lines with the added line of code in bold):

```
$(document).ready(function(){
    $('#createEntry form').submit(createEntry);
    $('#settings form').submit(saveSettings);
    $('#settings').bind('pageAnimationStart', loadSettings);
    ...
});
```

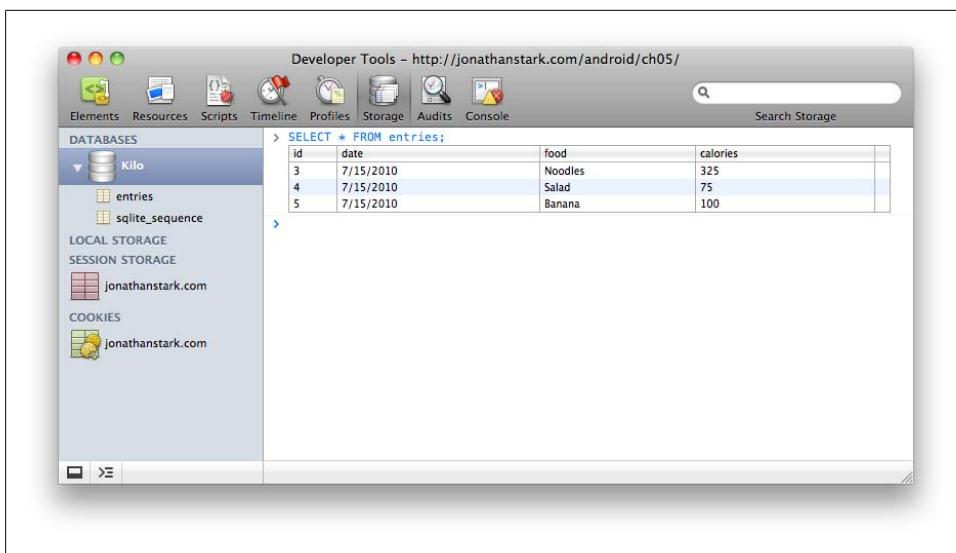


Figure 5-4. The Storage tab in Chrome’s Developer Tools allows you to execute arbitrary SQL statements against your database

Now when a user submits the `#createEntry` form, the `createEntry()` function is called. Next, add the following to `kilo.js` to create the record in the database:

```
function createEntry() {
    var date = sessionStorage.currentDate;❶
    var calories = $('#calories').val();
    var food = $('#food').val();
    db.transaction(❷
        function(transaction) {
            transaction.executeSql(
                'INSERT INTO entries (date, calories, food) VALUES (?, ?, ?);',
                [date, calories, food],
                function(){
                    refreshEntries();
                    jQT.goBack();
                },
                errorHandler
            );
        }
    );
    return false;
}
```

- ❶ This section contains some variables that we’re going to use in the SQL query. As you may recall (from “[Saving the Selected Date to Session Storage](#)” on page 75), the date the user taps on the Dates panel is stored in `sessionStorage.currentDate`. The other two values (calories and food) are pulled out of the data entry form using the same approach that we used earlier with the Settings form.

- ② This code opens a database transaction and runs an `executeSql()` call. Here we are passing four parameters to the `executeSql()` method:

```
'INSERT INTO entries (date, calories, food) VALUES (?, ?, ?);'
```

This is the statement that will be executed. The question marks are data placeholders.

```
[date, calories, food]
```

This is an array of the values being sent to the database. They correspond by position with the data placeholder question marks in the SQL statement.

```
function(){refreshEntries();jQT.goBack();}
```

This anonymous function will execute if the SQL query is successful.

```
errorHandler
```

This is the name of the function that will execute if the SQL query fails.



Quotes (' or ") around the ? placeholders are not necessary—escaping and quoting of data is handled automatically.

Error handling

Assuming the insert is successful, the anonymous function passed as the third parameter will be executed. It calls the `refreshEntries()` function (at the moment, this function only updates the title of the Date panel, but soon it will make entries you create appear in the list there) and it simulates a tap on the Cancel button to dismiss the New Entry panel and return to the Date panel. As we saw earlier with the Settings panel, the Cancel button does not cancel the submit action—it's really just a Back button labeled “Cancel” that isn’t shaped like a left arrow.

If the insert is not successful, the `errorHandler()` function will run. Add the following to the `kilo.js` file:

```
function errorHandler(transaction, error) {
    alert('Oops. Error was '+error.message+' (Code '+error.code+')');
    return true;
}
```

The error handler is passed two parameters: the transaction object and the error object. Here, we’re using the error object to alert the user to the message and error code that were thrown.

Error handlers must return true or false. When an error handler returns true (i.e., “Yes, this is a fatal error”), execution is halted and the entire transaction is rolled back. When an error handler returns false (i.e., “No, this is not a fatal error”), execution will continue.

In some cases, you might want to branch based on the type of error to decide whether you should return true or false. [Table 5-1](#), at the end of this chapter, shows the (current) possible error codes according to the W3C Web SQL Database working draft specification.

You may have noticed that the error handler function accepts a transaction object in addition to the error object. It's conceivable that in some cases you might want to execute a SQL statement inside the error handler, perhaps to log the error or record some metadata for debugging or crash-reporting purposes. The transaction object parameter allows you to make more `executeSql()` calls from inside the error handler, like so (this is just an example; it will not run unless you've created the `errors` table that it refers to):

```
function errorHandler(transaction, error) {
    alert('Oops. Error was '+error.message+' (Code '+error.code+')');
    transaction.executeSql('INSERT INTO errors (code, message) VALUES (?, ?);',
        [error.code, error.message]);
    return false;
}
```

Please take special note of the fact that we have to return `false` from the error handler if we want the `executeSql()` statement to run. If we return `true` (or nothing at all), the entire transaction—including this SQL statement—will be rolled back, thereby preventing the desired result.



Although I won't be doing so in my examples, you should know that you can also specify success and error handlers on the `transaction` method itself. This gives you a convenient location to execute code after a long series of `executeSql()` statements have completed.

Oddly, the parameter order for the `transaction` method's callbacks is defined to be error, then success (the reverse of the order for `executeSql()`). Here's a version of the `createEntry()` function with transaction callbacks added toward the end (don't add these to `kilo.js`, because we haven't defined either of these methods):

```
function createEntry() {
    var date = sessionStorage.currentDate;
    var calories = $('#calories').val();
    var food = $('#food').val();
    db.transaction(
        function(transaction) {
            transaction.executeSql(
                'INSERT INTO entries (date, calories, food) VALUES (?, ?, ?);',
                [date, calories, food],
                function(){
                    refreshEntries();
                    jQT.goBack();
                },
                errorHandler
            );
        },
        transactionErrorHandler,
    );
}
```

```

        transactionSuccessHandler
    );
    return false;
}

```

Selecting Rows and Handling Result Sets

The next step is to expand the `refreshEntries()` function to do more than just set the title bar to the selected date. Specifically, we'll query the database for entries on the selected date and append them to the `#date ul` element using the hidden `entryTemplate` HTML for structure. It's been a while since we looked at that code, so here's the Date panel again (it's already in `index.html`, so you don't need to add it again):

```

<div id="date">
  <div class="toolbar">
    <h1>Date</h1>
    <a class="button back" href="#">Back</a>
    <a class="button slideup" href="#createEntry">+</a>
  </div>
  <ul class="edgetoedge">
    <li id="entryTemplate" class="entry" style="display:none">❶
      <span class="label">Label</span>
      <span class="calories">000</span>
      <span class="delete">Delete</span>
    </li>
  </ul>
</div>

```

- ❶ Recall that we had set the `style` attribute of the `li` to `display: none`, which makes it not show up on the page. We did this so we could use that HTML snippet as a template for the database rows.

Here's the complete `refreshEntries()` function; you must replace the existing `refreshEntries()` function in `kilo.js` with this:

```

function refreshEntries() {
  var currentDate = sessionStorage.currentDate;❶
  $('#date h1').text(currentDate);
  $('#date ul li:gt(0)').remove();❷
  db.transaction(❸
    function(transaction) {
      transaction.executeSql(
        'SELECT * FROM entries WHERE date = ? ORDER BY food;',❹
        [currentDate], ❺
        function (transaction, result) {❻
          for (var i=0; i < result.rows.length; i++) {
            var row = result.rows.item(i);❻
            var newEntryRow = $('#entryTemplate').clone();❽
            newEntryRow.removeAttr('id');
            newEntryRow.removeAttr('style');
            newEntryRow.data('entryId', row.id);❾
            newEntryRow.appendTo('#date ul');❿
            newEntryRow.find('.label').text(row.food);
            newEntryRow.find('.calories').text(row.calories);

```

```
        }  
    },  
    errorHandler  
);  
};  
});  
};
```

- ❶ These two lines set the toolbar title of the Date panel to the contents of the `currentDate` value saved in `sessionStorage`.
 - ❷ This line uses jQuery's `gt()` function (`gt` stands for “greater than”) to select and remove any `li` elements with an index greater than 0. The first time through, this will do nothing because the only `li` will be the one with the ID of `entryTemplate`, which has an index of 0 and is hidden anyhow. However, on subsequent visits to the page, we need to remove any other `lis` before appending rows from the database again. Otherwise, items would end up appearing multiple times in the list because we'd be adding the same items over and over again.
 - ❸ These three lines set up a database transaction and the `executeSql` statement.
 - ❹ This line contains the first parameter for the `executeSql` statement. It's a simple `SELECT` statement with a question mark acting as a data placeholder.
 - ❺ This is a single-element array that contains the currently selected date. This will replace the question mark in the SQL query.
 - ❻ This anonymous function will be called in the event of a successful query. It accepts two parameters: `transaction` and `result`.

The `transaction` object can be used within the success handler to send new queries to the database, as we saw with the error handler previously. However, there is no need to do that in this case, so we won't be using it.

The `result` object is what we are most interested in here. It has three read-only properties: `rowsAffected`, which you can use to determine the number of rows affected by an insert, update, or delete query; `insertId`, which returns the primary key of the last row created in an insert operation; and `rows`, which has the records that were found.

The `rows` object will contain 0 or more `row` objects and has a `length` property that appears in the `for` loop on the next line.

- ⑦ This line uses the `item()` method of the `rows` object to set the `row` variable to the contents of the current row.
 - ⑧ On this line, we `clone()` the template `li` and remove its `id` and `style` attributes on the next two lines. Removing the `style` will make the row visible, and removing the `id` is important because otherwise we would end up with multiple items on the page with the same `id`.

- ❾ This line stores the value of the `row`'s `id` property as data on the `li` itself (we'll need that later in case the user decides to delete the entry).
- ❿ This code appends the `li` element to the parent `ul`. The next two lines update the `label` and `calories` span child elements of the `li` with the corresponding data from the `row` object.

With all this out of the way, our Date panel will display an `li` for each row in the database that corresponds to the selected date. Each row will have a label, calories, and a Delete button. Once we create a few rows, you can see that we need to add a bit of CSS to style things up nicely ([Figure 5-5](#)).

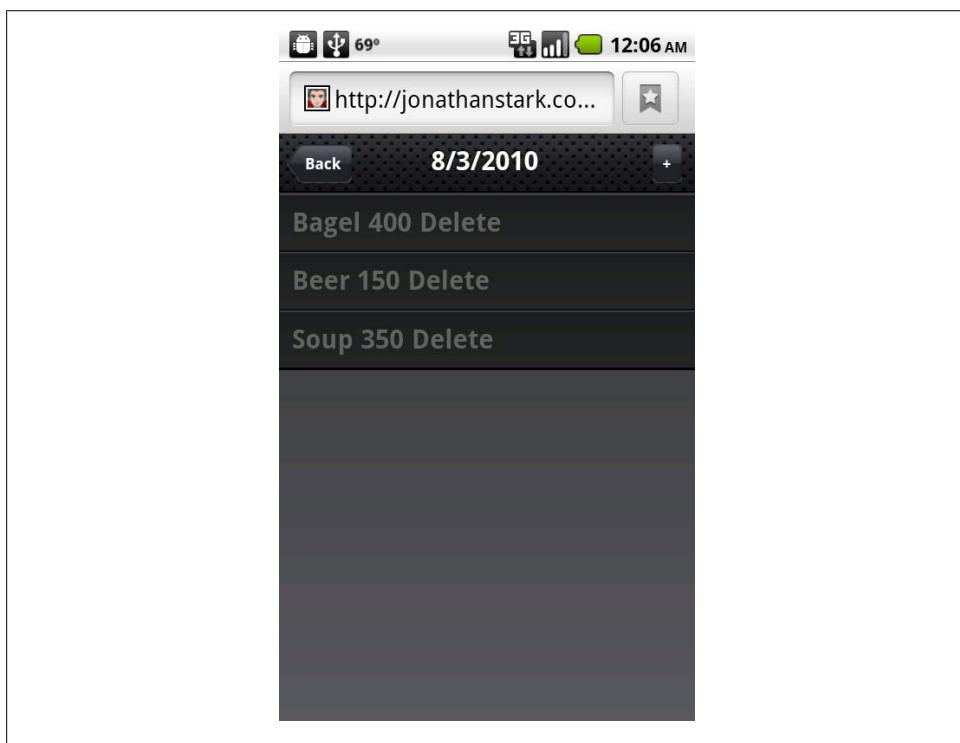


Figure 5-5. The entries are showing up now, but they still need to be fancied up with some CSS

Save the following CSS into a file named `kilo.css` (save this in the same directory as the HTML file):

```
#date ul li {  
    position: relative;  
}  
#date ul li span {  
    color: #FFFFFF;  
    text-shadow: 0 1px 2px rgba(0,0,0,.7);  
}
```

```
#date ul li .delete {  
    position: absolute;  
    top: 5px;  
    right: 6px;  
    font-size: 12px;  
    line-height: 30px;  
    padding: 0 3px;  
    border-width: 0 5px;  
    -webkit-border-image: url(themes/jqt/img/button.png) 0 5 0 5;  
}
```

Now, link to *kilo.css* by adding the following line to the head section of *index.html*:

```
<link type="text/css" rel="stylesheet" media="screen" href="kilo.css">
```

Although the Delete buttons now look like buttons (see [Figure 5-6](#)), they won't do anything when tapped at this point. This is because we set them up using the `span` tag, which is not an interactive element in an HTML page.

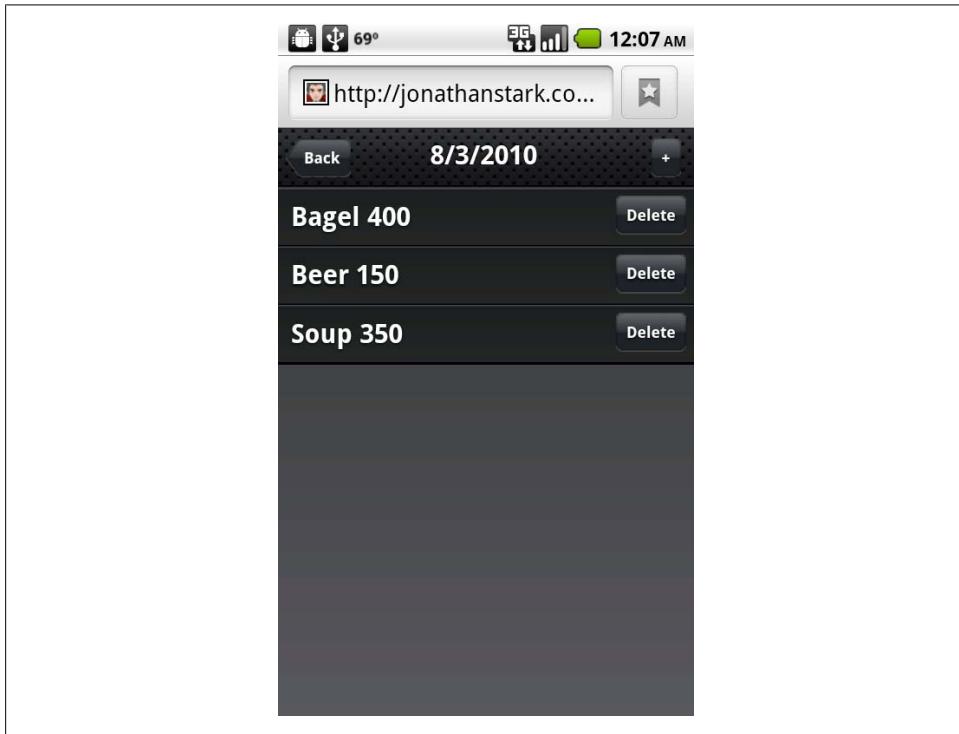


Figure 5-6. The entries with CSS applied

Deleting Rows

To make our Delete buttons do something when clicked, we need to bind a click event handler to them with jQuery. We did the same sort of thing earlier with the items on the Date panel using jQuery's `click()` method.

Unfortunately, that approach won't work in this case. Unlike the items on the Dates panel, the entries on the Date panel are not static. This means they are added and removed throughout the course of the user's session. In fact, when the application launches, there are no entries visible on the Date panel at all. Therefore, we have nothing to bind the `click()` to at launch.

The solution is to bind click events to the delete buttons as they are created by the `refreshEntries()` function. To do so, add the lines shown in bold to the end of the `for` loop:

```
...
newEntryRow.find('.calories').text(row.calories);
newEntryRow.find('.delete').click(function(){❶
    var clickedEntry = $(this).parent();❷
    var clickedEntryId = clickedEntry.data('entryId');❸
    deleteEntryById(clickedEntryId);❹
    clickedEntry.slideUp();
});
}
```

- ❶ The function begins by specifying that we are looking for any elements that have a class of `delete` inside of an element that has an ID of `date`, and calls the `click()` method on those elements. The `click()` method accepts the anonymous function that will handle the event as its only parameter.
- ❷ When the click handler is triggered, the parent of the Delete button (i.e., the `li`) is located and stored in the `clickedEntry` variable.
- ❸ This line sets the `clickedEntryId` variable to the value of the `entryId` we stored on the `li` element when the `refreshEntries()` function created it.
- ❹ This line passes the clicked ID into the `deleteEntryById()` function, and on the next line, jQuery's `slideUp()` method gracefully removes the `li` from the page.

Add the following `deleteEntryById()` function to `kilo.js` to remove the entry from the database:

```
function deleteEntryById(id) {
    db.transaction(
        function(transaction) {
            transaction.executeSql('DELETE FROM entries WHERE id=?;',
                [id], null, errorHandler);
        }
    );
}
```

As we've done in previous examples, we open a transaction, pass it a callback function with the transaction object as the parameter, and call the `executeSql()` method. We're passing in the SQL query and the ID of the clicked record as the first two arguments. The third argument is where the success handler would go, but we don't need one, so we just specify null. As the fourth argument, we specify the same error handler that we've been using all along.

And there you have it. It may have taken a lot of description to get to this point, but in reality we haven't had to write all that much code. In fact, *kilo.js* only contains about 100 lines of JavaScript ([Example 5-1](#)).

Example 5-1. The complete JavaScript listing for Kilo database interaction

```
var jQT = $.jQTouch({
    icon: 'kilo.png'
});
var db;
$(document).ready(function(){
    $('#createEntry form').submit(createEntry);
    $('#settings form').submit(saveSettings);
    $('#settings').bind('pageAnimationStart', loadSettings);
    $('#dates li a').click(function(){
        var dayOffset = this.id;
        var date = new Date();
        date.setDate(date.getDate() - dayOffset);
        sessionStorage.currentDate = date.getMonth() + 1 + '/' +
            date.getDate() + '/' +
            date.getFullYear();
        refreshEntries();
    });
    var shortName = 'Kilo';
    var version = '1.0';
    var displayName = 'Kilo';
    var maxSize = 65536;
    db = openDatabase(shortName, version, displayName, maxSize);
    db.transaction(
        function(transaction) {
            transaction.executeSql(
                'CREATE TABLE IF NOT EXISTS entries ' +
                '(id INTEGER NOT NULL PRIMARY KEY AUTOINCREMENT, ' +
                'date DATE NOT NULL, food TEXT NOT NULL, ' +
                'calories INTEGER NOT NULL);'
            );
        }
    );
    function loadSettings() {
        $('#age').val(localStorage.age);
        $('#budget').val(localStorage.budget);
        $('#weight').val(localStorage.weight);
    }
    function saveSettings() {
        localStorage.age = $('#age').val();
        localStorage.budget = $('#budget').val();
    }
});
```

```

localStorage.weight = $('#weight').val();
jQT.goBack();
return false;
}
function createEntry() {
    var date = sessionStorage.currentDate;
    var calories = $('#calories').val();
    var food = $('#food').val();
    db.transaction(
        function(transaction) {
            transaction.executeSql(
                'INSERT INTO entries (date, calories, food) VALUES (?, ?, ?);',
                [date, calories, food],
                function(){
                    refreshEntries();
                    jQT.goBack();
                },
                errorHandler
            );
        }
    );
    return false;
}
function refreshEntries() {
    var currentDate = sessionStorage.currentDate;
    $('#date h1').text(currentDate);
    $('#date ul li:gt(0)').remove();
    db.transaction(
        function(transaction) {
            transaction.executeSql(
                'SELECT * FROM entries WHERE date = ? ORDER BY food;',
                [currentDate],
                function (transaction, result) {
                    for (var i=0; i < result.rows.length; i++) {
                        var row = result.rows.item(i);
                        var newEntryRow = $('#entryTemplate').clone();
                        newEntryRow.removeAttr('id');
                        newEntryRow.removeAttr('style');
                        newEntryRow.data('entryId', row.id);
                        newEntryRow.appendTo('#date ul');
                        newEntryRow.find('.label').text(row.food);
                        newEntryRow.find('.calories').text(row.calories);
                        newEntryRow.find('.delete').click(function(){
                            var clickedEntry = $(this).parent();
                            var clickedEntryId = clickedEntry.data('entryId');
                            deleteEntryById(clickedEntryId);
                            clickedEntry.slideUp();
                        });
                    }
                },
                errorHandler
            );
        }
    );
}

```

```

function deleteEntryById(id) {
    db.transaction(
        function(transaction) {
            transaction.executeSql('DELETE FROM entries WHERE id=?;',
                [id], null, errorHandler);
        }
    );
}

function errorHandler(transaction, error) {
    alert('Oops. Error was '+error.message+' (Code '+error.code+')');
    return true;
}

```

What You've Learned

In this chapter, you learned two ways to store user data on the client: Web Storage and Web SQL Database. The Web SQL Database in particular opens up a world of possibilities for web-based application developers.

The only thing stopping us from running this example application in offline mode is that we have to initially connect to the web server each time the app is launched to download the HTML and related resources. Wouldn't it be sweet if we could just cache all that stuff locally on the device? Yeah, it would.

Web Database Error Code Reference

An error in the SQL database API will be reported with a callback containing one of the codes shown in [Table 5-1](#).

Table 5-1. Web database error codes

| Constant | Code | Situation |
|---------------|------|--|
| UNKNOWN_ERR | 0 | The transaction failed for reasons unrelated to the database itself and is not covered by any other error code. |
| DATABASE_ERR | 1 | The statement failed for database reasons not covered by any other error code. |
| VERSION_ERR | 2 | The operation failed because the actual database version was not what it should be. For example, a statement found that the actual database version no longer matches the expected version of the Database or DatabaseSync object, or the Database.changeVersion() or DatabaseSync.changeVersion() methods were passed a version that doesn't match the actual database version. |
| TOO_LARGE_ERR | 3 | The statement failed because the data returned from the database was too large. The SQL LIMIT modifier might be useful to reduce the size of the result set. |
| QUOTA_ERR | 4 | The statement failed because there was not enough remaining storage space, or the storage quota was reached and the user declined to give more space to the database. |
| SYNTAX_ERR | 5 | The statement failed because of a syntax error, the number of arguments did not match the number of ? placeholders in the statement, the statement tried to use a statement that is not |

| Constant | Code | Situation |
|----------------|------|---|
| | | allowed, such as BEGIN, COMMIT, or ROLLBACK, or the statement tried to use a verb that could modify the database when the transaction was read-only. |
| CONSTRAINT_ERR | 6 | An INSERT, UPDATE, or REPLACE statement failed due to a constraint failure. For example, because a row was being inserted and the value given for the primary key column duplicated the value of an existing row. |
| TIMEOUT_ERR | 7 | A lock for the transaction could not be obtained in a reasonable time. |

CHAPTER 6

Going Offline

There's a feature of HTML5 called the *offline application cache* that allows users to run web apps even when they are not connected to the Internet. It works like this: when a user navigates to your web app, the browser downloads and stores all the files it needs to display the page (HTML, CSS, JavaScript, images, etc.). The next time the user navigates to your web app, the browser will recognize the URL and serve the files out of the local application cache instead of pulling them across the network.

The Basics of the Offline Application Cache

The main component of the offline application cache is a *cache manifest file* that you host on your web server. I'm going to use a simple example to explain the concepts involved, then I'll show you how to apply what you've learned to the Kilo example we've been working on.

A manifest file is just a simple text document that lives on your web server and is sent to the user's device with a content type of `cache-manifest`. The manifest contains a list of files a user's device must download and save in order to function. Consider a web directory containing the following files:

```
index.html  
logo.jpg  
scripts/demo.js  
styles/screen.css
```

In this case, `index.html` is the page users will load in their browsers when they visit your application. The other files are referenced from within `index.html`. To make everything available offline, create a file named `demo.manifest` in the directory with `index.html`. Here's a directory listing showing the added file:

```
demo.manifest  
index.html  
logo.jpg  
scripts/demo.js  
styles/screen.css
```

Next, add the following lines to *demo.manifest*:

```
CACHE MANIFEST
index.html
logo.jpg
scripts/demo.js
styles/screen.css
```

The paths in the manifest are relative to the location of the manifest file. You can also use absolute URLs like so (don't bother creating this just yet; you'll see how to apply this to your app shortly):

```
CACHE MANIFEST
http://www.example.com/index.html
http://www.example.com/logo.jpg
http://www.example.com/scripts/demo.js
http://www.example.com/styles/screen.css
```

Now that the manifest file is created, you need to link to it by adding a manifest attribute to the HTML tag inside *index.html*:

```
<html manifest="demo.manifest">
```

You must serve the manifest file with the `text/cache-manifest` content type or the browser will not recognize it. If you are using the Apache web server or a compatible web server, you can accomplish this by adding an *.htaccess* file to your web directory with the following line:

```
AddType text/cache-manifest .manifest
```



If the *.htaccess* file doesn't work for you, please refer to the portion of your web server documentation that pertains to *MIME types*. You must associate the file extension *.manifest* with the MIME type of `text/cache-manifest`. If your website is hosted by a web hosting provider, your provider may have a control panel for your website where you can add the appropriate MIME type. I'll also show you an example that uses a PHP script in place of the *.htaccess* file a little later on in this chapter (because PHP can set the MIME type in code, you won't need to configure the web server to do that).

Our offline application cache is now in working order. The next time a user browses to `http://example.com/index.html`, the page and its resources will load normally over the network (replace `example.com/index.html` with the URL of your web app). In the background, all the files listed in the manifest will be downloaded locally. Once the download completes and the user refreshes the page, he'll be accessing the local files only. He can now disconnect from the Internet and continue to access the web app.

Mac OS X and the .htaccess File

If you are serving up web pages on your local network using the Apache web server that's included with Mac OS X, it will ignore any *.htaccess* file in your personal web folder (the *Sites* folder that's in your home directory). However, you can enable support for *.htaccess* by following these steps:

1. Open Applications→Utilities→Terminal and typing these commands (you'll need to type your password when prompted):

```
cd /etc/apache2/users
sudo pico $USER.conf
```

This loads your personal Apache configuration file into the pico editor (you can see a list of editor commands at the bottom of the screen—the ^ symbol indicates the Control key).

2. Use the arrow keys to move down to the line `AllowOverride None`, delete the word `None`, and replace it with `All`.
3. Press Control-X to exit, answer Y to save changes, and press Return to save the file.
4. Start System Preferences, go to Sharing, and, if needed, click the lock icon labeled “Click the lock to make changes.” Type your password when prompted.
5. Clear the checkbox next to Web Sharing and then check it again (this restarts Web Sharing). The web server on your Mac should now respect the settings in *.htaccess* files you put in your *Sites* directory or its subdirectories.

Now that the user is accessing our files locally on his device, we have a new problem: how does he get updates when we make changes to the website?

When the user does have access to the Internet and navigates to the URL of your web app, his browser checks the manifest file on the site to see if it still matches the local copy. If the remote manifest has changed, the browser downloads all the files listed in it. It downloads these in the background to a temporary cache.



The comparison between the local manifest and the remote manifest is a byte-by-byte comparison of the file contents (including comments and blank lines). The file modification timestamp or changes to any of the resources themselves are irrelevant when determining whether or not changes have been made.

If something goes wrong during the download (e.g., the user loses Internet connection), the partially downloaded temporary cache is automatically discarded and the previous one remains in effect. If the download is successful, the new local files will be used the next time the user launches the app.



Remember that when a manifest is updated, the download of the new files takes place in the background *after* the initial launch of the app. This means that even after the download completes, the user will still be working with the old files. In other words, the currently loaded page and all of its related files don't automatically reload when the download completes. The new files that were downloaded in the background will not become visible until the user relaunches the app.

This is very similar to standard desktop app update behavior. You launch an app, it tells you that updates are available, you click Download Updates, the download completes, and you are prompted to relaunch the app for the updates to take effect.

If you want to implement this sort of behavior in your app, you can listen for the `updateready` event of the `window.applicationCache` object, as described in “[The JavaScript Console](#)” on page 106, and notify the user however you like.

Online Whitelist and Fallback Options

It is possible to force the browser to always access certain resources over the network (this process is known as *whitelisting*). This means the browser will not cache them locally and they will not be available when the user is offline. To specify a resource as online only, use the `NETWORK:` keyword (the trailing `:` is essential) in the manifest file like so:

```
CACHE MANIFEST
index.html
scripts/demo.js
styles/screen.css
```

```
NETWORK:
logo.jpg
```

This whitelists `logo.jpg` by moving it into the `NETWORK` section of the manifest file. When the user is offline, the image will show up as a broken image link ([Figure 6-1](#)). When he is online, it will appear normally ([Figure 6-2](#)).

If you don't want offline users to see the broken image, use the `FALLBACK` keyword to specify a fallback resource like so:

```
CACHE MANIFEST
index.html
scripts/demo.js
styles/screen.css
```

```
FALLBACK:
logo.jpg offline.jpg
```

Now, when the user is offline, he'll see `offline.jpg` ([Figure 6-3](#)), and when he's online, he'll see `logo.jpg` ([Figure 6-4](#)).

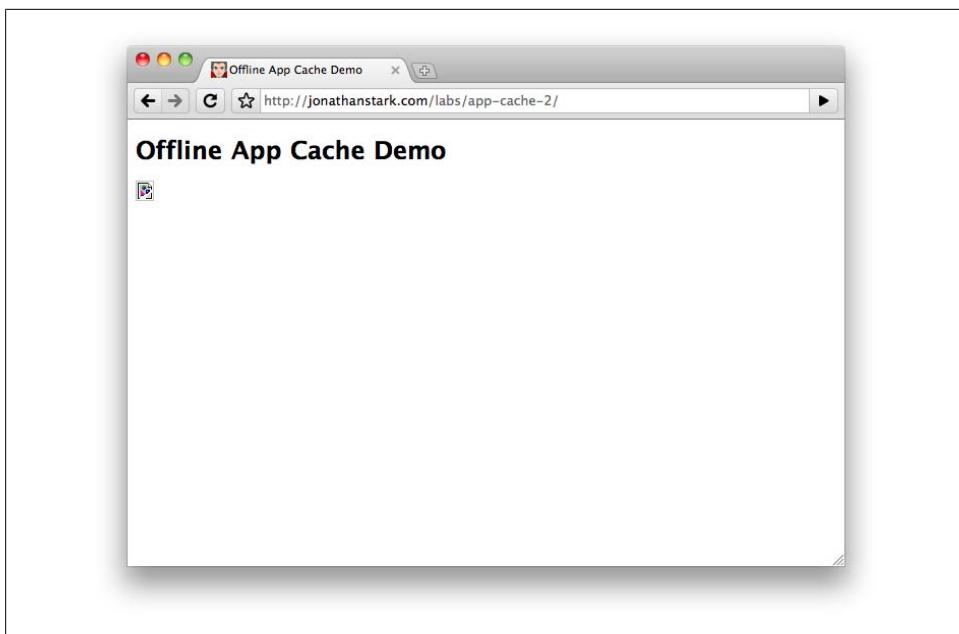


Figure 6-1. Whitelisted images will show up as broken links when the user is offline

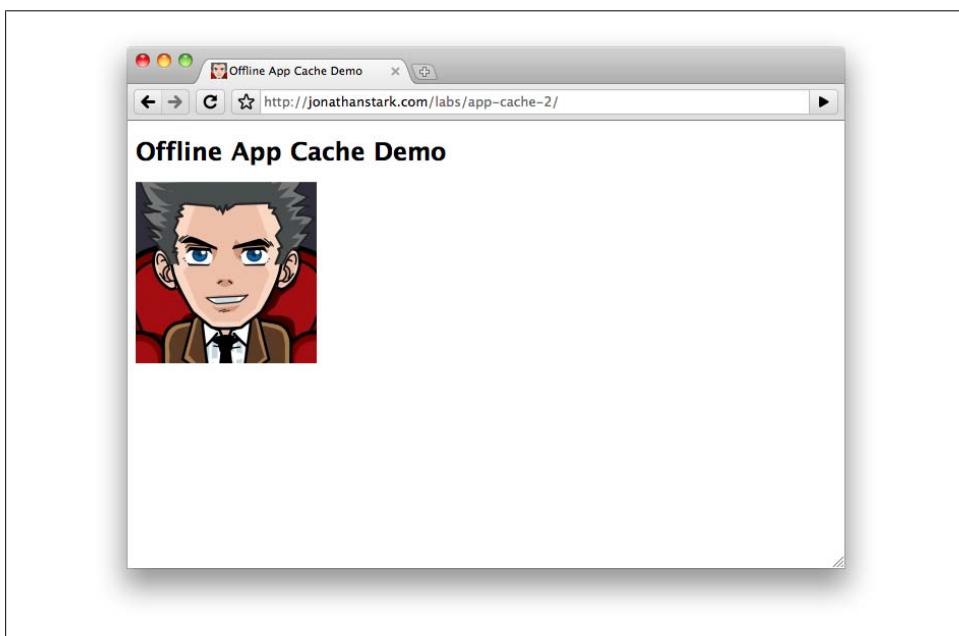


Figure 6-2. Whitelisted images will show up normally when the user is online

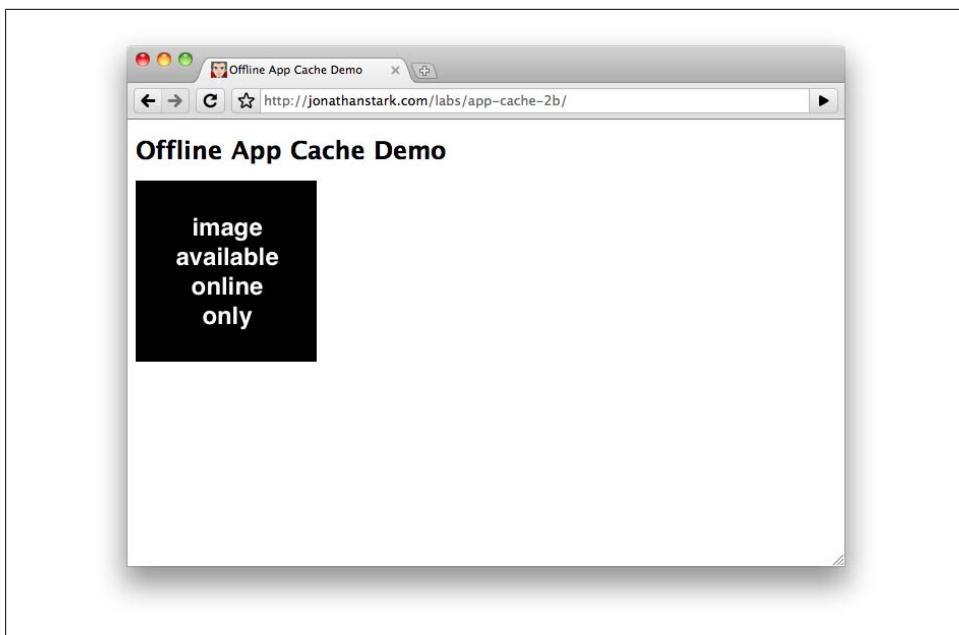


Figure 6-3. Fallback images will show up when the user is offline

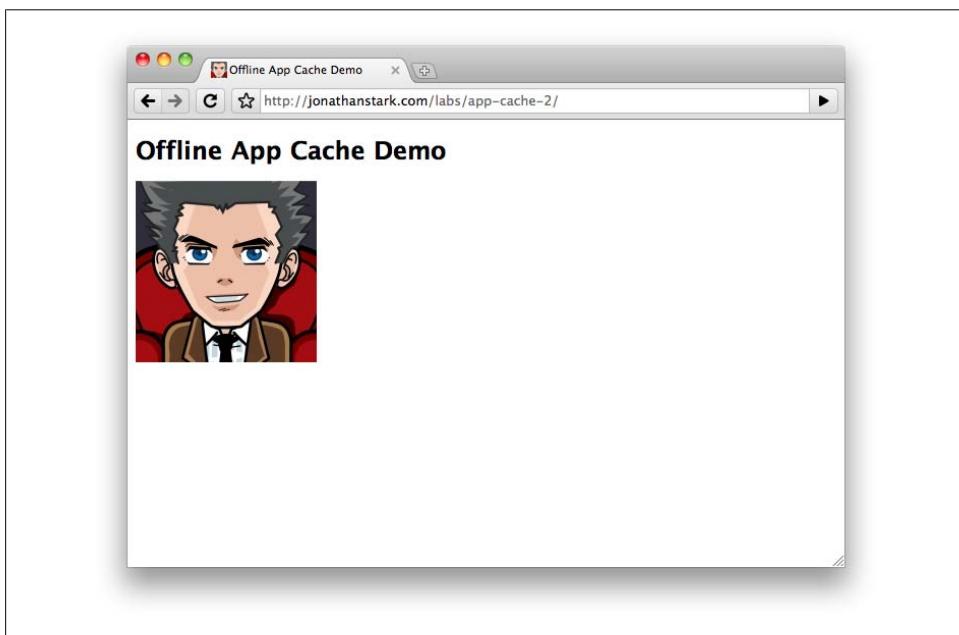


Figure 6-4. Hosted images will show up normally when the user is online



It's worth noting that you don't have to additionally list *offline.jpg* to the CACHE MANIFEST section. It will automatically be stored locally by virtue of being listed in the Fallback section of the manifest.

This becomes even more useful when you consider that you can specify a single fallback for multiple resources by using a *partial path*. Let's say I add an *images* directory to my website and put some files in it:

```
/demo.manifest
/index.html
/images/logo.jpg
/images/logo2.jpg
/images/offline.jpg
/scripts/demo.js
/styles/screen.css
```

I can now tell the browser to fall back to *offline.jpg* for anything contained in the *images* directory like so:

```
CACHE MANIFEST
index.html
scripts/demo.js
styles/screen.css

FALLBACK:
images/ images/offline.jpg
```

Now, when the user is offline, he'll see *offline.jpg* (Figure 6-5), and when he's online, he'll see *logo.jpg* and *logo2.jpg* (Figure 6-6).

Whether you should add resources to the NETWORK or Fallback sections of the manifest file depends on the nature of your application. Keep in mind that the offline application cache is primarily intended to store apps locally on a device. It's not really meant to be used to decrease server load, increase performance, etc.

In most cases you should be listing all of the files required to run your app in the manifest file. If you have a lot of dynamic content and you are not sure how to reference it in the manifest, your app is probably not a good fit for the offline application cache and you might want to consider a different approach (e.g., a client-side database, perhaps).

Creating a Dynamic Manifest File

Now that you're comfortable with how the offline app cache works, let's apply it to the Kilo example we've been working on. Kilo consists of quite a few files and manually listing them all in a manifest file would be a pain. Plus, a single typo would invalidate the entire manifest file and prevent the application from working offline.

Running PHP Scripts on Your Web Server

PHP is a versatile web-scripting language, and is supported by most web hosting providers. This means that on most web servers, you can create a file whose name ends with the extension `.php`, add some PHP code to it, visit it in your web browser, and it will just work. If you've been using a web server on your personal computer to serve up pages to your Android phone, you'll need to get set up to run PHP scripts. If you're running a web server on Windows, see <http://php.net/manual/en/install.windows.php> for downloads and information. You may also want to use a solution such as [EasyPHP](#) or check out the Wikipedia page on this topic at http://en.wikipedia.org/wiki/Comparison_of_WAMPs.

PHP is easy to install on Linux. For example, Ubuntu users can type `sudo aptitude install apache2 php5` at a shell prompt. To enable PHP in a user's personal `public_html` directory, edit the file `/etc/apache2/mods-available/php5.conf` as root and follow the instructions inside it to comment out a series of lines (by putting a `#` in front of each one).

Macs come with PHP installed, but you need to take a step to enable PHP like you did in “[Mac OS X and the .htaccess File](#)” on page 95:

1. Open Applications→ Utilities→ Terminal and type these commands (you'll need to type your password when prompted):

```
cd /etc/apache2
sudo pico httpd.conf
```

2. Press Control-W. This brings up the option to search the file. Type `php5` and press Return. This brings you to a line that should look like this:

```
#LoadModule php5_module      libexec/apache2/libphp5.so
```

3. Using the arrow keys, move to the beginning of the line and delete the `#` comment character, which is preventing this line from having any effect.

4. Press Control-X to exit, answer Y to save changes, and press Return to save the file.

5. Next, start System Preferences, go to Sharing and, if needed, click the lock icon labeled “Click the lock to make changes” and type your password when prompted.

6. Clear the checkbox next to Web Sharing and then check it again. Now PHP should be enabled on your Mac's web server.

7. Create a file in the `Sites` subdirectory of your home folder named `test.php` with these contents:

```
<?php
  phpinfo();
?>
```

8. Finally, visit the following URL in your browser: `http://localhost/~YOURUSERNAME/test.php`. Replace `YOURUSERNAME` with your username, but don't delete the `~` (you can discover your username at the Terminal by typing `echo $USER` and pressing Return). If PHP is working, you'll see a table displaying your PHP version number and a lot of other information about your PHP installation. If it is not working,

you'll see nothing but a blank page. Visit <http://www.php.net/support.php> for links to documentation and help with using PHP.

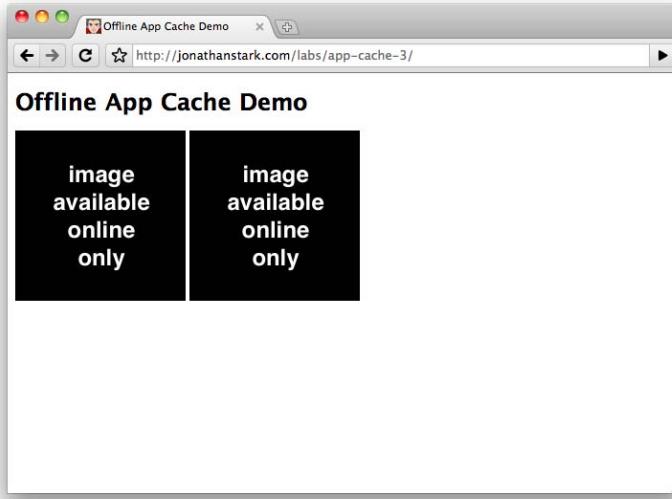


Figure 6-5. A single fallback image will show up in place of multiple images when the user is offline

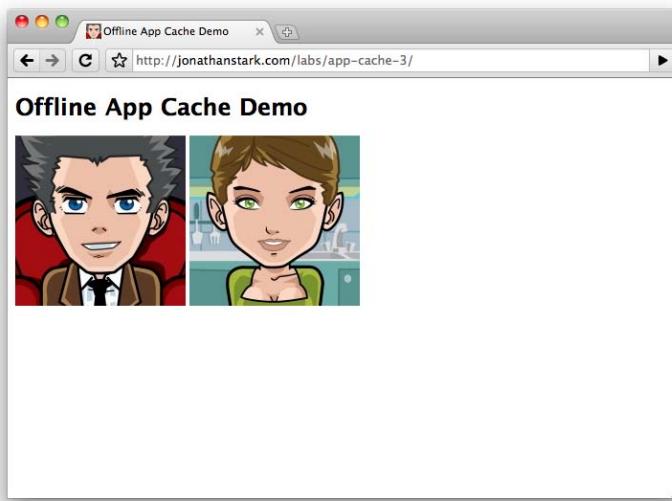


Figure 6-6. Hosted images will show up normally when the user is online

To address this issue, we're going to write a little PHP file that reads the contents of the application directory (and subdirectories) and creates the file list for us. Create a new file in your Kilo directory named *manifest.php* and add the following code:

```
<?php
    header('Content-Type: text/cache-manifest');①
    echo "CACHE MANIFEST\n";②

    $dir = new RecursiveDirectoryIterator('.');
    foreach(new RecursiveIteratorIterator($dir) as $file) {④
        if ($file->IsFile() &&⑤
            $file != "./manifest.php" &&
            !strpos($file, '/') &&
            substr($file->getFilename(), 0, 1) != ".") {
            echo $file . "\n";⑥
        }
    }
?>
```

- ➊ The PHP `header` function outputs this file with the `cache-manifest` content type. Doing this is an alternative to using an `.htaccess` file to specify the content type for the manifest file. In fact, you can remove the `.htaccess` file you created in “[The Basics of the Offline Application Cache](#)” on page 94, if you are not using it for any other purpose.
- ➋ As I mentioned earlier in this chapter, the first line of a cache manifest file must be `CACHE MANIFEST`. As far as the browser is concerned, this is the first line of the document; the PHP file runs on the web server and the browser only sees the output of commands that emit text, such as `echo`.
- ➌ This line creates an object called `$dir`, which enumerates all the files in the current directory. It does so recursively, which means that if you have any files in subdirectories, it will find them, too.
- ➍ Each time the program passes through this loop, it sets the variable `$file` to an object that represents one of the files in the current directory. In English, this line would be, “Each time through, set the file variable to the next file found in the current directory or its subdirectories.”
- ➎ The `if` statement here checks to make sure the file is actually a file (and not a directory or symbolic link) and ignores files named `manifest.php` or any file that starts with a `.` (such as `.htaccess`) or is contained in a directory that begins with a `.` (such as `.svn`).



The leading `.` is part of the file's full path; the `.` refers to the current directory and the `/` separates elements of the file's path. So there's always a `.` that appears before the filename in the output. However, when you check for a leading `.` in the filename, use the `getFileName` function, which returns the filename without the leading path. This way, you can detect files beginning with a `.` even if they are buried in a subdirectory.

⑥ This section displays each file's name.

To the browser, `manifest.php` will look like this:

```
CACHE MANIFEST
./index.html
./jqtouch/jqtouch.css
./jqtouch/jqtouch.js
./jqtouch/jqtouch.transitions.js
./jqtouch/jquery.js
./kilo.css
./kilo.js
./themes/apple/img/backButton.png
./themes/apple/img/blueButton.png
./themes/apple/img/cancel.png
./themes/apple/img/chevron.png
./themes/apple/img/grayButton.png
./themes/apple/img/listArrowSel.png
./themes/apple/img/listGroup.png
./themes/apple/img/loading.gif
./themes/apple/img/on_off.png
./themes/apple/img/pinstripes.png
./themes/apple/img/selection.png
./themes/apple/img/thumb.png
./themes/apple/img/toggle.png
./themes/apple/img/toggleOn.png
./themes/apple/img/toolbar.png
./themes/apple/img/toolButton.png
./themes/apple/img/whiteButton.png
./themes/apple/theme.css
./themes/jqt/img/back_button.png
./themes/jqt/img/back_button_clicked.png
./themes/jqt/img/button.png
./themes/jqt/img/button_clicked.png
./themes/jqt/img/chevron.png
./themes/jqt/img/chevron_circle.png
./themes/jqt/img/grayButton.png
./themes/jqt/img/loading.gif
./themes/jqt/img/on_off.png
./themes/jqt/img/rowhead.png
./themes/jqt/img/toggle.png
./themes/jqt/img/toggleOn.png
./themes/jqt/img/toolbar.png
./themes/jqt/img/whiteButton.png
./themes/jqt/theme.css
```



Try loading the page yourself in a browser (be sure to load it with an HTTP URL such as `http://localhost/~YOURUSERNAME/manifest.php`). If you see a lot more files in your listing, you may have some extraneous files from the jQTouch distribution. The files `LICENSE.txt`, `README.txt`, and `sample.htaccess` are safe to delete, as are the directories `demos` and `extensions`. If you see a number of directories named `.svn`, you may also safely delete them (unless you have put your working directory under the SVN version control system, in which case these files are important). Files beginning with a `.` will not be visible in the Mac OS X Finder or Linux File Manager (but you can work with them at the command line).

Now open `index.html` and add a reference to `manifest.php` in the `head` element like so:

```
<html manifest="manifest.php">
```

Now that the manifest is generated dynamically, let's modify it so its contents change when any of the files in the directory change (remember that the client will only re-download the application if the manifest's contents have changed). Here is the modified `manifest.php`:

```
<?php
  header('Content-Type: text/cache-manifest');
  echo "CACHE MANIFEST\n";

$hashes = "";①

$dir = new RecursiveDirectoryIterator(".");
foreach(new RecursiveIteratorIterator($dir) as $file) {
  if ($file->IsFile() &&
      $file != "./manifest.php" &&
      substr($file->getFilename(), 0, 1) != ".")
  {
    echo $file . "\n";
    $hashes .= md5_file($file);②
  }
}
echo "# Hash: " . md5($hashes) . "\n";③
?>
```

- ① This line initializes a string that will hold the *hashed* values of the files.
- ② This line computes the hash of each file using PHP's `md5_file` function (Message-Digest algorithm 5) and appends it to the end of the `$hashes` string. Any change to the file, however small, will also change the results of the `md5_file` function. The hash is a 32-character string, such as `4ac3c9c004cac7785fa6b132b4f18efc`.

- ③ This code takes the big string of hashes (all of the 32-character strings for each file concatenated together) and computes an MD5 hash of the string itself. This gives us a short (32-characters instead of 32 multiplied by the number of files) string that's printed out as a comment (beginning with the comment symbol, #).

From the viewpoint of the client browser, there's nothing special about this line. It's a comment and the client browser ignores it. However, if one of the files is modified, this line will change, which means the manifest has changed.

Here's an example of what the manifest looks like with this change (some of the lines have been truncated for brevity):

```
CACHE MANIFEST
./index.html
./jqtouch/jqtouch.css
./jqtouch/jqtouch.js
...
./themes/jqt/img/toolbar.png
./themes/jqt/img/whiteButton.png
./themes/jqt/theme.css
# Hash: ddaf5ebda18991c4a9da16c10f4e474a
```

The net result of all of this business is that changing a single character inside any file in the entire directory tree will insert a new hash string into the manifest. This means that any edits we make to any Kilo files will essentially modify the manifest file, which in turn will trigger a download the next time a user launches the app. Pretty nifty, eh?

Debugging

It can be tough to debug apps that use the offline application cache, because there's very little visibility into what is going on. You may find yourself constantly wondering if your files have downloaded or if you are viewing remote or local resources. Plus, switching your device between online and offline modes is not the snappiest procedure and can really slow down the develop-test-debug cycle.

One thing you can do to help determine what's going on when things aren't playing nice is to set up some console logging in JavaScript.



If you want to see what's happening from the web server's perspective, you can monitor its log files. For example, if you are running a web server on a Mac or Linux computer, you can open the command line (see “[Using the Command Line](#)” on page 110), and run these commands (the \$ is the *shell prompt*, which you should not type):

```
$ cd /var/log/apache2/
$ tail -f access?log
```

This will display the web server's log entries, showing information such as the date and time a document was accessed, as well as the name of the document. When you are done, press Control-C to stop following the log.

The ? on the second line will match any character; on Ubuntu Linux, the filename is *access.log* and on the Mac it is *access_log*. If you are using another version of Linux or if you're on Windows, the name of the file and its location may be different.

The JavaScript Console

Adding the following JavaScript to your web apps during development will make your life a lot easier, and can actually help you internalize the process of what is going on. The following script will send feedback to the console and free you from having to constantly refresh the browser window:

```
// Convenience array of status values❶
var cacheStatusValues = [];
cacheStatusValues[0] = 'uncached';
cacheStatusValues[1] = 'idle';
cacheStatusValues[2] = 'checking';
cacheStatusValues[3] = 'downloading';
cacheStatusValues[4] = 'updateready';
cacheStatusValues[5] = 'obsolete';

// Listeners for all possible events❷
var cache = window.applicationCache;
cache.addEventListener('cached', logEvent, false);
cache.addEventListener('checking', logEvent, false);
cache.addEventListener('downloading', logEvent, false);
cache.addEventListener('error', logEvent, false);
cache.addEventListener('noupdate', logEvent, false);
cache.addEventListener('obsolete', logEvent, false);
cache.addEventListener('progress', logEvent, false);
cache.addEventListener('updateready', logEvent, false);

// Log every event to the console
function logEvent(e) {❸
  var online, status, type, message;
  online = (navigator.onLine) ? 'yes' : 'no';
  status = cacheStatusValues[cache.status];
  type = e.type;
  message = 'online: ' + online;
```

```

        message+= ', event: ' + type;
        message+= ', status: ' + status;
        if (type == 'error' && navigator.onLine) {
            message+= ' (probably a syntax error in manifest)';
        }
        console.log(message);④
    }

    // Swap in newly downloaded files when update is ready
    window.applicationCache.addEventListener(
        'updateready',
        function(){
            window.applicationCache.swapCache();
            console.log('swap cache has been called');
        },
        false
    );

    // Check for manifest changes every 10 seconds
    setInterval(function(){cache.update()}, 10000);

```



You can store this in a `.js` file such as `debug.js` and refer to it in your HTML document via the `script` element's `src` attribute, as in `<script type="text/javascript" src="debug.js"></script>`.

This might look like a lot of code, but there really isn't that much going on here:

- ① The first seven lines set up an array of status values for the application cache object. There are six possible values defined by the HTML5 spec, and this code maps their integer values to a short description (i.e., status 3 means "downloading"). We include them to make the logging more descriptive down in the `logEvent` function.
- ② The next chunk of code sets up an event listener for every possible event defined by the spec. Each one calls the `logEvent` function.
- ③ The `logEvent` function takes the event as input and makes a few simple calculations in order to compose a descriptive log message. If the event type is `error` and the user is online, there is probably a syntax error in the remote manifest. Syntax errors are extremely easy to make in the manifest, because all of the paths have to be valid. If you rename or move a file but forget to update the manifest, future updates will fail.



Using a dynamic manifest file helps avoid syntax errors. However, you have to watch out for including a file (such as in a `.svn` subdirectory) that the server can't serve up due to permissions. This will make even a dynamic manifest fail, since the file ends up being unreadable.

- ④ This line sends the composed message to the console.

You can view the console messages in Chrome by selecting View→Developer→JavaScript Console and clicking Console if it was not automatically selected.

If you load the web page in your browser and open the console, you'll see new messages appear every 10 seconds (Figure 6-7). If you don't see anything, change the contents of one of the files (or the name of a file) and reload the page in your browser *twice*. I strongly encourage you to play around with this until you have a feel for what's going on. You can tinker around with the manifest (e.g., change the contents and save it, rename it, move it to another directory) and watch the results of your actions pop into the console like magic.

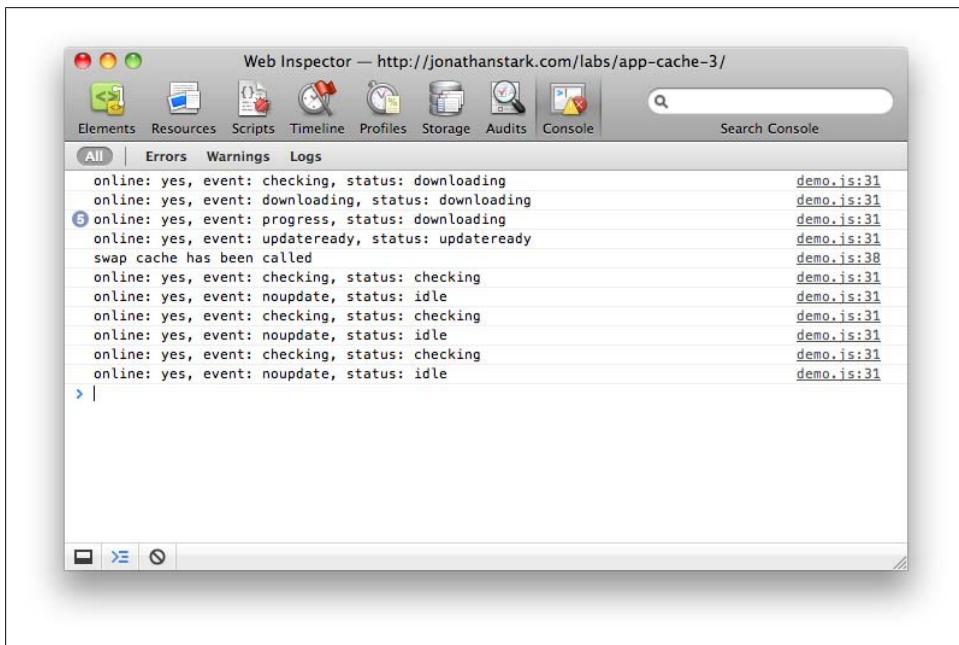


Figure 6-7. Use the `console.log()` function to send debugging messages to the JavaScript console

What You've Learned

In this chapter, you've learned how to give users access to a web app, even when they have no connection to the Internet. With this new addition to our programming toolbox, we now have the ability to create an offline app that is virtually indistinguishable from a native application downloaded from the Android Market.

Of course, a pure web app such as this is still limited by the security constraints that exist for all web apps. For example, a web app can't access the Address Book, the camera, vibration, or the accelerometer on the phone. In the next chapter, I'll address these issues and more with the assistance of an open source project called PhoneGap.

CHAPTER 7

Going Native

Our web app can now do many things that a native app can do: launch from the home screen, store data locally on the phone, and operate in offline mode. We've formatted it nicely for the device and set up native-looking animations to provide feedback and context to the user.

However, there are still two things that it cannot do: it can't access the device features and hardware (e.g., geolocation, accelerometer, sound, and vibration) and it can't be submitted to the Android Market. In this chapter, you will learn how to extend the reach of your web app beyond the normal confines of the browser using an open source project called PhoneGap.

Introduction to PhoneGap

The mobile landscape is littered with devices, platforms, and operating systems. If you are a web developer, you might be familiar with the agony of testing 10 or so browser versions across 10 or so operating system versions. Multiply that by 100 and you have mobile. There is simply no cost-effective way to develop and test across all of the possible combinations.

Enter PhoneGap. PhoneGap is an open source development tool created by [Nitobi](#) that acts as a unified bridge between web apps and mobile devices. It essentially consists of a native app project template for each of the major platforms, where each project is just a chromeless web browser with heightened permissions. What this means in concrete terms is that PhoneGap makes it possible to add a single snippet of JavaScript to your web app that will give you access to the camera on an iPhone, a Nexus One, a Palm Pre, and others.

Furthermore, the resulting app—although written by you with HTML, CSS, and JavaScript—is encased in a native app and you can submit it to the respective app store for the platforms in question. Currently, iPhone, Android, BlackBerry, Palm, Symbian (Nokia), and Windows Mobile are supported, and Windows Phone 7 is in development.

Of course, different devices have different features. Maybe a particular device doesn't have a camera or doesn't have an accelerometer. Even when devices do have the same features, they each have their own ways of exposing these features to the developer. PhoneGap abstracts the APIs for the most widely available mobile phone features so mobile application developers can use the same code everywhere. You still need to deploy your app manually using the SDK (Software Development Kit) provided by the vendor, but you don't need to change your application code.



There are other projects and products available that serve a similar purpose as PhoneGap, such as [RhoMobile](#) and [Titanium Mobile](#), but I prefer PhoneGap because it allows you to write a standard web app and drop it into a native code environment virtually unchanged.

Every other product that I've looked at requires you to write code based on a proprietary framework that only outputs native code (i.e., you aren't writing HTML, CSS, and JavaScript that would run in a browser). I'm not familiar enough with them to do an in-depth comparison, so you might want to check them out in case one suits your needs better than PhoneGap.

Since this is an Android book, we'll focus on the Android branch of PhoneGap. Just be aware of the fact that you could potentially deploy your app to iPhone, Nokia, Palm, and other popular devices with little or no modification.

Using the Command Line

In this chapter, we'll be interacting with PhoneGap and the Android SDK via the command line. The command line is a text-only environment that allows you to do things that you can't do through the operating system's normal graphical UI. On Mac OS X, this is the Terminal application, which lives in the */Applications/Utility* folder. On Windows, it's the command prompt (click the Start Menu, choose All Programs→Accessories→Command Prompt). On Linux, open an xterm or Terminal.

The command line can seem pretty geeky and cryptic at first, so I promise to keep things to a bare minimum and explain everything as much as possible along the way. As you work through the examples, be sure to type things exactly as you see them here. In other words, spaces and capitalization count. You can also download the sample files for this chapter from the [O'Reilly page for this book](#) if you'd prefer to copy and paste.

Download the Android SDK

PhoneGap works in conjunction with the Android SDK, so before we can get started with PhoneGap, we need to download and install the Android SDK itself. Follow the steps here to do so:

1. Navigate to the [Android SDK download page](#) and download the package appropriate for your platform. If you are on Windows or Linux, you will need to install Java (see <http://java.sun.com/javase/downloads>) first. My development machine is a MacBook Pro running Mac OS X 10.6, so in my case, the appropriate package is *android-sdk_r06-mac_86.zip* for Mac OS X (Intel) ([Figure 7-1](#)). The 06 in the SDK filename refers to the version of the Android SDK and may be different at the time you read this.

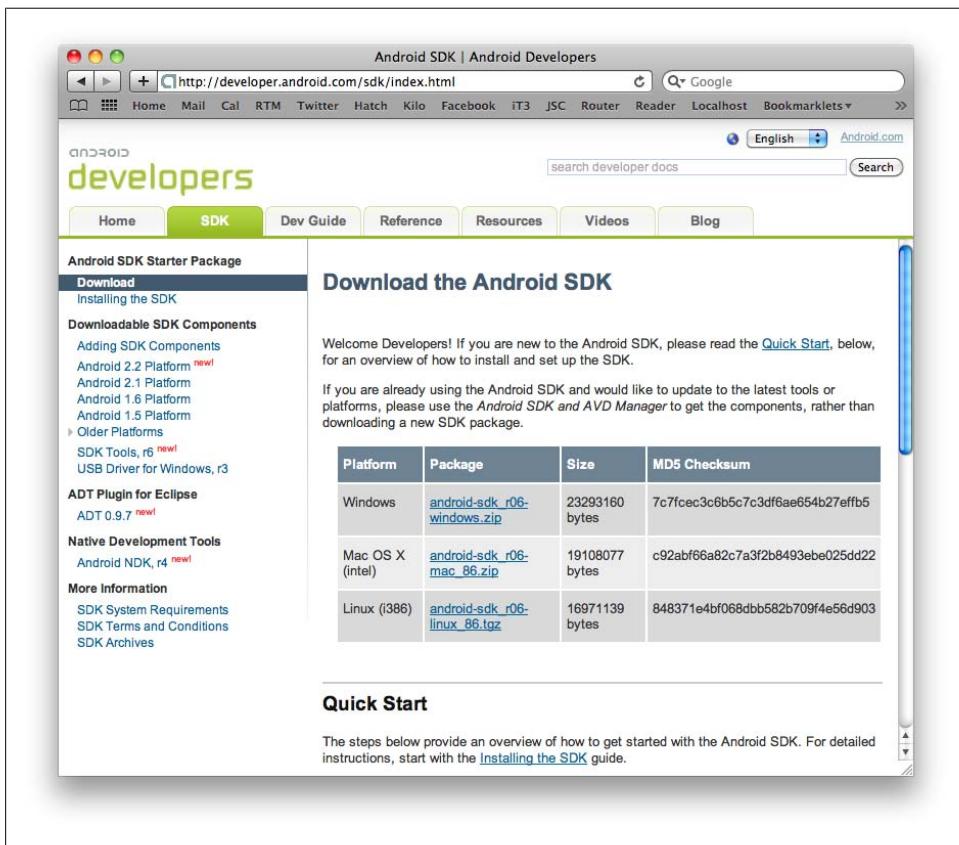


Figure 7-1. Download the appropriate Android SDK for your development machine



Java comes preinstalled on Mac OS X and is available in most Linux package managers. If you install it on Windows, you'll need to set your JAVA_HOME environment variable. Follow the instructions in "[Setting Up the Environment](#)" on page 115, but instead of modifying the PATH environment variable, create a new environment variable called JAVA_HOME and set it to the directory that Java was installed in (such as C:\Program Files\Java\jdk1.6.0_21).

2. Unzip the downloaded archive to whichever directory you like. I'm going to put mine on the desktop.



On Windows, you won't be able to use the `~` shortcut for your home directory. Also, you should avoid spaces in the path names, so if you are using Windows XP (which puts at least two spaces in your home directory due to home directories residing in *Documents and Settings*), you should create a directory such as `C:\Source` instead of putting things on your desktop.

3. For simplicity's sake, I'm going to rename the unzipped SDK directory to *Android*.
4. Launch the Terminal application and navigate into the *tools* subdirectory of the Android SDK directory. If you put the Android directory on your desktop and renamed it, use the following command:

```
cd ~/Desktop/Android/tools/
```

On Linux, the command will be the same (if you put the *Android* directory in the *Desktop* subdirectory of your home directory). On Windows, the command would be something like:

```
cd %USERPROFILE%\Desktop\Android\tools
```

5. Enter the following command to launch the Android SDK and AVD Manager. On the Mac or on Linux, the command is:

```
./android
```

On Windows, the command is:

```
android
```

6. When the Android SDK and AVD Manager window opens, click Available Packages in the left sidebar. You should see a single item appear in the Sites, Packages, and Archives panel ([Figure 7-2](#)).
7. Check the box next to <https://dl-ssl.google.com/android/repository/repository.html> to install all of the available packages and archives ([Figure 7-3](#)).
8. Click the Install Selected button in the lower right corner of the window.
9. A window will appear asking you to accept the license terms. Read the terms, check the box next to Accept, and click the Install button to begin your download ([Figure 7-4](#)).

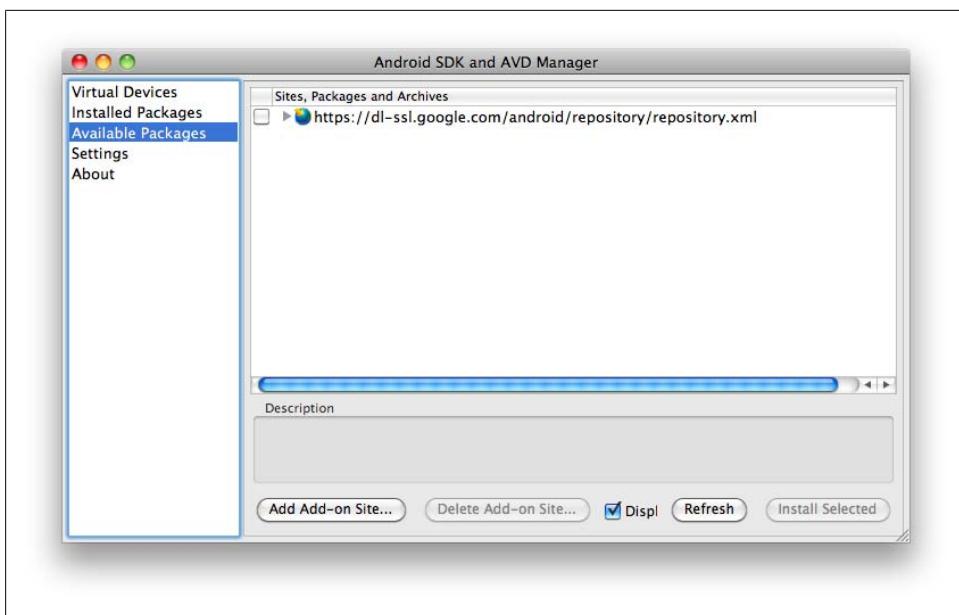


Figure 7-2. Use the Android SDK and AVD Manager to download SDK packages for particular versions of the Android OS

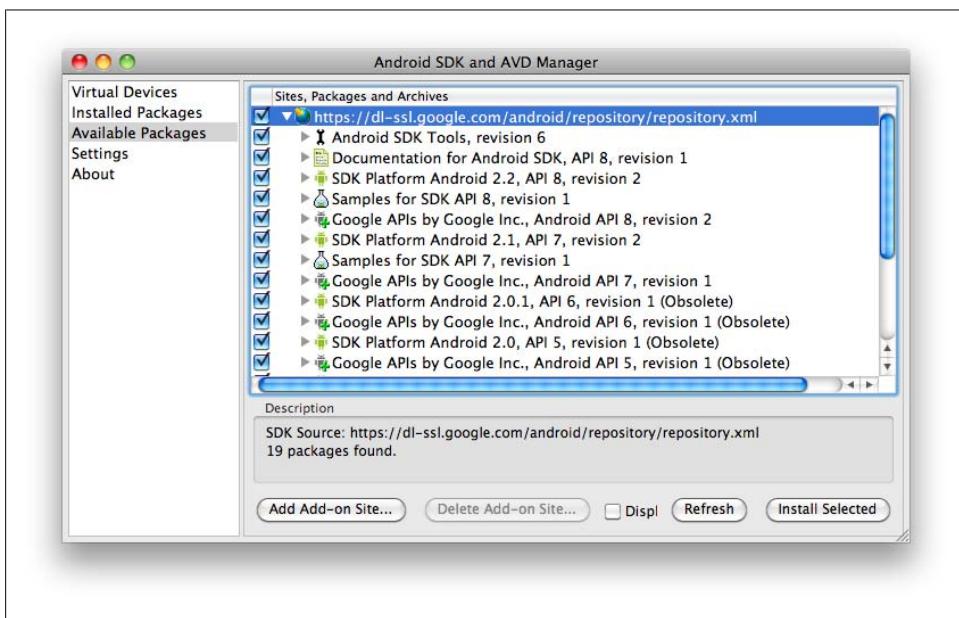


Figure 7-3. Check the box next to <https://dl-ssl.google.com/android/repository/repository.html> and click the Install Selected button

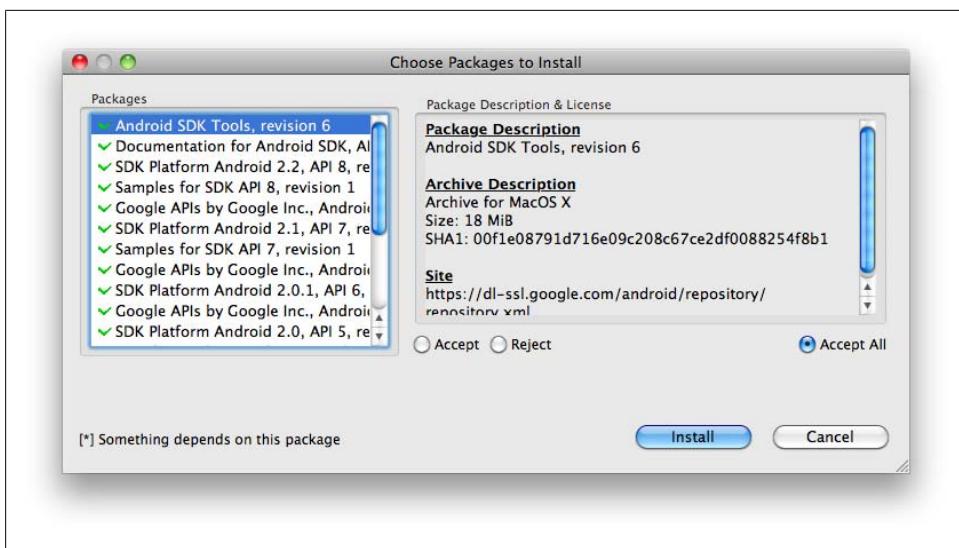


Figure 7-4. Read and accept the platform description and license, then click the *Install* button

10. When your download completes, click Close to close the download window.
11. On Mac OS X, select Quit Android from the Android menu to leave the Android app. On Windows or Linux, simply close the window.

Download PhoneGap

Now that we have the Android SDK installed, we can use PhoneGap to create an Android project based on our web app.



To ensure the instructions in this book will continue to work long into the future, I have forked the main phonegap-android project and intend to keep a relatively static version. Once you become comfortable using my version of PhoneGap for your Android development, you might want to visit the main page for the [PhoneGap project](#) to see if there is anything new and exciting that you might want to incorporate into your apps.

1. Navigate to the [Android PhoneGap download page on GitHub](#) and click the Download Source button in the top right under the Search box (Figure 7-5).
2. When prompted to select an archive format, click on the big *.zip* icon. The download graphic will stay open even after the file has been downloaded.

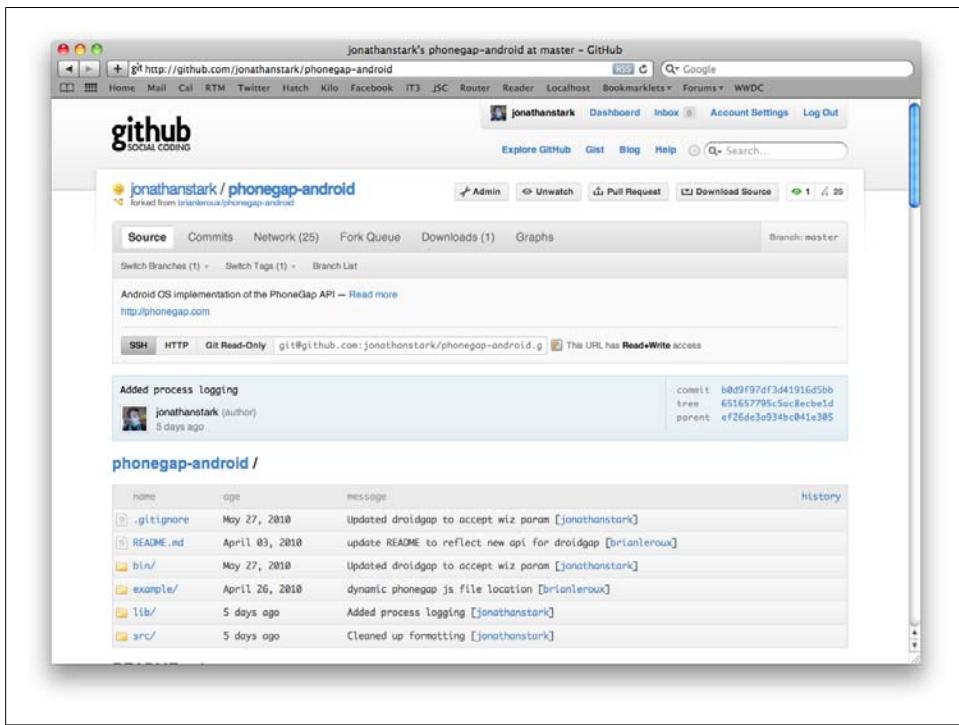


Figure 7-5. My PhoneGap Android page will ensure forward compatibility for the examples in this book

3. Unzip the downloaded archive to whichever directory you like. I'm going to put mine on the desktop and rename the unzipped SDK directory to "PhoneGap" for the sake of simplicity.

Setting Up the Environment

In order to work together, the Android SDK and PhoneGap need to be able to find each other. To facilitate this, you need to configure your PATH environment variable.

Your computer uses *environment variables* to store little bits of data that are used by programs that you run. One of these, PATH, is a list of directories that tells programs where to look for other programs. So, when you type the name of a command (such as `grep` or `findstr`) at the command prompt, your computer looks in each of the directories in your PATH for the command.

On Windows, items in the PATH are separated by a semicolon, as in: `C:\Windows\System32;C:\Windows`. On Mac and Linux, they are separated by a colon, as in `/usr/bin:/usr/local/bin`.

To add a directory to your PATH under Windows, open up your computer's System Properties. You can get to this by left-clicking the Start Menu, right-clicking Computer (or My Computer), and selecting Properties. On Vista or Windows 7, click the Advanced System Settings link on the left. On Windows XP, click the Advanced tab.

In the dialog box that appears, click Environment Variables. Under System Variables, scroll down until you see PATH and double-click it. Be careful not to modify anything in there yet (if you make a mistake, you can always click Cancel and start over). Move the cursor all the way to the right, and add the following (with no space before the semicolon):

```
;C:\Android\tools;C:\PhoneGap\bin
```

Replace C:\Android with the location of the Android SDK (such as C:\Users\yourusername\Desktop\Android) and replace C:\PhoneGap with the location where you put PhoneGap. Click OK and dismiss the remaining dialog boxes.

On Mac OS X or Linux, you should find a *.bash_profile* file in your home directory. It will be invisible, so try running this command at the command line:

```
ls -l ~/.bash_profile
```

If that file exists, edit it by running the nano editor as shown below. If it does not exist but you have a *.profile* file (use `ls -l ~/.profile` to find out), edit that file instead (just replace *.bash_profile* with *.profile*):

```
nano ~/.bash_profile
```

Next, scroll all the way to the bottom of the file using the arrow keys and add the following line:

```
PATH=$PATH:~/Android/tools:~/PhoneGap/bin
```

Replace ~/Android with the location of the Android SDK (such as ~/Desktop/Android/tools) and replace ~/PhoneGap with the location of PhoneGap. Save the file by pressing Control-O then Enter. Press Control-X to exit.

Close any open Command Prompts or Terminals, then restart them. You should be able to run commands such as `adb` or `android` at the command line. If not, see <http://developer.android.com/sdk/installing.html#Installing> and review the instructions there.



The utility in the *PhoneGap/bin* folder requires that Ruby be installed on your computer. It should be installed by default on any Mac or Linux system. If you install it on Windows (see <http://www.ruby-lang.org/en/downloads/>), you may need to edit your PATH variable again and add the path to Ruby's *bin* directory (such as C:\Ruby191\bin). Don't forget to add a semicolon before the path entry as you did earlier.

Create an Android Virtual Device

Now that we have the Android SDK and PhoneGap installed, (and our PATH variable updated), we need to create a device emulator that will allow us to test our code in a simulated environment.

1. To see a list of available targets, enter the following:

```
android list targets
```

I downloaded all of the SDK platforms, so running this command on my machine lists four options:

```
jsc-mbp:~ jstark$ android list targets
Available Android targets:
id: 1 or "android-3"
    Name: Android 1.5
    Type: Platform
    API level: 3
    Revision: 4
    Skins: HVGA (default), HVGA-L, HVGA-P, QVGA-L, QVGA-P
id: 2 or "android-4"
    Name: Android 1.6
    Type: Platform
    API level: 4
    Revision: 3
    Skins: HVGA (default), QVGA, WVGA800, WVGA854
id: 3 or "android-7"
    Name: Android 2.1-update1
    Type: Platform
    API level: 7
    Revision: 2
    Skins: HVGA (default), QVGA, WQVGA400, WQVGA432, WVGA800, WVGA854
id: 4 or "android-8"
    Name: Android 2.2
    Type: Platform
    API level: 8
    Revision: 1
    Skins: HVGA (default), QVGA, WQVGA400, WQVGA432, WVGA800, WVGA854
```

Take note of the ID string listed in the output for Android 2.1 (i.e., android-7). This SDK is the most widely deployed platform at the time of this writing.

2. Enter the following command to create your AVD:

```
android create avd -n mySim -t android-7
```

Here we're telling Android to create a virtual device (**avd**) with the name (**-n**) "mySim" that targets (**-t**) the **android-7** platform.

When asked if you want to configure custom options, just type **no** and press Enter. The process should only take a few seconds and when it's complete, the emulator is installed.

3. To launch the emulator, enter the following command:

```
emulator -avd mySim
```

Here we're using the `emulator` command to launch the Android Virtual Device that we just created. The `-avd` flag is followed by the name you chose when creating your AVD in the previous step.

Wait while the emulator initializes and eventually displays the phone's home screen ([Figure 7-6](#)). The first launch can take a minute or two, so be patient.

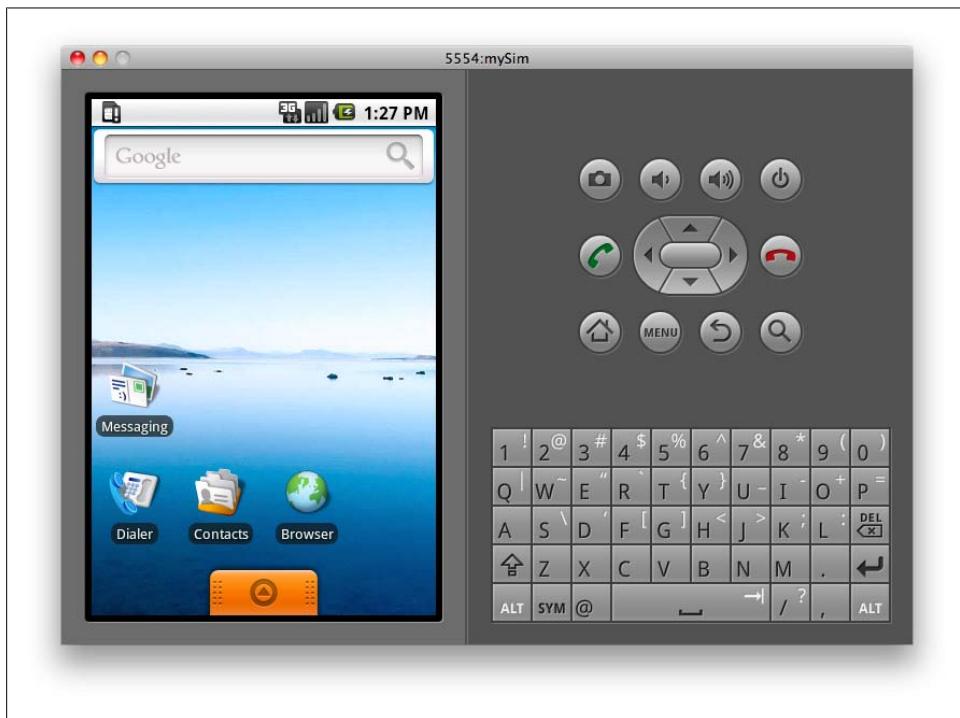


Figure 7-6. The Android Virtual Device (AVD) allows you to test and debug your app without using an actual phone

Build KiloGap

Next, we're going to convert our web app into a native Android app. The gang at Nitobi has created a little helper application named droidgap to help us with this. When you run droidgap, it'll ask you a few questions and insert your answers into a bunch of locations throughout a template to create your project. It's very cool; in fact, if you ever run into someone from Nitobi, you should buy him a martini.



The Android SDK requires Apache Ant, which is included with Mac OS X and many versions of Linux. If you’re using Windows, see <http://ant.apache.org/manual/install.html>. You will need to install Ant before you can run droidgap.

1. To begin the wizard, launch the Terminal application and enter the following command:

```
droidgap wiz
```

The wizard will ask you for a few pieces of information that will be used to generate your PhoneGap project (Figure 7-7).

```
Terminal — ruby — 101x29
jsc-mbp:Desktop jstark$ droidgap wiz
Public name for your app (e.g. MyApp):
Kilo
Package name for your app (e.g. com.example.myapp):
com.jonathanstark.kilo
Path to your web app directory (e.g. the directory that has your HTML, CSS, and JavaScript files):
~/Desktop/www
Path to directory where droidgap should output your files (NOTE - must not exist):
~/Desktop/KiloGap
Android SDK platform you are targeting (leave blank for a list of available targets):
android-7
```

Figure 7-7. The droidgap wizard asks you a few questions and builds a customized Android project based on your answers

2. When prompted, enter a name for your app. This is the name that will be displayed to the user in various places on the phone (e.g., beneath the home screen icon for your app, in the list of applications). I’m going to enter “Kilo.”
3. When prompted, enter a package name for your app. The package name serves as a unique identifier for your app. Typically, people use reverse domain name syntax for app package names. I’m going to enter `com.jonathanstark.kilo`, but you should use your own domain name.

- When prompted, enter the path to the folder on your computer that contains the HTML, CSS, and JavaScript files for your web app. My files are in a folder named *www* on my desktop ([Figure 7-8](#)), so I'll enter:

```
~/Desktop/www
```

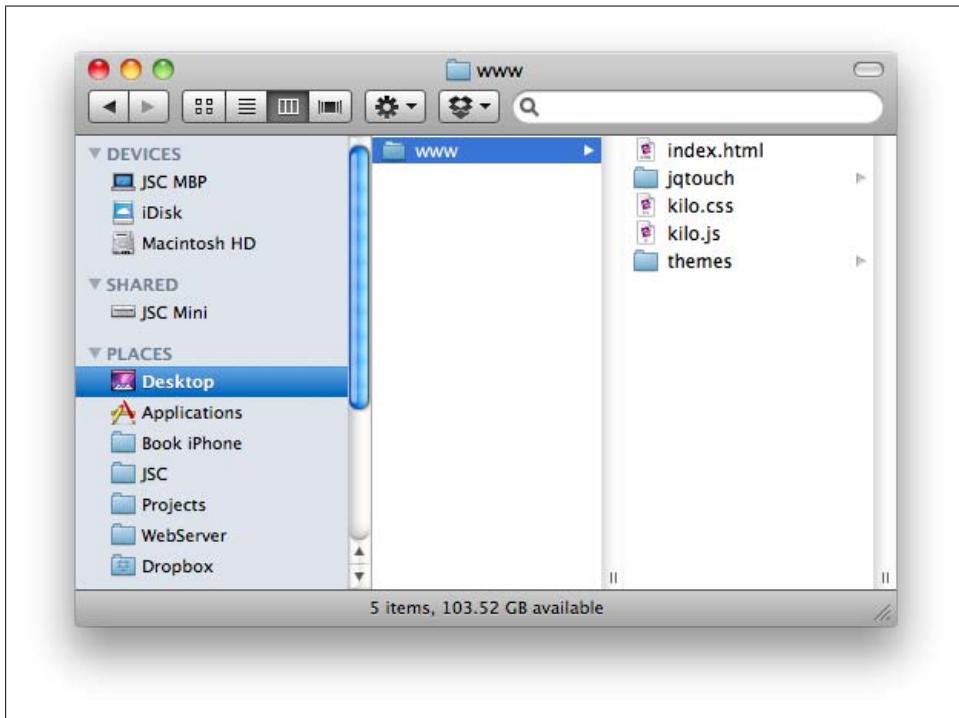


Figure 7-8. My HTML, CSS, and JavaScript files are in a folder named *www* on my desktop

- When prompted, enter a directory path for your project. The directory must not already exist—droidgap is going to create it for you. If a directory exists at the path you specify, droidgap will give you an error and ask for a different path. I want droidgap to put my PhoneGap project on my desktop in a directory named KiloGap, so I'm going to enter the following:

```
~/Desktop/KiloGap
```

- When prompted, enter the Android SDK platform you are targeting. If you followed the instructions above to install all Android SDK platforms, your target platform ID is `android-7`.

If you want to target a different platform, you can get a list of available platform IDs by leaving the platform ID blank and pressing Enter. In the list that appears, the first line of each entry will have an ID displayed as both an integer and string (e.g., id: 2 or "android-4"). Enter the string version of the ID without quotes (i.e., android-4) when the droidgap prompt returns.

After entering the target SDK ID, droidgap will build your project and put the files in the output directory you specified. The process should only take a couple of seconds ([Figure 7-9](#)).

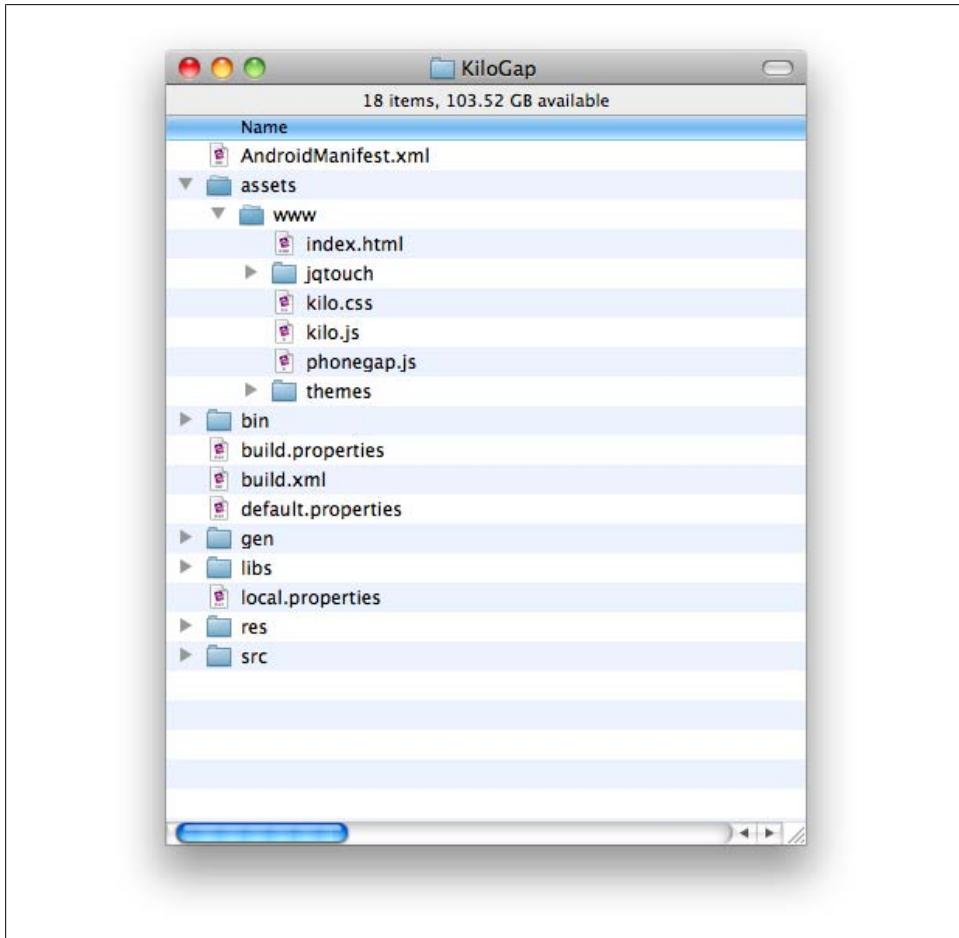


Figure 7-9. droidgap will build your project and put the files in the output directory you specified

If you navigate to the `~/Desktop/KiloGap/assets/www/` directory, you'll notice that droidgap has deposited a file named `phonegap.js` alongside your other application files. This is the file that PhoneGap uses to expose certain native device functionality via JavaScript. To make use of `phonegap.js`, you have to include it in the `head` section of your `index.html` file like so:

```
...
<head>
  <title>Kilo</title>
  <link type="text/css" rel="stylesheet"
    media="screen" href="jqtouch/jqtouch.css"/>
  <link type="text/css" rel="stylesheet"
    media="screen" href="themes/jqt/theme.css"/>
  <link type="text/css" rel="stylesheet"
    media="screen" href="kilo.css"/>
  <script type="text/javascript" src="phonegap.js" charset="utf-8"></script>
  <script type="text/javascript" src="jqtouch/jquery.js" charset="utf-8"></script>
  <script type="text/javascript" src="jqtouch/jqtouch.js" charset="utf-8"></script>
  <script type="text/javascript" src="kilo.js" charset="utf-8"></script>
</head>
...
...
```

Installing KiloGap in the Emulator

Now it's time to test our shiny new native Android app in the emulator.

1. If your emulator is not running, launch it by entering the following command in the Terminal application (this way, you can let it “warm up” while you're building the Kilo package):

```
emulator -avd mySim
```

You should see the Android emulator window appear after a few seconds. Notice that the command prompt doesn't return in the terminal window—it will sort of just sit there and hang until you close the emulator. We won't be interacting with this window, so you can minimize it to get it out of the way.

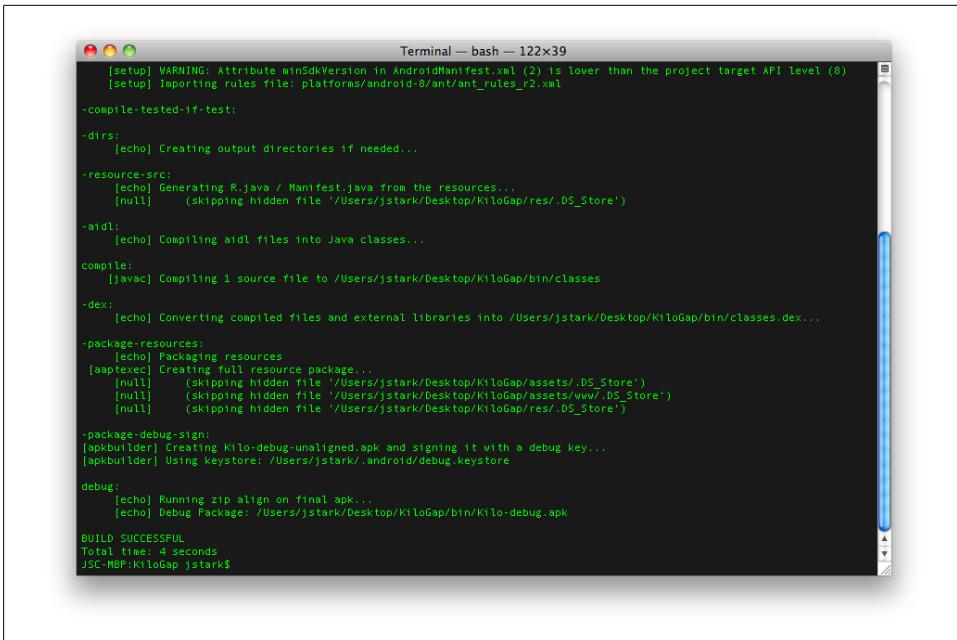
2. Open a new terminal window and navigate into the `KiloGap` directory. In my case, the command to do so is:

```
cd ~/Desktop/KiloGap
```

3. Enter the following command to compile your app with debugging enabled:

```
ant debug
```

If all goes well, you'll see a stream of output with `BUILD SUCCESSFUL` at the end ([Figure 7-10](#)). A binary executable named `Kilo-debug.apk` will now be sitting in the `~/Desktop/KiloGap/bin` directory ([Figure 7-11](#)). If the build is not successful, repeat the steps in [“Build KiloGap” on page 118](#).



```

Terminal — bash — 122x39
[setup] WARNING: Attribute minSdkVersion in AndroidManifest.xml (2) is lower than the project target API level (8)
[setup] Importing rules file: platforms/android-8/ant/ant_rules_r2.xml
-compile+tested-if-test:
-dirs:
[echo] Creating output directories if needed...
-resource-src:
[echo] Generating R.java / Manifest.java from the resources...
[null]    (skipping hidden file '/Users/jstark/Desktop/KiloGap/res/.DS_Store')
-aidl:
[echo] Compiling aidl files into Java classes...
compile:
[javac] Compiling 1 source file to /Users/jstark/Desktop/KiloGap/bin/classes
dex:
[echo] Converting compiled files and external libraries into /Users/jstark/Desktop/KiloGap/bin/classes dex...
-package-resources:
[echo] Packaging resources
[aaptexec] Creating full resource package...
[null]    (skipping hidden file '/Users/jstark/Desktop/KiloGap/assets/.DS_Store')
[null]    (skipping hidden file '/Users/jstark/Desktop/KiloGap/assets/www/.DS_Store')
[null]    (skipping hidden file '/Users/jstark/Desktop/KiloGap/res/.DS_Store')
-package-debug-sign:
[apkbuilder] Creating Kilo-debug-unaligned.apk and signing it with a debug key...
[apkbuilder] Using keystore: /Users/jstark/.android/debug.keystore
debug:
[echo] Running zip align on final apk...
[echo] Debug Package: /Users/jstark/Desktop/KiloGap/bin/Kilo-debug.apk
BUILD SUCCESSFUL
Total time: 4 seconds
JSC-MBP:KiloGap jstark$
```

Figure 7-10. If the ant debug command finishes without errors, you'll see BUILD SUCCESSFUL at the end of the output

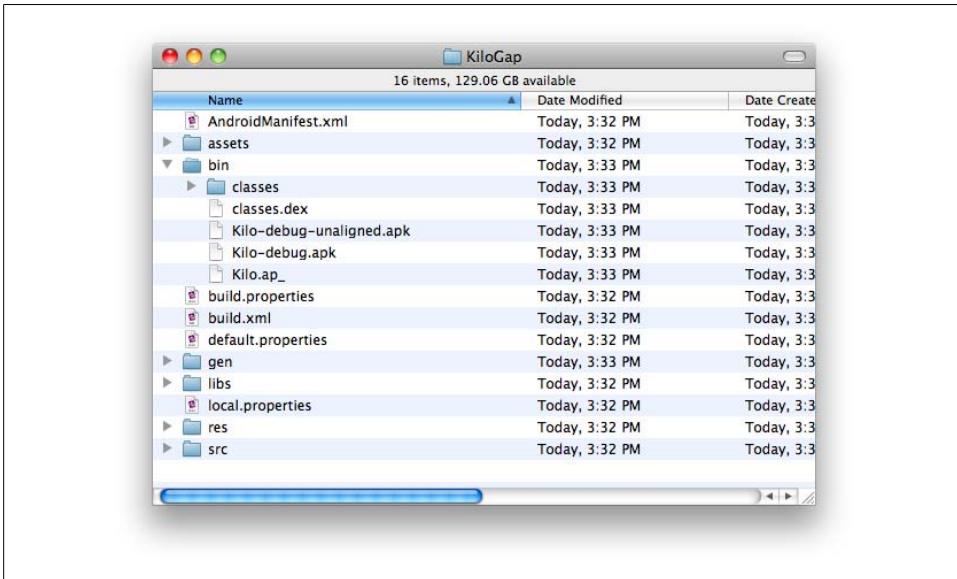


Figure 7-11. The ant debug command will create the Kilo-debug.apk binary in the KiloGap's bin directory

- Now that we have a binary, we can install it on the emulator. To do so, enter the following command (if you’re using a different location, replace `~/Desktop/KiloGap/bin/` with the location of the `bin` subdirectory of wherever you told droidgap to create the project back in step [5 on page 120](#)):

```
adb -e install -r ~/Desktop/KiloGap/bin/Kilo-debug.apk
```

“adb” is short for Android Debug Bridge, which is a tool that is included in the Android SDK we installed earlier in the chapter. The `-e` flag tells adb to install our binary package (i.e., `~/Desktop/KiloGap/bin/Kilo-debug.apk`) on the first running emulator that it finds. The `-r` flag tells adb to replace the binary on the emulator if it has been installed previously. If you get a “device offline” error, go into the emulator and unlock it if it’s locked (for example, on Android 2.2, slide the green lock icon to the right), then try again.

Your app is now available on the emulator just like any other application ([Figure 7-12](#)). To play around with it, locate Kilo in the application launcher and tap it to launch the app. You’ll notice right away that there is a bit of cleanup to do. For example, there is an approximately 40px gap at the bottom of the window ([Figure 7-13](#)).



Figure 7-12. Your app is now available on the emulator, just like any other application



Figure 7-13. Your web app is now running as a native app on the Android Emulator

Using the Screen's Full Height

This gap occurs because jQTouch does not realize we are running it outside of a normal web browser, so it's allowing room for the browser's toolbar. Fortunately, the fix is easy. Just open `~/Desktop/KiloGap/assets/www/kilo.js` and add the following to the document ready function:

```
if (typeof(PhoneGap) != 'undefined') {
    $('body > *').css({minHeight: window.innerHeight + 'px !important'});
}
```

This code uses the `typeof` operator to make sure the `PhoneGap` object has been defined. If the code is running inside PhoneGap, this conditional will evaluate to `true`. If the code is launched as a web app, the `PhoneGap` object will be undefined and the conditional will evaluate to `false`.

When the app is launched with PhoneGap, the immediate children of the HTML body element will be given a minimum height that matches the height of the window's content area (455px on emulator, 508px on the Nexus One). To make sure the declaration takes effect, add the `!important` directive to override any conflicting instructions elsewhere in the stylesheets. Now the app will completely fill the window when launched ([Figure 7-14](#)).



Figure 7-14. The body height has changed from 420px to 455px, so now the app takes up the whole screen

Customizing the App Icon

So far, our app is represented in the emulator using the default PhoneGap icon (a blue square with a ladder on it). To customize the look of the icon, we need to place our own image in a particular spot in the *KiloGap* project directory; actually, in three spots.

Navigate to `~/Desktop/KiloGap/res` in the Finder and you'll see three folders that begin with the prefix `drawable-`: `drawable-hdpi`, `drawable-ldpi`, and `drawable-mdpi`. Because Android supports a wide range of devices with varying screen characteristics, these three folders were created to hold different resolution versions of your icon graphics. `ldpi` is for 100 to 140 dpi screens, `mdpi` is for 140 to 180 dpi screens, and `hdpi` is 190 to 250 dpi screens.

Perfecting the display of your home screen icon across all Android devices is a graphic design issue that falls outside the scope of this book. But don't worry—for now just replace the default PhoneGap `icon.png` files with a 56-pixel square `.png`, and Android will do a really good job of rendering it appropriately on various devices. For more details on launcher icons, please refer to “[Adding an Icon to the Home Screen](#)” on page 52. For the examples here, I'll be using a chocolate frosted donut with jimmies on a pink background.

Once you have replaced the default icons, enter the following commands in the Terminal application to recompile and install the app:

```
cd ~/Desktop/KiloGap
ant debug
adb -d install -r bin/Kilo-debug.apk
```

When the process completes, you should see your new icon displayed in the launcher on the phone ([Figure 7-15](#)).

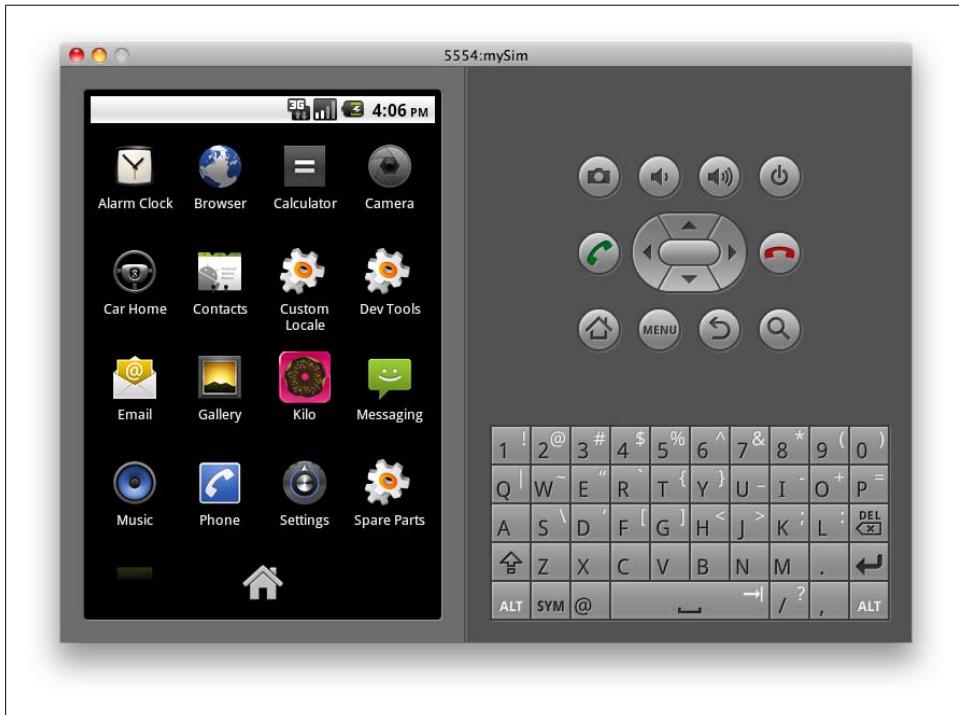


Figure 7-15. You can customize your app's launcher icon by putting a .png file in each of the three drawable directories in your Android project

Installing KiloGap on Your Phone

If you have an actual Android device at your disposal, you can install Kilo on it directly. The instructions for doing so are similar to the steps for the emulator installation:

1. Plug your phone in to the USB port on your laptop.
2. Enable debugging on your phone by navigating to **Settings→Applications→Development** and enabling the USB Debugging option.

3. Open a terminal window and navigate into the *KiloGap* directory. In my case, the command to do so is:

```
cd ~/Desktop/KiloGap
```

4. If you haven't compiled it already, enter the following command in a terminal window to compile your app with debugging enabled:

```
ant debug
```

If all goes well, you'll see a stream of output with **BUILD SUCCESSFUL** at the end. A binary executable named *Kilo-debug.apk* will now be sitting in the *~/Desktop/KiloGap/bin* directory. If the build is not successful, repeat the steps in “[Build Kilo-Gap](#)” on page 118.

5. Now that we have a binary, we can install it on the phone. To do so, enter the following command:

```
adb -d install -r bin/Kilo-debug.apk
```

The **-d** flag tells adb to install our binary package (i.e., *bin/Kilo-debug.apk*) on the first connected device it finds.

Your app is now available on the phone just like any other application. To play around with it, locate Kilo in the application list and tap the icon to launch it.

Controlling the Phone with JavaScript

The stage is now set for us to start enhancing our application with calls to the native device features. Thanks to *phonegap.js*, all you have to do to make the phone vibrate, for example, is to add a bit of JavaScript to your code:

```
navigator.notification.vibrate();
```

Pretty simple, right?

Beep, Vibrate, and Alert

PhoneGap makes beep, vibrate, and alert functions so simple that I'm going to lump them together into one example. Specifically, we'll set up the app to beep, vibrate, and display a custom alert when the user creates an entry that puts him over his daily calorie budget. To do so, add the following function to the end of the *kilo.js* located in the *~/Desktop/KiloGap/assets/www/* directory:

```
function checkBudget() {❶
    var currentDate = sessionStorage.currentDate;
    var dailyBudget = localStorage.budget;
    db.transaction(❷
        function(transaction) {
            transaction.executeSql(❸
                'SELECT SUM(calories) AS currentTotal FROM entries WHERE date = ?;',❹
                [currentDate], ❺
```

```
function (transaction, result) {❶
    var currentTotal = result.rows.item(0).currentTotal;❷
    if (currentTotal > dailyBudget) {❸
        var overage = currentTotal - dailyBudget;❹
        var message = 'You are '+overage+' calories over your'
                     + ' daily budget. Better start jogging!';❺
        try {❻
            navigator.notification.beep(1);
            navigator.notification.vibrate();
        } catch(e){❻
            // No equivalent in web app
        }
        try {❽
            navigator.notification.alert(message,
                'Over Budget', 'Dang!');
        } catch(e) {
            alert(message);
        }
    }
},
errorHandler❾
);
}
});
```

Here's the blow-by-blow description:

- ➊ This is the beginning of the `checkBudget()` function. It initializes the `currentDate` variable to the value stored in `sessionStorage` (i.e., the value entered by the user in the Settings panel) and sets the `dailyBudget` variable to the value stored in `localStorage` (i.e., the date the user taps on the Dates panel).
 - ➋ Start a database transaction in preparation for calculating the total calories for the current date.
 - ➌ Run the `executeSql()` method of the transaction object.

Let's examine the four parameters of the `executeSql()` method:

- ④ The first parameter is a prepared SQL statement that uses the SUM function to add up all the values in the calories column for the entries that match the current date.
 - ⑤ The second parameter is a single-value array that will replace the question mark in the prepared statement on the previous line.
 - ⑥ The third parameter is an anonymous function that will be called if the SQL query completes successfully (we'll look at this in detail momentarily).

Here's what's going on in the anonymous function that was passed in as the third parameter:

- ⑦ This line grabs the current total from the first row of the result. Since we are just asking for the sum of a column, the database is only going to return one row (i.e., this query will always return one row). Remember that the records of the result set are accessed with the `item()` method of the `rows` property of the result object, and that the rows are zero-based (meaning that the first row is 0).
- ⑧ Check to see if the current calorie total for the day is greater than the daily budget specified on the Settings panel. If so, the block that follows will be executed.
- ⑨ Calculate how far the user is over his calorie budget.
- ⑩ Compose a message to display to the user.
- ⑪ This is a try/catch block that attempts to call the `beep(1)` and `vibrate()` methods of the navigator notification object. These methods only exist in PhoneGap, so if the user is running the app in a browser, these methods will fail and execution will jump to the catch block. Since there is no browser-based equivalent to beep or vibrate, the catch block has been left empty.
- ⑫ This is a try/catch block that attempts to call the `alert()` method of the navigator notification object. This method only exists in PhoneGap, so if the user is running the app in a browser, it will fail and execution will jump to the catch block. The browser-based equivalent to alert is a standard JavaScript alert, which is called as a fallback.

There are a couple of differences between the PhoneGap alert and the native JavaScript alert. For example, the PhoneGap alert allows you to control the title and the button name ([Figure 7-16](#)); the JavaScript alert does not ([Figure 7-17](#)).

There is also a more subtle difference between the two alerts: the native JavaScript alert is modal and the PhoneGap alert is not. In other words, script execution will pause at the point when you call a native alert, whereas execution will continue with the PhoneGap version. This may or may not be a big deal depending on the nature of your application, so keep this distinction in mind.

- ⑬ The fourth parameter is the name of the generic SQL error handler that will be called in the event of a SQL error.

With our `checkBudget()` function complete, we can now call it by adding a single line to the success callback of our `createEntry()` function:

```
function createEntry() {
    var date = sessionStorage.currentDate;
    var calories = $('#calories').val();
    var food = $('#food').val();
    db.transaction(
        function(transaction) {
            transaction.executeSql(
```

```
'INSERT INTO entries (date, calories, food) VALUES (?, ?, ?);',
[date, calories, food],
function(){
    refreshEntries();
    checkBudget();
    jQT.goBack();
},
errorHandler
);
}
);
return false;
}
```

After you've made these changes, save the *kilo.js* file, open up a command line (see “[Using the Command Line](#)” on page 110) and run the following commands to recompile and install it on your phone (change `-d` to `-e` if you'd like to use the emulator instead):

```
ant debug
adb -d install -r ~/Desktop/KiloGap/bin/Kilo-debug.apk
```

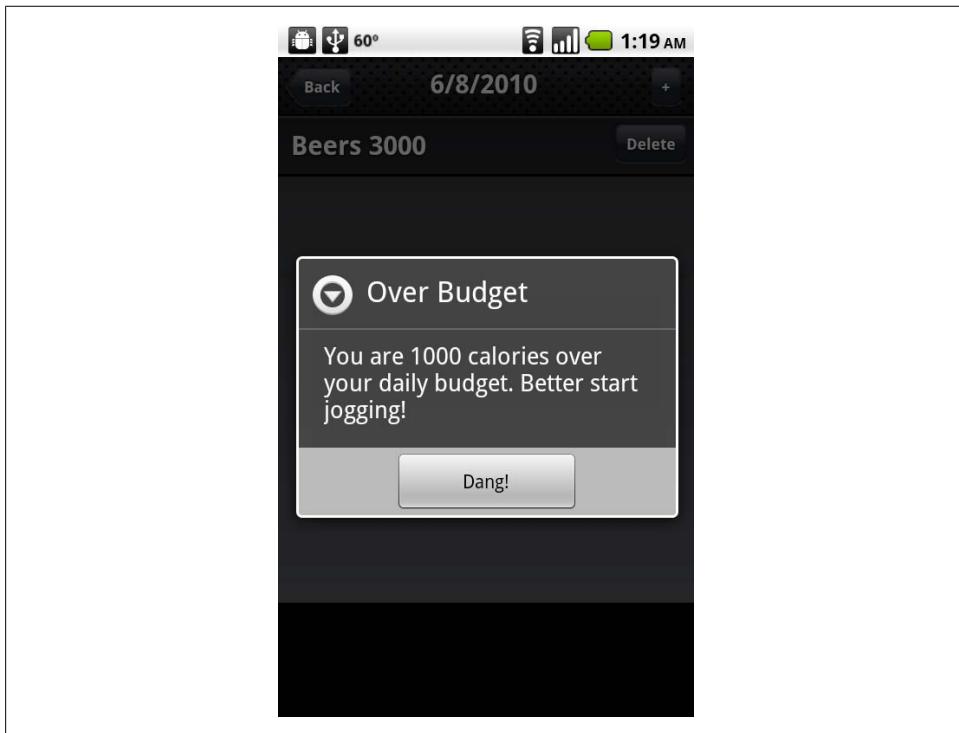


Figure 7-16. The PhoneGap alert allows you to specify the title and button label

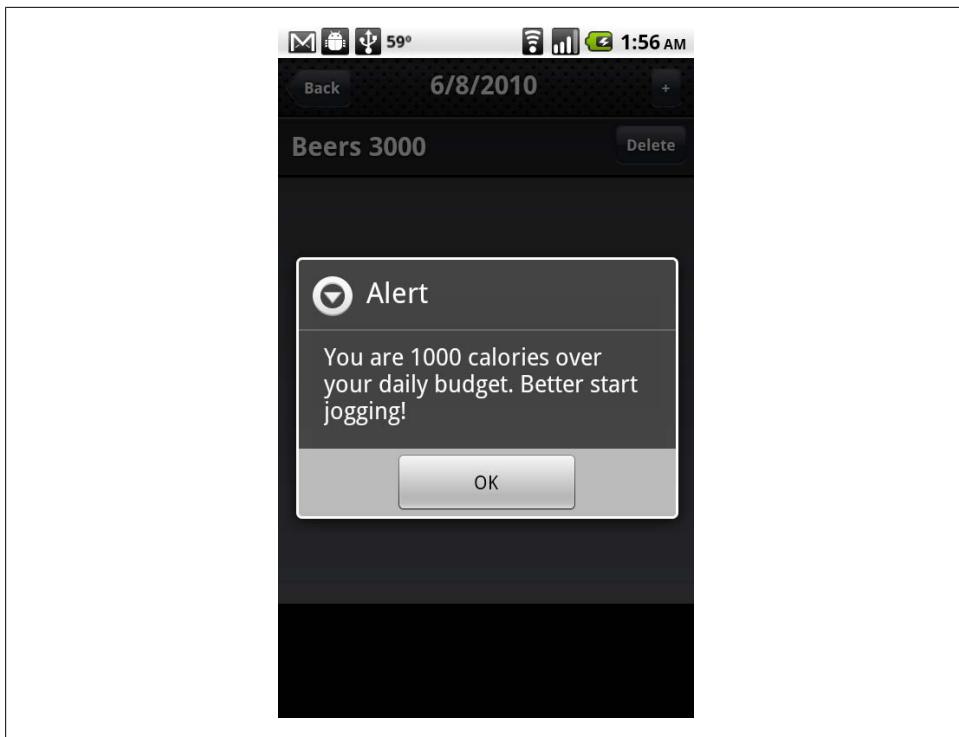


Figure 7-17. A native JavaScript alert does not allow you to specify the title and button label

Geolocation

Let's update Kilo to save the location when entries are created. Once we have that information, we'll add a Map Location button that will open the built-in Maps application and drop a pin at the point where the entry was created.

The first step is to add latitude and longitude columns to the database to store the information. To do so, replace the CREATE TABLE statement in `~/Desktop/KiloGap/assets/www/kilo.js` with the following:

```
db.transaction(
  function(transaction) {
    transaction.executeSql(
      'CREATE TABLE IF NOT EXISTS entries ' +
      ' (id INTEGER NOT NULL PRIMARY KEY AUTOINCREMENT, ' +
      ' date DATE NOT NULL, food TEXT NOT NULL, ' +
      ' calories INTEGER NOT NULL, ' +
      ' longitude TEXT NOT NULL, latitude TEXT NOT NULL);'
    );
  }
);
```

Next, we'll rewrite the `createEntry()` function that we first saw in Chapter 5 to use the geolocation feature of the phone to determine the current latitude and longitude. Replace the existing `createEntry()` function in *kilo.js* with this:

```
function createEntry() {❶
    navigator.geolocation.getCurrentPosition(❷
        function(position){❸
            var latitude = position.coords.latitude;❹
            var longitude = position.coords.longitude;
            insertEntry(latitude, longitude);❺
        },
        function(){❻
            insertEntry();❼
        }
    );
    return false;❽
}
```

- ❶ Begin the `createEntry()` function.
- ❷ Call the `getCurrentPosition()` function of the `geolocation` object and pass it two callback functions: one for success and one for errors.
- ❸ This is the beginning of the success callback. Notice that it accepts a single parameter (i.e., `position`).
- ❹ These two lines grab the `latitude` and `longitude` coordinates out of the `position` object.
- ❺ Pass the `latitude` and `longitude` coordinates into a function called `insertEntry()`, which we'll look at momentarily.
- ❻ This is the beginning of the error callback.
- ❼ Because we're in the error callback, this will only be called if geolocation fails (for example, if the user does not allow the application to access his location when prompted), so call the `insertEntry()` function without parameters.
- ❽ Return `false` to prevent the default navigation behavior of clicking the form's Submit button.

Wondering where the SQL `INSERT` statement got to? Let's take a look at the `insertEntry()` function. This new function creates the entry in the database. Add the following to *kilo.js*:

```
function insertEntry(latitude, longitude) {❶
    var date = sessionStorage.currentDate;❷
    var calories = $('#calories').val();❸
    var food = $('#food').val();❹
    db.transaction(❺
        function(transaction) {❻
            transaction.executeSql(❼
                'INSERT INTO entries (date, calories, food, latitude, longitude) ' +
                'VALUES (?, ?, ?, ?, ?);',❽
                [date, calories, food, latitude, longitude],❾
            )
        }
    );
}
```

```

        function(){⑩
            refreshEntries();
            checkBudget();
            jQT.goBack();
        },
        errorHandler⑪
    );
}
);
}
}

```

- ➊ The beginning of the `insertEntry()` function, allowing for `latitude` and `longitude` values to be passed in. Although there is no way to explicitly mark a parameter as optional in JavaScript, they will simply be `undefined` if they are not passed in.
- ➋ Get the `currentDate` out of `sessionStorage`. Remember that its value will be set when the user taps an item on the Dates panel to navigate to the Date panel. When he taps the + button to reveal the New Entry panel, this value will still be set to the currently selected Date panel item.
- ➌ Get the `calories` value out of the `createEntry` form.
- ➍ Get the `food` value out of the `createEntry` form.
- ➎ Begin a database transaction.
- ➏ Pass a callback function into the transaction, with the transaction object as its sole parameter.
- ➐ Call the `executeSql()` method of the transaction object.
- ➑ Define the SQL prepared statement with question marks as data placeholders.
- ➒ Pass an array of values for the placeholders. If `latitude` and `longitude` are not passed into the `insertEntry()` function, they will be `undefined`.
- ➓ Define the success callback function.
- ➔ Define the error callback function.

To confirm that Kilo is actually saving these location values, we'll want to display them somewhere in the interface. Let's add an Inspect Entry panel to display the stored values. We'll include a Map Location button on the panel that will display where the entry was created. Add the following to `index.html`, right before the closing body tag (`</body>`):

```

<div id="inspectEntry">
    <div class="toolbar">
        <h1>Inspect Entry</h1>
        <a class="button cancel" href="#">Cancel</a>
    </div>
    <form method="post">
        <ul class="rounded">
            <li><input type="text" placeholder="Food" name="food" value="" /></li>
            <li><input type="tel" placeholder="Calories" /></li>
        </ul>
    </form>
</div>

```

```

        name="calories" value="" /></li>❶
    <li><input type="submit" value="Save Changes" /></li>
</ul>
<ul class="rounded">
    <li><input type="text" name="latitude" value="" /></li>❷
    <li><input type="text" name="longitude" value="" /></li>
    <li><p class="whiteButton" id="mapLocation">Map Location</p></li>❸
</ul>
</form>
</div>

```

This should look very similar to the New Entry panel that we first saw in [Example 4-5](#), “The HTML for the New Entry panel,” so I’ll just call out a couple of things:

- ❶ The input type has been set to `tel` to call the telephone keyboard when cursor is placed in the field. This is a bit of a hack, but I think it’s worth it, because that keyboard is much more appropriate for a numeric data field.
- ❷ The latitude and longitude fields are editable and contained within the form, which means the user would be able to edit them. This probably would not make sense in the final application, but it makes it a lot easier to test during development because you can enter location values manually to test the Map Location button.
- ❸ This Map Location button won’t do anything when clicked at this point; we’ll add a click handler to it momentarily.

Now we need to give the user a way to navigate to this Inspect Entry panel, so we’ll modify the behavior of the Date panel such that when the user taps an entry in the list, the Inspect Entry panel will slide up from the bottom of the screen.

The first step is to wire up the click event handler (which we’ll create next), and also modify the way clicks on the Delete button are processed. Add the three highlighted changes below to the `refreshEntries()` function in `kilo.js`:

```

function refreshEntries() {
    var currentDate = sessionStorage.currentDate;
    $('#date h1').text(currentDate);
    $('#date ul li:gt(0)').remove();
    db.transaction(
        function(transaction) {
            transaction.executeSql(
                'SELECT * FROM entries WHERE date = ? ORDER BY food;',
                [currentDate],
                function (transaction, result) {
                    for (var i=0; i < result.rows.length; i++) {
                        var row = result.rows.item(i);
                        var newEntryRow = $('#entryTemplate').clone();
                        newEntryRowremoveAttr('id');
                        newEntryRow.removeAttr('style');
                        newEntryRow.data('entryId', row.id);
                        newEntryRow.appendTo('#date ul');
                        newEntryRow.find('.label').text(row.food);
                        newEntryRow.find('.calories').text(row.calories);
                        newEntryRow.find('.delete').click(function(e){❶

```

```
        var clickedEntry = $(this).parent();
        var clickedEntryId = clickedEntry.data('entryId');
        deleteEntryById(clickedEntryId);
        clickedEntry.slideUp();
        e.stopPropagation();❷
    });
    newEntryRow.click(entryClickHandler);❸
}
},
ErrorHandler
);
}
});
```

- ❶ We have to add the `e` parameter (the event) to the function call in order to have access to the `stopPropagation()` method of the event, used shortly. If we didn't add the `e` parameter, `e.stopPropagation()` would be undefined.
 - ❷ The `e.stopPropagation();` added to the Delete button click handler tells the browser not to let the click event bubble up the DOM to parent elements. This is important because we've now added a click handler to the row itself (and the entry row is the parent of the Delete button). If we didn't call `stopPropagation()`, both the Delete button handler and the `entryClickHandler` would fire when the user tapped the Delete button.
 - ❸ The `newEntryRow.click(entryClickHandler);` tells the browser to call the `entryClickHandler` function when the entry is tapped.

Now let's add the `entryClickHandler()` function to `kilo.js`:

```
function entryClickHandler(e){  
    sessionStorage.entryId = $(this).data('entryId');①  
    db.transaction(②  
        function(transaction) {③  
            transaction.executeSql(④  
                'SELECT * FROM entries WHERE id = ?;', ⑤  
                [sessionStorage.entryId], ⑥  
                function (transaction, result) {⑦  
                    var row = result.rows.item(0);⑧  
                    var food = row.food;⑨  
                    var calories = row.calories;  
                    var latitude = row.latitude;  
                    var longitude = row.longitude;  
                    $('#inspectEntry input[name="food"]').val(food);⑩  
                    $('#inspectEntry input[name="calories"]').val(calories);  
                    $('#inspectEntry input[name="latitude"]').val(latitude);  
                    $('#inspectEntry input[name="longitude"]').val(longitude);  
                    $('#mapLocation').click(function(){⑪  
                        window.location = 'http://maps.google.com/maps?z=15&q=' +  
                            food+'@'+latitude+', '+longitude;  
                    });  
                    jQT.goTo('#inspectEntry', 'slideup');⑫  
                },  
            );  
        },  
    );  
};
```

```

        errorHandler⑬
    );
}
);
}
}

```

- ➊ Get the `entryId` from the entry that the user tapped and store it in session storage.
- ➋ Begin a database transaction.
- ➌ Pass a callback function into the transaction, with the transaction object as its sole parameter.
- ➍ Call the `executeSql()` method of the transaction object.
- ➎ Define the SQL prepared statement with a question mark as data placeholder.
- ➏ Pass a single element array for the placeholder.
- ➐ Begin the success callback function.
- ➑ Get the first (and only, since we're just querying for one entry) row of the result.
- ➒ Set some variables based on the values from the row.
- ➓ Set values of the form fields based on the variables.
- ➔ Attach a click handler to the `#mapLocation` button. The function sets the window location to a standard Google Maps URL. If the Maps application is available, it will launch. Otherwise, the URL will load in a browser. The `z` value sets the initial zoom level; the string before the `@` symbol will be used as the label for the pin that is dropped at the location. The latitude and longitude values must appear in the order shown here, separated by a comma.
- ➕ Call the `goTo()` method of the `jQT` object to make the Inspect Entry panel slide up into view.
- ➖ Define the error callback function.

To test your changes, open a command prompt, `cd` into the *KiloGap* directory, and run the following commands to recompile and install the app on your phone:

```

ant debug
adb -d install -r ~/Desktop/KiloGap/bin/Kilo-debug.apk

```

Accelerometer

Next, let's set up Kilo to duplicate the last entry in the list by shaking the phone. Add the following function to the end of *kilo.js*:

```

function dupeEntryById(entryId) {
    if (entryId == undefined) {➊
        alert('You have to have at least one entry in the list to shake a dupe.');
    } else {
        db.transaction(➋

```

```

        function(transaction) {
            transaction.executeSql(
                'INSERT INTO entries (date, food, calories, latitude, longitude) ' + ❸
                    'SELECT date, food, calories, latitude, longitude ' +
                    'FROM entries WHERE id = ?;',
                [entryId], ❹
                function() {❺
                    refreshEntries();
                },
                errorHandler❻
            );
        }
    );
}
}

```

- ❶ This line makes sure an `entryId` was passed to the function. If not, the user is notified.
- ❷ Begin the usual database transaction steps.
- ❸ Define an `INSERT` statement that copies the values from the specified `entryId`. This is a type of query you haven't seen before. Instead of using a list of values for the `INSERT`, this takes the values from the results of a `SELECT` query for the specified `entryId`.
- ❹ Pass the `entryId` into the prepared statement, replacing the `?` in the `SELECT` query with the value of the `entryId`.
- ❺ On success, call `refreshEntries()`, which will display the newly copied entry.
- ❻ On error, call the standard SQL error handler.

Now we need to tell the application when to start and stop watching the accelerometer. We'll set it up to start watching when the Date panel finishes sliding into view and to stop listening when the panel starts sliding out. To do this, we just need to add the following lines to the document ready function in `kilo.js`:

```

$('#date').bind('pageAnimationEnd', function(e, info){❶
    if (info.direction == 'in') {❷
        startWatchingShake();
    }
});
$('#date').bind('pageAnimationStart', function(e, info){❸
    if (info.direction == 'out') {❹
        stopWatchingShake();
    }
});

```

- ❶ Bind an anonymous handler to the `pageAnimationEnd` event of the `#date` panel. Pass the event and the additional information in as parameters.
- ❷ Check to see if the `direction` property of the `info` object equals `in`. If it does, call the `startWatchingShake()` function, which we'll look at shortly.

- ③ Bind an anonymous handler to the `pageAnimationBegin` event of the `#date` panel. Pass the event and the additional information in as parameters.
- ④ Check to see if the `direction` property of the `info` object equals `out`. If it does, call the `stopWatchingShake()` function, which we'll look at shortly.



Technically, we can bind to just one of the page animation events, like so:

```
$('#date').bind('pageAnimationEnd', function(e, info){
    if (info.direction == 'in') {
        startWatchingShake();
    } else {
        stopWatchingShake();
    }
});
```

The reason I didn't do this is that `stopWatchingShake()` will not be called until after the page animation is complete. Therefore, the accelerometer will be actively watched during the page transition, which can sometimes result in choppy animation.

All that's left for us to do is write the `startWatchingShake()` and `stopWatchingShake()` functions. Add the following functions to the end of `kilo.js`:

```
function startWatchingShake() {❶
    var success = function(coords){❷
        var max = 2;❸
        if (Math.abs(coords.x) > max
            || Math.abs(coords.y) > max
            || Math.abs(coords.z) > max) {❹
            var entryId = $('#date ul li:last').data('entryId');❺
            dupeEntryById(entryId);❻
        }
    };
    var error = function(){};❻
    var options = {};<❽
    options.frequency = 100;<❾
    sessionStorage.watchId =
        navigator.accelerometer.watchAcceleration(success, error, options);❿
}
function stopWatchingShake() {❾
    navigator.accelerometer.clearWatch(sessionStorage.watchId);❿
}
```

- ❶ Begin the `startWatchingShake()` function. This function will be called when the `#date` panel finishes animating into view.
- ❷ Begin defining the success handler. It accepts a `coordinates` object as its sole parameter.
- ❸ Define the threshold for the shake. The higher the number, the harder the user will have to shake.

- ④ Check to see if any of the coordinates have exceeded the threshold.
- ⑤ Get the `entryId` of the last entry on the `#date` panel.
- ⑥ Call the `dupeEntryById()` function.
- ⑦ Define an empty error handler.
- ⑧ Define an options object to pass in to the `watchAcceleration()` method of the `accelerometer` object.
- ⑨ Set the `frequency` property of the options object to the number of milliseconds delay between receiving data from the accelerometer.
- ⑩ Call the `watchAcceleration()` method of the `accelerometer` object, passing in the success handler, the error handler, and the options object as parameters. Store the result in `sessionStorage.watchId`, which we'll need for the `stopWatchingShake()` function.
- ⑪ Begin the `stopWatchingShake()` function. This function will be called when the `#date` panel starts animating out of view.
- ⑫ Call the `clearWatch()` method of the `accelerometer` object, passing it the `watchId` from session storage.

What You've Learned

In this chapter, you've learned how to load your web app into PhoneGap, how to install your app on your phone, and how to access five device features that are unavailable to browser-based web apps (beep, alert, vibrate, geolocation, and accelerometer).

In the next chapter, you'll learn how to package your app as an executable and submit it to the Android Market.

CHAPTER 8

Submitting Your App to the Android Market

Finally, the moment you've been waiting for: submitting your completed app to the Android Market. The process is actually pretty straightforward: you just need to prepare a release version of the app and upload it.

Preparing a Release Version of Your App

You need to do a few things to get the app ready for distribution:

- Remove any debugging or logging code
- Version the app
- Compile the app
- Sign the compiled app with a private key

Removing Debug Code

There's no reason to have debugging or logging code slowing down your app while it's running on a user's phone. If you have added any such code (see “[The JavaScript Console](#)” on page 107) to your HTML, CSS, or JavaScript files, now's the time to take it out.

You should also open up the *AndroidManifest.xml* file in the *KiloGap* folder, search for “debuggable” and set it to false. When you're done, it should look something like this:

```
...
<application
    android:icon="@drawable/icon"
    android:label="@string/app_name"
    android:debuggable="false">
...

```



While you have the manifest file open, you might as well check to make sure `android:icon` and `android:label` are specified as shown in the previous listing. PhoneGap normally takes care of this for you, but I think it's worth double checking, because you won't be able to upload your app if these values are not set.

Versioning Your App

Near the top of your `AndroidManifest.xml` file, you should see values set for the version name and version code for your app:

```
...
<manifest
    xmlns:android="http://schemas.android.com/apk/res/android"
    package="com.jonathanstark.kilo"
    android:versionName="1.0.0"
    android:versionCode="1">
...

```

Because this is probably your first app, these values are fine as is. Once you've published your app and later want to release an update, you'll update these values appropriately. The Android system doesn't check or enforce this version information, but it's a critical piece of data for your long term app strategy.

The version name is the value that will be shown to the user. It's a string, so you can put whatever you want here, but the common practice is to use a `<major>.<minor>.<point>` format (such as 1.0.0).

The version code is expected to be a positive integer value. It need not correspond to the version name in any way. In fact, it probably won't—you should just increment it by 1 every time you release an update, regardless of whether the release is a major upgrade or a minor bug fix.

Signing Your App

Android requires that all apps be digitally signed by the developer. The process for doing so is easy, but a little cryptic:

1. Launch the Terminal application and navigate into the `KiloGap` directory:

```
cd ~/Desktop/KiloGap
```

2. Compile the app in release mode:

```
ant release
```

You'll see a page or so of output scroll by, ending with `BUILD SUCCESSFUL`. An unsigned binary named `Kilo-unsigned.apk` will now be sitting in the `~/Desktop/KiloGap/bin/` directory ([Figure 8-1](#)).

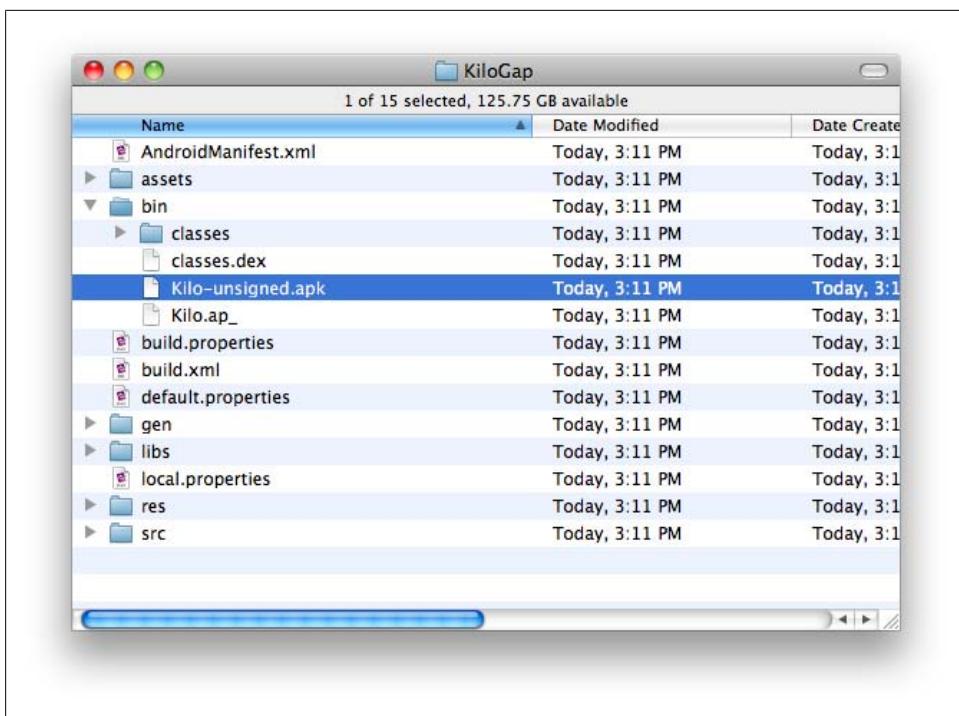


Figure 8-1. The `ant release` command creates an unsigned binary named `Kilo-unsigned.apk` in the `~/Desktop/KiloGap/bin/` directory

3. Create a private key:

```
keytool -genkey -v -keystore keystore -alias alias -keyalg RSA -validity days
```

This command is interactive and will ask you a bunch of questions. Mine looks like this:

```
JSC-MBP:KiloGap jstark$ keytool -genkey -v -keystore myAndroidKey.keystore \
    -alias myAndroidKeyAlias -keyalg RSA -validity 10000
Enter keystore password:
Re-enter new password:
What is your first and last name?
[Unknown]: Jonathan Stark
What is the name of your organizational unit?
[Unknown]:
What is the name of your organization?
[Unknown]: Jonathan Stark Consulting
What is the name of your City or Locality?
[Unknown]: Providence
What is the name of your State or Province?
[Unknown]: RI
What is the two-letter country code for this unit?
[Unknown]: US
Is CN=Jonathan Stark, OU=Unknown, O=Jonathan Stark Consulting, L=Providence,
```

```
ST=RI, C=US correct?  
[no]: yes
```

```
Generating 1,024 bit RSA key pair and self-signed certificate (SHA1withRSA) with  
a validity of 10,000 days for: CN=Jonathan Stark, OU=Unknown, O=Jonathan Stark  
Consulting, L=Providence, ST=RI, C=US  
Enter key password for <myAndroidKeyAlias>  
(RETURN if same as keystore password):  
[Storing myAndroidKey.keystore]
```

When the process completes, you should see *myAndroidKey.keystore* created in the *~/Desktop/KiloGap* directory ([Figure 8-2](#)). If you'd like to use this keystore for other apps in the future, you might want to move the keystore file to a more central location.

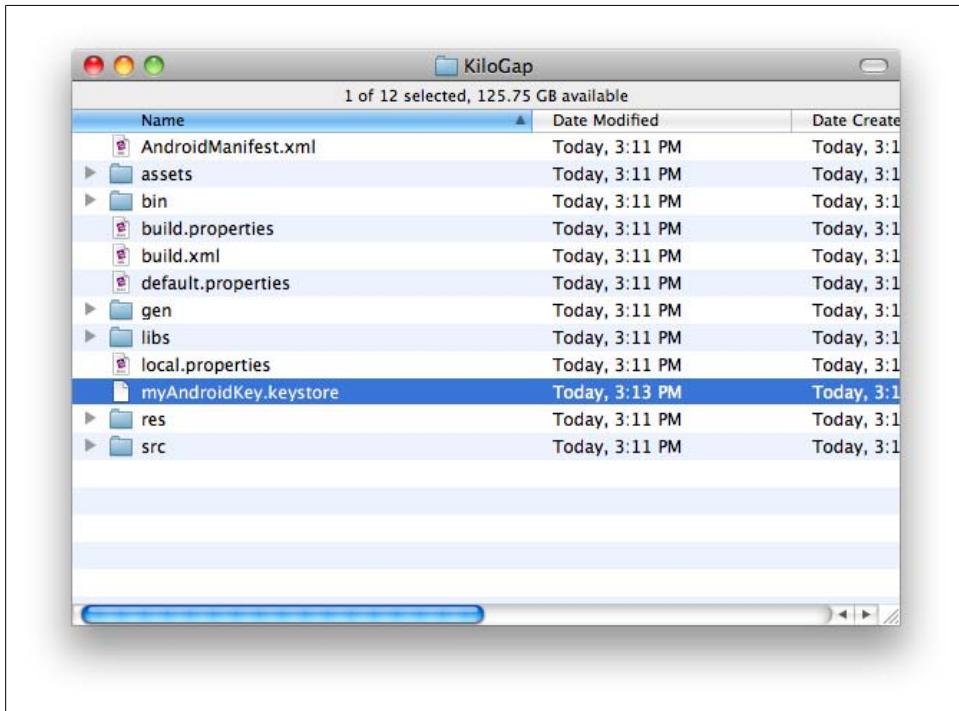
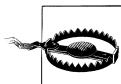


Figure 8-2. The keytool command will generate a keystore file named *myAndroidKey.keystore* in the *KiloGap* directory



Do not lose this password. If you forget your keystore password, you won't be able to update your app once it's published.

4. Sign your app with the key you just created:

```
jarsigner -verbose -keystore myAndroidKey.keystore  
./bin/Kilo-unsigned.apk myAndroidKeyAlias
```

When you run this command, you'll be asked for your keystore password.

5. Align the .apk file:

```
zipalign -v 4 ./bin/Kilo-unsigned.apk ./bin/Kilo.apk
```

You'll see a page or so of output scroll by, ending with "Verification successful." A signed binary named *Kilo.apk* will now be sitting in the *~/Desktop/KiloGap/bin/* directory ([Figure 8-3](#)). This *.apk* file is your completed app!

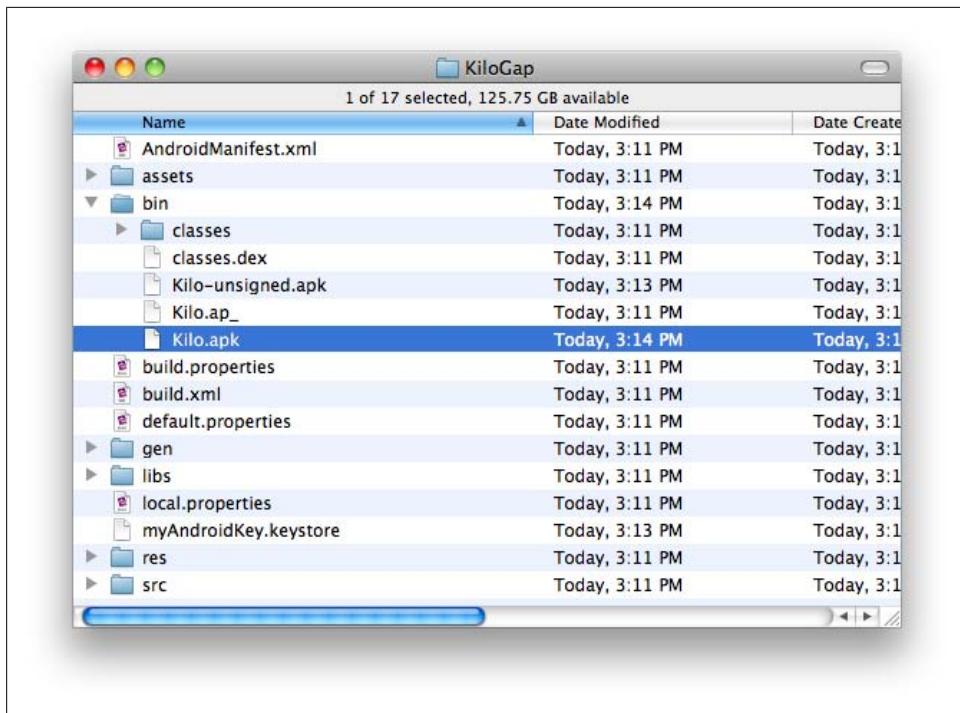


Figure 8-3. Once you run the jarsigner and zipalign commands, your final app will be generated in the *~/Desktop/KiloGap/bin/* directory

Uploading Your App to the Android Market

All that is left to do is upload our signed binary to the Android Market.



You need to be a registered Android Developer to upload your app. If you have not already registered, you can do so at <http://market.android.com/publish/signup>. The process is quick and easy—you just fill out a bit of profile information (name, email, phone, etc.), pay a \$25 registration fee (using Google Checkout), and agree to the Android Market Developer Distribution Agreement.

1. Launch your web browser, navigate to <http://market.android.com/publish/>, and sign in to your Google account.
2. If you aren't forwarded automatically after logging in, navigate to <http://market.android.com/publish/Home> and click the Upload Application button (Figure 8-4).

The screenshot shows the "Developer Console" interface for the Android Market. The URL in the address bar is http://market.android.com/publish/Home#EDIT_APPLICATION. The user is signed in as jstark@gmail.com. The main section is titled "Upload an Application". It has two main sections: "Upload assets" and "Listing details".

Upload assets:

- Application .apk file:** A "Choose File" button shows "no file selected". An "Upload" button is next to it.
- Screenshots:** A section for "0 or 2 screenshots" with a "Choose File" button showing "no file selected". An "Upload" button is next to it. To the right, there are instructions: "Screenshots: 320w x 480h or 480w x 854h, 24 bit PNG or JPEG (no alpha), Full bleed, no border in art, Landscape thumbnails are cropped".
- Promotional Graphic:** An optional section for "Promotional Graphic" with a "Choose File" button showing "no file selected". An "Upload" button is next to it. To the right, there are instructions: "Promo Graphic: 180w x 120h, 24 bit PNG or JPEG (no alpha), Full bleed, no border in art".

Listing details:

- Language:** English (en_US). There is a "add language" link.
- Title (en_US):** A text input field with "0 characters (30 max)" feedback.
- Description (en_US):** A large text input field with "0 characters (325 max)" feedback.
- Promo Text (en_US):** A text input field.

Figure 8-4. Navigate to the Android Market upload page to submit your app

3. Click the Choose File button next to “Application .apk file,” browse to *Kilo.apk* on your hard drive, and click the Upload button.
4. You can optionally upload a couple of screenshots to be displayed on the Market page for your app.
5. Enter a title for your app in the Listing Details section (30 characters max).
6. Enter a description for your app (325 characters max).
7. Select a type and category for your app.
8. Specify a price for your app.
9. Indicate your copy protection and location preferences in the Publishing Options section.
10. Enter your website address, email address, and phone number in the Contact Information section.
11. Agree to the terms in the Consent section.
12. Click the Publish button.

Congrats! Your app will be available in the Android Market almost immediately.

Distributing Your App Directly

One very attractive feature of the Android platform is that it lets developers skip the Android Market completely and distribute apps directly to users. This is a great option in many situations. For example, a corporate IT department might want to distribute a private app to employees. Or maybe you want to run a private beta of your app before uploading it to the Android Market.

Whatever the case, direct distribution couldn’t be easier: upload your signed *.apk* binary to your web server and provide your users with a link to it. Users click the link—say, from an email message or a web page—and the app is downloaded and installed. Simple.



You can also use QR codes to distribute links to your app. A QR code is a two-dimensional barcode that can store up to 4,296 alphanumeric characters of arbitrary text and be read by the camera on an Android phone. When a user encounters your QR code, she can take a picture of it with Google Goggles (or another QR code reader app), and she’ll be provided with a link to your app. You can learn more by visiting the [Google Chart Tools page devoted to QR codes](#). You can create your own for free using Google’s [Live Chart Playground](#).

The only caveat is that users have to first allow installation of non-Market applications by navigating to Settings→Applications and enabling the Unknown Sources option ([Figure 8-5](#)). If the user has not first enabled downloads from unknown sources, he will

still be allowed to download the app, but will be alerted that the install is blocked (Figure 8-6). The alert dialog will allow him to navigate directly to the relevant setting or cancel the installation. When the user first activates the checkbox, he'll see a confirmation dialog that warns him about the implications of his choice (Figure 8-7).



Figure 8-5. Users can opt to download applications from sources other than the Android Market

Further Reading

If you'd like to dig deeper into the mechanics of the Android SDK, the best place to start is the excellent online documentation available at <http://developer.android.com/>. Here are some other resources that I find useful and refer to often:

- [Android Discuss mailing list](#)
- [Android Developers mailing list](#)
- [jQTouch mailing list](#)
- [PhoneGap mailing list](#)

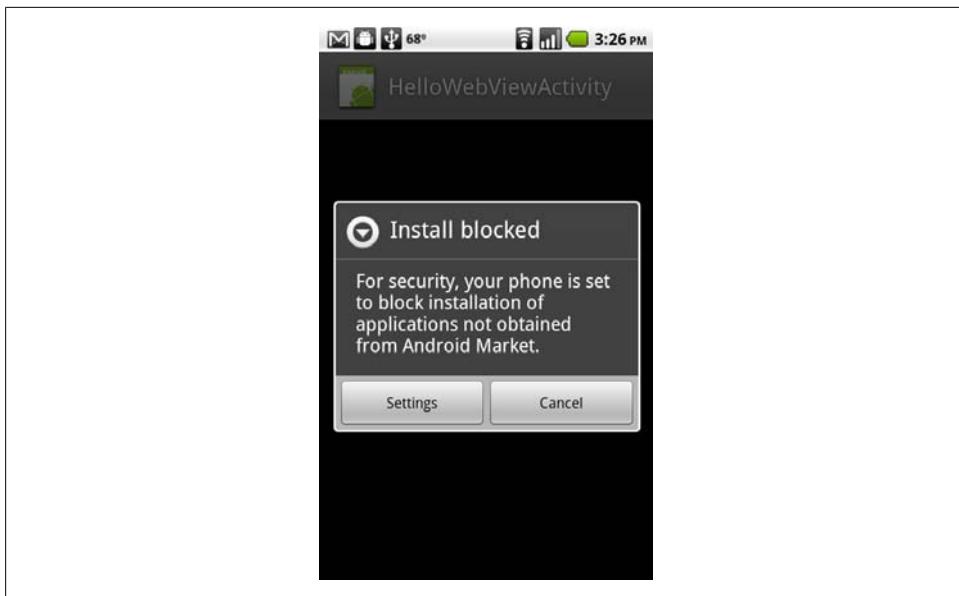


Figure 8-6. If the user attempts to install an app from an unknown source without having checked the appropriate setting, he will be prompted to change the setting or cancel the installation process

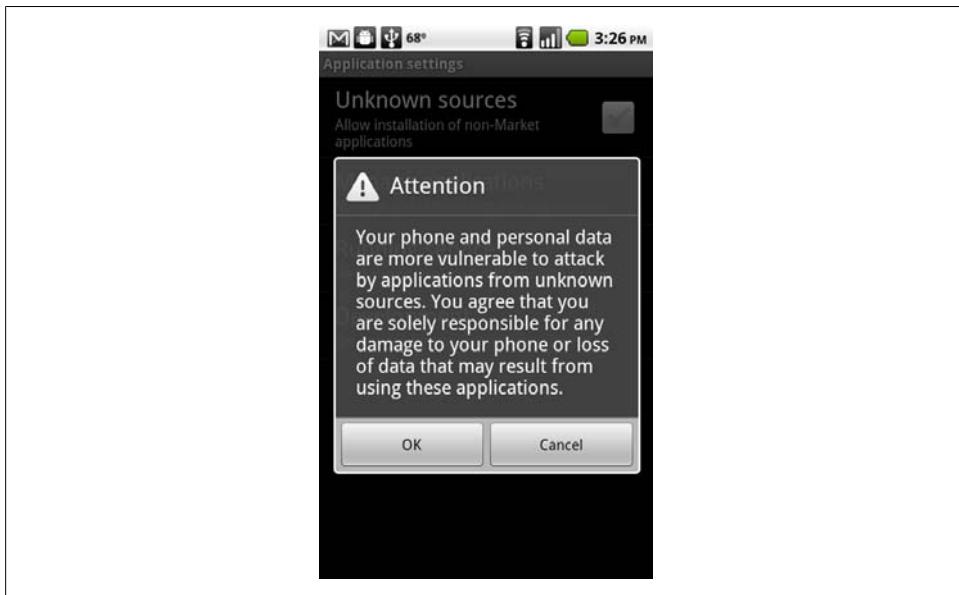


Figure 8-7. When the user first enables the Unknown Sources option, he'll be presented with a confirmation dialog that warns him about the implications

- [Android reference for WebView](#)

- [Android reference for WebChromeClient](#)
- [Android reference for WebViewClient](#)
- [Android reference for WebSettings](#)



The Android references in the list above are interesting only if you want to start digging around in the PhoneGap source code or maybe write your own native HTML app wrapper. WebView is the primary class and it's used to display HTML; by default, it doesn't support JavaScript, browser widgets (e.g., location bar, back/forward buttons), or error handling.

The other three classes extend the WebView in various ways. WebChromeClient adds support for JavaScript dialogs, favicons, titles, and progress indicators. WebViewClient adds support for some useful event listeners like `onFormResubmission()`, `onPageStarted()`, and `onPageFinished()`. Finally, WebSettings gives you access to WebView settings state with methods such as `getDatabaseEnabled()` and `getUserAgentString()`.

Again, you won't need to worry about these unless you want to get into the Java code under the hood.

Now get out there and make some great Android apps!

APPENDIX

Detecting Browsers with WURFL

WURFL (Wireless Universal Resource File) is an XML file that contains the information needed to identify a wide range of mobile devices. On its own, it doesn't do anything. But if you use one of the many available libraries for it, you can create web apps that can figure out what kind of device has connected to your app.

For example, `wurfl-php` (<http://sourceforge.net/projects/wurfl/files/WURFL%20PHP/>) lets you detect which operating system a remote device is running from within a PHP script.



To use WURFL and `wurfl-php`, you'll need to be running your web app on a hosting provider that supports PHP. You'll also need to understand how to install files and PHP libraries onto your server. In this appendix, I show you how to do this using the Unix or Mac OS X command line. If you are uncomfortable with any of this, but are comfortable working with PHP, contact your hosting provider's support department and ask if they'd be willing to install WURFL and `wurfl-php` on the server you use. If you're using a shared server, it would give your hosting provider a competitive advantage to offer this feature to all their customers.

Installation

First, download `wurfl-php` and unzip it somewhere on your server (in general, it's best to not put libraries in your public web folder, so I'm putting it into the `src` directory in my home directory). Replace `~/src` with the location you want to install it to and replace `wurfl-php-1.1.tar.gz` with the name of the file you actually downloaded:

```
$ mkdir ~/src  
$ cd ~/src  
$ tar xvfz ~/Downloads/wurfl-php-1.1.tar.gz
```

Next, download the latest WURFL file (<http://sourceforge.net/projects/wurfl/files/WURFL/>), copy it into the `wurfl-php` folder, and gunzip it (see the `wurfl-php` documentation for tips on using this file in its compressed state). Replace `~/src/wurfl-php-1.1/` with the full path to the directory that was created in the previous step when you extracted the `wurfl-php` distribution, and replace `~/Downloads/wurfl-latest.xml.gz` with the path to the WURFL distribution that you downloaded:

```
$ cd ~/src/wurfl-php-1.1/
$ cp ~/Downloads/wurfl-latest.xml.gz .
$ gunzip wurfl-latest.xml.gz
```

Finally, download the desktop web browser patch so WURFL doesn't encounter errors when someone visits your page from a desktop browser:

```
$ curl -O http://wurfl.sourceforge.net/web_browsers_patch.xml
```

Configuration

Create the following `wurfl-config` file (`wurfl-config.xml`) in `~/src/wurfl-php-1.1/` (or the directory you created when you extracted `wurfl-php`):

```
<?xml version="1.0" encoding="UTF-8"?>
<wurfl-config>
  <wurfl>
    <main-file>wurfl-latest.xml</main-file>
    <patches>
      <patch>web_browsers_patch.xml</patch>
    </patches>
  </wurfl>
  <persistence>
    <provider>file</provider>
    <params>dir=../cache</params>
  </persistence>
</wurfl-config>
```

Create a cache directory and make sure it's writable by whichever user runs PHP scripts. If your web server is configured to run your PHP scripts under your user credentials, this step should not be necessary. As with previous examples, replace `~/src/wurfl-php-1.1/` with the location you created earlier. Replace `_www` with the username that your PHP scripts run under (you will need superuser credentials to run this command):

```
$ mkdir ~/src/wurfl-php-1.1/cache
$ sudo chown _www ~/src/wurfl-php-1.1/cache
```



If in doubt, contact your hosting provider's tech support and explain you want the cache directory to be writable by your PHP scripts.

Testing wurfl-php

Now, in your web directory (such as *Sites* or *public_html*), create the following PHP file (name it something like *wurfl-test.php*). The first time you visit it from your Android device (or any other browser), it will take a long time as it builds the initial cache. After that it should be zippy. Figure A-1 shows how this should appear in your browser. You can now modify this PHP code to suit your needs:

```

<html>
<head>
    <meta name="viewport" content="user-scalable=no, width=device-width" />
    <title>WURFL Test</title>
<?php

define("WURFL_DIR", "/Users/bjepson/src/wurfl-php-1.1/WURFL/");
define("RESOURCES_DIR", "/Users/bjepson/src/wurfl-php-1.1/");

require_once WURFL_DIR . 'Application.php';

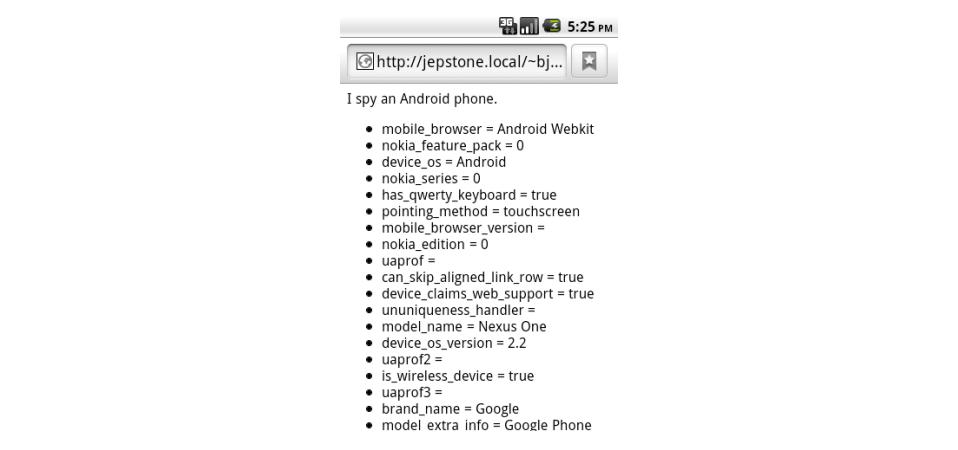
$wurflConfigFile = RESOURCES_DIR . 'wurfl-config.xml';
$wurflConfig = new WURFL_Configuration_XmlConfig($wurflConfigFile);
$wurflManagerFactory = new WURFL_WURFLManagerFactory($wurflConfig);

$wurflManager = $wurflManagerFactory->create();
$wurflInfo = $wurflManager->getWURFLInfo();

$requestingDevice = $wurflManager->getDeviceForHttpRequest($_SERVER);
$is_android = FALSE;
if ($requestingDevice->getCapability("device_os") == "Android") {
    $is_android = TRUE;
}
?>
</head>
<body>
<?php
    if ($is_android) {
        echo "I spy an Android phone.";
    }
?>
<ul>
    <?php
        foreach ($requestingDevice->getAllCapabilities() as $key => $value) {
            echo "<li>$key = $value";
        }
    ?>
</ul>
</body>
</html>
```



I couldn't use ~, so I had to put in the full path to the WURFL stuff; replace /Users/NAME/src/wurfl-php-1.1/ with the full path to the *wurfl-php* directory you created earlier.



The screenshot shows a web browser window with the URL `http://jepstone.local/~bj...`. The page content displays the output of a WURFL-PHP script, which includes a header "I spy an Android phone." followed by a list of device properties.

```
I spy an Android phone.  
• mobile_browser = Android Webkit  
• nokia_feature_pack = 0  
• device_os = Android  
• nokia_series = 0  
• has_qwerty_keyboard = true  
• pointing_method = touchscreen  
• mobile_browser_version =  
• nokia_edition = 0  
• uaprof =  
• can_skip_aligned_link_row = true  
• device_claims_web_support = true  
• ununiqueness_handler =  
• model_name = Nexus One  
• device_os_version = 2.2  
• uaprof2 =  
• is_wireless_device = true  
• uaprof3 =  
• brand_name = Google  
• model_extra_info = Google Phone
```

Figure A-1. Output of the sample wurfl-php script

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About the Author

Jonathan Stark is a mobile and web application consultant who has been called “an expert on publishing desktop data to the web” by the *Wall Street Journal*. He has written two books on web application programming, is a tech editor for both *php|architect* and *Advisor* magazines, and has been quoted in the media on internet and mobile lifestyle trends. Jonathan began his programming career more than 20 years ago on a Tandy TRS-80 and still thinks Zork was a sweet game.

Colophon

The animal on the cover of *Building Android Apps with HTML, CSS, and JavaScript* is a maleo (*Macrocephalon maleo*), an endangered bird with a current population between 5,000 and 10,000 that is only found on the Indonesian islands of Sulawesi and Buton. This distinctive, rare bird is about the size of a full-grown chicken, with white and light-pink belly and breast feathers standing out against its black back and wings. The maleo’s scientific name indicates that individuals possess strong legs and large heads. Their sloped foreheads are often described as “helmet-shaped.”

Perhaps the most remarkable characteristic of this monogamous bird is the way it nests and cares for its offspring. Unlike most birds, who incubate their own eggs, the maleo lays its eggs in pits in the sand to be incubated by the sun, geothermal energy, or both. Maleos nest communally, which is likely a defensive measure against egg predators. When a young maleo hatches and emerges from the sand after two to three months of incubation, it is independent and able to fly. It quickly heads to the forest on its own to hide from predators and find food.

Maleo eggs are approximately five times the size of a chicken egg, making them desirable among locals. In 2009, the US-based Wildlife Conservation Society purchased a 36-acre area of the Sulawesi beach (containing about 40 nests) in order to raise awareness about the steadily declining species and to protect the birds from human egg harvesters.

The cover image is from *Cassell's Natural History*. The cover font is Adobe ITC Garamond. The text font is Linotype Birk; the heading font is Adobe Myriad Condensed; and the code font is LucasFont's TheSansMonoCondensed.

