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Programming the

Mobile Web



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Maximiliano Firtman

Programming the Mobile Web

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—Luca Passani
*WURFL inventor
and maintainer*

Maximiliano Firtman is an expert in Ajax, Adobe Flex, Java ME, Widgets for Mobile, and iPhone development. He's a Forum Nokia Champion, an educator on web and mobile technologies, the author of numerous technical books and articles, and founder of ITMaster Professional Training.

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Programming the Mobile Web

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Programming the Mobile Web

by Maximiliano Firtman

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*For my parents, Stella Maris and Edgardo, my
brother, Sebastián, and my lovely wife, Ani, who
have supported me during all of my projects*

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Preface

In your pocket is a device that has changed the lives of billions of people all over the world. The third personal screen (after the TV and the computer) is the most personal one, and bringing our services to it is one of the key business priorities of this decade.

Mobile development, however, is a more challenging activity than desktop development. Platforms are severely fragmented, and developers have to work with minimal resources. Fortunately, the mobile web makes it easier to deal with this fragmentation, allowing developers to create applications that run on many more platforms than native (or installable) applications. As we will see later, the mobile web and installable applications are not enemies. In fact, they work together very well.

All of that sounds great: billions of devices, web technologies, multiplatform solutions...where's the problem? More than half of your desktop web skills and the tips, hacks, and best practices you already know simply do not apply on the mobile web. The mobile web demands new usability patterns, new programming best practices, and new knowledge and abilities.

At the time of this writing there are almost no books, websites, or training courses focused on concrete mobile web programming. We don't need vague information like "this may not work on some phones"; we need real, fresh, and working data. On which devices does a solution not work? Why? Is there another solution? That is why I've written this book: to help developers in programming mobile websites.

You may feel that you are advanced enough to go directly to the code, but I encourage you to start from the beginning of the book if you are new to the mobile world. This is another universe, and every universe has its own rules.

Who This Book Is For

This book is for experienced web developers who want to learn what's different about designing for the mobile web. We will talk about HTML, CSS, JavaScript, Ajax, and server-side code as if you have experience with all those technologies. If you are a web designer with some basic programming skills, you will also find this book useful.

We will cover HTML 5 features, but don't worry if you don't have any experience with this new upcoming version yet; we will cover it from the ground up, and your HTML 4 and XHTML 1.0 knowledge will be enough.

If you are an individual freelancer, if you work for a company in the areas of programming or web development, or if you work in a web design studio, this book is for you. Perhaps you need to create a mobile application or client for a current desktop service, you want to add new services to your portfolio, or you need to migrate an old WAP site to newer devices.

Or perhaps you are a widget developer or a Rich Internet Application programmer, using desktop offline technologies like Google Gears or Adobe AIR. This book will teach you how to use your current skills to create offline mobile applications and browser-based solutions.

You may also be a Web 2.0 entrepreneur with—or looking for—a great idea for mobile devices, and you want to analyze what you can do with current mobile browsers. This book investigates compatibility device by device and discusses advanced features you can implement.

The book will also be useful if you are wondering how to identify devices and deliver proper and compatible content for ad campaigns, to sell content or to deliver free content to mobile users.

Who This Book Is Not For

We don't really want to cut anyone out of the possibility of reading this book, but there are a lot of people who aren't likely to enjoy it. If you are a graphic designer, you will not find detailed tips and practices in this book, and you are likely to only enjoy the first three chapters.

If you are a web designer without programming skills, Chapters 1 through 7 are the ones you should read line by line; the rest will be useful to review so you know the capabilities you can request from a developer.

If you are a native mobile developer (iPhone, Android, Symbian, Java ME, Windows Mobile), some web knowledge will be required in order to understand and follow all the samples in this book.

This is also not a book for learning basic HTML, CSS, or JavaScript. You will not find detailed samples or step-by-step instructions on how to implement every task. It is assumed that you are experienced enough to create code on your own or, at least know how to find out by searching on the Web.

If you are a manager, a CTO, a project leader, or an entrepreneur without any web knowledge, you will find the first four chapters useful: they describe the state of the art in this market and should help you decide how to organize your team.

What You'll Learn

This book is an advanced reference for the mobile web today, and it is the most complete reference available at this time. This may seem an ambitious claim, but it is the truth. This book draws upon a mix of experience and very detailed research and testing not available in other books, websites, or research papers about the mobile web.

Programming the Mobile Web will teach you how to create effective and rich experiences for mobile web browsers, and also how to create offline applications or widgets that will be installed in the devices' applications menu.

We will not talk only about the star devices, like the iPhone and Android devices; we will also cover mass-market platforms from Nokia, Sony Ericsson, Motorola, BlackBerry, Palm, Windows Mobile, and Symbian.

[Chapter 1, The Mobile Jungle](#), and [Chapter 2, Mobile Browsing](#), introduce the mobile world: they will help you understand who is who in this market, what platforms you should care about, how to know your users, and how mobile browsing works (covering all the mobile browsers currently available in the market). We will also cover the history of the mobile web, including WAP and Mobile Web 2.0.

[Chapter 3, Architecture and Design](#), focuses on architecture, design, and usability, presenting a quick review of the tips, differences, and best practices for defining the navigation structure; the design template; and the differences for touch devices.

We will install our development and production environment in [Chapter 4, Setting Up Your Environment](#), which covers all the emulators, tools, and IDEs we will need to use for our work and what is required on the server side.

[Chapter 5, Markups and Standards](#), and [Chapter 6, Coding Markup](#), focus on markup coding; we will review every standard (mobile and not) that we can use, with a full compatibility table presented for each one. We will cover what happens with standard code (including links, images, frames, and tables) and how to deal with mobile-specific markup, like call-to actions and viewport management for zooming purposes. Every feature will be tested for almost every important browser today, so we know what we can use on every platform. We will also cover how SVG and Adobe Flash work on the mobile web.

In [Chapter 7, CSS for Mobile Browsers](#), we will start our journey in CSS Mobile and look at how to deal with standards and differences in attribute support. We will see how CSS 2.1 and CSS 3 work on mobile browsers and what advanced extensions we can use on some devices. [Chapter 8, JavaScript Mobile](#), deals with JavaScript, starting with how standard dialogs and pop-ups work and passing through DOM compatibility and touch event support.

We will continue adding best practices for mobile web development in [Chapter 9, Ajax, RIA, and HTML 5](#), covering Rich Internet Application technologies including Ajax

support, Dynamic HTML, and new features of HTML 5, such as offline support, database storage, and form enhancements.

We start our work on device detection, discoverability, and content delivery in [Chapter 10, Server-Side Browser Detection and Content Delivery](#), working on the server side. We will explore solutions for all server platforms and look at some samples in PHP to detect devices, transform output, and deliver content.

Location-Based Services (LBS) will be covered in [Chapter 11, Geolocation and Maps](#), along with geolocation and maps support for mobile devices. We will talk about standard and nonstandard APIs, server-side solutions, and best practices to locate the user and to show map information.

[Chapter 12, Widgets and Offline Webapps](#), will be the gem for everyone looking to bypass the browser barrier and create offline applications with icons in the user's home or applications menu using strictly web technologies. We will cover web apps for iPhone and Android devices, hybrid application development, and the widget platforms available today in other platforms, including JavaScript API extensions. Store distribution (free or premium) will be also covered in this chapter.

[Chapter 13, Testing, Debugging, and Performance](#), illustrates how we can test and debug mobile web applications and how to measure and enhance our mobile web performance. Finally, in [Chapter 14, Distribution and Social Web 2.0](#), we will talk about distribution and social networks in a Web 2.0 environment, covering mobile search engine optimization (SEO), mobile advertisement, distribution techniques including QR codes, and mobile social network integration, with Facebook and Twitter as samples.

Other Options

There aren't many resources available today for multiplatform mobile web development. You will find specific information and books for the iPhone and maybe for Android, but that's about it. Other available books (at present, not more than three) are outdated or do not contain much real information, having plenty of "maybes," "perhaps," and "be carefuls."

If you need to learn web technologies, there are plenty of books and resources available. Take a look at <http://www.oreilly.com/css-html> and <http://www.oreilly.com/javascript> for some lists.

If you want to get information on the mobile web for specific platforms, here are some resources you can explore:

- [Building iPhone Apps with HTML, CSS, and JavaScript](#) by Jonathan Stark (O'Reilly)
- [Palm webOS](#) by Mitch Allen (O'Reilly)
- [BlackBerry Development Fundamentals](#) (Addison-Wesley Professional)
- [Practical Palm Pre webOS Projects](#) (Apress)

- *Developing Hybrid Applications for the iPhone* (Addison-Wesley Professional)
- *Safari and WebKit development for iPhone OS 3.0* (Wrox)
- *AdvancED Flash on Devices* (Friends of Ed)

If you want a complement to this book in the areas of design, performance, and advanced programming, I recommend the following books:

- *Mobile Design and Development* by Brian Fling (O'Reilly)
- *Programming the iPhone User Experience* by Toby Boudreaux (O'Reilly)
- *JavaScript: The Good Parts* by Douglas Crockford (O'Reilly)
- *High Performance JavaScript* by Nicholas Zakas (O'Reilly)
- *High Performance Websites* by Steve Souders (O'Reilly)
- *Even Faster Web Sites* by Steve Souders (O'Reilly)
- *Website Optimization* Andrew B. King (O'Reilly)

You may also want to begin in the native mobile development world. For that, you should explore some of these books:

- *Learning iPhone Programming* by Alasdair Allan (O'Reilly)
- *Head First iPhone Development* by Dan Pilone and Tracey Pilone (O'Reilly)
- *Android Application Development* by Rick Rogers et al. (O'Reilly)
- *Beginning iPhone 3 Development* (Apress)
- *Beginning Java ME Platform* (Apress)
- *Qt for Symbian* (John Wiley & Sons)
- *Professional Microsoft Smartphone Programming* (Microsoft Press)

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If you like—or don't like—this book, by all means, please let people know. Amazon reviews are one popular way to share your happiness (or lack of happiness), and you can leave reviews on this book's website:

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There's also a link to errata there, which readers can use to let us know about typos, errors, and other problems with the book. Reported errors will be visible on the page immediately, and we'll confirm them after checking them out. O'Reilly can also fix errata in future printings of the book and on Safari, making for a better reader experience pretty quickly.

We hope to keep this book updated for future mobile platforms, and will also incorporate suggestions and complaints into future editions.

Conventions Used in This Book

The following font conventions are used in this book:

Italic

Indicates pathnames, filenames, and program names; Internet addresses, such as domain names and URLs; and new items where they are defined.

Constant width

Indicates command lines and options that should be typed verbatim; names and keywords in programs, including method names, variable names, and class names; and HTML/XHTML element tags.

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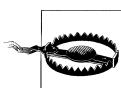
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We have tested and verified the information in this book to the best of our ability, but you may find that features have changed (or even that we have made a few mistakes!).

The author has created a blog to maintain updated information and links for this book; it is available at <http://www.mobilexweb.com>.

Please let us know about any errors you find, as well as your suggestions for future editions, by writing to:

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Finally, to Simon St.Laurent at O'Reilly Media, thanks for all your help and for trusting me when I presented this risky project.

Creating a book about the mobile web was really a challenge, but it was worth it. Enjoy!

The Mobile Jungle

Isn't the mobile web the same web as the desktop one? It does use the same basic architecture and many of the same technologies, though mobile device screens are smaller and bandwidth and processing resources are more constrained. There's a lot more to it than that, though, with twists and turns that can trip up even the most experienced desktop web developer.

Myths of the Mobile Web

As the Web has moved onto mobile devices, developers have told themselves a lot of stories about what this means for their work. While some of those stories are true, others are misleading, confusing, or even dangerous.

It's Not the Mobile Web; It's Just the Web!

I've heard this quote many times in the last few years, and it's true. It's really the same Web. Think about your life. You don't have another email account just for your mobile. (OK, I know some guys that do, but I believe that's not typical!)

You read about the last NBA game on your favorite site, like ESPN; you don't have a desktop news source and a different mobile news source. You really don't want another social network for your mobile; you want to use the same Facebook or Twitter account as the one you used on your desktop. It was painful enough creating your friends list on your desktop, you've already ignored many people...you don't want to have to do all that work again on your mobile.

For all of these purposes, the mobile web uses the same network protocols as the whole Internet: HTTP, HTTPS, POP3, Wireless LAN, and even TCP/IP. OK, you can say that GSM, CDMA, and UMTS are not protocols used in the desktop web environment, but they are communication protocols operating at lower layers. From our point of view, from a web application approach, we are using the same protocols.

So, yes...it's the same Web. However, when developing for the mobile web we are targeting very, very different devices. The most obvious difference is the screen size, and yes, that will be our first problem. But there are many other not-so-obvious differences. One issue is that the contexts in which we use our mobile devices are often extremely different from where and how we use our comfortable desktops or even our laptops and netbooks.

Don't get me wrong—this doesn't mean that, as developers, we need to create two, three, or dozens of versions duplicating our work. In this book, we are going to analyze all the techniques available for this new world. Our objective will be to make only one product, and we'll analyze the best way to do it.

You Don't Need to Do Anything Special About Your Desktop Website

Almost every smartphone on the market today—for example, the iPhone and Android-based devices—can read and display full desktop websites. Yes, this is true. Users want the same experience on the mobile web as they have on their desktops. Yes, this is also true. Some statistics even indicate that users tend to choose web versions over mobile versions when using a smartphone.

However, is this because we really love zooming in and out, scrolling and crawling for the information we want, or is it because the mobile versions are really awful and don't offer the right user experience? I've seen a lot of mobile sites consisting of nothing but a logo and a couple of text links. My smartphone wants more!

One Website Should Work for All Devices (Desktop, Mobile, TV, etc.)

As we will see, there are techniques that allow us to create only one file but still provide different experiences on a variety of devices, including desktops, mobiles, TVs, and game consoles. This vision is called "One Web." This is to an extent possible today, but the vision won't fully be realized for years to come. Today, there are a lot of mobile devices with very low connection speeds and limited resources—non-smartphones—that, in theory, can read and parse any file, but will not provide the best user experience and will have compatibility and performance problems if we deliver the same document as for desktop. Therefore, One Web remains a goal for the future. A little additional work is still required to provide the right user experience for each mobile device, but there are techniques that can be applied to reduce the work required and avoid code and data duplication.

Mobile Web Is Really Easy; Just Create a WML File

I'm really surprised how many mobile websites are still developed using a technology deprecated many years ago: WML (Wireless Markup Language). Even in emerging markets, there are almost no WML-only web-capable devices on the market today. The worst part of this story is that these developers think that this is the markup language

for the mobile web. Wrong! WML development was called mobile web (or WAP) development a couple of years ago, when the first attempt at building a mobile web was made. (We will talk more about history in the “[Mobile Web Eras](#)” on page 54 section of [Chapter 2](#).) There are still a small proportion of WML-only devices available in some markets, but WML is definitely not the mobile web today.

Just Create an HTML File with a Width of 240 Pixels, and You Have a Mobile Website

This is the other fast-food way to think about the mobile web. Today, there are more than 3,000 mobile devices on the market, with almost 30 different browsers (actually, more than 300 different browsers if we separate them by version number). Creating one HTML file as your mobile website will be a very unsuccessful project. In addition, doing so contributes to the belief that mobile web browsing is not useful.

Native Mobile Applications Will Kill the Mobile Web

Every solution has advantages and disadvantages. The mobile web has much to offer native applications, as [Chapter 12](#) of this book will demonstrate. The mobile web (and the new concept of mobile widgets) offers us a great multi-device application platform, including local applications that don’t require an always-connected Web with URLs and browsers.

People Are Not Using Their Mobile Browsers

How many Internet connections are there in the world?

1,802,330,457 (26% of the world’s population) at the beginning of 2010 (<http://www.internetworldstats.com>)

How many people have mobile devices?

4,600,000,000 (68% of the population) at the beginning of 2010 (U.N. Telecommunications Agency, <http://www.itu.int>)

So, one of the reasons why people are not using their mobile browsers may be because of us, the web producers. We are not offering them what they need. There are other factors, but let’s talk about what we can do from our point of view.

Opera Mini is a mobile browser for low- and mid-range devices. It is free and it has had more than 50 million downloads to date. This tells us that 50 million users wanted to have a better mobile web experience, so they went out and got Opera Mini. Do all the 4 billion plus worldwide mobile device users know about Opera Mini? Perhaps not, so it’s difficult to know how many would be interested in trying this different mobile web experience. However, 50 million downloads for one only browser that the user had to install actively is a big number for me. When Opera Mini appeared in Apple Inc.’s App

Store, from which users can download and install applications for the iPhone, iPod, and iPad, 1 million users downloaded the browser on the first day. This is quite impressive.

Today, less than 4% of total web browsing is done from mobile devices. This percentage is increasing month by month. Mobile browsing may never become as popular as desktop browsing, but it will increase a lot in the following years.

In addition, user browsing on mobile devices will likely have a higher conversion rate. How many tabs do you usually have open at once in Internet Explorer or Firefox on your desktop or laptop? On a mobile device, when you browse you are more specific and more likely to act on what you find.

The Mobile Ecosystem

If you are coming from the desktop web world, you are probably not aware of the complete mobile ecosystem. Let's review the current state of affairs, so we can be sure we have all the knowledge we need to create the best solutions.

What Is a Mobile Device?

It's really difficult to categorize every mobile device. Is it a smartphone? Is it a handheld? Is it a netbook? Is it a music player?

First, when is a device considered a mobile one?

For the purposes of this book, a mobile device has the following features:

- It's portable.
- It's personal.
- It's with you almost all the time.
- It's easy and fast to use.
- It has some kind of network connection.

Portable

A mobile device has to be portable, meaning that we can carry it without any special considerations. We can take it to the gym, to the university, to work; we can carry it with us everywhere, all the time.

Personal

We've all heard it: "Don't touch my phone!" A mobile device is absolutely personal. My mobile is mine; it's not property of the family, nor is it managed by the company who manufactured it. I choose the ringtone, the visual theme, the games and applications installed, and which calls I should accept. My wife has her own mobile device,

and so do my kids. This personal feature will be very important in our projects. You can browse a desktop website from any computer—your familiar home PC, your computer at work, or even a desktop at a hotel or Internet café—and numerous people may have access to those machines. However, you will almost always browse a mobile website from the same device, and you are likely to be the only person who uses that device.



Do a test: go now and ask some friends or colleagues to allow you to view your email or your Facebook account using their mobile devices. Pay attention to their faces. They don't want to! You will log them out from their accounts, you will use their phone lines, and you will touch their devices. It's like a privacy violation.

Companion

Your mobile device can be with you anytime! Even in the bathroom, you probably have your mobile phone with you. You may forget to take lots of things with you from your home in the morning, but you won't forget your wallet, your keys, and your mobile device. The opportunity to be with the user all the time, everywhere, is really amazing.

Easy usage

A notebook (or even a netbook) is portable; it can be with you at any time and it has a network connection, but if you want to use it, you need to sit down and perhaps find a table. Therefore, it's not a mobile device for the purposes of this book.

A mobile device needs to be easy and quick to use. I don't want to wait two minutes for Windows to start; I don't want to sit down. If I'm walking downtown, I want to be able to find out when the next train will be departing without having to stop.

Connected device

A mobile device should be able to connect to the Internet when you need it to. This can be a little difficult sometimes, so we will differentiate between *fully connected devices* that can connect any time in a couple of seconds and *limited connected devices* that usually can connect to the network but sometimes cannot.

A classic iPod (non-Touch) doesn't have a network connection, so it's out of our list too, like the notebooks.



Where do tablets, like the iPad, fit in? They are not so personal (will you have one tablet per member of the family?), and they may not be so portable. But, as they generally use mobile instead of desktop operating systems, they are more mobile than notebooks or netbooks. So, I don't have the answer. They are in the middle.

Mobile Device Categories

When thinking about mobile devices, we need to take the “phone” concept out of our minds. We are not talking about simply a phone for making calls. A voice call is just one possible feature of a mobile device.

With this in mind, we can try to categorize mobile devices.

Mobile phones

OK, we still have mobile phones in some markets. These are phones with call and SMS support. They don’t have web browsers or connectivity, and they don’t have any installation possibilities. These phones don’t really interest us; we can’t do anything for them.

In a couple of years, because of device recycling, such phones will probably not be on the market anymore. The Nokia 1100 (see [Figure 1-1](#)) is currently the most widely distributed device in the world, with over 200 million sold since its launch in 2003. In terms of features, it offers nothing but an inbuilt flashlight. The problem is that we can’t create web content for it. Some companies may continue to make very low-end entry devices in the future, but hopefully Nokia and most other vendors will stop creating this kind of device. Even newer, cheaper mobile devices now have inbuilt browser support. This is because the mobile ecosystem (vendors, carriers, integrators, and developers) wants to offer services to users, and a browser is the entry point.

For example, through its OVI Services Nokia offers OVI Mail, an email service for non-Internet users in emerging markets. Thanks to this service, many, many people who have never before had access to email can gain that access, with a mobile device costing less than \$40. This widespread solution meets a real need for many people in emerging markets, like some countries in Africa and Latin America.

Low-end mobile devices

Low-end mobile devices have a great advantage: they have web support. They typically have only a very basic browser, but this is the gross market. People who buy these kinds of devices don’t tend to be heavy Internet users, but this may change quickly with the advent of social networks and Web 2.0 services. If your friends can post pictures from their mobile devices, you’ll probably want to do the same, so you may upgrade your phone whenever you can.

Nokia, Motorola, Kyocera, LG, Samsung, and Sony Ericsson have devices for this market. They do not have touch support, have limited memory, and include only a very basic camera and a basic music player. We can find phones in this category from \$40 on sale all over the world.



Figure 1-1. 200 million devices worldwide sounds very attractive but this device (Nokia 1100) is out of our scope because it doesn't have a web browser.

Mid-end mobile devices

This is the mass-market option for a good mobile web experience. Mid-end devices maintain the balance between a good user experience and moderate cost. From \$150, we can find a lot of devices in this market sector. In this category, devices typically offer a medium-sized screen, basic HTML-browser support, sometimes 3G, a decent camera, a music player, games, and application support.

One of the key features of mid-end devices is the operating system (OS). They don't have a well-known OS; they have a proprietary one without any portability across vendors. Native applications generally aren't available publicly and some runtime, like Java ME, is the preferred way to develop installed applications.

The same vendors develop these devices as the low-end devices.

High-end mobile devices

Originally the same category as smartphones, high-end devices are generally non-multitouch but have advanced features (like an accelerometer, a good camera, and Bluetooth) and good web support (but not the best in the market). They are better than mid-end devices but not on a par with smartphones. The enhanced user experience on smartphones is one of the key differences. The other difference is that high-end devices

generally are not sold with flat Internet rates. The user can get a flat-rate plan, but he'll have to go out and find it himself.



You will find different mobile categories defined in different sources. There isn't only one de facto categorization. The one used here is based on mobile web compatibility.

Smartphones

This is the most difficult category to define. Why aren't some mid-end and high-end devices considered "smart" enough to be in this category? The definition of smart evolves every year. Even the simplest mobile device on the market today would have been considered very smart 10 years ago.

A device in this category can cost upwards of \$400. You can probably get one at half that price from a carrier; the devices are often subsidized because when you buy them you sign up for a one- or two-year contract with a flat-rate data plan (hopefully). This is great for us as users, because we don't care too much about the cost of bytes transferred via the Web.

A smartphone, as defined today, has a multitasking operating system, a full desktop browser, Wireless LAN (WLAN, also known as WiFi) and 3G connections, a music player, and several of the following features:

- GPS (Global Positioning System) or A-GPS (Assisted Global Positioning System)
- Digital compass
- Video-capable camera
- TV out
- Bluetooth
- Touch support
- 3D video acceleration
- Accelerometer

Currently, this category includes the Apple iPhone, some Symbian devices like the Nokia N97 (some consider this device only high-end because of its browser), Nokia MeeGo devices like the N900, every Android device (including the HTC Magic and Nexus One), and the Palm Pre.



Google bills its own device, the Nexus One (launched in partnership with HTC), not as a smartphone but rather a “superphone,” because of its 1-Ghz processor. The fact is, any “superphone” is super only for a couple of months before it is knocked from the podium by some other device, so this is not really a valid category.

Some other companies, like Nokia, call their phones “mobile computers.”

If you are still confused about the models, brands, and operating systems, don’t worry, it will become clearer. Some confusion is normal, and I will help you to understand the mobile web ecosystem in the following pages.

Non-phone devices

This may sound a bit strange. Non-phone mobile devices? Indeed, there are some mobile devices that have all the features we’ve mentioned, but without voice support using the normal carrier services.

For example, Apple’s iPod Touch and iPad are devices in this category. They aren’t phones, but they can be personal, are portable and easy to use, can be kept with you most of the time, and have WLAN connections, so they fall into the category of limited connected devices. They both also have a great mobile browser—the same one as the iPhone—so they will be in our list of devices to be considered for development.

We can also consider some of the new ebook readers. I have a Sony ebook reader, and it’s really great. My reader (a Sony PRS-700) isn’t a mobile device because it isn’t connected, but there are other versions (like the Amazon Kindle, shown in [Figure 1-2](#), the Barnes & Noble Nook, and some newer Sony devices) with data connection support. The Kindle can display very basic web pages on its included browser, and a Kindle SDK has been announced for Java native development on this platform. Ebook readers aren’t phones, but they conform to all our other guidelines for mobile devices (with perhaps one difference: they are more likely to stay at home than to travel everywhere with us).

Small Personal Object Technology (SPOTs)

This may sound like a sci-fi category, but every year sci-fi gets nearer to us. The only difference between SPOTs and the other devices we’ve considered is their size: a SPOT may be a watch, or even a pair of glasses. The LG GD910 in [Figure 1-3](#) is a watch with 3G support. It’s on the market now, so it’s not sci-fi.

“OK,” you may be thinking, “but are we really going to create a website for a one-inch screen?” Maybe not. But we can create small widgets to update information presented to the users, and this falls under the category of mobile web work.

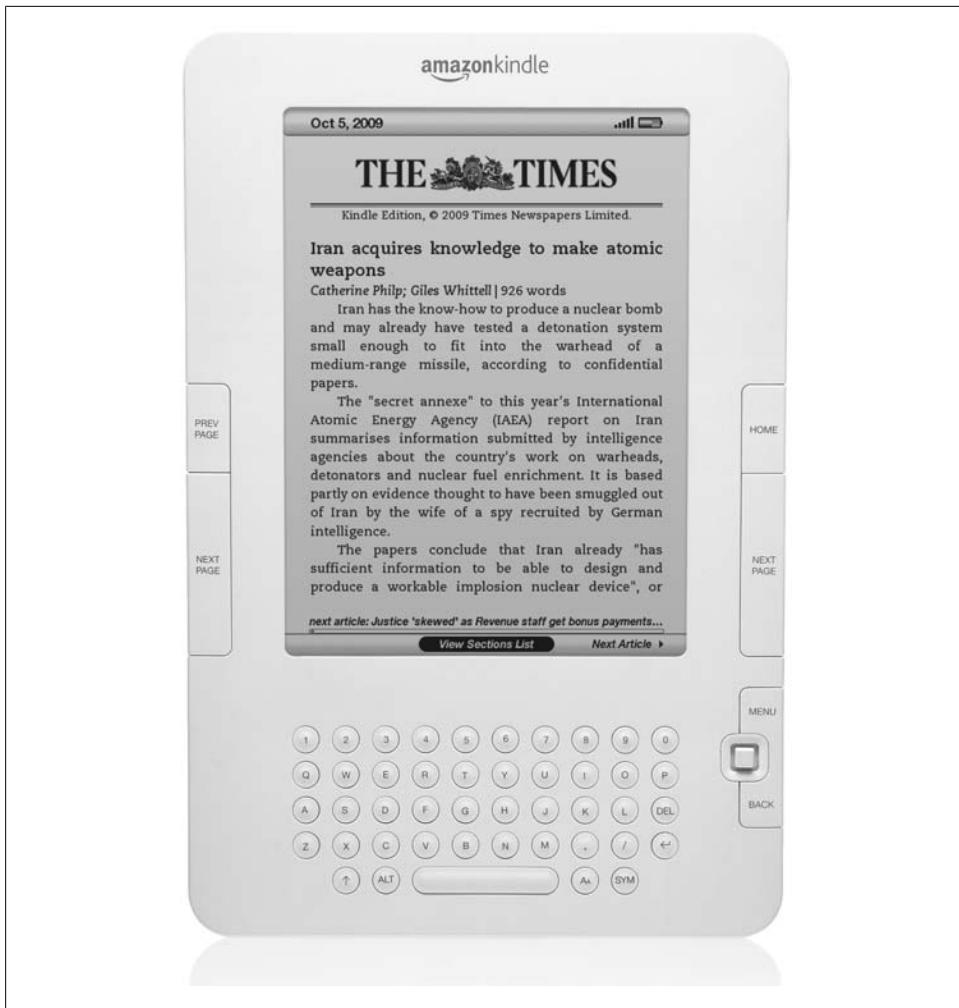


Figure 1-2. The Amazon Kindle can be considered a mobile device because of its network connection and (limited) web browser.

Tablets, netbooks, and notebooks

I have to be honest: I love the tablet concept. For three years I had a Tablet PC from HP, and I always loved the idea of it. A small notebook with touch support was a really great device. However, when I bought it (back in 2005), the concept didn't work. Why? I don't know. However, the concept is back again, and we now have light netbooks, tablet PCs, the Apple iPad, and a variety of mobile-OS tablets on the market.

These devices have at minimum a nine-inch display, and they are more like desktops than mobile devices. Some have desktop operating systems and desktop browsers, while others, such as the iPad, have mobile software.



Figure 1-3. The LG GD910 (the “watchphone”) is the first of a new generation of mobile devices that will have web support through widgets with updatable information in the near future.

If a device has a full operating system, you will need to install antivirus protection and a firewall on it, so it won’t meet the easy usage criterion for a mobile device. Also remember that you can’t use a netbook while walking.

Still, this concept is growing up. Nokia, a well-known mobile device manufacturer, is now creating a netbook line: its Booklet 3G has 3G and WLAN support and runs Windows. Apple, with the iPad, has also entered this market with a hybrid half-ebook reader, half-iPhone.

Mobile Knowledge

If you are not (up to now) a part of the mobile world, we need to discuss some things before we start analyzing the devices and before we do any coding. I know you want to start coding right now, but believe me that your project will be more successful if you know the environment.

Display

I know what you’re thinking: “you’re going to talk me about the small screen problems.” Yes, I was going to start with that. A mobile device has a very small screen compared with a desktop. While in desktop development we talk about 17-, 19-, and 21-inch screen sizes (diagonally), in mobile development we talk about 1.5, 2.3, or 3 inches. It’s really a big difference. Similarly, while in desktop development we talk about

1024×768 pixel resolution, in mobile development we talk about a quarter or half of that.

Resolution

Resolution is the primary concern in mobile design. How many pixels (width and height) are available on a given device? This was the only portability problem for many years in the area of mobile development.



Portability refers to the ability of a mobile application to be used on multiple devices with different hardware, software, and platforms.

There are no mobile device standards regarding screen resolution. One device may have a resolution of 128×128 pixels, and another 800×600. But if we talk about devices sold from 2007, we can separate most of them into four basic groups:

- Low-end devices: 128×160 or 128×128 pixels
- Mid-end devices (group #1): 176×220 or 176×208 pixels
- Mid-end devices (group #2) and high-end devices: 240×320 pixels
- Touch-enabled high-end devices and smartphones: 240×480, 320×480, 360×480, 480×800, 480×854, or 640×960 pixels



Touch devices typically have a higher resolution than devices with a keyboard because no space needs to be reserved for the keypad.

Today, the most widely available screen resolution is 240×320 pixels. This is also known as QVGA (Quarter VGA), because the 1990s VGA standard was 640×480 pixels. An iPhone 3GS, for example, has a resolution of 320×480 pixels; this is known as HVGA (Half VGA).

There are also still a lot of devices with custom resolutions. Web technologies will simplify this problem for us, as we'll see later in this book.

Physical dimensions

The resolution isn't the only thing we can talk about with regard to a mobile device's screen. One feature as important as the resolution is the physical dimensions of the screen (in inches or centimeters, diagonally or measured as width/height), or the relation between this measure and the resolution, which is known as the PPI (pixels per inch) or DPI (dots per inch). This is very important, because while our first thought

may be that a screen with a resolution of 128×160 is “smaller” than a screen with a resolution of 240×320, that may be a false conclusion.

One of the phones I owned back in 2006, thanks to a gift from Nokia, was an N90. The device was like a brick, but the great (or not so great, as it turned out) feature was its resolution: 352×416. The problem was that the screen size was very similar to those of other devices on the market at the time that used resolutions like 176×208. Therefore, I couldn’t use any game or application on the device, or browse the Web; I needed a magnifier to see the normal font size. Every programmer thought that more available pixels meant a bigger screen, so why bother increasing the font? “Let’s use the extra space to fit more elements,” everyone thought. Wrong.



In June 2010, Apple presented iPhone 4, the first device with a “retina display,” that is a display with 326 pixels per inch (ppi). The human retina has a limit of 300 ppi at a certain distance, so this device with 960×640 in landscape mode has more pixels per inch than the ones we can really see. This is perfect for images and zoom-out viewing, but remember that we need to zoom in or have large fonts to perfectly read text.

The Nokia N90 has a display size of $1.36'' \times 1.6''$ ($3.45\text{ cm} \times 4.07\text{ cm}$) = 259 PPI (or 0.0979 mm dot pitch), in comparison with other devices with a similar screen size, which have between 130 and 180 PPI.



You can find an online PPI and DPI calculator at <http://members.ping.de/~sven/dpi.html>.

Aspect ratio

A device’s aspect ratio refers to the ratio between its longer and shorter dimensions. There are vertical (or portrait) devices whose displays are taller than they are wide, there are horizontal (or landscape) devices whose displays are wider than they are tall, and there are also some square screens, as shown in Figure 1-4. To complicate our lives as programmers even more, today there are also many devices with rotation capabilities. Such a device can be either 320×240 or 240×320, depending on the orientation. Our websites need to be aware of this and offer a good experience in both orientations.



Figure 1-4. Mobile devices may have horizontal screens, vertical screens, or even square screens.

Input methods

Today, there are many different input methods for mobile devices. One device may support only one input method or many of them. Possibilities include:

- Numeric keypad
- Alphanumeric keypad (ABC or QWERTY)
- Virtual keypad on screen
- Touch
- Multitouch
- External keypad (wireless or not)
- Handwriting recognition
- Voice recognition

And of course any possible combination of these, like a touch device with an optional onscreen keyboard and also a full QWERTY physical keyboard (see [Figure 1-5](#)).

If you are thinking that QWERTY sounds like a *Star Trek* Klingon's word, go now to your keyboard and look at the first line of letters below the numbers. That's the reason for the name; it's a keyboard layout organized for the smoothest typing in the English language that was created in 1874. This layout is preserved in many onscreen keyboards (see [Figure 1-6](#)).



Figure 1-5. The Nokia N97 mini has a full slider QWERTY keyboard and, when closed, an onscreen touch keyboard.

Other features

We could talk for hours about mobile device features, but we'll focus on the ones that are useful for us as mobile web programmers. Key features include:

Geolocation

Many devices can detect the geographical location of the users using one or many technologies, like GPS, A-GPS, WPS (WiFi Positioning System), or cell-based location tracking.

Phone calls

Yes, mobile devices also make phone calls!

SMS (Short Message Service)

Most devices allow you to create text messages to send to other devices or to a server, with a length of up to 160 7-bit ASCII characters (or 140 8-bit ASCII characters, or 70 Unicode chars), or to concatenate many messages for a larger text.

MMS (Multimedia Message Service)

Mobile devices often allow users to create messages with text and attachments, such as images, videos, or documents.

Application installations

Many devices allow the user to download and install an application using OTA (Over-The-Air). This means that we can serve applications to a device from our websites.

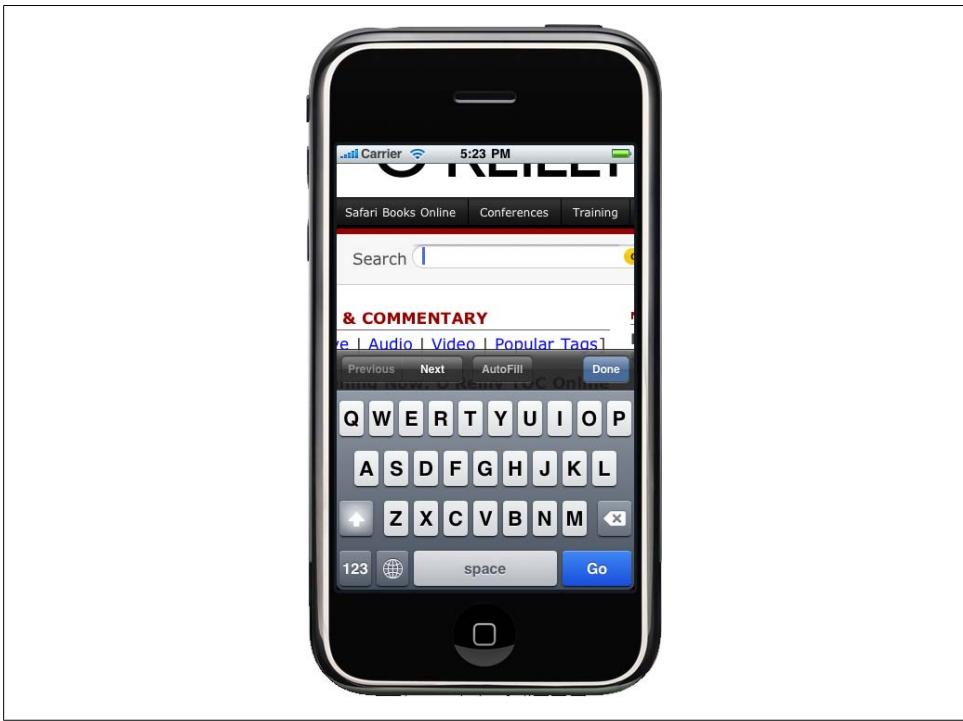


Figure 1-6. The iPhone and iPod Touch use an onscreen virtual keyboard when the user needs to type something on a website.

Brands, Models, and Platforms

Now that we have established a set of categories in the mobile world, let's talk about the difficult part: the brands and models on the market. We are not going to talk about every model available, and we don't need to know about all of them. We only need to be aware of some information that will be useful for making decisions in the future.

Writing a book about brands and models is very difficult. The market changes a lot every year. In fact, during the months while I was writing this book, I had to update the information several times. That is why I will be general and aim to show you how to understand any new device that could appear on the market.

Apple

We are going to start with Apple, not because its devices are the best or because it has the greatest market share, but because Apple has caused a revolution in the market. It changed the way mobile devices are seen by users, and it is the reason why many developers (web or not) have turned their attention to the mobile world.

Apple, a well-known desktop computer company, entered the mobile world with a revolutionary device: the *iPhone*. Luckily for us, all of Apple's devices are quite similar. They have a multitouch screen, a 3.5" screen size, WLAN connections, and Safari on iOS (formerly Mobile Safari) as the browser.

Apple's devices have a great feature: an operating system called *iOS* (formerly iPhone OS) that is based on Mac OS X (a Unix-based desktop OS). Up to this writing, even the first version of the iPhone can be upgraded to the latest operating system version. By default, the iPhone and iPod Touch are charged using USB; when you charge your device, *iTunes* (the Apple software for managing your device's content and music) will detect automatically if an OS update is available for your device, and you can install the update in minutes without any technical skill needed.

That is why today, for a mobile web developer, it's more important to know what OS version an Apple device has installed than which device it is. For those of us whose aim is to create great web experiences for the iPhone, it doesn't matter if the device is an iPhone (the basic phone), an iPhone 3GS (S for speed, a device with more power and speed), an iPhone 4 or an iPod Touch (like the iPhone without the phone). Even within each device type, we have many generations.



The Apple iPad is a 9.7" multitouch tablet running iOS 3.2 or greater. It includes the same functionality and browser as the iPhone, with minor differences because of the larger screen, which has a 768×1024 resolution.

The important thing is to know which OS version a device that accesses your website is running. It may be iOS 1.0, 2.0, 2.2, 3.0, 3.2, 4.0, or newer (although versions 1.0 and 2.0 are rarely seen on devices in use today, so we can safely work with versions 2.2 and beyond). Up to version 4.0, iOS was called iPhone OS. Every version has upgrades in the browser and is backward compatible. For example, the Gmail version for the iPhone is different if you have an iPhone running OS 1.0, 2.2, or 3.0. You can see sample screens in [Figure 1-7](#).

Today, we can develop applications for iOS devices on only two platforms: using mobile web techniques, and using the native *Cocoa Touch* framework built on Objective-C.



Later in this book, we are going to talk about how to detect the OS and use all the features available only in Safari on iOS. We will also talk about the App Store and how to distribute our mobile web applications via this store.



Figure 1-7. This is the same Gmail account accessed from an iPhone running OS 2.0 and one running 3.0. The latter provides a more rich and contextual experience for the user.

Nokia

Nokia has the largest market share in mobile devices and smartphones worldwide (but not necessarily in specific markets, like the U.S.). Nokia has devices in all the mobile categories, from very low-end devices to very high-end smartphones.

I've been working in the mobile development world since 2000 and I have to admit that Nokia has the best support for developers, compared to all the other companies. Hundreds of documents and a huge amount of sample code, ideas, and best practices for many technologies, including technologies used for mobile web development are available on its website for developers, [Forum Nokia](#).

I've been one of the Forum Nokia Champions (a worldwide recognition program for top mobile developers) since 2006, and I know that Nokia really cares about the developer community.

The bad news for developers is that hundreds of different Nokia devices are available today. The good news is that they are very well organized by platform into different series, making it easier for us to develop, test, and port our web applications to most of them.

Series 40

Nokia's Series 40 consists of low- and mid-end devices using a proprietary Nokia OS focused on the mass market. The devices in this series first appeared in 2003, and today they are separated into different editions and even small update packages (called Feature Packs) that will help us to understand the abilities of each mobile device in this series.



The series, the edition, and even the Feature Pack cannot be updated. So, there are no operating system changes in Series 40.

At the time of writing, Series 40 includes the following divisions:

- Series 40 1st edition
- Series 40 2nd edition
- Series 40 3rd edition
- Series 40 3rd edition Feature Pack 1
- Series 40 3rd edition Feature Pack 2
- Series 40 3rd edition Feature Pack 3
- Series 40 5th edition
- Series 40 5th edition Feature Pack 1
- Series 40 5th edition Feature Pack 1 Lite
- Series 40 6th edition

Every edition has between 5 and 40 devices on the market today. The best part is that Nokia guarantees us that development for each device in one series is the same.



You may have noticed that there isn't a 4th edition in Nokia's Series 40. Why is this? Nokia has a lot of market share in Asia, and in China, 4 is considered a bad-luck number (like the number 13 in the Western world) because it is pronounced "si," similar to "death" in Chinese.

All the Series 40 devices have a mobile browser and *Java ME* (Micro Edition)—formerly known as J2ME (Java 2 Micro Edition)—support. From the 3rd edition, they also support different versions of *Adobe Flash Lite*.



Java ME is today the most widespread mobile platform, apart from mobile web. It was developed by Sun (now Oracle) in 1998, and the goal was to create a multiplatform programming language. Sun has said that Java ME will be retired in 2015.

Almost all the Series 40 devices have a numeric keypad and a medium-sized screen. Today, all have a camera and an MP3 player, and many of them have an FM receiver.



It's interesting to see how the mobile world is changing other business markets. Today, the worldwide leading company in the MP3 player market is Nokia.

Some Nokia Series 40 devices that are well distributed in the market include:

- Nokia 6500
- Nokia 6120 Classic
- Nokia 6600 Fold
- Nokia 6600 Slide
- Nokia 6131
- Nokia 5310
- Nokia 5200
- Nokia 3220
- Nokia 2610

S60

Series 60 began as the smartphone line from Nokia. Today these devices are closer to the high-end category, but the limit is not clear. All S60 devices use the Symbian operating system. The Symbian company was formed by a group of manufacturers including Nokia, Ericsson, and Motorola. Later, Samsung and Sony Ericsson were added to the member list. For many years Nokia has been the leading company using the Symbian platform, but there are some Samsung, Sony Ericsson, and Motorola Symbian-based devices on the market. Some of them use the same user interface layer and platform, so there are many non-Nokia S60 devices on the market today. Motorola and Sony Ericsson developed their own UI layers for Symbian, called *UIQ*, and DoCoMo in the Japanese market created *MOAPS*.

This is history, though. In 2008, after the launching of *Android* as an open source operating system, Nokia made a decision: it bought 100% of Symbian, Ltd. from all the other manufacturers and created the *Symbian Foundation* to migrate the Symbian operating system to open source.

Today, there are some Nokia, Sony Ericsson, and Samsung devices based on the Symbian Foundation's OS and the ex-S60 user interface layer. *UIQ* has been deprecated.

Talking about only Nokia devices, the S60 platform is divided into the following versions:

- S60
- S60 2nd edition
- S60 2nd edition Feature Pack 1
- S60 2nd edition Feature Pack 2
- S60 3rd edition Feature Pack 1
- S60 3rd edition Feature Pack 2
- S60 5th edition



After S60 5th edition, the platform was renamed to *Symbian platform*.

All new devices coming from Nokia and other manufacturers will not use the S60 brand.

All the S60 devices are based on Symbian and include a camera, a mobile browser, multitasking support, and a numeric or QWERTY keyboard. The 5th edition has touch support.

Apart from the technical series divisions, Nokia has divided its Symbian-based devices into commercial series based on the user groups for whom they were designed since the 3rd edition.

The *n-series* is intended for all type of users, including high-tech users, gamers, and Internet users. This series includes the N97, N95, N85, N78, etc. Some of these devices have hardware-accelerated video cards for 3D gaming.

The *e-series* is aimed at enterprise users wanting access to email, web browsing, and corporate applications. They include a corporate email application, and many of them have a QWERTY keyboard for easy typing. This series includes the E52, E65, E71, etc.

The *x-series* (formerly known as *XpressMusic*) is designed for the music user. These devices have multimedia keys for easy music player manipulation and provide access to the Nokia Music Store so users can buy songs legally. The last devices from this series are touch-based. This series includes the 5800 XpressMusic (see [Figure 1-8](#)) and the X6.



Figure 1-8. The 5th edition Nokia 5800 XpressMusic was the first touch-enabled S60 device.

Every S60 device has a WebKit-based browser that allows the devices to browse almost any website on the Internet, including Flash-based sites like YouTube. The S60 WebKit browser is an open source browser developed by Nokia (now managed by the Symbian Foundation) based on WebKit, an open source browser originally developed by Apple Inc. Before this browser was developed, S60 devices included a proprietary Nokia browser or preinstalled some other browser, like Opera Mobile.

Maemo/MeeGo

Nokia has recently created a new platform, called *Maemo*. It's a Linux-based operating system designed for small netbooks or devices with full web browsing support. The first devices to use Maemo weren't phones, but today there are devices like the Nokia N900 with 3G support, competing directly with Symbian devices.

Future smartphone devices from Nokia will be Maemo-based. Maemo was the first mobile platform to support the popular Firefox browser and Google Chrome.

In 2010, Nokia's Maemo merged with Intel's Moblin OS, creating the *MeeGo* OS. At the time of this writing, it is not yet clear whether Maemo will continue as a branding name or if MeeGo will replace it.

BlackBerry

Research in Motion (RIM) is the Canadian manufacturer of the BlackBerry devices, mobile devices focused on being "always connected" with push technologies that are primarily used by corporate users who need to remain connected to intranets and corporate networks. RIM calls all its devices "smartphones."



In following chapters, we will cover all the tools, SDKs, and emulators available from each manufacturer to make our lives as web developers easier.

RIM has few devices aimed at the mass market, so most of them have QWERTY keyboards and aren't designed for gaming. Many of them have proprietary input devices, like a scroll wheel or a touchpad; some touch-enabled devices have also been launched in the last few years. All BlackBerrys have the RIM OS, a proprietary operating system compatible with Java ME with extensions, and, of course, a mobile browser. We can categorize the devices by operating system version.

BlackBerry has become very popular in the corporate market because of its integration with Exchange and other corporate servers. A BlackBerry user can browse the Internet via the corporate Internet connection through a proxy, and many other manufacturers, such as Nokia, LG, HTC, and Sony Ericsson, support the BlackBerry email client.

Samsung

Samsung has many devices on the market, most of which are divided into three different series: native devices, Symbian devices, and Windows devices. At the end of 2009, Samsung surprised the market with a new platform for the devices launching from 2010: *Bada*.

Samsung's native devices are low- and mid-end mobile devices with a proprietary OS including a browser and Java ME support, and typically a camera and a music player.

Prior to 2010, the smartphones and high-end devices were divided into two categories by operating system—Symbian and Windows Mobile—each having its own set of features. The latest devices on the market have touch support, with a UI layer installed over the operating system.

For newer devices, there is one feature that is available on all the three platforms: Samsung Widgets. These are small applications created using mobile web technologies that can operate on all the operating systems Samsung uses.



In [Chapter 12](#), we will cover Mobile Widgets and offline applications. We will talk about the widget platform for Samsung there.

Starting in 2010, Samsung will also be delivering mobile devices with Bada, Android, and Windows Phone.

Sony Ericsson

Ericsson built many mobile phones in the 1990s, and in 2001 it merged with Sony and created the Sony Ericsson company. Today, Sony Ericsson produces a range of low- and mid-end devices and a couple of smartphones.

Sony Ericsson, like Samsung, has decided to offer devices with different operating systems. It offers low- and mid-end devices using a proprietary Sony Ericsson operating system, as well as Windows Mobile devices, Android devices, and Symbian devices. Before 2009, the Symbian devices used UIQ as the UI layer for the operating system. Since 2009, there are Symbian Foundation devices using the same UI layer as Nokia's and Samsung's devices. So, in terms of developing web applications for them, they are very similar.

The proprietary OS devices support Java ME and Flash Lite development (and also both at the same time, thanks to a project called Capuchin), and they are divided in series according to the Java ME APIs they support. So, today we have Sony Ericsson devices from Java Platform 1 (JP-1) to Java Platform 8 (JP-8), with each category differing in terms of the API support and the screen resolution.

All the devices have a camera, a music player and, of course, a web browser built in. The Symbian Foundation-based devices are touch-enabled.

Motorola

For many years, Motorola has been a leading manufacturer of low- and mid-end devices. Motorola's devices were the first mobile devices on the market, and the company pioneered the clamshell design with the classic Motorola StarTac. Motorola's mobile devices have traditionally used either a proprietary operating system (like the well-known Motorola v3), Symbian UIQ, Windows Mobile, or a Linux-based operating system the company created for its devices. On the proprietary OS-based devices, Java ME and the browser were the only supported development platforms. The Linux-based OS supports Java ME, web, and native development.

This situation created a very fragmented market for developers. Today, Motorola has changed its vision and has focused on a single solution: Android. All new mid-end devices and smartphones, like the one shown in [Figure 1-9](#), are Android-based, and it appears that Motorola will no longer create new Windows Mobile or Symbian devices. I won't make any bets about this, because anything could happen in the future of the mobile world; however, as of today, Motorola is an Android-based company.



Figure 1-9. The Motorola CLIQ was the first Android-based device from this company. It includes MOTOBLUR, a push service connecting your home screen with social networks and news sites.

The Windows-based Motorola devices, like the Motorola Q, which has a QWERTY keyboard, are intended for the corporate market. The company also has some touch devices on the market, all with a built-in camera and music player, and some mobile devices for the two-way radio market, like the Nextel network. These devices have a proprietary OS and the model names usually start with an “i.”

There are no series divisions in Motorola, unlike in the Nokia and Sony Ericsson lines, so we will need to use other information (such as the browser used in each device) to test and make decisions about the devices.

LG Mobile

LG Mobile has many low- and mid-end devices on the market today. Most are based on a proprietary OS with Java ME, Flash, and web support. Some of the new ones support web widgets based on WebKit.

LG is currently working with Android and Windows Mobile/Windows Phone to create some new smartphones (the company has not previously produced any devices in this category). LG participated in the creation of the Symbian Foundation and has two Symbian devices based on the S60 platform, but as it has now decided to support Android, we should see a lot of Android-based LG devices in the future.

HTC

HTC has become very popular in the mobile market since it created the first and second Android devices in the world and the first Google phone, the Nexus One. But HTC doesn't only create Android devices; it also produces a lot of Windows Mobile ones. Many HTC devices have touch support, and a key feature is that HTC tries to emulate the same user experience on all its devices. We can think of HTC devices as either Android devices or Windows devices; that's the only distinction that's needed.

This simplicity is reflected in the HTC website for developers: it only contains kernel files for Android devices and links to the Android and Windows Mobile generic websites.

Android

This is the first platform we are covering that isn't a manufacturer. Therefore, it may not seem to fit in this list. It does, though—if we are developing a website for an Android device, we don't need to bother too much about who the manufacturer is. This is because the Android platform is powerful enough to leave the brand and model in a second place when we are talking about developer features.

Android is an open source, Linux-based operating system created and maintained by a group of software and hardware companies and operators called the *Open Handset Alliance*. Google mainly maintains it, so it is sometimes known as the “Google Mobile Operating System.” As with any open source software, any manufacturer could theoretically remove all the Google-specific stuff from the operating system before installing it on their devices. However, as of this writing no vendor has done this, which is why every Android device is very “Google friendly.”

Android is a software stack including a Linux-core, multitasking operating system based on the concept of a virtual machine that executes bytecode, similar to .NET or JVM (Java Virtual Machine). Google chose Java as the main language to compile (not compatible with Java ME) with Web 2.0 users in mind. Android includes a full HTML browser based on WebKit and, in fact, is very similar to the iPhone Safari browser, and all Android devices to date ship with Google Maps, Google Calendar, and an email client and provide connections to many free Google web services. It's not an obligation, but as of today every Android device is touch-based, and many of them have a QWERTY physical keyboard, GPS, a digital compass, and an accelerometer.

Today, HTC, Motorola, Samsung, LG, and Sony Ericsson make Android devices. Many other vendors have announced the release of Android devices in the future, including Kyocera and Dell. There are also some non-phone devices, such as tablets, that use Android.

As of the writing of this book, the Android OS comes in versions 1.0, 1.5, 1.6 with update features, and a major 2.0 release with a 2.1 and a 2.2 update. Knowing the OS

version will be very useful to determine what browser features are available. Unfortunately, the documentation about the Android browser features is not complete.

Windows Mobile

One of the older mobile operating systems on the market is Windows Mobile (formerly Windows CE for PocketPC and Smartphones). For many years, its market included the well-known PocketPCs as Personal Digital Assistants (PDAs) without phone features. The “mobile revolution” pushed Microsoft to create a smartphone version of its mobile operating system, now called Windows Mobile, which is available in two flavors: the Professional (formerly Pocket PC) and Smartphone editions.

Today Windows Mobile doesn’t have too much market share, but it is still well received in the corporate world. Microsoft has begun gaining ground in the end-user market since the release of the Windows Mobile 6.5 operating system, which supports a very intuitive touch UI.

Almost every mobile device with Windows Mobile that has launched since 2003 has .NET Compact Framework support. This means you can develop native applications using C# or Visual Basic with a reduced .NET Framework. All of them come with the web browser Internet Explorer Mobile (formerly known as Pocket Internet Explorer) and with Office Mobile (formerly known as Pocket Word, Pocket Excel, and so on).

The browser version will depend on the operating system version, from Windows CE 2002 and 2003 to Windows Mobile 5.0, 6.0, 6.5, or newer.

In 2010 Microsoft rebranded the operating system as *Windows Phone*, starting with version 7. Windows Phone was presented as a new operating system, with a new UI and services and a new developer platform not compatible with the previous one, using Silverlight and XNA instead of the .NET Compact Framework.



Microsoft, like Google, has entered the hardware mobile market. With Sharp as a manufacturing partner it has begun creating its own mobile phones, starting with the Kin devices, designed with social networking and teen users in mind. The Kin One and Kin Two have a custom operating system based on Windows CE and cloud services; as of this writing they are not Windows Phone devices.

Windows Mobile has its own unique features, like Android, and as developers we can consider it as a platform without regard to who the device manufacturer is. Windows Mobile devices are produced by HP, Toshiba, Motorola, Sony Ericsson, Samsung (shown in [Figure 1-10](#)), and Palm, with the Treo W series.



Figure 1-10. The Samsung Omnia is a Windows Mobile 6.5 device. The operating system is very friendly for desktop Windows users, featuring the Start menu and a very similar user interface.

Palm

My first mobile was a Palm III, back in 1998. At that time, it was a great device for me. It was touch-enabled (used with a stylus), black and white, and very small. It was a revolution for me: I could install applications, read newspapers, and even program directly on the device with a Pascal for Palm interpreter. OK, the programming wasn't the best experience, but the concept was really powerful.

USRobotics bought Palm Computing Inc. in 1995. At the time, it was the pioneer launching PDA devices. USRobotics later merged with 3Com, and as 3Com was dedicated to network cards and accessories, Palm Inc was created as a subsidiary. Palm Inc. was very successful, and other manufacturers (including IBM) created other devices licensing its Palm OS. In 1998, a couple of Palm's directors left to create another company, HandSpring, which releases the Treo devices to the market. Half PDA and half mobile phone, they can be considered the first smartphones on the market.

A few years later, Palm decided to divide the company into a hardware manufacturer, palmOne, and an operating system developer, PalmSource. This idea didn't work out: customers didn't accept the palmOne trademark, so the company again acquired the

Palm trademark and the operating system became the Garnet OS. In the meantime, Palm acquired HandSpring, so now we have Palm Treo devices.

In 2005, ACCESS (who also had other mobile technologies) acquired PalmSource and the operating system. Suddenly, the new-old Palm company made a difficult decision: it started to manufacture Treo devices with Windows Mobile, killing all hopes for the future of the Garnet OS (formerly Palm OS).

The Treo series was the only type of Palm device that survived in the mobile world, and BlackBerrys, the Nokia E Series, and other devices soon pushed Palm to the bottom of the market. In response, Palm created another operating system for mobile devices, aimed at being a web-oriented platform for iPhone-killer devices. *webOS* came to the market in 2009 with the first device, the Palm Pre. Other devices, such as the Palm Pixi, followed. [Figure 1-11](#) shows the progression.

The company didn't go so-well in the market, so in 2010, Palm was acquired by HP, who promised evolution of *webOS*, so we should expect HP netbooks, tablets and more mobile phones with this operating system in the following years.



Figure 1-11. Palm has a really interesting history. Pictured here are the original USRobotics PalmPilot, the Handspring Treo, and the new webOS-based Palm Pre.

Palm's new *webOS* devices are touch and multitouch devices with a very smooth user interface, excellent web support, and all the functions of a modern mobile device. The operating system and all the device applications are web-based. That's because any "native" application developed for *webOS* is created using web technologies. We will talk about this platform in [Chapter 12](#). You can learn more about *webOS* development by reading Mitch Allen's [*Palm webOS*](#), also from O'Reilly.



It's not widely known today that Apple, creator of the iPod and iPhone, was really one of the pioneers in the mobile device market. The Apple Newton was on the market from 1990 to 1998.

Symbian Foundation

We talked earlier about the history of the Symbian Foundation and Nokia's relationship to the new Symbian Foundation operating system. Today there are many Symbian Foundation-based devices on the market (from Nokia, Sony Ericsson, and Samsung), all with similar operating system features. [Figure 1-12](#) shows one such device.



Figure 1-12. The Sony Ericsson Satio is a Symbian-based device (S60 5th edition), so it's very similar to the Nokia 5800 XpressMusic.

The Symbian Foundation's OS allows us to develop applications using the native C++ framework, Java ME, Adobe Flash, web applications, widgets using web technologies, Python, and Qt, a free C-based framework owned by Nokia (Qt is the current recommended platform for creating native applications for Symbian and MeeGo).

The open source OS is versioned as Symbian^{^1}, Symbian^{^2}, Symbian^{^3}, etc. As with Android and Windows Mobile devices, if we are talking about a Symbian device we know that it will be very similar to all other Symbian devices, no matter which manufacturer created it.

Other Platforms

We've already covered almost 98% of the market. There are many other manufacturers, like Sanyo, Alcatel, Kyocera, ZTE, but they don't have visible market share, and many of them produce devices based on platforms we've already discussed, like Windows Mobile. With the information I've shared with you in the last pages, I think you will be capable of understanding any new platform you can find on the market.

Technical Information

After reading the previous section, you may be wondering where you will find information about all the individual devices on the market. What operating system does the Nokia N81 use? Does the BlackBerry Pearl use the first- or second-generation browser? Which Motorola devices use Windows Mobile?

To get you closer to these answers, [Table 1-1](#) lists the developer sites of all the major device manufacturers and platforms. Everyone has one, and almost all of them list the technical specifications of each of their devices. You can usually filter the devices by any characteristic, such as screen size, platform, operating system, or browser version. Sony Ericsson's developer site is shown in [Figure 1-13](#).

The screenshot shows the "Phone Gallery" section of the Sony Ericsson Developer World website. At the top, there are links for "Developer World" and "中文" (Chinese), along with "Member Login", "Register", "Contact", and "Search". The main navigation bar includes "Home", "Phones" (which is underlined in red), "UI Style Guide", "Docs & Tools", "Community", "Testing & Support", "News & Events", and "Go to Market". Below the navigation, there are links for "Gallery", "Java ME", "Symbian OS", "Flash Lite", "Project Capuchin", and "Phone Gallery API". The main content area is titled "Phone Gallery" and features a search bar with "select a phone" and dropdown menus for "Open All" and "Collapse All". To the right of the search bar are links to "email a friend" and "print this page". Below the search bar, it says "178 phones matching your criteria" and "View Current Criteria". On the far right, there are page navigation links "1 | 2 | 3 | 4 | 5 | Next". The main list displays several phones in a grid format:

- C702**: Screen Displays 240x320. Technology Platform: Sony Ericsson Java Platform 8. Buttons: More, C702c, C902a, C902c, C905.
- C702a**: Screen Displays 240x320. Technology Platform: Sony Ericsson Java Platform 8. Buttons: More.
- C702c**: Screen Displays 240x320. Technology Platform: Sony Ericsson Java Platform 8. Buttons: More.
- C902c**: Screen Displays 240x320. Technology Platform: Sony Ericsson Java Platform 8. Buttons: More.
- C905**: Screen Displays 240x320. Technology Platform: Sony Ericsson Java Platform 8. Buttons: More.

On the left side of the list, there is a sidebar with various filters:

- JSRs & APIs**
- Screen Sizes**
- Platforms**
- Audio & Video**
- Flash**
- SVG**
- Connectivity**
- Regions**
- Miscellaneous**
- Theme Version**
- External Storage**
- Browser**
- DRM**

Below the sidebar, there are buttons for "Check All" and "Uncheck All", and checkboxes for various browser options: NetFront™ v 3.3, NetFront™ v 3.4, Opera 8, Sony Ericsson browser, Internet Explorer Mobile, Open Wave 7.2, WebKit Web Browser, and NetFront™ v 3.5. At the bottom of the sidebar, there are "Cancel", "Update", and "More" buttons.

Figure 1-13. Almost every manufacturer website for developers allows you to filter the devices by features, such as the browser used. This is the Sony Ericsson Phone Gallery.

Table 1-1. Mobile manufacturer and platform developer website URLs

Manufacturer/platform	Developer site URL
Apple	http://developer.apple.com/iphone
Nokia	http://forum.nokia.com
Symbian Foundation	http://developer.symbian.org
Palm webOS	http://developer.palm.com
BlackBerry	http://www.blackberry.com/developers
Sony Ericsson	http://developer.sonyericsson.com
Windows Mobile	http://msdn.microsoft.com/windowsmobile
Motorola	http://developer.motorola.com
Opera Mobile/Mini	http://dev.opera.com
LG	http://developer.lgmobile.com
Samsung	http://innovator.samsungmobile.com
Android	http://developer.android.com
HTC	http://developer.htc.com
Bada (from Samsung)	http://developer.bada.com



If you are new to the mobile development ecosystem, it's a good idea to register on all the developer websites—even operators' ones, if they have one. You will receive updates about tools, documentation, and news. You will also have access to download tools and emulators.

Market Statistics

At this point, you may be tempted to close this book and leave the mobile jungle via a shortcut. However, believe me, the path through the jungle is clearer than you probably think right now.

Let's analyze some market share information. This will help us to make some decisions about how our work will be done.

Sometimes it's difficult to decide what to target. Should we develop for all devices, or only for the iPhone and Android devices? How can we decide how many versions to create?

The mobile world is very different from the desktop world. If we are developing for desktops, we can assume that the market share of the available browsers will be similar worldwide. In the mobile world, this is not the case. Because of commercial agreements and cultural differences, we find very diverse market shares in different regions of the world (U.S. & Canada, Latin America, Europe, Asia, Oceania). For example, Nokia has a huge market share in Europe and Asia, but not in the United States. That's why

we need to define who our targets are. Worldwide users? U.S. users? What about gender and age? Depending on the target demographic, we can define our porting strategy.

Overall mobile device sales statistics aren't the only ones we need to analyze. The market shares are very different if we look only at people using their mobile devices to browse the Web. A device with a very low total worldwide market share, such as the iPhone, can prove to have a big market share if we only analyze devices with high web consumption. Figures 1-14 through 1-16 show a few different counts with varying results.

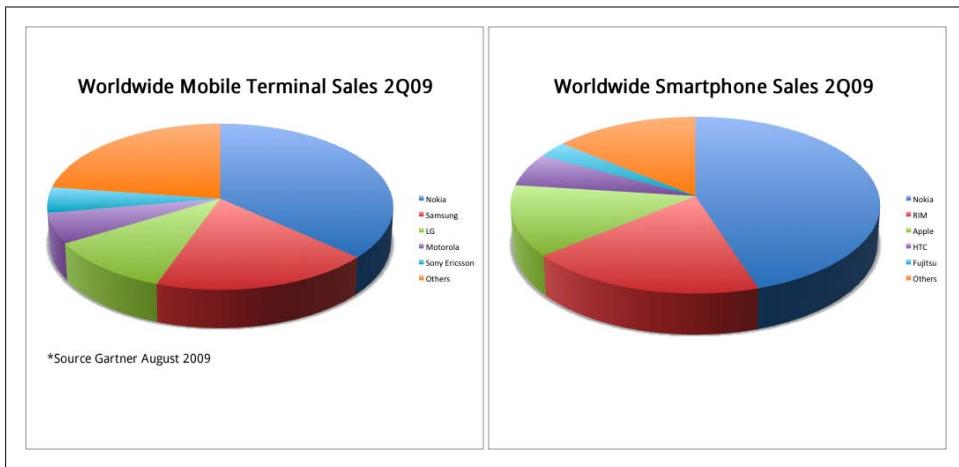


Figure 1-14. Gartner offers frequently updated statistics about mobile terminal (all devices) and smartphone sales. Nokia is the global leader in both segments.



Some statistics services use JavaScript code or some other technique that is not available for microbrowsers or low-end devices, so they are generally left out of the list of devices visiting your website. You need to be very careful about interpreting statistics.

GetJar.com is an application store for freeware and shareware applications, mainly developed in Java ME but with other platforms supported, too. The site offers public statistics about the market share of its visitors, as shown in Table 1-2. This information is very useful, because the visitors are active—they are browsing a website looking for applications to download—so we can consider them active mobile Internet users in the Java ME-compatible market.

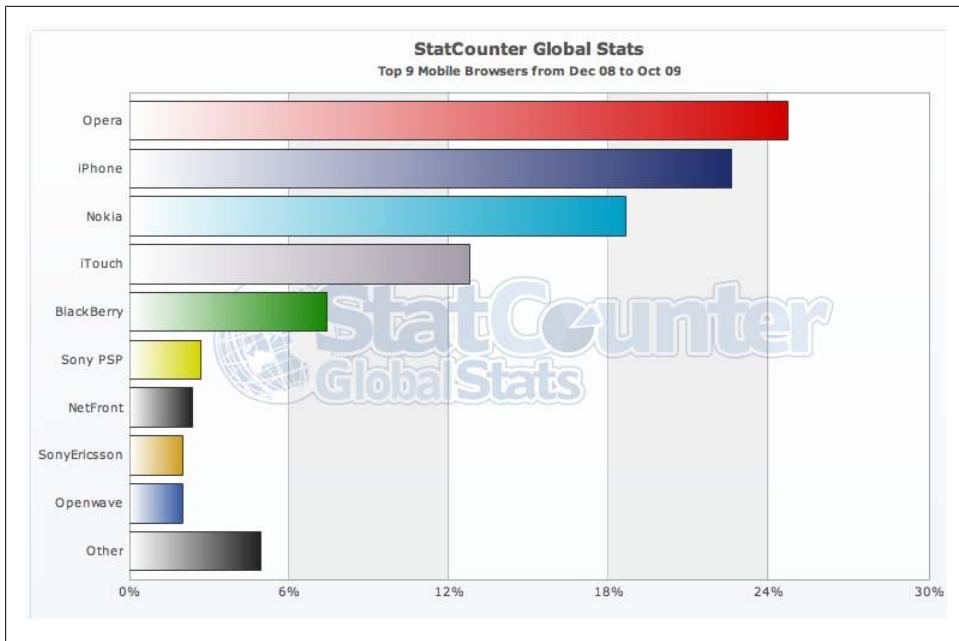
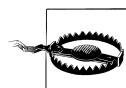


Figure 1-15. At <http://gs.statcounter.com> we can find mobile browser statistics (global and by region) collected from websites using the StatCounter tool. The iPod Touch is registered as iTouch, so iPhone OS devices are leading here.

Table 1-2. Global GetJar market share statistics by manufacturer (September 2009)

Manufacturer	Market share
Nokia	47.8%
Sony Ericsson	16.6%
Samsung	7.8%
LG	3.2%
BlackBerry	3%
Motorola	2.29%



While GetJar statistics are very useful, we need to understand that the market share of iPhone, Android, Windows Mobile, and webOS devices are not represented accurately because their users don't typically use GetJar.

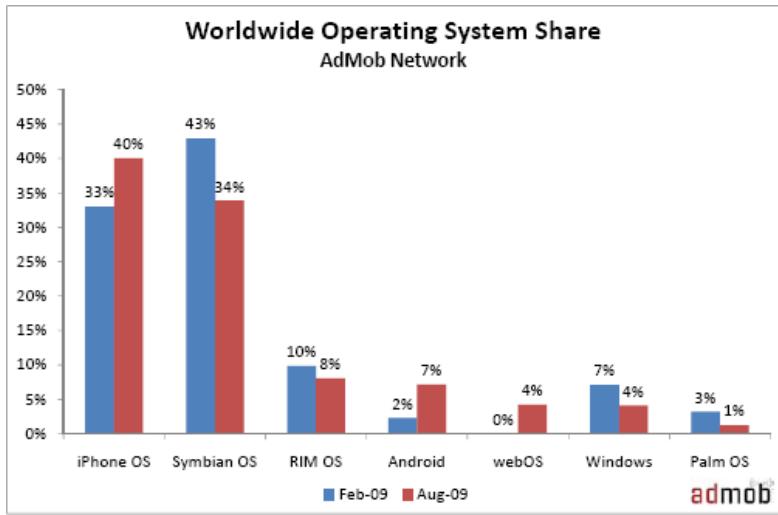


Figure 1-16. AdMob is an advertisement network for mobile websites and applications. It offers public statistics at <http://metrics.admob.com>.

The well-known research firm Gartner predicts the 2012 smartphone market share as shown in [Table 1-3](#) and [Figure 1-17](#), with Symbian still at the head, followed by Android and iPhone. The prediction indicates a small reduction for Symbian but a positive future for Android and Windows Mobile, with both increasing their market share.

Table 1-3. Gartner's prediction for 2012 smartphone market share

Smartphone platform/manufacturer	2012 predicted market share
Symbian	39%
Android	14.5%
iPhone	13.7%
Windows Mobile	12.8%
BlackBerry	12.5%
Linux	5.4%
webOS	2.1%

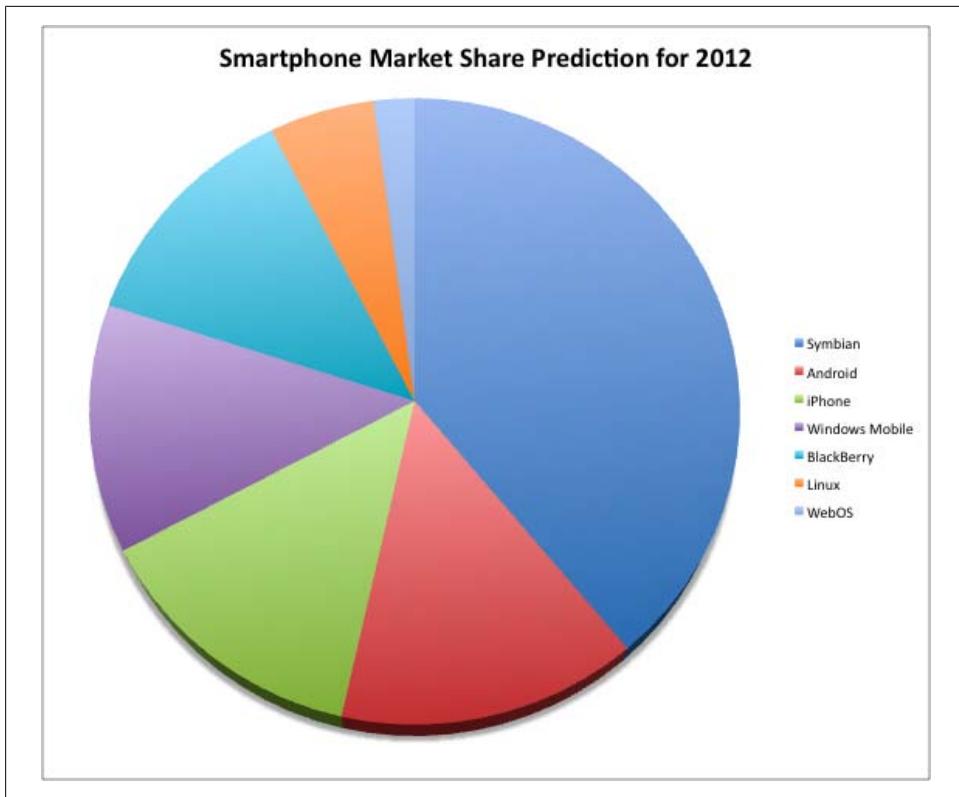


Figure 1-17. Gartner predicts that in 2012 Android will have more market share than iPhone, BlackBerry, and Windows Mobile. Symbian will continue its worldwide leadership.

Smartphones Versus Non-Smartphones

Phone-by-phone statistics are helpful, but a broader categorization can show a bigger picture. Luke Wroblewski (<http://www.lukew.com>) created a very extensive blog post about smartphone versus feature phone statistics found in different sources. The article can be found at <http://www.mobilexweb.com/go/lukestats>.

Here are some of the key points:

- The average smartphone user generates 10 times the amount of traffic generated by the average non-smartphone user.
- iPhones, in particular, can generate as much traffic as 30 basic feature phones.
- 35% of smartphone owners browse the mobile Internet at least daily, versus only 4% of feature phone owners.
- 80% of smartphone users have accessed mobile media on their mobile devices, versus 26% of non-smartphone users.

- 65% of smartphone users have accessed news/information sites on their mobile devices, vs. 14% of non-smartphone users.
- Data traffic for an iPhone operator is almost 14 times that of a non-iPhone operator.

Figure 1-18 shows another way of exploring localized device statistics. Remember that these statistics depend on the source and can change a lot over time.

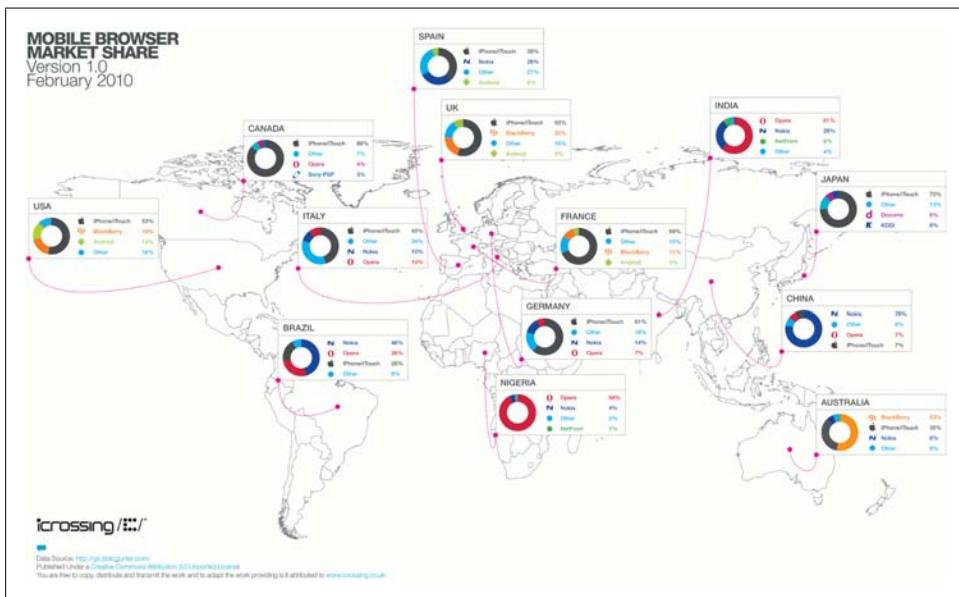


Figure 1-18. A nice updated mobile browser market share graphic based on StatCounter data is available at <http://www.icrossing.co.uk>.



You can find a list of updated mobile browser and device market share statistics in the statistics section of this book's blog, at <http://www.mobilexweb.com/go/stats>.

Mobile Browsing

Understanding the big picture about platforms, operating systems, brands, and models is important for getting started in the mobile market, but the most important information for us will be which mobile browser is used. Browsers will guide the rest of this book and most of our work as mobile web developers.

Many web developers curse desktop browsers and compatibility issues between them. Maybe you are one of them. But compared with the mobile world, in the desktop world the browser war is really simple: we have Internet Explorer (6, 7, 8, or newer), Firefox, Safari, Opera, and Chrome. And that's about it. In the mobile world, there are more than 5,000 devices on the market. The good news (compared with this number) is that there are fewer than 25 mobile browsers in common usage—every smartphone OS has its own mobile browser, but the proprietary operating systems for the low- and mid-end devices mostly use similar browsers. Still, the situation is far more complex than in the desktop world!

All mobile devices come with one preinstalled mobile browser, and very few of them can be upgraded or uninstalled. There are some exceptions: the browsers included with iOS, webOS, and Android are automatically upgraded when you update the operating system firmware. This can also be done in other operating systems, like Symbian or Windows Mobile, but up to now it's not an operation that users do frequently.

To complicate the situation, almost every device on the market allows users to add an alternative web browser, and some carriers, like Vodafone in Europe, include a copy of an alternative web browser customized for that operator, such as Opera Mini or Mobile, along with the factory-installed browser.

The Mobile Browsing Experience

The mobile browsing experience varies among different devices, and even among different browsers running on the same device. The user interfaces work very differently.

Browsing Types

A mobile website can be navigated using different techniques. Every mobile browser uses one or many of these modes of navigation. The modes are:

- Focus navigation
- Cursor navigation
- Touch navigation
- Multitouch navigation

Focus navigation, illustrated in [Figure 2-1](#), is the most frequent mechanism used for browsing websites on low- and mid-end devices. (Smartphones that have hardware cursor keys, a touchpad, or a scroll wheel sometimes use focus navigation as an alternative.) With this mode, a border or a background color is used to show the user where the focus is. In general it is used in non-touch devices, so the user uses the cursor keypad to navigate between links and scroll the website. Pressing the down key makes the browser change the focus to the next focusable object (e.g., a link, a text field, or a button), or scroll a couple of lines in the content if there is no other focusable object nearby.



Figure 2-1. Focus navigation on a low-end device.

Cursor navigation, illustrated in [Figure 2-2](#), emulates a mouse cursor over the screen that can be moved using the arrow keys. A mouse click is emulated with the Fire or



Figure 2-2. Cursor navigation on non-touch devices shows a typical mouse pointer that allows mouseover events and mouse effects in a website.

Enter key. For a better experience, many browsers jump the cursor to a nearby focusable object to reduce the distance the user has to move the pointer to use a link or a button.

Touch navigation may seem obvious, but we need to be aware of one thing: the user may navigate using a finger or a stylus. The differences in design can be huge; precision is much lower if fingers are used. Touch devices allow the user to use detectable gestures to easily perform some actions. We will cover gesture detection in later chapters.

Some devices are also *multitouch*, allowing the users to select many objects at the same time and incrementing the number of gestures that can be detected.

Zoom Experience

Analyzing how browsers manage zoom options reveals two different types of browser. The first type offers *basic zoom* capabilities: the web page is always rendered at 1:1 scale to the original design, and the user can only change the font size. If the design doesn't fit on the screen, the scrollbar comes in to solve the problem.

The second type offers *smart zoom* capabilities: the web page can be viewed at any zoom scale the user wants, and the zooming action affects the font size, images, and the web page as a whole. Based on a user gesture or menu option, we can switch from a full-page view to a paragraph view, as shown in Figure 2-3.

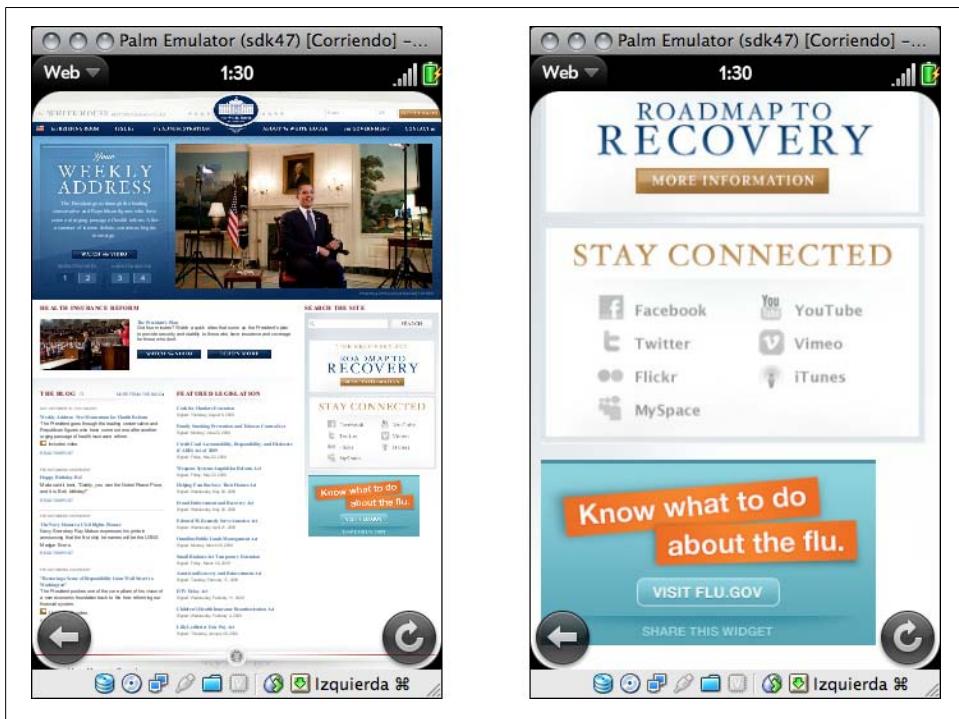


Figure 2-3. The webOS browser offers smart zooming. The entire website layout is rendered first, and when the user double-taps on part of the page the smart zoom focuses in on that area.

Some browsers use smart zooming like on a desktop: if a paragraph extends beyond the page width, when you zoom in you need to scroll horizontally (Safari on iOS is one example). Some others reflow the text when zoomed in to fit the page width (the Android browser does this), and still others (such as Opera Mini) reflow the page even when zoomed out.

Reflow Engines

Some mobile browsers aim to offer a better experience to mobile users browsing websites that were not designed for mobile devices by reflowing the pages to a one-column design. The smart zoom option has started to replace this technique, but there are still some browsers that use a reflow algorithm. For example, the result of using Opera Mini's "Mobile View" on the page displayed on the left in Figure 2-3 is shown in Figure 2-4.

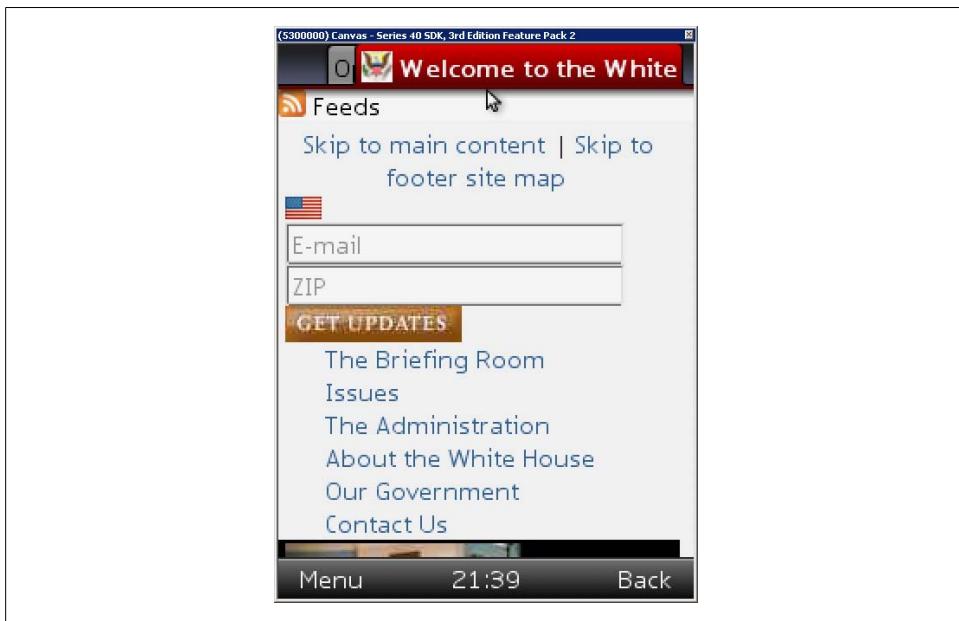


Figure 2-4. The same website as in [Figure 2-3](#) viewed with Opera Mini “Mobile View,” a reflow engine that autodetects navigation bars, content zones, and footers and shows us a one-column view of the site.

Direct Versus Proxied Browsers

Another difference we will find is between *direct* browsers, which get content directly from the website server, and *proxied* browsers, which go through a proxy server. The proxy server usually does many of the following actions on the fly:

- Reduces the content, eliminating features that are not mobile-compatible
- Compresses the content (images included)
- Pre-renders the content, so it can be displayed in the browser faster
- Converts the content, so we can see Flash Video in devices with no Flash support
- Encrypts the content
- Caches the content for quick access to frequently visited sites

Multipage Experience

There are very different approaches to multipage browsing (i.e., opening more than one web page at the same time). This can be initiated by the user, or by the developer opening a pop-up window or a link in a new window. Different browsers take different approaches:

- Only one page support
- Multiple windows (shown in [Figure 2-5](#))
- Windows stacks (shown in [Figure 2-6](#))
- Tab navigation

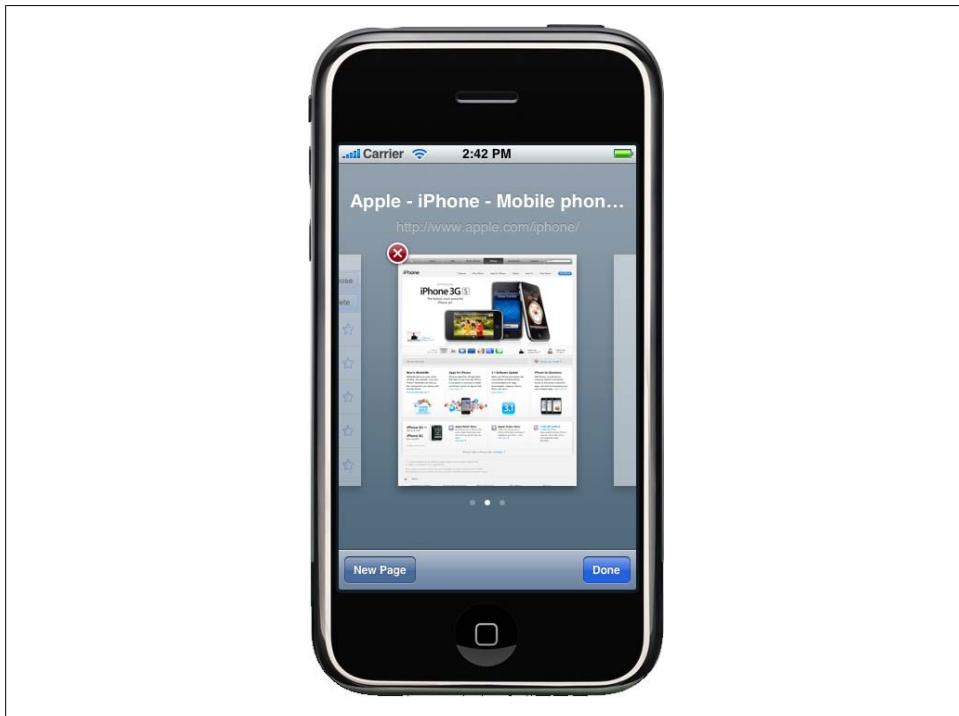


Figure 2-5. The iPhone browser has multiwindow support that allows the user to maintain up to eight different websites open at the same time. Android and webOS have similar features.

The WebKit Engine

WebKit is an open source layout engine for web browsers. It renders HTML and CSS websites and can execute JavaScript. It was created by Apple to be used in its Safari web browser for Mac OS X, and later Windows and iOS. As an open source project, there are many ports of the rendering engine, and today we can find many applications using it—for example, Google Chrome and Adobe AIR.

The great thing about WebKit is that almost everyone in the mobile world is using it (or wants to use it in the future). This means that even on very different mobile devices we can expect very similar web rendering with simple markup and styles, which is good news for developers. However, it isn't heaven—as we'll see in later chapters, many differences do exist between WebKit implementations.

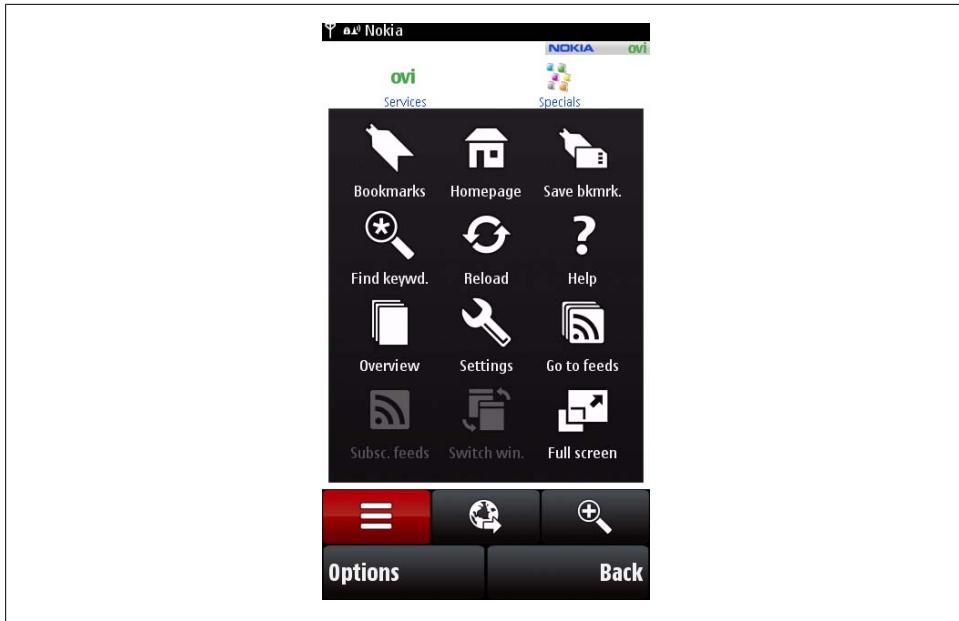


Figure 2-6. The Symbian browser maintains an opened window stack (accessed via “Switch win.”) when a website opens pop-ups or new windows. On most devices, the user cannot create new windows or tabs himself.

Preinstalled Browsers

Practically every phone has a preinstalled browser. Fortunately, there are fewer browser varieties than phone varieties.

NetFront

NetFront is a mobile browser created by the Japanese company ACCESS, targeting low- and mid-end devices. It is licensed by the manufacturer, and that's why we can find devices of many different brands using the same browser engine. NetFront is installed on thousands of Sony Ericsson, LG, Samsung, and ZTE devices, as well as on Amazon Kindle ebook readers. It was also included with the old Palm OS.

It has many different versions and it uses its own rendering engine. From NetFront 3.5, it supports cursor navigation and a feature called *Smart-Fit* that reorganizes websites to fit into a single column without horizontal scrolling.

Myriad

The Openwave browser was for many years one of the preferred mobile browsers to be preinstalled on low-end devices. In conjunction with NetFront, it is used for the majority of low- and mid-end browsing. Openwave was acquired by Myriad in 2008, and since that time it has been known as the Myriad browser. Like NetFront, it is used

by many vendors, including Motorola, LG, Sharp, and Kyocera. Up to version 7 it used its own rendering engine, but the company has announced that the next version will use WebKit.

Internet Explorer

Microsoft has its own mobile browser, called Internet Explorer Mobile. Formerly known as Pocket Internet Explorer (PIE), it can be considered one of the first mobile browsers on the market. The first version was released in 1996, for Windows CE 1.0. Up to version 6.5, it had its own rendering engine (based on IE4). Windows Mobile 6.5 was based on Internet Explorer 6 (it even identified itself as IE6). This version (see Figure 2-7) uses a desktop IE-derived engine and provides a better browsing experience with smart zoom capabilities.



Figure 2-7. Starting from version 6.5, IE Mobile has smart zoom features and a desktop-derived rendering engine.



Before Windows Mobile 6.5, the browser accepted focus navigation for smartphones and stylus touch navigation for Pocket PCs. Now, it supports both focus and touch for the latest devices on the market.

The new operating system, Windows Phone 7, is based on Silverlight and has an entirely multitouch UI. It comes with a new version of Internet Explorer Mobile, based on the

IE7 engine with some IE8 features mixed in (some have called it an IE 7.5 engine). It is likely to offer similar behavior to Internet Explorer 7, and multitouch support.

Safari on iOS

Safari is a WebKit-based browser bundled with iOS (formerly known as iPhone OS) that offers a great browsing experience and smart zoom options. It is updated with every operating system change to include new features that allow us to create better user experiences.

Safari on iOS is currently the only mobile browser to support a range of new features, including those that allow us to create animations, transitions, 3D, and Flash-like experiences using HTML, JavaScript, and CSS, but without Flash. We will cover this topic in [Chapter 7](#) and [Chapter 12](#).

This browser is designed only for touch and multitouch navigation. It doesn't support focus or cursor navigation because of the lack of a keyboard in the devices on which iOS is installed.

The official documentation for mobile Safari can be found at <http://www.mobilexweb.com/go/safaridocs>.



The only well-known big problem of the mobile Safari browser is its poor support for caching web content before iOS 4.0.

Nokia Series 40 browser

Every Nokia Series 40 device comes with a built-in web browser created by Nokia. Up to Series 40 5th edition, it was a simple browser without smart zoom capabilities, designed with low- and mid-end devices in mind. It was basically a focus navigation browser, based on Nokia's own rendering engine.

Beginning in Series 40 6th edition, the browser is WebKit-based (similar to Nokia's S60 browser), creating a new browsing experience for low- and mid-end devices. The main problem with this browser is that the low- and mid-end devices are not created with high-quality hardware, which can lead to some performance problems.

In 2010, Nokia acquired a browser company called Novarra that offers proxy-based web support. It is possible that new Series 40 devices created after this writing will come with a proxy-based browser based on Novarra's solutions to offer a better and faster browsing experience in these kinds of devices.

Sony Ericsson browsers

If we analyze Sony Ericsson's non-smartphone devices—that is, those not based on an operating system like Symbian or Windows Mobile—we can find three primary browsers in use, depending on the device's release date:

- Sony Ericsson WAP browser before 2004
- Sony Ericsson web browser from 2004 to 2006
- NetFront browser (version 3.3, 3.4, or 3.5) from 2006

Other browsers, such as Opera and even Openwave, were also preinstalled in some devices.

Devices that shipped with NetFront 3.4 or 3.5 support cursor navigation. In this book, we will focus on NetFront for Sony Ericsson devices.

Obigo browser

The Obigo mobile browser from Obigo/Teleca claimed 14% browser market share in 2007 (before the smartphone revolution). It can be found in Samsung, LG, Motorola, and Sony Ericsson devices and in many CDMA devices from some operators, like Verizon. Obigo also offers a widget solution implemented by LG Mobile.

The Obigo Q7 supports major web standards plus smart zooming, multiple windows, and RSS. It can run in several operating systems, including Symbian, Windows Mobile, Linux, and various native platforms.

Motorola Mobile Internet Browser (MIB)

Motorola devices based on the Motorola proprietary OS (excluding the company's Linux, Windows Mobile, Android, and Symbian devices) come with a simple proprietary browser that allows focus navigation and page scrolling. The last version was 2.2. As an indication of its limits, it can only render documents up to 10 KB.

Some other older devices came with the Openwave, Obigo, or Opera browser preinstalled. The same device model shipped at different dates and in different markets did not necessarily come with the same browser.

Symbian browser

In 2005, Nokia created an open source WebKit-based mobile browser for the S60 platform using Symbian (also known as the S60 OSS Browser). It supports smart zoom features (called *Mini Map Browser*) and has been installed on every S60 device since that year. Depending on the device, it supports focus, cursor, and touch navigation. Many devices support more than one navigation type; for instance, the Nokia N97 supports touch (finger and stylus) navigation, and cursor navigation when the keyboard is opened.



The Symbian WebKit browser is the browser with the highest install base in the market. However, this doesn't mean it's the most-used browser.

Some older devices that use an older Nokia proprietary browser without modern features are still on the market.

Android browser

The Android OS comes with its own browser, based on WebKit. It is called the Android browser (not Chrome, differentiating it from Google's desktop WebKit-based browser) and is a very powerful browser with touch support. It is often compared in terms of its standards and extension support to Safari on iOS.

The Android browser supports multiple windows, smart zooming, and many other advanced features.

webOS browser

The new Palm operating system comes with a WebKit-based browser that supports the latest web technologies. It supports touch navigation and a card concept that allows the user to open many websites at the same time and flip between them using a finger. Starting with OS 1.4, the webOS browser is based on a different version of the WebKit engine, so there may be differences before and after 1.4.



Older Palm devices using Garnet OS (Palm OS) 3.1 and later shipped with the browser Blazer.

BlackBerry browser

Every RIM device comes with a mobile web browser with focus navigation and, more recently, touch navigation support. Many versions of the browser are available, depending on the device. There are devices with trackball and cursor navigation, older devices with focus navigation, and newer smartphones with touch support.

The first generation of the BlackBerry browser was included with Device Software version 4.5 and earlier. The second generation, available from version 4.6, had a completely redesigned rendering engine. There are still a lot of first-generation browsers in devices on the market today, so we will need to target them if we are targeting BlackBerry users.

BlackBerry devices running OS 6.0 will have a WebKit-based browser more similar to other smartphone browsers. BlackBerry recently acquired Torch Mobile, creators of the Iris browser, which in the future will be available only for BlackBerry devices.

A BlackBerry can be connected to the Internet in different ways, depending on the device and the operator's plan:

BlackBerry browser

You access the Internet using your company's corporate intranet proxy. The documents are transcoded, compressed, and encrypted by the BlackBerry Enterprise Server, using your company's security policies.

Internet browser

You access the Internet directly using the BlackBerry Internet Solution as a compressor proxy.

WAP browser

You access the Internet directly using your operator's WAP gateway (1.0 or 2.0).

WiFi browser

You access the Internet directly using a Wireless LAN connection.

Newer BlackBerry devices support many browsers. The available browsers depend on whether you are a private customer with or without a BlackBerry server account or a corporate customer; there is no simple rule. The different browsers appear on the device as different applications, but they are mainly the same rendering engine connecting through different networks.

Samsung WebKit browser

The Samsung WebKit browser is installed with the new Bada OS. At the time of this writing there aren't yet any Bada devices on the market, and no information is available about the browser. The demo shows a modern web browser with smart zoom features.

MicroB (Maemo browser)

MicroB, the browser installed in Maemo (now MeeGo) devices (Linux-based Nokia devices), uses Mozilla's Gecko rendering engine, the same one used in Firefox. That is why MicroB is very similar to Firefox and understands some of the unique features of that browser.

MicroB was developed by Nokia and supports plug-ins, similar to Firefox. However, due to the lack of some XUL features, Firefox plug-ins must be rewritten to work on MicroB. Available plug-ins include Adobe Flash Player, Greasemonkey, Adblock, Gears, and Windows Media Player. The website for the MicroB can be found at <http://browser.garage.maemo.org>.

Japanese Mobile Web

In the mobile web world, the Japanese market is quite an exception. The three main carriers in Japan (DoCoMo, Softbank, and AU, with approximately 100 million subscribers) each have their own mobile web standards regarding markup, Emoji, geolocation, etc. that browsers preinstalled on their devices must support. They don't actually make their own browsers.

ACCESS's i-mode browser is the most common on DoCoMo devices, while Openwave is more common on Softbank and AU devices. Of course, there are also iPhones and other major brands on the market, using their own browsers and operating systems.

User-Installable Browsers

The market complicates the situation further: we also need to think about *user-installable browsers*. These are free and commercial web browsers that you can install after you buy a device. Sometimes they are included on the device by the vendor or the operator in a particular country or region.

Opera Mobile

I was an addict of Opera for the desktop for many, many years. Opera has lost the desktop browser war, but it took its experience in browser creation and entered the mobile world in 2000. Opera Mobile has been installed on 125 million smartphones since 2004.

Opera Mobile is a full browser with tab and cursor navigation that comes factory-preinstalled on some devices and is sometimes preinstalled by the carrier using an OEM license, replacing the default device browser.

Opera Mobile is also a product available to be downloaded by the end user for Windows Mobile and Symbian devices.

The latest versions support smart zooming, widgets, Opera DragonFly (a toolkit for developers), and Opera Turbo, a service that compresses web pages on Opera's servers, reducing traffic by up to 80%.

Opera Mini

My Opera addiction continues: Opera Mini is one of the best Java ME applications ever produced. It is a free browser that works on almost any device, including Android and iOS devices (iPhone, iPod, iPad). It supports "the full web" as a proxied browser. This means that if you browse using Opera Mini, you won't be accessing websites directly. Instead, the application will contact an Opera Mini server that will compress and pre-render the websites. This allows very quick full web navigation for every device, whether low-end or smartphone.

From version 4, it supports video playback, Ajax, offline reading, and smart zooming, even in low-end devices (see [Figure 2-8](#)). From version 5, it also supports tabbed browsing, a password manager, and touch navigation in devices with touch support.

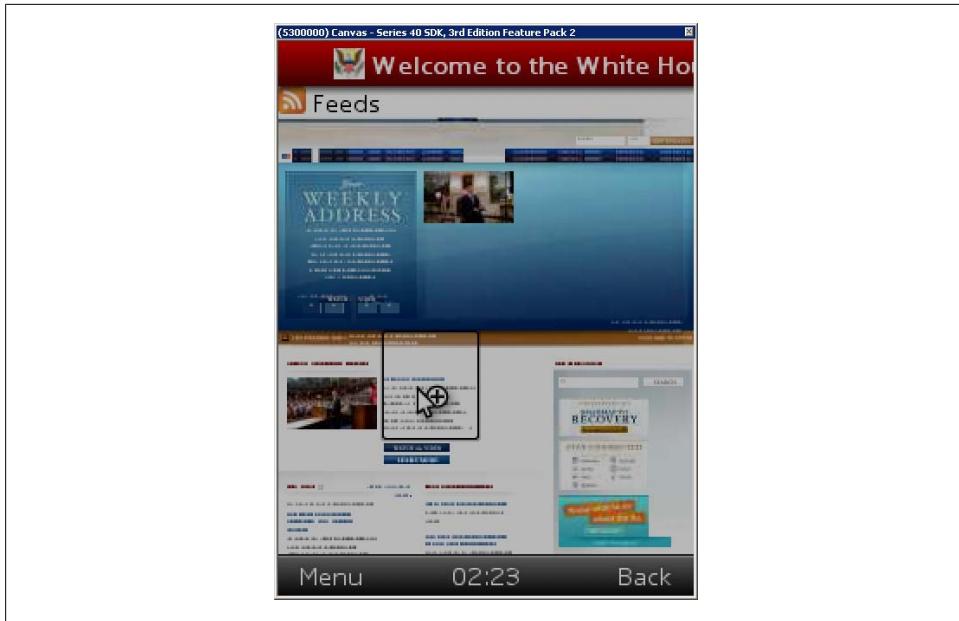


Figure 2-8. Opera Mini is an excellent option for low- and mid-end devices, offering a proxied browser with smart zooming for almost any mobile phone with Java ME support.



You can download Opera Mini for free by browsing to <http://m.opera.com> from your mobile device. The application has over 50 million downloads to date, and I know many Opera Mini fanatics in my social network that never use the preinstalled device browsers. For Android and iOS devices, you can find Opera Mini in the Android Market and the App Store.

Firefox for mobile

The Mozilla Foundation arrived a bit late to the mobile browser world. At the time of this writing, Mozilla offers a downloadable Firefox version for Maemo devices (the Nokia N900, for example), and a version for Android has been announced. Updated information is available at <http://www.mozilla.com/mobile>.

You can download the mobile version of Firefox from <http://m.firefox.com>. It uses the same Gecko engine as the Firefox 3.6 desktop browser.

For alpha releases, you can find information using the code name Fennec, at <http://www.mozilla.org/projects/fennec>.

UC Browser

The UC Browser (formerly known as UCWEB) is the #1 browser in the Chinese market and is now available in English for other markets. It is a proxy-based browser supporting

full HTML and JavaScript, multiple windows, and many advanced features. Free downloads are available for Java ME, Windows Mobile, Symbian, and even iPhone devices (only those with jailbreak). Android and BlackBerry versions have been announced, too.

You can download the browser from <http://www.uc.cn/English>.

SkyFire

SkyFire is a free proxied browser for Windows Mobile, BlackBerry, and S60 with full web support and support for Flash and video streaming. Websites are pre-rendered on the SkyFire server, using the Gecko rendering engine (the same as Firefox/Fennec). You can download it from <http://www.skyfire.com>.

Bolt

Bolt is another free proxied browser that allows the user to see full websites, including video and audio content. It is based on Java ME, like Opera Mini, and it's also compatible with BlackBerry devices. A Bolt Lite version without multimedia support is available for low-end devices. You can download Bolt from <http://www.boltbrowser.com>.



Other browsers not covered here include Blaze for Garnet OS (formerly Palm OS); ibisBrowser, a Japanese Java ME-based browser; Konqueror Embedded for Linux devices; Steel, a free Android alternative browser; Phantom browser for new LG devices; and ThunderHack for Windows Mobile, Symbian, and Java ME devices.

Chromium

Chromium is the name of the open source project for the Google Chrome desktop browser. As it's an open source project, anyone can create a port for different mobile devices. At the time of this writing, there are non-official compilations for Maemo (N900), but Google has not officially ported the browser to any mobile devices.

Browser Overview

That list of browsers is a lot to digest. [Table 2-1](#) compares key features of the most commonly used browsers on the market.

Table 2-1. Mobile browser features

Browser/platform	WebKit engine	Smart zoom	Proxyed	Navigation
Safari	Yes	Yes	No	Multitouch
Android browser	Yes	Yes	No	Multiple ^a
Symbian/S60	Yes	Yes	No	Cursor ^a

Browser/platform	WebKit engine	Smart zoom	Proxyed	Navigation
Nokia Series 40	No <= 5 th ed. Yes >= 6 th ed.	No	No (expected in the future)	Touch ^a Focus
WebOS	Yes	Yes	No	Touch
BlackBerry	No <= 5.0 Yes >= 6.0	Yes ^a	Yes/No ^b	Cursor Touch ^a
NetFront	No	No	No	Focus ^a Cursor ^a
Openwave (Myriad)	No (yes in the future)	No	No	Focus
Internet Explorer	No	No < 6.5 Yes >= 6.5	No	Focus Touch ^a
Obigo/Teleca	No	Yes >= Q7	No	Multiple ^a
Motorola Internet Browser	No	No	No	Focus
Opera Mobile	No	Yes	Yes/No ^c	Focus
Opera Mini	No	Yes	Yes	Cursor Touch ^a
Bada browser	Yes	Yes	No	Touch
MicroB for Maemo	No (Gecko)	Yes	No	Multiple
Firefox	No (Gecko)	Yes	No	Multiple
UC browser	No	Yes	Yes	Multiple

^a Depending on the device.

^b Depending on the connection method.

^c Depending on the usage of Opera Turbo as a proxy.

Mobile Web Eras

Don't panic; this isn't a history class. However, it is useful to be aware of the history of the mobile web. This is recent history: the first mobile web platform was developed less than 15 years ago. Analyzing this history can help us to understand the technologies behind the mobile web, and compatibility issues.

WAP 1

The mobile Internet appeared at the end of the last millennium. I remember all the advertising on the streets and in TV commercials. A wide range of operators started to offer mobile web browsing, with one or two devices with Wireless Application Protocol (WAP) browsers.

What Is WAP?

The Wireless Application Protocol is a standard for application-layer network communication in the mobile world. With the exception of the i-mode protocol used in Japan and briefly in other countries, WAP is the primary protocol used by operators worldwide.

The WAP standard describes a protocol suite that allows the transportation of information between a device and the Internet (via a WAP gateway), and list of standard recommendations for the content to be transmitted. It was created by the WAP Forum (converted in 2002 to the Open Mobile Alliance, or OMA).

For many years the term “WAP” was used incorrectly, to refer to a document type (“a WAP file”) or a website as a whole (“I’ve developed a WAP”).

WAP has two main versions: 1.1, released in 1998, and 2.0, released in 2002 (this is the actual standard). Many users are not even aware of the existence of the newer version.

I can remember traveling by train in my home city in 2000, using the first device with a WAP browser (my Nokia 7110, famous because of its similarity to Neo’s phone in the film *The Matrix*). My operator had an excellent promotion: free browsing for two months. I was browsing a website with an ICQ client, and nobody in my buddy list could believe that I was chatting from my mobile phone. The free browsing promotion wasn’t very popular, because at the time few people understood what the mobile Internet was. When I received a \$300 bill for “voice calls” I realized that I was probably the only one using that promotion (of course, I didn’t pay the bill, because it was supposed to be free!).



Some WAP 1.X browsers were so simple that they didn’t even have a Back feature—the developer was responsible for providing a link back to the previous page.

At that time, mobile devices connected to the Internet using a voice call as a modem communication. So, every minute you were connected was charged as a voice call minute. The devices with browsers had black and white screens without image support (or very basic support) and could display only three or four lines of text on the screen. This early version of the mobile Internet was a failure. It was expensive and did not offer any useful services. The overall user experience was very poor.

A few years later, 2.5G technologies such as the General Packet Radio Service (GPRS) appeared on the market. These technologies allowed us to browse the Internet (even WAP 1 sites) and be charged according to the number of kilobytes transferred, no matter how many minutes we were connected to the Internet.

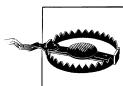
This first mobile web was defined by the WAP 1.0 standard (which, in practice, never existed on the market, having quickly been replaced by WAP 1.1). That standard suggested Wireless Markup Language (WML)—an XML version designed for mobile devices that was not compatible with the HTML standards—as the document type for the web content. The devices communicated with the operators' WAP gateways using WAP protocols, and the gateways translated the communications to HTTP and passed them on to the destination web servers. WAP 1.X is not recommended today, as it has been replaced by new technologies.



The HTML 3.2 subset in the Japanese i-mode service was one of the first languages that shifted the mobile web away from the old HDML (Handheld Device Markup Language) and WML and pushed it toward HTML and, eventually, XHTML.

Mobile browsers in this era were called “WAP browsers,” and websites using this standard were called “WAP sites”—“WAP” was used instead of “web.” This created a perceived distinction between the two (WAP appeared to be different from the Web).

At this time, the de facto standard for publishing WAP sites on the Internet was the use of the *wap* subdomain. So, for example, we could access Yahoo!'s WAP site using the URL <http://wap.yahoo.com>. Even today, it is not uncommon to find this domain pattern in use for mobile websites.



Most low- and mid-end devices on the market today still support WAP 1.0 content, but the browsers on newer smartphones (like the iPhone, Android, and webOS devices) don't support WML content anymore.

WAP 2.0

The last OMA standard, WAP 2.0, was released in 2002. The first WAP 2.0 devices appeared in 2002, and almost every device on the market today is WAP 2.0 compatible (with some exceptions in the last few years). This standard is nearer to the web standards than the previous version and allows HTTP communication between the device and the server. The WAP gateway acts only as a proxy in the operator network.

WAP 2.0 deprecated WML and created XHTML MP (Mobile Profile), along with other companion standards that we will analyze in detail in [Chapter 5](#). Surprisingly, after this new standard was released the word “WAP” dropped out of usage and “mobile web” started to be used. So, if we talk about a “WAP site” today, it will be understood that we are referring to a WAP 1.1 website.

Many sites continued to use the *wap* subdomain for mobile websites, while others started using the other de facto standard for publishing mobile websites, the *m* subdomain (“m” for mobile). For example, today we can access the Google Mobile website

using <http://m.google.com>, or the popular Facebook social networking site using <http://m.facebook.com>.

Even now, nearly 10 years after WAP 2.0 was released, it is still normal to find WAP 1.1 sites using WML on the Web. The only well-known desktop browser that can render WML pages without a plug-in is Opera.

WAP Push

WAP Push is a standard available since WAP 1.2 that allows content to be pushed to a mobile device at any time. A WAP Push is generally an SMS (Short Message Service) message to a special port with a URL to content or a website. When a device receives a WAP Push, it asks the user if he wants to go to that URL. This method is used by content portals to push games, ringtones, and other premium content when you ask for that content using SMS. There are also some silent pushes from the operator that the user doesn't receive any feedback about.

WAP Link is a similar solution, but it sends an SMS to the user's inbox. The message contains a URL. Modern devices autodetect URLs inside the text messages and convert them into links that the user can click on.

The dotMobi era

dotMobi (*.mobi*) is a top-level domain (TLD) approved by the Internet Corporation for Assigned Names and Numbers (ICANN) in 2005 and made available to the public at the end of 2006. It was approved to be used as the main domain for the mobile Internet and it had the support for many software companies, Internet companies, manufacturers, and operators. So, if you have the domain *yourcompany.com*, you should use *yourcompany.mobi* for your mobile website. The idea was original and some big companies have gotten on board (for example, Nokia uses *nokia.mobi*), but it's not as well supported as everyone wanted. For example, there is no browser with a shortcut to *.mobi* when you are typing in a URL address (there are shortcuts for *.com*, *.net*, and *.org*).

The TLD is managed by mTLD, an organization with many services and web portals centered around the mobile web. Any *.mobi* site should be WAP 2.0 compatible, but there is no technical obligation for this. You can buy a dotMobi domain from any registrar and host it anywhere, without any limitation.

The main criticism of dotMobi is that it created two Internets, a desktop Web (*.com*, *.net*, etc.) and a mobile Web (*.mobi*), rather than promoting a single Web that can be browsed from different devices.

On-Device Portals and rich clients

As WAP 2.0 had limited multimedia features and there were porting problems between platforms, many medium and large websites started to create applications to be installed on mobile devices that would allow mobile users to browse their content and services. Yahoo! was one of the first big portals to create an *On-Device Portal* (ODP), called Yahoo! Go. It offered a better experience for mobile users to access Yahoo!'s web services, with options not available for a web browser. The other great advantage is that an icon for the website appears in the user's applications menu or even on the home screen. It was discontinued in 2010 and replaced with a new mobile website.



In [Chapter 12](#) we will analyze mobile widgets and offline web applications that can be compared to the On Device Portal solution, but use the same multiplatform web technologies described in this book.

The disadvantage, of course, is that a different version of the ODP must be created for every platform: Java ME (and many portings), BlackBerry, Windows Mobile, Symbian, iPhone, and so on.

There are also many companies offering ODP solutions to distribute web content via operators or websites. These solutions are also known as *rich clients*. For example, Google Maps offers the interface in [Figure 2-9](#), and Facebook has a mobile website and a rich client for some devices, such as Symbian and iOS devices, shown in [Figure 2-10](#).



Figure 2-9. Google Maps offers a mobile web interface and, optionally, a free rich client (some kind of On-Device Portal) with a richer UI.



Figure 2-10. Facebook is one of the Web 2.0 websites offering both a mobile browser version and a rich client version. We can see both versions here on a Nokia X6 with Symbian.

Mobile Web 2.0

I could write a whole book about Web 2.0, but...what is Mobile Web 2.0? There isn't a single definition. Mobile Web 2.0 began in 2007, with the new smartphones that appeared on the market (iPhone, Nokia N95, Android devices, etc.). These devices introduced great changes for the mobile web: WiFi support, 3G, full desktop browsers (not only WAP 2.0), Ajax or Flash support, and streaming video. At the same time, thousands of social networks, blogs, and user-generated content portals appeared.

All these ingredients created Mobile Web 2.0, which to date has advanced more than Web 2.0 itself. That's why we can find HTML 5 mobile browsers, but a few HTML 5 desktop browsers on the market today. Clearly, the market really wanted to create better mobile web experiences than the ones delivered only with WAP 2.0.

Mobile Web 2.0 sites typically have many of the following features:

- Ajax or Rich Internet Application experience
- Geolocation
- Offline working capability
- Social networking activities

- Contextual ads
- On-demand/live video streaming
- HTML 4/5, CSS 2/3, JavaScript
- Touch/multitouch support

As we can see from [Figure 2-11](#) (and, no doubt, from personal experience), social networks are increasingly being accessed from mobile devices, and the predicted trend is for continued growth.

Mobile Social Network Users Worldwide, 2007-2012 (millions)						
	2007	2008	2009	2010	2011	2012
Mobile phone subscribers*	3,078	3,417	3,697	3,894	4,150	4,275
Mobile Internet users	406	490	596	757	982	1,228
Mobile social network users**	82	147	243	369	554	803
Mobile social network users % of mobile phone subscribers	2.7%	4.3%	6.6%	9.5%	13.3%	18.8%

*Note: *data for 2007-2010 from European Information Technology Observatory (EITO), March 2007; **registered users (identified by their mobile number) who create, edit and view personal content using their phone*

Source: eMarketer, April 2008

www.eMarketer.com

Figure 2-11. The numbers of mobile Internet users and mobile social network users are expected to grow rapidly over the next few years.

Architecture and Design

While this is not a book about design, understanding some architectural and usability concepts is critical to creating useful mobile services. Many common desktop web design patterns and usability concepts do not apply in a mobile environment.

Website Architecture

Yes, a mobile website is still a website. The details are very different, however.

Navigation

When creating your mobile web concept, before you do any coding you should define what will be in the navigation tree for the user. To do that, you need to understand what services and information will be available for the mobile user. Always remember the *80/20 law*: 80% of your desktop site will not be useful to mobile users. Therefore, you need to research the 20% you should be focusing on.



You can decide that you won't have a mobile website and just want to allow access to your desktop site to full HTML smartphones. If you're sure you will have mobile users I don't recommend you leave the desktop website as-is, but if you do decide not to create a separate mobile site, you will see later in this book how to optimize your desktop website for better visualization in smartphones.

Here are some tips you will need to follow:

- Define the use cases (for example, find a product price, find a store near you, call us, or perform a search).
- Order the use cases by the most frequent for a mobile user. Use your best guess, statistical information, and usability tests to keep this order updated.

- Do your best to make every use case successful in no more than three clicks or at a page depth of no more than three.
- Define approximately three main sections below the home page. If you need more, you should separate your service into more mobile pages.
- Always offer a link to the desktop website.
- Determine whether locating the user is useful for your services.
- Reduce the form pages for user input to the minimum.
- Avoid startup or welcome screens.
- Do your best to predict users' input based on the context and their browsing history to reduce the number of selection pages and clicks required.

Context

Remember that a mobile user has a different context than a desktop user. You should think about and define your users' possible contexts:

- Where is the user?
- Why is the user accessing your mobile website?
- What is the user looking for?
- What can you offer from a mobile perspective to help solve the user's problem?
- Where will the user be when accessing your website? Walking on the street, using public transportation, at the office, traveling as a tourist?

The context will tell you many things about your navigation, use cases, and the usability needs for your mobile site.

A Bad Example of Navigation

I have imprinted in my mind a bad example for navigation in a mobile website. In my city, years ago (but still online right now), there was a free mobile web service to get public bus time slots. It is a great service for mobile web users; you are on the move, you need to take the bus, but you're not sure when it will arrive. Should you go for a coffee first?

When you first enter the site, you see a welcome page with a Begin link. After that, you have to choose from a list which bus line you want to query. Then you see a list of final stops for that line, to select your orientation. The first problem is whether you know the name of the final stop in the direction you want to travel. After selecting your orientation, you have to choose the stop or station where you want to get on the bus. There is a list of around 50 addresses, ordered alphabetically. If you don't know the street name for the stop you want, you will need to make an average of 25 clicks to find the right one.

Once you've found your stop, you need to select whether you want a normal bus or a bus with accessibility support. Finally, the service informs you when the next two buses

will be arriving. You have two navigate through six pages and choose from a 50-item list to get the result.

In my city, on weekdays during the day buses have a very short delay time (between 5 and 8 minutes), so what will be the most common context for the service? Probably night and weekend services. The first time I really needed the service was at 1 am, coming back from an event. I completed the six-step query only to receive a “There is no information” message. The service did not work at night!

What could be done to improve navigation? Avoid the welcome screen, the accessibility support selection page, and maybe also the direction selection (we can usually guess it from the stop, and even if the stop has service in two directions, information for both can be shown). The stop selection could be improved with features such as a search box, a list filtered by neighborhood, a list of nearby points of interest (museums, cinemas, etc.), a location query, a history of stops used before (perhaps using cookies), and so on.

Progressive Enhancement

Progressive enhancement is a simple but very powerful technique used in web design that defines layers of compatibility that allow any user to access the basic content, services and functionality of a web and providing an enhanced experience for browser with better support of standards.

The term was coined by Steven Champeon (<http://www.hesketh.com>) in 2003, and while this approach wasn't defined for the mobile web specifically, it is really perfect for mobile web design. The concept subverts the typical web design strategy, known as “graceful degradation,” where designers develop for the latest technologies and browsers and their designs automatically work with the lesser functions available on older browsers. This technique is not useful for mobile browsers because, as we will see, there are serious compatibility issues in the mobile world. If we develop a website for the latest device (for example, the iPhone), it may not automatically work on other, less advanced devices.

Progressive enhancement has the following core principles:

- Basic content is accessible to all browsers.
- Basic functionality is accessible to all browsers.
- Semantic markup contains all content.
- Enhanced layout is provided by externally linked CSS.
- Enhanced behavior is provided by unobtrusive, externally linked JavaScript.
- End user browser preferences are respected.

We will add some other ingredients to this recipe when talking about mobile devices. The objective is to have one only code that is compatible with all devices. And, as we are going to discuss later, we must provide the right user experience on every device.

We shouldn't create lowest common denominator websites just so that they will be compatible with all devices, and we shouldn't create overly complex mobile websites that will only work on high-end smartphones.

In the mobile web, a progressive enhancement approach will also include some server-side detection and adaptation that will be mandatory for some specific mobile markup (sending an SMS, for example).

From my point of view, a mobile web design approach should have the following layers that will be added using a progressive enhancement strategy:

1. Create valid and semantic markup containing only the content—no CSS, no frames or iframes, no JavaScript, and no Ajax. All the content and services on the website (with the exception of some nonstandard features, like geolocation) should work with this simple version.
2. Insert in the document any special tags or classes required for device-specific functionality, such as call-to links or a file upload form control.
3. Optionally, from the server, decide which MIME type you will be using (this will be covered in [Chapter 5](#) and [Chapter 10](#)) and recognize the device.
4. Optionally, from the server, replace the special tags inserted in step 2 with real markup depending on the device capabilities.
5. Add one CSS layer for basic devices, one for high-end devices, and one for some specific smartphones (Android and iPhone devices, for example). You can insert all the markup at the same time using CSS media queries (to be covered in [Chapter 7](#)), or use a server-side mechanism to decide which CSS file to apply.
6. Add an unobtrusive basic JavaScript layer for form validation and other basic features.
7. Add an unobtrusive Ajax layer for content updating, capturing the onclick event of every link.
8. Add an unobtrusive JavaScript layer and a CSS layer for advanced features (animations, effects, geolocation, offline storage, etc.).
9. Optionally add widget support using a new layer.

We will cover most of these technologies over the next few chapters. The most important part to understand right now is that using this strategy all devices receive similar markup (with minor changes if we use a server-side adaptation engine), and using CSS and JavaScript we add layers of behavior and design adapted to each device.

Different Version Approach

A different approach is to create n different versions and redirect the user to the appropriate one depending on the device detected. The main problem with this approach is that we need to maintain n different versions of the same document.

If this will be your strategy, expect to need a minimum of four versions for a successful mobile website, with an optional fifth. If you create fewer versions, some users will probably have a bad experience with your site.

Using a server-side adaptation mechanism, you can reduce the number of required versions to two: one for low- and mid-end devices and one for high-end devices and smartphones. In the high-end and smartphone world it will be better to use an adaptation strategy for the many features that are not compatible with all devices. Broadly, here are the features you will need to consider for each device category:

Low-end devices

Basic XHTML markup, maximum screen width of 176 pixels, basic CSS support (text color, background color, font size), no JavaScript

Mid-end devices

Basic XHTML markup, average screen width of 240 pixels, medium CSS support (box model, images), basic JavaScript support (validation, redirection, dialog windows)

High-end devices

XHTML or HTML 4 markup, average screen width of 240 pixels, advanced CSS support (similar to desktops), Ajax and DOM support, optional touch support, optional orientation change support (for an average screen width of 320 pixels)

Advanced smartphones

HTML 5, large screen size and high resolution, touch support, support for CSS extensions (animations, effects) and Ajax, storage, geolocation

Old devices (optional)

WML (we will discuss this in [Chapter 5](#))



I've seen a lot of browser grouping techniques to decide which versions or features we can use in each browser group. The reality is that browsers are so different that there is no way to group them that guarantees all members will have the exact same features. In the next chapters, we will analyze compatibility browser by browser and feature by feature. I suggest you create your own groups based on your code features and the website versions you will design.

Design and Usability

Designing a mobile website can be a challenge at the beginning. Unless you are working on a website for only one device, forget about creating an exact pixel-by-pixel web design. Your mobile website will look different on every device it's viewed on; you need to accept this and, keeping it in mind, create a strategy to create the best web design you can.



The best advice I can give you about mobile web design is: Keep It Simple! However, that doesn't mean Keep It Ugly.

A mobile website ideally consists of vertically scrollable documents. The typical two- or three-column design is not suitable for mobile web pages. Every mobile web document has a few identified zones:

- Header
- Main navigation
- Content modules
- Second-level navigation
- Footer

These sections will be created one after the other in a vertical scope. Only for devices with a landscape orientation and smartphones it is suitable to create an alternative organization where you can move the main navigation section to a right-side column.



On high-end smartphones, your main navigation can become a top or bottom tab bar, and the content modules can shrink with an accordion or master-detail design.

When you are creating a mobile version of an existing desktop website, you need to understand that you are mobilizing the website, not minimizing it. Minimizing (or miniaturizing) a desktop website simply involves displaying the same content on a smaller screen. Mobilizing is more than that; it requires understanding the context and offering your services and content in a manner that is useful and allows for quick access by the user.



If you are designing a mobile Rich Internet Application or a webapp using Ajax, you should always insert in the UI a background operation icon to alert the user when a background connection is in progress. An offline button could be useful if the user is not on WiFi or is in roaming mode and doesn't want to get updates for a while.

Some best practices include:

- Avoid horizontal scrolling.
- Maintain visual consistency with your desktop site, if you have one.
- Reduce the amount of text.
- Use legible fonts on every screen; don't rely on the resolution.

- Use background colors to separate sections.
- Keep the main navigation to three or four links.
- Maintain the total link count at no more than 10 per page.
- For low- and mid-end devices, don't insert more than one link per line.
- Use all the available width (i.e., not columns) for links, list elements, text inputs, and all possible focusable elements.
- Provide a Go to Top link in the footer.
- Provide a Back button in the footer (some browsers don't have a Back button visible all the time).
- Provide the most-used features at the top.
- Group large lists by categories, each with no more than 10 items (for example, country selection by selecting the continent first).
- Minimize the amount of user text input required.
- Save the user's history and settings for future predictive usage.
- Split large text articles into pages (with page size depending on the richness of the browser).
- Try your color palette in different environments. Users may be in a place with poor lighting, on public transport, at the beach in bright sunlight, or in an office with fluorescent lighting.
- Provide different styling for touch devices.
- Think about fluid (liquid) designs for best adaptation.
- Use lists rather than tables.
- Don't use text images.
- For touch and cursor-based devices, use full-width links so that a link will activate if the user clicks on any pixel in the line containing it. Make sure there is only one link in each line.
- Use high-quality color images and fancier features stuff for smartphones (we will discuss optimizing later).
- For cursor navigation, create medium-sized clickable zones for the cursor, moving by 5 or 10 pixels every time. Do not make the user travel a lot using the cursor; design all the clickable buttons near each other.
- If you are providing a shortcut, a widget, or an offline version of your mobile website, create an alert at the top of the design (generally with yellow background) alerting the user to download it. Don't show that alert after many views or after the user has entered the download area. We will cover these techniques in Chapters [12](#) and [14](#).



Keep the text on your site to a minimum. Read every paragraph five times, and you will always find some word you can remove or a shorter way to say the same thing.

For low- and mid-end devices, it is preferred to use a table design instead of floating divs, like in the first years of the desktop web. But keep in mind that using more than one item, link, or idea per line isn't a good practice on those devices.

I Didn't Want to Buy It!

Many years ago, I was browsing my operator's deck portal checking the games and content available for my device. I remember accessing the details of one game and seeing a screen that offered to let me buy it and have the charge added to my phone bill. I didn't want to buy the game.

The page asked me for permission to make the charge and offered two links, YES and NO. Both links were in the same line, one after the other. The focus was in the YES link (of course). What did I do? Unconsciously, I pressed the right key to shift focus to the NO link.

What happened? The right key was a “go-to-link” action for my browser! I could only change the link focus using the up and down keys (like a tab), no matter where the links were located. So, because of a usability problem, I had to pay for content I didn't want.

That is why we need to test our websites on a wide range of real devices, and why I advise you to use only one link per line when targeting low- and mid-end devices.

If you want to get deeper into mobile web design, you can read *Mobile Design and Development*, by Brian Fling (<http://www.flingmedia.com>), also published by O'Reilly. Another excellent resource is Design4Mobile (<http://patterns.design4mobile.com>), which provides a list of mobile web design patterns with explanations and examples.

Among the Design4Mobile patterns, I recommend that you read the following:

- Screen Design Basics—presents dozens of small tips for markup.
- Screen Design Patterns—provides a list of common solutions for designing buttons, list-based layouts, fisheye lists, zoom lists, search results, breadcrumbs, carousels, and text input fields.
- Application Navigation—describes how to manage list navigation, autocomplete, the back button, and other stuff.



If your navigation requires going back frequently, you should check whether the browser maintains the scroll position after going back. If not, you should probably create Back links with anchors to scroll to directly where the user was.

Glyphish (<http://www.glyphish.com>) is a free iPhone-styled gallery where you can find icons to use for lists, tabs, and buttons. Figure 3-1 shows a sample of the available designs.

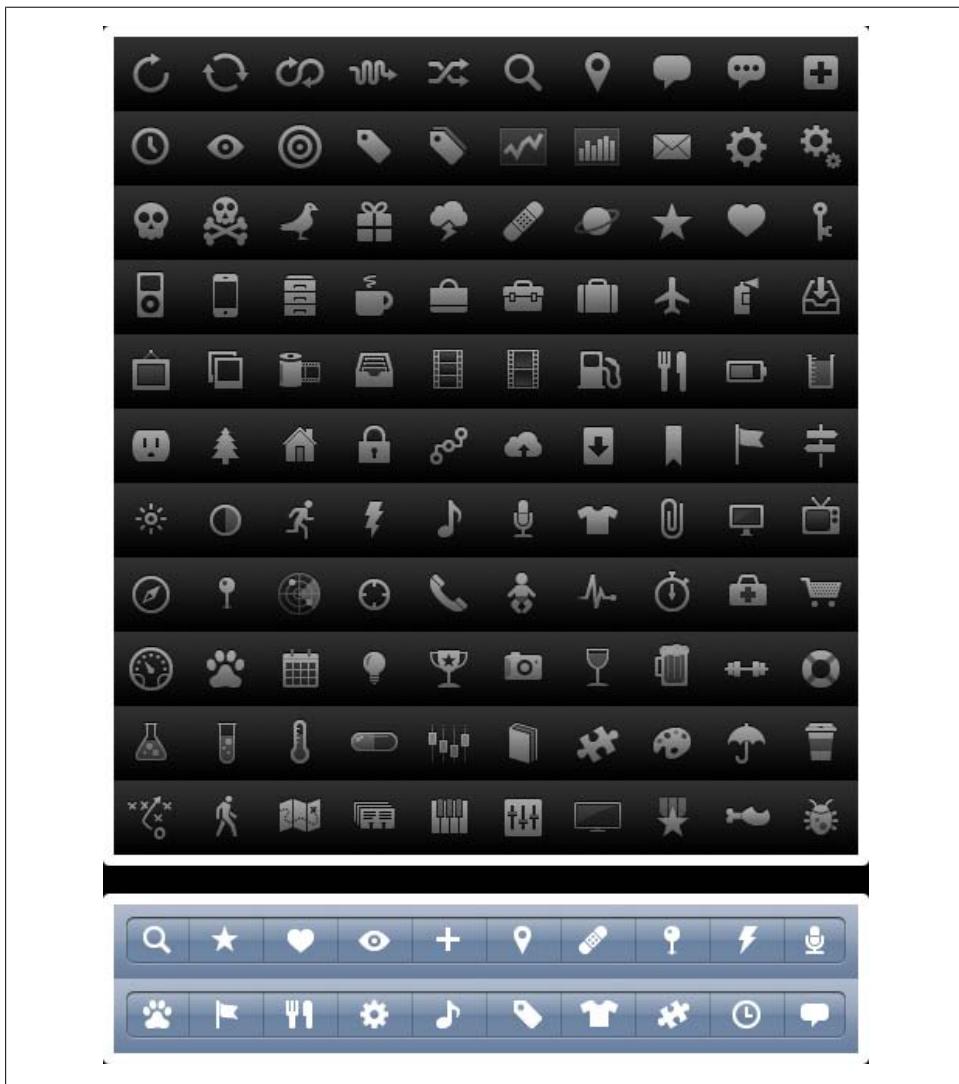


Figure 3-1. Some of the free icons for touch devices available at Glyphish.



Some low- and mid-end devices have buggy CSS implementations, like the 100% width bug that generates a minimal (and annoying) horizontal scrolling action when this style is used on an element. You should test your design and change your strategy when things like this happen.

Touch Design Patterns

Touch devices have unique features in terms of design and usability. With the same amount of effort, the user can access every pixel on the screen; this encourages a different way of thinking about a design. Another difference is that the user will use her finger for touch selection (unless it is a stylus-based device). A finger is big compared to a mouse pointer, and the hit zone should reflect this.



The Touch Gesture Reference Guide is a great resource put together by Luke Wroblewski (<http://www.lukew.com>) that contains an overview of core gestures for most touch commands, how to utilize gestures, visual representations of each one to use in documentation, and an outline of popular software platforms supporting them. You can download it from <http://www.mobilexweb.com/go/touchguide>.

Here are some useful design tips for touch devices:

- When the user touches the screen, parts of it will be obscured. Think about what will be hidden, and if it is important. Consider both right- and left-handed users.
- Provide a reasonable amount of space (20 pixels or more) between clickable elements.
- For frequently used buttons and links, provide a big clickable area (minimum 40 pixels width and height).
- For less frequently used buttons, you can use a smaller area (minimum 25 pixels).
- Provide quick feedback when a touch is accepted.
- Think about how scrolling will work.
- When using form input fields, try to insert the label above and hints below, not to the right or left of the input field. Generally, touch devices with virtual keyboards zoom in on the field when the user moves the focus to it, so the user will not see what is at the right or left of the input field while typing.



Nokia has recently released Flowella, a free tool for creating design prototypes for mobile applications by using mock-ups and defining links between screens. It can export designs to Flash Lite or WRT widgets for Symbian, and it is ideal for testing the look and feel of an application. You can download it from <http://www.mobilexweb.com/go/flowella>.

- Use finger gestures on compatible devices.
- Use infinite lists instead of pagination. An infinite list, like that shown in [Figure 3-2](#), has a “More” final item that the user can click to dynamically add more elements to the list (via Ajax or other techniques). For performance purposes, you should reduce the number of pages shown at the same time. When adding new

pages, the best way to approach this is to eliminate the first page from the DOM and create a “Previous” first item when the count reaches n pages (for example, 5). Doing this ensures that you will not have more than n pages shown at the same time.

- Use an auto-clear textbox feature for the most common text inputs. This is just an X icon at the right of the text input box that the user can click to automatically clear the input.
- Use the long-press design pattern (also known as “touch and hold”) for contextual actions. This means that if the user presses a zone for 2 seconds or more, you can show a pop-up menu with contextual options.
- Prefer bottom-fixed to top-fixed tab navigation. The bottom of the screen (or the right, in landscape mode) is nearer the finger while browsing than the top zone.
- Analyze native touch applications for usability ideas.



Figure 3-2. An infinite list offers an option to load more items in the same list using Ajax.

Panorama UI

A panoramic user interface, shown in [Figure 3-3](#), is a great design pattern for touch-enabled smartphones. It gives you the ability to create a big interface (normally horizontally oriented) and treat the screen as just a window into that big panorama.

For example, for a screen width of 320 pixels, you can design a big UI—say, 1600 pixels wide, with five different sections—and the user can flip from one screen to other using a finger gesture, dragging the whole interface.

A great design tip (used in Windows Phone 7, for example) is to use the last 5–10% of the pixels on the right side of the screen to show the first pixels at the left edge of the next screen, even cropped. This pattern allows the user to understand that more information, menus, or actions are available off the right side of the screen, and that dragging the whole screen will show that hidden information.

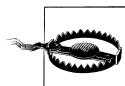
Remember, with a panoramic UI, you have to think of the viewport as just a window into the whole user interface.



Figure 3-3. The panoramic UI design pattern shows a bit of the following content at the right, and the user can scroll the whole screen using his fingers. Here is a Windows Phone 7 screen.

Official UI Guidelines

Official user interface guidelines from the manufacturers, links to which you can find at <http://www.mobilexweb.com/go/uiguides>, are another source of inspiration for mobile web design. Here, you will find guidelines, samples, tips, and descriptions of common mistakes. Many of the guidelines focus on native application development, but we can apply most parts of them to mobile web design, too.



If you apply the long-press (touch and hold) design pattern, you should be aware that browsers have their own long-press actions for clickable elements, like links, images, or text for copying and pasting. In WebKit-based browsers, you can disable text selection on text items using the `webkit-user-select:none` style and then create your own menu.

The most important guides are:

- iPhone Human Interface Guidelines
- UI Guidelines for BlackBerry Smartphones
- Motorola's Best Practices for UI
- Forum Nokia UI Visual Guidelines
- Sony Ericsson's UI Style Guidelines
- UI Guidelines for Windows Mobile
- UI Guidelines for Android

A fragment of the iPhone Human Interface Guidelines is shown in [Figure 3-4](#).

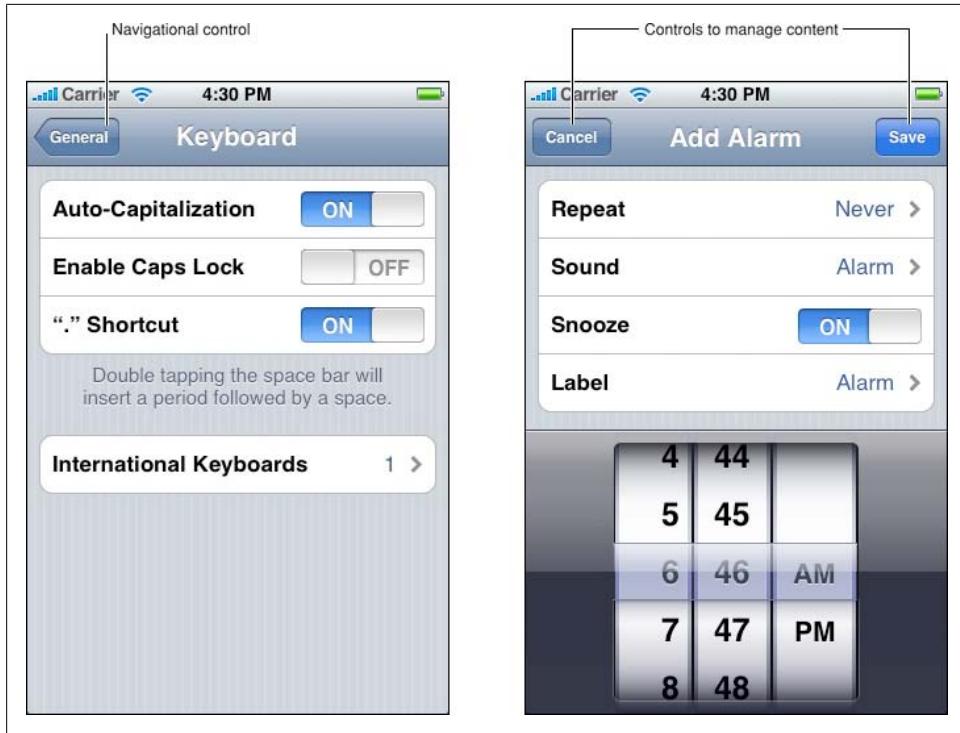


Figure 3-4. Official UI guidelines provide information about how your design should follow the user's well-known interface.

Setting Up Your Environment

Unlike desktop web development, where you’re likely to create and test your work on the same device, mobile development generally requires creating and managing several development environments.

Setting Up a Development Environment

Before starting our mobile web markup work, let’s take a look at some of the best tools, IDEs, and emulators available for our use. In [Chapter 13](#), we’ll take a deeper look at testing and debugging and cover advanced techniques and tools.

Working with Code

For coding our markup, JavaScript, and CSS, we can use almost any web tool available in the market, including Adobe Dreamweaver, Microsoft Expression Web, Aptana Studio, or even a text editor. Some tools, like Dreamweaver (since the CS4 version), work better with mobile markup and allow us to validate against mobile web standards. In this editor, when we create a new document we can choose XHTML Mobile as the document type, as shown in [Figure 4-1](#).

We will see in the following pages that it may be useful not to use too many of an editor’s visual design features. In mobile web development, it is often easier and cleaner to work directly with the code.

Emulators and Simulators

The most useful tools for our work will be emulators and simulators. Generally speaking, an *emulator* is a piece of software that translates compiled code from an original architecture to the platform where it is running. It allows us to run an operating system and its native applications on another operating system. In the mobile development world, an emulator is a desktop application that emulates mobile device hardware and a mobile operating system, allowing us to test and debug our applications and see how

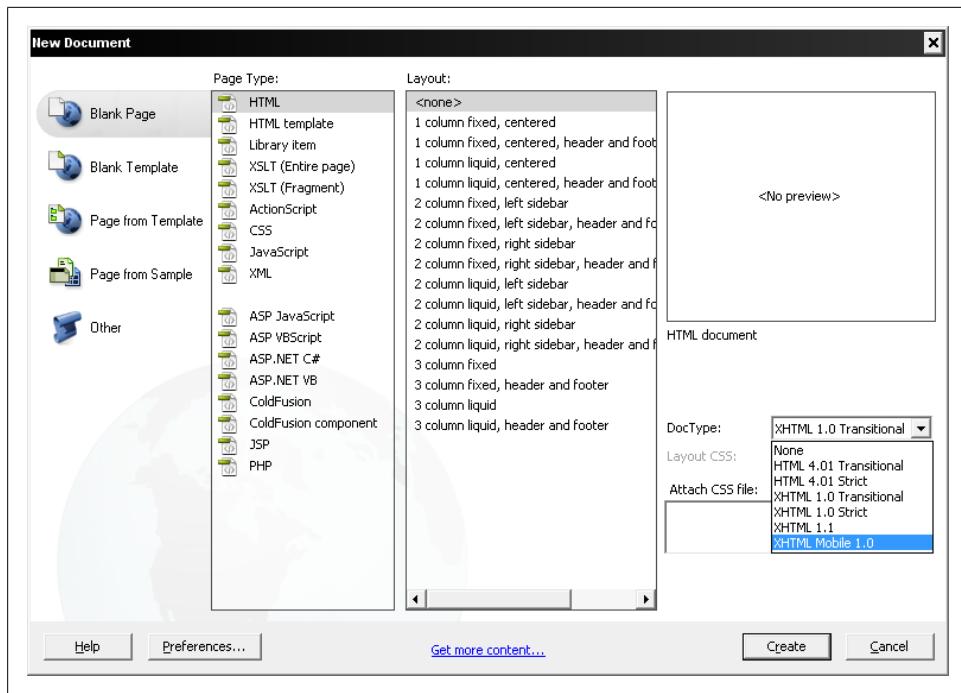


Figure 4-1. Dreamweaver allows us to define new files as XHTML Mobile documents. It is better not to use the layout templates.

they are working. The browser, and even the operating system, is not aware that it is running on an emulator, so we can execute the same code that will execute on the real device.



We should also add to our mobile development environments classic tools for project and configuration management, like bug tracking, version control, and project management tools.

Emulators are created by manufacturers and offered to developers for free, either standalone or bundled with the Software Development Kit (SDK) for native development.

There are also operating system emulators that don't represent any real device hardware but rather the operating system as a whole. These exist for Windows Mobile and Android.

On the other hand, a *simulator* is a less complex application that simulates some of the behavior of a device, but does not emulate hardware and does not work over the real operating system. These tools are simpler and less useful than emulators. A simulator may be created by the device manufacturer or by some other company offering a

simulation environment for developers. As the simulator does not simulate all the device features, we can also find tools that will not be helpful for mobile web development but rather for other technologies, like Java ME. In mobile browsing, there are simulators with pixel-level simulation, and others that neither create a skin over a typical desktop browser (e.g., Firefox or Safari) with real typography nor simulate their rendering engines.

For mobile web development, we will find emulators from Nokia, Symbian, BlackBerry, Android, Palm Pre, and Windows Mobile and simulators from Apple for the iPhone (though only for Mac OS X). A multiple mobile browser simulator is available from Adobe, called Device Central, but we will not find any help from Sony Ericsson, LG, Motorola, or Samsung with their proprietary OSs (used on their low- and mid-end devices).

Some browser-based emulators, like the Opera Mini emulator, are also available.

An up-to-date list of emulator download URLs can be found at <http://www.mobilexweb.com/go/emulators>.

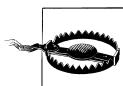


As the emulators have the same operating system and applications as the real devices, we will need to wait for the OS to load before opening a web page.

Android emulator

The Android emulator, shown in [Figure 4-2](#), is available in conjunction with the SDK to create native Java applications for Android. You can download it for free from <http://developer.android.com>; the base SDK and the different Android OS versions are available separately. The Android emulator is available for Windows, Mac OS X, and Linux. Once you've downloaded it, create a folder for the contents on your hard drive and unzip the package.

In the folder where you extracted the package, there is an `android` terminal command on Mac OS X/Linux and an `SDK Setup.exe` application for Windows that opens the *Android SDK and AVD Manager*, where you can download and configure Android platforms after installing the base SDK.



If you get errors while trying to retrieve “Available Packs” in the Android SDK and AVD Manager, you can go to Settings, click the option “Force https:// sources to be fetched using http://”, and then click Apply.

Opening the Android emulator can be a little tricky the first time. You can open it from an IDE such as Eclipse, but first you need to install the Android plug-in and create a native empty application. Alternatively, you can open the emulator from a console

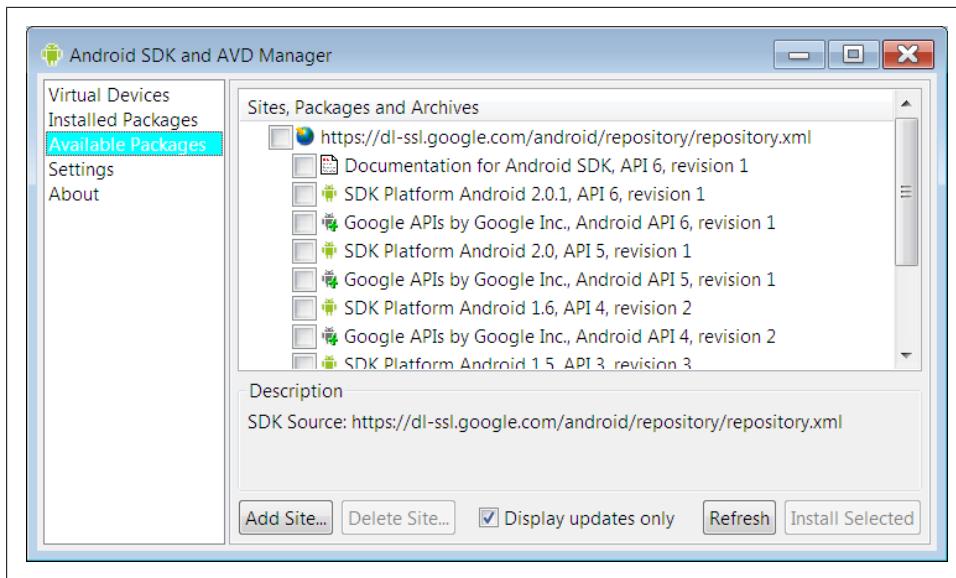
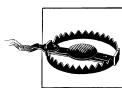


Figure 4-2. After downloading the Android SDK, open the Manager and download the platforms you want. The Google APIs are needed for native development using Google's services.

window (Terminal or the command prompt, depending on the operating system) or from the SDK and AVD Manager.



After you've had the Android SDK installed for a while, you may want to update it and install a new package. If you receive an XML error while doing this, you may have an outdated version of the AVD manager. Just go to the website and download the SDK again.

Once you've installed a platform, you need to create a new Virtual Device using the SDK and AVD Manager. Creating a new device involves selecting the target (of the installed platforms), defining a name, and specifying the size of the SD card, the screen size, and other optional hardware features, as you can see in [Figure 4-3](#). Once you've created the device, you can go to Virtual Devices and click Launch to reach a result like the one shown in [Figure 4-4](#).

You can also install new tools from vendors, like the Droid device for Motorola. In the Motorola case, you need to download the MotoDev Studio for Android, available for free at <http://developer.motorola.com>.



Motorola will simplify the SDK install process and emulator launch if you download MotoDev Studio for Android IDE first. It will ask you to download and configure the SDK and platforms automatically.

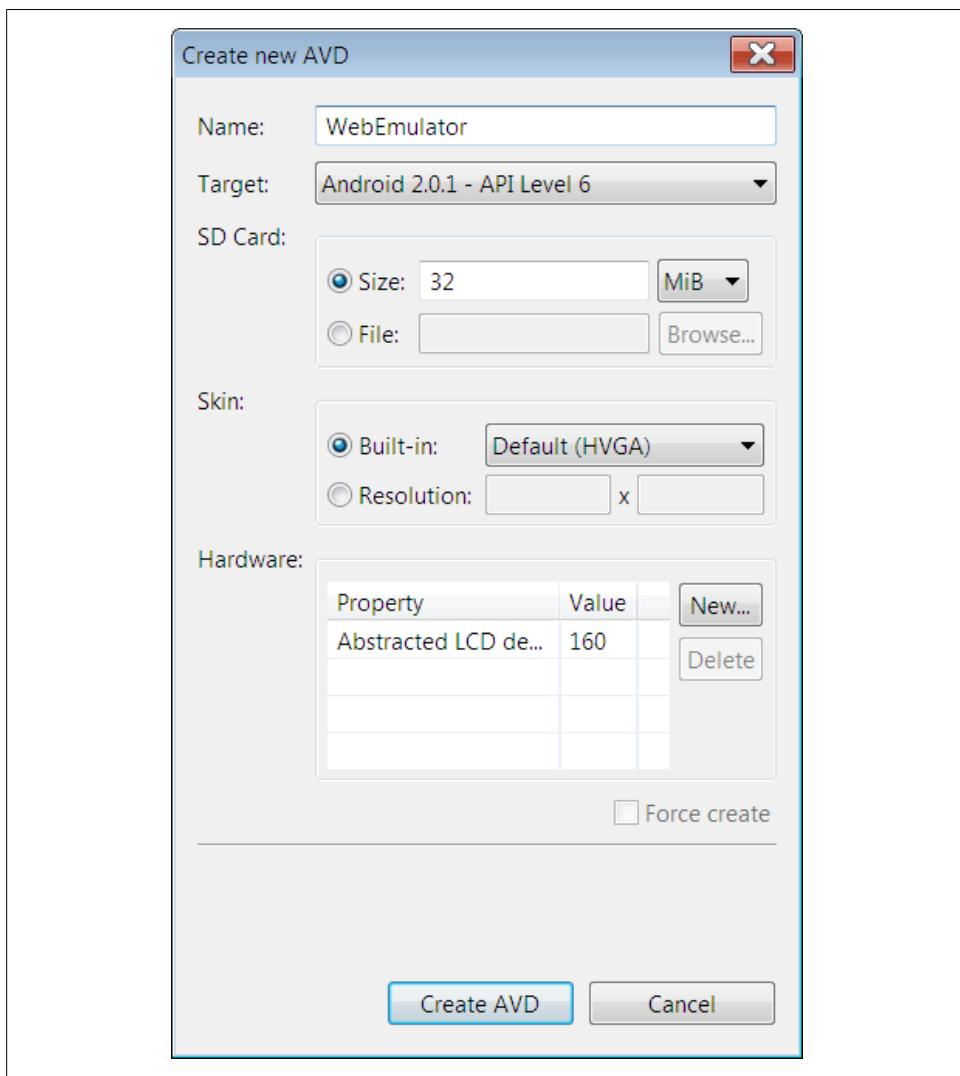
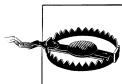


Figure 4-3. After installing the SDK and the platform, you must create virtual devices for each platform and screen combination you need.

With the emulator opened, you can open a mobile website by finding the browser using your mouse (remember that almost all Android devices are touch capable) and typing the URL in its location bar. Up to Android 2.0, the emulator doesn't support opening local files, so you'll need to set up a local web server (e.g., Apache) or upload your files to a web server on the Internet.



Figure 4-4. At this point, you can open the browser as if you were on a touch-enabled Android device. You can use the mouse over the emulator's screen to emulate the user's gestures.



If you want to load a local web server in the Android emulator, you can't use localhost or 127.0.0.1 because the browser will point the request to Android itself. There is a special IP address available to point to the host computer: 10.0.2.2.

Nokia emulators

Nokia has always had the better emulators, since the beginning of mobile web development. Instead of one emulator per device, you'll find one emulator for each version of each platform. You can download emulators for Series 40 (mid- and low-end devices) and for S60 (Symbian smartphones) at <http://www.forum.nokia.com>. In some cases there are also specific model emulators with specific features, like for the Nokia N97 (an S60 5th edition device with home screen widgets, a feature we will cover in Chapter 12).



Nokia also has a tool called the Nokia Mobile Browser Simulator, developed in 2003 to test mobile websites for old WAP 1.0 devices and the first WAP 2.0 ones. Today, this tool is still available but deprecated; we don't need it.

Unfortunately, Series 40 and S60 Nokia emulators, like that shown in [Figure 4-5](#), are available only for the Windows operating system, and some of the old ones have problems with Windows Vista and Windows 7. It is a good idea to install at least the last three emulators for each platform; for example, Series 40 6th edition, Series 40 5th edition FP1 (Feature Pack 1), and Series 40 3rd edition FP2.



Figure 4-5. Here is a focus-based navigator over a Nokia S40 emulator. If you use File→Open, you must type <http://> first.

If you need to emulate a Nokia device, first find the correct platform version for that device at <http://forum.nokia.com/devices> and then download the emulator for that platform. Nokia guarantees (and it works almost all the time) that every device based on the same platform version has the same browser and rendering engine and even the same hardware features.



There isn't a Maemo or MeeGo emulator for testing mobile websites, but you can download MeeGo for netbooks from <http://www.meego.com> and run it on a virtual machine.

The Nokia emulators will add shortcut icons to your Start menu, so it will be easy to find them. Once you've launched the emulator, you can open the browser and type in the URL or use the shortcut File→Open, which allows you to type or paste a URL or browse for a file in your local filesystem. The emulator will open the browser automatically.



Some of the latest S40 emulators have predictive text input active by default, and this will deactivate the usage of your desktop QWERTY keyboard to type. Before using them, you'll need to disable predictive input.

Nokia S40 emulators support the use of localhost or 127.0.0.1 to connect with your desktop host computer.

Running Mac OS X or Linux?

If you are taking seriously mobile web programming for multiple devices, it will be very useful to have at least one development desktop with Windows XP, even if it is on a virtual PC. Some emulators work only in Windows environments, and some have issues with Vista and/or 7. Hopefully this will change with time; emulators for Mac OS X and Linux are already available for some platforms.

iPhone simulator

Only available for Mac OS X, the iPhone Simulator, shown in [Figure 4-6](#), offers a free simulation environment including Safari. It is not an emulator, so it does not really provide a hardware emulation experience and is not a true performance indicator. However, it is perfectly suitable for seeing how your website is rendering and how your code is working. It's especially convenient for loading local or remote files by typing in the URL field using your desktop keyboard.

The iPhone Simulator is included with the SDK for native development, available for free at <http://developer.apple.com/iphone>. The SDK may take a while to download, because it's more than 2 GB. You can download the latest version of the operating system, in which case you can switch between versions using the Hardware→Version menu option. With the Simulator, you can also select if you want to simulate an iPhone or an iPad.

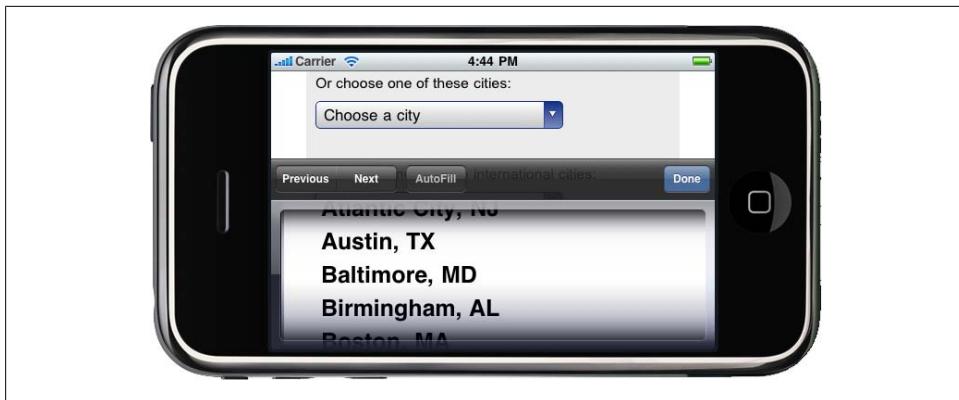
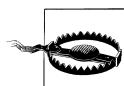


Figure 4-6. The iPhone Simulator allows us to rotate the screen as in the real device.



At the time of this writing, there is no way to emulate the real iPhone browser on Windows or Linux machines. In [Chapter 13](#) we will cover alternatives to emulation that can help even on Windows machines.

Once the emulator is open, you can open the Safari application and type a URL in the address bar. To open a local file, use the `file:///` protocol in the address field (for example, `file:///Users/myUser/Desktop/test.html` to open an HTML file on the desktop of the `myUser` user).



The most accurate iPhone experience on Windows can be found using the MobiOne emulator, which includes a Visual Designer. It is available for free at <http://www.genuitec.com/mobile> and it includes a WebKit browser emulating most of the iPhone extensions. It also supports a Palm webOS skin.

Pasting a URL from the clipboard can be a little tricky from iOS 3.0. When you paste text using the keyboard or the Edit menu, the text will be pasted into the iPhone's internal clipboard. You then need to paste it again using the iPhone's gesture, tapping once over the text input and selecting Paste from the contextual menu, as shown in [Figure 4-7](#).

Palm emulator

Palm has been in the emulator market for more than 10 years and has always had great support for these tools. We have already talked about the history of Palm and Palm OS; in this book we will cover only the new webOS, the operating system available since Palm Pre. You can download the Palm Mojo SDK, which includes the Palm emulator, from <http://developer.palm.com>. It is available for Windows, Mac OS X, and Linux. To use it, you must have Sun VirtualBox, a free virtualization tool available from



Figure 4-7. You can use your desktop keyboard, or Edit→Paste to paste text to the iPhone's clipboard, and then tap once on the text input and press Paste on the screen to paste it where you want it to go.

<http://www.virtualbox.org>, installed on your machine. If everything goes OK, you can open the Palm emulator from the Start menu, the command line/Terminal, or your applications list.



If you want to download and install old Palm OS (now Garnet OS) SDKs and simulators, you can find them at <http://www.accessdevnet.com>. This is the developer's site for ACCESS, the current owner of Garnet OS and the NetFront browser.

In the Palm emulator, you can open the applications menu with your mouse and choose Web to type a URL. This emulator can be a little confusing at first because it doesn't support an onscreen keyboard (see Figure 4-8); we only see the screen of the device.

To help you get started, Table 4-1 lists some keyboard shortcuts that will be helpful for using the emulator.

Table 4-1. Palm emulator keyboard shortcuts

Key	Description
Alt (Windows, Linux), Option (Mac)	Option key
End	Opens (or closes) the launcher
Esc	Back action (generally goes back to the previous card/window)
Home	Minimizes (or maximizes) the current card (window)
Left and right arrow	Switches between applications



If you have a MacBook laptop like me, you will not find the End or Home keys on your keyboard. In the Palm emulator, you can use Function-right arrow and Function-left arrow for the same functionality.

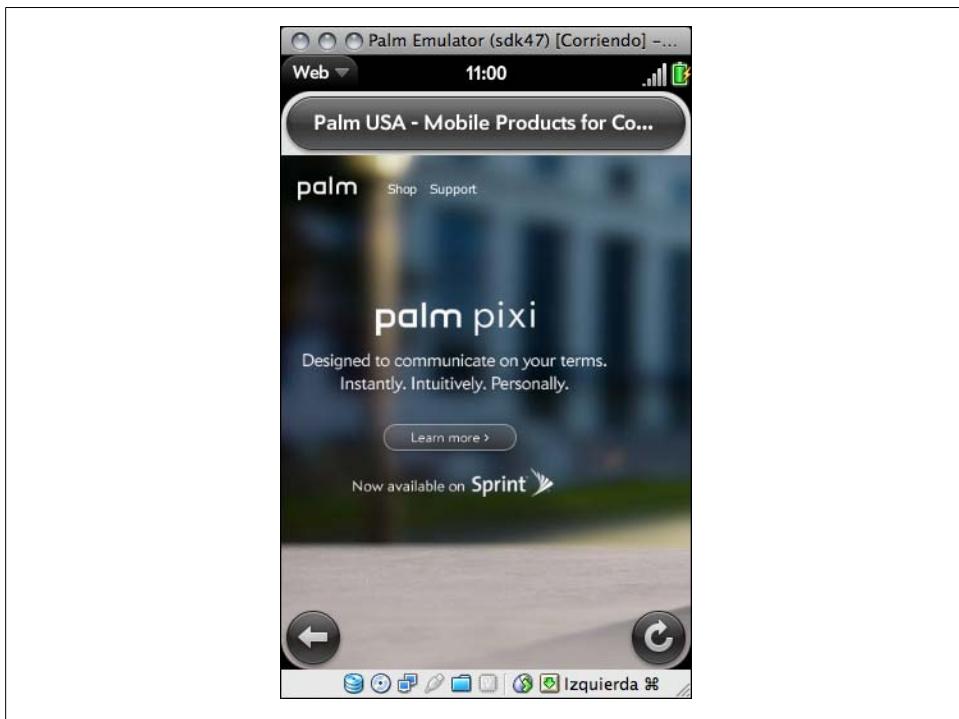


Figure 4-8. The webOS emulator doesn't have an onscreen keyboard, so you need to learn the shortcuts to emulate keypresses.

The Palm emulator, like Android's, doesn't support simple local file opening. You'll need to use a local web server and use the internal VirtualBox IP address to access the host server.

BlackBerry simulators

Research in Motion (RIM), vendor of the popular BlackBerrys, has done a great job with emulators, with one only problem: it is very difficult to decide which one to download and use. Dozens of different installers are available at <http://www.blackberry.com/developers>; you can download the proxy server, plug-ins for Eclipse and Visual Studio for web developers, and the simulators. All the tools are compatible only with the Windows operating system.

The first requirement is to download the BlackBerry Email and MDS Services Simulator Package. This proxy allows any simulator to access the network and emulates email services and an enterprise server. Before opening a browser, you need to start this service on your computer.

The BlackBerry Smartphone Simulators are available at <http://na.blackberry.com/eng/developers/resources/simulators.jsp>. The first step is to select the smartphone you want

to emulate (for example, BlackBerry Tour 9630) and choose either the carrier you want (or Generic), or the OS version.

You can also click the “view all BlackBerry Smartphone Simulator downloads” link and select the appropriate version of the BlackBerry simulator from the list of more than 20 available choices, starting with version 3.6. Every version has a choice of simulators available for many combinations of BlackBerry device and operator firmware. For example, if you choose version 4.2, you can download a BlackBerry 8100 simulator with one of the following operator options:

- Operator-less
- Cingular Wireless
- Vodafone
- TIM
- Telefonica
- Rogers Wireless
- T-Mobile USA
- Orange
- O2

In addition, there are different versions of the operating system available for the same device and for the same operators. You can either select the operator-agnostic firmware (Generic) or the firmware for a specific operator to download. One example of a BlackBerry simulator is shown in [Figure 4-9](#).

A list of the devices available per version is shown in [Table 4-2](#).

Table 4-2. List of BlackBerry simulators and device models available for each version

Simulator version	Some devices available (with many operators for each one)
5.0.0	Tour (9630), Curve (8530), Storm (9500, 9530), Storm 2 (9520, 9550), Bold (9700)
4.7.1	Tour (9630)
4.7.0	Storm (9500, 9530)
4.6.1	Curve (8350i, 8900, 8520, 8230), Bold (9000)
4.6.0	Pearl (8220, 8230), Bold (9000)
4.5.0	Pearl (8100, 8110, 8120, 8130), Curve (8300, 8310, 8330), 8800, 8820, 8830, 8880, 8700
4.3.0	Pearl (8110, 8120, 8130), Curve (8330)
4.2.2	8707, 8820, 8830, Curve (8300, 8310, 8320)
4.2.1	Pearl (8100), 7130, 8707, 8700, 8800
4.2	Pearl (8100)
4.1	8700, 8707, 7130, 8703, 8707, 7290, 7250, 7130, 7100



Figure 4-9. This BlackBerry simulator is pointer-based, so you need to use the onscreen keys or the arrow keys on your desktop keyboard to browse as a mobile user.

Once you've installed your emulator, remember to open the BlackBerry MDS Services Simulator before using it. Launch the emulator, open the browser, and type the URL you want to access, and you'll see something like Figure 4-9. These emulators don't support local files or accessing them through localhost; you can use the local IP address of your desktop if you're on a network or the public IP address if you are connected directly to the Internet.

Windows Mobile emulators

You can download Windows Mobile emulators along with Visual Studio 2008 or 2010, or without the IDE in standalone mode. The emulator isn't available with the free Express versions of Visual Studio, and they work only on Windows-based computers.

You will need to download:

- The Microsoft Device Emulator
- Windows Mobile emulator images or images from manufacturers
- Virtual PC 2007 for Internet connectivity
- ActiveSync (only for Windows XP or 2003 Server) or Windows Mobile Device Center (only for Windows 7, Vista, or 2008 Server)

All these packages are available for free at <http://www.msdn.microsoft.com/windowsmobile>.

If you're using a version prior to 6.0, shortcut icons will not automatically appear in the Start menu after installation. You will need to locate the installation folder (e.g., `c:\Program Files\Microsoft Device Emulator\1.0`) and execute the Emulator Device Manager (the file `dvcemanager.exe`).

The Emulator Device Manager lists all the installed images; you can right-click on one and select Connect from the context menu. However, your work is not finished yet.

One of the most common problems with Windows Mobile emulators is that the Internet connection doesn't work out of the box. You need to do some setup before connecting to the network. To connect the emulator with the network, follow these steps:

1. With the emulator opened, right-click it in the Device Manager and select Cradle.
2. In the Device Manager, choose File→Configure. On the Network tab, check "Enable NE2000 PCMCIA network adapter and bind to."
3. Press OK to save your changes and create a bridge between your real network and a virtual network in the emulator.
4. In the emulator, go to the network settings. The location may change between Windows Mobile versions, but it should be found near Start menu→Settings→Connections. Choose Network Cards and select The Internet from the drop-down list.
5. Repeat this process for each emulator.
6. Open a champagne bottle and enjoy.



If you have installed Visual Studio, you can create an empty Smart Device solution (for Windows Mobile or PocketPC) and run it. The emulator will open without any other issue.

Windows Phone emulator

Remember that starting in 2010, Microsoft will stop evolving the Windows Mobile operating system and replace it with Windows Phone 7. The whole platform is new, including the mobile browser. To install the Windows Phone emulator you should use Visual Studio 2010 (you can use the free version, called Visual Studio 2010 Express for Windows Phone). It includes the emulator, and you can also use Internet Explorer. To install it, you will need Windows Vista or Windows 7. A multitouch screen is required to emulate multitouch over the emulator.

You can download it for free from <http://www.microsoft.com/express>.

i-mode HTML simulator

If Japanese people are likely to use your website, you should consider testing it for NTT DoCoMo i-mode devices. Fortunately for people like me, who do not read Japanese,

the company has created an English version of its website containing almost all the relevant development information. A simulator for its devices is also available for Windows.

You can download the i-mode HTML Simulator and the i-mode HTML Simulator II from <http://www.nttdocomo.co.jp/english/service/imode/make/content/browser/html>. The first one is suitable for simulation of devices released prior to May 2009, and the second one is for the second generation of devices, starting in May 2009.



The Fire Mobile Simulator (<http://www.firemobilesimulator.org>) is a Firefox plug-in simulator for the three main operators in Japan, DoCoMo, Au, and Softbank. The page and plug-in are in Japanese, but an online translator such as Google Translate (<http://translate.google.com>) will give you all the information you need.

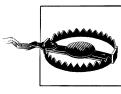
Opera Mobile emulator

In 2010, Opera released the first emulator for its Opera Mobile browser, available for Mac OS X, Linux, and Windows. The emulator runs the exact same code as the mobile version, so it is accurate. In addition to the browser, the package includes an Opera Widgets Mobile Emulator, a desktop version of the widget engine available for Symbian and Windows Mobile, discussed in [Chapter 12](#). With this emulator you can also debug your mobile web applications using Dragonfly, a debugging service for Opera that we will cover in [Chapter 13](#).

You can download the emulator for free at <http://www.opera.com/developer/tools>. You can also download the Opera Debug Menu, a set of shortcuts to Opera's developer-focused features, from the same URL.

Openwave simulator

We have already talked about Openwave, a browser installed on many low- and mid-end devices from a variety of vendors before 2008. The company has since been acquired by Myriad Group, but we can still download different versions of the simulator at <http://developer.openwave.com>.



If you are using Visual Studio Development Server you will not be able to access your ASP.NET pages from a mobile emulator, for security reasons. You will have to change your security permissions, or use IIS instead.

Adobe Device Central

I really like Adobe and many of its products. I even manage an official Adobe User Group. However, while Adobe Device Central (the tool that provides mobile emulation

for Flash and for mobile websites) is great for Flash Lite emulation, it's not so good for websites.

The tool is included with Adobe Dreamweaver, Adobe Flash Professional, and some of the suites and has an updated list of devices, including their screen sizes and Flash Lite capabilities. However, for browser emulation it is just a miniature WebKit browser on the desktop. It doesn't provide real (or almost similar) simulation in terms of typography, browser bars, and markup rendering.

To simulate a website as shown in [Figure 4-10](#), open the HTML source in Dreamweaver and select File→Preview→Device Central or, from version CS5, use File→Open.



Figure 4-10. Don't rely on Adobe Device Central's rendering engine for mobile devices. Its best feature is its great library of mobile device capabilities.

Comparison

[Table 4-3](#) shows how the different platform emulators and simulators allow us to access files and the clipboard on our host machines.

Table 4-3. Comparison of available emulators and simulators

Platform	Able to open local files	Accesses host's local server via	Supports copy/paste from host
Android	No	10.0.2.2	No
Nokia S40 and S60	Yes	localhost	Yes
iPhone	Yes	localhost	Yes (two-phase for 3.0)
BlackBerry	No	Network IP address	No
Palm webOS	No	Virtual Box IP address	No
Windows Mobile	No	Virtual PC IP address	No



For emulators without URL pasting abilities, you can generate a free mobile-optimized short URL for easy typing on a mobile device or in an emulator at <http://www.mobiletinyurl.com>.

Online simulators

Online simulators are another option for exploring the mobile web.

Opera Mini Simulator. At <http://www.opera.com/mini/demo>, you can enjoy a full Opera Mini simulation in a Java applet (see Figure 4-11). This URL is for the latest version of the software (at the time of this writing, 5.0), but you can also find simulators for previous versions, like 4.2 at <http://www.opera.com/mini/demo/?ver=4>.



Remember that Opera Mini and other user-installable browsers are available as normal native or Java ME applications, so you can use any emulator to download them. The Nokia, Windows Mobile, and BlackBerry emulators are great for this purpose.

Opera also offers an emulator for Opera Mobile that works on Windows, Mac OS X, and Linux and can be downloaded for free at <http://www.opera.com/developer/tools>.

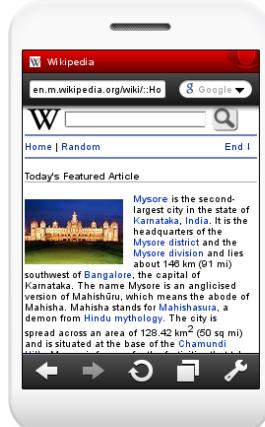
ready.mobi. The website <http://ready.mobi> has a great testing tool that we will cover later in this book (see Chapter 13). It also has an online simulator for some older devices, such as the following:

- Nokia N70
- Samsung Z105
- Sony Ericsson K850i
- Motorola v3i
- Sharp GX-10

Opera Mini Simulator

Overview Opera Mini 4 Opera Mini 5 beta Download **Demo** Help Developer

Below is a live demo of Opera Mini 5 beta that functions as it would when installed on a handset.



Simulator tips

- Use your mouse or keyboard to control the simulator (**F1**, **F2** function keys, **arrow keys** and **Enter** to navigate).
- Drag the scrollbar or the screen to scroll the page.
- Pass an URL directly to the simulator using a simple [bookmarklet](#).

Meet the community

Voice your opinion, share experiences and seek answers in the dedicated Opera Mini [forum](#).

Contact us

If you are a content provider, handset manufacturer or telecom operator and want to learn how Opera Mini can benefit your users, [contact us](#) for more information.

Opera Mini 4.2 Simulator

Live [demo](#) of Opera Mini 4.2, the world's most popular mobile Web browser.

Figure 4-11. The Opera Mini Simulator is an online free service running the same Java browser as the one on real devices.



When using the Nokia, BlackBerry, Symbian, Windows Mobile, and Android emulators, we can install over them browsers that are available for free, such as Opera Mini, Bolt, Opera Mobile, and the UC Browser.

iPhone web simulation. Some websites, such as <http://www.testiphone.com> and <http://www.iphonetest.com>, try to simulate the iPhone browser, but the experience isn't the real thing; they are just iframes with the skin of the iPhone.



We will get deeper into the creation of a testing environment in [Chapter 13](#), moving beyond emulators and simulators.

Production Environment

The mobile production environment, surprisingly, doesn't differ too much from a classic web environment. Although many web hosting companies used to offer a "premium WAP hosting" option (obviously, more expensive than the non-mobile options), there is no need for any such distinction.

Web Hosting

To get started, you will need a web server with your favorite platform installed. It should support either static or dynamic files on all platforms you plan to work with (PHP, ASP.NET, Java, Ruby, Python, etc.). Cloud hosting (via a service like Amazon EC2, Google App Engine, Aptana Cloud, or Microsoft Azure) will work well, too.

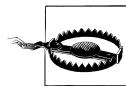
You will need to have permissions to manage MIME types on the server. We will talk about this in Chapters 5 and 10, but for now, just remember that it will allow you to make compatible mobile websites more easily.



There is no special need to use HTTPS (secure connections) for mobile devices. If you want to, just remember that the most widely accepted certificates are from Thawte and VeriSign.

Domain

Which domain alternative should you use? I have no answer for this; you will have to decide for yourself. You can create a subdomain of your desktop website (if you have one), like *m.mydomain.com*, or you can use the main entry point (*mydomain.com* or *www.mydomain.com*), or you can buy a *.mobi* domain from any registrar (fees start at \$10 per year). My only recommendation is that, whatever decision you make, you should try to have the other options available and set up a 301 HTTP Redirect to the domain you've chosen. I've tried myself many times to guess a mobile URL using *m.<anysite>.com* or *<anysite>.mobi*, and you should support that user behavior.



No matter which mobile domain you will be using, remember to create a 301 HTTP Redirect to the chosen one from all the possibilities (*m.yourdomain*, *wap.yourdomain*, *mobile.yourdomain*, and, if possible, *yourdomain.mobi*). You don't want to lose visitors because they couldn't guess your mobile address.

Error Management

You'll need to ensure that your error pages will be mobile compatible. You should be able to configure the default error pages for most common HTTP error codes, like 404 (Page not Found) and 500 (Internal Server Error), on your server. These files must be mobile compatible; we don't want to waste traffic for the user on a server error or deliver pages that aren't compatible with low-end devices. If you're not sure how to configure the default error pages, ask your server provider.

If you are providing both the desktop and mobile versions of your website from the same domain, you should create a dynamic code to detect whether the device accessing your site is a mobile or not. In the case of a 500 error, deliver a very simple HTML page

for both desktop and mobile users; you won't know whether the problem was in your dynamic platform.



Facebook uses a main mobile site, <http://m.facebook.com>, but also delivers special URLs for some platforms (for example, <http://touch.facebook.com> for touch devices, <http://iphone.facebook.com> for iPhones, and <http://zero.facebook.com> for basic phones). You should provide only one URL and deliver appropriate content from that, as we will see in [Chapter 10](#).

Statistics

Statistics about mobile website usage are typically the same as those for desktop usage, but a mobile-friendly tool will be very helpful in understanding mobile-specific features. You can log requests on the server for later processing with a log analysis tool, or you can use a third-party tool for help in your statistics management. We will cover mobile-friendly statistical tools in [Chapter 14](#).

Markups and Standards

Finally, we have arrived at the best part: coding! If you are reading this chapter but have skipped the previous ones, I encourage you to read them. Mobile web development is not just about coding; it is important to understand the full ecosystem, including what types of devices and browsers are available, and to be aware of mobile design and usability issues. That said, let's take a look at the available markup languages and the relevant standards.

First, the Old Ones

Although you're unlikely to use them in mobile web projects today, some familiarity with at least the basic concepts of the old markup languages can be useful. One day you may need to migrate an old mobile website or to work with older devices, and I wouldn't be satisfied if I didn't talk a little about them.

One of the first mobile web markup languages to be developed was *HDML* (Handheld Device Markup Language). Similar to HTML, it was developed by a company called Unwired Planet (the company that became Openwave and was later taken over by the Myriad Group). This markup language was never released as a standard, but it helped in the creation of WML.

Why Not HTML from the Beginning?

The first specialized language for the mobile web, HDML, appeared in 1996. Why not use the well-known HTML from the beginning? There were a few main issues. For one thing, mobile devices were so limited in terms of network access and CPU and memory resources that it was necessary to create very small rendering solutions. A mobile browser couldn't process non-strict markup and decide what to do if the developer forgot to close a tag, for example. The other issue was the need to create mobile-specific functionality in the markup, like keyboard shortcuts.

Over time, mobile devices evolved into what we know today; now some mobile devices are even more mature than desktop ones, and mobile devices are already using HTML 5.0 (before desktops, and before the standard is finished).

WML

WML was incorporated into the WAP 1.1 standard and was the first standard of the mobile web. It wasn't standardized by the World Wide Web Consortium (W3C), but rather by the WAP Forum (known today as the Open Mobile Alliance), an organization made up of many players from the mobile industry working on standards in this market.

We have already agreed that WML is absolutely deprecated today. Any non-smartphone will still understand WML, but I want you to consider it a historic language, like Latin, instead of a current standard. Depending on your target, you may still want to create a basic WML version like that in [Figure 5-1](#), but it is not the place to start.



Figure 5-1. A typical WML document contains just text, links, and maybe some little image. It is always focus-based and optionally can execute WMLScript code, but that is very rarely used.

In fact, some modern browsers based on WebKit (iPhone, Android, Palm) do not read this format anymore, as shown in [Figure 5-2](#). It was the markup for WAP 1.1, and the first (and almost the last) version was created in 1998! Just think about what mobile phones were like in that year. Still, if you search for “filetype:wml” in Google, you’ll find more than 2 million results using this format. And Google did not index the majority of the WAP 1.1 mobile web!



Figure 5-2. Both the iPhone and Android browsers show the WML source code instead of rendering it.

I asked some big mobile portals about their WML usage. The Weather Channel (<http://m.weather.com>) was the first to give me a good answer (from Cathy Rohrl, Product Manager – Mobile Web):

To have a WML-compliant site is not that big of an issue. It was easy to build and it's just out there. But the importance of having WML today is supporting the concept of access to EVERYONE, everywhere. You start tempting people with older handsets, and they'll want more. Another year and we may completely mothball the site, but even then I don't think we'll take it down. It will just become a site that is not actively maintained.

Internal nonaudited private reports of U.S. traffic on The Weather Channel's mobile site indicate that 5% of traffic in 2008 was WML-only, decreasing to 2% in 2009 and even less in early 2010.

A WML file is an XML file, normally using the `.wml` extension. It is similar to HTML in some ways and very different in others. Let's take a look at a typical WML file:

```
<?xml version="1.0"?>
<!DOCTYPE wml PUBLIC "-//WAPFORUM//DTD WML 1.1//EN"
  "http://www.wapforum.org/DTD/wml_1.1.xml" >
<wml>
```

```
<card id="home" title="Welcome to Old Mobile">
    <p mode="wrap">This is a <b>typical</b> paragraph in WML</p>
    <p mode="wrap">It can include images,
        <a href="http://wap.yahoo.com">External Links</a> and
        <a href="#two">Internal Links</a>.
    </p>
</card>
<card id="two" title="Second screen">
    <p>This is like a second page in the same document</p>
</card>
</wml>
```

We can recognize many tags found in HTML here, like `p`, `b`, and `a`, and they have the same functionality. Other tags the two standards have in common include `img`, `br`, and `input`.



Today it is common to use the self-closed tag `
` in XHTML files instead of the classic `
` without a closing tag. WML, as one of the first XML-based markup languages, was the pioneer in using the self-closed tag.

WML Today

WML was replaced in the WAP standard in 2002, but it continues as the fallback markup for older devices. Today, only sites that are linked in carrier decks are forced to create WML versions for full compatibility with all devices on the market. Some major websites are also available in WML versions, but to take two well-known examples, Twitter and Facebook don't provide WML versions of their popular services.

In 2009 the percentage of WML-only traffic was below 2%, and it can now be estimated as accounting for less than 1% of all traffic.

However, you'll also notice some differences. Firstly, a WML file starts with a root `wml` tag after the DOCTYPE declaration. A WML document is also called a *deck*. Every deck can contain many cards. A *card*, identified by a tag with the same name, is one visible page in a browser; it is like the contents of a `body` tag in HTML. So yes, a WML file can contain many pages in the same document (see [Figure 5-3](#)). This was a great feature for speeding up the performance of the mobile web in the early 2000s.



The Document Type Declaration (known as the DOCTYPE) is an instruction in a XML document (or an SGML document, e.g., HTML) that allows the browser to match that document with a Document Type Definition (DTD) so it can tell how to understand the document.

WML was conceived for mobile devices. Consequently, we will find tags and attributes supporting mobile device functionality (e.g., voice calls, keyboard support, adding

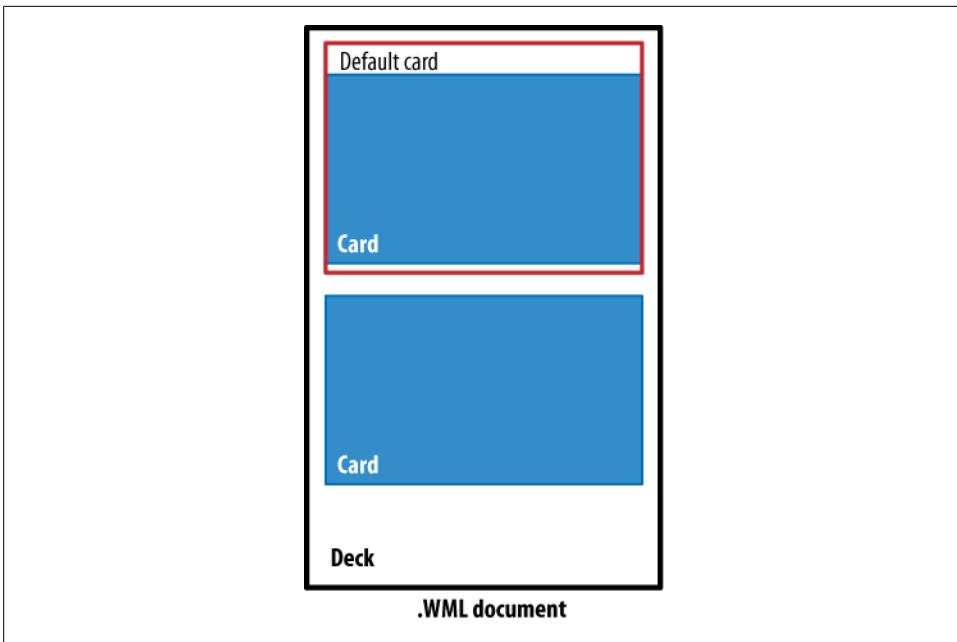


Figure 5-3. A WML document can have many cards (one, by default), and we can link to any card using the format wml_document#card_name.

contacts to the phonebook, and accessing the SIM card) in the standard. The best part is that we can use the well-known anchor tag to create an absolute link, a link to a relative document, or a link to another card in the same document using the `#card_name` URL.



The multiple cards design pattern in WML is very useful. We will use it in our modern mobile websites using JavaScript, DOM, and even Ajax. You'll need to wait a few pages for that, though!

There is a lot to say about WML; in fact, I have a book on WML on my bookshelf that's more than 600 pages long. But to be honest, WAP 1.1 pages today are so simple that this quick introduction should be enough for you to understand WML.



WML is not compatible with CSS, and its minimal design support includes the use of the tags `big`, `small`, `b`, and `i` using a “best effort” mechanism. Many old WML browsers had only one font and no bold or italic support.

If you are still curious about WML, you can use Adobe Dreamweaver to create WML files with code hinting support. When you select File→New, you will find WML in the

“Other” section. Of course, you can also use any text editor and a WML-compatible emulator. The best WML emulators today are the Nokia Series 40 emulators (only for Windows), as they show real rendering and work well on modern desktops running Windows Vista or 7.

WML was not alone

WML does not generally support GIF, JPG, or PNG images (although some browsers did accept GIF and JPG images, starting with color screens). Images in WML files were typically in *WBMP* (Wireless Bitmap) format. WML also supports scripting using a language called *WMLScript*, loosely based on ECMAScript. They aren’t worth discussing; just know that they existed and talk to your grandchildren about them. A WBMP file is just a 1 bit per pixel bitmap file, in black and white.

Other common scenarios involved compiled WML and WMLScript files. These files were compiled by the developer or by a proxy or WAP gateway between the user and the web server. A free tool for compiling WMLScript files is the old Nokia Mobile Internet Toolkit, still available for download.

Testing Suite from This Book

All the testing documents used in this book are available for free at <http://www.mobilexweb.com/tests>; you can test yourself with any mobile browser every feature tested here. For less typing, you can use the Mobile Tiny URL, typing **t.ad.ag** in your browser’s address bar (you will need to type 8123124 on almost every numeric keypad). This is a valid URL on the Internet, and it uses only the first characters associated with each numeric key to reduce keypresses. You can create your own URLs for easy mobile typing by accessing <http://www.mobiletinyurl.com> from your desktop browser.

Every suite was tested on the latest versions of some of the platforms available at the time of this writing, on all the major versions available on the market, and on older versions of the same platforms. As mobile browsers are evolving quickly, new versions could have different results. You can follow my blog at <http://www.mobilexweb.com> or my Twitter account <http://www.twitter.com/mobilexweb> for updates. Because of space limitations, we didn’t test every browser, like Bolt or Firefox for Nokia N900.

Newer versions are supposed to support all the features supported by the older versions. You should also expect currently noncompatible browsers to start supporting new technologies in the future (e.g., HTML 5).

Serving WML

To serve WML, you just need to configure your server (or your dynamic code) to deliver the right MIME type. We will talk more about this in [Chapter 10](#). The list of MIME types for WAP 1.0–compatible markup is shown in [Table 5-1](#), while [Table 5-2](#) reports on those files’ compatibility with current devices.

Table 5-1. WAP 1.0 MIME types and extensions

Format	MIME type	Common extension
Wireless Markup Language	<i>text/vnd.wap.wml</i>	.wml
Wireless Markup Language Script	<i>text/vnd.wap.wmlscript</i>	.wmls
Compiled Wireless Markup Language	<i>application/vnd.wap.wmlc</i>	.wmlc
Compiled Wireless Markup Language Script	<i>application/vnd.wap.wmlsc</i>	.wmlsc
Wireless Bitmap	<i>image/vnd.wap.wbmp</i>	.wbmp

Table 5-2. WML support testing compatibility table

Browser/platform	WML support	What happens	WBMP	GIF in WML
Safari	No	Shows source code	No	No
Android browser	No	Shows source code	No	No
Symbian/S60	Yes/No >= 3 rd ed.	Images not rendered in 5 th ed. devices	No	No
	Yes <= 2 nd ed.	Document not compatible in some 3 rd ed. devices		
Nokia Series 40	Yes	Renders OK	Yes	Yes
webOS	No	Nothing happens	No	No
BlackBerry	Yes	Renders OK	Yes	No
NetFront	Yes	Renders OK	Yes	Yes
Openwave (Myriad)	Yes	Renders OK	Yes	No
Internet Explorer	No			
Motorola Internet Browser	Yes	Renders OK	Yes	No
Opera Mobile	Yes	Multiple cards don't work	Yes	Yes
Opera Mini	Yes	Multiple cards are rendered on the server	Yes	Yes
NTT DoCoMo (Japan)	No		No	No

Today, you should not use WML for a normal mobile website. If you are working with a carrier that requires it or providing a very popular service, though, you should consider creating a very basic WML site for 100% compatibility.

Remember, there is poor or no support for WML in modern smartphones' browsers (the most-used mobile Internet devices), and the future is even darker. If you have a WML-only site, you should consider migrating it quickly; you are losing valuable customers.

cHTML, the Forgotten Standard

At the same time that WML appeared on the market, in 1998, compact HTML (cHTML) also appeared, mainly in the Japanese market. cHTML is a subset of HTML with additions for mobile features, like support for access key shortcuts, pictorial characters (emoticons), and Japanese characters. It was submitted as a standard to the W3C but its adoption was mainly in Japan, with some implementations in the Netherlands, Italy, France, Australia, and the United States. Early versions of cHTML lacked support for JPEG, tables, backgrounds, frames, and stylesheets.

Current Standards

In terms of the mobile web today, our real work will be directly related to the following standards and pseudo-standards:

- XHTML Mobile Profile 1.0, 1.1, and 1.2
- XHTML Basic 1.0 and 1.1
- XHTML 1.0 and 1.1
- HTML 3.2 and 4.0
- HTML 5.0 draft
- De facto standard (X)HTML extensions
- WAP CSS
- CSS Mobile Profile
- CSS 2.1
- CSS 3.0
- CSS custom extensions

This may seem overwhelming, but don't panic: it isn't really that complicated. We can distinguish two types of standards: HTML-based and CSS-based.



This discussion will largely ignore the desktop web, but not because I believe in two different webs. Desktop web development relies on techniques designed for desktop browsers, like Internet Explorer or Firefox. Many of the techniques used in mobile web development are different.

Politics of the Mobile Web

Why are there so many standards? The first answer is politics. Politics? Yes. Many actors are involved in the mobile web, and everyone wants to be part of the decision-making process. Are mobile web standards "mobile enough" to be managed by mobile standards organizations, like the Open Mobile Alliance (OMA)? Are they "web

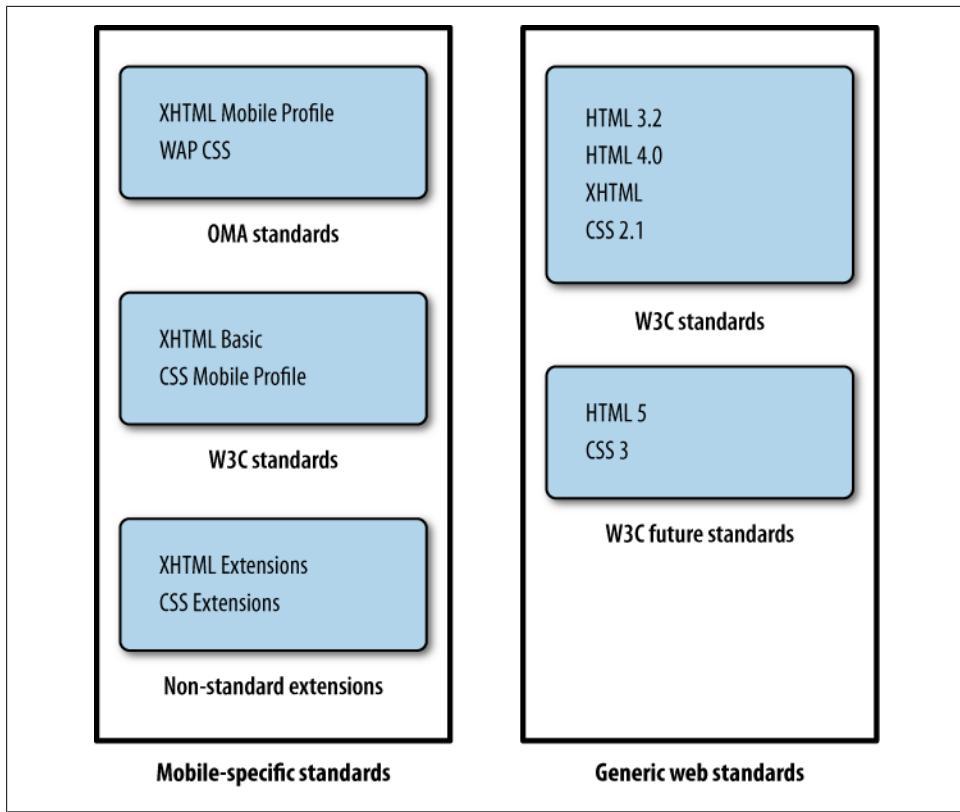


Figure 5-4. Today, many standards exist for mobile web markup.

enough” to be managed by web standards organizations, like the W3C? Do the manufacturers have enough power to decide on their own markup? [Figure 5-4](#) shows the mobile-specific and generic web standards that are available today and those that are currently in the pipeline.

Those kinds of questions are responsible for the nightmares that can occur with markup. Here’s another look at the list in [Figure 5-4](#), but grouped by owners:

W3C mobile web standards:

- XHTML Basic 1.0 and 1.1
- CSS Mobile Profile (CSS MP)

OMA mobile web standards:

- XHTML Mobile Profile (MP) 1.0, 1.1, and 1.2
- Wireless CSS (WCSS) or WAP CSS

Non-mobile web standards adopted by manufacturers:

- XHTML 1.0

- HTML 3.2 and 4.0
- CSS 2.1

Non-mobile future web standards adopted by manufacturers using the standard drafts:

- HTML 5.0
- CSS 3.0

Manufacturers' extensions to the standards:

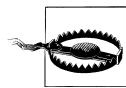
- De facto standard (X)HTML extensions
- CSS Custom Extensions

Managing multiple standards

The first bit of good news is that, with the exception of new features in HTML 5 and CSS 3, all the standards are similar and compatible with each other. The second bit of good news is that HTML-based browsers—that is, every mobile browser on the market today—have a “good effort” mechanism to manage nonrecognized tags and attributes. This is at the heart of HTML’s evolution.

I remember my first desktop HTML project in 1996, and the projects after that. The list of compatible tags was different for each browser on the market (at that time, Mosaic, Netscape Navigator, the AOL Browser, and a bit later, Internet Explorer). However, it wasn’t a big problem. If the browser did not understand a tag or an attribute, it just ignored it. The same is true of most mobile browsers. This will be very helpful in enabling us to manage all standards at the same time (with some exceptions: basically, older devices).

As the mobile device manufacturers are nearer to OMA than the W3C, they officially implement the WAP 2.0 standard using XHTML MP and WAP CSS. However, almost all browsers also understand XHTML Basic and CSS MP, and most mid- and high-end devices understand full desktop web standards (HTML and CSS).



Don’t rely on the standards. Even two devices supporting the same standard may render different results for many tags, attributes, and styles. We will analyze every usage, and I’ll recommend the best solution.

Delivering Markup

Before we talk about the individual standards and the differences between them, we will analyze how to deliver each standard to a mobile device. Firstly, as in the desktop web, all static document markups use the `.html` extension, and the style ones use the `.css` extension. Of course, we can deliver XHTML MP or XHTML Basic using a dynamic template, a `.php` or `.aspx` file, or servlet Java.

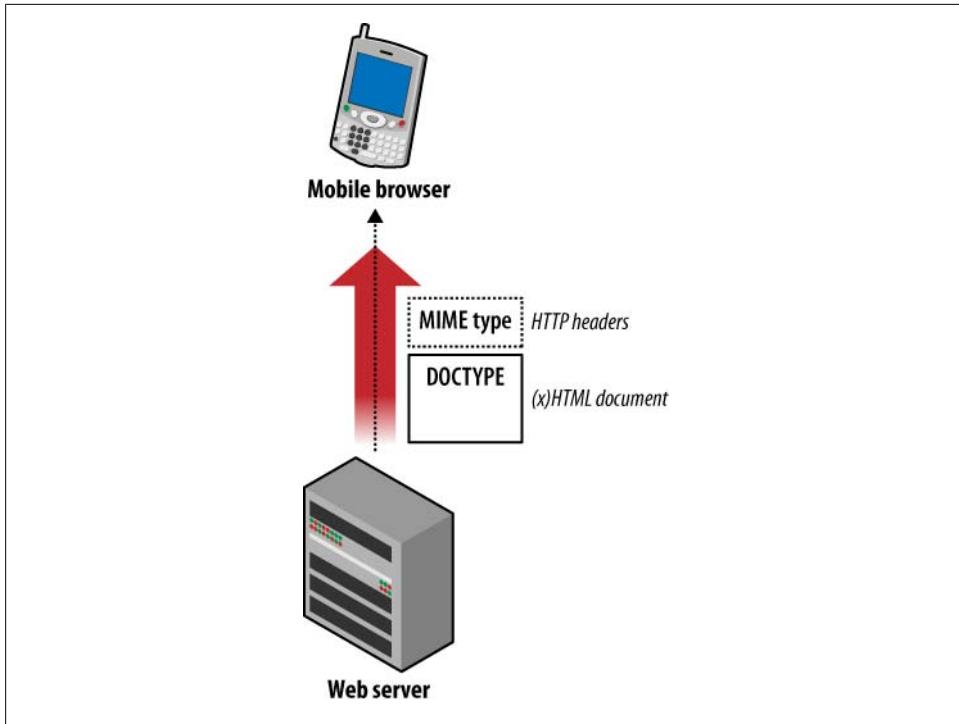


Figure 5-5. The MIME type travels with the server's response headers and the DOCTYPE is defined inside the HTML document.

So, how does the device know which standard we coded a website in? By reading the MIME type and the DOCTYPE. The MIME type is a string sent by the server telling the browser the format of the document, and the DOCTYPE is the first line in the HTML file. If you omit the DOCTYPE it should still work in many browsers, but don't do this! The other thing to notice is that in HTML 3.2, 4.0, and 5.0 the opening tag should be:

```
<html>
```

while for all the other XHTML subtypes it should be:

```
<html xmlns="http://www.w3.org/1999/xhtml">
```

All CSS standards use the same MIME type as in the desktop web (`text/css`), and there is no format indicator inside the CSS. That is why for the style file, we will not need to define which standard we are using. The selectors and attributes used will determine compatibility. [Figure 5-5](#) illustrates how MIME types and DOCTYPES travel through the network, one in the header and the other inside the document.

The preferred MIME types and DOCTYPES are listed in [Table 5-3](#).

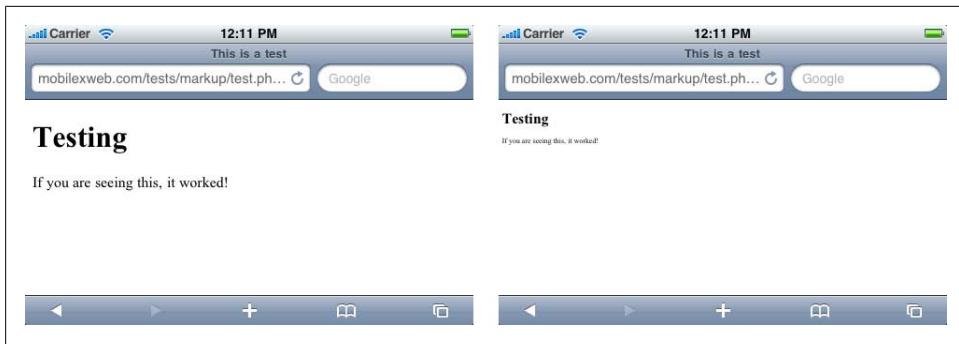


Figure 5-6. The same document, with the same MIME type, rendered in Safari on iOS. The version on the left is using the XHTML Mobile Profile DOCTYPE and the version on the right a non-mobile XHTML one.

Table 5-3. MIME types and DOCTYPES for today's standards

Standard	Preferred MIME type	DOCTYPE
XHTML MP 1.0 (first version)	application/ xhtml+xml	<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN" "http://www.wapforum.org/DTD/xhtml-mobile10.dtd">
XHTML Ba- sic 1.1	application/ xhtml+xml	<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML Basic 1.1//EN" "http://www.w3.org/TR/xhtml-basic/xhtml-basic11.dtd">
XHTML MP 1.2 (last version)	application/ vnd.wap.xhtml +xml	<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.2//EN" "http://www.openmobilealliance.org/tech/DTD/xhtml-mobile12.dtd">
XHTML 1.0	application/ xhtml+xml	<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
HTML 4.0	text/html	<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN" "http://www.w3.org/TR/html4/loose.dtd">
HTML 5.0	text/html	<!DOCTYPE html>

The iPhone browser will render a file differently if the markup is using the XHTML Mobile Profile or XHTML Basic 1.0 DOCTYPE, as shown in Figure 5-6. The biggest difference will be the viewport used. This will be covered in Chapter 6, but for now, it's good to know that a file in XHTML MP markup will not start zoomed out, like a normal HTML file.

We should also include the `meta` tag to tell the browser the content-type of the file, using the right MIME type or `text/html` (even if we are using XHTML or XHTML MP, as the W3C recommends) and define the charset used (UTF-8 in almost all situations):

```
<meta http-equiv="Content-Type" content="text/html; charset=UTF-8" />
```

This is optional, but it may be useful if we don't define the charset used in the HTTP header and we don't use the XML header. Using the header alternative is the preferred and most compatible way to do it.



If we use a basic markup compatible with all standards, some low- and mid-end devices will not understand the `text/html` MIME type, and some smartphones will not understand the XHTML MP MIME type. In a later chapter, we will learn how to change this attribute dynamically, even when we deliver the same code.

XHTML MP can be delivered using the OMA MIME type (`application/vnd.wap.xhtml+xml`), the XHTML type (`application/xhtml+xml`), or even the HTML type (`text/html`), with the same result. The OMA recommends using the first one, but using the XHTML type will work well in almost all situations. Some older and low-end devices render the page differently depending on the MIME type used.

Table 5-4 shows the results of a test of the effects of using different MIME types and DOCTYPEs, testing XHTML MP first with all the browsers listed and seeing if it is displayed correctly or not (leading to the result shown in **Figure 5-7**). You can find this test at <http://www.mobilexweb.com/tests/ch6>.

Table 5-4. HTML and XHTML testing compatibility table

XHTML Mobile Profile						
Browser/platform	XHTML MP MIME	XHTML MIME	HTML MIME	XHTML Basic	XHTML	HTML
Safari	No	Yes	Yes	Yes	Yes	Yes
Android browser	Yes	Yes	Yes	Yes	Yes	Yes
Symbian/S60	Yes	Yes	Yes	Yes	Yes	Yes
Nokia Series 40	Yes	Yes	Yes	Yes	Yes	Yes
webOS	No	Yes	Yes	Yes	Yes	Yes
BlackBerry	Yes	Yes	Yes	Yes	Yes	Yes
NetFront	Yes	Yes	Yes	Yes	Yes	Yes
Openwave (Myriad)	Yes	Yes	Yes	Yes	Yes	Yes
Internet Explorer	Yes	Yes	Yes	Yes	Yes	Yes
Motorola Internet Browser	Yes	Yes	Yes	Yes	Yes	Yes
Opera Mobile	Yes	Yes	Yes	Yes	Yes	Yes
Opera Mini	Yes	Yes	Yes	Yes	Yes	Yes
NTT DoCoMo (Japan)	Yes	Yes	Yes	Yes	Yes	Yes

Top mobile websites

Table 5-5 shows the top nine mobile websites visited in the UK (statistics by Opera State of the Mobile Web) with a Nokia 5800 XpressMusic user agent and an iPhone user agent and reports on how they delivered the documents.



Figure 5-7. Safari on iOS doesn't understand the XHTML MP MIME type, so documents for smartphones using this browser need to be served using non-mobile MIME headers.

Table 5-5. Top mobile websites' DOCTYPES and MIME types

Site	URL	Nokia DOCTYPE	MIME type	iPhone DOCTYPE
Facebook	http://m.facebook.com	XHTML MP 1.0	HTML	No DOCTYPE
Google	http://m.google.com	XHTML 1.0	XHTML	XHTML MP 1.0
BBC	http://m.bbc.co.uk	XHTML 1.0	HTML	XHTML 1.0
Live/Bing	http://m.bing.com	XHTML MP 1.0	XHTML	XHTML MP 1.0
Yahoo!	http://m.yahoo.co.uk	XHTML MP 1.2	HTML	HTML 5
Wikipedia	http://m.wikipedia.org	XHTML 1.0	HTML	XHTML 1.0
YouTube	http://m.youtube.com	XHTML MP 1.0	XHTML	HTML 4
Bebo	http://m.bebo.com	XHTML MP 1.0	XHTML	XHTML MP 1.0
eBay	http://wap.ebay.co.uk	XHTML MP 1.0	XHTML	HTML 4

Charset encoding

For the best compatibility for Latin languages, we should deliver any XHTML with UTF-8 defined in the XML header or in the Content-Type HTTP header. If we are delivering just HTML or content in other languages, we can use other encodings.

Conclusion about MIME types and DOCTYPES

As we've seen, almost every browser actually understands the HTML MIME type and DOCTYPE. However, the recommendation is to use the XHTML MP 1.0 DOCTYPE and the XHTML MIME type. We will see how to detect this compatibility in [Chapter 10](#).

What is the advantage of using the mobile headers? There was some different behavior on some devices (those using mobile Safari, for example), and it is the semantically correct solution. This will be our flag saying "Hey, this is a mobile website, and it is

not intended to be used from a desktop.” This metadata will be very helpful for search engine robots to determine which pages are mobile-ready.

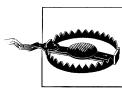
Only if we are going to use some HTML 5 features or non-mobile-compatible tags should we consider using the HTML DOCTYPE, so we will still have valid markup.

XHTML Mobile Profile and Basic

XHTML MP is based on the W3C’s XHTML Basic, and they are almost the same. The W3C has an online mobile validator at <http://validator.w3.org/mobile>; it accepts XHTML Basic and MP as valid markup.

XHTML Mobile Profile is a subset of XHTML. It is XML-based, so we need to follow the strict rules. If you have never worked with XHTML 1.0 or 1.1 for the Web, let’s analyze the differences compared with working with HTML:

- The file must have a root element (`html` tag).
- Every tag name and tag attribute must be in lowercase.
- Every attribute value must be enclosed in quotes.
- Every tag must be closed. This may seem obvious, but it is not; tags like ``, `<input>`, and `
` don’t need to be closed in HTML, but they do need to be closed in XHTML. The general rule is to use self-closed tags, like `
`.
- The tags need to be closed in reverse order. If you open a paragraph and then a link, you must close the link before closing the paragraph.
- XHTML entities must be well formed. A mandatory space should be `&nbsp`; and an ampersand character should be `&`.
- All attributes must have a value. For example, `<option selected>` is invalid; you must use `<option selected="selected">`.
- The DOCTYPE declaration is mandatory, and the XML opening tag is optional. In fact, for mobile browsers we should not insert the XML opening tag.



This is not a book about XHTML, CSS, or even JavaScript. I assume you have some basic experience with these markup and programming languages; if not, you will find a lot of resources on the Web and excellent books from O'Reilly Media to help you get started.

Available Tags

We have finally arrived at the level of code. XHTML MP, as a subset of XHTML derived from HTML, will look familiar to most web developers.

The Space Before the Final Closing Slash

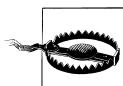
You may be familiar with the use of `
` in recent years, whether in XHTML or in HTML. Do you know why the space is included before the closing slash? In an XML file, we can use `
` without a space, and it's valid. The space is for backward compatibility with non-XHTML browsers that don't expect a final slash in the tag. Using the space ensures that most older browsers will understand the tag as a line break.

The tags available in both XHTML Mobile Profile 1.2 and XHTML Basic 1.1 (the two standards are almost at the same level) are listed in [Table 5-6](#). Some features, like scripting support, were added in XHTML MP 1.1 and others, like object support, in the last standard (1.2).

Table 5-6. HTML tags available in XHTML MP 1.2 and Basic 1.1

Tag types	Tags available
Structure	<code>body, head, html, title</code>
Text	<code>abbr, acronym, address, blockquote, br, cite, code, dfn, div, em, h1, h2, h3, h4, h5, h6, kbd, p, pre, q, samp, span, strong, var</code>
Links	<code>a</code>
Presentation	<code>b, big, hr, i, small</code>
Stylesheet	<code>style</code>
Lists	<code>dl, dt, dd, ol, ul, li</code>
Forms	<code>form, input, label, select, option, textarea, fieldset, optgroup</code>
Basic tables	<code>caption, table, td, th, tr</code>
Other	<code>img, object, param, meta, link, base, script, noscript</code>

If we compare previous versions of XHTML MP and Basic, the differences are bigger. The last XHTML Basic standard (1.1) added almost every addition in XHTML MP 1.2, and now the two are almost equal.



XHTML Mobile Profile 1.2 is the last standard from the OMA. The first draft was presented in 2004 and the approved version was released in 2008. That is why there are still some low- and mid-end devices on the market that don't comply with this version. Remember that it takes some time for browser developers to comply with new standards, and more time for manufacturers to get devices using the new standards to the market.

We can still use a tag that is not supported in our declared DOCTYPE. It will not validate against the DTD, but most mobile browsers will simply ignore the tag without any error visible to the user.

Official Noncompatible Features

Every WAP 2.0 browser on the market today should understand and render the tags listed in [Table 5-6](#). However, in XHTML MP (and Basic), there are also several tags, techniques, and technologies that are officially not supported. We will still test them in every browser, though, because as we've seen there are many full HTML browsers on the market, and others that will understand some noncompatible features. All of the following are officially unsupported:

- Nested tables (table inside other tables)
- Full table tags: `thead`, `tbody`, `, and attributes`
- Full form tags: `input type="image,"` `input type="file"`
- Editing: `ins`, `del`
- Image maps
- Frames
- Iframes
- Deprecated formatting tags: e.g., `font`, `dir`, `menu`, `strike`, `u`, and `center`

We will check all browsers for compatibility with those features, as well as the following:

- Adobe Flash
- Microsoft Silverlight
- The `XMLHttpRequest` object (Ajax)
- SVG
- The `canvas` tag
- Other embedded objects: Windows Media, QuickTime, Java applets
- Multimedia tags: `audio` and `video`
- Opening links in new tabs or windows

We will also verify which URL schemas are available for each browser.

Creating Our First Compatible Template

Let's create a very simple markup template that will be compatible with all devices. I really recommend that you use the source code view if you are using a visual web tool, like Adobe Dreamweaver or Microsoft Expression Web. You should feel comfortable with nonintrusive, semantic HTML code for mobile web development.

Our template will look like this:

```
<?xml version="1.0" ?>
<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.2//EN"
 "http://www.openmobilealliance.org/tech/DTD/xhtml-mobile12.dtd">
```

```

<html xmlns="http://www.w3.org/1999/xhtml">
<head>
    <title>First Template</title>
</head>

<body>
    <h1>First Template</h1>
    <h2>Programming the Mobile Web</h2>
    <p>Welcome to the first template of this book</p>
    <p>It <strong>should work</strong> in every mobile browser in the market</p>
    <ol>
        <li><a href="http://m.yahoo.com" accesskey="1">Yahoo!</a></li>
        <li><a href="http://m.google.com" accesskey="2">Google</a></li>
        <li><a href="http://m.bing.com" accesskey="3">Bing</a></li>
    </ol>
    <p></p>
</body>
</html>

```

Here are some comments on this code, which produces the results shown in [Figure 5-8](#):

- We are using the XHTML MP DOCTYPE.
- We are using standard header tags for titles: `h1` ... `h6`, not `p` or `div` tags.
- We are using the paragraph tag (`p`) to enclose text.
- We are using an ordered list to show a link menu. The option numbers match the `accesskey` attributes of the anchor (`a`) tags.
- We provide a `width`, `height`, and alternate text for all images.

As these images prove, this code works on every platform. I know what you’re thinking: “Hey, this is an awful experience for the iPhone.” If you’re tempted to throw away this book right now, wait! Give me a chance. Using this exact code, we will create a great iPhone (or other smartphone) experience in the following pages. Well, OK, there may be some little changes to the code, but not so many. Our goal will be to keep our document template as simple as this one, even for very complex HTML 5 web apps.

Markup Additions

WML, as a mobile-specific language, has many mobile-prepared tags and attributes. This is not true of XHTML MP or Basic, and that’s why many developers were against WAP 2.0 in the early 2000s. Some vendors, such as Nokia, even tried to create their own markup supersets over XHTML with mobile-specific features.

The only mobile-specific addition is present in XHTML Basic 1.1, but even with the XHTML MP DOCTYPE it will work if the browser understands that markup. The addition is the attribute `inputmode`, available for the `input` and `textarea` tags; it allows us to specify input mode tokens indicating the expected type of the input characters (e.g., `latin`, `thai`, `arabic`) and modifier tokens for the text input (e.g., `predictOff` to

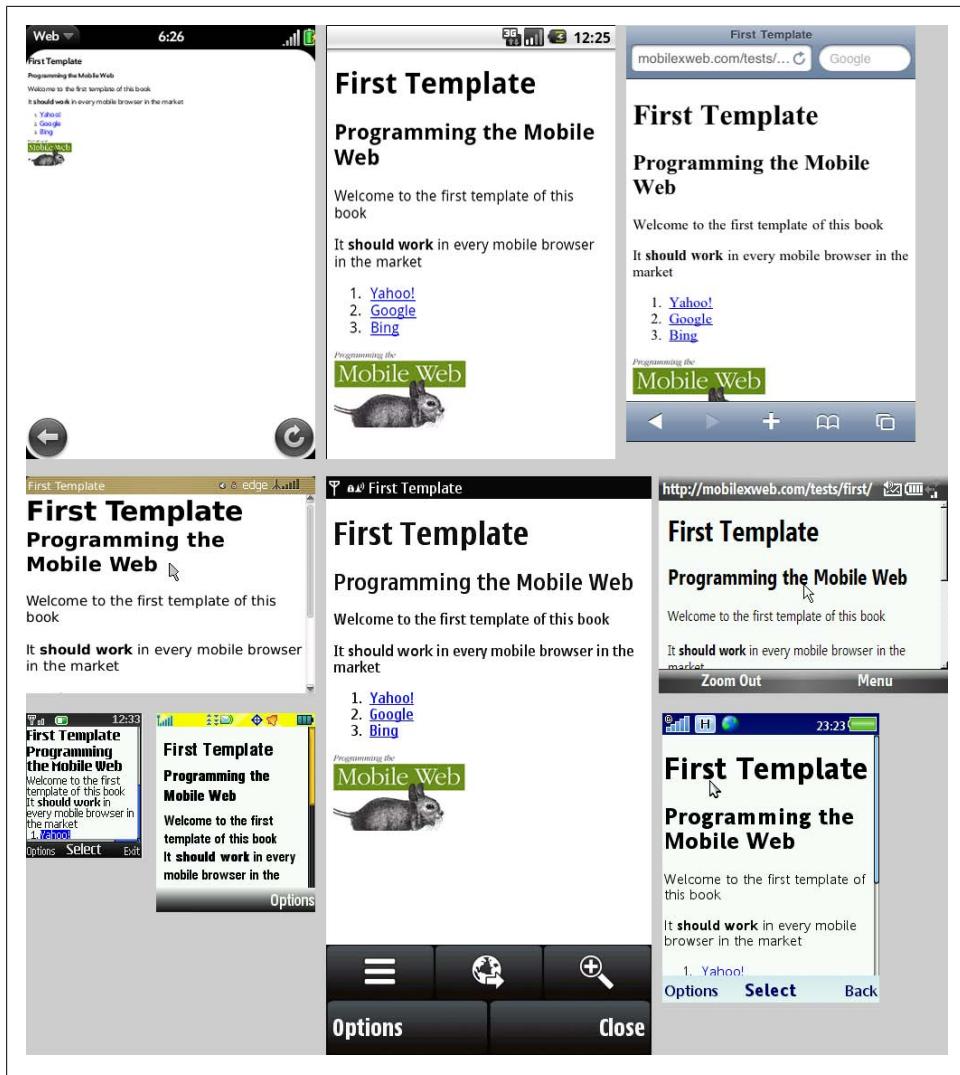


Figure 5-8. The same template without CSS in the webOS, Android, Safari, BlackBerry, Nokia S60, Windows Mobile, Nokia S40 (low-end device), Motorola, and NetFront (Sony Ericsson device) browsers.

deactivate predictive input). XHTML MP adds similar support with WAP CSS that we will cover later.



WML had a `format` attribute for the `input` tag that was similar to `input mode`. Some browsers, such as Openwave, still understand this attribute in an XHTML file.

CSS for Mobile

Web (and mobile) browsers have a great feature that makes our lives much easier. If we use any selector or attribute that the browser doesn't understand, the browser will just ignore it. This will be very helpful in the following pages. Usage of CSS 2.1, CSS 3.0, CSS Mobile Profile, and WAP CSS is the same; we specify CSS selectors and attributes for those selectors. The standards only tell us which selectors and attributes are supported, and we will find browsers that do not properly render standard ones and do properly render noncompatible tags.

If you are interested in having W3C-valid markup, remember that XHTML Basic 1.0 doesn't support CSS, and 1.1 added support, but only for a `style` or `link` tag with external styles. The W3C standard doesn't support the inner styles defined in the `style` attribute.

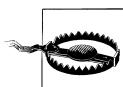
WCSS, or WAP CSS (the OMA standard that comes with XHTML MP), is a CSS 2.0 subset, like CSS MP (the W3C standard that comes with XHTML Basic). That's why we will focus here on CSS 2.0 features (and beyond). We'll begin by talking generally about "mobile CSS," and later we will see how the different mobile browsers handle each of those features.

WCSS Extensions

The Open Mobile Alliance standard added to CSS 2 some new attributes that we can use in mobile browsers. As this is how CSS defines extensions, every new attribute has a dash (-) as a prefix. We will see later that some mobile browsers also understand some nonstandard extensions, like Mozilla's. But again, don't worry; we will look at compatibility attribute by attribute so you understand how to manage incompatibilities the best you can.

Access key

The first attribute is `-wap-accesskey`; it is the counterpart of the XHTML `accesskey` attribute. It can be used with any interactive element (generally, the `a`, `textarea`, `label`, `input`, and `button` tags). The possible values are the digits 0 through 9 and the special values * and #. For some browsers on devices with numerical keypads, this attribute can be used to create shortcuts to access those elements. Some browsers do nothing with it, some browsers set the focus on that element when the user presses the key, and other browsers directly fire the action associated with it (go to a link, submit a form, etc.).



We should only use the standard keys 0–9, *, and # as access keys. We cannot assign functions to soft keys or any other special keys in HTML. WML allows us to assign links to soft keys, but this functionality has no effect in modern browsers.

We can only assign the same key to one element in the same page. That's why the `-wap-accesskey` attribute is useful only with ID selectors or with inline styles. You shouldn't use this attribute with element or class selectors.

The next three samples all have the same result:

```
<a href="http://mobilexweb.com" accesskey="0">Our website</a>
<input type="submit" value="Send" accesskey="9" />

<a href="http://mobilexweb.com" style="-wap-accesskey: 0">Our website</a>
<input type="submit"" value="Send" style="-wap-accesskey: 9" />

<style type="text/css">
#linkWeb {
    -wap-accesskey: 0;
}
#btnSubmit {
    -wap-accesskey: 9;
}
</style>

<a href="http://mobilexweb.com" id="linkWeb">Our website</a>
<input type="submit"" value="Send" id="btnSubmit" />
```

Table 5-7 tests all the possibilities to determine which version it's better to use, and in which browsers we will have results.

Table 5-7. Access key testing compatibility table

Browser/platform	Behavior in links			
	As XHTML	As inline CSS	As CSS by ID	Behavior in text inputs
Safari	No behavior			
Android browser	No behavior			
Symbian/S60	No behavior			
Nokia Series 40	No behavior			
webOS	No behavior			
BlackBerry	No behavior			
NetFront	If accesskey active in preferences, go to link		If accesskey active, focus	
Openwave (Myriad)	Go to link		Focus	
Internet Explorer	Go to link		Focus	
Motorola Internet Browser	Go to link		Focus and open edit window	
Opera Mobile	No behavior			
Opera Mini	No behavior			



As [Table 5-7](#) reveals, access keys only work with a few browsers. This is because many of them use the keypad for accelerators (shortcuts for browser functions like scrolling, going back, or reloading). That is why we can only use them if they are not the preferred or only way to access functionality on the website.

Marquee

If you've been doing web development for a long time, like me, you probably hate the nonstandard `marquee` element that many people used to insert in web pages. WAP CSS revived this technique to create small animations without images that do not require Flash. A marquee is generally a text that scrolls from one side of the screen to the other, wrapping around continuously. In some mobile browsers it can contain any HTML code, including images and even tables. However, don't scroll too much heavy markup, for the sake of your visitors and the performance of your website.

To create floating, scrolling text, use any paragraph element, like `p` or `div`, define the `display` attribute as `-wap-marquee`, and assign values to some of the CSS attributes listed in [Table 5-8](#).

Table 5-8. Marquee WAP CSS attributes

Attribute	Possible values	Description
<code>-wap-marquee-dir</code>	<code>ltr</code> or <code>rtl</code>	Direction of the scrolling. Can be left to right (<code>ltr</code>) or right to left (<code>rtl</code>).
<code>-wap-marquee-loop</code>	Any number or <code>infinite</code>	Animation count. The <code>infinite</code> value creates a never-ending animation.
<code>-wap-marquee-speed</code>	<code>slow</code> , <code>normal</code> , or <code>fast</code>	Speed of the animation, without fine control.
<code>-wap-marquee-style</code>	<code>scroll</code> , <code>slide</code> , or <code>alternate</code>	Possible styles for the animation.

The following sample shows how to use a marquee to present an offer to the user:

```
<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN"
  "http://www.wapforum.org/DTD/xhtml-mobile10.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=UTF-8" />
<title>Mobile Web Test</title>
<style type="text/css">
.offer {
  display: -wap-marquee;
  -wap-marquee-dir: rtl;
  -wap-marquee-speed: medium;
  -wap-marquee-loop: infinite;
  -wap-marquee-style: scroll;
}
.offer strong {
```

```

        color: red;
    }
</style>
</head>

<body>
<div class="offer"><strong>Fly to the Moon</strong> Special offers this month
starting at US$ 145.000. Apply now and see us from the sky.</div>
<h1>TravelWithUs.com</h1>
(...)
</body>
</html>

```

The result is shown in Figure 5-9.



Figure 5-9. A Nokia N95 showing a marquee animation in progress using standard WAP CSS.

Now let's take a look at how browsers react to this tag. We may be tempted to use this display type to show a large amount of text in a small space, but if the mobile browser doesn't understand the marquee display, all that text will appear on the page, pushing down the important content! That is why we should consider alternative solutions for noncompatible browsers, like hiding the content. For example:

```

.offer {
    display: none;
    display: -wap-marquee;
    -wap-marquee-dir: rtl;
    -wap-marquee-speed: medium;
    -wap-marquee-loop: infinite;
    -wap-marquee-style: scroll;
}

```

In the preceding code, we first assign `display: none` to remove the text from the display. Then we assign `display: -wap-marquee`. If the browser understands the WAP CSS marquee styles, it will replace the `none` value. If not, it will just ignore the second setting and the `none` will win. We can also apply this style to a `marquee` HTML element, so it can work in all possible marquee-compatible browsers, as listed in [Table 5-9](#). The problem is that the code will not validate against standards (if we are interested in that).

Table 5-9. Marquee testing compatibility table

Browser/platform	Supports -wap-marquee	Supports marquee tag
Safari	No	Yes
Android browser	No	Yes
Symbian/S60	Yes	Yes
Nokia Series 40	Yes	Yes
webOS	No	Yes
BlackBerry	Yes	Yes
NetFront	Yes	Yes
Openwave (Myriad)	Yes	Yes
Internet Explorer	Yes	No
Motorola Internet Browser	Yes	Yes
Opera Mobile	Yes	Yes
Opera Mini	Buggy	No

Try to avoid marquees for important information. You may want to use them to reduce the space taken up by information that is not directly relevant, or to have some kind of animation free of plug-ins. Avoid the usage of links, images, or any other non-text markup inside a marquee, and create an alternative CSS stylesheet for noncompatible devices.

CSS form extensions

Another great enhancement in WAP CSS is the ability to define useful information for form input. We will talk about this in depth later, but for now let's see what extensions are included in the standard. They are listed in [Table 5-10](#).

Table 5-10. WAP CSS form extension attributes

Attribute	Possible values	Description
-wap-input-format	Complex pattern (see Chapter 6)	Defines the pattern of the text. Can be applied to text fields, password fields, and textareas.
-wap-input-required	true or false	If true, requires the user to provide some content before exiting the field. Can be applied to text fields, password fields, and textareas. This attribute has precedence over the format attribute in the input tag, if both are defined.

Confusion

It's OK to be a little confused after reading about all the incompatibilities. This is just an introduction to general and mobile-specific standards—just theoretical information. Actual concrete practice will make it much clearer.

Coding Markup

The standards are sometimes utopias, while the real world is something different. Many devices officially support standards, but in practice some feature is missing; many other devices add support for more technologies besides what is covered by the standards.

The W3C maintains a list of *Mobile Web Best Practices* at <http://w3.org/TR/mobile-bp>; dotMobi adds more advice in the *Developer's Guide* at <http://mobiforge.com/node/197>; and Luca Passani, an independent developer well known in the mobile web market (you'll see why in a few chapters), maintains an alternate set of guidelines, called *Global Authoring Practices for the Mobile Web*, at <http://passani.it/gap>.

They are decent resources, and they have much good advice for multiplatform mobile web development. We will take that and go further, testing every feature in the standards (and some nonstandard ones) to draw real conclusions about their usage.

We will go through a typical document, from the heading to the body structure, looking at the most common design patterns for document structure, including forms, frames, tables, links, and images. We will test every possible solution for each topic in every mobile platform so we can get some useful information about what we can and cannot use.

Heading Structure

The `<head>` part of a mobile web document will be very similar to that in a desktop web document, with the addition of some new `<meta>` tags useful only in mobile browsers.

First we'll define a `title`, as for any other web page. The space available for the title in a mobile browser is small compared with a desktop browser (Table 6-1 gives the average lengths of the titles displayed on the different platforms). The page title is used as the heading at the top of the screen on some devices; other devices also use the title as the default text for bookmarks and the history list.

Table 6-1. Average characters used in titles compatibility table

Browser/platform	Average number of chars used in titles
Safari	40 chars in portrait and 60 in landscape. Hidden after the user scrolls the page and in web apps.
Android browser	15 chars after the domain name in 1.0 and 1.5. Titles are not displayed after 2.0.
Symbian/S60	5 th edition: 35 chars in portrait, 20 in landscape.
Nokia Series 40	13 chars in 2 nd edition. 20 chars in 3 rd edition. No usage in 5 th and 6 th edition.
webOS	No usage up to webOS 1.3. In webOS 1.4, the title appears only if the user scrolls down from the top.
BlackBerry	15–30 chars, depending on screen width.
NetFront	No usage.
Openwave (Myriad)	15 chars.
Internet Explorer	No usage.
Motorola Internet Browser	15 chars.
Opera Mobile	Depends on the screen, between 20 and 60 chars.
Opera Mini	Depends on the screen, between 20 and 60 chars.

Every mobile title needs to be:

Meaningful

Avoid duplicate titles for every page of your mobile site using only your company name. However, on your home or entry page, don't use "Home Page," use your company or product name and keep it very short. This may be the most bookmarked page.

Short

Keep the title between four and eight words long. If mentioning the name of your company, do that last (for example, "Big Mac - Meals in McDonald's"). Use small words first; some old devices truncate the title after 10 or 12 characters.

Concise

Don't waste words. For example, avoid using "Mobile" in the title; the user knows that she is using a mobile device.

Icons for the Mobile Web

In the early 2000s, everyone rushed to insert *favicon.ico* files in their websites' root files to see how the icons would be added to Internet Explorer's address bar. Today, in the desktop web those icons are more useful for tab iconography. But what about in mobile browsers?

For performance purposes, mobile browsers don't look for a *favicon.ico* file in the root folder if we don't explicitly specify an icon to be used. In valid XHTML, the way to add an icon file is to use the following link tag:

```
<link rel="icon" type="image/png" href="favicon.png" />
```

Originally, the icons were in Windows ICO format (similar to BMP), but these files are difficult to export from well-known graphic editors and are not optimized in size. Today, you can use GIF or PNG for mobile compatibility. Originally the icon size had to be 16×16 pixels, but now they can be any square size and the browser will resize them.

Safari on iOS adds another type of icon (*WebClip*), which is available if the user adds the website to the home screen. We will talk about this in [Chapter 12](#), but for now just know that Safari for iPhone and iPod requires a 57×57-pixel PNG file (with no transparency preferred) and the following metatag, which can coexist with the other icon tag:

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



Up to iOS 3.1 (known as iPhone OS at that time), 57×57 pixels was the only available size for the WebClip. Starting with iOS 3.2 for iPad, 72×72 is the icon size we should use if we detect this device. For iOS 4.0 or newer, devices with high DIs (such as iPhone 4) need an icon size of 114×114 pixels. Otherwise, the device will resize the icon with quality loss.

The icon will automatically be given rounded borders and a glossy effect, like that shown in the middle of [Figure 6-1](#). If you don't want your icon to have that effect, instead use the following meta tag:

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



Figure 6-1. The original 57×57-pixel iPhone icon file, the final appearance once the website has been added to the home screen, and the icon using the precomposed meta tag.



If you don't define the *apple-touch-icon* link, mobile Safari will look for the existence of a file called *apple-touch-icon.png* in the root folder. If it does not find this file, it will look for an *apple-touch-icon-precomposed.png* file (from iOS 2.0); no effect will be added to this icon.

Android (since version 1.5) supports only the `apple-touch-icon-precomposed` metatag for high-resolution icons.

[Table 6-2](#) explores compatibility for this type of icon, including usage of both the favicon ICO files and PNG files, and the final display size.

Table 6-2. Icon display compatibility table

Browser/platform	Usage	PNG	ICO	Final size on screen (px)
Safari	iPhone special icon used on the home screen	Yes	No	57×57, or 72×72 for iPad or 114×114 for high-DPI devices
Android browser	In the title area and on the home screen	Yes	Yes	16×16, or 57×57 if iPhone precomposed icon defined
Symbian/S60	No			
Nokia Series 40	No			
webOS	No			
BlackBerry	In the title area (some devices)		Yes	16×16
NetFront	No			
Openwave (Myriad)	No			
Internet Explorer	No			
Motorola Internet Browser	No			
Opera Mobile	Title and bookmarks	Yes	Yes	16×16
Opera Mini	Title and bookmarks	Yes	Yes	16×16

Generally speaking, you should create an icon in PNG format and use it as the icon for your pages. Noncompatible browsers won't use it, but for the ones that do, it will make a difference. It is better to have a `favicon.ico` and an Apple touch icon, even if you don't want to use it: some browsers will make the HTTP request regardless of whether you define the reference in the markup, and a 404 response is always worse than delivery of a small file.

Hey! I'm Mobile Friendly

We talked about the MIME type and DOCTYPE in the last chapter. As you saw, these are very helpful in telling browsers that documents are prepared for mobile delivery. However, this is not enough for mobile browsers that can read any desktop website. Those browsers treat the pages differently if they are for desktop users or are optimized for mobile devices. The differences are the initial zoom scale and some possible changes in the layout.

If you are creating a mobile-optimized version of your website, you need to tell the browsers to be aware of this. They are not part of any standard, but there are some different `meta` tags to define. You should implement all of them at the same time.

BlackBerry and some others use a `meta` tag for defining mobile-friendly documents:

```
<meta name="HandheldFriendly" content="True" />
```

Internet Explorer Mobile (formerly Pocket IE) has also created its own `meta` tag in Windows Mobile 5:

```
<meta name="MobileOptimized" content="width" />
```



Mobile Internet Explorer allows us to activate ClearType technology for smoothing fonts for easy reading using the tag `<meta http-equiv="cleartype" content="on">`.

A not-so-standard variation is to use the `alternate link` metatag. This is intended to be used in the desktop document, defining the alternative URL for the same content intended for viewing on different media (`handheld`, in this case):

```
<link rel="alternate" media="handheld" href="http://m.mysite.com" />
```

However, some mobile sites (like the Google mobile home page) use the same `link` tag inserted in the mobile page, too, with an empty `href` like a flag saying that this is alternative content for mobile devices and should not be considered as duplicated content:

```
<link rel="alternate" media="handheld" href="" />
```

I don't have real evidence yet that this works in any mobile browsers or for SEO purposes, but it won't do any harm.



Defining mobile `meta` tags will be useful for transcoders, in determining whether to show the mobile version as we've created it rather than transcoding the content as a full website. We will talk about transcoders in [Chapter 10](#).

Defining the viewport

The viewport is the area in which the page fits. You can specify its width and height, and it can be larger or smaller than the total visible area of the screen (see [Figure 6-2](#)). This is where the scale and zoom features of the mobile browser come into play. If you are creating a mobile-friendly website it shouldn't need to be zoomed in or out, so you can say to the browser that you want to start with a scale of 1:1 (viewport area:visible area) and that you don't want the user to change that scale (with gestures or buttons).

You define the viewport using the `meta name="viewport"` tag. The content of the tag can be a comma-separated list of one or more of the attributes listed in [Table 6-3](#).



Figure 6-2. Safari on iOS uses a 980-pixel-wide default viewport. If your desktop website is prepared for a lower width, you should define it explicitly to avoid the right margin.

Table 6-3. Viewport metadata attributes

Attribute	Possible values	Description
width	Integer value (in pixels) or constant device-width	Defines the viewport width
height	Integer value (in pixels) or constant device-height	Defines the viewport height
initial-scale	Floating value (0.1 to n); 1.0 is no scale	Defines the initial zoom scale of the viewport
user-scalable	no or yes	Defines whether we will allow the user to zoom in and out in the viewport
minimum-scale	Floating value (0.1 to n). 1.0 is no scale	Defines the minimum zoom scale of the viewport
maximum-scale	Floating value (0.1 to n). 1.0 is no scale	Defines the maximum zoom scale of the viewport



If you open a document without a mobile DOCTYPE on an iPhone, the default viewport size will be 980 pixels wide. If you define only some of the attributes of the `viewport` metatag, mobile Safari will infer the other attributes for the best display.

You can define a viewport with a fixed size (in case you are showing a desktop-friendly website), or with a size relative to the visible area. The most common approach for our mobile template (introduced in [Chapter 5](#)) is to define the `width` as `device-width` and both the `maximum-scale` and the `minimum-scale` as `1.0`:

```
<meta name="viewport" content="width=device-width,minimum-scale=1.0,maximum-scale=1.0"/>
```

or the `width` as `device-width`, the `initial-scale` as `1.0`, and the `user-scalable` attribute as `no`:

```
<meta name="viewport" content="width=device-width,initial-scale=1.0,user-scalable=no"/>
```

[Figure 6-3](#) shows the effect that these settings can have on the user experience.



Figure 6-3. The same 300x300-pixel image viewed in the default Safari viewport, in a 1500-pixel viewport, at a device-width scale of 1.0, and at a device-width scale of 2.0.

Viewport compatibility. [Table 6-4](#) shows what happens if you try the `viewport` metatag in every browser to see which ones detect it and do something with it. Remember that we can still add it in noncompatible browsers because the `meta` tag accepts any content.

Table 6-4. Viewport usage compatibility table

Browser/platform	Usage
Safari	Yes
Android browser	Yes, but the initial automatic scale is always 1.0 before 2.2
Symbian/S60	No
Nokia Series 40	No
webOS	Yes
BlackBerry	No before 4.2.1 Yes from 4.2.1
NetFront	No
Openwave (Myriad)	No

Browser/platform	Usage
Internet Explorer	No before IE 6
Motorola Internet Browser	No
Opera Mobile	No
Opera Mini	No

Changing the navigation method

The Symbian browser (on 3rd edition and later devices) has two possible methods of browsing, the standard and normal way (cursor-based) and a hidden focus-based mechanism. A `meta` tag available for these devices allows us to change the default navigation method and use a simple focus mechanism:

```
<meta name="navigation" content="tabbed" />
```

This should be used only if you have a vertical tabular design (for example, a list of links using the whole width of the page). Using this tag will disallow the mouse events and hover effects over the page. If your design supports only vertical navigation, focus-based navigation will be faster for the user than the standard cursor navigation. However, when using a finger or a stylus on a touch-enabled 5th-edition device (like the N97 or 5800 XpressMusic), the user will not have access to focus-based navigation.



If you are creating a mobile-optimized site, insert the `viewport` metatag in every document of your site, disallowing user scaling and starting at a scale of 1.0.

If you are just configuring a desktop website to have a better display on smartphone browsers, use the `viewport` metatag to tell the browser your preferred width and initial scale.

The Document Body

The body is the most important section of the document, as it will define the content that the user will see.

Key best practices include:

- Avoid formatting tags.
- Use semantically correct, clean XHTML; we will define styles later with CSS.
- Don't create a document larger than 25 KB. Larger documents cause problems on old browsers (and caching problems even on modern ones).
- If you have a lot of text to show, separate the content into many pages.
- Don't use tables for layout.



The classic desktop web `meta` options, like `refresh` and `cache-control`, work well on mobile browsers. Usage of the `refresh` metatag for autoupdating documents is not good practice for mobile devices, though: it is difficult to scroll on some mobile browsers, and an unsolicited page refresh can be unpleasant for the user. You can do an Ajax autoupdate if it is really necessary to keep the document updated.

Almost every mobile browser supports caching, either in `meta` tags or using HTTP headers. It is best practice to use the `meta` cache tag for enhanced cache purposes. For example:

```
<meta http-equiv="expires" content="Mon, 5 Mar 2012 01:01:01 GMT">
```

Main Structure

A typical mobile document will be divided into four main sections:

1. Header
2. Main navigation
3. Content
4. Footer

The header should be as simple as possible, using an `h1` title and/or a logo or company banner. The main navigation should be no more than five main links, ordered by likelihood of use in a mobile context (most to least probable). The content is obvious; the footer should include very brief copyright information, a home link, a back link, and optionally other related links (such as “go to top”).

This is a simplification, I know, but most mobile pages should fit this structure. If your structure is more complex, give some careful thought to whether that complexity is necessary.

The Hell of Transcoders

Some carriers have decided to install and execute in their networks a transcoder that proxies every mobile web request, even those made with nonproxied browsers, to create a “better experience” for the user. This is a very bad practice from a developer’s perspective, for the following reasons:

- It compresses the content, the document, the CSS, the JavaScript, and the images without our consent.
- It changes our layout and design.
- It can even change our markup language.
- It removes all the original HTTP headers from the browser, blinding us from knowing which devices are accessing our websites.

Luca Passani, a mobile web developer well known in the community, created a manifesto in 2008 addressing content reformatting problems, available at <http://wurfl.sourceforge.net/manifesto>. The W3C is also taking part in this issue; it has issued a document on the Content Transformation Landscape, available at <http://www.w3.org/TR/ct-landscape>.

Chapter 10 will discuss the transcoder problem in greater depth.

The basic document structure should look like this. Separating every section with a `div` tag is not necessary for the document definition, but it is useful later for CSS styling. The main navigation can be an unordered list (`ul`) instead of a `div`:

```
<body>
  <div id="header">
    <h1>Mobile Web</h1>
  </div>
  <ul id="nav">
    <li><a href="Tests">Tests</a></li>
    <li><a href="Blog">Blog</a></li>
    <li><a href="Contact">Contact</a></li>
  </ul>
  <div id="content">
  </div>
  <div id="footer">
  </div>
</body>
```

The main content `div` should have as children only the tags `h2–h6`, `p`, `ul`, and, if necessary, another `div`. I know, this doesn't seem so exciting. However, using CSS and maybe JavaScript libraries prepared for smartphones, we can take this simple markup and create great experiences for high-end devices. Using a simple document structure will be one of our best practices in the mobile world, to avoid duplication.

Navigation Link Menus

XHTML MP 1.2 recommends the usage of linked resources for navigation purposes. A navigation link menu is a series of `link` tags, generally defined in the `head` element, that refers to the main index file (the Home) and optionally the next and previous pages in a series of related documents. These links can be useful for indexing and search engine optimization purposes. Here is an example of a navigation link menu for a photo gallery showing photo #2:

```
<link rel="start" href="index.html" />
<link rel="next" href="photo3.html" />
<link rel="prev" href="photo1.html" />
```

Go to top

Some mobile browsers, like Safari, allow the user to tap with a finger in the top section of the screen to scroll the page to the top. Other browsers have keyboard shortcuts for

that. And many others don't have any such mechanism, or if they do, it's so obscure that most users probably don't know what it is. So, it is a good mobile web practice to insert an anchor at the top of the page (in the header) and a link to that anchor at the bottom:

```
<body>
  <div id="header">
    <a name="top"></a>
    <h1>Mobile Web</h1>
  </div>
  ...
  <div id="footer">
    <ol>
      <li><a href="#top">Go to Top</a></li>
      <li><a href="/">Go Home</a></li>
    </ol>
  </div>
</body>
```

Images

It's often said that a picture is worth a thousand words. This is true in the mobile web, too. However, we need to find a balance with regard to the number of images in a document. Every image adds to the network traffic, number of requests, and load time. (Later chapters will discuss optimizing images.)

For now, we are talking about the `img` tag. This tag should be used only for:

- A company logo
- An article or product photo
- A map

Don't use the image tag for:

- Buttons
- Icons for links or menus
- Backgrounds
- Visual separators
- Titles

This doesn't mean that we won't use images for any of those purposes—we just won't use the image tag. The image tag is semantically correct for images that the user understands as images in their own right, not for visual aids. An arrow icon for a link isn't considered as an image for a normal user. It is just a button, or a link. We will follow the same rule.

Tag usage

The mandatory attributes for an `img` tag are `src`, `width`, `height`, and `alt`. It is very important to define the width and height of every image in a mobile document. This will reduce the initial rendering time, because the mobile browser won't need to wait for the image to load to know how much space it will take up and how to draw the rest of the content.

The alternative text (`alt` attribute) is also mandatory, because the user can disable images or they can be very slow to load, and the document must work without them. The `alt` text should provide enough information for the user to understand what is missing.



Image maps should be avoided on the mobile web. Focus-navigation devices don't have image map support, and while cursor-navigation devices may support them, usability is a problem for the users. Touch-navigation devices can also be problematic because of the finger size. Only use image maps when targeting compatible devices, and if those devices support touch navigation, use large areas for every link.

Formats

There's good news here. Almost every mobile browser understands normal web image formats: GIF, JPEG, and PNG. The suggestion is to use PNG because, thanks to its openness and because it is the mandatory format for Java ME, every phone with a browser understands PNG. That said, there are some differences with regard to index and alpha transparency.

For animation, the standard in mobile web development is Animated GIF. As Flash isn't included in many browsers (as you'll see later in this chapter), and even when it is included it can be slow, banners and animations will be most widely compatible using this classic format.



Later in this book we will talk about SVG (Standard Vector Graphics) and the HTML 5 `canvas` tag, which are great image replacements in compatible browsers.

Inline images

Thanks to lack of support in Internet Explorer 7 and earlier, most web developers don't even know about this great feature of modern browsers. For a mobile website, this technique is very useful.

A *data URI* is a mechanism for defining a URL with embedded content (e.g., an inline image). For example, we can define an `img` tag with the image itself inside it, without using an external file. This can be done using a base64 encoding of the image file—

basically, storing the binary file as a set of visible ASCII characters in a string. This is great for small images, icons, backgrounds, separators, and anything else that doesn't merit a new request to the server. Where is the catch? Not every mobile browser is compatible with this feature.



The size of an image (or any other binary file) will increase by about 30% when it's converted to a base64 string for a data URI, but its size will be reduced again if we are serving the document using GZIP from the server. Therefore, at the end it will be the same size or even smaller, and it won't require a new request (with all the overhead that involves).

The best part about data URIs is that they can be used in a CSS file, with caching and multipage support. We will cover that later in this book.

To convert an image file to a base64 string representation, we can use any online converter or command-line utility. There are free and online alternatives at <http://www.webutils.pl/index.php?idx=base64> and <http://www.motobit.com/util/base64-decoder-en-coder.asp>.

PHP Base64 Conversion

Many web server platforms offer base64 conversion. For example, PHP offers a `base64_encode` function to this purpose. To generate the code based on a real file on your server, use something similar to `base64_encode(file_get_contents($path))`. You'll need to add error support and insert the result in an `img` tag.

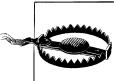
The compact syntax is `data:[MIME-Type][;base64],data`. The data can contain spaces and newlines for readability purposes.

For example, the O'Reilly logo (original PNG file 75 pixels wide) attached as a data URI image looks like this:

```

```

I know what you're thinking: "This is awful, didn't you tell me to create clean XHTML?" Maybe you're right.



You should deliver data URI images only to known compatible browsers. Later in this chapter we will talk about CSS Media Queries, and later in the book we will talk about server device detection.

In CSS this image could be a `background-image`, like:

```
#logo {  
    width: 70px; height: 17px;  
    background-image: url('data:image/png;base64,  
iVBORw0KGgoAAAANSUhEUgAAAEYAAARABAMAAACS18f4AAAAA3NCVQICAjb4U/gAAAAGFBMVEX/  
//////8AAACpqnMzMxmZmaHhoQ/Pz9kt3AEAAAACHRST1MA/////////9XKVDIAAAAJchZcwAA  
CxIAAsSAdLdfvwAAArdEVydnvZnR3YXJ1AEFkb2JlIEZpcmV3b3JrcyBDUzQGst0gAAAAFnRF  
WHRDcmVhdGlvbIBUaW1lADEyLzExLzA5uegApgAAQNJREFUKJGVkUFTwyAQhfMXXiH1LA3hDMTe  
SVDPidW7WnMvkxn/vo+MsamX6s7wg0y3029JgetR/I2Rdy8B8HicAyhj8PLIrodsuYlDF8i8KWNc  
/BRKaVCUTaJmkhcDuNOHLVCaJg6VfJY6JivqGJHEjn0oq3tpsGcfdoKuuGdx2+fsmSl3m2r2k2gG  
g3oi434xSMlmhtoYbR+EflAU71dMW89zzWcy2W61eF6YssK5j3vII81Lj0vzOKHaXCuSz8334yb  
gC2bd1UK6ZeMVVTdMMOMoIL3fmQskbD08LA8HDzCDw9Nyn7Hziuvhsh/PltCQi9770MmsXFaG  
f/z3q/EFat1L/IFsBmgAAAAASUVORK5CYII=') top left no-repeat;  
}
```

The best part of using data URI images in CSS is that we can use them in more than one document without downloading the image content again (i.e., by caching the same CSS), and we still have clean XHTML.



With HTML 5 features, you can save in a database or in a JSON object a list of base64 image files that will be cached for the user on the device for future usage in URLs. See [Chapter 9](#) for more information.

Table 6-5 explores image features and the browsers that support them.

Table 6-5. Image format compatibility table

Browser/platform	PNG 8 bits index transparency	PNG 8 bits alpha transparency	Animated GIF	Data URI
Safari	Yes	Yes	Yes	Yes
Android browser	Yes	Yes	No	Yes
Symbian/S60	Yes	Yes	Yes (sometimes stopped in 5 th edition)	Yes
Nokia Series 40	Yes	Yes	Yes	No
webOS	Yes	Yes	Yes from 1.4	Yes
BlackBerry	Yes	Yes	Yes from 3.8	Yes, not valid in CSS in older devices
NetFront	Yes	Yes	Yes	Yes
Openwave (Myriad)	Yes	Yes	Yes	No

Browser/platform	PNG 8 bits index transparency	PNG 8 bits alpha transparency	Animated GIF	Data URI
Internet Explorer	Yes	Yes	Yes	No
Motorola Internet Browser	No on old devices (v3 series)	Yes on newer devices	Yes	No
Opera Mobile	Yes	Yes	Yes	Yes
Opera Mini	Yes	Yes	No	Yes

Local pictograms

The Japanese carriers have created a de facto standard for using small icons in HTML without really using images and requests. The images (called *Emoji*, a Japanese word combining picture and letter) are based on a list of dozens of icons available to use, with the real rendering done by the browser. For example, say you would like to insert a heart icon. Every compatible browser will display a heart icon, but you might not know the exact image that the browser will use. Today, NTT i-mode services include *Basic Pictograms* (176) compatible with all devices and *Expansion Pictograms* (76) added in HTML 4.0. Other Japanese carriers (Au and Softbank) have their own pictograms (and their own usage mechanisms), so if you need to cover all Japanese carriers there are a lot of conversion tables between codes.

To display these pictograms, you can just embed the binary code into your HTML (saved as a Shift-JIS file, not UTF-8) or define them as Unicode standard characters using 香, where 9999 should be replaced with the pictogram number. The list of possible pictograms can be found at <http://www.mobilexweb.com/go/pictograms>.

This is a very underused feature in the occidental world. Even the iPhone supports these icons (though not the Android browser, as shown in Figure 6-4), although I have not seen too many websites using them. iOS has supported an Emoji keyboard since version 2.2 (though only for devices sold in Japan), and the browser allows Emoji pictograms for users worldwide. The list of iPhone Emoji is available at <http://www.mobilexweb.com/go/emoji-iphone>. The list is long—there are more than 450 Emoji—and the icons have great designs. Moreover, remember, they are images that don't use network resources! For example, for the iPhone we can show a message with a smiley at the end with the following code:

```
<p>Thanks for your message! &#xe415;</p>
```

There is also a Windows program (in Japanese, but understandable) that shows every pictogram we can use. It is called *iEmoji*, and you can download it from <http://www.mobilexweb.com/go/iemoji>.

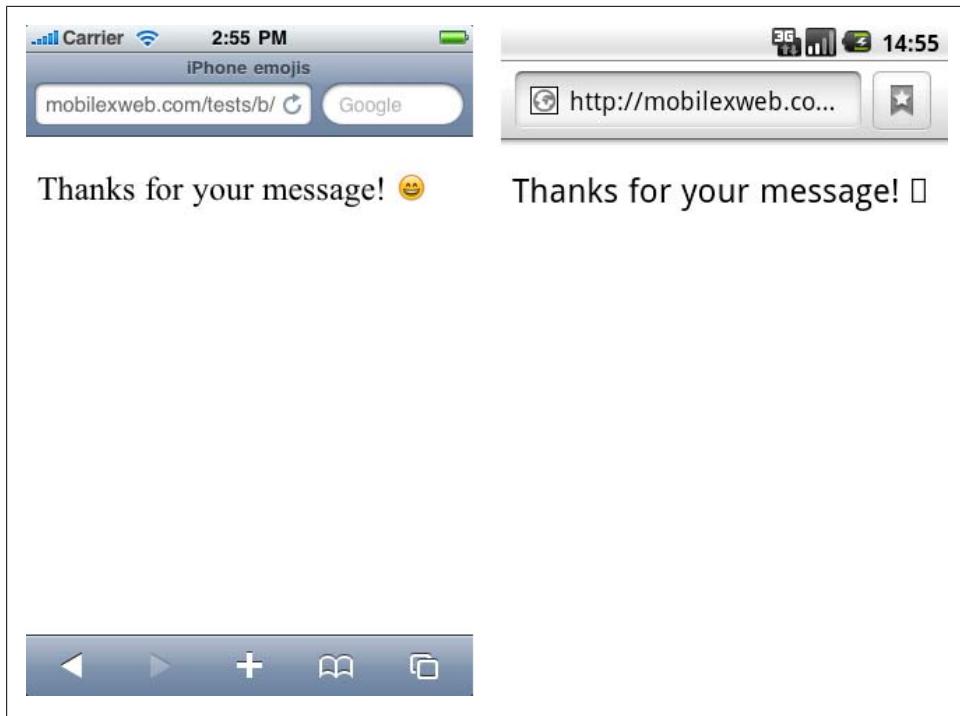


Figure 6-4. Safari on iOS shows the Emoji icon, but Android shows only a rectangle indicating a noncompatible character.



Remember, iPhone Emoji work all over the world, not just in the Japanese market. The only requirement is having iOS 2.2.1 or newer.

The OMA standardized pictograms in XHTML MP using an `object` tag:

```
<object data="pict:///core/arrow/right" />
```

The standards support alternative content. That is, if the pictogram is not available, you can add a child to the object with an alternative. The alternative can be another pictogram or a classic image:

```
<object data="pict:///time/season/summer">
  <object data="pict://weather/sunny">
    
  </object>
</object>
```

The pictogram sets are not standardized between browsers, and that's why today they are not widely used in mobile websites. [Table 6-6](#) lists pictogram compatibility for the

most common mobile browsers. A good resource for Emoji and pictograms is <http://sites.google.com/site/unicodesymbols/Home/emoji-symbols>.

Table 6-6. Pictograms compatibility table

Browser/platform	OMA pictograms	Emoji pictograms
Safari	No (shows page error alert)	Yes
Android browser	No (shows a big error message)	No (shows nothing)
Symbian/S60	No (shows nothing)	No (shows nothing)
Nokia Series 40	No (shows an X)	No (shows a square)
webOS	No (shows nothing)	No (shows a square)
BlackBerry	Yes before 4.6 No after 4.6	No (shows nothing or a square)
NetFront	Yes	No (shows nothing)
Openwave (Myriad)	Yes	No (shows nothing or a character)
Internet Explorer	No (shows nothing)	No (shows a square)
Motorola Internet Browser	Yes	No (shows a square)
Opera Mobile	No (shows nothing)	No (shows nothing)
Opera Mini	No (shows nothing)	No (shows nothing)

The Openwave browser (found on millions of low- and mid-end devices) also supports its own icon mechanism. Icons can be included in the `img` tag with the `localsrc` attribute, or with CSS using `background-image` or `list-style-image`. There are 562 different icons available; visit <http://mobilexweb.com/go/openwaveimages> to find the whole list.

For example, to show a back arrow image, we can use the icon name or number:

```
  

```

Openwave also works with WAP standard pictograms using the `object` tag and a URL like `pict:///<image path>`. For example:

```
<object data="pict:///core/action/stop" height="32" width="32"  
standby="Stop loading..." name="stop"/>
```

Using images effectively

Out of all of these complications and possibilities, some guidelines emerge:

- Use images in XHTML only for logos, photos, and maps.
- Compress the images with normal web image methods.
- Define the width, height, and alternative text for every image.
- Use data URIs for small images whenever possible.

- Leave icons, buttons, backgrounds, and visual alert images for CSS.
- Open your mind to the usage of Emoji and pictograms with known compatible devices.
- Avoid the usage of image maps.
- Analyze the use of `canvas` or SVG for compatible devices and for some graphic types. These technologies will be covered later in this book.



Once again, if you are thinking how messed up these things are in the mobile web, you are probably right. Later in this book, we will talk about frameworks and best practices to reduce the fragmentation problem while coding markup.

Lists

Using standard lists will help us a lot in defining our designs later and for semantic search engine optimization. For the mobile web, we should use the following list types:

Ordered lists (`ol` tag)

To navigation link menus

Unordered lists (`ul` tag)

To present lists of similar objects

Definition lists (`dl` tag)

To show key/value details

The last one is perhaps the lesser-known list tag in web development. For example, if we are showing a product detail page, in many browsers it's better to use a definition list rather than a table for attributes:

```
<h2>iPhone 3GS</h2>
<dl>
  <dt>Price</dt>
  <dd>300 EUR</dd>
  <dt>Memory</dt>
  <dd>32Gb</dd>
  <dt>Network</dt>
  <dd>3G, Wifi, Bluetooth</dd>
</dl>
```

The `dt` tag is used for the key (definition term) and the `dd` tag for the value (definition description). This is very useful, semantically correct, and clearer than using a table. Later, with CSS, we can rearrange the elements.

Links

Hyperlinks are the heart of the Web, and this holds for the mobile web, too. You might think there isn't much to say about links, but that's not the case.

Every link in a mobile website should have the well-known `href` attribute, set to the URL of the desired resource, and the most important links on the page (up to 10) can have an `accesskey` attribute assigned for easy access via keyboard shortcuts, on devices that support access keys (see [Chapter 5](#)). The `target` attribute should be avoided, unless you are developing for smartphones with tab or multipage support.



Some devices support the usage of `tabindex` for focusable elements (links, form controls, etc.) to change the element order for browsers with focus-based navigation. However, changing the natural order of tabbing is discouraged, unless you have a difficult design and you want to improve the user experience.

If you are making a link to the desktop version of your website (a must-have, as discussed earlier), use `rel="alternate"` to specify that the link is to the same page in an alternative format.



In devices that support focus-based navigation (most low-end devices, and even some touch devices with a touchpad or scroll wheel, like the Nexus One and some BlackBerrys), it is important to define whole clickable zones. For example, if you want to make a title and description both clickable, use one link tag for both elements instead of two separate links to the same page. A single focus border will appear around the whole area you want to be clickable.

New windows

Some browsers accept the `target="_blank"` attribute (from the XHTML MP standard), but depending on the browser the behavior is different, as shown in [Table 6-7](#). Some browsers simply open the URL in the same window, others create a new tab or window (allowing the user to browse between them), and still others open the new URL as a modal pop-up, in which case the user cannot go back to the first page until he closes the new one.

Table 6-7. Opening links in new windows compatibility table

Browser/platform	New window links
Safari	Open in a new window (maximum of 8)
Android browser	Open in a new window
Symbian/S60	Open in a new window (not easy for users to move between windows)
Nokia Series 40	Open in the same window before 5 th edition Open in a new window in 6 th edition
webOS	Open in a new card (OS window)
BlackBerry	Open in the same window before OS 6.0

Browser/platform	New window links
NetFront	Open in the same window
Openwave (Myriad)	Open in the same window
Internet Explorer	Open in the same window
Motorola Internet Browser	Open in the same window
Opera Mobile	Open in the same window
Opera Mini	Open in a new window from 5.0

Navigation lists

A navigation list is any list of links that are related in some manner and listed one after the other. The recommended way to create such a list is with `ol` or `ul` tags (for non-accesskey-compatible devices). With the ordered list, the number of the key to press to access each option is printed for us for free, but we still need to add the `accesskey` attributes to the `a` tags by hand:

```
<ol>
  <li><a href="option1.html" accesskey="1"></a>
  <li><a href="option2.html" accesskey="2"></a>
</ol>
```

Linking to phone features

There are some URL schemes that many mobile browsers understand to communicate with some phone features.

One standard, the Wireless Telephony Application Interface (WTAI), is part of the WAP 1.X standard (created in the last millennium). The WTAI libraries are preinstalled on the phones and can be accessed by other applications, such as the browser. To use these libraries (if available), use the syntax `wtai://<library name>/<function name>[(¶meter)*]`.

Making a call. Remember: most mobile devices are also phones! So, why not create link-to-call actions? If you're creating a business guide, or even for your own unique phonebook, most people will prefer to call a person instead of filling in a form on the device. [Figure 6-5](#) shows how link-to-call actions work on a few different devices.

Fortunately, there are some URLs that will help us. The first de facto standard (copied from the Japanese i-Mode standards) is to use the `tel:<phone number>` scheme. This is called the i-Mode format:

```
<a href="tel:+1800229933">Call us free!</a>
```

Some devices also allow sending DMTF tones after the call has been answered by the destination. This is useful for accessing tone-controlled services, helpdesk systems, or voicemail; you can say to the link, "call this phone number and, when the call is answered, press 2, wait 2 seconds, and then press 913#". You do this using the `postd`

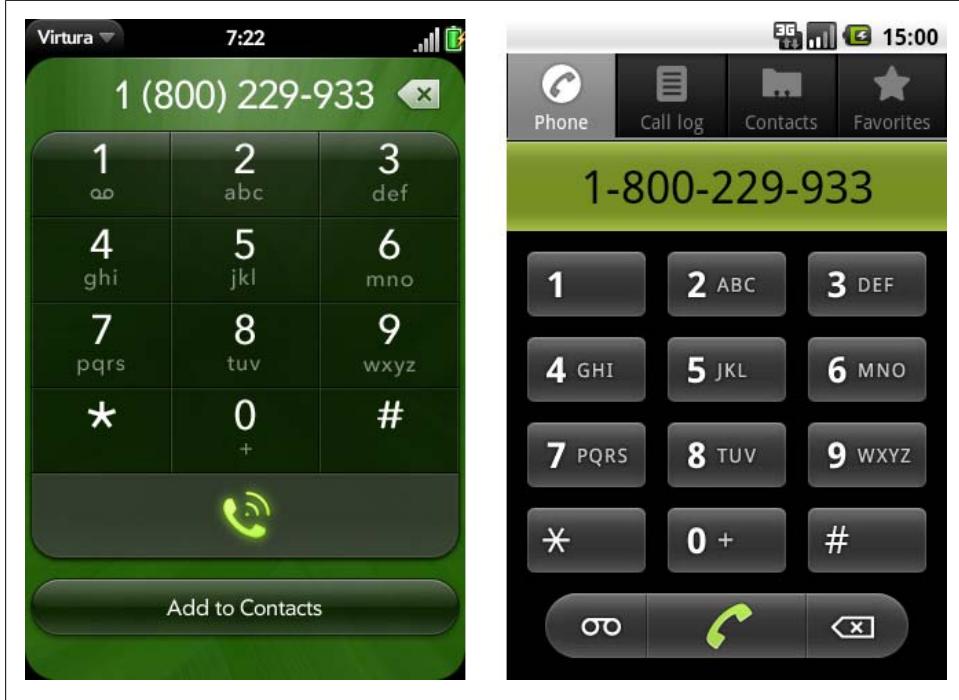


Figure 6-5. Palm's webOS and Android show the call window when we activate a tel: link.

parameter after the number: the syntax is ;postd=<numbers>. You can use numbers, *, and # (using the URL-encoded %23 value), as well as p for a one-second pause and w for a wait-for-tone pause:

```
<a href="tel:+1800229933;postd=4">Call us free!</a>
```

This function doesn't work on all mobile devices, but on devices that don't understand it, the primary telephone number should at least be called. The compatibility list for this feature is complex, and I don't recommend relying on it.

If the user activates a call link she will receive a confirmation alert asking whether to place the call, showing the full number so she can decide (see Figure 6-6). This is to avoid frauds tricking the user into calling another country or a premium number.



I recommend inserting the phone number in the international format: the plus sign (+), the country code, the local area code, and the local number. We do not really know where our visitors will be located. If they are in the same country, or even in the same local area, the international format will still work.

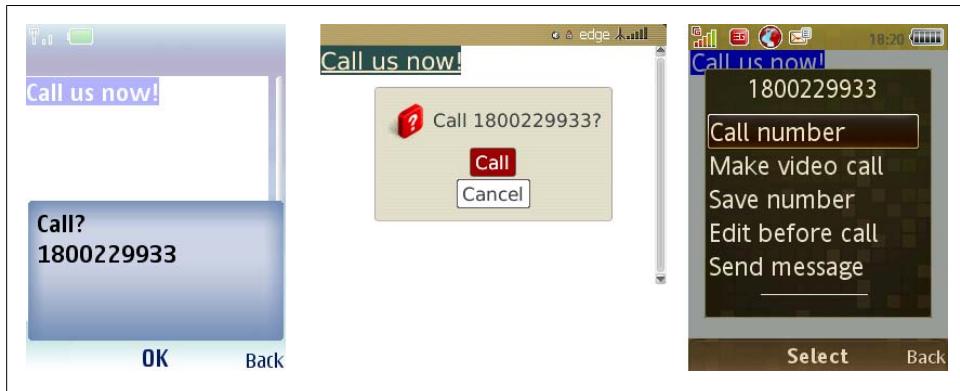


Figure 6-6. While Nokia and BlackBerry offer a confirmation alert for the call action, Sony Ericsson's NetFront browser presents the user with a menu proposing different actions to take.

Although [Table 6-8](#) shows that it is not as well supported as `tel:`, the other way to originate a call is using the WTAI standard, via the `wp` public library and the `mc` (make call) function:

```
<a href="wtai://wp/mc;+1800229933">Call us free!</a>
```

WTAI also accepts a link to be used while the call is in progress, but this is useful only if the user is in hands-free mode or using a headset. This link can include tones to be sent to the destination as if the user had pressed them on the keypad, specified using the `wp` library's `sd` (send DTMF tones) function.



The BlackBerry browser automatically detects phone numbers and email addresses and converts them to links. If you don't want this feature, you should use the `meta` tag `<meta http-equiv="x-rim-auto-match" content="none">`. Safari also has its own metatag for the same action: `<meta name="format-detection" content="telephone=no">`.

iDEN networks (like Nextel) use radio packets to make internal calls inside the network. If you are working with customers of such a network—for example, for an intranet—you can allow users to launch internal calls to other members of the team (or external calls) using the Direct Connect URL scheme (`dc:<number>`). This is compatible with BlackBerry iDEN devices:

```
<a href="dc:5040*0077">Ping John</a>
```



Some models present users with a submenu when they click a `tel:` link so they can choose whether to place a voice-only or a video call (available in 3G systems). Some Japanese phones also allow you to specify that a link should initiate a video call, using the protocol `tel-av:<phone number>`.

Table 6-8 lists which voice call URI schemes work with which platforms.

Table 6-8. Call-to action compatibility table

Browser/platform	tel: compatibility	WTAI compatibility
Safari	Yes	No
Android browser	Yes	Yes
Symbian/S60	Yes	Yes
Nokia Series 40	Yes	Yes
webOS	Yes	No
BlackBerry	Yes	Yes
NetFront	Yes, for call and add to contact manager	
Openwave (Myriad)	Yes	Yes
Internet Explorer	Yes, for call, SMS, and add to contact manager	
Motorola Internet Browser	Yes, for call, SMS, and add to contact manager	
Opera Mobile	Yes	Yes
Opera Mini	Yes (unless Java MIDP 1.0 device)	Yes (unless Java MIDP 1.0 device)



The iPod Touch, a non-phone mobile device, doesn't allow voice calls. Instead, it shows a prompt to add the phone number used in the tel: link to the phonebook.

Sending email. Some modern devices with browsers also have mail applications that can react to the classic web `mailto:` protocol. The syntax is `mailto:<email_destination>[?parameters]`. The detected parameters can change from device to device but generally include `cc`, `bcc`, `subject`, and `body`. The parameters are defined in a URL format (`key=value&key=value`), and the values must be URI-encoded.

Here are some samples:

```
<a href="mailto:info@mobilexweb.com">Mail us</a>
<a href="mailto:info@mobilexweb.com?subject=Contact%20from%20mobile"> Mail us</a>
<a href="mailto:info@mobilexweb.com?subject=Contact&body=This%20is%20the%20body">
Mail us</a>
```



Be aware that the `mailto:` mechanism doesn't guarantee that the message will be sent. It generally just opens the mail application, and the user has to confirm the sending after making optional changes. If you need to actually send the mail, use a server mechanism.

Generally, if we want to insert a newline in the body of the email we can use the Carriage Return plus Line Feed characters (%D%0A). This does not currently work with the Mail application in iOS, but we can insert HTML tags inside the body, so we can use
 for the mobile Safari browser:

```
<a href="mailto:info@mobilexweb.com?subject=Contact&
body=This%20is%20the%20body%D%0AThis%20is%20a%20new%20line">Mail us</a>

<a href="mailto:info@mobilexweb.com?subject=Contact&
body=This%20is%20the%20body<br/>This%20is%20a%20new%20line">Mail us from iPhone</a>
```

Sending an SMS. We all like the Short Message Service; that's why mobile browsers generally offer the ability to invoke the new SMS window from a link. To do this, we have two possible URI schemes, `sms://` and `smsto://`. Unfortunately, there is no standard way to know for sure which one is compatible with a user's browser.



We will see in [Chapter 10](#) how to detect `sms:` and `smsto:` protocol compatibility from the server to select the right alternative.

The syntax is `sms[to]://[<destination number>][?parameters]`. As you can see, the destination number is optional, so you can open the SMS composer from the device without any parameters defined. The *parameters* usually define the body, but this property is not compatible with all phones for security reasons (e.g., to avoid a website sending premium SMS texts). As with sending an email, an SMS is not automatically sent when the user presses the link. The link only opens the SMS Composer window; the user must finish the process manually.

The destination number should either be an international number or, if it is a short number code, we should guarantee that the user is in the right country and is connected with one of the compatible carriers of that short code.



BlackBerry devices offer direct messaging between two BlackBerry devices on the same network. For creating a direct message, you can use the `PIN:<number>` URL scheme.

Here are some samples:

```
<a href="sms://">Send an SMS</a>

<a href="sms://?body=Visit%20the%20best%20site%20at%20http://mobilexweb.com">
Invite a friend by SMS</a>

<a href="sms://+3490322111">Contact us by SMS</a>

<a href="sms://+3490322111?body=Interested%20in%20Product%20AA2">
More info for producto AA2</a>
```

Working with MMS

The Multimedia Messaging Service (MMS) is the standard way to send messages with multimedia content (images, video, or any attached content). It depends on the SMS standards and a content file (the multimedia message) that the sender uploads to the carrier and the recipient downloads from the carrier. Symbian devices allow us to define the URI schemes `mms:<url>` to download an MMS file from the specified URL and `mmsto://<destination number>` to open the Multimedia Message Composer.

Table 6-9 lists which messaging features work with which platforms.

Table 6-9. Messaging actions compatibility table

Browser/platform	sms:/smsto: scheme	mms:/mmsto: scheme	mailto: scheme
Safari	Only sms : and in iPhone (not iPad/iPod). No body support.	No	Yes
Android browser	Yes, no number or body support		Yes
Symbian/S60	Only sms :	Only mmsto:	Yes
Nokia Series 40	No (use mailto: instead)	No	Yes (it can also be used for SMS and MMS)
webOS	Only sms :	No	Yes
BlackBerry	No	No	Yes
NetFront	Yes	Yes	Yes
Openwave (Myriad)	No	No	Yes
Internet Explorer	Only sms :	No	Yes
Motorola Internet Browser	No	No	Yes
Opera Mobile	Yes	Yes	Yes
Opera Mini	Depends on the device		



If you are developing mobile widgets or offline JavaScript applications, almost every platform provides a low-level API for sending messages and even receiving them from your application. We will cover these web technologies in [Chapter 12](#).

Adding a contact to the phonebook. It might be useful to invite users to add your company's contact information (only the phone number, or full details) to their phonebooks for future communication. A WTAI function is available for this purpose for older and WML-compatible devices, and there's also a tricky way of doing it for modern (and smarter?) devices.

The WTAI library is `wp`, as for making phone calls, and the function is `ap` (Add to Phonebook). The parameters are the number and optionally a name to be assigned to it, separated by a semicolon. For example:

```
<a href="wtai://wp/ap;+12024561111;White%20House">  
    Add <strong>White House</strong> to contacts  
</a>
```

For modern browsers (not supporting WTAI, as shown in [Figure 6-7](#)), the trick is to create a *vCard* file (*vCard* is a standard file format for electronic business cards). If you link to this file, most browsers will send the file to the device's Phonebook application, and the user will be invited to add the contact to the database.



Figure 6-7. We need to be careful about using URI schemes not compatible for a device. The user will not understand the error messages.

A simple vCard 2.1 file (the most compatible version for mobile devices) will look like this:

```
BEGIN:VCARD  
VERSION:2.1  
N:Maximiliano;Firtman  
ORG:O'Reilly Media  
TITLE:Author  
TEL;CELL;VOICE:+133MFIRTMAN  
TEL;WORK;VOICE:+541150320077  
END:VCARD
```

For the device to detect this text file as a valid vCard, we must deliver it with the MIME type `text/x-vcard`. The file, if static, is generally a `.vcf` file.



Bookmarker is an automatic vCard generator for mobile devices, available at <http://bookmarker.mobi>.

Unfortunately, many modern (again, smarter?) mobile browsers, like Safari, don't understand vCards if you provide them as links in a document. However, they do understand them if the user receives them by email! The solution, therefore, is to retrieve the user's email address and, from the server, send the vCard as an attachment.

Another excellent feature to provide to compatible devices is to automatically add to the user's calendar details about a meeting or appointment scheduled online, or a reminder about an event for which the user has bought tickets. If you're selling tickets to a concert or a theater show, this is a great way to ensure that the user won't forget it.

There isn't a WTAI way to do this—in fact, in 1998 mobile devices generally didn't have calendar programs. For compatible devices we can use the *iCalendar* format, based on an older vCalendar standard similar to vCard. iCalendar files should be served with the MIME type `text/calendar`. There are a lot of server libraries for creating this format, although as [Table 6-10](#) shows, it really only works with Symbian devices right now.

Table 6-10. Contacts and calendar integration compatibility table

Browser/platform	WTAI ap	vCard	iCalendar
Safari	No	No (only as an email attachment)	No
Android browser	No	No	No
Symbian/S60	Yes	Yes	Yes
Nokia Series 40	Yes	No	No
webOS	No	No	No
BlackBerry	Yes	No	No
NetFront	Yes, also for calls	No	No
Openwave (Myriad)	No	No	No
Internet Explorer	Yes	No	No
Motorola Internet Browser	No	No	No
Opera Mobile	Yes	No	No
Opera Mini	Depends on the device		

Integrating with other applications

Some devices allow us to integrate our websites with other native installed applications. This is dramatically nonstandard, though, and it depends very much on the device and the applications.

iOS URL schemes. Safari supports some standard URL schemes that will open other native applications. For example, we can open the YouTube and Google Maps applications simply by using the classic URLs for each service (`youtube.com/...`and `maps.google.com/...`). Safari will automatically open the native application, showing the information we want. This method also works for App Store and iTunes links.

Prior to iOS 4.0, when the user clicks a link that opens another application, the browser closes. To get back to your website, the user must reopen the browser.

An updated list of URL schemes for iOS is maintained at http://wiki.akosma.com/IPhone_URL_Schemes, and a list of applications, URL schemes, and optional parameters for Safari can be found at <http://www.handleopenurl.com>.

For example, according to these sites we can open the Facebook iPhone native application (if installed) showing the user's list of friends using the URL `fb://friends`, and if the user has installed Twitterrific (a Twitter client), we can directly post a message using `twitterrific://post?message=<msg>`. Here's a sample:

```
<a href="twitterrific://post?message=I%20have%20just%20visit%20a%20site">Tweet this on  
Twitterrific</a>
```



When passing parameters by URL, remember to properly encode spaces and other characters (for example, using %20 for spaces).

Detecting Whether an Application Is Installed

When the user clicks a link in mobile Safari that is designed to open another application, what happens if that application is not installed on the user's device? In this case, the browser shows an alert to the user and continues displaying the same page. We can take advantage of this behavior to improve the user experience. Create a timer in JavaScript that starts when the user clicks the link; if the timer is executed quickly, it means that the application could not be opened because it is not installed.

We can't avoid the Safari message, but we can show the user an error message indicating that the application seems not to be installed and providing a link to the App Store so the user can buy or download it.

Symbian local applications. Symbian devices also allow us to open applications using the nonstandard `localapp` scheme. For example, for opening the Calendar, Contacts, or Messages, we can use `localapp:calendar`, `localapp:contacts`, or `localapp:messaging`.

Android intents. Android also has the ability to communicate with other applications, via *intents* (abstract descriptions of actions to be performed). A native Android application can register an intent as an explicit call (not available from web applications), from a URL, or from a MIME type.

For example, we can open the default PDF viewer on the user's device by delivering a PDF file with the MIME type `application/pdf`. To open an application without sending a file, we can use the URI schemes defined by the intent. For example, linking to a YouTube video will fire the YouTube internal application (if the user has defined it as the default player).

When the intention call is implicit (using a URL instead of a unique package name), there may be more than one installed application that can respond to that URL. In this case, the user will receive a pop-up asking her to select the application to use. The user can also select a default application for future usages.



In Android, an intent can be registered as part of an HTTP URL or be activated from a MIME type. For example, if we link to <http://www.google.com/m/products/scan> in the Android browser, it will try to open a Barcode Scanner application.

Among the internal URLs that Android supports are those for Google Maps placemarks using `geo:<latitude>, <longitude>`, Google Maps searches using `geo:0,0?q=<search>`, and Google street views using `google.streetview:cbll=<latitude>, <longitude>&cbp=1`. More information is available at <http://developer.android.com/guide/appendix/g-app-intents.html>.

Similarly, using `market://search?q=<search>` in Android will open Android Market (the store for applications and games) with a query search.



In Android, when a URI scheme is not registered as an intent, that means the application is not installed. The user will be taken to a new page showing an error message, like when you link to a website that doesn't exist.

Unfortunately, at the time of this writing there are no websites that list all the possible URI schemes to use on Android. Some individual applications do offer developer websites to show this information, though. For example, Twidroid (a Twitter client) has <http://twidroid.com/plugins>, where you can see documentation about using a URL to show a nice Twitter pop-up over the page. The URL syntax is `twitter://send?<message>`. Therefore, the example we looked at earlier for Twitterrific can be converted to:

```
<a href="twitter://send?I%20have%20just%20visit%20a%20site">Tweet this on Twidroid</a>
```



When developing widgets, as discussed in [Chapter 12](#), we will have nonstandard APIs to connect with other native applications from our widgets.

Document download

Linking to a document that isn't an (X)HTML file produces different results depending on the device. Your first thought about this may be that it depends on the applications installed on the device. This is true, in part. Some mobile browsers, like the iPhone's, don't allow document downloading even if the user has installed a compatible reader

for that document type, as shown in [Figure 6-8](#). Others, like the Symbian browser shown in [Figure 6-9](#), let the user store the file.

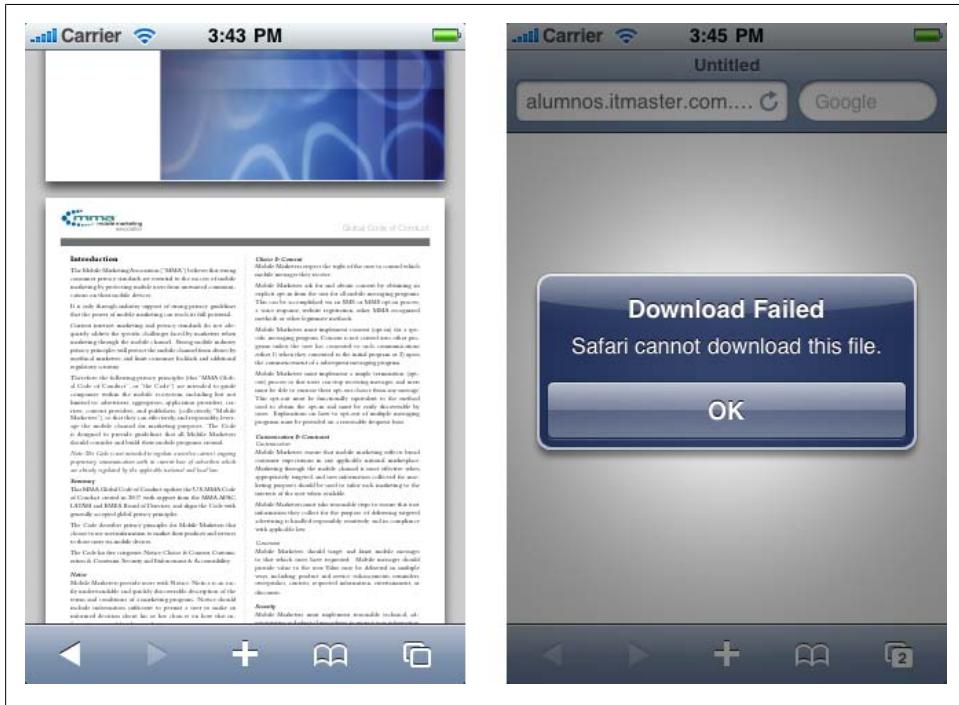


Figure 6-8. Safari on iOS opens PDFs directly and doesn't download noncompatible documents.

[Table 6-11](#) reports the default reactions of the different browsers when we deliver a nonstandard file format (e.g., an invented one) and the most common file types, Adobe PDF and Microsoft Office (.doc, .xls, etc.).

Table 6-11. Document download compatibility table

Browser/platform	Unknown file	Adobe PDF	Microsoft Office
Safari	No	Yes. The user can view the PDF but not download it.	Yes. 2007 and 2010 (partial). Word, Excel, PowerPoint Viewer.
Android browser	Yes	Yes, but the user needs to have a compatible viewer or editor installed.	
Symbian/S60	Yes	Yes, but the user needs to have a compatible viewer or editor installed.	
Nokia Series 40	Yes	Yes, but no reader available. Only download.	

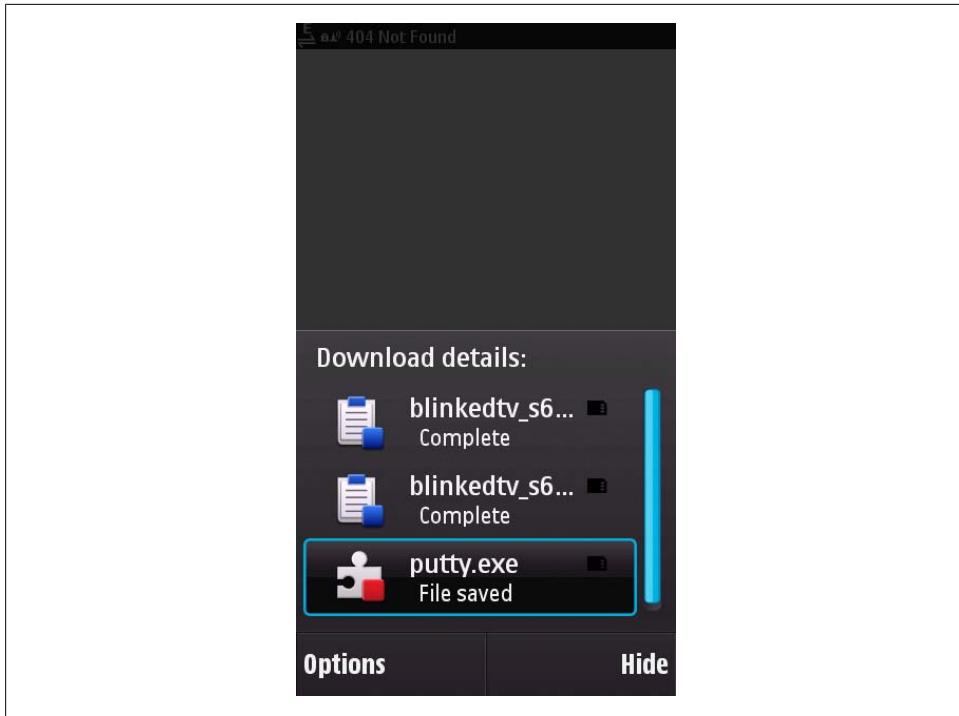


Figure 6-9. The Symbian browser has a download manager capable of downloading any file to the internal or external memory.

Browser/platform	Unknown file	Adobe PDF	Microsoft Office
webOS	Yes	Yes, but the user needs to have a compatible viewer or editor installed.	
BlackBerry	Yes	Yes	Yes. Word, Excel, PowerPoint 2007.
NetFront	Yes	Only download.	
Openwave (Myriad)	No	No	No
Internet Explorer	Yes	Yes, but needs a viewer	Yes
Motorola Internet Browser	No	No	No
Opera Mobile	Yes	Download. Opening depends on device.	
Opera Mini	Yes if the device supports the File API from Java ME.	Download. Opening depends on device.	

Chapter 10 will cover the delivery of multimedia content.

Forms

Input forms are common features of web applications. In the mobile world, we should keep forms and the amount of typing they require to the minimum. The input controls should be inside the classic `form` tag, with `method="GET"` or `"POST"` and the `action` URL as any web form.

Form design

Avoid using tables for form layout. The best solution is to use definition lists, labels, and input controls. We will enhance this form design in the next chapter with JavaScript for smartphones.



BlackBerry devices allow offline form submission. If the device is offline when the user completes the form, it is placed in a queue and is automatically submitted when the device goes back online. You can find more information about this technique at <http://www.mobilexweb.com/go/offlineform>.

A typical key/value form should look like this:

```
<form action="formAction" method="POST">
  <dl>
    <dt><label for="name">Name</label></dt>
    <dd><input type="text" name="name" /></dd>
  </dl>
</form>
```

The usage of the `label` tag is very important for mobile input controls, and especially for touch devices. For example, if you insert a checkbox without a `label` tag, the user will need to tap (click) over the tiny checkbox to select it. Using a `label` allows the user to tap anywhere in the text assigned to the checkbox.



As discussed in [Chapter 3](#), mobile forms should have a vertical design, so it is better to put the label above each input field instead of to the right or left. This is because touch devices zoom in on the field when it's in focus and do not show what is to the right or left of the control. Tables don't help in this design.

So, a form with a checkbox should look something like this:

```
<form action="formAction" method="POST">
  <input type="checkbox" name="accept" id="accept" value="yes" />
  <label for="accept">I accept terms and conditions</label>
</form>
```



Some mobile browsers have a lower limit for the URL length than desktop ones. That is why we should avoid long forms using the `GET` method.

We can also assign access keys to the form controls (using the `accesskey` attribute in the `input` tags) and show which keys are assigned in the labels, with a CSS class. This method is very useful in devices with QWERTY keyboards, where you can assign a letter to each field instead of numeric values:

```
<form action="formAction" method="POST">
  <input type="checkbox" name="accept" id="accept" value="yes" accesskey="a" />
  <label for="accept">I <span class="accesskey">A</span>ccept terms and
    conditions</label>
</form>
```

A typical form should include one or more `fieldset` tags, each with a `legend` inside. The `fieldset` is just a container for form controls, and the `legend` is a child tag that defines the title or legend for its parent:

```
<fieldset>
  <legend>Personal Information</legend>
  <!-- controls here -->
</fieldset>
```

Select lists

The `select` tag should be one of the most-used tags in a mobile form. Selection from a list is the first option for reducing typing. In a mobile browser, when you click on a `select` element, typically you will see a pop-up window (modal or not) showing all the options. As shown in Figures 6-10 and 6-11, how `select` lists are rendered varies across devices.

You can use the `size` property of the `select` tag to define a list with a predefined height, and you can specify that the list accepts multiple selection using the `multiple="multiple"` property. The multiple-selection feature is more useful in mobile forms than desktop forms. In a desktop form, the user generally uses Shift or Control to select multiple options. In a mobile form, we generally present a pop-up window with checkboxes for the user to make his selections and a confirm action to go back to the main page.

The code for the `select` lists shown in the previous two figures looks like this:

```
<form action="formAction" method="post">
  <dl>
    <dt><label for="country">Country</label></dt>
    <dd>
      <select name="country">
        <option>Argelia</option>
        <option>Argentina</option>
        <option>Bolivia</option>
        <option>Brazil</option>
      </select>
    </dd>
  </dl>
```

```
<dt><label for="filter">Looking for</label></dt>
<dd>
    <select name="filter" multiple="multiple">
        <option>Flights</option>
        <option>Hotels</option>
        <option>Restaurants</option>
        <option>Car Rental</option>
    </select>
</dd>
</dl>
</form>
```



Mobile Safari uses a spinning wheel for selections in HTML, but the native control also supports a multicolumn spinning wheel to select multiple fields at the same time. This functionality is not provided in HTML and can only be used natively in Objective-C. However, there is a JavaScript library that emulates the multicolumn control available at <http://www.mobilexweb.com/go/wheel>.

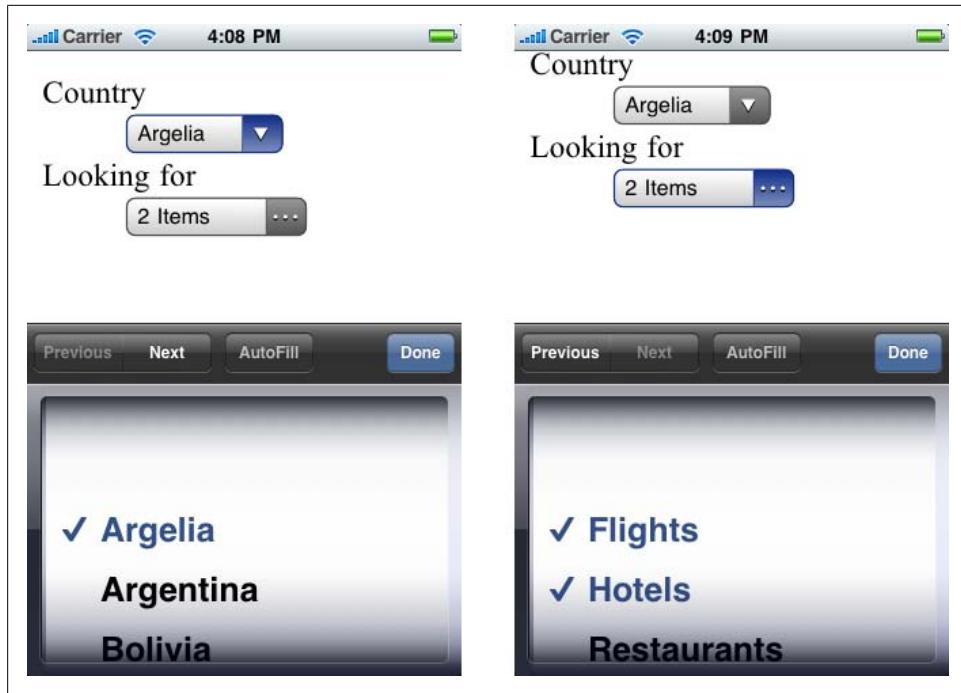


Figure 6-10. Safari on iOS uses a half-screen selection with tabular navigation between form controls using Previous and Next buttons.

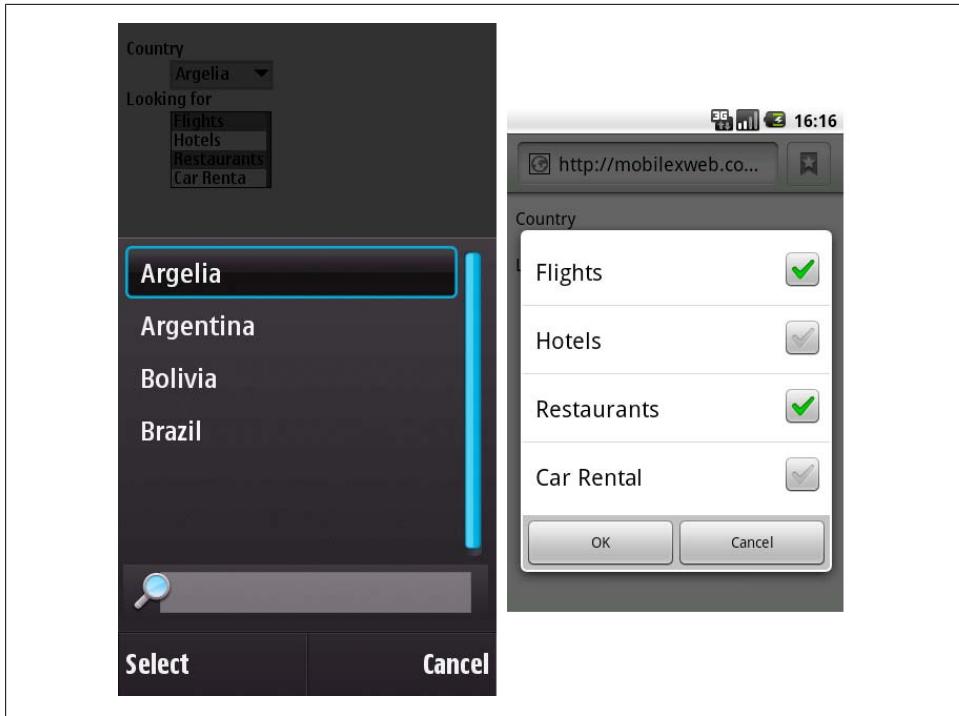


Figure 6-11. Symbian select lists offer a search box for all the options, and Android shows a beautiful modal pop-up.

Option groups. Option groups are an underused feature of select lists, even in desktop web development. Defining an optgroup allows you to provide a label for a set of children, so you can group the available options by category. Here's an example:

```
<dl>
  <dt><label for="country">Country</label></dt>
  <dd>
    <select name="country">
      <optgroup label="America">
        <option value="ar">Argentina</option>
        <option value="bo">Bolivia</option>
        <option value="br">Brazil</option>
      </optgroup>
      <optgroup label="Europe">
        <option value="at">Austria</option>
        <option value="be">Belgium</option>
        <option value="bg">Bulgaria</option>
      </optgroup>
    </select>
  </dd>
</dl>
```

The result is shown in Figure 6-12. Again, different devices may render option groups differently!

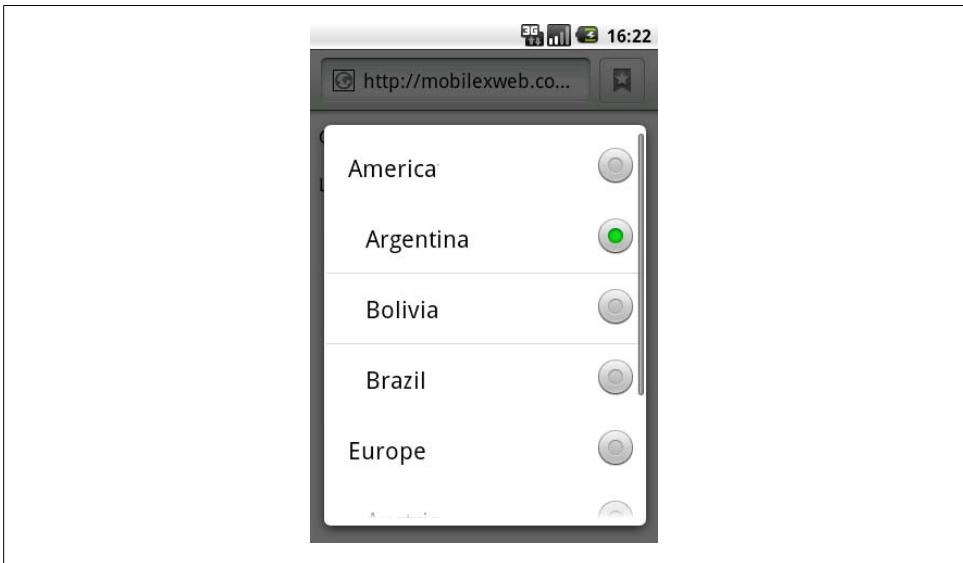


Figure 6-12. Option groups can be rendered strangely. Here, Android 2.1 shows buttons next to the group labels “America” and “Europe,” even though they are not selectable options.

Select list compatibility. Table 6-12 summarizes mobile browser support for select list features.

Table 6-12. Select list compatibility table

Browser/platform	select	select w/size	select w/ multiple	optgroup
Safari	Half-height selection	No difference	Yes	Yes
Android browser	Modal pop-up	No difference	Yes	Yes
Symbian/S60	Pop-up with search	Yes	Yes	Yes
Nokia Series 40	Open in separate window	No difference before 6 th edition	Yes	Yes, show options grouped in folders
webOS	Modal pop-up	Yes	Yes	Yes
BlackBerry	In-place drop-down	Yes	Yes	Yes from 3.8
NetFront	In-place drop-down	Yes	Yes	Yes
Openwave (Myriad)	In-place drop-down	Yes	Yes	Only a separator without label
Internet Explorer	In-place drop-down	Yes	Yes	No
Motorola Internet Browser	Shows full list	Yes	Yes	Yes
Opera Mobile	In-place drop-down	Yes	Yes	Yes
Opera Mini	In-place drop-down	Yes	Yes	No

Radio buttons and checkboxes

The usage of radio buttons and checkboxes is the same on mobile devices as on desktops. The only recommendation I can give you is to avoid the usage of these controls if there are more than four options, using in that case a `select` with single or multiple selection, as appropriate. A group of more than four radio buttons is likely to increase the page height and may require scrolling, which can impact the usability of the form.

Buttons

(x)HTML has five types of buttons:

1. Image map buttons: `<input type="image" />`
2. Submit buttons: `<input type="submit" />`
3. Clear buttons: `<input type="reset" />`
4. Custom buttons: `<input type="button" />`
5. Submit buttons with HTML support: `<button></button>`

The image map button allows us to use an image as a button and receive on the server the coordinates of the point inside the image where the user clicked. Of course, this functionality is only possible on mobile devices supporting touch- or cursor-based navigation. This type of button should be avoided if possible (this is the recommendation of the W3C) and replaced with a classic submit button. We can later add an image or icon using CSS.

The submit button is the most widely compatible, and for the lowest common denominator devices it should work fine. I've always hated (yes, hated!) the clear button. How many times have you clicked a clear button thinking it was the submit button? This button should be avoided when developing for mobile devices: why add more scrolling and take up more space for a function that few people use? If do you want to include this functionality in your form, please be sure to use a different style for the clear button (smaller, darker) than the style you use for the submit button.

The custom buttons should be avoided if you want full mobile compatibility, because they only work with JavaScript. For compatible devices, you can still use submit buttons and capture the submit action with JavaScript.

Finally, be aware that the `button` tag is not compatible with all devices. In fact, it was only added to the latest versions of the standards, and I don't know many HTML designers and developers who use it.

Hidden fields

Hidden fields are fully compatible with mobile browsers.

File upload

The file upload control is not included in the mobile web standards, but many devices still accept it (see [Figure 6-13](#)). When the user selects this control a modal pop-up window appears, allowing the user to select a file from the public internal memory folders or from the additional memory card. A simple upload form might look like this:

```
<dl>
<dt><label for="file">Upload a photo</label></dt>
<dl><input type="file" name="photo" /></dl>
</dl>
```

The usage is typical: the `form` tag must be defined with `enctype="multipart/form data"`. Selecting multiple files using a single selection dialog is not allowed, and displaying the upload progress is not supported. In desktop websites this is typically done using a Flash invisible movie, and at the time of this writing there are no devices that are compatible with this feature. Beginning with Flash Player 10.1 in mobile browsers, this is scheduled to change; however, this mechanism will not be compatible with all devices because Flash Player will not be widely supported.

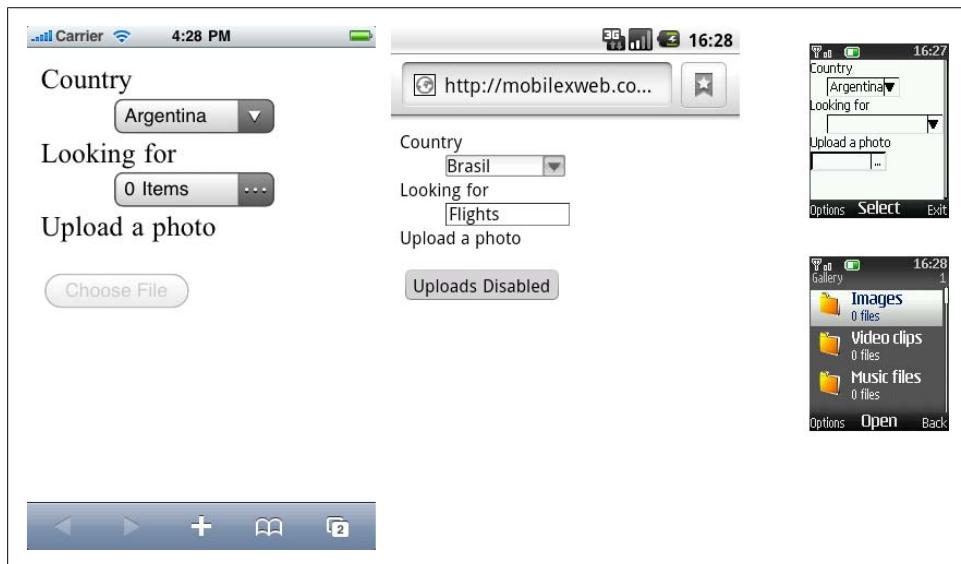


Figure 6-13. It is ironic that modern smartphone browsers such as Safari and the Android browser don't support file uploads, while the low-end Nokia S40 browser does.

The BlackBerry browser (since version 4.2) has a property called `accept` that you can use to define a comma-separated list of MIME types that the server will accept. This can reduce sending of noncompatible files. For example:

```
<dl>
<dt><label for="file">Upload a photo</label></dt>
<dl>
```

```

<input type="file" name="photo" accept="image/jpeg,image/gif,image/png" />
</dl>
</dl>

```



The iPhone Photo Picker (<http://code.google.com/p/iphone-photo-picker>) is an open source solution for uploading photos to a server. You can create your own version of this native application and make it available in the App Store. Then, when you need the user to upload a photo or file, you call this URL from your website and the app will be opened. After the upload, the app will close, taking the user back to your website.

Table 6-13 shows which browsers support file uploading.

Table 6-13. File upload compatibility table

Browser/platform	File upload compatibility	accept attribute
Safari	No	
Android browser	No before 2.2. Yes from 2.2 (only images from gallery or sounds)	No
Symbian/S60	Yes	Yes; shows a warning if a file of an incorrect type is selected
Nokia Series 40	Yes	No
webOS	No	
BlackBerry	Yes from 4.2 No before 4.2	
NetFront	Yes	No
Openwave (Myriad)	Yes	No
Internet Explorer	Yes	No
Motorola Internet Browser	No	
Opera Mobile	Yes	No
Opera Mini	Yes, if the device supports the File API in Java ME	No

Text input

The text input is the form feature that requires the most attention. Typing on mobile devices is not the best experience, and text input mechanisms vary widely between touch devices, QWERTY devices, and phones with numeric keypads.

QWERTY devices are the only ones that don't require a new window to insert the text: when the text input has focus, the user can start typing. In all other device types, when the field has focus the user can either click (or tap) in it or start typing to open a modal pop-up window with all of the OS's typical text typing features (e.g., predictive text, onscreen keyboard, character recognition, dictionary, and symbol list). Some devices

show a full-screen text input window (hiding the entire web interface), and others show a smaller window inside the browser window. In the first case, a descriptive label is required so the user knows what to type.

Password or No Password

The usage of the password text input (`<input type="password" />`) on mobile devices is a subject of much debate. The password text input (with the classic stars displayed instead of the typed characters) was originally created because of the possibility of a password or other sensitive data being stolen by someone standing behind the user with a view of the screen.

In the mobile ecosystem, the situation is different. With the limited screen size and font size, it is very difficult for another person to see what the user is typing on his mobile phone. Furthermore, typing on non-QWERTY devices is difficult, and if we show a star instead of the real character typed the user may be unsure that he's entered the text correctly (even if, as some devices do, the character is displayed for a second before it's changed to a star). If you still want to use the password input, I recommend forcing the text input to be numeric.

Jakob Nielsen (<http://useit.com>), guru of web usability, agrees. In a 2009 Alertbox column, Nielsen wrote: "Usability suffers when users type in passwords and the only feedback they get is a row of bullets. Typically, masking passwords doesn't even increase security, but it does cost you business due to login failures."

Multiline text inputs (using the `textarea` tag) should be used very carefully. Generally speaking, we don't want the user to type too much text in a form. However, when more space is required (like in a mail message body), we can use a `textarea`, and depending on the device the experience should be the same as with a normal text input. Rich text input controls are not very common in the mobile world, and it is really difficult to implement because of the browser internals. The only solution is to capture keypresses using JavaScript events and emulate your own text input control.

Placeholder. A placeholder is a hint that is shown inside the text box until the user inserts text in that field. When the user starts typing, the placeholder is hidden, as shown in [Figure 6-14](#). This feature is very useful in mobile designs because of the lack of space. Instead of using a `label`, as discussed earlier, we can use a placeholder, reducing the amount of space required for the field.

The big problem with placeholders is that they are nonstandard. There are two possible approaches for implementing them: using an HTML 5 attribute (`placeholder`), and using JavaScript. The `placeholder` attribute is compatible with some modern browsers, and for the others we can create a little script to give this functionality, even using the standard label as the source. The JavaScript solution will be implemented later in this book. For now, we will just use the HTML attribute:

```
<input type="text" name="zip" placeholder="Your ZIP Code" />
```



Figure 6-14. The placeholder is the gray descriptive text inside the text box that is automatically deleted when the user begins typing a value in the box.



If we need only one text input from the user, a very good approach on compatible devices is to use the standard JavaScript `window.prompt` function. It will reduce the work required for the user to type the input.

Text input validation. To reduce the client-side scripts and server-side trips for validation and to improve the usability of our forms, we should provide as many input validation properties as we can.

The first typical option is to define the maximum size accepted for the text input using the `maxlength` property, expressed as a number of characters. Many platforms automatically add a character counter while the user is typing.



A JavaScript library can add support for `placeholder` and `autofocus` (an HTML 5 attribute for input tags that indicates that this control has to be focused on as soon as the page is loaded) even on devices with no support for those attributes. You can download this library from <http://gist.github.com/330318>.

As mentioned in [Chapter 5](#), WAP CSS added the property `-wap-input-format`, which allows us to define the type and number of characters that the user can input (known as the *input mask*). Specifying an input mask will reduce the user's error possibilities; it can yield error messages like the one shown in [Figure 6-15](#). We have also talked about the `-wap-input-required` attribute, which prevents the user from moving the focus away from a field until she has entered some text in it.

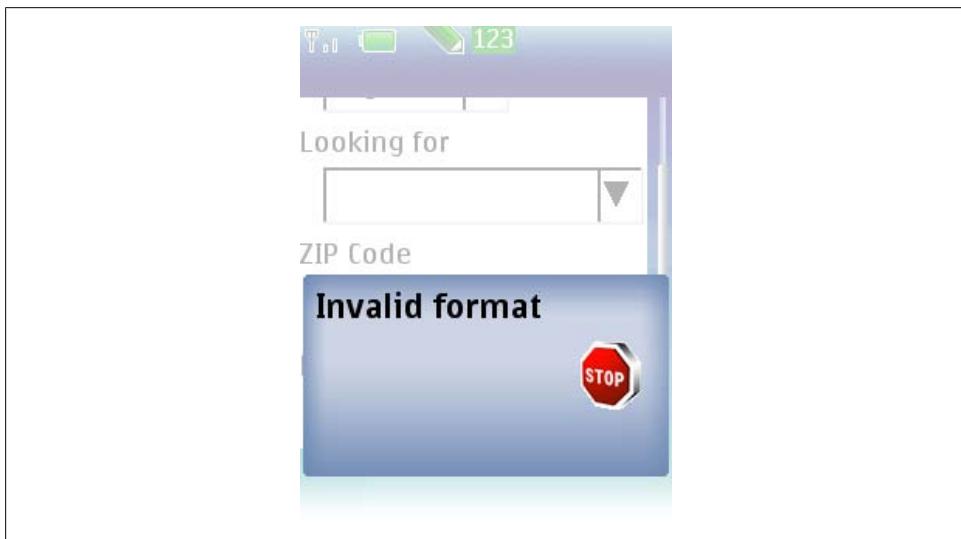


Figure 6-15. Browsers compatible with WAP CSS input constraints show some kind of error message when the user enters text in an invalid format and then tries to move the focus away from that field.

The content of the `-wap-input-format` attribute is a string mask using the special characters in [Table 6-14](#).

Table 6-14. WAP CSS input format patterns

Pattern	Usage
a	Any character, letter, number, or symbol.
A	Any uppercase alphanumeric character.
n	Any numeric character or symbol.
N	Any numeric character.

Pattern	Usage
x	Any lower case alphanumeric character or symbol.
X	Any uppercase alphanumeric character or symbol.
m	Any character, lowercase by default, but with uppercase possible.
M	Any character, uppercase by default, but with lowercase possible.
{n}{pattern}	A fixed number of repeats (<i>n</i>) of the pattern defined. For example, 4N means four numeric-only characters.
*{pattern}	Any number of repeats of the pattern defined. For example, *A means any number of uppercase alphanumeric characters. It can be used only once per pattern.
{pattern}{pattern}	Pattern combination. For example, A*a means one uppercase character and then any number of any other character.

We can also escape other characters to create complex patterns, but this is not recommended because the pattern matching engines are not the same on all platforms and strange behavior can result.



Internet Explorer Mobile also accepts the Boolean attribute `emptyok` defining whether a value is required (`false`) or not (`true`).

The next sample shows the standard way to define a required U.S. zip code text input, an optional phone number text input, and a required password numeric field:

```
<dl>
  <dt><label for="zip">ZIP Code</label></dt>
  <dl><input type="text" name="zip" style="-wap-input-format: '5N';
           -wap-input-required: true" /></dl>
  <dt><label for="phone">Phone Number</label></dt>
  <dl><input type="text" name="phone" maxlength="15" style="-wap-input-format:
           '*n';" /></dl>
  <dt><label for="password">Password</label></dt>
  <dl><input type="password" maxlength="8" name="password"
           style="-wap-input-format: '8N'; -wap-input-required: true'" /></dl>
</dl>
```

Many older XHTML mobile browsers understand the nonstandard `inputformat` or `format` attribute, imported from WML. The syntax is the same as for the WAP CSS attribute. If we want to add the same feature for older Openwave-based devices, for example, we can use the `inputformat` attribute. Internet Explorer uses the `format` attribute with the same pattern inside:

```
<input type="text" name="zip" inputformat="5N" format="5N" maxchars="5" />
```

Table 6-15 lists which input formats are supported by which mobile browsers.

Table 6-15. Text input format compatibility table

Browser/platform	-wap-required	-wap-input-format	HTML attribute	placeholder
Safari	No	No	No	Yes
Android browser	No	No	No	Yes
Symbian/S60	Yes, type required to get out the input. Error message shown in 3 rd edition	Yes, doesn't allow invalid chars and show a red style (5 th edition) or an error message (3 rd edition) if incorrect	No	Yes in 5 th edition No before 5 th edition
Nokia Series 40	Yes, type required	Yes, doesn't allow invalid chars or shows a message error	No	Yes in 6 th edition No before 6 th edition
webOS	No	No	No	Yes
BlackBerry	Show alert if missing input	Filter characters	No	No
NetFront	Show alert at form submission	Filter characters and OK only appear when input is correct	No	No
Openwave (Myriad)	Error message	No behavior in 6.x Filter characters in 7.0	Input	No
Internet Explorer	Error alert at submit	Error alert at submit	No	No
Motorola Internet Browser	Error on submit	Filter text input	No	No
Opera Mobile	Error message in form submission	Error message in blur and in form submission	No	No
Opera Mini	No	No	No	No

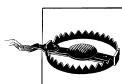
Safari extensions. Safari for iPhone and iPod Touch has different onscreen QWERTY keyboards for different situations, with the keys rearranged or with special onscreen keys added to improve usability. For example, there is an email-optimized keyboard that includes the @ character, and a URL-optimized keyboard with a “.com” button.



XHTML MP 1.2 added support for the `inputmode` HTML attribute for text inputs, password inputs, and textareas. It can receive dozens of possible values, but the most important are `digits` for numeric input and `latin lowercase` for email addresses or other lowercase values.

If your site includes a search field, you can define it as a `type="search"` input; this changes the default keyboard button from “Go” to “Search” (also in Android 2.2).

Before iOS 3.0, an undocumented feature allows us to force a numeric keyboard using the `name` property of the text input. If the name of the input contains the string “zip” or “phone,” the keyboard will change to numeric. However, using this feature is not good practice, because it’s inconvenient in non-U.S. countries where the zip code can contain letters (the United Kingdom and Argentina, for example).



Some of these Safari form extensions don’t work in the iPhone Simulator, so you will need to test your form on real devices.

iOS 3.1 and later allow us to define new HTML 5 input types: `email`, `tel`, `url`, and `number` (we’ll talk more about HTML 5 features in [Chapter 9](#)). If you specify one of these values instead of `text` for the `type` attribute, the user will be presented with the right keyboard for that type when the field has focus:

```
<input type="email" name="user_email" />
<input type="tel" name="user_phone" />
<input type="text" name="quantity" pattern="[0-9]*" />
```

The `number` value is not official, but it works. Officially, we should use a text field and provide the HTML 5 attribute `pattern` with a regular expression inside. The regular expressions accepted are quite small though (and undocumented).

One of the great things about these new controls is that if a browser doesn’t understand the new `input type` values, it will render a text input by default.

Other extensions include `autocorrect="on/off"` and `autocapitalize="on/off"`, to activate/deactivate automatic spelling correction (preferred for non-dictionary input fields) and automatic capitalization for the input.

BlackBerry extensions. BlackBerry 4.7.1 and later also add partial support for new HTML 5 form controls. At the time of this writing, the values accepted are `number`, `email`, `search`, `url`, `color`, `date`, `datetime`, `time`, `week`, `month`, and `range`. We will cover these new input types in [Chapter 9](#).

From version 5.0, the browser also accepts the `inputmode` attribute with a comma-separated list of tokens. The tokens can be script tokens (language charsets) or modifier tokens. The available script tokens are:

- `arabic`
- `bopomofo`
- `cyrillic`
- `georgian`
- `greek`
- `han`
- `hangul`

- hebrew
- hiragana
- kanji
- katakana
- latin
- simplifiedhanzi
- thai
- traditionalhanzi
- user

The possible modifiers are:

- lowerCase
- upperCase
- titleCase
- startUpper
- digits
- symbols
- predictOn
- predictOff

Autocomplete. Many mobile browsers maintain a dictionary that is updated with non-included words the user inserts in text inputs and offer the user an autocomplete feature while he is typing or when he first clicks in the text input (suggesting the values recently inserted in fields of the same type, such as last name or email address fields). We will talk more about autocompletion in [Chapter 9](#). For now, it is useful to know that if we don't want the browser to interfere with suggestions, we can tell it so using the `autocomplete="off"` HTML attribute (this attribute is nonstandard and does not work in all browsers). For BlackBerry 5.0 devices, we should also add `inputmode="predictOff"`.

Tables

Repeat after me: “I will not use tables for document layout.” Write it with a red marker on your bedroom ceiling, if it will help you remember. Using tables for document layout is bad in desktop web development. It is hell for the mobile web. Table support is extremely limited in some mobile browsers and, even when devices have great support, the screen size is not table-friendly.

Mobile browsing is more a one-column experience, even in landscape browsers. If you do want or need to use a table, you should limit it to at most five columns of tabular data (preferably with short column headings and data values). Nested table support is even worse; there are no good examples of mobile web designs using nested tables, so

don't even try it. You can do whatever you are thinking of using a nested table for using CSS and clean markup.

XHTML 1.0 and 1.1 added a lot of tags for tables, not all compatible with mobile browsers. We can define the table title (`caption`), the header (`thead`), the body (`tbody`), the footer (`tfoot`), the columns (`colgroup`, `col`) and finally, the rows (`tr`), the header cells (`th`), and the data cells (`td`). Cells can be merged using the `rowspan` and `colspan` attributes, and the design should be defined in CSS.

As an exercise, let's emulate the following table in XHTML and see how the different mobile browsers render it (see [Table 6-16](#)).

Table 6-16. Sales of the Company in 1998

Sales			
City	Half 1	Half 2	# Clients
New York	445,000	233,000	589
Paris	No operations		0
Barcelona	233,400	344,000	422
Madrid	133,400	239,000	
Total	811,800	816,000	1,011

The XHTML 1.1 code is:

```
<table>
  <caption>
    Sales of the Company in 1998
  </caption>
  <colgroup align="left" />
  <colgroup span="2" align="right" style="color: blue;" />
  <thead>
    <tr>
      <th rowspan="2">City</th>
      <th colspan="2">Sales</th>
      <th rowspan="2"># Clients</th>
    </tr>
    <tr>
      <th>Half 1</th>
      <th>Half 2</th>
    </tr>
  </thead>
  <tbody>
    <tr>
      <td>New York</td>
      <td>445,000</td>
      <td>233,000</td>
      <td>589</td>
    </tr>
    <tr>
      <td>Paris</td>
```

```

<td colspan="2">No operations</td>
<td>0</td>
</tr>
<tr>
<td>Barcelona</td>
<td>233,400</td>
<td>344,000</td>
<td rowspan="2">422</td>
</tr>
<tr>
<td>Madrid</td>
<td>133,400</td>
<td>239,000</td>
</tr>
</tbody>
<tfoot>
<tr>
<td>Total</td>
<td>811,800</td>
<td>816,000</td>
<td>1,011</td>
</tr>
</tfoot>
</table>

```

Browser compatibility for the previous sample is shown in [Table 6-17](#).

Table 6-17. Table display compatibility

Browser/platform	Table compatibility
Safari	Full
Android browser	Full
Symbian/S60	Full
Nokia Series 40	Full
webOS	Full
BlackBerry	Full from 3.7 No table support before 3.7
NetFront	Full
Openwave (Myriad)	Full from 6.x
Internet Explorer	Full
Motorola Internet Browser	Full
Opera Mobile	Full
Opera Mini	Full

Frames

Frames are one of the “better if you avoid it” features in the mobile world. I remember back in 1997 (the Microsoft FrontPage era) being happy with the frames technique, creating fixed menu bars and dealing with links between frames. It was a happy time, until search crawlers came into action and frames became the worst thing you could ever do in a website. OK, background music can be even worse, but it is true that today the usage of frames is suitable only for intranet sites and non-crawled applications. Similar functionality can now be provided with the much more versatile Ajax.

The HTML frames mechanism allows the developer to split a document into n subdocuments, vertically and/or horizontally. Every frame is a different document (that’s the problem for search engine spiders), and every frame manages its own scrolling (this is the problem for the mobile world).

We already know that in the mobile world, even though the viewport can be large, the screen is small. Splitting this small screen into smaller windows as frames can be difficult. The only situation where it can be useful is to define fixed toolbars at the top or bottom of a document. However, this will still cause problems with search engines, and what’s more, there are plenty of mobile browsers that don’t work with frames.



The fixed toolbar can be replaced in some high-end browsers with floating toolbars, as we’ll see in [Chapter 9](#). The iOS browser has a two-finger scrolling gesture to scroll inside a frame or iframe.

So, the final advice is: don’t use frames when developing for the mobile web. The inline frame (or *iframe*) is a modern way to do frames (although it was introduced by Internet Explorer in 1997). The *iframe* tag is not part of the XHTML standards, but in mobile browsers it does produce better results than frames. Today, iframes are often used for ad servers to serve advertisements from a third-party server. If you can, it’s still best to avoid them; if you can’t, consult the list in [Table 6-18](#) to see which browsers support iframes.

Table 6-18. Frames compatibility table

Browser/platform	Frames	Iframes
Safari	Yes	Yes
Android browser	Yes	Yes
Symbian/S60	Yes	Yes
Nokia Series 40	Yes in 6 th edition No, shows noframe before 6 th edition	Yes on 240-width devices No in Lite editions
webOS	Yes	Yes
BlackBerry	Yes, but show one after the other vertically	Yes from 4.0

Browser/platform	Frames	Iframes
NetFront	Yes from 3.4	No before 4.0
Openwave (Myriad)	Show frames as links	Yes from 3.4 in some devices only
Internet Explorer	Yes	No
Motorola Internet Browser	Shows noframe on v3 series and shows a frame below the other in newer devices	Yes
Opera Mobile	Yes	No
Opera Mini	Yes from 4.0	Yes

i-mode XHTML

Japanese devices from NTT DoCoMo use their own version of XHTML with extensions for XHTML and CSS, based on the old cHTML. Serving i-mode XHTML files requires using a new DOCTYPE and defining the charset UTF-8 or Shift-JIS for Japanese characters. For example, for the latest version, the first two lines of the file might look like this:

```
<?xml version="1.0" encoding="Shift_JIS"?>
<!DOCTYPE html PUBLIC "-//i-mode group (ja)//DTD XHTML i-XHTML(Locale/Ver.=ja/2.3)
1.0//EN" "i-xhtml_4ja_10.dtd">
```

The latest version of i-mode XHTML at the time of this writing is 2.3; there is also a non-XML version, called i-mode HTML, which is currently at version 7.2. i-mode Browser 2.0 is the browser delivered by devices manufactured after May 2009; it includes the latest versions of both i-mode HTML and XHTML.

There is an excellent portal of information in English for versions 1.0 and 2.0 of the i-mode Browser at <http://www.nttdocomo.co.jp/english/service/imode/make/content/browser>.

The good news is that the latest versions of i-mode HTML and i-mode XHTML support almost every tag used in XHTML MP. The list of supported attributes differs, though, and a lot of new attributes and values are available as i-mode extensions. For example, an `li` element can have a `type` attribute with `circle` as the value, and a numeric text input can be defined with `type="text"` and `istyle="3"`.

Plug-ins and Extensions

By their very nature, you can't count on plug-ins to work on every browser, but they are even less likely to be reliably available on the mobile web.

Adobe Flash

The Flash Player is a de facto standard in desktop browsers: Flash Player 8 penetration was at more than 99.5% as of September 2009.* However, the mobile world is a very different jungle. Adobe is trying to bring the same experience to the mobile browser, but it has found many stones in the road. That is why Adobe as yet has no official up-to-date penetration percentages for the mobile world.

Adobe currently has two mobile lines: Flash Lite and the major Flash Player 10 for mobile devices. The first one is intended for low- and mid-end devices (and high-end devices shipped before 2010), and the major player will be available for Android, Symbian, and Palm Pre (but not iPhone) devices starting in 2010. [Table 6-19](#) shows the ActionScript version and Flash Video support in the Flash versions available for mobile browsers.

Table 6-19. Flash Mobile version comparison

Version	ActionScript version	Flash Video (FLV) support	Desktop Flash Player similarity
Flash Lite 1.0/1.1	1.0	No	Flash Player 4.0
Flash Lite 2.0/2.1	2.0	No	Flash Player 7.0
Flash Lite 3.0/3.1	2.0	Yes	Flash Player 8.0
Flash Lite 4.0	3.0	Yes	Flash Player 9.0
Flash Player 10.1	3.0	Yes	Same

[Figure 6-16](#) shows what users with noncompatible devices will see if you embed Flash content in your site.

The Flash Lite player can be used in menus, backgrounds, games/apps, and in the browser. Having Flash Lite installed on the device doesn't mean that the Flash player can be used from the browser, though.

Apple Versus Adobe

Apple versus Adobe, Adobe versus Apple...this is one of the great fights in the mobile web world today. When the iPhone SDK arrived in 2008, Adobe wanted to create a Flash Player for it. Apple appeared to agree. A year later, Adobe accused Apple of not providing any help, and months later Apple announced that the iPhone would not have Flash support. The justification was the high battery consumption of Flash content in the browser, and that it was not necessary because iPhone extensions to CSS and JavaScript allow any developer to create Flashy content without Flash.

One of the off-the-record causes, though, is that if Apple enables Flash content in the iPhone, it will lose political control over the content, games, and applications on the device.

* http://www.adobe.com/products/player_census/flashplayer/version_penetration.html.

In early 2010, Adobe announced that starting with Adobe Flash CS5, the tool would export SWF to native iPhone applications that could then be distributed in the App Store. However, Apple counterattacked by changing the terms of the App Store and saying that those applications will not be allowed. There is a big discussion in the web world about HTML 5 versus Flash and the Apple–Adobe war, with fans on both sides.

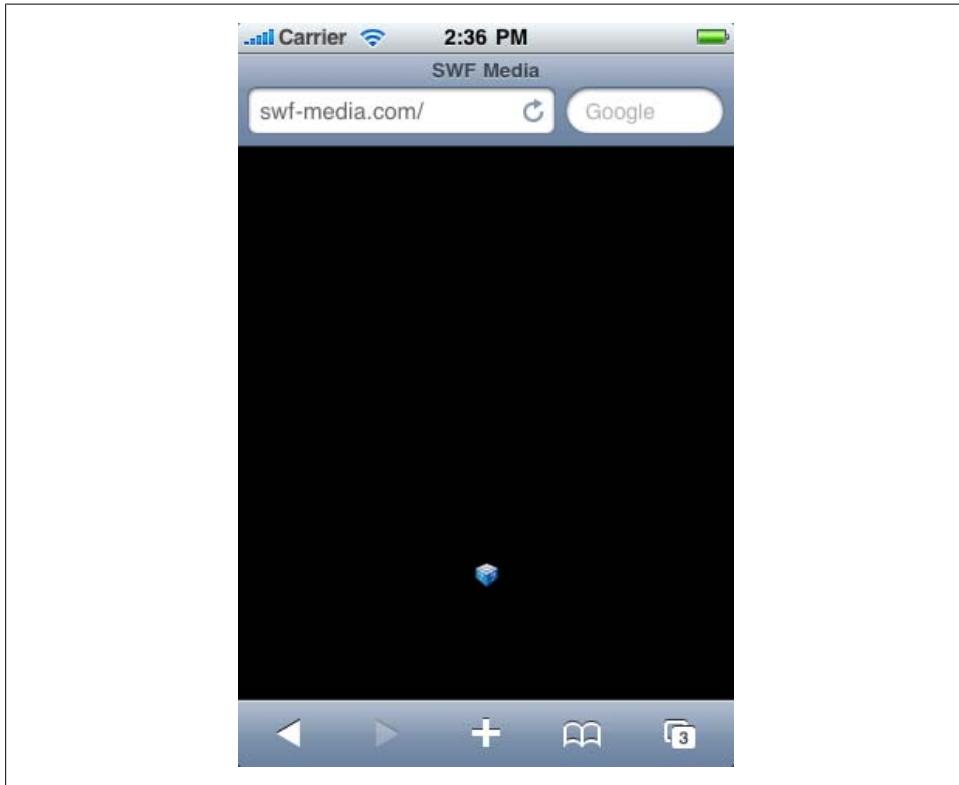


Figure 6-16. As we can see, showing Flash content on noncompatible devices is a big mistake.

Even if Adobe does achieve decent penetration in the mobile world, the differences between Flash Lite 1.0 and 4.0 are really huge. For example, Flash Lite 1.0 has no support for arrays or functions as we know them in a programming language. That is why the use of Flash in a mobile website should be considered only if you are working with a controlled suite of devices and should be tested thoroughly. If you're using Flash, keep the following guidelines in mind:

1. Optimize the ActionScript as much as you can.
2. Avoid effects that demand complex mathematical processing.
3. Don't use object-oriented programming.

4. Don't rely on click events if you're developing for non-touch devices.
5. Maximize usability using keyboard event listening.
6. Compress images and sounds to the maximum.

Flex for Mobile

Adobe Flex is an open source framework for ActionScript 3.0 for developing Rich Internet Applications. Flex applications don't run on mobile devices today, although they will be compatible for Flash Player 10.1 devices beginning in 2010. The Flex 4 team is also working on an upcoming release of Flex controls for enhanced performance on mobile devices.

[Table 6-20](#) shows which mobile platforms currently have Flash support.

Table 6-20. Adobe Flash compatibility table

Browser/platform	Flash support
Safari	No
Android browser	No up to 2.1, Flash Player 10.1 from 2.2
Symbian/S60	Yes
Nokia Series 40	Yes in 6 th edition No before 6 th edition
webOS	No, Flash player 10.1 announced
BlackBerry	No, Flash player 10.1 announced
NetFront	Depends on the device (some Sony Ericsson devices have Flash support)
Openwave (Myriad)	No
Internet Explorer	No (optional)
Motorola Internet Browser	No
Opera Mobile	No
Opera Mini	No

Flash on the iPhone? Yes, you can!

The out-of-the-box thinking some people exhibit really surprises me (in a good way!). Tobias Schneider has developed an open source Flash runtime, totally created using JavaScript and SVG, called *Gordon*. If you are wondering why the name, remember the comic hero "Flash Gordon" and you will have the answer.

Gordon is a JavaScript library, compatible with SVG browsers, that renders an Adobe Flash SWF file in the browser without using the Flash Player. Moreover, as you may be wondering, it works great on iPhone devices. It is a heavy-JavaScript library, so don't

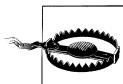
abuse it; use it only for important animations. You can test some sample animations at <http://paulirish.com/work/gordon/demos>.

At the time of this writing, the library is in its first version, and it supports only a subset of the SWF format and no ActionScript 2 or 3. It is most suitable for animations and simple buttons, and it is compatible with the SWF 1 format, with a pre-release version supporting the SWF 4 format.

Usage is simple: you just need to download the library from <http://github.com/tobeytaylor/gordon> and insert the *gordon.js* file and the *src* folder in your website. Your HTML should look like this:

```
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
    <title>Gordon: An open source Flash" runtime written in pure JavaScript</title>
    <script type="text/javascript" src="gordon.js"></script>
</head>
<body onload="new Gordon.Movie('movie.swf', {id: 'stage', width: 500,
height: 400})">
    <div id="stage"></div>
</body>
</html>
```

As you can see from the code, the library replaces a *div* with the *.swf* defined in the *onload* event.



Remember that Gordon isn't a Flash Player for iPhone devices; it is just a runtime. Users don't need to install anything for it to work, but it won't make any website with Flash content work automatically. You need to insert the library in your code, export your movie to SWF 1.0, and insert the JavaScript code required for it to work if you detect that the browser is Safari on iOS.

Microsoft Silverlight

Silverlight is a technology for Rich Internet Application development similar to Flash. It is new in the desktop market and incipient in the mobile world. At the time of this writing, there are betas available for Windows Mobile, Windows Phone, and Symbian 5th edition, so we should expect the Silverlight Player to be preinstalled on future devices.

Today, Silverlight is not an option for mobile web development.

SVG

Standard Vector Graphics is an open XML specification describing 2D vector graphics. An SVG document can be static (declared in an XML file or tag) or dynamically generated from a JavaScript file. As a vector-rendering engine, a great feature is the adaptation to different screen sizes without loss of quality.

SVG is a W3C standard for desktop platforms, with two subsets prepared for mobile platforms: *SVG Basic* and *SVG Tiny*. Thanks to this standards fight (as with XHTML mobile versions), we can use either SVG Basic or SVG Tiny with the same code and results. However, the Tiny sub-version appears to have won the battle.

The latest version available is SVG Tiny 1.2, but the most compatible version of SVG Tiny for mobile browsers is 1.1 (*SVGT 1.1*), which offers some support for animation. This version has been adopted by OMA and the 3rd Generation Partnership Project (3GPP). Opacity and gradients are not part of the mobile standard, but some devices still render them. This addition is known in the market as *SVGT 1.1+*. One compatibility issue between SVGT devices is text support. Some devices allow us to use system fonts to declare text in the SVG, but others do not, forcing us to convert text to curves in a graphic design tool.



For better performance, some browsers understand SVGZ files, which are just gzipped SVG files.

[Table 6-21](#) shows the current state of SVG support on mobile web platforms.

Table 6-21. SVG compatibility table

Browser/platform	SVG in browser	SVG animation
Safari	Yes, from 2.1, object and img ^a	Yes
Android browser	No	No
Symbian/S60	Yes, from 3 rd edition, object only	Yes
Nokia Series 40	No	No
webOS	No	No
BlackBerry	No	No
NetFront	Yes	Yes
Openwave (Myriad)	No	No
Internet Explorer	No	No
Motorola Internet Browser	No	No
Opera Mobile	No	No
Opera Mini	Yes, object and img	No

^a See the upcoming section “[Embedding the SVG](#)” on page 177.

Tools for SVGT

Most vector graphic design software supports SVG as an export format. Adobe Illustrator, for example, can export to SVGT 1.1, SVGT 1.1+, and SVGT 1.2. Corel Draw is another useful tool for SVG conversion. Sometimes the markup generated by Illus-

trator has more tags than you need, so you may want to open it with another tool and export it again. The most useful tool for mobile SVG currently on the market is Ikivo Animator. It is intended for mobile devices and can create animations using SVGT 1.1. You can download a trial version from <http://www.ikivo.com/animator>.

In the open source world, Inkscape (<http://inkscape.org>) offers SVG support, and for Windows only we can use SVGmaker Tiny (<http://svgmaker.com>), a printer driver that converts any printed document into SVGT.

The recommendations for SVG Tiny document generation are:

- Keep the quantity and size of the objects used to the minimum.
- Avoid big gradient areas; they decrease performance.
- Reduce path points to the minimum.
- If the object is too complex, a raster PNG may be better.
- Use GZIP if compatible.
- Combine paths when possible.
- Maintain one copy of each object online.
- Export text as curves.
- For simple shapes, don't use a graphic design tool.

SVG for beginners

SVG is beyond the scope of this book, but here is a very quick lesson on SVG Tiny.

An SVG document is an XML document with a root `svg` tag defining an original view-port size (width and height), but remember that it is a vector image, so you can resize it. Inside the image, we can draw the following kinds of shapes:

- Rectangles (`rect`)
- Circles (`circle`)
- Ellipse (`ellipse`)
- Line (`line`)
- Polyline (`polyline`)
- Polygon (`polygon`)
- Path (`path`)

The following is an SVG Tiny 1.1+ compatible document (it uses a `LinearGradient`, which is not included in the SVGT 1.1 standard):

```
<?xml version="1.0" encoding="utf-8"?>
<!DOCTYPE svg PUBLIC "-//W3C//DTD SVG 1.1 Tiny//EN"
  "http://www.w3.org/Graphics/SVG/1.1/DTD/svg11-tiny.dtd">

<svg version="1.1" baseProfile="tiny" xmlns="http://www.w3.org/2000/svg"
  xmlns:xlink="http://www.w3.org/1999/xlink" x="0px" y="0px" width="200px">
```

```

height="200px">

<linearGradient id="grad1" gradientUnits="userSpaceOnUse" x1="54" y1="61"
    x2="147" y2="61">
    <stop offset="0" style="stop-color:#FFFFFF"/>
    <stop offset="1" style="stop-color:#000000"/>
</linearGradient>

<rect x="0" y="0" fill="url(#grad1)" stroke="#000000" width="193" height="84"/>
<ellipse fill="#FF0000" stroke="#000000" cx="30" cy="100" rx="25" ry="25"/>
</svg>

```

This document creates a 200×200-pixel SVG image with a rectangle (`rect` tag) and a circle (`ellipse` tag with equal radius `rx` and `ry` centered at `cx`, `cy`). The circle is filled with a plain red color and the rectangle is filled with a linear gradient defined with an `id` of `grad1`. This gradient is not compatible with SVGT 1.1 (without the +).



Google Docs (<http://docs.google.com>) has an online free vector graphic designer for diagrams and graphs. It has the option to export to SVG.

This document has a size of 670 bytes (0.6 KB) as an SVG file. A 24-bit PNG with the same image has a size of 5.77 KB, and an 8-bit PNG with quality loss has a size of 1.31 KB. Clearly, SVG is better from a size (and network traffic) perspective. The bad thing is that the browser has to render the image on the mobile device (although this is not the case for proxied browsers, such as Opera Mini, or BlackBerry devices where the SVG is pre-rendered on a server).

Embedding the SVG

To insert an SVG document inside an XHTML document we can use the `object` tag, defining the `data` attribute with the URL of the SVG, the type as `image/svg+xml`, and the `width` and `height`. As an SVG is a vector-based image, we can use percentages for the size attributes to adapt the content to the viewport size. If SVG is not available, we can use the fallback feature to create an alternative image in another format as a child of the `object` tag:

```

<object data="logo.svg" type="image/svg+xml" width="100" height="30">
    
</object>

```

Some browsers (such as Safari on iOS) also use the classic `img` tag for SVG files:

```

```

Canvas

HTML 5 incorporates a new tag, `canvas`, that allows the developer to create a dynamic picture using graphic primitives in JavaScript. Compatibility and syntax will be covered in [Chapter 9](#). For now, just remember that there is a way to draw small images and patterns without having to make any new requests to the server.

CSS for Mobile Browsers

CSS is very forgiving. If the browser encounters a selector or attribute that it cannot understand, it will just ignore that rule. This will be very helpful in the following pages.

The previous chapter discussed the many standards in the mobile CSS world and noted the CSS extensions available in WAP CSS. Whether we decide to use CSS 2.1, CSS 3.0, CSS Mobile Profile, WAP CSS, or WebKit extensions, it will be just the same; we'll use CSS selectors, and attributes for those selectors. The standards only tell us which ones are supported. What's more, we will find some browsers that do not render standard styles but do render nonstandard ones.

If you're interested in having W3C-valid markup, remember that XHTML Basic 1.0 doesn't support CSS, and that version 1.1 added support, but only for a `style` or `link` tag with external styles. The W3C standards don't support the inner styles defined in the `style` attribute. And to be perfectly honest, in the real world, we won't worry too much about standards in CSS; we will simply do whatever we need to do to create the most compatible stylesheet, and this will by default include official standards and extensions.



Remember, there is no special MIME type, file extension, or XHTML tag for defining mobile CSS.

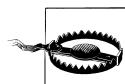
Where to Insert the CSS

The first question to answer is: where should we tell the browser what styles to apply? We have many options:

- `<style>` tags inside the XHTML or HTML markup
- External stylesheets as `.css` files
- `style` attributes inside the tags

The third option might seem like the most efficient approach, but it is not the best one. That said, there are times when it is useful. For the CSS WAP extensions for form controls described in [Chapter 6](#), for instance, it is easiest to insert inline styles to avoid defining IDs and ID selectors for each control:

```
<input type="text" name="name" style="-wap-input-format: A*a" />
```



On BlackBerry devices running Device Software 4.5 or earlier, stylesheets can be disabled from the browser or from a corporate policy.

A fourth option (a new way of including an external stylesheet) is specified in the WAP CSS standard, but it is not implemented and not recommended as it offers no advantages. It looks like this:

```
<?xml-stylesheet href="style.css" media="handheld" type="text/css" ?>
```

If the website you are creating is a one-page document (a widget, an Ajax mobile application, or just a simple mobile document), it will be faster to include the CSS in the `<style>` XHTML tag to avoid a request and a rendering delay. The other ideal situation for this technique is if your home page is very different from the other pages in your site. Otherwise, odds are good that external stylesheets will help you manage your site more efficiently.

Media Filtering

Is one CSS stylesheet adequate for all devices? Maybe. The first factor to consider is whether we are working on a desktop XHTML site or a mobile-specific one.

Desktop websites

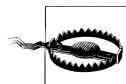
If we decide to use only one XHTML site for both desktop and mobile devices, our only option for changing the design and layout is the CSS file. This situation is a good fit for the `media` attribute.

The CSS standard allows us to define more than one stylesheet for the same document, taking into account the possibility of a site being rendered on different types of media. The most used values for the `media` attribute are `screen` (for desktops), `print` (to be applied when the user prints the document), and `handheld` (for... yes, mobile devices). There are also other values, like `tv` and `braille`, but no browsers currently support these.

Great! We've found the solution. We can just define two stylesheets, one for `screen` and one for `handheld`, and all our problems will be solved. The two stylesheets can define different properties for the same elements, and we can even use `display: none` to prevent some elements from being shown on mobile devices:

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

However, this “ideal” situation becomes hell when we test it. Many modern mobile browsers rely on `screen` stylesheets because they can render any desktop website. And other browsers use `screen` when they think it is a desktop website and use `handheld` when they think it is a mobile website, depending on the DOCTYPE, a `meta` tag, or the user’s view preferences.



To further complicate the situation, some mobile browsers (such as Mobile Internet Explorer) use `media="handheld"` if it is the only value defined, but use `media="screen"` by default if both are defined. The hack is to define `media="Screen"`, with an uppercase S; this causes Mobile IE to use the `handheld` option when both are defined.

Table 7-1 shows the `media` values selected by the different mobile browsers when both `screen` and `handheld` options are defined in the document. Clearly, we can’t rely on the `media="handheld"` attribute!

Table 7-1. CSS media compatibility table

Browser/platform	Media used
Safari	<code>screen</code>
Android browser	<code>screen</code>
Symbian/S60	<code>screen</code>
Nokia Series 40	<code>screen</code> in 6 th edition Both (no media understanding) before 6 th edition
webOS	<code>screen</code>
BlackBerry	<code>screen</code> (<code>handheld</code> if <code>meta</code> available)
NetFront	<code>handheld</code>
Openwave (Myriad)	<code>handheld</code>
Internet Explorer	<code>screen</code>
Motorola Internet Browser	<code>handheld</code>
Opera Mobile	<code>screen</code>
Opera Mini	<code>screen</code>

Media queries

CSS3 comes to our help with *media queries*. These complex media definitions include conditions about the screen size and `media` values allowed.

For example, we can say: “Apply this stylesheet for devices supporting only `screen` and with a maximum device width of 480.” This will apply to an iPhone, because in

landscape mode it has a screen width of 480px and it doesn't support `print`, `hand held`, or any other `media` type. Here's how to write this as a conditional media query:

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

We can then target non-iPhone desktop devices with a filter saying: "Apply this stylesheet for browsers supporting at least `screen` and with a minimum device width of 481." This query is written as follows:

```
<link media="screen and (min-device-width: 481px)" href="notiphone.css" type="text/css" rel="stylesheet" />
```



Internet Explorer (through version 8) does not understand CSS media queries, so it will apply the iPhone stylesheet by default. That is why we need to add IE conditional comments:

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

Some browsers also understand CSS media queries inside the same stylesheet file. For example, the following code will change the background color displayed on an iPhone (and other similar devices):

```
@media only screen and (max-device-width: 480px) {
    body {
        background-color: red;
    }
}
```

An extension for conditional media queries is the `orientation` media query, which allows us to define different styles for different orientations. There are two possibilities: `orientation:portrait` and `orientation:landscape`. For a device running iOS 3.2 or later, you can use the `orientation` media query as follows:

```
<link rel="stylesheet" media="all and (orientation:landscape)" href="land.css" />
<link rel="stylesheet" media="all and (orientation:portrait)" href="port.css" />
```

iPhone 4 and Pixel-Ratio

iPhone 4 comes with a 326-DPI screen, twice the original iPhone screen. This means that this new device has double width, double height in the same physical screen size. That is why Apple decided to give its browser the same CSS, viewport, and JavaScript dimensions as the low-DPI device, 320x480, and created a pixel-ratio of 2. This means that for every pixel, four real pixels will be drawn (a 2x zoom). Therefore, your website will render equally in iPhone 3GS or iPhone 4 beyond the clearer text. If you still want to show something different for iPhone 4 (as a high-DPI image) you can use the new media query condition `-webkit-min-device-pixel-ratio`:

```
<link media="all and (-webkit-min-device-pixel-ratio:2)"  
      href="iphone4.css" type="text/css" rel="stylesheet" />
```

The orientation query also works in Android from 2.0, in MicroB for MeeGo devices like the Nokia N900, and in Firefox Mobile. [Table 7-2](#) provides a more complete list of browser compatibility for CSS media queries and the orientation extension.

Table 7-2. CSS3 conditional media queries compatibility table

Browser/platform	Conditional media queries compatibility	Orientation support
Safari	Yes	Yes, from OS 3.2
Android browser	Yes	Yes from 2.0
Symbian/S60	Yes from 5 th edition No before 5 th edition	No
Nokia Series 40	Yes from 6 th edition No before 6 th edition	No
webOS	Yes	No
BlackBerry	No	No
NetFront	No	No
Openwave (Myriad)	No	No
Internet Explorer	No	No
Motorola Internet Browser	No	No
Opera Mobile	Yes	No
Opera Mini	Yes	No

Selectors

The classic CSS 2.1 selectors are compatible with almost every device, and for the few that don't recognize them entirely, it may not be worth the effort to create alternatives. The mobile CSS-compatible selectors we can trust for every device are:

1. Universal: `*` (compatible but not recommended)
2. Element: `tagName`
3. Class: `.className`
4. Unique ID: `#elementId`
5. Descendant: `selector selector`
6. Child: `selector > selector`
7. Multiple: `selector, selector`
8. Pseudoclasses (`link`, `visited`, `active`, `focus`): `selector:pseudoclass`

As we discussed previously, some mobile browsers also understand some additional styles to CSS 2.1. A compressed list of other selectors to use for these mobile browsers is:

1. Selector with attribute: `selector[attribute]`
2. Selector with attribute condition: `selector[attribute<operator>value]`



`operator` can be one of the following: equals (=), contains as one value (~=), begins with (^=), ends with (\$=), contains as a string (*=), or begins with and followed by hyphen (=).

3. Negation: `selector:not(selector)`
4. Immediately preceded by: `selector + selector`
5. Preceded by: `selector ~ selector`
6. Pseudoclasses (after, before, root, nth-child(n), first-child, last-child, empty, and others): `selector:pseudoclass`



Some CSS3 selectors don't work for mobile devices. How complex should a mobile website be, though? If it has that much complexity, perhaps we should consider simplifying.

CSS3 selectors should be used only for noncritical features for the basic behavior. For example, we can use one style for input tags and, only if the device supports it, another style for different input types. For very important features, we should consider using class selectors instead.

[Table 7-3](#) lists the browsers' compatibility with CSS3 selectors, as well as their ACID 3 results (on a scale of 0 to 100, with 100 being a perfect score). The ACID test is a well-known test from the Web Standards Project that evaluates how similar to the standard the implementation is on each browser.

Table 7-3. CSS3 selectors compatibility table

Browser/platform	CSS3 selectors compatibility	ACID 3 results
Safari	Yes	100
Android browser	Yes	93
Symbian/S60	Partial on 5 th edition: problems with attribute and child selectors Poor support before 5 th edition	47 (5 th edition)
Nokia Series 40	None	40 (6 th edition) Complete fail before
webOS	Partial	92 in webOS 1.4

Browser/platform	CSS3 selectors compatibility	ACID 3 results
Incompatible test until 1.2		
BlackBerry	None	
NetFront	None	
Openwave (Myriad)	None	
Internet Explorer	None	
Motorola Internet Browser	None	
Opera Mobile	Yes	99
Opera Mini	Partial in 5.0	98
Firefox on Maemo	Yes	94

If a browser has only partial support for some attribute or selector, that means the behavior is not complete. For example, the browser may not accept all the possible values, or it may render a selector properly in the original document but not apply the style if we change the DOM dynamically. This stylesheet fragment illustrates a non-critical use of CSS3 selectors:

```
input {
    background-color: yellow;
    border: 1px solid gray;
}
/* The next style will only work in CSS3-compatible browsers */
input[type=button] {
    background-color: silver;
}
```

CSS Techniques

In this section we are going to talk about some well-known CSS techniques (reset CSS files, text formatting, and the box model) and see how the different browsers react to these features.

Reset CSS Files

It is very common in desktop web design to create a CSS hack to reset all the default margins and padding for common HTML elements. We can use this technique when developing for the mobile web, with some considerations: we should only reset the elements we are going to use, we should avoid the usage of the global selector (*) for performance purposes, and if we are using an external reset CSS file we should consider merging it with our local CSS file.

Some browsers always create a margin around the whole document that cannot be deleted. And in the browsers that do allow you to delete the margin, remember that a zero margin may not be a good design decision.

Nokia offers three markup and CSS templates for mobile web design for free through its developer site at <http://www.mobilexweb.com/go/nokiatemplates>. Every template has a reset CSS file. The following code is extracted from the mid-range device template, and we can adapt it to our needs:

```
html, body, div, span, object, blockquote, pre,
abbr, acronym, address, big, cite, code,
del, dfn, em, font, img, ins, kbd, q, s, samp,
small, strike, strong, sub, sup, tt, var,
b, u, i, center, dl, dt, dd, fieldset, form, label, legend,
caption, tr, th, td {
    margin: 0;
    padding: 0;
    border: 0;
    font-size: 100%;
    font-weight: normal;
    vertical-align: baseline;
    background: transparent;
}

p {
    border: 0;
    font-size: 100%;
    font-weight: normal;
    vertical-align: baseline;
    background: transparent;
}
a {
    margin: 0;
    padding: 0;
    font-weight: normal;
}

h1, h2, h3, h4, h5, h6 {
    margin: 0;
    padding: 0;
    border: 0;
    vertical-align: baseline;
    background: transparent;
}

body {
    line-height: inherit;
}

body table {
    margin: 0;
    padding: 0;
    font-size: 100%;
    font-weight: normal;
    vertical-align: baseline;
    background: transparent;
}

/* remember to highlight insertions somehow! */
```

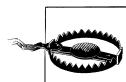
```
ins {  
    text-decoration: none;  
}  
del {  
    text-decoration: line-through;  
}  
  
/* tables still need 'cellspacing="0"' in the markup */  
body table {  
    border-collapse: collapse;  
    border-spacing: 0;  
}
```



The Nokia Mobile Web Templates are a set of templates (including XHTML and CSS files) for low-, mid-, and high-end devices that generate similar experiences across different devices, including hacks that solve some bugs, like the 100% width bug. They have been optimized for the Series 40 browser, S60 browser, Maemo browser, and Opera Mini. You can download them for free at <http://www.mobilexweb.com/go/nokiatemplates>.

Box Model

The box model, shown in [Figure 7-1](#), is how the browser represents every context box. Every block element (paragraph, image, title) has a content size, padding, borders, and outer margins. The sum of all of these defines the final size of the whole box. Fortunately, most mobile browsers have good compatibility with all of these features.



BlackBerry devices (up to Device Software 4.5) support only borders and padding from the box model; any other properties are ignored.

I don't recommend using common desktop techniques such as negative margins for fully compatible mobile websites. These hacks can be used only in modern browsers, and after testing.



CSS 2.1 adds the `outline` property, which provides a border with the same color and size for each side that doesn't take up space in the flow of the document. It is not supported in low- and mid-end devices.

Text Format

Showing text is the most common situation in a mobile website, and styling it in a way that maximizes compatibility can be a little tricky. Bold (`font-weight: bold`) and italics

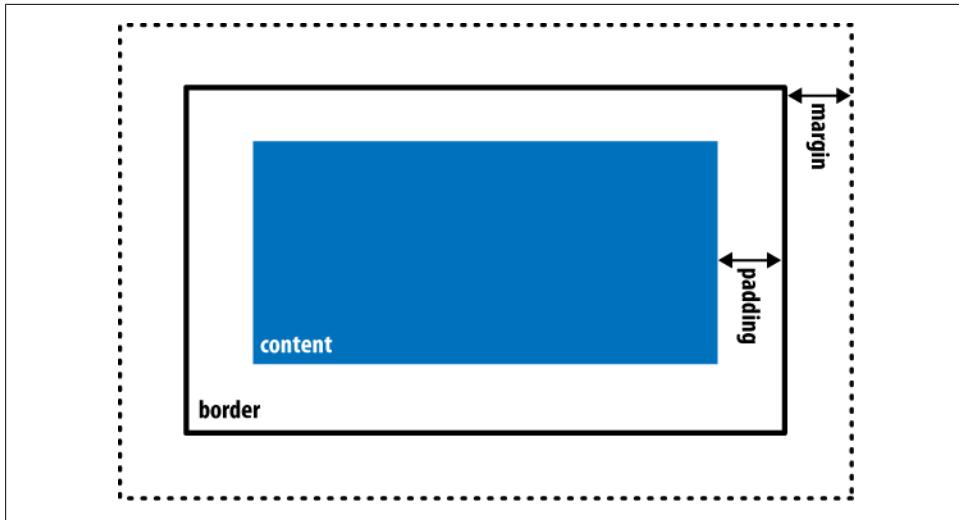


Figure 7-1. The CSS box model is the same for mobile and classic web. Understanding this model will save us some headaches.

(`font-style: italic`) are reliably compatible, but support for other text-formatting features varies.

Font family

This will be our first problem in styling text for mobile browsers. There are no standards in terms of fonts for mobile operating systems, and most platforms have only one system font (generally a sans-serif one).



NTT DoCoMo markup (for the Japanese market) still uses the old `font` tag for defining font properties like face, color, and size. Newer devices also support CSS. Other WebKit-based mobile browsers also support the `font` tag, but its use is not recommended. Use CSS instead.

We can provide specific font names (like `Arial`, `Verdana`, or `Times New Roman`) or generic font types (like `serif`, `sans-serif`, `monospace`, `cursive`, or `fantasy`).



Opera Mini has two modes: desktop and mobile. The default mode since version 4 is desktop, although the user (or carrier) can change this default. In mobile mode, some CSS from your website will be ignored and styling will be handled by the browser's own styling engine.

For the best compatibility, you should use the default font and apply other attributes (color, size, etc.). If you want to define a font name, you should consider providing a

list of alternatives. If the first font isn't available, the browser will try the second, then the third, and so on; if none of the listed fonts is available, it will use the default one.

Table 7-4 shows only the browsers with font support and lists the available choices for each.

Table 7-4. Font support list for compatible browsers

Browser/platform	Specific fonts available
Safari	American Typewriter American Typewriter Condensed Arial Arial Rounded MT Bold Courier New Georgia Helvetica Marker Felt Times New Roman Trebuchet MS Verdana Zapfino
Android browser	Droid
Symbian/S60	S60 Sans
webOS	Arial Coconut Verdana

Custom fonts. If you thought defining a system font was a headache, using custom fonts is even worse. No browsers support the CSS `@font-face` rule (with the exception of Safari for iOS, which has very limited support for SVG fonts).

If you want to use your own font for text, you should think again. If it's a matter of life or death, you can consider using an image (again, not recommended) or a different approach on compatible browsers: *sIFR* on Flash-enabled devices, or *Cufón* for HTML 5 devices. Compatibility is limited, though, and even if these solutions work, they can be slow.

sIFR (Scalable Inman Flash Replacement) is a nonintrusive JavaScript and Flash technique that replaces normal HTML text with a Flash movie with the same text and an embedded vector font. It can be downloaded from <http://wiki.novemberborn.net/sifr>.



Unobtrusive code does not change the way we create the document. We just add a JavaScript line and, if the browser is compatible, it will activate. If not, the normal HTML document will be used.

Cufón intends to be the more standard replacement for sIFR: it is a free service that allows us to upload a font to the website (<http://cufon.shoqolate.com>) and download a “FontForge” script containing the embedded font in two formats: VML for Internet Explorer and HTML 5 canvas for the other browsers.



If delivering a custom font, you need authorization to distribute it. The font may be copyrighted, and you should make sure you have the right to distribute it as a custom font for your website.

Table 7-5 lists browser compatibility for sIFR and Cufón.

Table 7-5. Custom font techniques compatibility table

Browser/platform	sIFR	Cufón
Safari	No	Yes
Android browser	No	Yes
Symbian/S60	Yes	No
Nokia Series 40	No	No
webOS	No	No
BlackBerry	No	No
NetFront	Depends on the browser version	No
Openwave (Myriad)	No	No
Internet Explorer	No	No
Motorola Internet Browser	No	No
Opera Mobile	No	No
Opera Mini	No	No

Font size

Which elements need a defined font size? For most cases, we should only define font sizes for headers and for element selectors (`h1`, `h2`, `p`, `div`). If you are defining a font size for a specific paragraph, it may be more appropriate to use a header tag.

We can use any measure for the font size, and almost every browser will understand it. However, it may be not rendered any differently. Only smartphone browsers with smart zoom support allow any font size to be rendered (like `13.5px` in Safari on iOS).

For most of the mobile browsers, the best font size technique is to use relative constants (`xx-small`, `x-small`, `small`, `medium`, `large`, `larger`, `x-large`, `xx-large`).

Operating systems have different font support. Some of them have only three possible sizes for text, and if we use the typical pixel definitions, two different sizes (for example, `12px` and `14px`) may be rendered identically. If we use relative constants (e.g., `large`), we have more probability of that text being rendered in a larger font. Another compatible way of specifying font sizes is to use `em` values. Using `em` values is perfect for supporting different screen sizes and DPIs because this unit is relative and scalable to the standard font in the device.

The default (`medium`) font size is generally the perfect size in the operating system for normal paragraph text, and for normal text we should leave it that way.

Text alignment

We can align the text using `text-align` over a block element (like a `p` or `h1`) with a value of `right`, `left`, `center`, or `justify`. As shown in [Table 7-6](#), the `justify` value is the least widely compatible for mobile devices; if not supported, it will render as `left`.

Table 7-6. Text alignment compatibility table

Browser/platform	Center	Justify
Safari	Yes	Yes
Android browser	Yes	Yes
Symbian/S60	Yes	Yes
Nokia Series 40	Yes	No
webOS	Yes	Yes
BlackBerry	Yes	No before 4.5 Yes from 4.5
NetFront	Yes	No
Openwave (Myriad)	Yes	No
Internet Explorer	Yes	No
Motorola Internet Browser	Yes	No
Opera Mobile	Yes	Yes
Opera Mini	Yes	Yes

Other standard text styles

Styles like `text-decoration`, `text-transform`, `font-variant`, `letter-spacing`, and `word-spacing` should be used with care. It is best to assume that they will not work and to create the standard functionality without them. If some browsers do render them, great; however, don't rely on them.

There are also some CSS3 and WebKit extensions for text styles that will be covered later.



A good source to find more detail about mobile CSS compatibility is the website <http://www.quirksmode.org/m/css.html>. It has many tests and results for CSS selectors and properties on a range of devices.

Text shadows

Another non-mobile CSS 2.1 feature is `text-shadow`. It allows us to define the color, x-offset, y-offset, and blur radius of a shadow to be applied to a text selector. For example, we can produce a shadowed headline like that shown in [Figure 7-2](#) with code like this:

```
h1 {  
    text-shadow: 0.1em 0.1em #AAA  
}
```

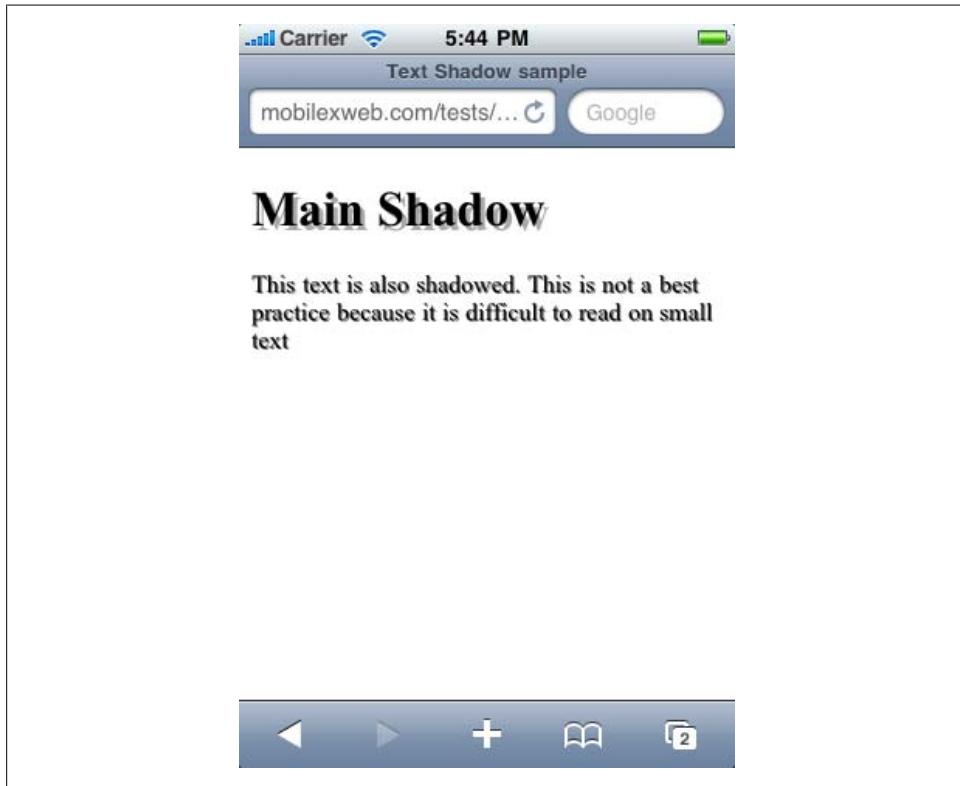


Figure 7-2. Text Shadow should be used with care and only for titles or short texts

If you're thinking about using this feature, remember that in the mobile world, the clearer the text is the better for usability. Use text shadows with extreme care. Only a few browsers support this feature anyway, as listed in [Table 7-7](#).

Table 7-7. Text shadow compatibility table

Browser/platform	Text shadow compatibility
Safari	Yes
Android browser	No
Symbian/S60	No
Nokia Series 40	No
webOS	No
BlackBerry	No
NetFront	No
Openwave (Myriad)	No
Internet Explorer	No
Motorola Internet Browser	No
Opera Mobile	Yes
Opera Mini	Yes from 5.0

Text overflow

CSS3 adds a very useful feature for mobile web designs: text overflow. This property, available in some mobile browsers, allows us to specify that an ellipsis should appear at the end of a piece of text if it doesn't fit in its container in a single line, depending on the font and space available. This is great for reducing the amount of space taken up by links, and for previews or summaries that will be shown completely in a details page after the user clicks on them.

For example, we can show a title, and a description with `text-overflow` set to `ellipsis`. When the user clicks on the title, via JavaScript, we remove the `text-overflow` property and the whole text is shown. This maximizes the amount of content we can display on a page. This feature also works well on devices that support both landscape and portrait orientations: with text overflow we can assure the usage of only one line in both modes.

To use this feature, the paragraph (or other element containing the text) must have `overflow: hidden` to avoid the continuing of the overflow text on the next line, `white-space: nowrap` to avoid wrapping, and some value for `text-overflow`.

In mobile browsers, the possible values for `text-overflow` are `clip` and `ellipsis`. The `ellipsis` value causes an ellipsis to appear after the last character that fits in the box (as shown in Figures 7-3 and 7-4). `clip` is the default value, which truncates the text without showing the ellipsis.

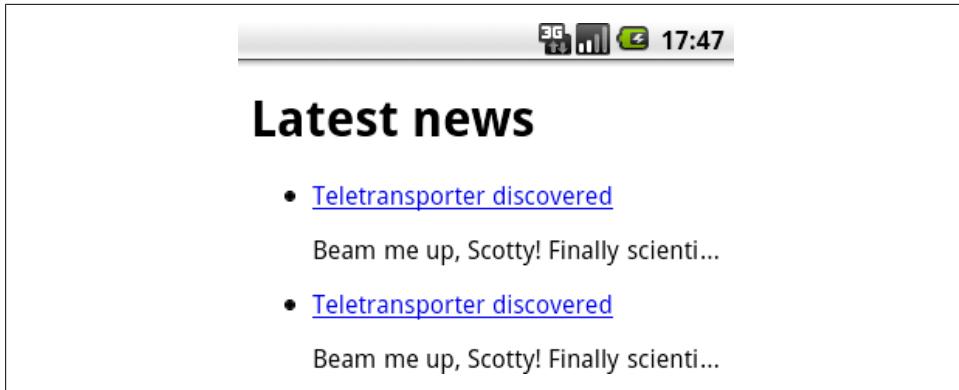


Figure 7-3. *text-overflow: ellipsis* is a great feature for displaying summaries in mobile designs.

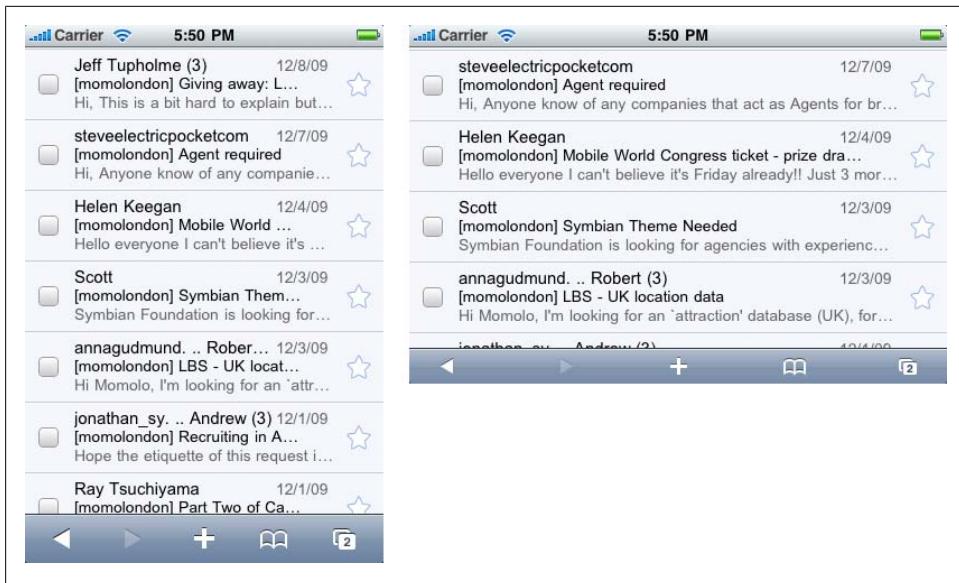


Figure 7-4. *Gmail for smartphones* is an excellent example of text overflow usage. Here is the same view in portrait and landscape modes. Note that the amount of text displayed is larger in the landscape orientation.

Here is a sample that produces the result shown in Figure 7-3:

```
<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN"
  "http://www.wapforum.org/DTD/xhtml-mobile10.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<title>Documento sin título</title>
<style type="text/css">
```

```



```

[Table 7-8](#) lists browser compatibility for the `text-overflow` property.

Table 7-8. Text overflow compatibility table

Browser/platform	Text overflow with ellipsis support
Safari	Yes
Android browser	Yes
Symbian/S60	No
Nokia Series 40	No
webOS	Yes
BlackBerry	No
NetFront	No
Openwave (Myriad)	No
Internet Explorer	Yes
Motorola Internet Browser	No
Opera Mobile	No
Opera Mini	No

There are more advanced styles under discussion for the next version of the standard, but they are not yet compatible with mobile devices.

iPhone text adjustment

Safari on iOS supports a CSS style especially for controlling the size of text prepared for the zooming action: `-webkit-text-size-adjust`. This style accepts values of `auto` (the default), `none`, and a percentage (e.g., `200%`). By default, iOS overwrites the site's font sizes to allow the text to be read without any problems when the user zooms over a paragraph. We can override this behavior with this style, turning it off (`none`) or defining a percentage zoom level to be applied on the default font defined for the desktop website.

If we want to enhance a desktop website for iPhone browsing, we should leave this style set to `auto`. However, if we are creating a mobile-only website, we will typically want to define our own font sizes, so we should turn this feature off:

```
body {  
    -webkit-text-size-adjust: none  
}
```

As we can see in [Figure 7-5](#), if a paragraph is prepared to be read in a desktop browser with a large viewport width, we can change this behavior using the `-webkit-text-size-adjust` attribute to enhance the iPhone reading experience without changing the desktop appearance.

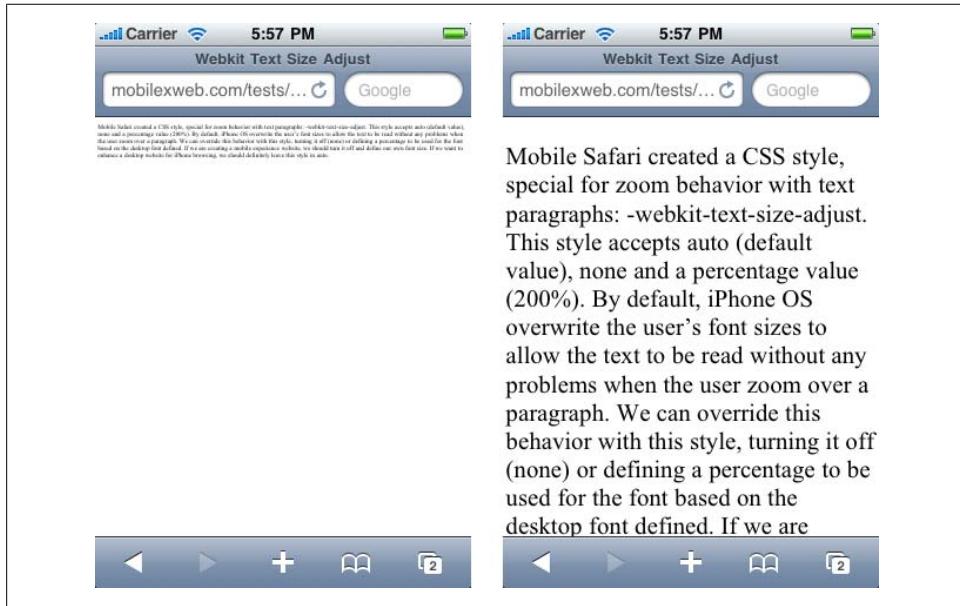


Figure 7-5. This is the same text paragraph with text adjustment off and with 400% as the value. This feature is useful only in non-mobile web designs.

Common Patterns

Even the most unique mobile web designs typically rely on a core set of common style patterns.

Display Properties

The most standard `display` values (`none`, `block`, `inline`) are supported, but in a limited way. If you change the value dynamically via JavaScript, many browsers will not render the change.

There are also other table and column values that I do not recommend using in mobile websites: `inline-table`, `table-column`, `table-cell`, and others. They are not common in desktop websites either, because of Internet Explorer's lack of compatibility.

And, to be perfectly honest, why should we need column or table layouts on the mobile web? If we do want to show tabular data, we should create the tables in HTML, not use the table layout CSS features.



Even when we're designing for some new smartphones, like the Nokia N900, which has a screen width of 800 pixels, we should avoid using tables and column layouts with more than two columns. Even at 800 pixels, the screen is still small, and we need to remember that it is a mobile device and think about the contexts in which it will be used.

The style `display: none` will be used a lot in JavaScript and Ajax development. In the next chapter, we will test browser compatibility for this property dynamically.

Absolute and floating positions

The standard position (`position: static`) is the most widely compatible and is recommended for mobile websites. This means that each element will be rendered in its normal position in the document.

Floating elements do work very well on most mobile devices, as you'll see in [Table 7-9](#). However, even on devices with average-sized screens it's best not to have more than two floating elements in the same row. This can be approached using `float: left` and `float: right`.

Relative positioning (`position: relative`) is trickier in mobile browsers. It defines movement (using `top`, `bottom`, `right`, `left`) from the original position as a static element.

A `clear` element (`clear: both`, for example) can be used after floating elements to ensure that no floating elements are allowed on the right, the left, or both sides of the element.



There is a JavaScript solution for creating a floating footer called *iScroll*. You can find it at <http://www.mobilexweb.com/iscroll>. The main problem with using this kind of JavaScript solution is that it impacts the performance of our websites.

Fixed positioning is not compatible with all mobile browsers (see [Table 7-9](#)) and is not recommended. The problem is that in mobile browsers we are scrolling a window, not the contents. Depending on the zoom and the viewport size, a fixed position can have different meanings.



There is a campaign on the Web that aims to reduce this problem in the future. You can read more about it at <http://www.abettermobileweb.com>; this site explains the problem of fixed positioning and how to solve it in the future.

Richard Herrera (<http://www.doctyper.com>) has also created some JavaScript and CSS-based solutions for the iPhone and other WebKit-based browsers to emulate some kind of fixed positioning.

Table 7-9. CSS position compatibility table

Browser/platform	Float	Float with clear	Absolute
Safari	Yes	Yes	Yes
Android browser	Yes	Yes	Yes
Symbian/S60	Yes	Yes	Yes
Nokia Series 40	Yes	No	Yes in 6 th edition Buggy before 6 th edition
webOS	Yes	Yes	Yes
BlackBerry	Yes	No before 4.0	No before 4.0
NetFront	No	No	No
Openwave (Myriad)	No	No	No
Internet Explorer	Yes	Yes	No
Motorola Internet Browser	No	No	No
Opera Mobile	Yes		
Opera Mini	Yes, if mobile mode off		

Scrolling and focus navigation can give us problems with absolute positions. The z-index can also give us problems on low- and mid-end devices.

According to the WAP CSS standard, the position and z-index properties are optional, so whether they are supported or not is up to each browser.

Rounded corners

Designers seem to love rounded corners (shown in [Figure 7-6](#)), and for years this was the nightmare of every web developer who needed to lay out a box with this feature. Table-based layouts for rounded corners are inappropriate for the mobile web, so we can only rely on CSS solutions. If a device doesn't render the style (see [Table 7-10](#) for a compatibility list), forget about rounded corners for that device.

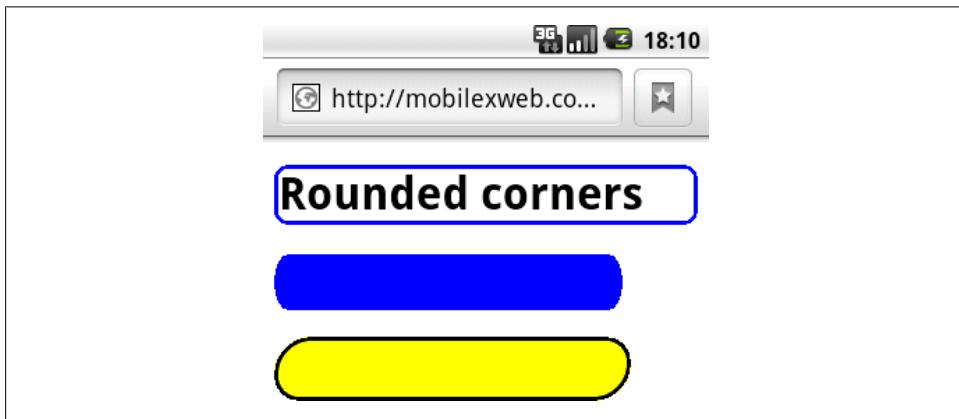


Figure 7-6. The rounded corners feature allows us to round any defined border or background color on compatible devices.

Table 7-10. Rounded corners compatibility table

Browser/platform	Rounded corners compatibility
Safari	Yes
Android browser	Yes
Symbian/S60	Partial
Nokia Series 40	No
webOS	Partial
BlackBerry	No
NetFront	No
Openwave (Myriad)	No
Internet Explorer	No
Motorola Internet Browser	No
Opera Mobile	No
Opera Mini	No

WebKit has an extension for rounded corners (`-webkit-border-radius`); Mozilla also has one (`-moz-border-radius`), but with very low compatibility in mobile devices.



Another solution is the use of `canvas` for drawing a rounded rectangle; more on this HTML 5 element in [Chapter 9](#).

The `-webkit-border-radius` attribute can be defined as one value (like `5px` or `10%`), two values (top-bottom and left-right), or four values giving the radius of each corner separately. These are samples of different styles:

```
.rounded {  
    -webkit-border-radius: 10px;  
}  
.rounded2 {  
    -webkit-border-radius: 10px 20px;  
}  
.rounded3 {  
    -webkit-border-radius: 3em 2em 3em 2em;  
}
```

Titles

A common approach for low- and mid-end devices is to rely on header tags and CSS to provide a simple solution for title design. The best approach is to define a 100% width, a background color (or image pattern), a top and bottom border, and the padding:

```
h1 {  
    width: 90%;  
    text-align: center;  
    background-color: red;  
    color: white;  
    border-top: 6px solid #500;  
    border-bottom: 6px solid #500;  
    padding: 8px 20px;  
    clear: both;  
    font-size: larger;  
}
```

In [Figure 7.7](#), we can see a very simple stylesheet applying some styles to titles without image usage.

Pseudoclasses

The pseudoclasses `link`, `active`, `focus`, and `visited` are compatible with all XHTML browsers and standards. The question is: when do the pseudoclasses work? Some situations are well known: for example, `link` is used for not-visited hyperlinks and `visited` is used if the links are in the previous browsing history.

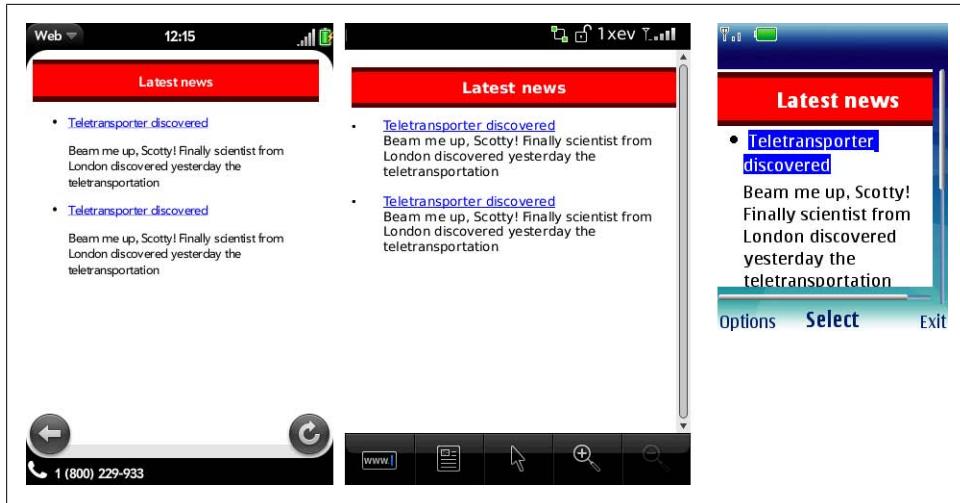
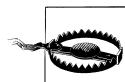


Figure 7-7. With simple CSS we can create nice designs without images (and network latency). We can do more for smartphones, though, as we'll see in later chapters.

What about the `focus` and `active` pseudoclasses, though? The behavior can vary in browsers with focus-based, cursor-based, and touch-based navigation.

The well-known `hover` pseudoclass is not available in the WAP CSS standard, but it is compatible with most non-touch devices, assuming a similar behavior to `focus`. In touch devices, there isn't a mouseover event; the screen doesn't detect the finger position until the user taps it (or clicks it).

Some mobile UIs for touch devices implement a two-tap pattern; if we tap once over an element, it will be like a hover effect, and if we tap again, it will be a click. This can be done with JavaScript and event handling.



Remember that even if a browser supports a given pseudoclass, it may not work in touch navigation mode.

[Table 7-11](#) shows the compatibility for pseudoclasses.

Table 7-11. CSS pseudoclasses compatibility table

Browser/platform	link	visited	focus	active	hover
Safari	Yes	Yes	Partial	Yes	No
Android browser	Yes	No	No	No	Yes (using keys)
Symbian/S60	Yes	No	No	No	Yes
Nokia Series 40	Yes	Yes	No	No	Yes from 6 th edition No before 6 th edition

Browser/platform	link	visited	focus	active	hover
webOS	Yes	No	No	No	No
BlackBerry	Yes	No	No	No	No
NetFront	No	No	No	Yes	No
Openwave (Myriad)	As visited	No	No	No	No
Internet Explorer	Yes	Yes	Yes	Yes	No
Motorola Internet Browser	Yes	Yes	No	Yes	No
Opera Mobile	Yes	Yes	No	No	Yes
Opera Mini	Yes	Yes	No	No	Yes

Backgrounds

Changing the background color was the first new feature in XHTML MP that every WML developer used. It was heaven after the old black and white WML. Every mobile browser understands the `background` property and its specific definitions, like `background-image` and `background-repeat`. However, we need to remember that on mobile devices, the context of the user can be very different from a desktop. It is not recommended to use a complex background, and it's best to use strongly contrasting foreground and background colors.

In compatible browsers, it will be very helpful to use data URI patterns for backgrounds to reduce network requests. One feature that can be buggy on mobile devices is the use of `background-attachment: fixed`. This allows the background image to be fixed even after scrolling.

Specifying multiple background images (separated by commas) is not good practice for mobile browsers. Symbian S60 browsers appear to be among the few that support it. Some WebKit-based browsers, like mobile Safari, also accept some CSS3 attributes as extensions, like `-webkit-background-origin` and `-webkit-background-size`. The upcoming [Table 7-12](#) lists background compatibility.

Overflow

A common design pattern in desktop websites is to use a `div` (or other element) with a fixed size, and content larger than that size. Using the `overflow` property, we can define a value of `scroll`, `auto`, `visible` (the default), or `hidden` to indicate what to do with the content that is outside the bounds of the element. If we use a value of `scroll`, the `div` will have its own scrollbar on supporting devices.

The use of `overflow` is discouraged, like the `iframe` technique. Even with compatible devices, there are usability problems; for one thing, it's not easy for the user to tell if she's moving the main scrollbar or the inner scrollbar. And if it works, there are a lot of bugs in mobile browsers, from touch devices with the scroll not working to devices

that hide the overflow content without providing scrollbars. Even less compatible are the CSS3 `overflow-x` and `overflow-y` properties. [Table 7-12](#) lists overflow compatibility.

Content

The `content` attribute allows us to use the `after` and `before` pseudoclasses to define an image, some text, or an attribute value to be inserted after or before the selector. The problem is that these pseudoclasses are not defined in the WAP CSS subset, so they will work in some devices but not in others.

Some browsers allow us to apply the `content` property to any selector, but this is not usually recommended because it will lead us to insert text and content in the CSS instead of the (x)HTML document.

The following sample will add two stars after the link's text and a bullet image before:

```
a:after {  
    content: " ** "  
}  
a:before {  
    content: url('bullet.gif');  
}
```

[Table 7-12](#) lists compatibility for the use of `content`.

Opacity

Alpha transparency of elements inside a mobile web page will not work in many low- and mid-end devices, so we should use it with care and knowing that it may not have a visible effect. The `opacity` CSS 2.1 property was not defined in the WAP CSS subset, but we can still use it and compatible browsers will render it. Compatibility with this and the other properties just discussed is illustrated in [Table 7-12](#).

Table 7-12. Common CSS display properties compatibility table

Browser/platform	Fixed background	overflow	content w/before & after	content in any selector	opacity
Safari	No	Yes, two fingers for scrolling	Yes	No	Yes
Android browser	No	No scrolling	Yes	No	Yes
Symbian/S60	Yes	Yes	Yes	No	No
Nokia Series 40	Yes	Yes but difficult from 6 th edition No before	Yes in 6 th edition No before 6 th edition		No
webOS	No	No scrolling	Yes	No	No
BlackBerry	No	No	No before 4.0	No	No
NetFront	Yes	No	No	No	No

Browser/platform	Fixed background	overflow	content w/before & after	content in any selector	opacity
Openwave (Myriad)	No	No	No	No	No
Internet Explorer	No	No	No	No	No
Motorola Internet Browser	No background image	No	No	No	No
Opera Mobile	No	Yes, difficult to scroll	Yes	Yes	Yes
Opera Mini	No	No	Yes	Yes	Partial

List design

The last chapter used a lot of ordered and unordered lists. Now is the time to use CSS to define our own design for each list. For doing this we have the typical list properties in CSS—`list-style-type`, `list-style-image`, and `list-style-position`—and the compressed `list-style`.

The compatibility for these styles in the mobile web is great, excepting some little differences in the bullets; for example, some devices show a square for a bullet, even if it's defined as a circle.

The use of images as bullets can enhance our designs. On compatible devices remember that we can use small data URI images, as we saw in the last chapter, eliminating the need for new requests for the image.

Visibility

The `visibility` property allows us to hide and show an element dynamically. This property is covered by all mobile standards and we are free to use it with the values `visible` and `hidden`. The `collapse` value can be more problematic.

Cursor management

CSS allows any web designer to define which mouse cursor should be used in any situation (generally, the `body` or a `:hover` selector). In the mobile world this is useful only for devices supporting cursor-based navigation, though, because they are the only browsers that show some kind of cursor over the screen.

The most useful cursors for mobile sites are `default`, `pointer`, and `progress`. The other cursors available (`resize` and `move`) can be very difficult to use in any mobile situation. We should use the `pointer` cursor for defining non-link clickable zones (using a `:hover` selector), which may be handled by a JavaScript event function.

The `progress` cursor is often applied to the body dynamically with JavaScript to indicate to the user that a current operation is working. In browsers supporting focus and touch navigation, we should generate this pattern using a modal pop-up window with a floating loading image.

Modal Pop-up Windows

A modal pop-up is a floating `div` that displays important information to the user, while disabling and/or fading out the background content.

In the mobile world these are recommended only for smartphones and should be used with extreme care. If we are displaying only simple text, it is better to use the standard `window.alert` JavaScript function, as it will render properly on all devices.

[Table 7-13](#) lists compatibility with the `progress` and `pointer` cursors for the various browsers.

Table 7-13. Cursor compatibility table

Browser/platform	pointer cursor	progress cursor
Safari	No cursor available, touch navigation	
Android browser	No cursor available, touch or focus navigation	
Symbian/S60	Yes (using keys)	No
Nokia Series 40	Yes in 6 th edition Before 6 th edition no cursor available, focus navigation	No
webOS	No cursor available, touch navigation	
BlackBerry	No	No
NetFront	No	No
Openwave (Myriad)	No cursor available in focus navigation mode	
Internet Explorer	No	No
Motorola Internet Browser	No	Yes
Opera Mobile	No	No
Opera Mini	No	No

CSS Sprites

CSS Sprites is a great modern web design technique for reducing the number of image server requests on a web page. There are a lot of online resources and books available on this technique. For now, suffice it to say that if you have many images in your site (preferred logos, icons, background images, flags, etc.), you can reduce all of those to one big image with all the originals inside and use a CSS mask to determine which portion of it to show in each container.

This technique has a great impact on web performance, but for mobile applications, we should think twice before using it and analyze the possible problems. First, we need full `background-position` CSS property compatibility (the mobile standards include this, so it's not really an issue). The second consideration is that we will not be using

`img` tags. In their place, we will use any block element (`div`) or any block-converted element using `display: block`, such as a `span` or `a` tag. This means that we cannot provide alternative text for the images, and the browser won't know how much space to allocate for each image until it renders the CSS file.

Finally, in some browsers this technique can have an impact on rendering performance, because the big image will be duplicated in memory for each usage. We need to balance the performance gained through the reduction of requests with the performance lost in the rendering engine in some browsers.

Samples and Compatibility

Let's create a sample using two techniques: using an original block element (`div`) and using an original inline element (`a`) converted to a block element.

The original document without CSS Sprites is the following country list:

```
<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN"
  "http://www.wapforum.org/DTD/xhtml-mobile10.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<title>Documento sin título</title>
<style type="text/css">

  ul {
    list-style: circle;
  }

  ul li {
    padding: 0px;
    margin-bottom: 5px;
  }

  ul li img {
    margin: 0px 10px 0px 0px;
    vertical-align: middle;
    border: 1px solid gray;
  }

</style>
</head>

<body>
<h1>The Best Seller</h1>
<h2>Select your nearest country</h2>
<ul>
  <li><img src='ar.png' width='30' height='19' alt='AR' />
    <a href='ar'>Argentina</a></li>
  <li><img src='br.png' width='30' height='19' alt='BR' />
    <a href='br'>Brazil</a></li>
  <li><img src='fi.png' width='30' height='19' alt='FI' />
    <a href='fi'>Finland</a></li>
```

```

<li><img src='jp.png' width='30' height='19' alt='JP' />
    <a href='jp'>Japan</a></li>
<li><img src='es.png' width='30' height='19' alt='ES' />
    <a href='es'>Spain</a></li>
<li><img src='us.png' width='30' height='19' alt='US' />
    <a href='us'>United States</a></li>
</ul>
</body>
</html>

```

The previous sample uses six images that can be converted into a single one (saving five requests and the HTTP and PNG headers) with the following code:

```

<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN"
    "http://www.wapforum.org/DTD/xhtml-mobile10.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<title>Documento sin título</title>
<style type="text/css">

    ul {
        list-style: circle;
    }

    ul li {
        padding: 0px;
        margin-bottom: 5px;
    }

    ul li div {
        /* We define the large image to all divs that represent an image*/
        background:url(sprite.png);
        width: 30px;
        height: 19px;
        float: left;
        border: 1px solid gray;
        margin-right: 10px;
    }

</style>
</head>

<body>
<h1>The Best Seller</h1>
<h2>Select your nearest country</h2>
<ul>
    <li><div style="background-position: 0px 0px;"></div>
        <a href='ar'>Argentina</a></li>
    <li><div style="background-position: 0px -29px;"></div>
        <a href='br'>Brazil</a></li>
    <li><div style="background-position: 0px -58px;"></div>
        <a href='fi'>Finland</a></li>
    <li><div style="background-position: 0px -87px;"></div>
        <a href='jp'>Japan</a></li>
    <li><div style="background-position: 0px -116px;"></div>

```

```

<a href='es'>Spain</a></li>
<li><div style="background-position: 0px -145px;"></div>
<a href='us'>United States</a></li>
</ul>
</body>
</html>

```

This produces the result shown in [Figure 7-8](#).

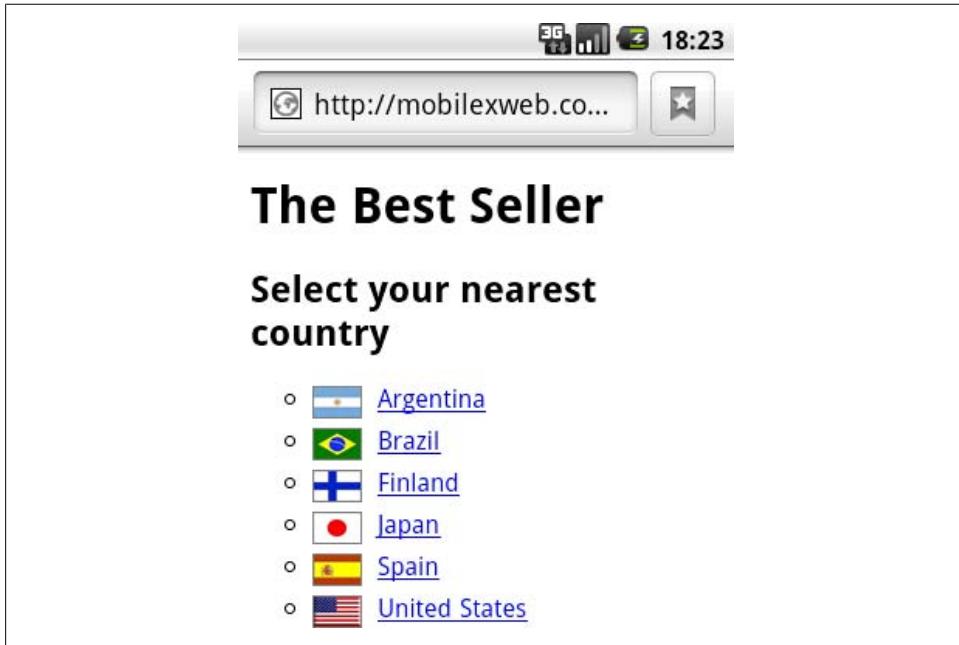


Figure 7-8. In compatible browsers, using CSS Sprites produces the same result using a single image as using six separate images for the flags.



There are plenty of online CSS Sprites generators where you can upload all your images and receive in seconds one big image and the CSS code to replace each of the original `img` tags. Examples include <http://spritegen.website-performance.org> and <http://csssprites.com>.

Now let's look at applying the same technique to a non-original block element, such as the `a` tag. The only problem will be the flag border: as we use the same `a` tag for the image and the text, we cannot define a border. The code looks like this:

```

<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN"
  "http://www.wapforum.org/DTD/xhtml-mobile10.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<title>Documento sin título</title>

```

```

<style type="text/css">
    ul {
        list-style: circle;
    }

    ul li {
        padding: 0px;
        margin-bottom: 5px;
    }

    ul li a {
        /* We define the large image to all divs that represent an image */
        background:url(sprite.png);
        /* We need to create block elements */
        display: block;
        /* We need the background to not be repeated */
        background-repeat: no-repeat;
        height: 19px;
        padding-left: 40px;
    }
}

</style>
</head>

<body>
<h1>The Best Seller</h1>
<h2>Select your nearest country</h2>
<ul>
    <li>
        <a href='ar' style='background-position: 0px 0px;'>Argentina</a></li>
    <li>
        <a href='br' style='background-position: 0px -29px;'>Brazil</a></li>
    <li>
        <a href='fi' style='background-position: 0px -58px;'>Finland</a></li>
    <li>
        <a href='jp' style='background-position: 0px -87px;'>Japan</a></li>
    <li>
        <a href='es' style='background-position: 0px -116px;'>Spain</a></li>
    <li>
        <a href='us' style='background-position: 0px -145px;'>United States</a></li>
    </ul>
</body>
</html>

```



Using CSS Sprites is not recommended for big files or photo images. If you are using PNG images, the best way to approach it is to group icons with a consistent color palette.

Table 7-14 lists CSS Sprites compatibility for the various platforms.

Table 7-14. CSS Sprites compatibility table

Browser/platform	Sprites over div	Sprites over anchors
Safari	Yes	Yes
Android browser	Yes	Yes
Symbian/S60	Yes	Yes
Nokia Series 40	Yes in 6 th edition No before 6 th edition	Yes, buggy on low-end devices
webOS	Yes	Yes
BlackBerry	Yes from 4.0	Yes from 4.0
NetFront	No	Yes
Openwave (Myriad)	No	No
Internet Explorer	No	Yes
Motorola Internet Browser	No	No
Opera Mobile	Yes	Yes
Opera Mini	Yes	Yes

CSS Sprites Alternatives

The idea behind optimizing the number of requests to the server is very interesting, even if you reject the usage of CSS Sprites. That is why we need to think about alternatives to this technique for some specific situations.

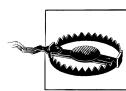


Image maps are the first technique that comes to mind as a CSS Sprites alternative. However, they are not recommended for non-touch navigation, because image maps in non-touch devices can have a negative impact on usability.

Inline images

As we discussed in the last chapter, inline images are a great technique for compatible browsers. When designing for browsers that understand them, we can copy the first sample (the original document without CSS Sprites) and replace the URL of each image with the `data:` representation.

Join images

If the images are near one another horizontally or vertically, as in our sample, we can consider joining all the images into one. The concept is similar to CSS Sprites, but we set up the image as a single-use background, adjusting the margins and padding so that the elements are properly aligned with the different parts of the image. This technique can have poor results on old devices with limited support for margins and padding.



If we use the original code but define a good cache policy on the server, subsequent pages of the site will load faster than if we used CSS Sprites, because no rendering work will be required. We will cover caching in [Chapter 10](#).

Box borders

If you were thinking of using CSS Sprites to define the borders of a rectangular area, there is a WebKit extension that can help you. In the following section, we will get deeper into this.

WebKit Extensions

The open source project WebKit added many extensions to CSS, and several of these are under discussion for addition to CSS3. In the mobile world we have many WebKit flavors (Safari, Android, webOS, Symbian, etc.), and the extensions compatibility isn't perfect across all of them.



Many of the WebKit extensions had counterparts for other desktop browsers, like Mozilla Firefox (using the `-moz-` prefix) or Opera (using the `-o-` prefix). In CSS3, many of these extensions are implemented without any prefix.

The following is a list of the most common WebKit extensions, in compressed form:

- `-webkit-border-radius` defines a rounded-corner box. Modern mobile browsers also understand it as `border-radius`.
- `-webkit-box-shadow` defines a shadow for a block element (similar to `text-shadow`).
- `-webkit-columns` specifies the width and count of columns.
- `-webkit-border-image` specifies an image to use as the border for a box
- `-webkit-text-stroke` defines a color to use for the stroke (outline) of the text.
- `-webkit-text-fill-color` defines a color to use for filling the text (inside the stroke).

We'll look at a few of them here in more detail.

Text Stroke and Fill

The stroke and fill properties are a handy way of creating fancy effects in titles (with big fonts) without the use of images. For example:

```
<h1 style="-webkit-text-stroke: blue; -webkit-text-fill-color: yellow">  
Great Title!  
</h1>
```

[Table 7-15](#) shows which browsers render these two extensions.

Table 7-15. Text stroke and fill compatibility table

Browser/platform	Text stroke and fill compatibility
Safari	Yes
Android browser	Yes
Symbian/S60	Only fill from 5 th edition No support before 5 th edition
Nokia Series 40	No
webOS	Only fill
BlackBerry	No
NetFront	No
Openwave (Myriad)	No
Internet Explorer	No
Motorola Internet Browser	No
Opera Mobile	No
Opera Mini	No

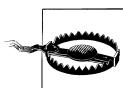
Border Image

The border image extension is an excellent solution to the problem of creating a dynamically sized rectangle with custom borders. Its implementation is very similar to CSS Sprites, and usage is simple. This technique is useful for buttons, titles, content zones, and every area where we want a custom border design without using tables.

The attribute to use is `-webkit-border-image`, and the most common syntax is:

```
-webkit-border-image: url top right bottom left x_repeat y_repeat;
```

The `url` is the image location (or inline image), and the four edge values (`top`, `right`, `bottom`, `left`) are distance values to be used from the image's sides. The center box defined by the space not used by these four values will be used for the center pattern. For example, if we define `5` as the top, the box to which we are applying this style will have as the top border the top `5px` of the border image.



The border image doesn't define the box's width and height or the border size; it is only used to define the contents of the border. If we need to change the dimensions of the box, we need to add `width` and `height` properties. We must also define the `border` property of the element, setting it to the desired size. The border image will be resized to the border size.

The `x_repeat` and `y_repeat` values are optional and can be defined as one of the following constants:

`repeat`

The portion of the image extracted using the `top` and `bottom` for `y_repeat` and using the `left` and `right` for `x_repeat` is repeated until it fills the available width/height of the box.

`round`

The image is repeated until it fills the available width/height of the box, but without any partial tile at the end; it is stretched so that it fits in the available space a whole number of times. This value has no effect in many mobile browsers.

`stretch`

The image is stretched to fill the entire width or height of the box without repetition.

The border image is cut in nine pieces, as we can see in the [Figure 7-9](#). Four are used as corners and the others are used as background images for sides and center.



If you are applying a border image to a button, it will not have any “pressed” effect. To create such an effect, you must change the `active` and/or `focus` pseudoclass, specifying another border image. Problems can occur when you try to change the way buttons are rendered dynamically, though, so for custom designs it is better to use links or remove the default button rendering with `-webkit-appearance: none`.

The simplest way to define the border image is with the four values equal, using:

```
-webkit-border-image: url distance;
```

This sample will produce the result shown in [Figure 7-10](#):

```
<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN"
  "http://www.wapforum.org/DTD/xhtml-mobile10.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=UTF-8" />
<title>Image Border</title>
<style type="text/css">
/* We should use input[type=button] too, but for testing purposes we will
not use CSS3 */
input.bordered {
  -webkit-border-radius: 10px;
  -webkit-border-image: url(border1.png) 6;
}
a.bordered {
  -webkit-border-image: url(border1.png) 6;
  color: white;
  text-decoration: none;
  padding: 3px;
}
```

```

}

h1 {
    -webkit-border-image: url(border2.png) 50 50 50 50 repeat stretch;
    border: 20px;
}

/* The h2 will use the same image border but half size */
h2 {
    -webkit-border-image: url(border2.png) 50 50 50 50 round round;
    border: 10px;
}

```

</style>

</head>

<body>

<h1>This is a title</h1>

<h2>This is a subtitle</h2>

<input type="button" class="bordered" value="Press Me" />

!-- Safari applies border image to inline elements too -->

This is a link

</body>

</html>

Another sample is the implementation of the classic back button in iPhone user interfaces, using only left, right, and center zones (splitting the image into three parts). This code produces the result shown in [Figure 7-11](#):

```

<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN"
    "http://www.wapforum.org/DTD/xhtml-mobile10.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=UTF-8" />
<title>Image Border</title>
<style type="text/css">
#back {
    -webkit-border-image: url(border1.png) 0 5 0 15;
}

</style>
</head>

<body>
    <a href="/" id="back">Home Page</a>
</body>
</html>

```

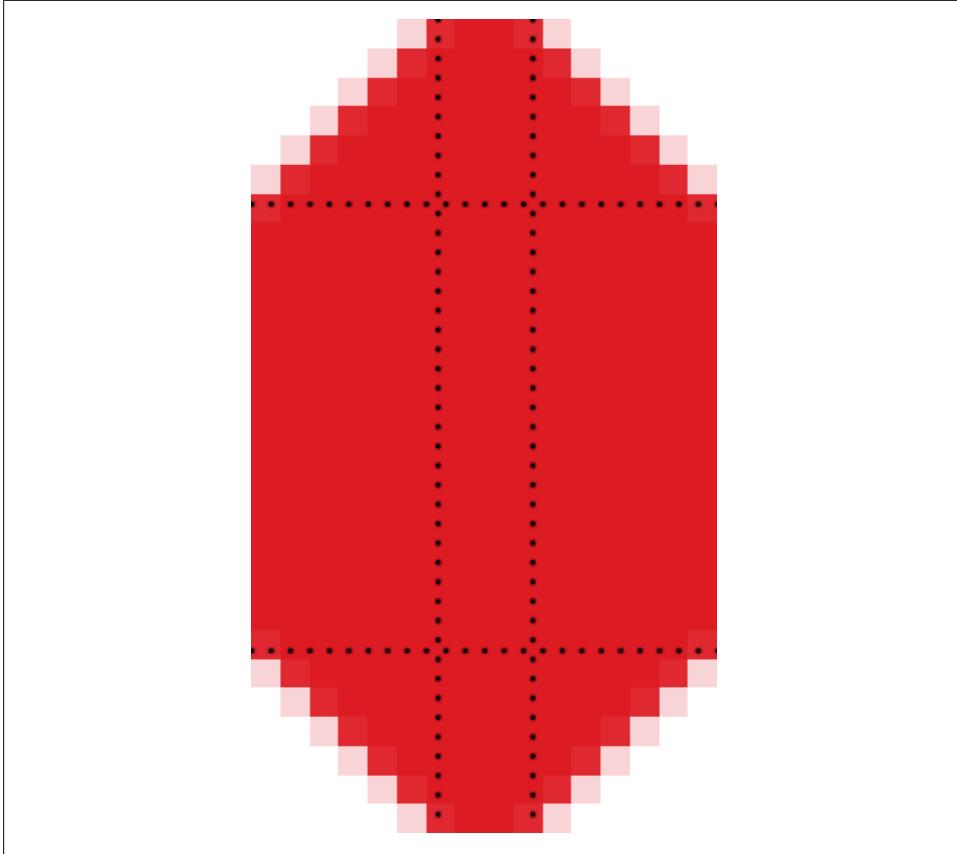


Figure 7-9. The image is cut into nine pieces and each one is used as either a corner or a part of the background.

As Table 7-16 shows, this extension works on about half of the major mobile web platforms.

Table 7-16. Border image compatibility table

Browser/platform	Block elements	Inline elements
Safari	Yes	Yes
Android browser	Yes (differences with content background)	Yes
Symbian/S60	Partial in 5 th edition No before 5 th edition	Yes
Nokia Series 40	Bad in 6 th edition No before 6 th edition	Buggy in 6 th edition
webOS	Yes	Yes

Browser/platform	Block elements	Inline elements
BlackBerry	No	No
NetFront	No	No
Openwave (Myriad)	No	No
Internet Explorer	No	No
Motorola Internet Browser	No	No
Opera Mobile	No	No
Opera Mini	No	No

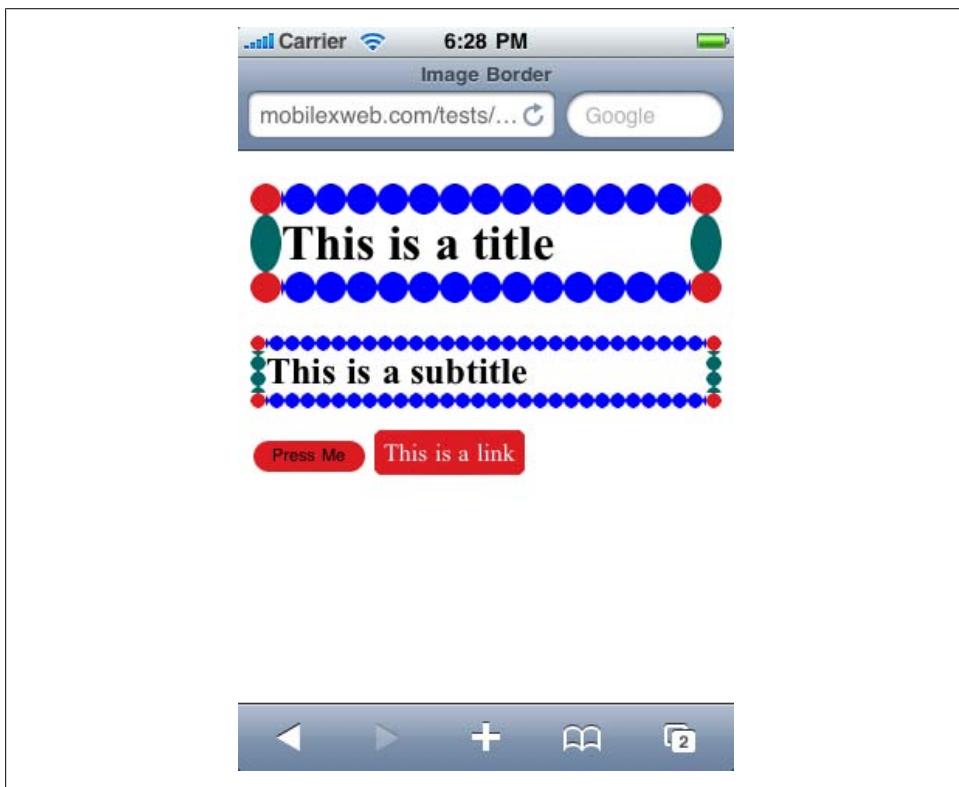


Figure 7-10. Using only two images, we can create these kinds of borders and backgrounds.



Some of the WebKit extensions will also work in Firefox Mobile and in the MeeGo/Maemo browser, because both use Mozilla's Gecko engine. For these browsers, we should replace the prefix `-webkit` with `-moz`.

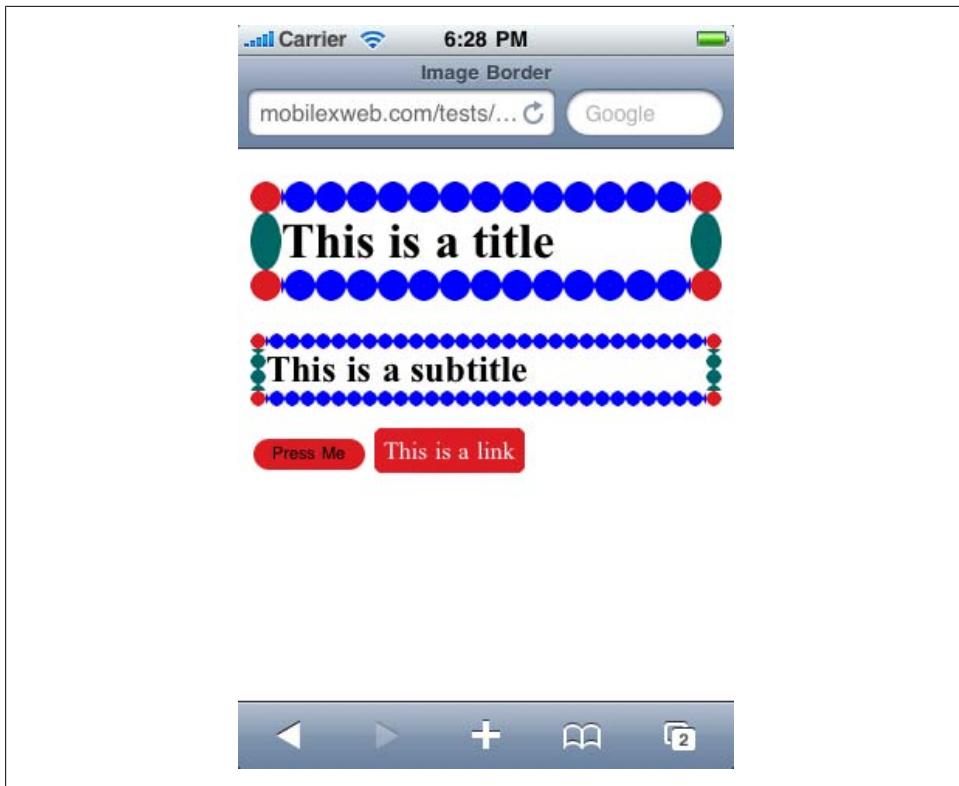


Figure 7-11. This kind of button can be designed very easily, with dynamic width using border image.

Safari-Only Extensions

Safari on iOS has added a lot of extensions to the CSS standards, and even to WebKit (which is the engine behind it). These extensions work only in Safari for iPhone, iPad, and iPod Touch (some of them also work in Safari for desktop, but we're only concerned with mobile browsers here). The Android and webOS browsers also understand some of these extensions, depending on which WebKit version they are based on.

The CSS extensions can be grouped into categories as follows:

- Transitions
- Animations
- 2D and 3D transforms
- Miscellaneous (listed in [Table 7-17](#))

The CSS extensions for iPhone are quite spectacular. They allow you to create Flash-like experiences and 3D transformations using only CSS. This is great, though also

sometimes painful because it all needs to be coded in CSS, a language not built for this kind of interaction. We will cover most of these advanced iPhone extensions in Chapters 9 and 12, as well as some open source JavaScript libraries that will help in our work.

Table 7-17. Common CSS extensions for Safari on iOS

Property	Values	Description
-webkit-text-security	circle, disc, none, square	Defines the character to display in password fields for each character the user enters.
-webkit-text-size-adjust	auto, none, percentage value	Defines the font size adjustment for easy reading.
-webkit-appearance	Partial list: none, button, button-bevel, checkbox, default-button, list-box, list-item, media-fullscreen-button, media-mute-button, media-play-button, radio, searchfield, searchfield-cancel-button, slider-horizontal, slider-vertical, square-button, textarea, textfield	Changes the appearance of elements to render as native controls of the OS. Available since iOS 2.0. A value of none will allow us to define a custom design using CSS.
-webkit-user-select	auto / none / text	From iOS 3.0, defines whether or not the user can select the text for copy/paste purposes.
-webkit-touch-callout	none, inherit	Removes the callout (hint window) that appears when the user keeps his finger over a link for a few seconds.
-webkit-tap-highlight-color	Color value	Defines a color to be used as the background when the user taps a link or a clickable element.

JavaScript Mobile

Designing for the Web is about more than content and presentation—users expect websites to be interactive, responding to their choices. Fortunately, although it has some limitations, the JavaScript you use in developing for the mobile web is similar to that used in desktop web development.

We have already talked a bit about the WAP 1.1 standard scripting language, *WMLScript*. We won't go any deeper into this obsolete language, but it will not be difficult to learn if you need to do a little scripting with it. The WAP 2.0 standard that brought us XHTML MP and WAP CSS didn't define any scripting support. This was bad for the first few years, because we could create scripts in WAP 1.0 documents but not in WAP 2.0 ones.

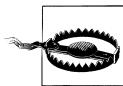
Thankfully, a couple of years after this standard was released, mobile browsers started to add some support for JavaScript (or ECMAScript, to be totally correct). The standards for mobile scripting are more difficult to define than the standards for CSS. The great benefit is that, excepting some bugs, JavaScript can check at runtime whether some feature, object, or API is available, so we can code for different “standards.”



The standard name for JavaScript is ECMAScript, because it is defined by the ECMA (an international, private nonprofit standards organization). There are three well-known dialects on the market: JavaScript (trademark of Sun, licensed now to the Mozilla Foundation), ActionScript (trademark of Adobe), and JScript (trademark of Microsoft). At the base, they are the same language, and everyone adds new behavior.

The only mobile-specific standard is called *ECMAScript Mobile Profile* (ESMP). It was defined by the Open Mobile Alliance (OMA), like XHTML MP and WAP CSS. In my 10 years in the mobile web world, I have never heard a developer or a company talking about ESMP. It is a subset of the ECMAScript language and is really just JavaScript with some features left out and some other features added in (imported from WMLScript).

The XHTML MP 1.2 OMA standard recommends using ESMP, but we will just use standard JavaScript code, as clean as possible.



VBScript is a similar language (created by Microsoft, based on Visual Basic), but it is compatible only with Internet Explorer for desktop. VBScript is not compatible with Pocket IE (now known as Mobile Internet Explorer).

There are many versions of JavaScript available (at the time of this writing, from 1.0 to 1.8). The most stable version for all browsers (from low-end devices to smartphones) is 1.3, and this is the version we should care most about. For mid-end devices and smartphones, 1.5 is the most stable. Newer versions only work in the latest editions of Firefox and Safari (including Safari on iOS), and the additions aren't worth the incompatibility. JavaScript developers often aren't aware of different languages' versions, so we will talk about feature compatibility instead of comparing version numbers.



Java and JavaScript only have in common the first four letters of their names.

OK, they both also have C syntax, both are object-oriented, and there are some other similarities. However, they are really different languages. Still, it's incredible how many developers I hear talking about them as if they were the same language.

Supported Technologies

We are going to test JavaScript compatibility in the following pages, but making JavaScript work requires more than just support for the language. There are many technologies (or APIs) that are bundled with JavaScript, but they are optional and will not work on all devices.

Document Object Model

DOM is a set of conventions for manipulating, browsing, and editing XML and HTML documents using a set of API conventions that may be implemented in many languages. In fact, although many developers think that DOM is a JavaScript thing, this is wrong. There are DOM APIs for PHP, .NET, Java, and many other languages.

Even if you've never heard about DOM, odds are good that you've used it. If you've used the well-known `document.getElementById` function, for example, you were using DOM.

Today, DOM is a W3C specification. The most compatible versions for web use are the DOM Level 2 Core specification (DOM2CORE) and the subspecification DOM Level 2 HTML (DOM2HTML) for HTML and XHTML documents.

With DOM, we can browse the XHTML document structure and make changes and additions dynamically from JavaScript without refreshing the page.

A mobile browser can be JavaScript-compatible but without DOM functionality. There are also some browsers that allow us to browse the document tree but not to modify it on the fly.

Ajax

Ajax, originally an acronym of *Asynchronous JavaScript and XML*, is a technique that involves making asynchronous server requests without refreshing the page, interrupting the user's activity, changing the browser's history, or losing global state variables.



Why did I say “originally an acronym”? Today the term Ajax is used in a more general way to define interactive Web 2.0 applications that use asynchronous requests to the server, but may or may not be written in XML. I even hear a lot about Ajax in dynamic websites using the jQuery UI, ExtJS, or other rich control libraries that don’t actually make background requests to the server.

The magic behind Ajax is called `XMLHttpRequest`; it is a native JavaScript object available in compatible devices that was based on an ActiveX object created by Microsoft in Internet Explorer 5.0.

JSON

JavaScript Object Notation (best known as JSON) is a lightweight data interchange format known to be compatible with almost every language in common use. It is sometimes used in JavaScript as a replacement for other transport formats, like XML.

JSON can be used in Ajax requests. We will talk about differences in the mobile browsers’ implementations in a while.

HTML 5 APIs

With the upcoming HTML 5 standard, JavaScript will support some new APIs for client scripting and document work. Mobile browsers are already adopting some of these new APIs, even though the standard is still in discussion.

Some of the APIs we are going to discuss in this chapter are those for:

- Offline applications
- Client storage
- Canvas drawing
- Workers

- Geolocation (available as another W3C standard)

Platform Extensions

There are other extensions available for web applications on some devices, and many other JavaScript APIs are supported in installed applications (also called mobile widgets, to be covered in [Chapter 12](#)). These JavaScript APIs can include support for:

- Messaging
- Address book management
- Geolocation
- Gallery
- Camera
- Calendar
- Device status information
- Native menus

Coding JavaScript for Mobile Browsers

First of all, let's see what is happening with basic JavaScript compatibility (variables, functions and basic alert functionality) with mobile browsers. [Table 8-1](#) illustrates the current levels of support on the different platforms.

Table 8-1. JavaScript support compatibility table

Browser/platform	JavaScript support
Safari	Yes
Android browser	Yes
Symbian/S60	Yes
Nokia Series 40	Yes
webOS	Yes
BlackBerry	Yes from 3.8 Can be disabled by the user or the company; in that case, noscript is executed
NetFront	Yes
Openwave (Myriad)	Not available in Openwave; yes in Myriad Browser V7
Internet Explorer	Yes
Motorola Internet Browser	Yes
Opera Mobile	Yes
Opera Mini	Yes, but everything after the onload script will be executed on the server, generating a postback



As Openwave does not support JavaScript and Myriad 7 is not commonly found on mobile devices today (making testing difficult), Openwave/Myriad will be left out of the following JavaScript-related tables.

We need to pay special attention to proxied browsers, like Opera Mini. Remember that these browsers render our websites on their servers and send compressed and compiled content to the clients. The clients aren't really browsers capable of rendering an XHTML file or JavaScript code.



For old non-JavaScript mobile browsers or for browsers with JavaScript disabled, we can use the `noscript` tag. Only those browsers will display its content.

When we talk about mobile JavaScript, we are talking about the same code you already know: a `script` tag including some code or a `script` tag with an external source. Many browsers accept the old way of defining the script language (`language="javascript"`), and many of them also accept not defining the language at all (using `script` alone):

```
<script type="text/javascript">  
// Code goes here  
</script>  
  
<script src="mysource.js" type="text/javascript">
```



ECMAScript Mobile Profile defines two new types for the `script` tag, `application/ecmascript` and `text/ecmascript`, as the preferred types to use for ESMP-compatible code. Beyond that, `text/javascript` is the recommendation for XHTML MP documents and is the most compatible type to use for non-MP browsers. My recommendation is to carry on using the well-known `text/javascript`.

Code Execution

You can execute JavaScript code in four different ways:

- From a `script` tag
- From an event handler
- From a link using the `javascript:` URL protocol
- From a bookmarklet using the `javascript:` URL protocol

Bookmarklets

A *bookmarklet* is a bookmark in the browser containing some JavaScript code using a `javascript:` protocol URL. When the user activates the bookmark, the JavaScript code is executed over the current document. This allows us to execute a wide range of testing, debugging, and other features over any web page.

There are bookmarklets on the Web that are large applications, encoded in a single line of JavaScript. One of my favorites for desktop usage is Readability (<http://lab.arc90.com/experiments/readability>).

The main problem with bookmarklets in mobile devices is how to add them. In the desktop web, the main way is to drag a link with the JavaScript code to the bookmarks area. This cannot be done in a mobile device, though, so bookmarklets are only useful if you can manage or synchronize them from a desktop (e.g., via iTunes for iPhone).

There are a lot of bookmarklets for iPhone on the Web, including some that will show the source code of the page inside the mobile browser. These are only really useful for testing or debugging purposes, though, or for “only geek” features.

Table 8-2 shows which of these work with which browsers.

Table 8-2. Script execution compatibility table

Browser/platform	Script	Event handler	URL
Safari	Yes	Yes	Yes
Android browser	Yes	Yes	Yes
Symbian/S60	Yes	Yes	Yes
Nokia Series 40	Yes	No before 6 th edition	Yes
webOS	Yes	Yes	Yes
BlackBerry	Yes	No before 4.6	Yes
NetFront	Yes	Yes	Yes
Internet Explorer	Yes	Partial	Yes
Motorola Internet Browser	Yes	No	Yes
Opera Mobile	Yes	Yes	Yes
Opera Mini	Yes	No	No



If a device is not compatible with JavaScript (different from a device that is compatible but has JavaScript disabled), it will show the JavaScript code to the user as text. We can avoid this problem by inserting an HTML comment just after the `script` tag:

```
<script type="text/javascript">
<!--
// JavaScript code here
```

```
-->  
</script>
```

JavaScript Mobile Compatibility

As you move into JavaScript on the mobile web, you'll want to test compatibility and use some old-fashioned features.

Feature detection

The simplest way to detect if a feature, API, function, or object is available to use is to ask if it exists using a simple `if` statement:

```
if (object) {  
    // Object available  
}
```

For example:

```
if (document.getElementById) {  
    // DOM function available  
}
```



Even on JavaScript-compatible devices, a script might not work because of the user's (or company's) profile. For example, BlackBerry devices have the option to disallow JavaScript from the browser or from the company policies. You should always present a non-JavaScript version of your site's functionality.

Standard dialogs

JavaScript supports a list of standard dialogs that are undervalued in modern desktop websites, often being replaced by Dynamic HTML or UI libraries. They make great standard dialogs for use in mobile websites, though, as shown in [Figure 8-1](#).

The list of available dialogs is:

- `alert`, for showing a message
- `confirm`, for receiving a Boolean response from the user
- `prompt`, for receiving a string from the user
- `print`, for sending the web page to the printer
- `find`, for invoking the find feature of the browser

The `find` dialog isn't really part of the standard, but it works in almost every non-IE desktop web browser on the market. This dialog receives three optional parameters: the text to find, a case-sensitive Boolean, and a backwards Boolean. In general, it should be avoided in mobile browsers. Most of them don't have a search feature.

The `print` dialog isn't mobile compatible, for obvious reasons, but the `alert`, `confirm`, and `prompt` dialogs are compatible with almost every JavaScript-enabled mobile



Figure 8-1. Using standard JavaScript dialogs you will get free rich and multiplatform interfaces, using UI controls from the operating system.

phone (as [Table 8-3](#) shows). I encourage you to use them when needed. Using a standard dialog will always be quicker, simpler, nicer, and more compatible than using any other solution for the same task.

Table 8-3. Standard dialog support compatibility table

Browser/platform	alert, confirm, prompt
Safari	Yes
Android browser	Yes
Symbian/S60	Yes
Nokia Series 40	Yes
webOS	Yes
BlackBerry	Yes
NetFront	Yes
Internet Explorer	Yes
Motorola Internet Browser	Yes
Opera Mobile	Yes
Opera Mini	Yes, rendered on the server

Common problems with the `alert` dialog (and the others) are the usage of the carriage return for multiline text, and how to display text that's too big to fit in the available space. For the first problem, it is common in desktop JavaScript to use the `\n` (newline) escape special character. (There are other special escape characters, too, like `\t` for tabulation.) Let's see what happens with both problems in mobile browsers. [Table 8-4](#) reports on their support for newlines and large amounts of text in dialogs, and [Figure 8-2](#) shows the use of a scrolling area that supports long text.

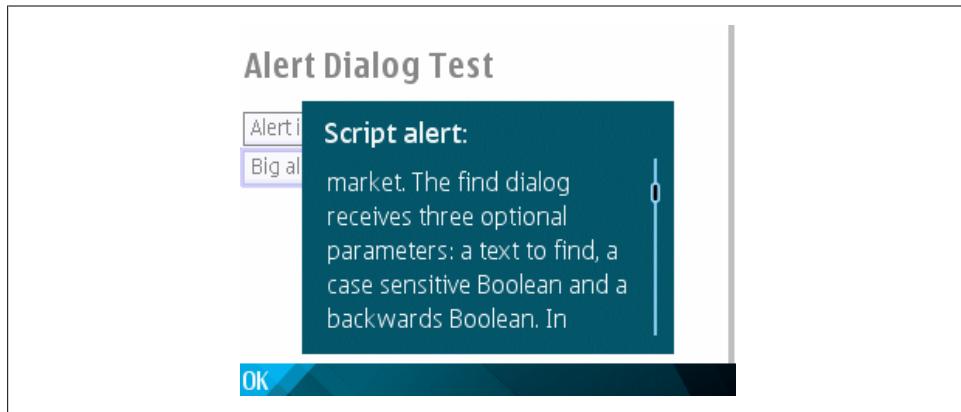


Figure 8-2. On some browsers, big alerts have scrollbars (or can be scrolled with a finger, on touch devices).

Table 8-4. Multiple lines and scrolling text in alerts compatibility table

Browser/platform	\n in alerts	Scrolling support for long text
Safari	Yes	Yes, change alert appearance with scroll support
Android browser	Yes	Scroll
Symbian/S60	Yes	Scroll
Nokia Series 40	Yes	Scroll
webOS	No, shows one line	No, text overflow screen without scroll
BlackBerry	Yes	Scroll
NetFront	Yes	Autoscroll
Internet Explorer	Yes	Scroll
Motorola Internet Browser	Yes	Scroll
Opera Mobile	Yes	Scroll
Opera Mini	Yes	Scroll



For usability reasons, if a device has a numeric keyboard it is best to use a normal text input with numeric capabilities, rather than a selection list. Remember that a numeric keyboard is useful for numeric entries.

Writing to the document

The `document.write` function allows us to dynamically write HTML code to a document while it is rendering. This was a very common technique in the '90s, but there are a lot of reasons for not using it in modern websites. Today, the preferred technique is to manipulate the document using DOM after the `onload` event.



If your script doesn't use `document.write`, you should use the script attribute `defer="defer"`. This will tell compatible browsers that they shouldn't wait for the script to download and/or execute to continue rendering the document.

That said, in the mobile space sometimes it is better not to deal with DOM (especially in low-end devices), so performing `document.write` operations can avoid a lot of problems. As [Table 8-5](#) shows, this technique still works on a lot of browsers.

Table 8-5. `document.write` compatibility table

Browser/platform	<code>document.write</code> support
Safari	Yes
Android browser	Yes
Symbian/S60	Yes
Nokia Series 40	Before 6 th edition, no after onload support
webOS	Yes
BlackBerry	Before 4.6, no after onload support
NetFront	Yes
Internet Explorer	Yes
Motorola Internet Browser	Yes, no after onload support
Opera Mobile	Yes
Opera Mini	Server rendering

For example, you can create a year selection list dynamically to save bytes in the original document. For rendering performance purposes, it is better to use `document.write` with all the HTML at the same time (including the beginning, contents, and end of a tag) rather than partially writing a tag with many lines. The following code demonstrates this technique:

```

<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN"
  "http://www.wapforum.org/DTD/xhtml-mobile10.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>

<meta http-equiv="Content-Type" content="text/html; charset=UTF-8" />
<title>Document Write</title>
<script type="text/javascript">
function createNumericSelect(name, from, to) {
    var html = "<select name='" + name + "'>";
    for (var i=from; i<to; i++) {
        html += "<option>" + i + "</option>";
    }
    html += "</select>";
    document.write(html);
}
</script>

</head>

<body>
<form action="send">
    <script type="text/javascript">
        createNumericSelect('year', 1990, 2020);
    </script>
</form>
</body>
</html>

```

Remember that `document.write` should not be used in an event handler, like `onload` or `onclick`, because it will have unpleasant results. If you need to dynamically generate content on the page, it is better to use DOM than `document.write`.

Platform detection

JavaScript has a native `navigator` object representing the client browser on which the code is running. We are going to take a look at server-side detection in the following chapter, but for now, we can use this technique to detect what device our code is running on and make a decision based upon that.



When using a `for`, remember to define the index variable as a local file with `var i=initial_value`. If not, you'll be using a global variable, which can have some performance and bug issues.

The `navigator` object has many properties, but the most useful are `appName` (the browser's name), `appVersion` (the browser's version), `mimeType`s (an array of supported MIME types), `plugin` (an array of supported plug-ins for `object` tag), `platform` (the operating system), and `userLanguage`.

Generally, we will use the string's `indexOf` function to verify whether some of these attributes have the values we are looking for. For example:

```
// Detects if it is an Android device
var android = (navigator.platform.indexOf("android")>=0);
if (android) {
    // Do something
}
```

Table 8-6 shows what is returned from these properties for each browser. In this table, assume that `<User Agent>` will be replaced with each device's user agent ID.

Table 8-6. JavaScript `navigator` object properties compatibility table

Browser/Platform	appName	appVersion	mimeTypes	platform
Safari	Netscape	5.0 (<code><User Agent></code>)	Array	iPhone, iPod, or iPad
Android browser	Netscape	5.0 (<code><User Agent></code>)	Array	null
Symbian/S60	Netscape	5.0 (<code><User Agent></code>)	Array	S60
Nokia Series 40 before 6 th edition	Nokia	Empty string	Undefined	Undefined
Nokia Series 40 6 th edition	Netscape	2.0	Undefined	Nokia_Series_40
webOS	Netscape	5.0 (<code><User Agent></code>)	Array	webOS
BlackBerry	Netscape	<code><Platform version></code>	Array	BlackBerry
NetFront	ACCESS Net Front	<code><Browser version></code>	Array	Unknown
Internet Explorer	Microsoft IE Mobile	Empty string	Undefined	WinCE
Motorola Internet Browser	Netscape	5.0	Array	WiderWeb
Opera Mobile	Opera	<code><opera engine version></code> (Symbian or Windows)	Array	Symbian or Windows
Opera Mini	Opera	<code><opera engine version></code>	Array	Pike

Window size

JavaScript has two objects related to sizes: `document.documentElement` and `screen`. The first is related to the size of the current document's viewport, and the second to the whole screen of the device. At the time of writing, there is no browser that allows windows smaller than the whole screen. We can create web widgets for the home screen on many devices, but this is another situation and it will be covered in [Chapter 12](#).



BlackBerry devices have a global variable, `blackberry`, that has two objects: `location` and `network`. `location` will be reviewed in [Chapter 11](#); the `network` property allows us to know whether the user is using WiFi, GPRS, EDGE, CDMA, or some other network. Android Browser, from 2.2, also has a similar property: `navigator.connection.type`.

The `screen` object has four properties: `width`, `height`, `availWidth`, and `availHeight`. The last two refer to the size available taking into account the space used by the operating system toolbars. In the mobile space, they are generally the same as the `width` and `height` values.

The most commonly used way to get the window size is via `document.documentElement.clientWidth` and `document.documentElement.clientHeight`.

The only way for these values to change while the page is loaded is in response to an orientation change, on compatible devices (landscape to portrait and vice versa). [Table 8-7](#) shows which browsers can access information about the screen and window size and which support orientation changes.

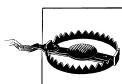
Table 8-7. Screen properties and events compatibility table

Browser/platform	Screen size	Window size	Orientation change
Safari	Yes	Yes	<code>onorientationchange</code> and <code>onresize</code>
Android browser	Yes	Yes	<code>onresize</code>
Symbian/S60	Yes, different in full-screen mode	Yes	<code>onresize</code>
Nokia Series 40	No before 6 th edition	No before 6 th edition	No
webOS	Yes	Viewport size	<code>onresize</code>
BlackBerry	No before 4.6	No	<code>document.onresize</code> in some devices
NetFront	Yes	No	No
Internet Explorer	Yes	No	No
Motorola Internet Browser	Yes	Yes	No
Opera Mobile	Yes	Yes	No
Opera Mini	Yes	Yes	No

History and URL management

JavaScript has a few standard mechanisms for browser history management: the `location` and `history` objects. The `location` object has several properties regarding the address, like `href` for the whole URL and `hash` for the anchor part of the URL, if present (the `#` and everything to the right of it). Changing the `location.href` property will redirect the browser to another page, on compatible devices. It has two useful methods:

`reload()`, which refreshes the same page, and `replace(url)`, which sends the user to another page without creating a new history entry.



Remember to use JavaScript as little as possible to reduce battery consumption (one of the main problems today in the mobile environment).

The `history` object has a few not-very-useful properties and three methods: `back()`, `go(number)`, and `forward()`. The `back` method is the most commonly used, for emulating a back button:

```
<!-- As a button -->
<input type="button" onclick="history.back()" value="Back" />
<!-- As a link -->
<a href="javascript:history.back()">Back</a>
```

Remember that we are designing for mobile browsers, and sometimes the users will be browsing in full-screen mode without any browser buttons in sight. A link or button for going back will be more useful here than in desktop websites.

Table 8-8 shows what happens when we try to manage the history and location using JavaScript in mobile devices.

Table 8-8. Redirection compatibility table

Browser/platform	href, replace, reload, and history.back support
Safari	Yes
Android browser	Yes
Symbian/S60	Yes
Nokia Series 40	Yes
webOS	Yes
BlackBerry	Yes
NetFront	Yes
Internet Explorer	Yes
Motorola Internet Browser	Yes
Opera Mobile	Yes
Opera Mini	Yes, reload causes a new history entry

Manipulating windows

One of the most popular (and annoying) features of JavaScript is the usage of `window.open` for opening the classic pop-up windows. For mobile browsers, the usage of this technique is not ideal, for many reasons. Many browsers can't open multiple windows (although [Figure 8-3](#) shows one that can in action), and we cannot define any attributes for the pop-ups; they will just be full-sized, like the main window.

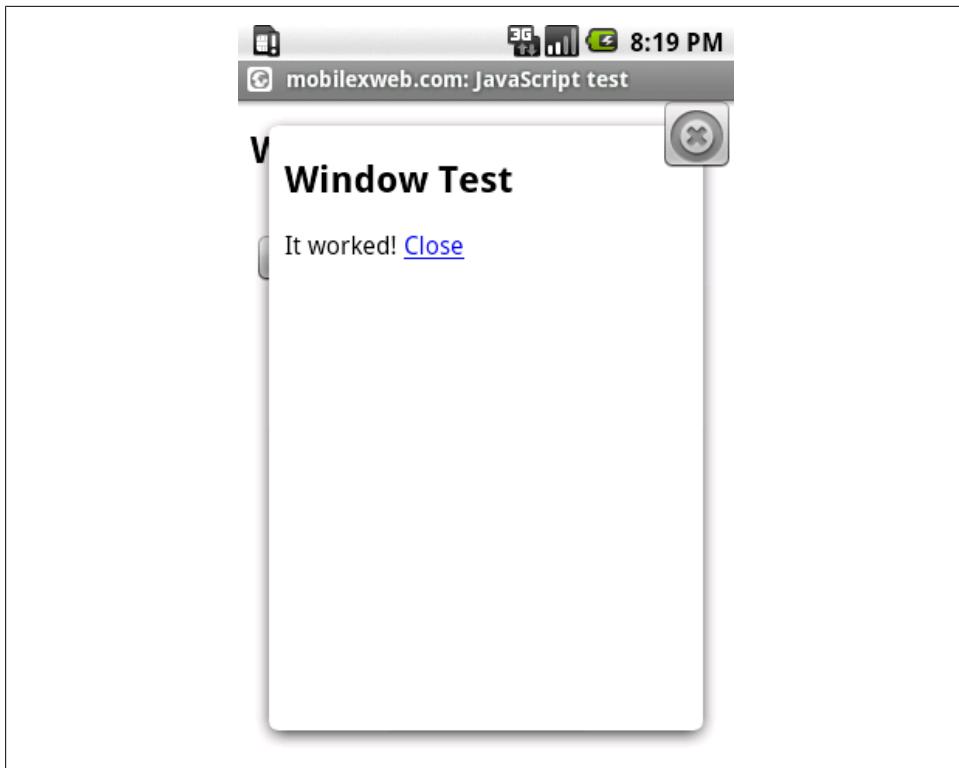


Figure 8-3. The Android browser is one of the few capable of opening pop-ups with a subwindow design.

Communication between the opener and the pop-up also often does not work well. Finally, closing pop-ups can be problematic on browsers that treat the new window as a normal page and not a pop-up, because `window.close` only works on pop-ups.

So, if you can, avoid using pop-ups. If you really need one for some reason, open the window after an `onclick` event (avoid opening windows in the `onload` event or inside a timer callback) and remember that some mid- and low-end devices will not show your window.



A better alternative is to use a link with `target="_blank"`. This will have the same result in mobile devices as a `window.open` call, and it will work on every browser. If the browser doesn't support multiple windows, it will just replace the current one.

Table 8-9 reports on how the different browsers handle `window.open`.

Table 8-9. `window.open` compatibility table

Browser/platform	<code>window.open</code> behavior
Safari	Same as <code>_blank</code> . <code>window.close</code> works, but the user will be redirected to the windows list after, not back to the original window.
Android browser	Yes, pop-up behavior and design. Your defined size will not be used.
Symbian/S60	Open in new window.
Nokia Series 40	Open in same window.
webOS	Open a new card. <code>window.close</code> does not work.
BlackBerry	Open in same window. Before 4.6, the user is asked if he wants to open it.
NetFront	Open in same window. <code>window.close</code> does not work.
Internet Explorer	Open in same window. <code>window.close</code> does not work.
Motorola Internet Browser	Open in same window.
Opera Mobile	Open in same window.
Opera Mini	Open in same window.

Focus and scroll management

You can set the focus to a clickable element (e.g., a form input, link, or button) using the `focus` function of every DOM element. The most helpful usage is for form input controls. The behavior varies on different mobile browsers. On some touch devices, focusing in a text box should automatically open the onscreen keyboard, and in some cursor-based browsers it will position the cursor over the element.



If the document the user is browsing is form-based, like a search page or a contact us page, it will be better for usability to automatically focus on the first text input. This reduces the amount of navigation the user has to do on the page.

On some devices, the global `window` object has a `scrollTo` function that takes two parameters, `xPosition` and `yPosition`, specifying the position at the top-left corner of the screen to scroll to. On some devices (like the iPhone), using `scrollTo` emulates the user's scrolling and hides the browser's toolbars, as if the user were scrolling with her fingers. So, for iPhone browsers, it is common to use the following code, which automatically hides the toolbars after the `onload` event:

```
window.scrollTo(0, 1);
```

This function can also be used to generate links to the top of the page, on compatible devices:

```
<a href="javascript:window.scrollTo(0, 1);">Go to Top</a>
```

This same behavior can also be applied without JavaScript, using anchors.

Table 8-10 lists the different browsers' compatibility with the `focus` and `scrollTo` functions.

Table 8-10. Focus and scrolling compatibility table

Browser/platform	focus	scrollTo
Safari	Yes	Yes
Android browser	Yes	Yes
Symbian/S60	Yes	Yes
Nokia Series 40	No	No
webOS	No	No
BlackBerry	No	No
NetFront	No	Yes
Internet Explorer	No	Yes
Motorola Internet Browser	No	No
Opera Mobile	Yes	No
Opera Mini	No	No

Timers

JavaScript offers two kinds of timers: `setTimeout` and `setInterval`. The first one is executed once and the second one is executed every n milliseconds until it is cancelled using `clearInterval`.

You can use timers for updating information from the server using Ajax every n seconds, for creating an animation, or for controlling the timeout of an operation.



In mobile browsers, you need to be especially careful about using timers because of the battery consumption. If you need to use many high-frequency timers at the same time, try to manage them using only one timer that will launch different behaviors from the same process.

The first question we need to ask ourselves is, what happens when our web page goes to the background because the user switches focus to another application (in multi-tasking operating systems) or opens or browses to another tab or window? Another problem is what happens when the phone goes to sleep (because of the user's inactivity while the script is executing). The behavior of timers can be a little tricky in these situations.

Yet another problem is that timers execute on the same thread as the main script. If our script is taking too much processor time (a normal situation with large scripts on low- and mid-end devices), our timers will be delayed until some spare execution time is found.

If we use a low frequency for the timer (for example, 10 milliseconds), the timer will generally have problems meeting the timetable.

Remember that the JavaScript execution time depends a lot on the device hardware and the browser's engine. Even if they're running the same operating system, like Android, execution times can differ: for example, an HTC G1 will be much slower than a Nexus One with a 1-Ghz processor.

Let's look at a simple example and see what happens normally and when we send the web page to the background:

```
<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN"
    "http://www.wapforum.org/DTD/xhtml-mobile10.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=UTF-8" />
<title>Using Timers</title>
</head>

<body>

<script type="text/javascript">
var timer = setInterval(timerHit, 200);
var q = 0;
var lastTime = new Date().getTime();

function timerHit() {
    q++;
    var deltaTime = new Date().getTime() - lastTime;
    document.getElementById("content").innerHTML += q + ": " +
        deltaTime + "<br />";
    lastTime = new Date().getTime();

    // Generate some random delay
    var randomNumber = Math.floor(Math.random()*1000)+5000;
    for (var i=0; i<randomNumber; i++) {
        var a = new Array();
    }

    // We will run only 15 experiments
    if (q==15) {
        clearInterval(timer);
    }
}
</script>

<div id="content">
</div>

</body>
</html>
```

As shown in [Figure 8-4](#), the real times are very different on different devices. On low- and mid-end devices, if they work at all, the result is far from our 200 ms intention—some low-end devices don't even accept timers with a frequency of less than 1 second.

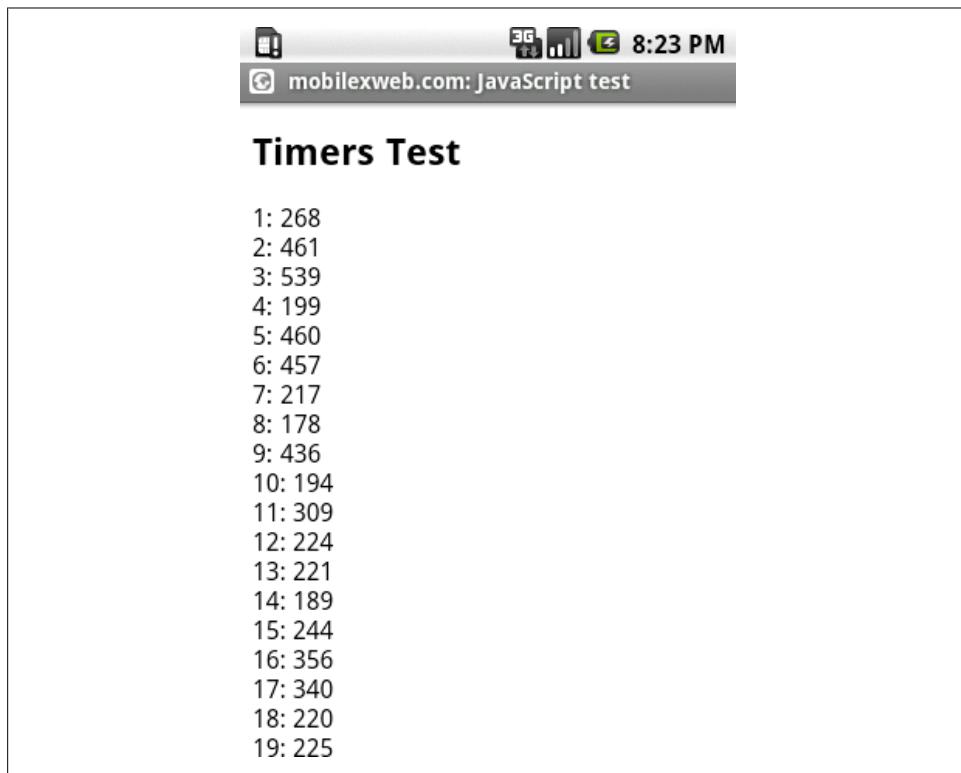


Figure 8-4. Timers will not always have the frequency we want.

[Table 8-11](#) shows which browsers support timers, and how they handle the timers when the page is in the background.

Table 8-11. Timers support compatibility table

Browser/platform	Timers available	Timers in background
Safari	Yes	Stopped. From iOS 4.0: continue working while in other browser's window.
Android browser	Yes	Stopped.
Symbian/S60	Yes	Stopped. From 2.2: continue working while in other browser's window.
Nokia Series 40	No	
webOS	Yes	Continue working.
BlackBerry	No	
NetFront	Yes	No multitasking.

Browser/platform	Timers available	Timers in background
Internet Explorer	Yes	Stopped.
Motorola Internet Browser	No	
Opera Mobile	Yes	Continue working.
Opera Mini	No	



The Gmail for Mobile team discovered some issues with timer behavior on mobile Safari and Android devices, and made the results public in the team blog at <http://www.mobilexweb.com/go/timers>. The conclusions are: for low-frequency timers (1 second or more), there are no performance issues, and you can add as many as you want; for high-frequency timers (for example, 100 ms), though, every new timer created makes the UI more sluggish. The preferred solution is to use only one high-frequency timer.

Waking up

As we discussed in the previous section, on most devices timers (and all JavaScript execution) are paused when the web page is sent to the background. I have an iPod Touch, and in Safari I always have my email open in one of the eight possible tabs (or windows). When I want to browse to another website, I change to another tab but leave that one open. That means my email can be frozen for several hours or even days, until I go back to that tab. As developers, this raises an important issue: when our web pages are put into the background, how can we detect when they should “wake up” again?

Neil Thomas, a software engineer from Google working in the Gmail for Mobile team, has published a very simple and clever solution using a high-frequency timer and a global variable for calculating the time elapsed between calls to that timer. Because the time will not fire when the application is in the background, if we detect that the delta time from the last execution is greater than a certain threshold value we can assume that the timer firing again indicates that the application has just woken up from hibernation.



Remember to use a large value for the threshold after deciding that the page has gone to sleep. Otherwise, depending on the tasks being done, the engine behind the browser, and the device hardware, it may take longer for the JavaScript code that’s executing to complete than the time defined for the timer.

This is Thomas’s public code (with a little variation from me). An explanation can be found at <http://www.mobilexweb.com/go/timers>:

```
// The time, in ms, that must be "missed" before we
// assume the app has been put to sleep.
```

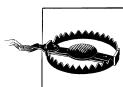
```

var THRESHOLD = 10000;

var lastTick_;
var detectWakeFromSleep_ = function() {
    var now = new Date().getTime();
    var delta = now - this.lastTick_;
    if (delta > THRESHOLD) {
        // The app probably just woke up after being asleep.
        notifyWakeFromSleep(delta/1000);
    }
    lastTick_ = now;
};

```

In the `notifyWakeFromSleep` method, you can decide what to do based on the received parameter telling you how many seconds have passed since the last active state. You may want to do different things if the delta time is 10 seconds or 1 day (86,400 seconds). For example, after a big delta you might want to show a warning or a loading animation while new results are fetched using Ajax.



There is one situation where we won't have the opportunity to wake up. If the device is running out of memory and our page is in the background, it is possible that the browser will delete the page state to release memory, and when the user comes back to it our page will be loaded by URL as a new session.

Remember that after waking from sleep, the document and the script are in the same state (including their HTML content and JavaScript variables) as they were before going to sleep. iOS before 4.0 doesn't support multitasking, but Safari stores the state of every window even when it is closed.

Changing the title

In desktop web applications, it is common to change the title dynamically to alert the users of a change in the page, when updates are made in an Ajax application, or simply as an animation (please, don't do this!).

In mobile browsers, this isn't such a good idea, for the following reasons:

- Many browsers don't even display the title.
- If the user is working with many tabs at the same time, dynamically changing the title won't be useful because your web page will be frozen when it is in the background.
- Animations in the title can be annoying in a mobile browser.

Regular expressions

Regular expressions are a great way to validate input and perform other tasks. They are included in the JavaScript 1.5 standard, but some low- and mid-end devices may not

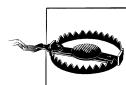
include regular expression algorithms. Still, [Table 8-12](#) shows that this is a very compatible feature across browsers.

Table 8-12. Regular expression compatibility table

Browser/platform	Regexp available
Safari	Yes
Android browser	Yes
Symbian/S60	Yes
Nokia Series 40	Yes
webOS	Yes
BlackBerry	Yes
NetFront	Yes
Internet Explorer	Yes
Motorola Internet Browser	Yes
Opera Mobile	Yes
Opera Mini	Yes

Cookie management

Cookies are a great solution for the problem of statelessness in HTTP. As you'll see in [Table 8-13](#), they work on practically all modern devices. This is good. The bad thing is that the lifetime of a cookie can be shorter in the mobile ecosystem than in the desktop world, especially in low- and mid-end devices, because of the lack of memory storage.



It is recommended to maintain cookies' values at below 2 KB for the best compatibility in mobile devices.

Cookies are normally stored and read by the server, but JavaScript also allows us to read and write them as a client-side storage mechanism. As [Table 8-13](#) shows, all the major platforms support cookie management from script code.

Table 8-13. Client-side cookies compatibility table

Browser/platform	Cookie management
Safari	Yes
Android browser	Yes
Symbian/S60	Yes
Nokia Series 40	Yes
webOS	Yes
BlackBerry	Yes

Browser/platform	Cookie management
NetFront	Yes
Internet Explorer	Yes
Motorola Internet Browser	Yes
Opera Mobile	Yes
Opera Mini	Yes

DOM

The Document Object Model is an increasingly common part of mobile development.

Versions

Two main DOM versions are available for mobile browsers:

- DOM Level 1 HTML
- DOM Level 2 HTML & Core

DOM Level 1 has been deprecated as a standard, but it still works in desktop and some mobile browsers. I remember using it in the '90s, before it was replaced by DOM Level 2.

DOM Level 1 allows a series of array collections as objects in the document for accessing all the elements in the document. The collections are:

- `images`
- `applets`
- `links`
- `forms`
- `anchors`

It also defines the `document.getElementById` and `document.getElementsByName` methods. In DOM Level 1, it is common to access a form's input values using the syntax `document.forms[0].input_name.value`, supposing a unique form.

DOM Level 2 added some new methods, and it is the most commonly used version today for mobile browsers. DOM Level 3 added events, validation, and XPath support, but it's not compatible with most mobile browsers.

Browsing

[Table 8-14](#) shows compatibility for DOM browsing methods in the different mobile browsers.

Table 8-14. DOM support compatibility table

Browser/platform	DOM HTML collecs.	getElementById	getElementsByName	childNodes
Safari	Yes	Yes	Yes	Yes
Android browser	Yes	Yes	Yes	Yes
Symbian/S60	Yes	Yes	Yes	Yes
Nokia Series 40 before 6 th edition	No	Yes	No	No
Nokia Series 40 after 6 th edition	No	Yes	Yes	Yes
webOS	Yes	Yes	Yes	Yes
BlackBerry	No	Yes	No before 4.6	Yes
NetFront	No	Yes	Yes	Yes
Internet Explorer	Partial	Yes	Yes	Yes
Motorola Internet Browser	No	Yes	No	Yes
Opera Mobile	Yes	Yes	Yes	Yes
Opera Mini	Yes	Yes	Yes	Yes

Query selectors

Query selectors are a way to use CSS selectors to retrieve an element result list from the DOM. This mechanism is very popular when using the jQuery JavaScript library, and it is included natively as an extension in some WebKit-based browsers and Firefox 3.5 for desktop. At the time of this writing query selectors are covered in a W3C draft known as Selectors API Level 1.

A query is made using `document.querySelector(selector)` for unique results, or `document.querySelectorAll(selector)` for many possible return values. For example:

```
var items = document.querySelectorAll("ul.menu > li");
var option = document.querySelector('#form1 input[type="radio"]:checked');
```

Many browsers have moved ahead to support query selectors, as shown in [Table 8-15](#).

Table 8-15. CSS-style query selector compatibility table

Browser/platform	Query selector support
Safari	Yes
Android browser	Yes
Symbian/S60	No
Nokia Series 40	No
webOS	Yes
BlackBerry	No
NetFront	No
Internet Explorer	No

Browser/platform	Query selector support
Motorola Internet Browser	No
Opera Mobile	Yes
Opera Mini	Yes

Changing properties

DOM for HTML defines an object representing each HTML tag with properties for each HTML attribute. Many browsers support this, as you'll see in [Table 8-16](#). For example, we can create an image gallery album by changing the `src` property of an `img` tag every 2 seconds. When you change a property that defines a change in a resource, the browser needs to get the new resource at that time. The following code demonstrates:

```
<body>

<script type="text/javascript">
var timer = setInterval(changeImage, 2000);
var currentImage = 0;

function changeImage() {
    // We have 5 images, from 0 to 4
    currentImage = (currentImage + 1) % 5;
    document.getElementById("album").src = currentImage + ".png";
}
</script>



</body>
```



If the mobile browser supports CSS Sprites, we can make the same album by changing the `style.backgroundPosition` property to move the window to a different part of the image.

[Table 8-16](#) shows which browsers support changing properties dynamically.

Table 8-16. Changing properties dynamically compatibility table

Browser/platform	Support for changing properties
Safari	Yes
Android browser	Yes
Symbian/S60	Yes
Nokia Series 40	No before 6 th edition
webOS	Yes
BlackBerry	No before 4.6

Browser/platform	Support for changing properties
NetFront	Yes
Internet Explorer	Partial
Motorola Internet Browser	Yes
Opera Mobile	Yes
Opera Mini	Yes (on the server)

Changing content

The most common usage of Dynamic HTML is to change the content of an element using the `innerHTML` property (or the simpler `innerText`). For example, you may want to use it to replace content in or add content to an element. [Table 8-17](#) shows which browsers currently support this property.

Table 8-17. innerHTML property compatibility table

Browser/platform	Support for innerHTML
Safari	Yes
Android browser	Yes
Symbian/S60	Yes
Nokia Series 40	No before 6 th edition
webOS	Yes
BlackBerry	No before 4.6
NetFront	Yes
Internet Explorer	Yes
Motorola Internet Browser	Yes
Opera Mobile	Yes
Opera Mini	Yes (on the server)

Prelading images

It is common in Dynamic HTML documents to preload images in memory if we are going to use them later in the same document (e.g., in the previous image gallery). This is typically done using code like the following:

```
var image = new Image(100,25);
image.src = "image_url";
```

Then, when we use the same `src` in another image, the resource should already be present in the cache. [Table 8-18](#) shows which devices support preloading.

Table 8-18. Preloading images compatibility table

Browser/platform	Support for preloading images
Safari	Yes
Android browser	Yes
Symbian/S60	Yes
Nokia Series 40	No before 6 th edition
webOS	Yes
BlackBerry	No before 4.6
NetFront	Yes
Internet Explorer	Yes
Motorola Internet Browser	No
Opera Mobile	Yes
Opera Mini	Yes

Adding and removing elements

The alternative to using `innerHTML` to insert elements inside another element is to use DOM methods to add objects as children. The next script will remove all of a list item's children and replace them with a link:

```
var items = document.getElementsById("li");
for (int i=0; i<items.length; i++) {
    for (int j=0; j<items[i].childNodes; j++) {
        items[i].removeChild(items[i].childNodes[j]);
    }
    var a = document.createElement("a");
    a.href = "go.html";
    a.innerHTML = "Item " + i;
    items[i].appendChild(a);
}
```

Table 8-19 shows how this works in mobile browsers.

Table 8-19. Adding and removing elements in DOM compatibility table

Browser/platform	Support for <code>appendChild</code> and <code>removeChild</code>
Safari	Yes
Android browser	Yes
Symbian/S60	Yes
Nokia Series 40	No before 6 th edition
webOS	Yes
BlackBerry	No before 4.6
NetFront	Yes
Internet Explorer	Yes

Browser/platform	Support for appendChild and removeChild
Motorola Internet Browser	No
Opera Mobile	Yes
Opera Mini	Yes



For the best mobile performance, use `innerHTML` instead of using DOM methods for adding, moving, and removing elements.

Scripting Styles

Changing content with JavaScript is useful, but sometimes it's easier to use styles from JavaScript to make things appear and disappear and change their appearance.

Changing styles

With DOM support, we can read and dynamically change every inner CSS style using `style` and its subproperties, like `backgroundColor`, `textAlign`, and `margin`. We can also change CSS styles using the `className` property of every element. [Table 8-20](#) explores which browsers support changing the class, removing the class, and applying multiple classes using a space (e.g., `class1 class2`).

Table 8-20. Changing CSS dynamically compatibility table

Browser/platform	Support for changing styles and classes dynamically
Safari	Yes
Android browser	Yes
Symbian/S60	Yes
Nokia Series 40	No before 6 th edition
webOS	Yes
BlackBerry	No before 4.6
NetFront	Yes
Internet Explorer	Yes
Motorola Internet Browser	Partial
Opera Mobile	Yes
Opera Mini	Yes

Showing and hiding styles

[Table 8-21](#) shows which browsers support showing and hiding block content using `element.style.display='none'` or `element.style.display='block'`. We can also use

`style.visibility`, but in this case the block will still occupy the box without showing its contents.

Table 8-21. Showing and hiding elements compatibility table

Browser/platform	Support for showing/hiding content
Safari	Yes
Android browser	Yes
Symbian/S60	Yes
Nokia Series 40	No before 6 th edition
webOS	Yes
BlackBerry	No before 4.6
NetFront	Yes
Internet Explorer	Yes
Motorola Internet Browser	No
Opera Mobile	Yes
Opera Mini	Yes

Event Handling

One of the most frequently used features of JavaScript is event handling, whether we define it inside the HTML document or by using code. Let's see how mobile browsers work with this way to execute script code.

Managing events

We can define event handling in scripts using the following methods, browser support for which is listed in [Table 8-22](#):

- Using HTML attributes, like `onclick="alert('sample')"`
- Using the JavaScript object property, `element.onclick = function() {}`
- Using the DOM `addEventListener` method



Microsoft uses the `attachEvent` property of the element instead of the DOM `addEventListener` method in Internet Explorer.

Table 8-22. Event registration compatibility table

Browser/platform	HTML attribute	Object property	addEventListener
Safari	Yes	Yes	Yes
Android browser	Yes	Yes	Yes
Symbian/S60	Yes	Yes	Yes
Nokia Series 40	Yes	No before 4.6	No before 4.6
webOS	Yes	Yes	Yes
BlackBerry	Yes	No before 4.6	No
NetFront	Yes	Yes	No
Internet Explorer	Yes	No	No
Motorola Internet Browser	Yes	No	No
Opera Mobile	Yes	Yes	Yes
Opera Mini	Yes, with server postback		

Load and unload events

The famous `onload` event is available for any HTML element, but it is best used in the `body` element. We'll test compatibility over different types of elements.

The `onunload` event is less famous. In theory it should work for every element, but again the most useful usage is applied to the `body` element (`document` object) to detect when the user is navigating away from our document.

In modern browsers, the `onunload` event does not work as we might want (I remember many battles against the `onunload` event when a new pop-up was opened every time I closed one), and it has been replaced by the nonstandard `onbeforeunload`. The `onbeforeunload` event is useful for alerting the user about unfinished work so she doesn't lose any changes she's made on the page before going back or browsing to another URL. To do this, it is generally used with a confirm dialog.

[Table 8-23](#) reports on the compatibility of all of these events across browsers.

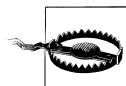
Table 8-23. Load events compatibility table

Browser/platform	body (load)	body (unload)	body (beforeunload)	img (load)
Safari	Yes	Yes	No	Yes
Android browser	Yes	Yes	Yes	Yes
Symbian/S60	Yes	Yes	No	Yes
Nokia Series 40	Yes	No	No	No before 6 th edition
webOS	Yes	Yes	Yes	Yes
BlackBerry	Yes	No	No	Yes

Browser/platform	body (load)	body (unload)	body (beforeunload)	img (load)
NetFront	Yes	Yes	No	Yes
Internet Explorer	Yes	Yes	No	Yes
Motorola Internet Browser	No	No	No	No
Opera Mobile	Yes	No	No	Yes
Opera Mini	Yes	No	No	No

Click events

The `onclick` event is the most-used event on the Web. In mobile sites, we have to test it to see where it can best be used. We know that there are focus-based, touch-based, and cursor-based browsers. The last ones are the simplest for click events: every time the user moves the cursor arrow and then presses FIRE or any other similar key, an `onclick` event is generated. In focus-based browsers, it is recommended to use the `onclick` event only in clickable elements, such as links or buttons, because the focus will not be active on other elements (such as `div`, `p`, or `li` elements).



The input type button should be used with care when developing for low-end devices. Some Series 40 devices require a `form` tag for every input to be rendered, and some Motorola devices use these buttons as submit buttons, so pressing them causes the form to be submitted.

For touch devices, the behavior is simple, too: every touch (finger- or stylus-based) is transferred as a click over the screen. [Table 8-24](#) reports on how different devices support these events.

Table 8-24. Click event compatibility table

Browser/platform	a	img	div	li
Safari	Yes	Yes	Yes	Yes
Android browser	Yes	Yes	Yes	Yes
Symbian/S60	Yes on touch and cursor browsing			
Nokia Series 40	No before 6 th edition			
webOS	Yes	Yes	Yes	Yes
BlackBerry	Yes	No	No before 4.6	No
NetFront	Yes	Yes	Yes	Yes
Internet Explorer	No	No	No	Yes
Motorola Internet Browser	Yes, they are all converted to buttons			
Opera Mobile	Yes	Yes	Yes	Yes
Opera Mini	Yes	Yes	Yes	Yes



If the user is using a finger to touch the screen, you need to be aware that the click coordinates can change during the touch (depending on how the user presses the screen), and the precision will not be good. Use big areas as clickable ones.

Double tap. On touch devices, if you want to detect a double-tap gesture, you shouldn't use the nonstandard `ondblclick` event; in most cases it will not work and it will also fire an `onclick`. The best solution (also compatible with non-touch devices) is to implement a tap–double tap detection pattern using the following code sample:

```
var doubletapDeltaTime_ = 700;
var doubletap1Function_ = null;
var doubletap2Function_ = null;
var doubletapTimer = null;

function tap(singleTapFunc, doubleTapFunc) {
    if (doubletapTimer==null) {
        // First tap, we wait X ms to the second tap
        doubletapTimer_ = setTimeout(doubletapTimeout_, doubletapDeltaTime_);
        doubletap1Function_ = singleTapFunc;
        doubletap2Function_ = doubleTapFunc;
    } else {
        // Second tap
        clearTimeout(doubletapTimer);
        doubletapTimer_ = null;
        doubletap2Function_();
    }
}

function doubletapTimeout() {
    // Wait for second tap timeout
    doubletap1Function_();
    doubleTapTimer_ = null;
}
```

We can use the previous library like this:

```

```

supposing `tapOnce` and `tapTwice` are two previously declared global functions.



In general, in a nonclickable element no events will be generated, while in clickable elements events are fired in the order `onmouseover`, `onmousedown`, `onmouseup`, `onclick`.

Alternatively, we can use it from JavaScript as follows:

```
element.onclick = function() {
    tap(
        function() {
            // This is the code for the first tap
        },
    );
```

```
        function() {
            // This is the code for the second tap
        }
    );
}
```



Remember that implementing touch and hold (or long press) handling can cause problems in some touch browsers because the browser is already capturing this event for contextual menus. You can only apply it in text blocks with `user-selectable` disabled.

Touch and multitouch events. Safari as of iOS 2.0 has multitouch support. The user can touch the screen with up to five fingers at the same time (11 fingers on the iPad) and the JavaScript code will receive the event for this. For multitouch detection, we should not use the standard `onclick` event. Instead, we should replace it with the following nonstandard events:

- `ontouchstart`
- `ontouchmove`
- `ontouchend`
- `ontouchcancel`



The Android browser also supports these touch events, but the multi-touch support depends on the hardware and software implementation.

When we capture these events, we will receive them both for single touches and multitouches. Every time the user presses a finger on the screen, `ontouchstart` will be executed; if she moves one or more fingers, `ontouchmove` will be the event to capture; and when the user removes her fingers, `ontouchend` will be fired. What about `ontouchcancel`? A touch cancel event is executed if any external event with more priority than our website (e.g., an alert window, an incoming call, or a push notification) cancels the operation.



If you are creating a game, a drawing application, or some other solution capturing touches, it is very important to remember the `ontouchcancel` event and to pause or stop the touch behavior when this event fires.

The four multitouch events receive the same event object (`TouchEvent`) as a parameter. It contains a `touches` array representing the coordinates of each touch on the page; each array element is an object with `pageX` and `pageY` properties. If the device is not multi-touch-enabled, you will receive an array of only one element.

A typical scenario, then, will be:

```
<div  
  ontouchstart="touchStart(event);"  
  ontouchmove="touchMove(event);"  
  ontouchend="touchEnd(event);"  
  ontouchcancel="touchCancel(event);">  
</div>
```



A touch sequence begins with the first finger and ends with the last finger. The touch events will be delivered to the same object that received the `ontouchstart`, no matter where the current touches are located.

The first thing we may want to do in all events is to cancel the default behavior of Safari for the gesture the user is doing. This can be done with the `TouchEvent` parameter:

```
event.preventDefault();
```

The `TouchEvent` object supports the array collections shown in [Table 8-25](#).

Table 8-25. TouchEvent collections

TouchEvent attribute	Description
<code>touches</code>	All the touches actually on the screen
<code>targetTouches</code>	Only the touches inside the target element of the event
<code>changedTouches</code>	Only the touches that changed since the last event call (useful in <code>ontouchmove</code> and <code>ontouchend</code> or to filter only new or removed touches)

When the user lifts a finger from the screen, that touch will be available in `changedTouches` but not in the other collections. In Android, the removed touch is also available in the `touches` collection.

Every `Touch` object has the properties outlined in [Table 8-26](#).

Table 8-26. Properties of the Touch object

Touch attribute	Description
<code>clientX, clientY</code>	Touch coordinates relative to the viewport
<code>screenX, screenY</code>	Touch coordinates relative to the screen
<code>pageX, pageY</code>	Touch coordinates relative to the whole page, including the scroll position
<code>identifier</code>	A number for identifying the touch between event calls
<code>target</code>	The original HTML element where the event was originated

The following sample will show a blue 20px circle below each finger touching the screen:

```

<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN"
  "http://www.wapforum.org/DTD/xhtml-mobile10.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=UTF-8" />
<title>iPhone Multitouch</title>
<meta name="viewport" content="width=device-width; initial-scale=1.0;
  maximum-scale=1.0; user-scalable=0;">
<style type="text/css">
  .point {
    width: 20px;
    height: 20px;
    position: absolute;
    -webkit-border-radius: 10px;
    background-color: blue;
  }
</style>
<script type="text/javascript">
function touch(event) {
  event.preventDefault();
  for (var i=0; i<event.touches.length; i++) {
    var top = event.touches[i].pageY-10;
    var left = event.touches[i].pageX-10;
    var html = "<div class='point' style='left: " + left +
      "px ; top: " + top + "px'></div>";
    document.getElementById("container").innerHTML += html;
  }
}

function clean() {
  document.getElementById("container").innerHTML = "";
}

</script>
</head>
<body>
<div ontouchstart="touch(event)" ontouchend="clean()" id="container"
  style="background-color:red; width: 300px; height: 300px">
</div>
</body>
</html>

```

Focusable and form events

Table 8-27 shows support for the `onfocus`, `onblur`, `onchange`, and `onsubmit` (only for forms) events on different mobile browsers.

Table 8-27. Form events compatibility table

Browser/platform	onfocus	onblur	onchange	onsubmit
Safari	Yes	Yes	Yes	Yes
Android browser	Yes	Yes	Yes	Yes
Symbian/S60	Yes	Yes	Yes	Yes
Nokia Series 40	Yes	No	No	Yes
webOS	Yes	Yes	Yes	Yes
BlackBerry	Yes	Yes	Yes	Yes
NetFront	Yes	Yes	Yes	Yes
Internet Explorer	Yes	No	Yes	Yes
Motorola Internet Browser	No	No	No	No
Opera Mobile	Yes	Yes	Yes	Yes
Opera Mini	No	Yes	No	Yes

Over events

The over events include `mouseover` and `mouseout` and are typically used for creating a hover effect when the cursor is over an element. Usage of these events in mobile websites is discouraged for must-have features, because they will only work on cursor-based browsers. Touch and focus devices don't have an "over" state; it should be replaced by an active state or a focus one for focus-based browsers.



Safari on iOS also supports the `onmousewheel` event when the user is scrolling the element using two fingers at the same time.

Resizing, scrolling, and orientation change events

When the user activates scrolling over the document, some browsers fire the `onscroll` event from the document as a whole. Others also support the `onresize` event, which fires when the window size is changed. Users cannot resize mobile browser windows in the way they can resize desktop application windows, but a resize can be generated if the orientation of the device changes from portrait to landscape or vice versa.



Using percentage values for widths is a good mobile design practice. It automatically works on all devices and allows your application to re-adapt automatically to any orientation. Unfortunately, some devices (like the Nokia N70) have some bugs with percentage values so the block still wraps around content, creating an awful horizontal scroll.

As of iOS 2.0, Safari also offers the `onorientationchange` window event and an `orientation` property. This property has a value of `0` in portrait mode, `90` in landscape mode, and `-90` in inverse landscape mode. We can use this to make changes in the DOM or use the body class pattern mentioned in [Chapter 12](#) to change the whole layout:

```
if (window.onorientationchange) {  
    window.onorientationchange = function() {  
        var orientation = window.orientation;  
        switch(orientation) {  
            case 0: // Portrait  
                break;  
            case 90: // Landscape to the left  
                break;  
            case -90: // Landscape to the right  
                break;  
        }  
    }  
}
```



Nokia N97 home screen widgets are just web documents that fire the `onresize` event when going from full screen to home screen mode and vice versa.

If the device isn't an iPhone and supports `onresize`, we can detect the change using the following code:

```
if (window.onresize) {  
    if (screen.width>screen.height) {  
        // Landscape  
    } else {  
        // Portrait  
    }  
}
```

[Table 8-28](#) lists the browsers' compatibility with the `onscroll` and `onresize` events.

Table 8-28. Scroll and resize events compatibility table

Browser/platform	onscroll	onresize
Safari	Yes	Yes
Android browser	Yes	Yes
Symbian/S60	Yes	Yes, also when the toolbar hides
Nokia Series 40	No	No
webOS	Yes	Yes
BlackBerry	No	In some devices
NetFront	No	No
Internet Explorer	No	No

Browser/platform	onscroll	onresize
Motorola Internet Browser	No	No
Opera Mobile	No	Yes
Opera Mini	No	No

Key events

Key events—`onkeypress`, `onkeyup`, and `onkeydown`—allow us to detect keypresses over the whole page (`body`) or in one element (generally, a text input). On compatible mobile devices, this can be useful for many situations:

- To provide keyboard shortcuts
- To provide navigation or movement in a game or application
- To enable form submission on Enter or another keypress
- To disallow some characters in a text input

If we are going to prevent a key from being used, we should be very careful. Remember that devices can have very different keyboards. Some devices have only virtual keyboards, some numeric, and some QWERTY, and key code management across platforms can be a little tricky.

[Table 8-29](#) shows the compatibility of key events over the `body` and in a text input.

Table 8-29. Key events compatibility table

Browser/platform	Support for <code>onkeypress</code> , <code>onkeyup</code> , and <code>onkeydown</code>	Support for <code>onkeypress</code> in a text input
Safari	No	Yes
Android browser	Yes, but it also opens address bar	Yes
Symbian/S60	Yes	Yes
Nokia Series 40	Yes	No
webOS	Yes, but it also opens address bar	Yes
BlackBerry	Yes	No
NetFront	No	No
Internet Explorer	Yes	No
Motorola Internet Browser	No	No
Opera Mobile	No	Yes
Opera Mini	No	No



If the device has a QWERTY keyboard we can also detect some modifier keys (if they exist), like Ctrl, Alt, or Shift, using the event properties.

A simple test for getting key codes can be created using the following code:

```
<script type="text/javascript">
window.onkeyup = function(event) {
    // charCode depends on modifiers (as shift), keyCode not
    var code = event.keyCode ? event.keyCode : event.charCode;
    alert( "code: " + code +
          " - ASCII value: " + String.fromCharCode(code));
};
</script>
```

Useful keys for some devices. In Safari on iOS, while the focus is inside a text input with the keyboard visible onscreen, we can capture every key pressed using only `keyCode`. [Table 8-30](#) shows some important codes.

Table 8-30. Useful keyCodes in Safari

Key	keyCode
Backspace/Del	127
Enter	10
Space	32

There are Android and webOS (Palm) devices with physical keyboards, and others without them. The possible special key values for all these devices are shown in [Table 8-31](#).

Table 8-31. Android and webOS useful keyCodes

Key	keyCode
Backspace/Del	8
Enter	13
Space	32

The Nokia N97 has a full QWERTY keyboard, but the letters don't provide the correct ASCII values unless the user presses the Shift key at the same time. For example, the H and I keys provide the same `keyCode` (56) but different `charCodes`. The default Unicode values for the `charCodes` are the numeric or symbol values of the keys (typically used with the Sym key). If the user is using the onscreen keyboard (only available as a pop-up window when a form has focus), every character typed is delivered (regardless of whether it was entered on the numeric keyboard, by touch recognition, or by predictive text). [Table 8-32](#) shows the common codes.

Table 8-32. Symbian 5th edition useful keyCodes

Key	keyCode	charCode
Backspace	8	8
Enter	13	13
Space	32	32
Up	38	63497
Down	40	63498
Left	37	63495
Right	39	63496
Fire	N/A	63557



Even if we can capture keypresses, remember that special keys (Menu, Call, End, Volume) are generally out of our scope as web developers. We cannot detect those keys.

Symbian 3rd edition devices (including the Nokia N95, E61, and so on) are non-touch devices with numeric keypads. The few keys we can capture on such devices are shown in [Table 8-33](#).

Table 8-33. Symbian 3rd edition useful keyCodes

Key	keyCode	charCode
Clear	8	8
Send	N/A	63586
Cursor and Fire	N/A	N/A

Preventing default behavior

For almost every event, we can prevent the default behavior by using the `event.preventDefault` method or capturing the event and returning `false`. This is commonly done with the `onsubmit` event, to cancel the submission when something doesn't validate, or to cancel a link. For example:

```
<a href="news.html" onclick="news();return false">Go to news</a>
```

The preceding code is a standard link to `news.html`, but if JavaScript is supported we can capture the `onclick` event, call a local function (that can get the news by Ajax), and cancel the normal behavior of the link by returning `false`. This avoids a page load and reduces network traffic.

We can also prevent a key from being used by cancelling the `onkeyup` event. This feature must be used very, very carefully, and only on tested devices.

[Table 8-34](#) shows which browsers support these three common scenarios.

Table 8-34. Preventing default event behavior compatibility table

Browser/platform	onsubmit	onclick on links	onkeyup
Safari	Yes	Yes	Partial
Android browser	Yes	Yes	No
Symbian/S60	Yes	Yes	Partial
Nokia Series 40	Yes	Yes	No
webOS	Yes	Yes	Partial
BlackBerry	Yes	Yes	No
NetFront	Yes	Yes	Yes
Internet Explorer	Yes	Yes	No
Motorola Internet Browser	Yes	Yes	No
Opera Mobile	Yes	Yes	No
Opera Mini	Yes	Yes	No

Touch Gestures

A *gesture* is a way of combining finger movements over the screen to fire an action, instead of using a simple touch or click. A complete touch (or mouse) move-capturing feature is required in order for gestures to be registered, and to be perfectly honest, today only mobile Safari and the Android browser offer good support.

If the users need to use a gesture in your web application, it is important to train them in what to do by showing a help message, a sample animation, or some other kind of hint, as shown in [Figure 8-5](#).

Swipe gesture

The swipe (also known as *flip*) gesture is a touch-based browser technique typically used for going forward and backward. For example, it is used in many photo galleries to change the currently displayed image, and in presentations to move from slide to slide. The gesture is simply a finger moving across the x-axis from left to right or right to left (a horizontal swipe) or along the y-axis from top to bottom or bottom to top (a vertical swipe). It is a one-finger gesture, so it is compatible with almost any touch device.

There is no standard event that captures the swipe action, so we need to emulate it using standard events.

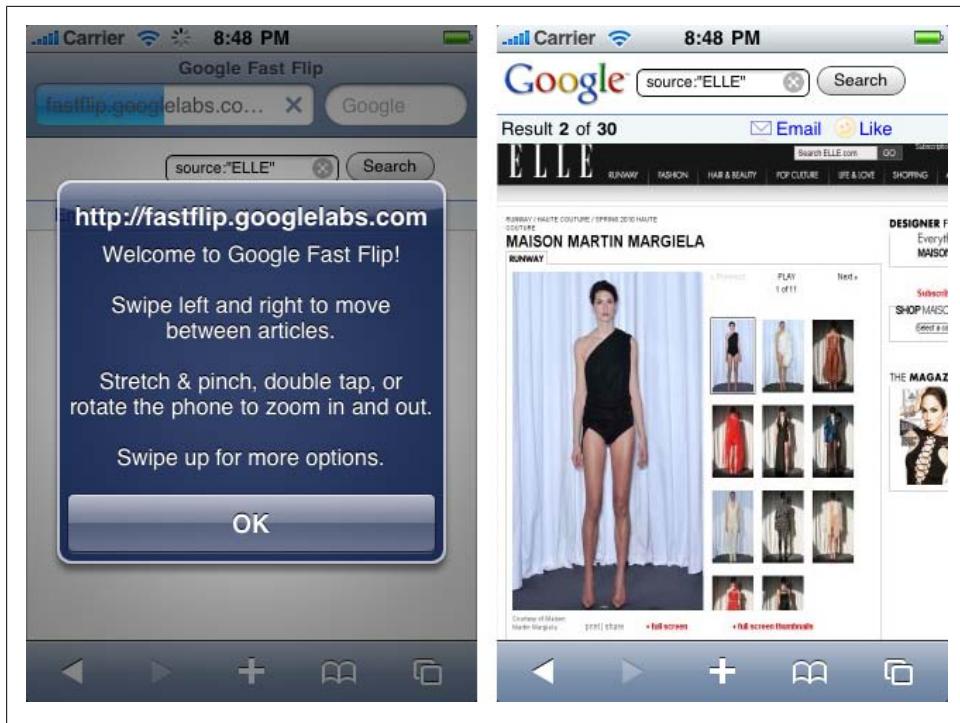
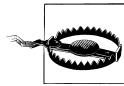


Figure 8-5. Google Fast Flip is a news reviewer that uses gestures on iPhone and Android devices. On the left, you will see the alert dialog with instructions on how to use it. You will see the instructions only once.



On Symbian 5th edition touch devices, strange behavior results for the mouse down, move, and up events when a finger is used instead of the cursor. The `onmousemove` event is fired only once in a finger drag operation, and the `onmouseup` event doesn't fire if the finger is moved from the original mouse-down coordinates. So, different approaches are needed for swipe detection.

The steps will be:

1. Capture `onmousedown` (or `ontouchstart` for iPhone and compatible browsers) and start a gesture recording.
2. Capture `onmousemove` (or `ontouchmove` for iPhone and compatible browsers) and continue the gesture recording if the move is on the x-axis (or y-axis), within a certain threshold. Cancel the gesture if the move is on the other axis.
3. Capture `onmouseup` (or `ontouchend` for iPhone and compatible browsers) and, if the gesture was active and the difference between the original and final coordinates is greater than a predefined constant, define a swipe to one direction.

The last item can be replaced with an on-the-fly verification of the gesture inside the `onmousemove` event.



If you use jQuery, there is a free plug-in available at <http://plugins.jquery.com/project/swipe> to detect horizontal swiping on iPhone devices.

We can create an unobtrusive, object-oriented library for swipe detection compatible with iPhone, Android, and other devices with the following code:

```
/***
 * Creates a swipe gesture event handler
 */
function MobiSwipe(id) {
    // Constants
    this.HORIZONTAL = 1;
    this.VERTICAL = 2;
    this.AXIS_THRESHOLD = 30; // The user will not define a perfect line
    this.GESTURE_DELTA = 60; // The min delta in the axis to fire the gesture

    // Public members
    this.direction = this.HORIZONTAL;
    this.element = document.getElementById(id);
    this.onswiperight = null;
    this.onswipeleft = null;
    this.onswipeup = null;
    this.onswipedown = null;
    this.inGesture = false;

    // Private members
    this._originalX = 0
    this._originalY = 0
    var _this = this;
    // Makes the element clickable on iPhone
    this.element.onclick = function() {void(0);}

    var mousedown = function(event) {
        // Finger press
        event.preventDefault();
        _this.inGesture = true;
        _this._originalX = (event.touches) ? event.touches[0].pageX : event.pageX;
        _this._originalY = (event.touches) ? event.touches[0].pageY : event.pageY;
        // Only for iPhone
        if (event.touches && event.touches.length!=1) {
            _this.inGesture = false; // Cancel gesture on multiple touch
        }
    };

    var mousemove = function(event) {
        // Finger moving
        event.preventDefault();
        var delta = 0;
```

```

// Get coordinates using iPhone or standard technique
var currentX = (event.touches) ? event.touches[0].pageX : event.pageX;
var currentY = (event.touches) ? event.touches[0].pageY : event.pageY;

// Check if the user is still in line with the axis
if (_this.inGesture) {
    if (_this.direction==_this.HORIZONTAL)) {
        delta = Math.abs(currentY-_this._originalY);
    } else {
        delta = Math.abs(currentX-_this._originalX);
    }
    if (delta >_this.AXIS_THRESHOLD) {
        // Cancel the gesture, the user is moving in the other axis
        _this.inGesture = false;
    }
}

// Check if we can consider it a swipe
if (_this.inGesture) {
    if (_this.direction==_this.HORIZONTAL) {
        delta = Math.abs(currentX-_this._originalX);
        if (currentX>_this._originalX) {
            direction = 0;
        } else {
            direction = 1;
        }
    } else {
        delta = Math.abs(currentY-_this._originalY);
        if (currentY>_this._originalY) {
            direction = 2;
        } else {
            direction = 3;
        }
    }
}

if (delta >= _this.GESTURE_DELTA) {
    // Gesture detected!
    var handler = null;
    switch(direction) {
        case 0: handler = _this.onswiperight; break;
        case 1: handler = _this.onswipeleft; break;
        case 2: handler = _this.onswipedown; break;
        case 3: handler = _this.onswipeup; break;
    }
    if (handler!=null) {
        // Call to the callback with the optional delta
        handler(delta);
    }
    _this.inGesture = false;
}

};

}

```

```

// iPhone and Android's events
this.element.addEventListener('touchstart', mousedown, false);
this.element.addEventListener('touchmove', mousemove, false);
this.element.addEventListener('touchcancel', function() {
    this.inGesture = false;
}, false);

// We should also assign our mousedown and mousemove functions to
// standard events on compatible devices
}

```

This is a simple example of usage of our last library, *swipe.js*, with a **div** with horizontal swipe detection and another **div** with vertical swipe detection:

```

<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN"
    "http://www.wapforum.org/DTD/xhtml-mobile10.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=UTF-8" />
<title>Swipe Gesture Detection</title>
<meta name="viewport" content="width=device-width; initial-scale=1.0;
    maximum-scale=1.0; user-scalable=0;">
<script type="text/javascript" src="swipe.js"></script>
<script type="text/javascript">

window.onload = function() {
    var swipev = new MobiSwipe("vertical");
    swipev.direction = swipev.VERTICAL;
    swipev.onswipedown = function() { alert('down'); };
    swipev.onswipeup = function() { alert('up'); };

    var swipeh = new MobiSwipe("horizontal");
    swipeh.direction = swipeh.HORIZONTAL;
    swipeh.onswiperight = function() { alert('right'); };
    swipeh.onswipeleft = function() { alert('left'); };
}

</script>
</head>

<body>

<div style="width: 100%; height: 150px; background-color: blue" id="vertical">
Vertical Swipe
</div>
<div style="width: 100%; height: 150px; background-color: red" id="horizontal">
Horizontal Swipe
</div>

</body>
</html>

```



Many touch devices use the drag gesture to scroll inside the page contents and don't support the `preventDefault` feature (see “[Preventing default behavior](#)” on page 258 earlier in this chapter). That is why we should consider other ways to navigate instead of swipe gestures.

Zoom and rotate gestures

One of the coolest features of the iPhone when it was presented as a new phone was the zoom and rotate gesture. Using a pinching gesture with two fingers, the user can zoom in and zoom out on content (generally a picture), and using two fingers moving in a circle, he can rotate that picture.



For non-multitouch devices, we should provide zoom features using normal floating buttons or with a slider.

Fortunately, from iOS 2.0, Safari allows us to detect these gestures without using low-level math in the touch events. There are three WebKit extensions available as events, listed in [Table 8-35](#). The Android browser has also added support for these events.

Table 8-35. Events available for touch handling

Event	Description
<code>ongesturerestart</code>	Fired when the user starts a gesture using two fingers
<code>ongesturerechange</code>	Fired when the user is moving her fingers, rotating or pinching
<code>ongesturereend</code>	Fired when the user lifts one or both fingers

The same events are used for rotate and zoom gestures. All three events receive a `GestureEvent` parameter. This parameter has typical event properties, and the additional properties `scale` and `rotation`.

The `scale` property defines the distance between the two fingers as a floating-point multiplier of the initial distance when the gesture started. If this value is greater than `1.0` it is a pinch open (zoom in), and if it is lower than `1.0` it is a pinch close (zoom out).

The `rotation` value gives the delta rotation from the initial point, in degrees. If the user is rotating clockwise we will get a positive degree value, and we'll get a negative value for a counter-clockwise rotation.

I know what you're thinking right now: “Great! Rotation and zoom. But we're working in HTML, so what we can do with that?” CSS extensions for Safari on iOS (and other compatible browsers) come to our help with one attribute, `-webkit-transform`, and two functions available for manipulating its value: `rotate` and `scale`.

The `rotate` function receives a parameter in degrees, and we need to define the `deg` unit after the number (e.g., `rotate(90deg)`). We can define it from a script using element `style.webkitTransform`.

Let's look at a simple sample:

```
<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN"
  "http://www.wapforum.org/DTD/xhtml-mobile10.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=UTF-8" />
<title>Gesture Management</title>
<meta name="viewport" content="width=device-width; initial-scale=1.0;
  maximum-scale=1.0; user-scalable=0;">

<script type="text/javascript">
function gesture(event) {
    // We round values with two decimals
    event.target.innerHTML = "Rotation: " + Math.round(event.rotation*100)/100
        + " Scale: " + Math.round(event.scale*100)/100;
    // We apply the transform functions to the element
    event.target.style.webkitTransform = "rotate(" + event.rotation%360 + "deg)" +
        " scale(" + event.scale + ")";
}
</script>
</head>
<body>
<div ongesturechange="gesture(event)" style="background-color:silver; width: 300px;
  height: 300px">
</div>
</body>
</html>
```

The sample works as shown in [Figure 8-6](#). You can rotate and scale the `div` (with all its contents) using two fingers on compatible devices. What's the only problem? The transform style is always applied to the original element. So, if we apply a scale of 2.0 to the element and later apply a second scale of 0.5, the new scale value will be 0.5 and not 1.0, as we might expect.

For typical zoom-rotate relative behavior, we should change our function to the following:

```
<script type="text/javascript">
var rotation = 0;
var scale = 1;

function gesture(event) {
    event.target.innerHTML = "Rotation: " +
        Math.round((event.rotation+rotation)*100)/100
```

```

        + " Scale: " + Math.round((event.scale*scale)*100)/100;
        event.target.style.webkitTransform = "rotate(" + (event.rotation+rotation)%360
            + "deg)" + " scale(" + event.scale*scale + ")";
    }

    function gestureend(event) {
        rotation = event.rotation+rotation;
        scale    = event.scale*scale;
    }

```

</script>

</head>

<body>

```

<div ongesturechange="gesture(event)" ongestureend="gestureend(event)"
      style="background-color:silver; width: 100%; height: 300px">

```

</div>

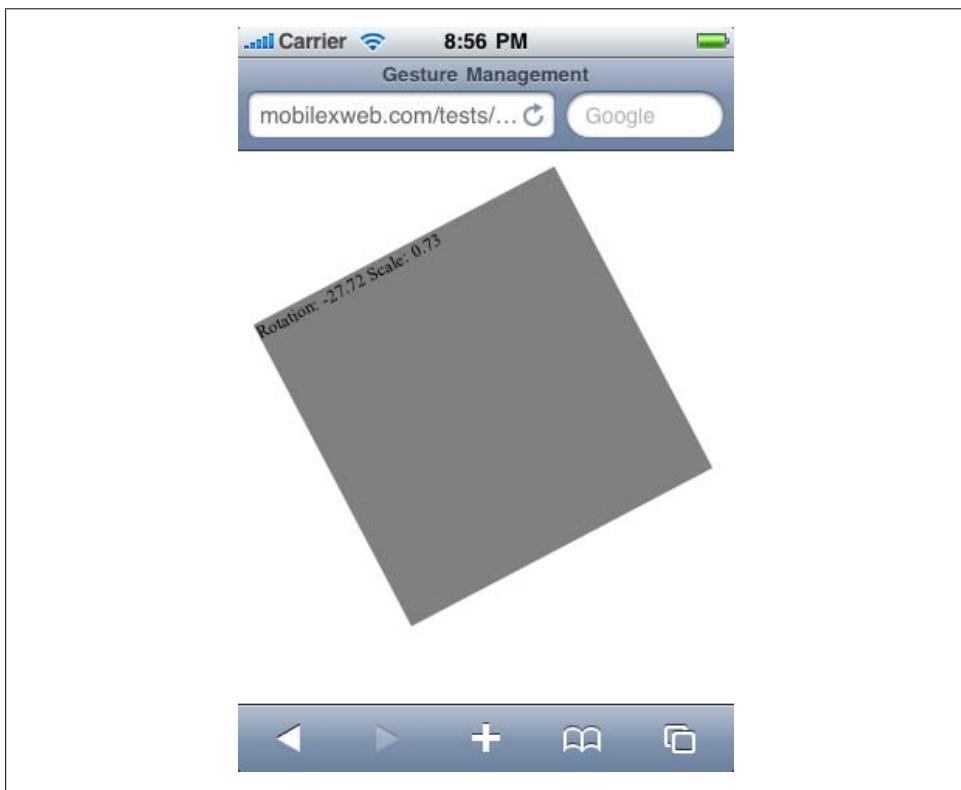


Figure 8-6. Combining touch events with CSS transformations, you can have rotation and scale features in your website.

Ajax, RIA, and HTML 5

Wow! Ajax, HTML 5, and RIA? How do these things fit together on a mobile device? We all know that Ajax is just a JavaScript technique, so that part is obvious. For mobile browsers, HTML 5 is also more or less a JavaScript thing, with some bonus markup features (the new technologies borrowed by the mobile browsers from the HTML 5 draft are almost all new JavaScript APIs that will work with HTML). Rich Internet Application development also involves the implementation of some JavaScript UI pattern designs.

Ajax Support

Ajax is especially important for mobile devices. The ability to download only the data to be updated and avoid unnecessary page loads is key for mobile browsers. However, Ajax is not part of the official standards, and support can vary from device to device.



If your mobile website gets content using Ajax, you should implement Google's proposal for search engine optimization (SEO). You can find more information about this at <http://code.google.com/web/ajaxcrawling>.

Let's first verify the browsers' support for the `XMLHttpRequest` native object (see [Table 9-1](#)). Cross-domain requests are not compatible with mobile browsers today because of supposed security problems, but you can bypass this problem with a simple proxy on your server.

Table 9-1. XMLHttpRequest support compatibility table

Browser/platform	XMLHttpRequest support
Safari	Yes
Android browser	Yes
Symbian/S60	Yes since 3 rd edition
Nokia Series 40	No before 6 th edition
webOS	Yes
BlackBerry	No before 4.6
NetFront	No before 3.5
Internet Explorer	Yes since Windows Mobile 5
Motorola Internet Browser	No
Opera Mobile	Yes since 8.0
Opera Mini	Yes since 3.0

When we say that the object is available, we are talking about full support for the following properties and methods:

- `open`
- `abort`
- `send`
- `onreadystatechange`
- `readyState`
- `status`
- `responseText`

XML Parsing

The property (standard in desktop Ajax) we left out from the previous list is `responseXML`. That is because XML parsing is a more complex mechanism inside the browser and can have some problems. The first difference we need to verify is how the browsers treat whitespace inside tags. Let's look at a simple example:

```
<node>
  <subnode />
</node>
```

Some browsers understand that the previous code is a node with only one child, the subnode. Other XML parsers believe that there are three children: a text node with spaces (and a newline character), the subnode, and another text node. This difference can be a little difficult to debug if we are not aware of it. Table 9-2 shows which browsers support XML parsing, and the nature of that support.

Table 9-2. XML parsing compatibility table

Browser/platform	XML parsing support	Spaces as children
Safari	Yes	Yes
Android browser	Yes	Yes
Symbian/S60	Yes	Yes
Nokia Series 40	No before 6 th edition	Yes
webOS	Yes	Yes
BlackBerry	No before 4.6	Yes
NetFront	Yes from 3.6	Yes
Internet Explorer	Yes	No
Motorola Internet Browser	No	Yes
Opera Mobile	Yes	Yes
Opera Mini	Yes, on the server	Yes

JSON Parsing

JavaScript Object Notation (JSON) is the most lightweight solution for Ajax because it allows us to use dot notation for object access, rather than the DOM parsing required for other techniques, such as XML. We receive the JSON as text with `responseText` and convert it to an object using `eval`. So, the first question is: how well does `eval` work on mobile devices?

We need to test `eval` support for JSON objects using the strict standard and the de facto standard used on and compatible with most browsers. The differences between the two are shown in this code, and [Table 9-3](#) reports on whether they worked:

```
// Strict standard
var obj = {
  'name': 'John',
  'surname': 'Doe'
}
// De facto standard
var obj = {
  name: 'John',
  surname: 'Doe'
}
```

Table 9-3. JSON parsing compatibility table

Browser/platform	eval with JSON (strict and de facto standards)
Safari	Yes
Android browser	Yes
Symbian/S60	Yes
Nokia Series 40	No before 6 th edition

Browser/platform	eval with JSON (strict and de facto standards)
webOS	Yes
BlackBerry	No before 4.6
NetFront	Yes
Internet Explorer	Yes
Motorola Internet Browser	Yes
Opera Mobile	Yes
Opera Mini	Yes



For low- and mid-end devices with Ajax support it is not recommended to create more than two connections to the server at the same time. If possible, try to keep the number of simultaneous connections to the minimum.

JSONP and Lazy Loading

JSON with Padding (JSONP) is a very modern technique for accessing a third-party domain's content without the cross-domain problems of Ajax requests. Many public web services are offering this new way of communicating with third-party servers.

JSONP uses a script tag generated by JavaScript to a URL with a parameter we define, generally for a local callback function to be called when the script (and the data it fetches) is downloaded and executed.

A very similar technique is used for scripting code: you download only a subset of the scripts in the initial download, and then you download the other scripts that you will need later.

JSONP needs one feature to be working on the browser: the ability to insert a script dynamically from JavaScript. If this feature works, the browser should detect the new DOM `script` element and automatically download and execute this new resource. As this script will call your function with the data, you will be able to receive data from a third-party server.



Modern JavaScript libraries such as jQuery support JSONP requests without dealing with DOM. You can use `$.getJSON` with a parameter to replace an Ajax query with a JSONP query.

Generally, the third-party server offers some URL to use JSONP as format. For example:

`http://api.thirdpartyserver.domain/<jsonp_script>?<callback>=<our_function>`

The server will respond with something like this:

```
<our_function>({<>});
```

We can test if a mobile browser detects the dynamic creation of `script` elements using the following code:

```
function doJSONP() {  
    var head = document.getElementsByTagName('head')[0];  
    var script = document.createElement('script');  
    script.type = 'text/javascript';  
    script.src = 'http://mobilexweb.com/tests/jsonp?cb=finished';  
    head.appendChild(script);  
}
```

[Table 9-4](#) shows how well this works on the different browsers. Some browsers support an `onload` event that can be applied to the script and will be executed when the script is ready. JSONP doesn't need this event because of the callback definition in the same URL, but for lazy loading it can be useful on compatible browsers.

Table 9-4. Dynamic script loading compatibility table

Browser/platform	Dynamic script loading support	onload support
Safari	Yes	Yes
Android browser	Yes	Yes
Symbian/S60	Yes	Yes
Nokia Series 40	No before 6 th edition	
webOS	Yes	Yes
BlackBerry	Yes from 4.6	No
NetFront	Yes	No
Internet Explorer	No	
Motorola Internet Browser	No	No
Opera Mobile	Yes	Yes, and onreadystatechange
Opera Mini	No	

Comet Techniques

Comet is a new web application model that provides an alternative to the polling design pattern used for making periodical checks for news on a server and similar tasks. With this model, we can send long-lived HTTP requests that remain open until the server has a response to give to the client.

For example, if we are showing a mailbox, we might want to check whether there are new messages every x seconds. A Comet technique allows us to emulate a kind of push technology where instead of us making a request every x seconds, we make only one request and the server holds that request open until it has new data for us. This can result in HTTP connections being held open for a very long time. This is only one kind of Comet technique; there are others available, but they are not very reliable.



Palm, BlackBerry, and Apple offer push services for developers: that is, we can push messages or content from our servers to their servers, and they will push the information to the devices. Unfortunately, these features are not available for web applications in Palm and Apple's solutions.

These techniques are not recommended for mobile browsers yet. The main problem will be 3G and 2.5G network connections: even if the server accepts them, Internet gateways are not prepared for long-lived HTTP connections, and the proxies will terminate the connections after a period of time.



If you are using a hung connection at the server as a Comet solution, be aware that only Symbian 5th edition, mobile Safari, Windows Mobile 6.5, and Android give predictable results. On Series 40 6th edition and other devices, the browser hangs with the request, so the user cannot even click on a link.

There are also some Adobe Flash solutions that work by opening sockets to receive news from the server. This will only work when Flash Player 10.1 has become widespread, though, and using WiFi. 3G networks will not be reliable for these situations. We will also need to be careful about battery consumption.

JavaScript Libraries

The life of a JavaScript programmer has changed radically since 2006, with the appearance of Ajax and hundreds of libraries that help us work better with this language. Many of these libraries modify or add complete new behaviors to the language, creating new languages inside (or over) JavaScript.

If the libraries are based on JavaScript, and mobile browsers support JavaScript, why do we care? The answer is that many of these libraries rely on some not-so-clear things in the standard, and while they have been prepared and tested on well-known desktop browsers (Internet Explorer, Firefox, Safari, Chrome, Opera), they have not been tested on all the mobile browsers. And as we've already seen, some DOM features (for example) are missing in many mobile browsers.

That is the first reason why we need to be careful about using big JavaScript libraries. The second (no less important) reason is the impact on download and execution times. As mentioned earlier, these libraries modify the language and the behavior of objects, and even if we don't use any (or very little) of a library's code, the library will need to load itself completely, which takes time. This can lead to performance problems in some browsers, so we are going to test the time that typical libraries take to initialize themselves on mobile browsers.



Some libraries, in their complete form, are larger than 600 KB. We need to be very careful about performance when using that code, as it will increase network traffic, memory consumption, and execution time. If you can, avoid those big libraries, or use only the code you need.

Table 9-5 shows the results for the jQuery, Prototype, Yahoo! UI, and Dojo libraries. Remember that execution time will depend a lot on the hardware and CPU. These tests are just intended to make you aware of the average time that including a library can take.

Table 9-5. JavaScript libraries average execution/load times in seconds

Browser/platform	jQuery	Prototype	Yahoo! UI	Dojo
Safari	1.8	0.2	0	0.1
Android browser	4	2.5	0.4	4.6
Symbian/S60	1.7	0.9	0.2	0.7
Nokia Series 40	Cannot be calculated			
webOS	0.2	0.5	0.1	0.4
BlackBerry	6.2	5	0.8	7
NetFront	8	13.6	3.7	11.1
Internet Explorer	2	3	0.4	2
Motorola Internet Browser	Not compatible			
Opera Mobile	1.4	0.3	0.1	0.4
Opera Mini	It can not be calculated, executed on the server			

The conclusion is that you should avoid these libraries if you can. If you cannot avoid them, use them only for smartphones, and be aware that some features and plug-ins may not work properly.

Mobile Libraries

The good news is that many developers have released alternative libraries that are geared for mobile devices and are lighter than the previous ones. There are also full frameworks for mobile application development (mostly prepared for iPhone) that we will cover later, like jQTouch, iUI, iWebKit, and Webapp.Net. These frameworks will take care of the visualization, events, and interaction of our websites.

There are also other libraries that can replace jQuery and the others on mobile devices. They are very light libraries that provide basic DOM, event, and Ajax support.

baseJS

baseJS is a lightweight library (8 KB) compatible with mobile Safari and other WebKit-based browsers, available at <http://paularmstrongdesigns.com/projects/basejs>. It has only been fully tested on Safari, from iOS 1.0 to 3.0.

baseJS provides a selector similar to jQuery's, `$(selector)`, and some similar methods, like `each`, `addClass`, `hasClass`, `removeClass`, `toggleClass`, `getXY`, `fire`, and some Ajax methods.

XUI

XUI is a simple JavaScript framework for building mobile websites that takes up only 6.7 KB compressed. It is available for free from <http://xuijs.com> and has been fully tested on WebKit-based browsers and Opera Mobile. The developers are working on adding support for IE Mobile and BlackBerry.

XUI is also similar to jQuery, but it is more powerful than baseJS. XUI uses `x$` as the main selector object and includes the methods listed in [Table 9-6](#).

Table 9-6. XUI common methods for a selector query

Method	Description
<code>html(code)</code> or <code>html(location, code)</code>	Defines the inner HTML (or other location, using the second option) of the elements. The <code>location</code> is a string and can be one of the following: <code>inner</code> , <code>outer</code> , <code>top</code> , <code>bottom</code> , <code>before</code> , <code>after</code> , or <code>remove</code> .
<code>on(event, function)</code>	Registers an event listener. The event name can also be used directly as the method name (e.g., <code>click</code> rather than <code>on('click')</code>). The events compatible are: <code>click</code> , <code>load</code> , <code>touchstart</code> , <code>touchmove</code> , <code>touchend</code> , <code>touchcancel</code> , <code>gesturestart</code> , <code>gesturechange</code> , <code>gestureend</code> , and <code>orientationchange</code> .
<code>setStyle(property, value)</code>	Defines a CSS style.
<code>getStyle(property, optional_callback)</code>	Reads the value of a property. If the selector has multiple elements, the callback will be fired.
<code>addClass(class_name)</code>	Adds a class to the elements.
<code>removeClass(class_name)</code>	Removes a class from the elements.
<code>css(object)</code>	Defines CSS styles using a JSON-style object having properties with values.
<code>tween(object)</code>	Animates one or more CSS properties from one value to another defined in the object.

So, for example, we can capture an `onclick` for buttons with a class with the following code:

```
x$('input.button').on('click', function(e){ alert('Ouch!') });
```

or with code like this, chaining the methods *à la* jQuery:

```
x$('input.button').click(function(e){ alert('Ouch!') })
    .html('Press Me! ').css({color: 'blue'});
```

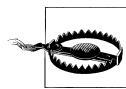
For Ajax, XUI provides global `xhr` and `xhrjson` functions to create requests with options.

WebKit CSS Extensions

Safari on iOS is the most complex mobile browser at the time of this writing. As mentioned in [Chapter 7](#), from version 2.0 of iOS it supports a great (and strange) group of CSS extensions that allow us to use hardware-accelerated animations, transitions, and even 3D effects in our websites. Some of these extensions also work with the Android and webOS browsers, depending on the operating system version.

WebKit Functions

Many CSS attributes accept a function as a parameter. These functions are WebKit extensions and are all hardware-accelerated.



The gradient-related functions listed here are not officially supported in iOS, according to the Safari Reference Library. However, they work properly from OS 3.0, and on older devices they will just use a plain background.

The functions available for iPhone devices are listed in [Table 9-7](#) (there are others, but they work only in Safari for desktop). Some of these functions, such as `scale` and `rotate`, are also available for the Android and webOS browsers.

Table 9-7. CSS functions available in Safari on iOS

Function	Description
<code>cubic-beizer(<i>p1x</i>, <i>p1y</i>, <i>p2x</i>, <i>p2y</i>)</code>	Specifies a cubic bezier timing function.
<code>matrix(<i>m11</i>, <i>m12</i>, <i>m21</i>, <i>m22</i>, <i>tX</i>, <i>tY</i>)</code>	Specifies a matrix transformation of six values with two translation elements.
<code>matrix3d(<i>m00</i>, <i>m01</i>, <i>m02</i>, <i>m03</i>, <i>m10</i>, <i>m11</i>, <i>m12</i>, <i>m13</i>, <i>m20</i>, <i>m21</i>, <i>m22</i>, <i>m23</i>, <i>m30</i>, <i>m31</i>, <i>m32</i>, <i>m33</i>)</code>	Specifies a 3D matrix transformation of 4×4.
<code>perspective(<i>depth</i>)</code>	Maps a viewing cube onto a pyramid whose base is far away from the viewer.
<code>rotate(<i>angle</i>)</code>	Defines a 2D rotation around the origin of the element.
<code>rotate3d(<i>x</i>, <i>y</i>, <i>z</i>, <i>angle</i>)</code>	Defines a 3D rotation with [<i>x,y,z</i>] as the direction vector of the rotation.
<code>rotateX(<i>angle</i>)</code>	Specifies a clockwise rotation around the x-axis.
<code>rotateY(<i>angle</i>)</code>	Specifies a clockwise rotation around the y-axis.
<code>rotateZ(<i>angle</i>)</code>	Specifies a clockwise rotation around the z-axis.
<code>scale(<i>scaleX</i>, [<i>scaleY</i>])</code>	Performs a 2D scale operation.

Function	Description
<code>scale3d(scaleX, scaleY, scaleZ)</code>	Performs a 3D scale operation.
<code>scaleX(value)</code>	Scales along the x-axis.
<code>scaleY(value)</code>	Scales along the y-axis.
<code>scaleZ(value)</code>	Scales along the z-axis.
<code>skewX(angle)</code>	Performs a skew transformation around the x-axis.
<code>skewY(angle)</code>	Performs a skew transformation around the y-axis.
<code>translate(deltaX, [deltaY])</code>	Specifies a 2D translation vector.
<code>translate3d(deltaX, deltaY, deltaZ)</code>	Specifies a 3D translation vector.
<code>translateX(value)</code>	Performs a translation around the x-axis.
<code>translateY(value)</code>	Performs a translation around the y-axis.
<code>translateZ(value)</code>	Performs a translation around the z-axis.
<code>from(color)</code>	Specifies the initial color in a sequence.
<code>to(color)</code>	Specifies the final color in a sequence.
<code>color-stop(stop_percentage, color)</code>	Specifies an intermediate color to be used at the <i>stop_percentage</i> value in a sequence.
<code>-webkit-gradient(linear, start_function, end_function, [stop_function, ...])</code>	Defines a linear gradient using a start point, a final point, and optional intermediate points. This can be used in place of any image in CSS. Available from iOS 3.0.
<code>-webkit-gradient(radial, inner_center, inner_radius, outer_center, outer_radius, [stop_function, ...])</code>	Defines a radial gradient with a center point (inner) and another point (outer) with colors determined by a series of color-stop functions. Available from iOS 3.0.



CSS functions are not a new feature of CSS; they are available for every browser. In fact, you are probably already familiar with some of the standard functions, such as `url(url_string)` or `rgba(red, green, blue, alpha)` for defining colors.

Gradients

From iOS 3.0, Safari supports CSS gradient extensions as functions anywhere we can use an image (for a background, for example). Instead of using the `url` function to provide the URL of the image, we can use the `-webkit-gradient` function to define a linear or radial gradient to use as the background. This technique enables us to create really nice backgrounds for titles, containers, and cells with minimal code. The same code also works on the Android browser.

Some samples of gradient definitions include:

```

/* Sun effect from top-right corner */
body {
    background: -webkit-gradient(radial, 50% -50, 0, 50% 0, 300, from(#676767),
                                to(black)) black;
}

body {
    background: -webkit-gradient(radial, 100% -10, 50, 70% 0, 200,
                                from(yellow), to(white)) #FFC;
}

/* Simple linear gradient */
li {
    background: -webkit-gradient(linear, 0% 0%, 0% 100%, from(#369), to(#3FF))
                #369;
}

/* Simple 3D effect */
h1 {
    background: -webkit-gradient(linear, 0% 0%, 0% 100%, from(#369), to(#369),
                                color-stop(0.5, #58B));
}

```

For position values, we can use percentages, absolute values (without px), or the constant values `top`, `bottom`, `right`, and `left`. For example, we can use `top right` as the second parameter of the CSS function instead of `0% 0%`. Figure 9-1 shows what these examples might look like in the browser.



As of version 6.0, Mobile Internet Explorer supports filters and transitions, using CSS extensions with the `filter` style. You can create alpha, chroma, shadow, glow, mask, and other effects. For more information, see <http://www.mobilexweb.com/go/iefilter>.

Reflection Effects

Reflection or mirror effects are among the most-used effects in Web 2.0 designs. They can be used on any content, including images. Remember, though, that we are designing for mobile screens and we don't want to waste too much space.



The reflection image doesn't change the layout or the size of the element's original content box. It is only part of the container's overflow.

To create a reflection effect in Safari on iOS, use the `-webkit-box-reflect` attribute with the following syntax:

```
-webkit-box-reflect: direction offset <mask-box-image>;
```

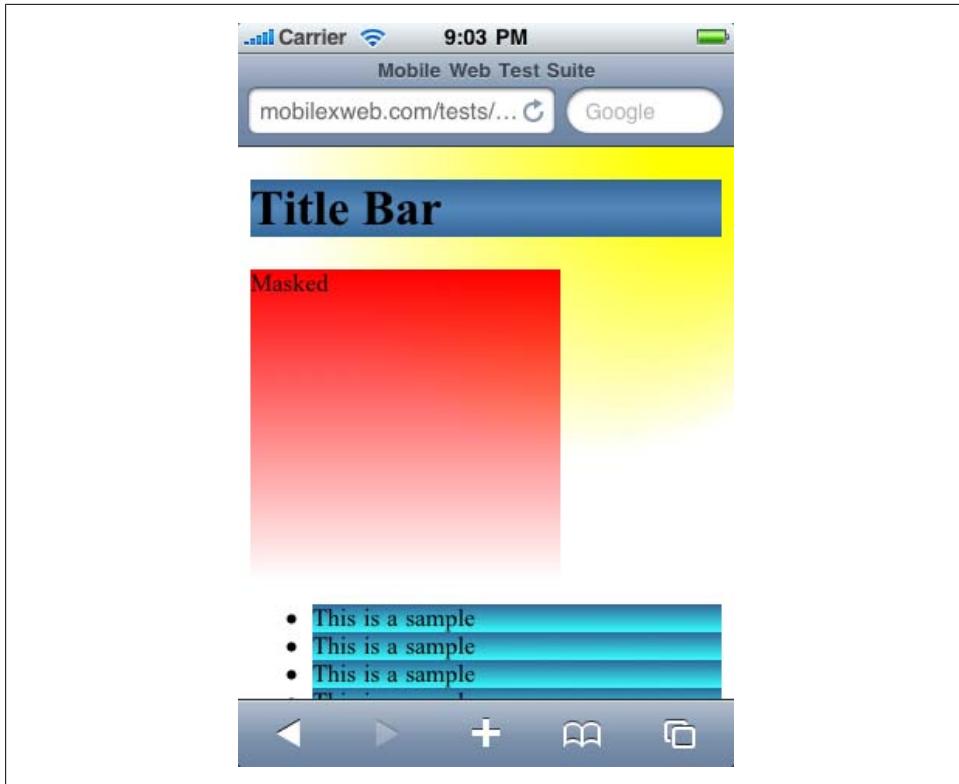


Figure 9-1. With just CSS you can create different gradient effects for iPhone, iPod Touch, iPad, and Android devices.

The *direction* can be *above*, *below*, *left*, or *right*; the *offset* is the distance (in px or %) from the original element at which the reflection should appear; and the optional *mask-box-image* is generally a gradient function that will work as a mask for the reflection image. If no mask image is defined, a normal mirror will be used.

The type of reflection effect typically seen on Web 2.0 websites has the following attribute values:

```
-webkit-box-reflect: below 3px -webkit-gradient(linear, left top, left bottom, from(transparent), color-stop(0.5, transparent), to(white));
```

Masked Images

As of iOS 3.0, we have access to a typical graphic design feature that has been missing for years in web development: masked images. We can use a masked image to apply any regular or irregular crop to the original image or, if using an alpha mask (or even a gradient function), to create a really nice visual effect over any image, like a fuzzy border. The mask properties are analogous to the background properties. For applying

a mask, we have a shortcut property, `-webkit-mask`, and specific properties for the position.

The syntax of the shortcut version with all the optional parameters is:

```
-webkit-mask: attachment, clip, origin, image, repeat, composite, box-image;
```

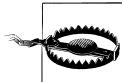
Of course, we also have access to all the properties separately, like `-webkit-mask-attachment`, `-webkit-mask-clip`, and so on. There are a lot of possibilities, but typically an image (alpha or not, PNG or SVG) or a gradient function is used as the image value. For example:

```
  
  

```

Transitions

A *transition* is just an automatic animation that takes place when a CSS property's value changes. The property must be defined by the browser as able to animate (typically this applies to position and size properties). There isn't an official list of properties that animations will work on, but the general policy is that any attribute with numerical or color values should be animated using transitions. There are also a few exceptions, like the `visibility` discrete property.



Remember, these transitions are defined entirely using CSS: we are not using JavaScript or any other technique to create the animations. This may sound a bit strange, but it is a simple and powerful technique.

The transitions framework is available for Safari (from iOS 2.0) and the Android browser, and transitions have enhanced performance on these devices.

To create a transition, we should:

1. Define the transition properties (duration, delay, where to apply, timing function) in the element(s) we want to animate.
2. Change the values of the attributes of the element(s) to animate using JavaScript, or apply classes to or remove them from the element.
3. Verify that the animation is working.

Sounds simple, right? Let's do it.

Animation properties

An animation can be defined using the shortcut property `-webkit-transition`, with the following syntax:

```
-webkit-transition: property duration timing_function delay [, ...];
```

We can also use the specific properties listed in [Table 9-8](#).

Table 9-8. WebKit transition properties

Property	Description
<code>-webkit-transition-property</code>	Defines which property or properties to animate. We can use a comma-separated list, or the constant value <code>all</code> .
<code>-webkit-transition-duration</code>	Defines the duration of the transition. The value can be 0 (no animation) or a positive value in seconds (using s as the unit) or milliseconds (using ms as the unit). If we want to define different timings for each property, we can use a list of comma-separated values in the same order as the <code>-webkit-transition-property</code> value.
<code>-webkit-transition-delay</code>	Defines the offset delay of the animation beginning from the time when the property was changed. This can be defined in seconds or milliseconds, and the default value is 0. If a negative value is used, the animation starts immediately but with some of the animation already done.
<code>-webkit-transition-timing-function</code>	Defines the function used to calculate intermediate values from the initial to the finish value of the property. You can use the CSS <code>cubic-bezier</code> function, or any of the following constants: <code>ease</code> , <code>linear</code> , <code>ease-in</code> , <code>ease-out</code> , and <code>ease-in-out</code> (the most commonly used.)

For example, the following code produces a fade-in, fade-out animation:

```
<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN"
  "http://www.wapforum.org/DTD/xhtml-mobile10.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<title>Fade Sample</title>
<style>

#box {
    width: 200px;
    height: 200px;
    background-color: red;
    -webkit-transition: opacity 2s;
}

.hide {
    opacity: 0;
}

</style>
<script type="text/javascript">
function fade() {
    var box = document.getElementById("box");
    box.className = (box.className=="hide") ? "" : "hide";
    box.innerHTML = box.className;
}
</script>
```

```

</script>

</head>
<body>

<h1>Fading</h1>
<input type="button" onclick="fade()" value="Hide-Show" />
<div id="box">
</div>
</body>
</html>

```

We can do similar transitions for resizing, relocation, color changes, or even 3D transitions using the transform properties that we will see in a minute.

Transition ending

The transition ending can be listened for from JavaScript just like any other DOM event, using `addEventListener`. You can then initiate another transition or do something else when you are sure that the animation has finished. The event to listen for is called `webkitTransitionEnd`.

We can listen for it using the following code:

```

box.addEventListener('webkitTransitionEnd', function(event) {
    alert("Finished transition");
});

```

Animations

Transitions are great and are the simplest way to create animations for iPhone- and Android-based devices. If you need finer animation control at the keyframe level, you can do this using the CSS animation framework. To be completely honest, I thought this was too much to be handled only by CSS, a nonprocedural and non-markup language, but it works great.

WebKit animations are done with the shortcut property `-webkit-animation`, which has the following syntax:

```

-webkit-animation: name duration timing_function delay iteration_count
direction

```

As you've probably guessed, there are also specific properties for each possible value, listed in [Table 9-9](#).

Table 9-9. WebKit animation CSS properties

Property	Description
-webkit-animation-name	Provides the name of the animation to be used by the keyframes.
-webkit-animation-duration	Specifies the duration of the animation, in seconds or milliseconds.
-webkit-animation-timing-function:	Defines the function used to calculate intermediate values between the initial and final values of the property. You can use the CSS cubic-bezier function or any of the following constants: ease, linear, ease-in, ease-out, and ease-in-out (the most commonly used).
-webkit-animation-delay	Defines the offset delay of the animation beginning from the time when the property was changed. This can be defined in seconds or milliseconds, and the default value is 0. If a negative value is used, the animation starts immediately but with some of the animation already done.
-webkit-animation-iteration-count	Defines how many times the animation will be repeated. This can be 1 (the default value), any integer value, the special constant infinite, or a float value.
-webkit-animation-direction	Defines whether the animation will play in forward direction (normal) or in alternate mode, playing forward on even iterations and in reverse on odd iterations.

After reading this list of properties you are probably asking yourself, where is the animation defined? What will be animating? For these, the WebKit keyframe extensions come into play.



If you are moving or scaling an object and you want it to be animated, it is better to use the performance-accelerated `-webkit-transform` property rather than the properties specified in the CSS standards.

Keyframe at-rule

To define how the animation will work and what it will do, we need to define a special CSS at-rule called `@-webkit-keyframes`. This rule is followed by the animation name (the one specified in `-webkit-animation-name`).

Inside the keyframe at-rule, we need to specify as many selectors or animation groups as keyframes we want. The selector is defined by a percentage value or the constants `from` (equivalent to 0%) and `to` (equivalent to 100%). Inside each selector, we define all the properties and values that we want at that point in the animation. We can also define the timing to use in every animation group using `-webkit-transition-timing-function`.



When the animation finishes, the original values are restored. The elements will not maintain the last keyframe values after the animation stops.

For example, the following sample moves a `div` in a square path:

```
<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN"
  "http://www.wapforum.org/DTD/xhtml-mobile10.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<title>Fade Sample</title>
<style>

#box {
    width: 200px;
    height: 200px;
    background-color: red;
    position: absolute;
    top: 0px;
    left: 0px;
}

.squareAnimation {
    -webkit-animation-name: squarePath;
    -webkit-animation-duration: 4s;
    -webkit-animation-timing-function: linear;
    -webkit-animation-iteration-count: infinite;
}

@-webkit-keyframes squarePath {
    /* We can use 0% or "from" as selector */
    from {
        top: 0px;
        left: 0px;
    }

    25% {
        top: 0px;
        left: 100px;
    }

    50% {
        top: 100px;
        left: 100px;
    }

    75% {
        top: 100px;
        left: 0px;
    }

    /* We can use 100% or "to" as selector */
    100% {
        top: 0px;
        left: 0px;
    }
}

```

```

</style>
<script type="text/javascript">
    function start() {
        // When we apply the -webkit-animation attributes, the animation starts
        document.getElementById("box").className = "squareAnimation";
    }
</script>

</head>
<body onload="start()">

<h1>Moving over a square path</h1>
<div id="box">
</div>
</body>
</html>

```



If we define the `-webkit-animation` attributes in the element from the beginning, the animation will begin when the page loads. The best solution is to define animations as classes and, when we want to start an animation, apply that class to the element.

So, to start the animation we apply the class, and if we want to stop it before it reaches the ending value we should assign an empty value to the `-webkit-transform-name` property.

We can define one animation that changes several properties, or use different animations with different names at the same time, each changing a single property.

Animation events

As with transitions, we can listen for the events `webkitAnimationStart`, `webkitAnimationIteration`, and `webkitAnimationEnd`. When fired, they will send a `WebKitAnimationEvent` object as a parameter. There is no event to capture each keyframe change.

The event object has the special properties `animationName` and `elapsedTime`, whose value is given in seconds.

Transformations

The last group of WebKit CSS extensions we'll look at are the transformation functions. We can apply these functions to any element to generate visual effects without using images, `canvas`, or SVG. The transformation functions work in the Safari, Android, and webOS browsers as of this writing.

The usage is very simple: we use the CSS property `-webkit-transform`, applying as a value any of the CSS functions that we saw earlier in this section—for example, `rotate`, `scale`, or `translate3d` (only for Safari).

We can change the origin point of the transformation with the `-webkit-transform-origin` property. The default value is the middle of the element (a value of `50% 50%`).

Perspective

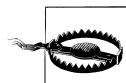
Setting a 3D perspective can be done using the `perspective` transformation function or the special CSS property `-webkit-perspective`, which takes a value in pixels defining the distance from the viewer's perspective. If we use the latter option the perspective will be applied to the children of the element, and if we use the transformation function it will be applied to the element itself.

Transform style

The transformation can act differently with regard to its nested elements. We can control this behavior with the `-webkit-transform-style` attribute, which has two possible values: `float` and `preserve-3d`. If `float` is used, the nested elements are flattened as if they were an image and the perspective is applied to that image. With `preserve-3d` every nested element will have its own 3D perspective, as seen in [Figure 9-2](#).

Backface visibility

Backface? What? An element in HTML has a backface? It can in mobile Safari, for 3D transformations defining the `-webkit-backface-visibility` CSS property. It is not what you might think (two faces in the same element), but the effect can easily be implemented.



3D transformations do not work on Android- and webOS-based devices; we should use them only when designing for the iPhone, iPod Touch, or iPad.

The backface visibility property can be defined as `hidden` or `visible`. If `hidden`, when we define a rotation of the y-axis of more than 180 degrees the element will disappear, and we can make another element showing a backface appear in its place.



All transformations can also be applied using JavaScript, by changing CSS styles or by using the `WebKitCSSMatrix` JavaScript class and defining a couple of objects. The most simple and quick way is to define the transformation as a string and apply it to `element.style.webkitTransform`.

The CardFlip pattern

This is one of the most “wow” visual features of Safari on iOS. The CardFlip pattern allows us to show an element in a rectangular area and, when some event occurs,

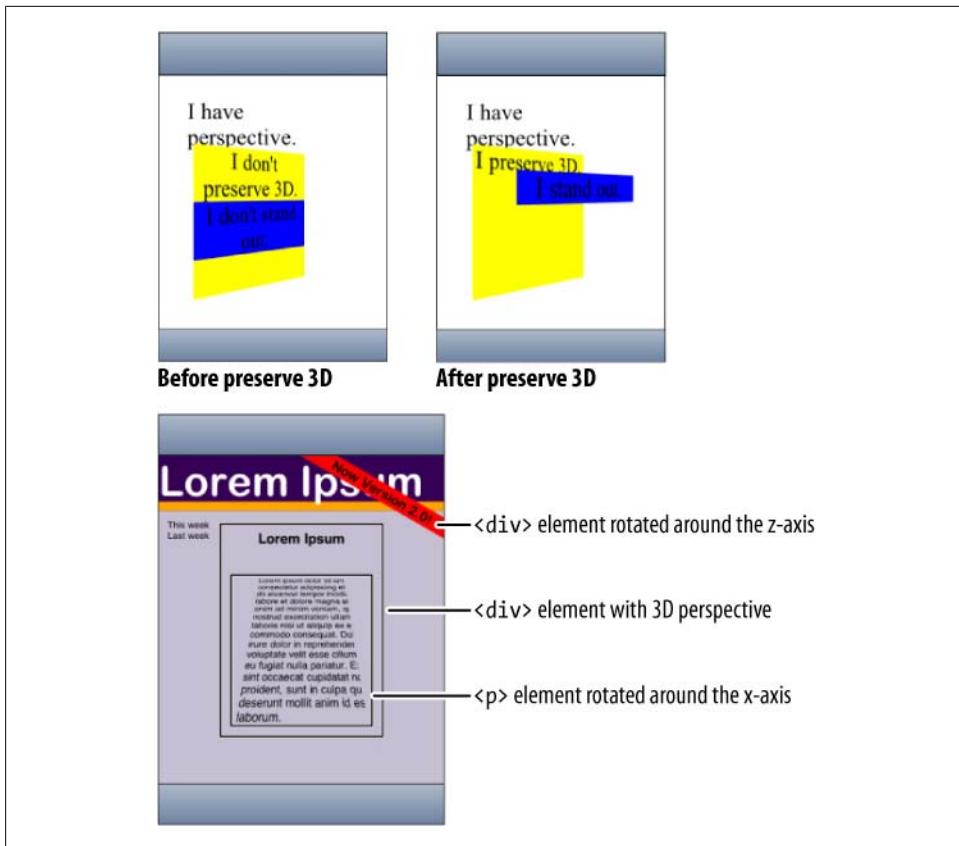


Figure 9-2. Sample of transformations provided by Apple in the Safari Visual Effects Guide at <http://developer.apple.com/safari>.

perform a transformation that flips the element as if it were a poker card and shows another element of the same size and in the same position as the backface.

Apple provides a full sample that can be used as the base template for designing this kind of animation. You can download it from <http://www.mobilexweb.com/go/cardflip>.

A simplified version of the CardFlip sample looks like this:

```
<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN"
  "http://www.wapforum.org/DTD/xhtml-mobile10.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<title>Card Flip</title>
<style>
body {
  margin: 0px;
  -webkit-user-select: none;
}
```

```

#container {
    height: 356px;
    width: 320px;
    background-color: rgba(56,108,179, 0.5);

    /* Disable tap highlighting */
    -webkit-tap-highlight-color: rgba(0,0,0,0);

    /* Give some depth to the card */
    -webkit-perspective: 600;
}

.card {
    position: absolute;
    height: 300px;
    width: 200px;
    left: 60px;
    top: 28px;

    -webkit-transform-style: preserve-3d;
    -webkit-transition-property: -webkit-transform;
    -webkit-transition-duration: 1.5s;
}

.card.flipped{
    -webkit-transform: rotateY(180deg);
}

/* Styles the card and hides its "back side" when the card is flipped */
.face {
    position: absolute;
    height: 300px;
    width: 200px;
    -webkit-border-radius: 10px;
    -webkit-box-shadow: 0px 2px 6px rgba(0, 0, 0, 0.5);
    -webkit-backface-visibility: hidden;
}

.face > p {
    margin-top: 36px;
    margin-bottom: 0;
    text-align: center;
    font-size: 92px;
}

.front {
    color: rgb(78,150,249);
    background-color: rgb(34,65,108);
}

.back {
    color: rgb(34,65,108);
    background-color: rgba(78,150,249,0.5);
    /* Ensure the "back side" is flipped already */
}

```

```

        -webkit-transform: rotateY(180deg);
    }
</style>
<script type="text/javascript">
function flip(event) {
    var element = event.currentTarget;
    /* Toggle the setting of the classname attribute */
    element.className = (element.className == 'card') ? 'card flipped' : 'card';
}
</script>

</head>
<body>
<div id="container">
    <div id="card" class="card" onclick="flip(event)">
        <div id="front" class="front face">
            <p>♠ ♦<br> ♣ ♥</p>
        </div>
        <div id="back" class="back face">
            <p>♦ ♣<br> ♥ ♣</p>
        </div>
    </div>
</div>
</body>
</html>

```

Analyzing the code, we see two `div` elements inside a container called `card`. One `div` is the “front” face and the other the “back” face. Both faces are positioned in the exact same position (as absolute elements), and the back side starts with a y-axis rotation of 180 degrees. Both faces also define themselves as hidden when backfaced.

When the user clicks the `card` container (with either the front or back face displayed on the screen), via JavaScript we apply (or not) the `flipped` CSS class, which rotates both elements 180 degrees around the y-axis. And *voilà!* Only one face will be at the front at any given time; the other will be automatically hidden. This process is done with a beautiful, smooth animation, which you can’t quite see in [Figure 9-3](#).

Mobile Rich Internet Applications

We are all comfortable with the RIA (Rich Internet Application) concept in the desktop web and Web 2.0, but we can also create mobile RIAs. Some of the techniques used are the same, and others are not: while all the Ajax pieces (strictly about network requests) are the same, some UI and richness controls need to be redesigned for the mobile world.



A mobile RIA is also called *webapp*, a term often used to define iPhone web applications that emulate the native UI behavior and can include offline work and home screen icon support.



Figure 9-3. With 3D flipping you can use a beautiful 3D effect to display the backface of an element.

Problems with the devices, including lack of a big screen and lack of mouse support (and the various kinds of mouse events), have made mobile RIA development more tricky than we might have hoped. However, the richness in services (e.g., autosave mechanisms for large text inputs) can be developed in the same way regardless of whether the application is targeting desktop or mobile users.

Some UI design pattern concepts that work great in mobile RIAs include:

- Accordion
- Tab navigation
- Menu bars
- In-place editors

For other concepts we need to think twice and ponder alternative solutions. Implementing the following can be more complex:

- Drop-down calendars for non-touch devices
- CSS modal pop-ups
- Flash-based interactions and menus
- WYSIWYG editors
- Rich datagrids

JavaScript UI Libraries

There are dozens of JavaScript UI libraries for implementing rich controls. The great question is: do they work on mobile browsers? [Table 9-10](#) show the results for six libraries:

- Yahoo! UI (<http://developer.yahoo.com/yui>)
- jQuery UI (<http://www.jqueryui.com>)
- Sencha (formerly Ext JS) (<http://www.sencha.com>)
- Microsoft Ajax Control Toolkit (<http://ajax.asp.net>)
- Google Web Toolkit (<http://code.google.com/webtoolkit>)
- Adobe Spry (included in Adobe Dreamweaver; <http://labs.adobe.com/technologies/spry>)

Table 9-10. UI libraries compatibility table

Browser/platform	Yahoo! UI	jQuery UI	Sencha	Control Toolkit	GWT	Adobe Spry
Safari	Yes	Yes	Yes	Yes	Yes	Yes
Android browser	Yes	Yes	Partial	Yes	Yes	Yes
Symbian/S60	Yes	Yes	Yes	Yes	Partial	Yes
Nokia Series 40	No before 6 th edition		Yes	Yes	Yes	Yes
webOS	Yes	Yes	No	Yes	Yes	Yes
BlackBerry	No before 5.0		Yes	Yes	Yes	Yes
NetFront	No	Yes	Yes	Yes	Yes	Yes
Internet Explorer	No	Yes	Yes	Yes	Yes	Yes
Motorola Internet Browser	No	Yes	Yes	Yes	Yes	Yes
Opera Mobile	Partial	Yes	Yes	Yes	Yes	Yes
Opera Mini	Yes	Yes	Partial	Partial	Yes	Yes

Mobile-specific UI libraries

Many UI libraries have appeared on the market in the past few years to facilitate mobile RIA development. Unfortunately, most of them were designed for specific platforms, but with minor changes or incompatibilities many of them should work on any device.

The browser with the most specific platform is mobile Safari, and lots of libraries allow us to create rich applications emulating native control behaviors for iOS. Common UI libraries for iPhone include:

- iUI (<http://code.google.com/p/iui>)
- jQTouch (<http://jqtouch.com>) and Sencha Touch (<http://www.sencha.com/products/touch>)
- iWebKit (<http://iwebkit.net>)
- WebApp.Net (also officially compatible with Android; <http://webapp-net.com>)
- ciUI (a C-NET alternative to iUI; <http://code.google.com/p/ciui-dev>)
- Universal iPhone UI Kit: (<http://code.google.com/p/iphone-universal>)
- Magic Framework (<http://www.jeffmcfadden.com>)

- Safire (<http://code.google.com/p/safire>)

The only official Android libraries are WebApp.Net and Sencha Touch. The others should work with Android, too, but there may be some bugs in animations and effects (because of the Apple extensions in Safari).

Symbian devices have a new library that is optimized for widgets (discussed in [Chapter 12](#)) but also works on browser-based documents for some of the controls available. It is called the Guarana UI and is a jQuery UI-based library for the Symbian WRT browser. The library is available at <http://wiki.forum.nokia.com> and a control UI tester (for desktop browsers) can be found at <http://www.jappit.com/m/guaranabrowser>.



An updated list of UI libraries for mobile browsers can be found at <http://www.mobilexweb.com/go/ui>.

Let's take a closer look at the two most often used libraries for iPhone: iUI and jQTouch, shown in [Figure 9-4](#).

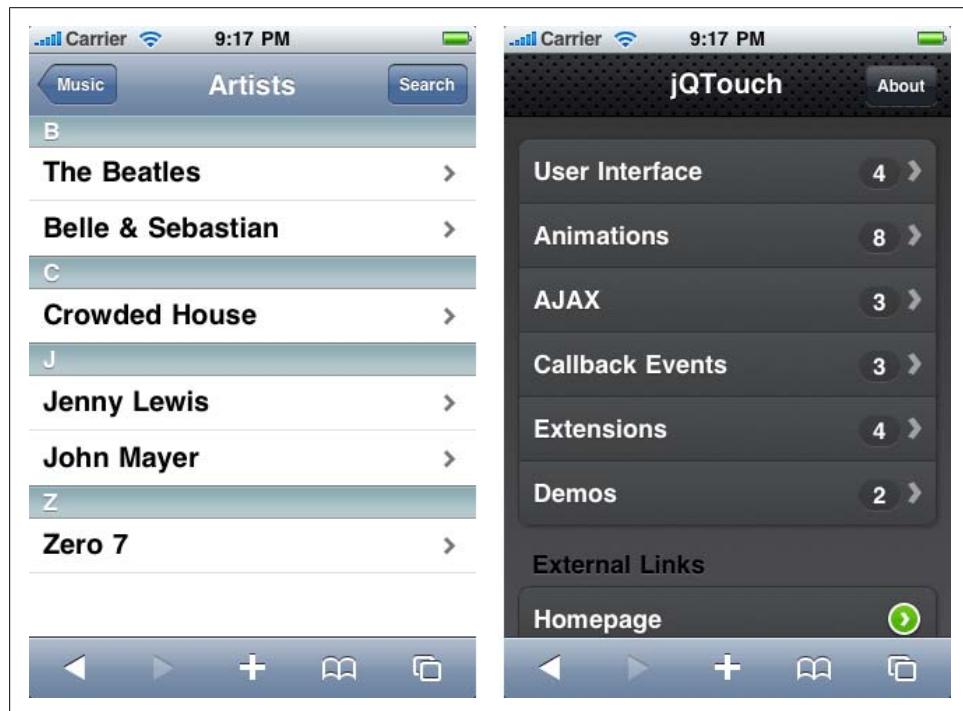


Figure 9-4. With simple code we can create iPhone-like experiences like the ones shown here, using iUI (left) or jQTouch (right).

iUI. iUI was one of the first libraries developed for iPhone-style application development. It was developed by Joe Hewitt (<http://www.joejhewitt.com>), member of the Facebook developer's team and author of the popular Firefox plug-in FireBug.

iUI is a very simple to use, nonintrusive JavaScript library, including CSS and assets (generally backgrounds) that emulate the native iPhone application controls, animations, and application workflow.

The main features are:

- No JavaScript coding required
- Extends the behavior of standard HTML markup
- Overrides links and forms with Ajax requests
- Updates the page with smooth iPhone transitions with no code

The library uses the master-detail navigation method, copied from the `UITableView` control from Cocoa Touch. `UITableView` is a native control in iPhone.

The main structure of an iUI website is just a simple HTML file that includes CSS and JavaScript files and contains a `div` for the top toolbar and one `ul` for each “list page” we want to show:

```
<!-- Leave this toolbar div with no changes -->
<div class="toolbar">
    <h1 id="pageTitle"></h1>
    <a id="backButton" class="button" href="#"></a>
</div>
<!-- This is the home screen -->
<ul id="home" title="Home Page" selected="true">
    <li><a href="#first">First</a></li>
    <li><a href="#second">Second</a></li>
    <li><a href="#third">Third</a></li>
    <li><a href="ajax.html">Loaded by AJAX</a></li>
    <li><a href="more.html" target="_replace">More...</a></li>
</ul>
<ul id="first" title="Other Screen">
    ... other options ...
</ul>
... other pages
```

iUI uses the child element with `selected="true"` as the home screen when the page loads the first time, and every link with a hash (#) is a link to another screen that loads on the same page and is identified by the ID after the hash, *à la WML card*.

The toolbar is always present and the Back button works automatically, restoring the previous screen's title and using a smooth swipe animation to go back.

To reference an external file, we can use a normal link: it will load via Ajax and be inserted below the toolbar. The external file should only have a `ul` or `div` element without any other root tag.

We can also implement an in-site pagination design pattern using `target=" _replace"`. This will load the `href` document using Ajax and insert its contents where the `li` with the replace link is defined. This document should only have `lis` without any other root element, and it should end with another replace link if there are more elements to paginate.

Other advanced features that iUI supports include:

- Modal dialog pop-ups
- Form designs
- Emulation of native form controls
- Stripped tables
- Right toolbar button

You can find more samples of iUI usage at <http://www.mobilexweb.com/go/iui>.

jQTouch. jQTouch is a jQuery plug-in for iPhone web development that produces similar results to iUI, but with more powerful graphics and animations. It is also unobtrusive, but it does require some JavaScript code to initialize the page.

With some visual differences, it also works on the Android and webOS browsers.

The supported features include:

- Native WebKit animations using jQuery methods
- Callback events
- Flexible themes
- Swipe detection
- Extensions: floaty bar, geolocation, offline capability
- Visual controls
- Animations

To use jQTouch we need to first load jQuery 1.3.2 and then the jQTouch script with two CSS files: the base file (`jqtouch.min.css`) and the visual theme we want to load. For example:

```
<script type="text/javascript" src="http://www.google.com/jsapi"></script>
<!-- We load jQuery using the Google AJAX API -->
<script type="text/javascript"> google.load("jquery", "1.3.2"); </script>
<script type="text/javascript" src="jqtouch/jqtouch.min.js"></script>
<style type="text/css" media="screen">@import "jqtouch/jqtouch.min.css";</style>
<style type="text/css" media="screen">@import "themes/jqt/theme.min.css";</style>
```

To initialize the page, we can use:

```
<script type="text/javascript">
$.jQTouch({
    icon: 'iphone-icon.png',
    preloadImages: [
```

```

        'themes/jqt/img/chevron_white.png',
        'themes/jqt/img/bg_row_select.gif',
        'themes/jqt/img/back_button_clicked.png',
        'themes/jqt/img/button_clicked.png'
    ]
});
</script>

```

There are dozens of properties we can define at the initialization. You can find a list at <http://code.google.com/p/jqtouch/w>.



Chapter 12 will talk about how we can work in full-screen mode on an iPhone, eliminating the mobile Safari UI and allowing our web applications to be first-class citizens of the iPhone's home screen menu.

As in iUI, the main markup is done using top-level elements (in this case, `div`) with `ids` and links with hashes for linking in the same document. For example:

```

<div id="home" class="current">
  <div class="toolbar">
    <h1>jQTouch</h1>
    <a class="button slideup" id="infoButton" href="#about">About</a>
  </div>
  <ul class="rounded">
    <li class="arrow"><a href="#ui">User Interface</a> <small
       class="counter">4</small></li>
    <li class="arrow"><a href="#animations">Animations</a> <small
       class="counter">8</small></li>
    <li class="arrow"><a href="#ajax">AJAX</a> <small
       class="counter">3</small></li>
    <li class="arrow"><a href="#callbacks">Callback Events</a> <small
       class="counter">3</small></li>
    <li class="arrow"><a href="#extensions">Extensions</a> <small
       class="counter">4</small></li>
    <li class="arrow"><a href="#demos">Demos</a> <small
       class="counter">2</small></li>
  </ul>
  <h2>External Links</h2>
  <ul class="rounded">
    <li class="forward"><a href="http://www.jqtouch.com/">
        Homepage</a></li>
    <li class="forward"><a href="http://www.twitter.com/jqtouch">
        Twitter</a></li>
    <li class="forward"><a href="http://code.google.com/p/jqtouch/w/list">
        Google Code</a></li>
  </ul>
</div>

```

JavaScript Mobile UI Patterns

Mobile devices have had to develop alternate paths for handling common tasks.

Clear text box button

In their native UIs, touch devices have added a very nice feature to text boxes: the possibility of clearing all the text by touching a small X at the righthand side of the box (as shown in [Figure 9-5](#)). This is especially useful because of the lack of a keyboard. We can emulate this UI pattern easily by combining an image (or, as we'll see later, a canvas tag) and a little JavaScript code.

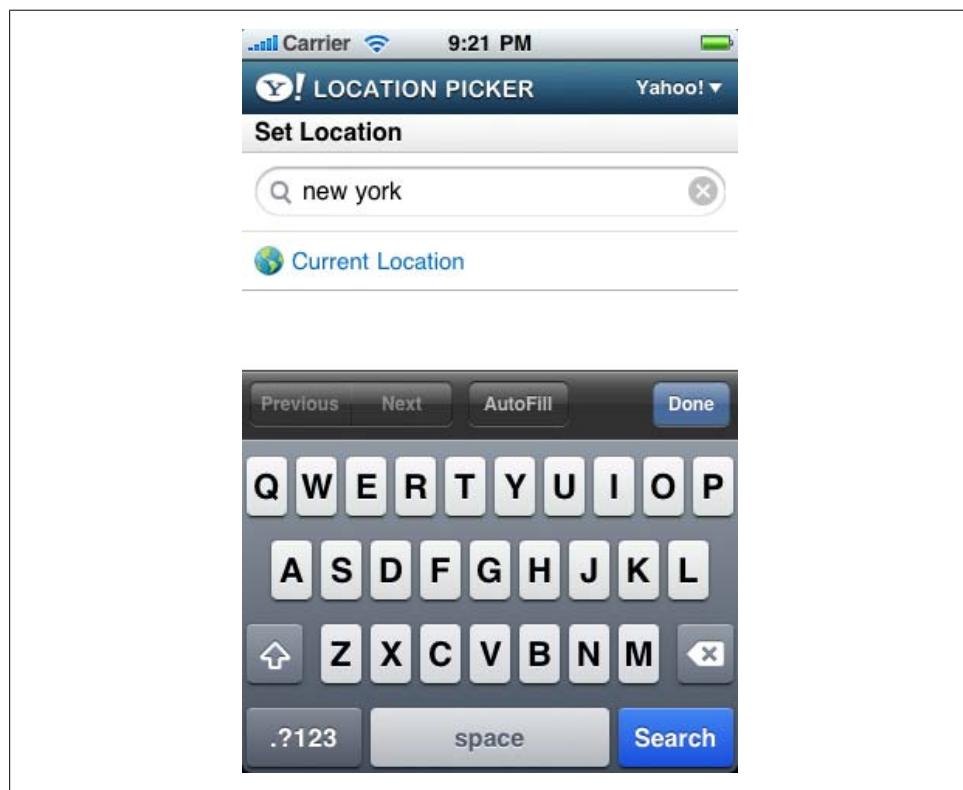


Figure 9-5. You can see this pattern implemented in the Yahoo! website for touch devices like the iPhone.

To implement the clear button, we can use a 20x20-pixel image (great for inline images in compatible devices) with the following CSS style. The image can be shown as a div with a background image from the beginning, or only when the user starts typing. It is important to add a right padding to the input box so the X is not overlapped by text:

```

<style type="text/css">
div.clearx {
    background: transparent url('clearx.png') no-repeat right;
    height: 20px;
    width: 20px;
    margin-top: -26px;
    position: absolute;
    left: 235px;
}
input.clearx {
    padding: 2px 40px 2px 10px;
    width: 200px;
    height: 24px;
}
</style>

```

The HTML should look like this:

```

<input type="text" id="search" placeholder="Enter your search"
       class="clearx" />
<div class="clearx"
     onclick="document.getElementById('search').value=''"></div>

```

Autogrowing textarea

This UI pattern was created by the Google Mobile team and is currently used in Gmail. The problem is that if we have a large amount of text in a textarea, scrolling inside it is very painful in some browsers (Safari on iOS is one of them). The solution is to grow the textarea to fit the contents, so the user can use the normal page scrolling instead of the textarea's.



All of these JavaScript UI patterns can be created using a nonintrusive, object-oriented approach with a little JavaScript work.

We can capture the `onkeyup` event and grow the textarea if necessary. We also need to capture `onchange`, because pasting in iOS doesn't generate an `onkeyup` event.

The complete solution is available at <http://www.mobilexcode.com/go/autogrowing>. The code, borrowed from the Google Code Blog with a few changes, is:

```

<script>
// Value of the line-height CSS property for the textarea.
var TEXTAREA_LINE_HEIGHT = 13;

function grow(event) {
    var textarea = event.target;
    var newHeight = textarea.scrollHeight;
    var currentHeight = textarea.clientHeight;

```

```
if (newHeight > currentHeight) {  
    textarea.style.height = newHeight + 5 * TEXTAREA_LINE_HEIGHT + 'px';  
}  
}  
</script>  
<textarea onkeyup="grow(event); onchange="grow(event);>  
</textarea>
```



The Google Mobile team are doing a great job with mobile web UI patterns and optimizations, and they release all the tips to the public in their blog: <http://googlecode.blogspot.com>.

Floating bar

Scrolling a large mobile page just to access a button or a link at the top of the document can be very painful. A floating bar is a great solution for avoiding this problem. A floating bar is just a full toolbar, a drop-down menu, or a mixture of both that always remains at the top (or bottom) of the page when the user scrolls the content.

It is not suitable for focus-based browsers, because there will be usability issues when the user is tabbing between links.



We need to create a custom floating bar solution because of the lack of `position: fixed` support in almost every mobile browser.

For floating bars to work, the browser needs to support the `onscroll` event. If the browser supports this event the toolbar moving can be done automatically, using a smooth animation on some browsers. You can decide whether to have the floating bar appear at the beginning of the navigation or only after scrolling.

The steps to create a floating bar (also known as *floaty bar*) are:

1. Create a `div` with the content of the floaty bar.
2. Define it as hidden off the screen with negative `top` values.
3. Define a WebKit transition animation (this will work only on compatible devices).
4. Capture `onscroll`.
5. If the value of `window.scrollY` (the top position of the scroll) is near zero, hide or move the `div` off the screen; if not, move the `div` (changing the `top` value) to the `scrollY` position.



For mobile Safari, there is a solution that will have better performance: instead of using a transition animation and changing the `top` value, we can use the `translateY` function and do a transformation animation. Transformations use hardware implementations for improved performance.

The following code produces a floaty bar with animation for compatible devices, similar to the one shown in [Figure 9-6](#):

```
<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN"
  "http://www.wapforum.org/DTD/xhtml-mobile10.dtd">
<html xmlns="http://www.w3.org/1999/xhtml"><html
  xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<title>Mobile Web Test Suite</title>
<style>

  p {
    font-size: xx-large;
  }

  #floaty {
    width: 200px;
    text-align: center;
    border: 2px solid red;
    -webkit-border-radius: 5px;
    background-color: silver;
    right: 0px;
    position: absolute;
    top: -50px;
    -webkit-transition: top 0.2s ease-out;
  }

</style>
<script type="text/javascript">
window.onscroll = function() {
  var floaty = document.getElementById("floaty");
  if (window.scrollY<10) {
    // It is near the top, so we can hide the floaty bar
    floaty.style.top = "-50px"; // out of the screen
  } else {
    floaty.style.top = window.scrollY + "px";
  }
}
</script>

</head>
<body>

<h1>Floaty Bar</h1>
<div id="floaty">
  This is a floaty bar
</div>
</body>
```

```
</div>  
  
<!-- Document goes here -->  
</body>  
</html>
```

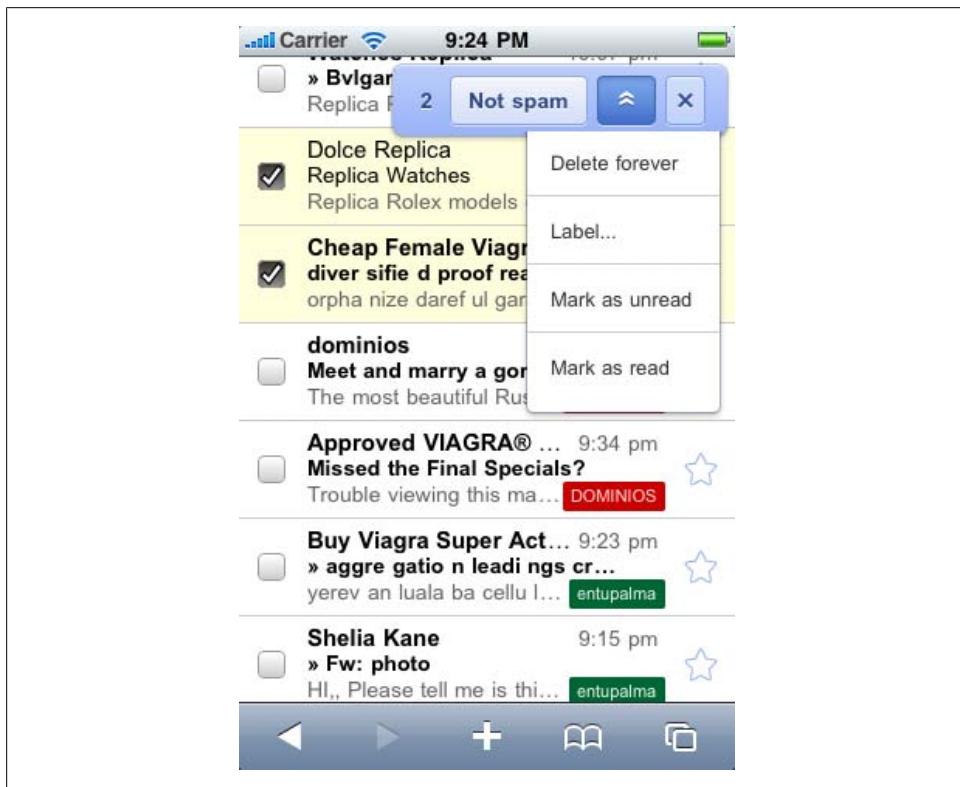


Figure 9-6. Here you can see my Gmail spam folder with a nice floaty toolbar at the top-right corner.

Cascading menu

A cascading menu should be used for large toolbars and only for touch devices. It can also be used in cursor-based browsers, but remember that in these browsers it may take the user a while to get the desired zone of the screen using the navigation keys.

As these menus will typically be used on touch devices, we should not use mouseover events to open and close the menu bar, and it is best to use `onclick` for both the opening and closing actions. We can also hide the menu when the user selects an option, scrolls the page, and moves the focus to another object.

A simple `div` show/hidden interaction with JavaScript will work, or (with care) you can use a JavaScript library for this purpose.

Autocomplete

An autocomplete (or autosuggest) feature to reduce the user's typing, like the one in Figure 9-7, is a great feature, but it is not as simple to implement in a mobile site as it is in a desktop site. There are two kinds of autocompletes: preloaded and Ajax-based. The preloaded ones involve downloading all the possible values to suggest (not recommended for more than 2,000 values) and storing them in JavaScript variables and then, if offline storage is available, storing them in the device for future usage.

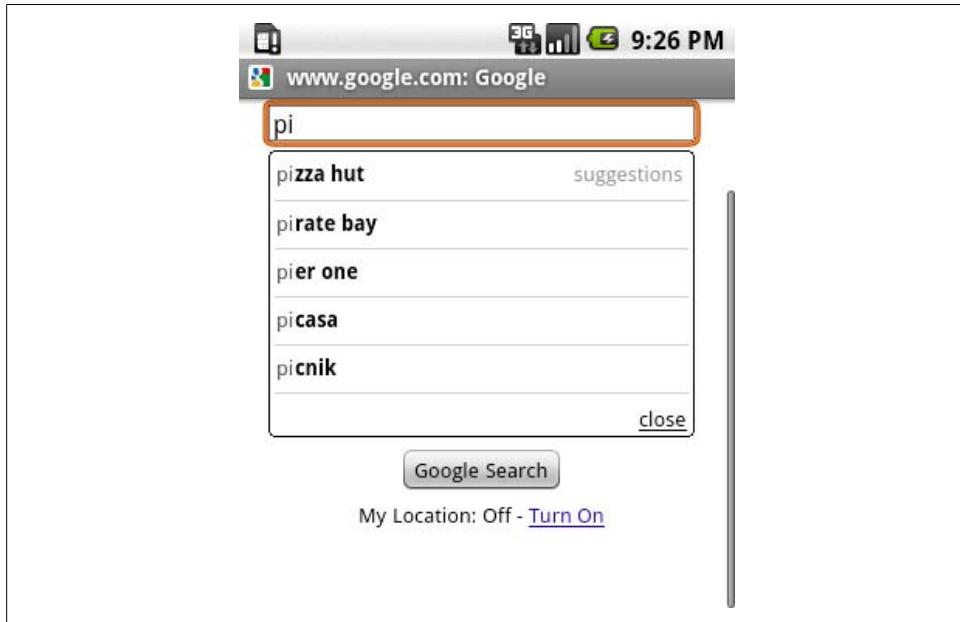


Figure 9-7. [Google.com](#) autocomplete on an Android device.

The first problem is the issue of network latency and consumption. If the user is using 2G technologies (GPRS, EDGE), the latency for going to the server or for preloading all the possible values can be long and costly. The second problem is the UI design, for a few reasons: generating a floating `div` over other elements can be problematic in many mobile browsers, and browsing between suggestions in non-touch devices can be difficult.



If you are going to use a JavaScript-based autocomplete solution, remember to deactivate the browser's standard autocomplete feature using `autocomplete="off"` in the text input.

All that aside, if we can save the users a lot of typing, we will be their heroes.

So, the first conclusion is that this solution is recommended only for touch-enabled smartphones, which we suppose are connected using WiFi or a 3G network. Next, we need to think about the design. The recommendation is not to use a floating `div` over other content, and instead to use a hidden `div` that replaces or pushes down the previous content. This `div` will appear just below the text box, and there must be a close button at the top-right corner.

Another thing to keep in mind for touch devices without QWERTY keyboards is that when the user has the focus in the text box (and our autocomplete feature is working), the virtual keyboard will be on the screen and there will not be much space available. One solution that will ensure that as much space as possible is available for the suggestion list is to scroll the document to the text box position when the user focuses in the text box. This will leave the text input just at the top of the screen, and with the keyboard at the bottom the middle will be open for our suggestion list (as we can see in [Figure 9-7](#)).



For BlackBerry 5.0, we can create local autocomplete solutions using the new HTML 5 `datalist` element, which we'll cover later in this chapter.

HTML 5

HTML 5 may not be finished yet, but it's already transforming a wide variety of mobile web development tasks.

The Standard

At the time of this writing, HTML 5 is a draft for the future standard for website markup. It will replace both XHTML 1.1 and HTML 4.0, adding new markup, deprecating some existing tags (like `font` and `center`), and adding some new JavaScript APIs. You can find the latest documentation at <http://dev.w3.org/html5>.

Mobile browsers are very hungry for new features in web applications, and this hunger has driven these browsers to have partial support of HTML 5 before it's available in desktop browsers. Many of the new elements that have been proposed (remember, HTML 5 is still a draft and in discussion) are semantic tags intended to reduce *divitis* (the abuse of the `div` tag). To this end, the draft standard includes new tags such as `section`, `article`, `footer`, `nav`, `video`, `audio`, `canvas`, and `command`.

It also adds support for new types of form controls, including `tel`, `search`, `url`, `email`, `datetime`, `date`, `month`, `week`, `time`, `number`, `range`, and `color`. For input tags, it also defines the attributes `placeholder`, `autofocus`, `required`, `autocomplete`, and `pattern`. (We've already discussed many of these new attributes, in [Chapter 6](#).)



Although this is not an HTML or JavaScript basics book, we are going to get deeper into some of the new HTML 5 features because they are new for almost every web developer. There are some new books appearing on the market for this new technology: visit <http://www.oreilly.com/css-html> for the latest books in this area.

Unfortunately, with a few exceptions (as shown in [Table 9-11](#)), the HTML 5 support in mobile browsers today is not about markup and attributes. It primarily includes the JavaScript API additions.

However, many of the new semantic tags (e.g., `section`, `article`, or `footer`) can still be used in smartphone browsers; they will just be ignored until support for them is added, and in the meantime we can emulate the incompatible tags and event behavior using CSS styles and JavaScript.

On compatible devices, the `video` and `audio` tags allow users to play the media object defined using the `src` attribute without having Adobe Flash Player or any other plugin installed. This object can be managed through JavaScript (playing/pausing/stopping and volume control). A great way to use progressive enhancement here is that the tags allow us to insert children for noncompatible devices, and we can use another player solution there:

```
<video src="video.avi" controls>
    <!-- This will be rendered on noncompatible browsers -->
    <object data="player.swf" type="application/x-shockwave-flash">
        <param value="video.flv" name="movie"/>
    </object>
</video>
```

[Table 9-11](#) reports on browser support for HTML 5 tags, tag emulation, and form controls.

Table 9-11. HTML 5 compatibility table

Browser/platform	Official tag support	Tag emulation	Form compatibility
Safari	canvas, audio, video	Yes	Partial: email, tel, phone, and number input types
Android browser	canvas	Yes	No
Symbian/S60	No	Yes	No
Nokia Series 40	No	Yes	No
webOS	canvas	Yes	No
BlackBerry	No	Yes	Yes, multiple input types from 5.0, datalist support
NetFront	canvas from 3.5	No	No
Internet Explorer	No	Yes	No
Motorola Internet Browser	No	No	No

Browser/platform	Official tag support	Tag emulation	Form compatibility
Opera Mobile	canvas	Yes	No
Opera Mini	canvas	Yes	No

Editable Content

HTML 5 introduces an attribute called `contenteditable` that allows almost any text HTML element to be edited by the user. For example:

```
<p contenteditable="true"> </p>
<div contenteditable></div>
```

The element will respond to text input events, like `blur` or `focus`. Almost all desktop browsers support this attribute, including Internet Explorer 6, because it was originally an extension of that browser. It has been used in many online tools for documents, spreadsheets, and presentation management.

No mobile web browsers currently support the `contenteditable` attribute, but WebKit-based browsers like Android and Safari can emulate this behavior using a `textarea` with a `-webkit-appearance` of `none`:

```
<textarea style="-webkit-appearance: none"></textarea>
```

The CSS style will remove the default visual design of the `textarea`, including borders.

New Input Types

As [Chapter 6](#) mentioned, HTML 5 adds new form input types that can be used on compatible devices. Incompatible browsers will generally show a typical text input instead.

The new input types include `number`, `email`, `search`, `url`, `color`, `date`, `datetime`, `time`, `week`, `month`, and `range`.

Even when the new fields invite the user to insert dates and numbers, we will always read the value as a string. The only difference from `type="text"` is some kind of visual hint to help the user with filling in the field: for example, when the input is defined as `email` the virtual onscreen keyboard changes to include an `@`, with `range` the user gets a slider, and select lists are provided for `date` inputs.

At the time of this writing, only BlackBerry 5.0 has full support for these new input types. Safari on iOS partially supports some of them, and it is very possible that other platforms will add this support soon.

The types that have specific attributes are `date` and `range` (and other date-related types, like `month`), which add two new attributes for limits: `min` and `max`. For example:

```
<input type="date" min="2010-01-01" max="2020-01-01" id="date" />
<input type="range" min="21" max="110" id="age" />
```

These new controls also accept the `step` attribute—for example, showing every 10 minutes in a `time` input control—but it seems that at the time of this writing no mobile browsers support it.

Data Lists

HTML 5 also adds a new `datalist` tag that is useful for autocomplete features. As of this writing, only the BlackBerry browser included with version 5.0 or newer of the operating system supports it.

We can define a data list with an ID and a set of child `option` elements:

```
<datalist id="dataCountries">
  <option>France</option>
  <option>Portugal</option>
  <option>Spain</option>
</datalist>
```

Then, we can use that list for suggestions in a text input, matching the `list` attribute with the data list's `id`:

```
<input type="text" id="txtCountry" list="dataCountries" />
```

The data list will not have any UI if it is not associated with one or more form elements. When the user focuses on an associated text input, the browser will suggest options regarding the data list.

On noncompatible browsers, the user may see the option's values. We can replace `<option>value</option>` with `<option label="value" />` to avoid this problem.

The `canvas` Element

The possibility of a drawing API was the dream of every web designer in the '90s, but it has only recently become available in browsers. `canvas` is an HTML element that defines a rectangular area where we can draw using a JavaScript API. The drawings are not vector-based, and we cannot browse through them using DOM or any other mechanism. `canvas` is not a competitor for SVG; it's just another way to generate dynamic graphics in a browser window.



`canvas` was originally defined by Apple in WebKit, and it is the oldest HTML 5 feature in the web developers' world. You will find a lot of resources on the Web on the usage of this element.

The only mandatory attributes are an `id` and the dimensions `width` and `height`:

```
<canvas width="300" height="300" id="canvas">
  Here goes text, images, or other tags for noncompatible browsers
</canvas>
```

The context

Once we have defined a canvas we get what is called a *2D context*: a JavaScript object that we can use for drawing bitmaps over that canvas.



Some desktop browsers add support for a very experimental 3D context, where we can draw in 3D coordinates and the browser renders the graphics. This is not available yet in mobile browsers.

We can get the context pointer using the following code, with the code checking for API support first:

```
var canvas = document.getElementById('canvas');
if (canvas.getContext) {
    // canvas is supported
    var context = canvas.getContext('2d');
}
```

Lines and strokes

Once we have the context, we can define the line type using the color properties `fillStyle` and `strokeStyle` and the integer property `lineWidth`. Then we can start drawing.

Drawing methods

The available drawing methods of the 2D context are listed in [Table 9-12](#).

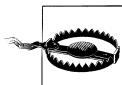
Table 9-12. Drawing methods in the HTML 5 canvas context

Method	Description
<code>fillRect(x,y,width,height)</code>	Draws a filled rectangle with the current styles.
<code>strokeRect(x,y,width,height)</code>	Draws a stroked rectangle with a transparent fill.
<code>clearRect(x,y,width,height)</code>	Clears the area and makes it transparent.
<code>beginPath()</code>	Begins a path drawing.
<code>closePath()</code>	Closes the shape by creating a line from the first path line to the ending path line.
<code>moveTo(x,y)</code>	Moves the pen to the coordinates for the next line in the path.
<code>lineTo(x,y)</code>	Draws a line from the current pen coordinates to the ones provided.
<code>arc(x,y,radius,startAngle,endAngle,anticlockwise)</code>	Draws an arc with its center at <i>x, y</i> and with the defined radius. The <i>anticlockwise</i> parameter is a Boolean value. Angles are defined in radians.
<code>quadraticCurveTo(controlx,controly,x,y)</code>	Draws a quadratic bezier curve.
<code>bezierCurveTo(controlx,controly,controlz,x,y)</code>	Draws a cubic bezier curve.
<code>stroke()</code>	Draws the path defined since the last <code>beginPath()</code> .

Method	Description
<code>fill()</code>	Closes the path defined since the last <code>beginPath()</code> and fills it.
<code>drawImage(x, y)</code>	Draws an image (<code>Image</code> JavaScript object) on the canvas. Other optional parameters also exist.
<code>createImageData(width, height)</code>	Creates an <code>ImageData</code> object with a <code>data</code> attribute that is an array of pixels to be manipulated as integers.
<code>getImageData(x, y, w, h)</code>	Gets an <code>ImageData</code> object from the current drawing to be manipulated.
<code>putImageData(image_data, x, y)</code>	Puts an <code>ImageData</code> object into the drawing.
<code>strokeText(string, x, y)</code>	Draws a stroked string.
<code>fillText(string, x, y)</code>	Fills a string.

An excellent example of drawing curves on a canvas is provided by Mozilla's documentation, which shows how to draw a dialog box with the following code:

```
context.beginPath();
context.moveTo(75,25);
context.quadraticCurveTo(25,25,25,62.5);
context.quadraticCurveTo(25,100,50,100);
context.quadraticCurveTo(50,120,30,125);
context.quadraticCurveTo(60,120,65,100);
context.quadraticCurveTo(125,100,125,62.5);
context.quadraticCurveTo(125,25,75,25);
context.stroke();
```



Remember that angles in the Canvas API are defined in radians, not degrees. To make the conversion we can use the formula `(Math.PI/180)*degrees`.

Advanced features

Some other advanced features for canvases include text shadowing, gradients, image scaling, transparency, fonts, line styles, patterns, and other drawing methods. Not all presently work with all canvas-compatible browsers, so running tests like the one shown in [Figure 9-8](#) is important.

Canvas compatibility

[Table 9-13](#) lists browser support for basic canvas functionality. For more information, samples, and code for `canvas`, visit <http://www.mobilexweb.com/go/canvas>.

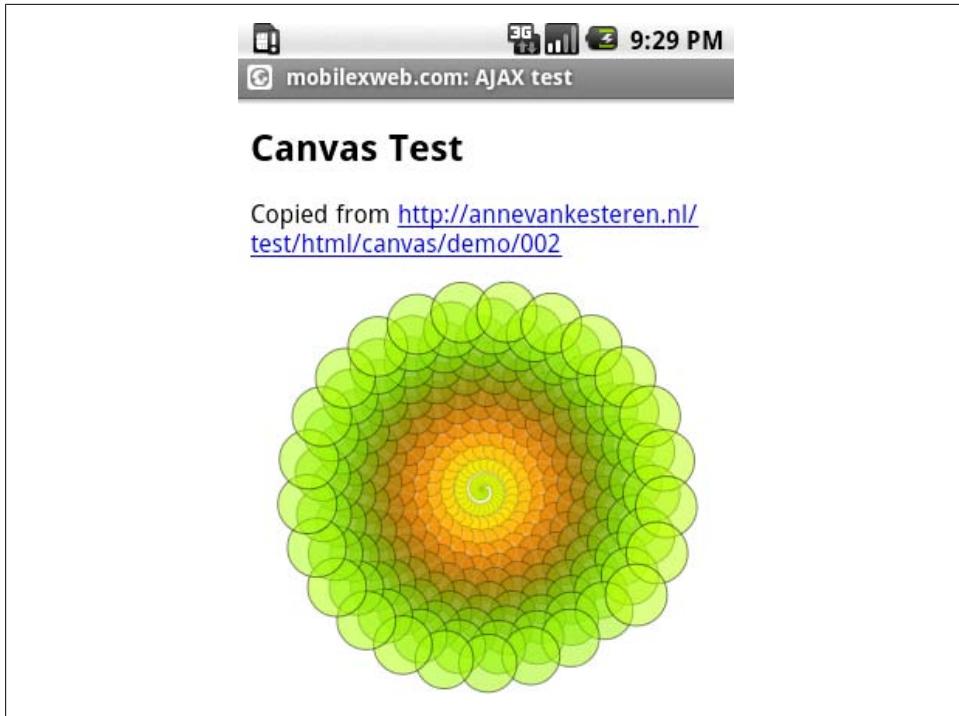


Figure 9-8. A nice canvas drawing sample created using only a few lines of code.

Table 9-13. HTML 5 canvas compatibility table

Browser/platform	Canvas support
Safari	Yes
Android browser	Yes
Symbian/S60	No
Nokia Series 40	No
webOS	Yes, with partial text support
BlackBerry	No
NetFront	No
Internet Explorer	No
Motorola Internet Browser	No
Opera Mobile	Yes
Opera Mini	Yes, rendered on the server

Offline Operation

HTML 5 allows us to create offline-capable websites using a mechanism known as *AppCache*. The concept is very simple. The user first opens the website in normal online mode, and it provides the browser with a predefined text file called the *manifest file*, which lists all the resources (images, stylesheets, JavaScript, etc.) we want to be cached for offline navigation in the future.

The next time the user visits the page, the browser will try to download the manifest file again to see if it has changed. If it has not changed or there is no Internet connection, the HTML document is loaded from the cache as well as all the resources in the manifest.



Google Gears (available in Android) supports a LocalServer API that emulates the offline manifest file with a JavaScript API. It will be replaced over time by HTML 5 in newer Android devices.

The architecture of our website will be exactly the same as if all the resources had been downloaded from the server. Images, stylesheets, and JavaScript scripts will be loaded, but they will be sourced from the cache instead of the server.

The manifest file

The manifest is a text file, served as `text/cache-manifest` and defined as the `manifest` attribute of the `html` element:

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

The file has to start with the line `CACHE MANIFEST`. This line can be followed by a series of relative or absolute URLs that we want to be cached for offline availability. We can comment lines by using a hash at the beginning of the line:

```
CACHE MANIFEST
# This is a comment
ourscript.js
images/logo.gif
images/other_image.jpg
ourstyles.css
```

After the initial page load the only request the browser will send is for the manifest file, to see if it has changed. If even a single character has changed, all the resources will be downloaded again so the current versions are available for the next load or for a reload action.

To ensure that the browser gets the most recent versions when any internal changes are made to the listed resources as well as when files are added to or removed from the list, the best and simplest way to update the manifest file is to use a comment with the

last modified date, a version number, or a hash calculated from all the resources' contents:

```
CACHE MANIFEST  
# Updated 2010-08-01
```

The standard also defined two subgroups inside the manifest file, but they do not work very well today on mobile browsers. The three groups are the **CACHE**—the implicit group we defined earlier—and the **NETWORK** and **FALLBACK** subgroups. In the network group we can define a series of folders, domains, or files that will always be fetched from the server, and in the fallback group we list a series of prefix (folder or resource) pairs. If the browser fails to download any resource from the server, it will use the other folder or resource defined in the same line.



Remember that the resources in the manifest will not be downloaded again until we update the manifest file or invalidate the AppCache.

These groups are defined as follows:

```
CACHE MANIFEST  
# resources  
NETWORK:  
# resources  
FALLBACK:  
# folder_first_option folder_if_fail  
CACHE:  
# This list is continuing the first resource list
```

Cache detection

`window.applicationCache` is the object JavaScript offers representing the AppCache engine. It has a `status` property that tells us what is happening with the cache. The possible values are listed in [Table 9-14](#).

Table 9-14. Status of applicationCache object

Value	Constant	Description
0	UNCACHED	This is the first load of the page, or no manifest file is available.
1	IDLE	The cache is idle.
2	CHECKING	The local manifest file is being checked against the server's manifest file.
3	DOWNLOADING	The resources are being downloaded.
4	UPDATEREADY	The cache is ready.



To use AppCache, we should use the HTML 5 DOCTYPE (`<!DOCTYPE html>`) in the HTML file.

If the application cache status is 0 our document is loaded from the network; otherwise, it is loaded from the application cache.

We can manually invoke the cache update process using the `applicationCache.update()` method. However, the new resources will not be served from the cache until the page is reloaded or we use the `applicationCache.swapCache()` method.



If your offline application needs to store custom images that are only for one user (for example, pictures of the user's contacts), you can create a manifest file dynamically for each user or, even better, store the images in base64 in offline storage for usage as inline images later.

Cache events

The `applicationCache` object supports many events, listed in [Table 9-15](#).

Table 9-15. Events available for applicationCache

Event property	Description
<code>oncached</code>	Executed after the first update process finishes
<code>onchecking</code>	Fired when the update process begins
<code>ondownloading</code>	Executed when the resources begin downloading
<code>onerror</code>	Fired when an error occurs in the cache
<code>onnoupdate</code>	Executed when the update process has finished but the manifest file hasn't changed from the previous load
<code>onprogress</code>	Fired when each resource starts downloading
<code>onupdateready</code>	Executed when the cache is ready after a new update process was started on an existing application cache

Debugging AppCache on iPhone

Debugging AppCache issues can be problematic at the beginning. To clear the cache in iPhone, go to Settings→Safari→Clear Cache.

If you want to see what AppCache has inside, you can find a SQLite database in the iPhone Simulator at `/Library/Application Support/iPhone Simulator/User/Library/Caches/com.apple.WebAppCache/ApplicationCache.db`.

More information on AppCache debugging can be found at <http://www.mobilexweb.com/go/appcache>.

[Table 9-16](#) reports on browser compatibility with AppCache.

Table 9-16. AppCache compatibility table

Browser/platform	AppCache support
Safari	Yes
Android browser	Yes, from 2.0 (Gears before 2.0)
Symbian/S60	No
Nokia Series 40	No
webOS	Yes
BlackBerry	No
NetFront	No
Internet Explorer	No
Motorola Internet Browser	No
Opera Mobile	No
Opera Mini	No



Web Workers is a possible HTML 5 feature that allows JavaScript to execute different threads at the same time. At the time of this writing, no mobile browser implements it.

Client Storage

Working offline is great, but there's a problem: where should a web application store vital statistics and other information when the device is not connected to the Internet? And if the device is not connected to the Internet, how can our applications access helpful databases or information? Client storage solutions come to our assistance, in two flavors: key/value storage and SQL databases (yes, from JavaScript, without server interaction).

Of course, we also have cookies, but they are simpler (only string storage), and we know they are not guaranteed to survive in the browser.

Key/value storage

HTML 5 defines a key/value store through two objects: `localStorage` and `sessionStorage`. They are pretty much the same, but the scopes are different: while the local store is used for long-term storage, the session store doesn't persist after the user closes the tab or window.



We should use `try/catch` blocks when saving items, in case problems occur with the storage or the maximum available space is exceeded.

Both stores are used in the same way:

```
// Save an object or variable in the store  
localStorage.setItem("name_in_the_storage", object_to_store);  
  
// Read an object from the store  
var object = localStorage.getItem("name_in_the_storage");
```

We can also delete all the objects using `clear` or delete one key using `removeItem`. There is also a `storage` event that we can listen for with `window.addEventListener` that will be fired when the contents of the local or session stores have changed.

SQL database

Having a relational database available in JavaScript sounds powerful. The main method that defines the availability of the JavaScript SQL database is the `window.openDatabase` method. This method has the following signature:

```
var db = window.openDatabase(shortName, version, displayName, sizeExpectable);
```

If we use a `try/catch`, we can capture errors during the operation. This method opens the database if it exists and creates it if it is the first time we've used it. To execute non-recordset sentences (`CREATE TABLE`, `INSERT`, etc.) we can use a transaction using the `transact` method, which receives a function as parameter. As a transaction, if one sentence fails, the others will not execute:

```
db.transact(function(t) {  
    t.executeSql('CREATE TABLE countries (id INTEGER NOT NULL PRIMARY KEY  
    AUTOINCREMENT, name TEXT NOT NULL)', [], function() {}, errorHandler);  
});
```

The array parameter after the query string is an array of parameters to be replaced in the query (using `?` inside), the next parameter is the data handler function (not used in a non-recordset query), and the last parameter is a function handler for errors in the query.



HTML 5 doesn't define which database engine should be used. Mobile browsers use SQLite, the open source database engine, so check the SQLite documentation for data type and SQL syntax support.

To create a typical `SELECT` statement with recordset looping, we can use the following template:

```
db.transact(function(t) {  
    t.executeSql('SELECT * FROM countries', [], countriesHandler, errorHandler);  
});  
  
function countriesHandler(transaction, data) {  
    var record;  
    var id;  
    var name;
```

```

        for (var i=0; i<data.rows.length; i++) {
            // We get the current record
            record = data.rows[i];
            id = record['id'];
            name = record['name'];
            // Do something with record information
        }
    }

    function errorHandler(transaction, error) {
        alert('Error getting results');
    }

```



JavaScript databases support versioning, allowing us to change schema on newer versions of our applications and detect what the current version installed on the client is, to create a migration procedure.

If you were working offline you should implement a synchronization method, using Ajax to download changes from and upload them to the server.



Safari on iOS accepts up to 5 MB in offline storage without user intervention. If you try to save more than 5 MB, the user will need to approve it (an automatic alert will appear).

Gears storage. Google Gears (<http://code.google.com/apis/gears>) is an open source project that enhances web browsers and JavaScript with more functionality, much of which is part of the HTML 5 draft. Android 1.X supports only Gears, and we can also use SQL databases with Gears. The normal usage is simple and synchronous, as the following sample demonstrates:

```

<script type="text/javascript" src="gears_init.js"></script>
<script type="text/javascript">
var db = google.gears.factory.create('beta.database');
db.open('countries');
db.execute('CREATE TABLE countries (id INTEGER NOT NULL PRIMARY KEY AUTOINCREMENT,
name TEXT NOT NULL)');

var rs = db.execute('SELECT * FROM countries');

while (rs.isValidRow()) {
    var id = rs.field(0);
    var name = rs.field(1);
    // Do something
    rs.next();
}
rs.close();
</script>

```

Fortunately, Google is working on an open source project that gives us an abstraction layer for both HTML 5 databases and Gears databases using the same code. The project is called the Web Storage Portability Layer and it is available at <http://code.google.com/p/webstorageportabilitylayer>.



Safari on iOS allows you to view stored databases and delete them from the device using Settings→Safari→Databases.

With this new layer, we can use the following code for select queries in both frameworks:

```
var database = google.wspl.DatabaseFactory.createDatabase('countries',
    'http://yourdomain/dbworker.js');
var statement = google.wspl.Statement('SELECT * FROM countries;');

database.createTransaction(function(tx) {
    tx.executeAll([statement], {onSuccess: function(tx, resultSet) {
        // Statement succeeded

        for(; resultSet.isValidRow(); resultSet.next()) {
            var id = resultSet.getRow()['id'];
            var name = resultSet.getRow()['name'];
        }
    }, onFailure: function(error) {
        // Statement failed
    }});
}, {onSuccess: function() {
    // After transaction commits, before any other starts
}, onFailure: function(error) {
    // After transaction fails, before any other starts
}});
```

Client JSON store

Prepared for mobile devices, *Lawnchair* is a local client JSON store that uses HTML 5 features behind a very simple API. You can download the library from <http://brianleroux.github.com/lawnchair>.

To create a store, we just use code like this:

```
var countries = new Lawnchair('countries');
```

Then, we can save an object synchronously:

```
countries.save({id: 5, name: 'Spain'});
// Object saved
```

or asynchronously:

```
countries.save({id: 5, name: 'Spain'}, function() {
    // Object saved
});
```

We can also save it using a key/value mechanism for easy retrieval:

```
countries.save({key: 5, value: 'Spain'});

var spain = countries.get(5);
```

And we can easily get all the documents using:

```
countries.all(function(country) {
    // We receive every country in this function
});
```

We can also remove documents, clear all the storage, and create iterators for easy filtering.

Web Compatibility Test

In 2010, the W3C created a test to score mobile browsers in terms of their RIA, Ajax, and HTML 5 support. The Web Compatibility Test for Mobile Browsers, available at <http://www.w3.org/2010/01/wctmb2>, verifies compatibility with Ajax, the `canvas` HTML tag, the `contenteditable` attribute, geolocation, HTML 5 input forms, the off-line AppCache, the `video` and `audio` HTML 5 tags, Web Workers, local storage, session storage, and `@font-face`. There are currently no mobile browsers that score 100%.

Some results are:

- iPhone 3.0: 83%
- Firefox 3.5 for Maemo: 83%
- Bada Browser: 75%
- Android 1.6–2.1: 67%
- Opera: 33%
- Symbian 5th edition: 17%
- webOS: 17%
- NetFront 3.5: 8.33%

Server-Side Browser Detection and Content Delivery

Until now, this book has only discussed the client side of mobile web development. Server-side development has an especially important part to play here, though, not only because of all we know about dynamic content generation, but because the server is the only place where we can easily make decisions about what content to send to which devices.

In this chapter we will look at device detection and content delivery, and introduce the creation of a content store. The server also manages the MIME types of content, a very important feature we need to define for good compatibility in the mobile world.



We can use any server-side platform, server, and/or programming language. For the purposes of clarity our samples will use PHP, although this chapter will provide short tips for ASP.NET and Java as well. You can easily export these techniques to any other server platform.

Mobile Detection

Before talking about detection of mobile devices and services on the server, we need to go back a bit and consider an old friend: the HyperText Transfer Protocol, also known as HTTP. Knowing a bit about its internals will help us determine what we can do in terms of mobile web development.



There are no special server requirements for mobile websites; you can just use the same Apache, Internet Information Server (IIS), or other server you are currently using for desktop websites.

HTTP

HTTP is a protocol originally defined in 1991 for document transportation over TCP/IP networks. It has two main versions: 1.0 and 1.1 (the last and current version of the protocol, defined in 1996). This same protocol is the one that we need to use from the server side in mobile web development.

Actually, the last sentence isn't strictly true if we consider WAP 1.1, where the device communicates with the WAP gateway and the WAP gateway is the one connecting to our server via HTTP. A similar approach is used in proxied browsers, like Opera Mini and Bolt (see [Figure 10-1](#)). However, from the server's point of view the requests coming in will always be HTTP requests.

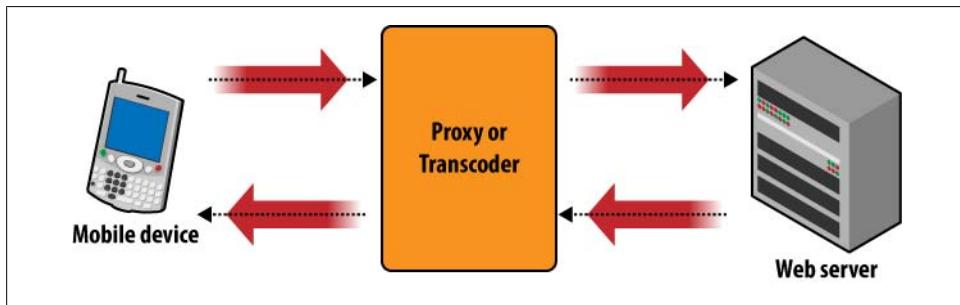


Figure 10-1. When the user is accessing our website via a proxied browser or a transcoder, we will not receive the request directly from the user's mobile device.

The request

An HTTP request involves a client (the browser) sending a request to a server using its IP address (previously converted from a domain name). That request has a header and an optional body. The body is generally sent when we are doing a `POST` request. The most common request type is a `GET`, requesting a document or a file from the server.



Verizon uses an Optimized View enhancement (a transcoder) for mobile websites that are not on one of the mobile addressing standards (`.mobi`, `wap`, `m`, etc.). If you want to avoid transcoding of your site you can make an opt-out request at <http://vzwdevelopers.com/aims/public/OptimizedViewOptout.jsp>.

The server responds with a response status code (hopefully not the famous 404), a header, and an optional (but generally sent) body. The body is the requested file.

Why are we taking this two-minute networking class? Because it illustrates many of the techniques we will use in server-side detection.

The request header

The request header has many attributes defined by the browser and sent to the server (if no proxy, gateway, or transcoder is in the middle). Some of the attributes that we will find useful are listed in [Table 10-1](#).

Table 10-1. Most common HTTP request headers

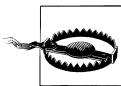
Header	Description
User-Agent	The name of the browser or platform that originated the request
Accept	A comma-separated values (CSV) list of MIME types accepted by the browser
Accept-Charset	A CSV list of charsets accepted by the browser (e.g., ISO-8859-1, UTF-8)
Accept-Language	A CSV list of preferred languages in the browser
Accept-Charset	A CSV list of compression methods available for the response (e.g., gzip, deflate)



Every mobile browser supports HTTP authentication, showing a modal window for username and password entry so the user can log into the website.

The following is the header of a real request from a mobile device to a server:

```
GET / HTTP/1.1
Host: mobilexweb.com
Accept: application/vnd.wap.wmlscriptc, text/vnd.wap.wml,
application/vnd.wap.xhtml+xml, application/xhtml+xml, text/html, multipart/mixed, /*/*
Accept-Charset: ISO-8859-1, US-ASCII, UTF-8; Q=0.8, ISO-10646-UCS-2; Q=0.6
Accept-Language: en
DRM-Version: 2.0
Cookie2: $Version="1"
Accept-Encoding: gzip, deflate
User-Agent: Nokia5300/2.0 (03.50) Profile/MIDP-2.0 Configuration/CLDC-1.1
x-wap-profile: "http://nds1.nds.nokia.com/uaprof/N5300r100.xml"
```



Many mobile browsers send /*/* as the list of accepted MIME types to avoid the server prefiltering the content that it can deliver using the Accept header. Other mobile browsers have known bugs in the MIME type lists that they provide.

The user agent

The user-agent string identifies the browser. It has had a complex history, with the result that today there are browsers that identify themselves as six different browsers at the same time in the same string. This somewhat complicates browser detection. There is an excellent history of the user-agent string, presented in a very funny way, at <http://webaim.org/blog/user-agent-string-history>.

In brief, as in the beginning of the web era developers often looked for a particular string in the `User-Agent` header to determine what content to deliver, many browsers, starting with Microsoft Internet Explorer, started using a hack that today has resulted in user agent hell. The hack was for Internet Explorer to identify itself as Mozilla (the way that the Netscape browser, IE's main competitor, was identified). After this initial identification, it clarified that it was not actually Mozilla, but rather a compatible browser (IE). Microsoft also added other information to the user-agent string, like the operating system and details on the plug-ins and languages supported. The end result was a very complex user agent syntax with no standards.

In the mobile world, the situation is even worse. Some browsers use the IE hack and identify themselves as Mozilla (with some clarification), others identify themselves with the correct browser name, and still others send the device brand and model number in the `User-Agent` header. Even the same device may provide a different user-agent string depending on the OS version or the firmware used. This makes device detection using this string a bit complex.



If you don't want your site to be transcoded, you can use `Cache-Control: no-transform` both in the HTML document and in the HTTP headers. Some transcoders use this information to decide whether or not to transcode a document, but there is no guarantee that this will work.

The following is a list of some mobile user-agent strings provided by a Nokia N95, a Nokia 3510, a Motorola v3, a BlackBerry, an iPhone 3.0, a Windows Mobile device, and a Japanese phone from the carrier Au:

- Mozilla/5.0 (SymbianOS/9.2; U; Series60/3.1 NokiaN95/20.0.015 Profile/MIDP-2.0 Configuration/CLDC-1.1) AppleWebKit/413 (KHTML, like Gecko) Safari/413
- Nokia3510i/1.0 (05.30) Profile/MIDP-1.0 Configuration/CLDC-1.0
- MOT-V3i/08.B4.34R MIB/2.2.1 Profile/MIDP-2.0 Configuration/CLDC-1.1
- BlackBerry8100/4.2.0 Profile/MIDP-2.0 Configuration/CLDC-1.1 VendorID/125
- Mozilla/5.0 (iPhone; U; CPU like Mac OS X; en) AppleWebKit/420+ (KHTML, like Gecko) Version/3.0 Mobile/1A538a Safari/419.3
- Mozilla/4.0 (compatible; MSIE 4.01; Windows CE; PPC; 240x320)
- UP.Browser/3.04-TS14 UP.Link/3.4.4

As you can see, there is no standard for this string. So, the initial approach is to search for some term—for example, “iPhone” or “Symbian”—to try to determine which device or platform a request has originated from. Don’t worry if this sounds nightmarish, though; in a few pages we will talk about a better solution.

iPad or iPhone?

When the iPad (the Apple tablet) came to the market, many thought that servers would automatically redirect iPad users to the iPhone versions of websites, if they existed. That is because the iPad uses iOS, just like the iPhone itself and the iPod Touch.

However, the iPad User-Agent header looks something like this:

```
Mozilla/5.0 (iPad; U; CPU OS 3_2 like Mac OS X; en-us) AppleWebKit/531.21.10  
(KHTML, like Gecko) version/4.0.4 Mobile/7B367 Safari/531.21.10
```

As you can see, it doesn't contain the word "iPhone," and that is one of the ways that developers detect usage of iPhone-based devices. It does include the word "Mobile," though, so if you are looking for that word you will be able to tell that the user is on a mobile device.

That said, because the iPad has a larger screen and can show more content than a mobile device, mobile websites are not ideal. Some big sites have created special iPad versions using mobile Safari extensions; these are neither the mobile nor the desktop web versions, but somewhere in between.

The iPod Touch does include "iPhone" in the user-agent string, because it is so similar (in terms of the operating system and screen size) to the iPhone itself.

What we can identify

Identification is useful for context definition. We need to remember that the user is a mobile user, and for these users the context is very important. We want to get all the information we can about that context, so we can provide the most useful experience possible.

The mobile browser doesn't send information about:

- The International Mobile Equipment Identity (IMEI) or serial number to identify the device uniquely
- The type of network used (WiFi, 3G, GPRS, EDGE, CDMA)
- The carrier (operator) providing service to the device
- The country of the user
- If the user is roaming
- The phone number of the user
- The device's brand and model number (not directly)

Some of this information (carrier, brand, and model number) can be inferred, but the other identification data will not be available. That is why we cannot identify users automatically without a login, as in desktop web applications.



If you are working closely with the carrier for your mobile website, you may be able to have yourself added to the WAP gateway's URL whitelist. You will then be able to receive a customer ID or phone number in a new nonstandard header.

Here's what we can glean from the device headers:

- The carrier and country, from the IP address of the request (if it is using a 2G or 3G network).
- The country (and maybe city or even location), from the IP address of the request (if it is using a WiFi network).
- The brand and model number, inferred from the `User-Agent` header.
- The language in which the operating system is defined.
- What markups and document types are accepted, if the header is not defined as `*/*`.



I can guess what you're thinking right now.... What about everything you told me in the last few chapters? How can we tell if the device supports CSS3 or Ajax? Wait a few pages, and you will have the answer.

The User Agent Profile

The `UAPerf` (User Agent Profile) is a voluntary standard defined by the Open Mobile Alliance (formerly WAP Forum). It takes the form of an XML file defining the abilities of the device, including its screen size, download features, and markup support.

The XML is defined by the manufacturer or the carrier, and a link to the XML is defined in a header (typically `x-wap-profile`). If you look back at the sample headers we saw earlier in this chapter, you'll see it:

```
x-wap-profile: "http://nds1.nds.nokia.com/uaprof/N5300r100.xml"
```

This URL will have been defined when the browser was created, which may have been several years before. If the URL is still working, we should get XML like the following extract:

```
<prf:ImageCapable>Yes</prf:ImageCapable>
<prf:Keyboard>Qwerty</prf:Keyboard>
<prf:Model>BlackBerry 8100</prf:Model>
<prf:NumberOfSoftKeys>0</prf:NumberOfSoftKeys>
<prf:PointingResolution>Character</prf:PointingResolution>
<prf:PixelAspectRatio>1x1</prf:PixelAspectRatio>
<prf:ScreenSize>240x260</prf:ScreenSize>
<prf:ScreenSizeChar>26x18</prf:ScreenSizeChar>
```

UAProf files have many problems. First, we need to download the XML for each request, process it, and either extract the properties we want or make a local copy on our

server. Second, the community has found lots of bugs and problems in this official information. Some devices (the iPhone, for example) don't define a UAProfile file, and they don't define the same properties. Also, UAProfile does not have the right granularity of information; for example, you can read that Flash is supported, but no information is there about which version.

So, another problem added to our list.

Detecting the Context

We've already seen how the network protocol works, and what information is provided and not provided in a mobile browser request. Now let's get some data and information from the context.

How to read a header

The specifics depend on the language, but all server-side platforms offer a way to read the request's header. Some languages use the same header as the parameter (for example, `Accept-Charset`), and others use a larger version with the syntax `HTTP_X`, where `X` is the header name in all uppercase and with the `-` replaced by `_` (for example, `HTTP_ACCEPT_CHARSET`).



Some Nokia devices expose a custom HTTP header that defines the connection type. The header is `x-nokia-musicshop-bearer` and the possible values are `WLAN` or `GPRS/3G`. We can try to read this header and, if it exists, get more information about the context.

In Java Servlets or JSP, we read a header using:

```
request.getHeader("header_key")
```

In ASP 3, we use this:

```
Request.ServerVariables("header_key_large")
```

And in PHP:

```
$_SERVER["header_key_large"]
```

In ASP.NET with C# or Visual Basic, we have a `Headers` collection and public members for most of the common headers:

```
// This is the C# version  
Request.Headers["header_key"]  
  
' This is the VB version  
Request.Headers("header_key")
```



Remember that BlackBerry devices have many browsers, as we saw in [Chapter 2](#). These devices also expose a custom HTTP `via` header that can be used to see which browser is being used. For example, if the value contains an `MDS` string, the user may be connected via the BlackBerry Browser through the corporate server; if it contains `BISB` the user is using the Internet Browser connecting through the carrier; and if the value is not defined, the user may be using the WiFi Hotspot Browser.

How to read the IP address

The IP address from which the request originated can be read with the following code:

```
// In Java  
String address = req.getRemoteAddr();  
  
// In PHP  
$address = $_SERVER["REMOTE_ADDR"];  
  
// In C#  
String address = Request.UserHostAddress;
```

What we can do with the IP address? The next chapter will talk about geolocation. However, if we want to define the user's carrier and country right now, we need to get an updated list of the IP ranges assigned to each carrier. The carriers distribute this information to their partners, and it can also be found in forums and communities or through commercial services.



Massive's Operator Identification Platform is a community-based database service that allows us to determine visitors' countries and network operators, if detected, using a simple HTTP service request. You can request an account at <http://www.werwar.com>. It is free for non-commercial sites, and commercial licenses start at \$10 per month.

Opera Mini

As mentioned earlier, there are some proxied browsers on the market (Opera Mini is the most widely installed), and we need to take care of differences in the headers in such browsers. Even on a well-known device, such as a BlackBerry or a Nokia N97, if Opera Mini is in use the requests we receive on our servers will come from the Opera Mini proxy and not from the device itself. So, the client IP address will be Opera's server address, and the user-agent string will be the proxy's one. On any device, the Opera Mini 5 user-agent string looks like this:

```
Opera/9.80 (J2ME/MIDP; Opera Mini/5.0.16823/1126; U; en) Presto/2.2.0
```

Fortunately, Opera Mini offers the original IP address and the original user-agent string, along with other information, in new headers (listed in [Table 10-2](#)) that we can read using the techniques we have already seen.



Opera Mini has a developer site at <http://www.opera.com/mini-devel> *oper* that offers tips and technical information about Opera Mini website development. Other intermediates are not as developer-friendly as Opera Mini and remove all the original headers, so we are blind in detecting the device and its origin.

Table 10-2. Opera Mini additional HTTP headers

Header	Description
X-OperaMini-Phone-UA	Provides the user-agent string identifying the device that downloaded the Opera Mini client (or the current device's user-agent string if not available).
X-OperaMini-Phone	Provides the device's brand and model, separated by a hash (<brand>#<model>).
X-Forwarded-For	Provides a CSV list of all the proxy servers in the chain that have forwarded the request from the device to Opera Mini's proxy. Opera recommends using the last IP address listed for geo-location purposes.
X-OperaMini-Features	Provides a CSV list of phone features, from the following list: <ul style="list-style-type: none">basic (Java MIDP 1.0 device, low resources)advanced (Java MIDP 2.0 device, high resources)camera (camera detected, so we can provide a file upload input for pictures)file_system (Java filesystem support detected, so the user can download and upload files)folding (content folding option is enabled)secure (connection between phone and proxy is encrypted)



Content folding in Opera Mini refers to the ability of the browser to group a series of links into a menu that can be closed and opened to gain space on the screen.

Mobile detection

If you only want to know whether the user is browsing from a desktop or a mobile device (perhaps for doing a redirection), the quickest way to find out is to check for some different well-known strings (iPhone, iPod, Nokia, etc.) inside the `User-Agent` header. Based on their presence or absence, you can make an educated guess about whether or not the user is on a mobile device.



There is an excellent collection of mobile-specific `User-Agent` headers at <http://mobiforge.com/developing/blog/useful-x-headers>.

Andy Moore has developed a very simple but powerful PHP script for detecting mobile user agents and browsers. The latest version (free for non-profit purposes) can be downloaded from <http://detectmobilebrowsers.mobi>.

You can find similar scripts in different languages at <http://www.mobilexweb.com/go/detection>.



Some devices support multipart document delivery. A multipart document includes XHTML and resources (images, CSS) in the same HTTP response, enhancing the download performance. To determine whether a device supports multipart documents, check for the `multipart/mixed` or `application/vnd.wap.multipart` MIME type in the `Accept` header. Visit <http://www.mobilexweb.com/go/multipart> for more information.

Transcoders

With WAP 1.1, operator gateways were required to precompile WML and make it lighter and more easily parsable by devices with limited memory/CPU resources. Gateways were also relied upon to manage cookies on behalf of the devices (which did not have enough memory) and for integration with the operator's backend (for example, the gateway was able to inject the users' phone numbers into HTTP headers, so that authorized content providers could recognize them and bill them for services).

With WAP 2 precompilation was no longer needed, but other aspects of gateways were and still are today, to some extent. In a lot of different contexts, the presence of a WAP gateway is beneficial to developers and content providers.

Around 2002, some companies started selling tools to “mobilize” web content. That is, users could type a URL into a field, and the transcoder/content reformatter would chop it up into pages that could be viewed by mobile devices.

Around 2006, some kind of genetic mutation happened: transcoder vendors realized that transcoders could be deployed in proxy mode and the whole Web could be transcoded behind the backs of the users and content providers, regardless of the presence of a mobile-optimized experience for any given site. This dangerous move posed a serious threat to the mobile ecosystem.

To help us to understand this problem, I contacted Luca Passani, CEO of WURFL-Pro and creator of the WURFL libraries we will analyze later in this chapter. He kindly answered my questions to keep us updated about this topic. The rest of this section was entirely written by Luca. For more information on this topic, see <http://wurfl.sourceforge.net/manifesto>.

What is a transcoder?

Defining transcoders requires a bit of care. Not only has the term “transcoders” been used in other industries, but there are also other terms in the mobile world that identify

mobile-web transcoders and what they do: notably, *content transformation* and *content adaptation*. Content transformation is basically a synonym for “transcoding,” but content adaptation can also refer to development techniques that, while they bear some similarities to transcoding, are more traditional (and legitimate) approaches to the creation of mobile websites.

When you say “transcoders” to mobile web developers, they’ll most likely think of the proxies (from companies such as Novarra, InfoGin, Openwave, and ByteMobile) that network operators (Vodafone, Verizon, Sprint, etc.) install in their networks to intercept desktop web pages on their way to mobile devices and “reformat” them. By “reformatting,” I mean one or more of the following:

- Splitting a full page into several smaller pages (which are supposedly more manageable for mobile devices)
- Replacing the original graphics with images of lower size (and lower quality)
- Adding an operator navigation bar on every page
- Injecting advertising from unknown sources
- Disabling mechanisms to detect successful download of applications, Java ME MIDlets, and other downloadable content

A less obvious effect of transcoders is that they often intercept and modify HTTP requests, removing the UAProf and/or the original user-agent string (which is key to recognizing devices and their capabilities).

I sometimes refer to transcoding as content transformation, but I never use “content adaptation” in this context because it would be very likely to generate confusion.



It is important to observe that WAP gateways are also proxies, but typically they do not interfere with the content that goes through them.

Why are transcoders a problem?

If you are a content provider or you build mobile websites, transcoders will make you furious. As soon as an operator deploys a transcoder, you will notice that you are unable to recognize devices using that operator’s network and its transcoder. If you have invested time and money in installing a framework to recognize mobile devices, all of your work will be lost: all you will see are web browser requests hitting your server. But that’s not all. Your branding is very likely to be disrupted, and so is your business model if, for example, you are no longer able to bill your customers directly, or if the ad banners you were injecting into your pages get discarded. These are things that have happened in practice and driven people mad. The icing on the cake was when operators started injecting their own advertising into other people’s content, trying to monetize

other people's efforts. It is no surprise that this has caused huge uproar amongst transcoder "victims."

Parties involved in the transcoding problem

There are two main culprits behind the mess caused by transcoders: operators and transcoder vendors. Transcoder vendors have been guilty of telling operators, "Look, we have this fantastic technology that will bring the entire Web to all of your users. Loads of fantastic content you don't need to pay for. Isn't this great? And who cares if people who have invested millions in creating mobile sites complain...We are the future, after all!" This was deeply irresponsible, but of course part of the blame goes to the operators who actually believed this story, decided to deploy transcoders, and were flooded by a wave of complaints and thrown into disrepute. Of course, I had a role in making mobile developers focus on the problem in detail, but there were thousands of irritated developers who backed me instantly when I blogged about the issue.

What was the response from carriers after receiving complaints?

Officially, the carriers were silent. After all, these are huge organizations, and getting anyone to stand up and talk on behalf of their employees is simply not realistic. Behind the scenes, I got loads of support from people working for operators (particularly Vodafone Global, Germany, and UK). They recognized that I was right and that the decisions taken at the top floors were wrong.

Practical tips

There are some practical tips to be given, such as using XHTML MP as the markup or adding the `Cache-Control: no-transform` header to all your HTTP responses. They are all contained in the "Manifesto for Responsible Reformatting" at <http://wurfl.sourceforge.net/manifesto>. Yet, I don't think that these alone are enough.

I firmly believe (and so do virtually all developers I have talked to) that developers have a right to a "clean" HTTP. They have the right to see HTTP headers as sent by the devices, *and* they have the right to insist that transcoders keep their dirty hands off other people's content. Therefore, the main practical tip I want to give is not actually a very technical one: make noise. Complain. Blog and tell the world that operator X or Y is doing something wrong. Get a lawyer to send a letter to the operator and complain about copyright infringement. Using a metaphor, mugging someone to steal his wallet is a more serious offence than simple pickpocketing, yet pickpocketing is still a crime that should be prosecuted, and advice such as "stay home," "hire a bodyguard," or "don't carry your wallet in your pocket" just doesn't cut it! We have the right to live and work in a better ecosystem; transcoders are the law of the jungle.

Operator whitelists

Some operators offer whitelists where you can explicitly opt your site out of transcoding. Whitelists are not the way to go, though. Accepting whitelists means accepting the law of the jungle. If we were to agree to whitelisting our sites with each and every operator around the planet, we would effectively be giving operators a right they do not have (and *must not* have). The network and HTTP must be the same for everyone, or this would represent a giant step back for the whole mobile industry. Just think of what the Web would be today if website creators had to “register” their websites with different ISPs around the globe....

Making content transformation a standard

Transcoding is stealing. How do you standardize stealing? There is only one answer: you don’t. Stealing is illegal and must remain that way. Of course, transcoding vendors (mainly Novarra Inc., now part of Nokia) are trying to convince the W3C to create “quasi-standards” that allow transcoding in some instances, which in real deployments will naturally translate into “whenever the heck we want.” The problem here is that the corporations who sit at the W3C table call the shots in their own interests.



Nokia acquired Novarra Inc. in 2010, and at the time of this writing there is no information about how the Novarra transcoding politics will evolve.

For those who are curious, Novarra’s attempt at getting the W3C to ratify its way of doing transcoding (its Guidelines for Web Content Transformation) is available online at <http://www.w3.org/TR/ct-guidelines>.

Transcoder detection

There is an ongoing battle between transcoder vendors and the rest of the mobile ecosystem. There are ways to recognize a transcoder, by checking certain headers (either their values, or simply checking for their presence). Again, the Manifesto has more information. The problem is that the business model of transcoder vendors (transcode as much as you can) is in direct conflict with the business model of content owners (protect your content as well as you can). For this reason, transcoders are progressively making it harder for others to detect them, by removing those hints from HTTP requests. A day may come when developers will need to maintain a list of IP ranges to identify transcoders and treat requests coming from them specially (again, don’t forget to complain loudly if you spot one).

What to do after detection

Assuming you have detected a transcoder, adopting the Cache-Control: no-trans form header and using mobile-specific MIME types and DTDs (XHTML Mobile Profile, for example) is your best bet to prevent your content from being touched. Serving your content from a hostname with a pattern such as *m.**, *wap.**, or **.mobi* will usually also help.

I say “help” because this is not a guarantee. Your content is still at the mercy of the operators’ transcoder policies, and nobody will go after them on your behalf if they decide not to respect your directives.



Novarra and InfoGin are the two largest companies in the transcoding field. Other names include Openwave, ByteMobile, and Volantis.

Device Libraries

As we’ve discussed, just looking at the HTTP headers and the UAProf will not give us enough useful information about the mobile devices that are accessing our websites. This is where device libraries come to our help. Device libraries are offline databases (or online web services) that take a user-agent string (or all of the request headers) and return to us dozens of properties about the detected device, from screen size, to Java ME compatibility, to Ajax support and video codec compatibility.

WURFL

Wireless Universal Resource File (known as WURFL) is a community-based, open source device capabilities repository created and maintained by the developer Luca Passani (<http://passani.it>), a fellow member of the Forum Nokia Champion program and author of the preceding section on transcoders.

The library is available in the form of an XML file. While updates to WURFL data happen every day on the WURFL DB, a publicly available “snapshot” of the DB is produced and published about once per month on the WURFL website.

WURFL can be downloaded for free from <http://wurfl.com>, and any suggestions, questions, or bugs can be discussed in the mailing list, <http://tech.groups.yahoo.com/group/wmlprogramming>.



If you are having doubts about how to pronounce WURFL, you can find a WURFL pronunciation link on the library’s home page, where you can listen to the word in English and Italian.

The sources of information include official technical information published by manufacturers, UAProf files, and data collected by the community after testing on real devices. Today, the WURFL database contains thousands of devices (11,000 profiles, 7,000 of which have a unique brand and model), with information on subversions, operating systems, firmware and hardware variations, and hundreds of attributes that we can query for each one.

Architecture. WURFL groups the devices into a hierarchy of devices and attributes. Some devices are equivalent to other devices from the same series, possibly with some new features, so there is a fallback mechanism in WURFL allowing a device to extend the features of another one. The same applies for different models in the same brand or even different brands with the same operating system.

Also, there is a feature called “actual device root” that manages multiple subversions (different firmware) of the same device, so the information is not duplicated in two records; the subversion will be based on the main record with any added or different abilities noted.

The WURFL database has a root fallback device called “generic device” that is matched when the device, the brand, and the series can’t be determined.

Patch file. What should you do if you need to make changes to the WURFL XML, whether to identify new devices or bugs that you’ve found or to add new private or public capabilities to be queried? Changing the original WURFL XML would be impractical, because you would have problems in the future when you wanted to download updates from the site.

That is why a *patch file* is included in the WURFL architecture. A patch is like a mini-WURFL (similar syntax, but typically a lot smaller in size). The WURFL API will merge the patch information with the information in the WURFL database when the service starts.



If you find a bug, new devices, or capabilities that aren’t private to your development, report them to the WURFL team or apply to become a WURFL contributor.

You can register to become a contributor by following the instructions at http://db.wurflpro.com/static/become_a_contributor.htm. You will be required to study religiously the WURFL conventions, available at <http://db.wurflpro.com/static/top.htm>.

Remember, this is a community project, and we are all part of the community.

WURFL is intended for use on mobile websites; that is why this library does not detect desktop browsers, or if they are detected misidentifies them as some fallback mobile. If users may access your mobile website from their desktops and you want to be able to detect that using WURFL, you can download a *web patch* that will detect desktop

web browsers like Firefox and Internet Explorer. You'll need to merge this patch with the main XML.



If you find a `generic_device`, this is a device that is not included in the WURFL database. It's good practice to log and report this information and the user agent received so it can be investigated and recognized in the future.

Capabilities. Every ability, property, or attribute is called a *capability* in the WURFL world. Capabilities are organized into groups. Each capability for each device has an optional string value (taken from the device itself, or from the fallback mechanism). That value can be converted to a Boolean, a number, a string, or an empty string.

The most useful groups at the time of this writing are shown in [Table 10-3](#).

Table 10-3. Most useful WURFL capability groups

Group name	Capabilities related to
<code>product_info</code>	Device information, such as the brand, model, operating system, and browser
<code>wml_ui</code>	WML rendering, including soft key support, WTAI support, and table support
<code>chtml_ui</code>	cHTML rendering
<code>xhtml_ui</code>	XHTML rendering, including tel URI scheme support, accesskey support, iframe support, and file upload support
<code>ajax</code>	Ajax and DOM support, including support for getElementById, innerHTML, and CSS manipulation
<code>markup</code>	Markup compatibility
<code>cache</code>	Cache support
<code>display</code>	The screen and display (physical dimensions, resolution, line rows, etc.)
<code>image_format</code>	Image formats, including support for Animated GIF and SVG
<code>wta</code>	WTAI, including voice call support
<code>security</code>	Encryption, including HTTPS support
<code>bearer</code>	Networks, including WiFi and VPN support
<code>storage</code>	Limits (e.g., max URL length)
<code>object_download</code>	Formats and object downloading support for each typical format
<code>streaming</code>	Audio and video streaming per format and codec
<code>wap_push</code>	WAP Push attribute support
<code>j2me</code>	Java ME configuration and profile versions and API compatibility
<code>mms</code>	MMS support
<code>sms</code>	SMS support
<code>sound_format</code>	Support for audio codecs and formats
<code>flash_lite</code>	Flash support on the browser, for standalone applications, and for wallpaper or screensavers

Group name	Capabilities related to
css	CSS properties
transcoding	Whether the client is detected as a transcoder
rss	RSS support
pdf	PDF viewing support
playback	Formats that can be played by the device

As you can see, the information that the XML provides is really complete. If you want to browse all the capabilities, you can browse the XML with any reader or use the tools that come with the Java API. You can check the first device definition, as the generic device and fallback for all devices. If any property is not defined in the generic device, there will be no fallback value to use if the device does not define it.

Table 10-4 shows the most important capabilities we can query, based on the compatibility problems outlined in the preceding chapters. Remember that there are dozens of other properties that you can query; take a look at the library so you'll have an idea of all the possibilities.

Table 10-4. Most useful WURFL capabilities

Capability name	Type	Indicates...
brand_name	String	The device's brand name (e.g., Apple, Nokia, or HTC)
model_name	String	The device's model name (e.g., iPhone, N97, Nexus One)
marketing_name	String	The device's marketing name, including the brand, model, and possibly another part of the name (e.g., Pearl, Touch)
is_wireless_device	Boolean	Whether the device is a mobile device (<code>true</code>) or a desktop/notebook
pointing_method	String	Which pointing method is accepted (joystick, stylus, touchscreen, clickwheel, or the empty string)
has_qwerty_keyboard	Boolean	Whether the device has a QWERTY keyboard (virtual or physical)
nokia_series	Integer	The series (40, 60), for Nokia devices
nokia_edition	Integer	The edition of the series, for Nokia devices
nokia_feature_pack	Integer	The feature pack of the series, for Nokia devices
device_os	String	The name of the operating system
device_os_version	String	The version of the OS
mobile_browser	String	The name of the browser
mobile_browser_version	String	The version of the browser
resolution_width	Integer	The screen width in pixels
resolution_height	Integer	The screen height in pixels
max_image_width	Integer	The display's usable width in pixels
max_image_height	Integer	The display's usable height in pixels

Capability name	Type	Indicates...
xhtml_support_level	Integer	The level of XHTML compatibility, from -1 to 4: <ul style="list-style-type: none"> -1: No support 0: Basic support (poor or no CSS support, basic form support, basic or no table support) 1 and 2: Advanced basic support (basic CSS and table support) 3: Medium support, including excellent CSS support) 4: Advanced support, including Ajax support
preferred_markup	String	The markup best supported by the device (even if it supports a newer one)
xhtml_format_as_css_property	Boolean	Whether -wap-input-format is available
xhtml_make_phone_call_string	String	The prefix preferred for making phone calls in a URL
xhtml_send_sms_string	String	Whether and how the device supports triggering the SMS client from a link (can be sms:, smsto:, or the empty string, meaning not supported)
xhtml_file_upload	String	Whether the device allows file uploading (returns not_supported, supported, or supported_user_intervention)
xhtml_supports_iframe	String	Whether the device supports iframes (returns none, partial, or full)
ajax_supports_javascript	Boolean	Whether the device supports JavaScript with basic operations (dialogs, form values, timers, and document.location)
ajax_supports_getelementbyid	Boolean	Whether document.getElementById works on the device
ajax xhr type	String	Which syntax to use when creating an XMLHttpRequest object (none, standard for the native XHR object, msxml2 for the normal Microsoft ActiveX object, and legacy_microsoft for the older one)
ajax_support_inner_html	Boolean	Whether we can change the innerHTML property dynamically
ajax_manipulate_dom	Boolean	Whether typical DOM methods are available
ajax_support_event_listener	Boolean	Whether the browser allows event registration through event listeners
html_wi_oma_xhtmlmp_1_0	Boolean	Whether the browser supports XHTML MP 1.0
html_web_3_0	Boolean	Whether the browser supports HTML 3
html_web_4_0	Boolean	Whether the browser supports HTML 4
gif_animated	Boolean	Whether Animated GIF is supported
svgt_1_1	Boolean	Whether SVG 1.1 is supported
svgt_1_1_plus	Boolean	Whether SVG 1.1+ is supported
flash_lite_version	String	Which version of Flash is supported
fl_browser	Boolean	Whether the browser supports Flash content
is_transcoder	Boolean	Whether a transcoder was detected as a proxy from the real device

Capability name	Type	Indicates...
transcoder_ua_header	String	Which header we can find the original device's user-agent string in, if a transcoder was detected
multipart_support	Boolean	Whether the browser supports multipart documents

WURFL usage

You can use WURFL by browsing the file as you would any other XML file and matching user-agent strings, but the wheel has already been invented, and on the same website where you can download the XML you will find APIs for the most common server platforms: Java, PHP, and .NET (in beta at the time of this writing). Generally speaking you should use the new APIs available on the website, but for compatibility purposes you can still find old APIs to download.

These APIs allow us to use WURFL in a couple of lines, with many advantages:

- Automatic device detection using the header information
- Two-step user agent analysis (optimized and clever user-agent searching inside the XML)
- Detection of transcoders and proxies, and matching of the correct user agent and device information
- Merging of the static XML provided by WURFL with patches (the web patch or your own), providing a simple and unique way to query capabilities
- Caching of the XML parsing for the best performance on every request

PHP API installation. To use WURFL in PHP, you should download the PHP API from <http://wurfl.sourceforge.net/nphp> and extract the contents of the GZIP file. The package contains documentation, examples, resources, unit tests, and a *WURFL* folder where the API resides.



The PHP WURFL API allows us to save persistence and cache information using memcache instead of using the filesystem.

To make it work, follow these steps:

1. Copy the *WURFL* folder into your web server root folder.
2. Copy the *resources* or *examples/resources* folder into your web server root folder (you can change the name).
3. Download the latest *wurfl-<version>.zip* file from the website and copy it to the new *resources* folder (along with the *web_browsers_patch.xml* file, if you need it).
4. Create a *cache* folder inside the *resources* folder (or in another place, with a different name if you like) and verify that it PHP scripts have write permissions for this folder.

5. Edit the `resources/wurfl-config.xml` file and check that the `<main-file>` tag matches the name of the ZIP file containing the main XML repository. It can also be a decompressed XML file.
6. Edit the `resources/wurfl-config.xml` file, go to the persistence node, and check that the `<params>` tag matches the name of the `cache` folder, as in `<params>dir=cache</params>`. The path needs to be relative to the config XML folder.

Once WURFL is installed, we can create our first PHP script that uses the repository. Using version 1.0 of the API, the code will be:

```
<?php

require_once('WURFL/WURFLManagerProvider.php');
$configFile='resources/wurfl-config.xml';

$wurflManager=WURFL_WURFLManagerProvider::getWURFLManager($configFile);

$device=$wurflManager->getDeviceForHttpRequest($_SERVER);

?>
```

In API 1.1, the objects were changed and `WURFLManagerProvider` was deprecated. So, the preceding code should be:

```
<?php
define("WURFL_DIR", dirname(__FILE__) . 'WURFL/');
require_once(WURFL_DIR . 'Application.php');
$configFile='resources/wurfl-config.xml';

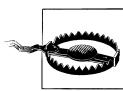
$wurflConfig=new WURFL_Configuration_XmlConfig($configFile);
$wurflManagerFactory=new WURFL_WURFLManagerFactory($wurflConfig);

$wurflManager=$wurflManagerFactory->create();

$device=$wurflManager->getDeviceForHttpRequest($_SERVER);

?>
```

If you run this file on your web server (local or remote), you will need to wait 1 or 2 minutes the first time while it creates the cache folder to enable quick detection in future requests. If you receive a blank page, great! If you get an error, you need to check all the steps again.



If you're working on a local server and are going to upload your website to another server using FTP or some other protocol, it will be better to not upload the cache folder because it will contain thousands of files. It is better to leave the server to recreate them locally.

Using the PHP API. The PHP API is an object-oriented API. Once you have the `WURFLManager` object, regardless of whether you are using version 1.0 or 1.1 of the API, you can use it.



If your server is too loaded, you may get a timeout error when processing WURFL the first time. If this happens, ask your server provider how to increase the maximum script time limit or change the *PHP.ini* file.

A typical usage is getting a device object using the manager's methods:

- `getDeviceForHttpRequest($_SERVER)`
- `getDeviceForUserAgent($user_agent)`
- `getDevice($deviceId)`

If you want to access the capabilities of the current device accessing your website, the first option is the best one. If you want to get properties for other devices, you can use the `user_agent` method or the `deviceId` method. Every device in WURFL has an ID that we can store in our databases for statistics or logs. We can then look for its capabilities later, after the mobile request.



You can browse the WURFL devices database using the free online tool Tera-WURFL Explorer, available at <http://www.tera-wurfl.com/explore>.

You can also get all the possible groups and capabilities using `getListOfGroups()` and `getCapabilitiesNameForGroup(groupId)`, both methods of the manager.

Once you have the device object, you can get all properties with the `getAllCapabilities()` method or query for one particular feature with `getCapability($capabilityName)`.

If you are using the desktop web patch, you can determine whether the client is a desktop or a mobile device:

```
if ($device->getCapability('is_wireless_device')==false) {  
    // It is not a mobile device  
    header('Location: http://yourdomain.com');  
}
```

To detect if it is an iPhone or iPod Touch, use:

```
if ($device->getCapability('brand_name')=='Apple') {  
    // It is an iPhone, redirect to a prepared version  
    header('Location: http://yourdomain.com/iphone');  
}
```

With the capability, you can then decide whether or not to provide some feature. For example:

```
if ($device->getCapability('xhtml_file_upload')=='supported') {  
    echo '<input type="file" />';  
}
```

A great option if you are offering content is to explicitly display to the user his phone model in the marketing information:

```
echo 'Download compatible content for your ' .  
$device->getCapability('marketing_name');
```



If you want to test whether your WURFL code is working on your desktop browser, you can use Firefox and the free plug-in User Agent Switcher that allows Firefox to change its user-agent string to that of any other device of your liking. We will cover this plug-in in [Chapter 13](#).

WURFL-related products. A lot of related tools, utilities, and frameworks are available at <http://wurfl.sourceforge.net>. These include:

- Device Thumbnails (a repository of device images for thumbnails on websites)
- Image Server (a Java servlet for dynamic conversion, scaling, and delivery of images to mobile devices)
- Tera-WURFL (a PHP and MySQL implementation of the WURFL repository)
- GAIA Image Transcoder
- PHP Image Rendering Library (works with an old version of the PHP API)
- Apache Mobile Filter



The Apache Mobile Filter is an open source solution for redirecting users to different versions using filters in an Apache module that looks into the WURFL database. It also supports image resizing. The project is available at <http://sourceforge.net/projects/mobilefilter>.

DeviceAtlas

In February 2008 (many years later than WURFL), the dotMobi company, which owns the *.mobi* top-level domain, launched its own device database that is similar in many ways to WURFL.

DeviceAtlas is a commercial product (with a free testing version for developers) available at <http://deviceatlas.com> that has partnerships with many data providers. According to dotMobi, this is not only the largest but also the most accurate device database on the market.

The main features are:

- Monthly, weekly, daily, or constant updates to the database, depending on your license
- A data explorer to browse the database from the Web
- JSON data format support

- APIs for PHP, Java, .NET, Python, and Ruby
- Apache server module (with the enterprise license)

At the time of this writing, the basic license costs \$99 per server per year and includes monthly updates but excludes the possibility to merge private data and other options available in higher license options.

Installation. You can apply for a free developer evaluation version at the website or buy a commercial version and then download the data and API from <http://deviceatlas.com/downloads>. You will receive by email the license key, which is valid for one year. You will also receive the direct links to download the data file (in JSON format) in ZIP format.



The W3C is trying to standardize the device database repositories in the Device Descriptions Working Group, currently in draft at <http://www.w3.org/TR/DDR-Simple-API>. DeviceAtlas is offering its database in this new format as a preview.

You can get an automatic update of the JSON file using the URL <https://deviceatlas.com/getJSON.php?licencekey=<license>&format=zip> (inserting your license key in the URL).

Properties. The data available in DeviceAtlas is segmented into categories. The most important properties per category are:

- Device name: vendor, model
- Hardware: displayHeight, displayWidth, mobileDevice, touchScreen
- Environment: developerPlatform, developerPlatformVersion, osAndroid, osLinux, osOsx, osProprietary, osRim, osSymbian, osWindows, osVersion
- Web browser: markup.xhtmlMp10, memoryLimitMarkup, uriSchemeSms, uriSchemeSmsTo, uriSchemeSmsTel, vCardDownload, usableDisplayWidth, usableDisplayHeight
- Network protocols: EDGE, GPRS, HSPA
- JavaVM: cldc, jsr118, jsr139, jsr30, jsr37, midp
- AudioPlayer: aac, amr, mp3
- Streaming: stream.3gp.aac.lc, stream.3gp.h263, stream.3gp.h264.level1, stream.mp4.aac.lc
- VideoPlayer: 3gp.h263, 3gp.h264.level1, mp4.aac.lc, wmv
- DRM: drmOmaCombinedDelivery, drmOmaForwardLock, drmOmaSeparateDelivery

You can browse all the data available with your license at <http://deviceatlas.com/explorer>.



Remember that if you have a developer account your database file will not be updated if you download it again, and if you have a basic license with monthly downloads a new file will not be available until 30 days from when you downloaded the previous version.

PHP API. Inside the PHP API package you will find a *doc* folder containing PHPDoc documentation, a *sample* folder containing examples of usage, and a *Mobi* folder containing the API. The PHP API requires PHP version 5.2.3 with JSON support.

You need to copy the *Mobi* folder with all of its content into your website root, but you can put the JSON data file in any place you want. In your PHP file, you must include the file *Mobi/Mtld/DA/Api.php*.

A typical project will look like the following:

```
<?php
include('Mobi/Mtld/DA/Api.php');
// We get a tree object loading the JSON
$tree = Mobi_Mtld_DA_Api::getTreeFromFile("deviceatlas.json");
// We get all the properties for the User Agent
$properties = Mobi_Mtld_DA_Api::getProperties($tree,
    $_SERVER['HTTP_USER_AGENT']);
// Or we can get one property at a time using
$value = Mobi_Mtld_DA_Api::getProperty($tree, $ua, 'some-property');
?>
```

If you want a cache implementation, you'll need to do it yourself or have memcache installed on the server and save the entire tree as the sample provided by the API. The Java and .NET APIs have better support for caching techniques.

The ASP.NET Mobile Device Browser File

If you work with the ASP.NET platform, you can find an open source mobile browser database at <http://mdbf.codeplex.com>, released by the Mobile Browse Platform Team at Microsoft. This file is attached to the current ASP.NET browser detection mechanism and is updated frequently. The sources of the information include WURFL, UAProf files, contributions from the community, and others.

To use it, all you need to do is download the *mobile.browser* file from the website, create a folder called *App_Browsers* (if you don't already have one) with a *mobile* subfolder, and copy the downloaded file into that folder. That's it!



The ASP.NET Mobile Device Browser File is only compatible with .NET Framework 2.0 and newer versions.

You can use the existing `Request.Browser` object in ASP to get information about the requesting device. `IsMobileDevice` will tell you whether or not it is a mobile browser, `Platform` will tell you the operating system, `ScreenPixelsWidth` and

`ScreenPixelsHeight` will tell you the screen dimensions, and you can query any other property using `Request.Browser` as a `Collection`.

Here is an example in C#:

```
if (Request.Browser.IsMobileDevice) {
    Response.Write("This is a " + Request.Browser.Platform + " device");
    if (Request.Browser["SupportsTouchScreen"]) {
        // It is a touch-based device
    }
}
```

Capabilities. A full list of capabilities can be found at <http://mdbf.codeplex.com/wikipage?title=capabilities>, but the most important are included in [Table 10-5](#). There are capabilities for each video, audio, and image property.

Table 10-5. Common capabilities of the ASP.NET Mobile Device Browser File

Capability	Return class	Indicates...
AcceptsImageSVG	Boolean	Whether the device supports SVG 1.1
AjaxCanManipulateCss	Boolean	Whether we can change CSS properties from JavaScript
AjaxSupportsFullDom	Boolean	Whether we can use full DOM methods
AjaxSupportsGetElementByID	Boolean	Whether we can use <code>getElementById</code> from JavaScript
AjaxSupportsInnerHTML	Boolean	Whether we can use <code>innerHTML</code> without problems
AjaxXmlHttpRequestConstructorSyntax	String	Which syntax to use when creating an <code>XMLHttpRequest</code> object (none for no Ajax support, standard for the native XHR object, or <code>msxml2</code> for IE syntax)
InputType	String	Which input type is supported (<code>keyboard</code> , <code>telephonePad</code> , or <code>virtualKeyboard</code>)
IsMobileDevice	Boolean	Whether or not the current device is a mobile device
JavaScript	Boolean	Whether the device supports JavaScript
MobileDeviceManufacturer	String	The device's brand name
MobileDeviceModel	String	The device's model name
PreferredRenderingMime	String	The preferred MIME type for XHTML content
SupportedFlashVersion	String	Which Flash version is supported (none or the version number)
SupportsAccesskeyAttribute	Boolean	Whether the device supports the <code>accesskey</code> value
SupportsCssBackgroundImage	Boolean	Whether the device supports defining background images
SupportsEmbeddedFlashInWebPages	Boolean	Whether the device supports embedding a SWF file
SupportsTouchScreen	Boolean	Whether the device is touch-based
SupportsWapPush	Boolean	Whether the device supports WAP Push
SupportsXhtmlRendering	Boolean	Whether the device supports XHTML

Service-based solutions

You may not want to write all this yourself. Services are available to help; we'll look at a few of them here.

Movila DetectFree. Movila Detection (<http://www.moviladetection.com>) is a server-side Java solution to detect in 500 microseconds which device is using an embedded repository. It also works as a tool for URL rewrites. However, Movila's most-used feature is the free service called DetectFree.

DetectFree is a free light version of the service available for PHP and JavaScript (and for any other platform that sends HTTP requests) that allows you to detect whether the connecting device is a mobile device. You can find samples and documentation at <http://www.moviladetection.com/detectfree>. Just to illustrate how easy it is to use, the following sample is a JavaScript detection mechanism:

```
<script src="http://detectfree.moviladetection.com/detectfree.js"
       type="text/javascript"></script>

<script type="text/javascript">
if (is_mobile) {
    alert("This is a mobile device");
}
</script>
```

DetectRight. DetectRight is a detection engine, device database, analytics engine, and API/SDK with both service-based and dedicated server options. Free noncommercial/developer licenses are available, and a shared-service license begins at 399 euros per month. It features SOAP and REST access, unique custom identification, country-level geolocation, and profiles in WURFL, DeviceAtlas, UAProf, DetectRight, and Java ME Polish-compatible formats. It features over 20,000 devices at the time of this writing.



If you want easy and quick mobile detection, at <http://www.detectmobi.lebrowsers.mobi> you will find a little PHP code that allows you to determine whether the user is using a mobile browser without any repository, database, or service call.

If you register at <http://www.detectright.com>, you will receive via email a key that enables you to access a variety of PHP, .NET, and SOAP samples and APIs.

Remember that this is a service-based solution, so you don't need to download or update any database on your server. Every request will be sent over the Internet to the DetectRight servers.



Remember that when using service-based solutions, your mobile website's performance will depend on the reliability of the third-party server to which you are connecting.

You can download the PHP or .NET API for easy usage for those platforms.

In PHP, once you've downloaded the API you can use the service as shown in the following sample:

```
include_once("detectRight.php");

DetectRight::$druser = '<detectright.com username>';
DetectRight::$drpassword = '<detectright.com password>';
// possible values: DR, WURFL, W3C, UAProfile, J2MEPolish
DetectRight::$defaultSchema = 'DR';

$profile=DR_Customer::deduceCustomer($_SERVER);
$value = $profile['<property>'];
```

The API can also be used to download lists of manufacturers and handsets, and to request individual ones by manufacturer/model name.

Content Delivery

A common situation in the mobile web world is content delivery. Java applications, widgets, music, video, wallpapers, and any other content can be delivered to compatible devices, but this requires a bit of explanation and expertise.

Defining MIME Types

MIME types, many of which are listed in the [Appendix](#), are a key element for content delivery. Many mobile browsers don't care about the file extension; they decide whether or not to accept the content based on the MIME type delivered by the server. Remember that the MIME type travels with the HTTP header response.

Static definition

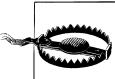
The simplest way to define the right MIME types is to statically define them on your web server. If you are working with a shared hosting service, the control panels often allow you to define document MIME types. If you manage your own server, you can set them up with the following instructions.

Apache. In Apache, the simplest way is to open the *mime.types* file located in the *conf* folder of the Apache root. In your favorite text editor, you can add one row per MIME type to be configured.

You will find hundreds of MIME type declarations. The first thing to do is to look for the following line and change the MIME type to the correct one for mobile XHTML documents:

```
text/html          html  htm
```

As you can see, each line contains a MIME type followed by a series of spaces or tabs and a space-separated list of file extensions.



This technique applies these changes to all the websites on the server. If you want to make changes to only one website or one folder of a website, you should create or edit the *.htaccess* file in the appropriate folder and use the *AddType* procedure:

```
AddType text/x-vcard vcf
```

You can find an Apache configuration file to download and use with all the important mobile web MIME types at <http://www.mobilexweb.com/go/mime>.

Internet Information Server. Configuring MIME types in Microsoft IIS can be done via the UI (as opposed to in Apache, where you need to edit a text file). To configure the MIME types in IIS 6.0 on Windows XP or Windows Server 2003:

1. Go to IIS Manager.
2. Right-click the whole server, a website, or a folder and select Properties.
3. On the HTTP Headers tab, click MIME Types.
4. Click New, type the file extension and MIME type, and press OK to finish.

In IIS 7.0 for Windows Vista/7 and Windows 2008 Server:

1. Go to IIS Manager.
2. Navigate to the level you want to manage.
3. In Features View, double-click on MIME Types.
4. In the Actions pane, click Add.
5. Type the file extension and MIME type and press OK to finish.



In IIS, you can also manage MIME types from the command line. Check the documentation for more information.

In IIS 7.0, it is also possible to define static MIME type declarations in the *web.config* file in your ASP.NET folder. The syntax is:

```
<configuration>
  <system.webServer>
    <staticContent>
      <mimeMap fileExtension=".mp4" mimeType="video/mp4" />
      <mimeMap fileExtension=".vcf" mimeType="text/x-vcard" />
    </staticContent>
  </system.webServer>
</configuration>
```

Dynamic definition

The other possible way to declare MIME types is to use dynamic header declarations in your server script code.

In PHP, you should define the MIME type before any other output using the `header` function:

```
header('Content-Type: application/xhtml+xml');
```

If you are delivering downloadable content (not markup), like a video, you should also define a filename. If not, when the file is saved it will have a `.php` extension and it will not work.



Remember that it is better to serve XHTML MIME types to mobile websites. You can define them either statically or, if you are using a server-side language, dynamically. You can also query WURFL or another library to check what the preferred MIME type to deliver is and use it to define the header.

To define the name of the file we use the `Content-disposition` header, as shown in the following sample:

```
$path = '/videos/video.mp4';
header('Content-Type: video/mp4');
header('Content-disposition: attachment; filename=video.mp4');
// We serve the file from our local filesystem
header("Content-Length: " . filesize($path) );
readfile($path);
```

ASP.NET has a `Response.ContentType` property that we can define:

```
// This is C# code
Response.ContentType = "application/xhtml+xml";
```

The filename should also be defined if it is downloadable content, using `Response.AddHeader`.

In a Java servlet or JSP, you should define the headers using the `setContentType` method of the `response` object:

```
response.setContentType("application/xhtml+xml");
```



When you are serving non-markup content using a dynamic script, if an error occurs you will not see the error details and the content will be broken (imagine a JPEG with a PHP error as the contents). You should capture any error, send yourself an email or log the error details, and replace the output with generic content.

File Delivery

To deliver a file, there are three models:

- Direct linking
- Delayed linking
- OMA Download

You can use any of these three methods to deliver the files, either using the physical file (video, audio, game, etc.) directly or via a script (PHP, ASPX, etc.). If you use a script to deliver a file, you can log, secure, and even charge for every download. If the file is available directly through the web server, anyone with the URL can download the file.



The installation of files using HTTP is also called OTA (Over-the-Air) provisioning. Some low-end devices don't have a web browser but do have the ability to download files (e.g., ringtones, applications, or images) using HTTP. We can offer files to those devices, but we must send the download URLs by WAP Push using SMS.

Direct linking

Direct linking is the simplest way to deliver content. A direct link is just a link to the file (with the right MIME type defined), a link to a script that will deliver the file, or a link to a script that will redirect the user to the file. For example:

```
<a href="game.jad">Download This Game</a>
<a href="download.php?id=22222">Download This Game</a>
```

The *download.php* script can save the download to the database, check permissions, and then deliver the content using the appropriate MIME type, writing the file to the response output or redirecting the browser to the file:

```
<?php
if ($everything_ok) {
    header('Location: game.jad');
} else {
    header('Location: download_error.php');
}
```

Delayed linking

Delayed linking is a technique often used in download sites for desktop browsers. It allows us to show a landing page before the download starts. This landing page will also be the document the user will see after the download has finished or, if the browser supports background downloading, while it is downloading.



Some devices also look for the `type` attribute in a link to decide how to manage the link before downloading the response from the server. For example, we can define a link as a Java ME JAD file using:

```
<a href="game.jad"
    type="application/vnd.sun.j2me.app-descriptor"> Download This Game</a>
```

The technique involves linking to an XHTML document that will show the user some information and will use a `refresh` metatag to redirect the user to the direct link in X seconds (more than 5 for mobile devices).

So, the download page will redirect to:

```
<a href="download.html">Download This Game</a>
```

And `download.html` will contain code like the following:

```
<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN"
    "http://www.wapforum.org/DTD/xhtml-mobile10.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=UTF-8" />
<meta http-equiv="refresh" content="5;game.jad" />
<title>Download File</title>
</head>

<body>
<h1>Your game is being downloaded</h1>
<p>If the file is not downloaded in 5 seconds,
    <a href="game.jad">click here</a>

<h2>Brought to you by "Your favourite ad here"</h2>

<p>Trouble downloading this game? <a href="sms:611">Send us an SMS</a>
    <a href="tel:611">Call Us</a></p>

    <a href="/">More Downloads</a>
</body>
</html>
```

OMA Download

OMA Download is a standard defined in 2004 by the Open Mobile Alliance to allow us more control over the delivery of media objects. It also has support for Digital Rights Management (DRM) in two versions, OMA DRM 1.0 and OMA DRM 2.0. The specification was used as the basis for the Java ME MIDlet OTA installation method that we will see later in this chapter, so the two are very similar.



Many browsers support the download of Multimedia Messaging Services (MMS) templates using a format called the *Synchronized Multimedia Integration Language* (SMIL). This is useful if you are offering templates like postcards. You can create messages using Nokia tools available at <http://www.mobilexweb.com/go/mms>.

OMA Download adds two phases to the download process: *before download* and *after download*.

The before download process involves a description file downloaded using HTTP before the real file is downloaded. This description file is an XML file containing meta-information for the operating system and instructions for doing the download. This process gives the user an opportunity to see information about the content (name, compatibility, size) before accepting it, as shown in [Figure 10-2](#).



Using OMA DRM you can protect a file from being sent by MMS, Bluetooth, or any other method after it has been installed on the device. This is to avoid piracy of video, music, Flash Lite, and other multimedia content. Nokia, Sony Ericsson, and Motorola devices are known to have support for this standard.

The after download process involves an HTTP request posted to your web server from the operating system, confirming the final status of the download. This allows you to confirm that the file has been correctly downloaded and installed.



Figure 10-2. With OMA Download we can give the user more information about the content before she downloads it.

OMA DRM supports the ability to define the right to play, display, or execute a media object or a file a limited number of times. DRM should be managed with care, and you need to test compatibility with the devices you're targeting before using it.



Sprint, a U.S. carrier, uses a similar format called General Content Descriptor (GCD). A GCD file is a text file with a `.gcd` extension that is very similar to the JAD file in Java ME.

Download descriptor. The descriptor is an XML-based file that should be served using the MIME type `application/vnd.oma.dd+xml`.

Here's a simple example of this file:

```
<?xml version="1.0"?>
<media xmlns="http://www.openmobilealliance.org/xmlns/dd">
  <name>The first man on the moon</type>
  <type>video/mp4</type>
  <objectURI>http://mobilexweb.com/video.mp4</objectURI>
  <size>230</size>
  <installNotifyURI>http://mobilexweb.com/download/notify.php?id=3333
    </installNotifyURI>
</media>
```

These are the typical attributes: `name`, the user-readable name of the content file; `type`, the MIME type of the file; `objectURI`, the absolute URL of the file; `size`, the file size expressed in KB; and `installNotifyURI`, the URL that will receive the after-download status (this can have GET parameters defined dynamically to log whether or not the download was saved).

Additional properties are also available, like `nextURL` (the URL of a website to visit after the download has finished), `description` (a short description of the media file), `vendor` (the organization providing the file), and `iconURI` (an optional icon to be shown with the file information).



There are good resources and tools on the Forum Nokia, Sony Ericsson, and Adobe websites about OMA Digital Rights Management. You can find more information at <http://www.mobilexweb.com/go/drm>.

Post-download status report. If you define the `installNotifyURI` in the download descriptor, you will receive a POST request to that URL when the download finishes. This URL will receive as the POST body an integer code with a status message. The important thing is that this request does not come in the normal URL-encoded way, so you can't use the typical `$_FORM` or `Request.Form`. To read the status code, you'll need to read the request body in a low-level format. [Table 10-6](#) lists the most common OMA Download status codes to read in our scripts.

Table 10-6. OMA Download status codes

Code	Message	Description
900	Success	The object was downloaded and installed.
901	Insufficient Memory	The device has no space to download or install the file.
902	User Cancelled	The user cancelled the download.
903	Loss of Service	The device lost the network connection while downloading the file.
905	Attribute Mismatch	The file doesn't match the download descriptor (e.g., the MIME type). The file will be rejected.
906	Invalid Descriptor	The download descriptor is invalid.
951	Invalid DDVersion	The download descriptor version is invalid.
952	Device Aborted	The device aborted the installation process. This can occur for different reasons.
953	Non-Acceptable Content	The device cannot use the file.
954	Loader Error	The URL of the file is not working.

To read the OMA Download response from a PHP script, you can use the following sample code:

```
<?php
// We get the post body from the input
$post = file_get_contents('php://input');
// We get the first three characters without spaces
$status = substr(trim($post), 0, 3);

if ($status==900) {
    // Download OK, save information to the database
} else {
    // Some error happens, save information to the database
    // to allow the same user to download it again
}

?>
```

If you are delivering premium content that the user has paid for, if the download fails you should deliver the same content without forcing the user to pay again. Even if the download has succeeded, many carriers insist that the content be made available free of charge for 24 hours (or even up to a week). Some new application stores also allow the users to download the premium content again even if they change their mobile devices.



Remember that you can check for OMA Download compatibility using WURFL, DeviceAtlas, or another library before using this download mechanism.

Table 10-7 reports on browser compatibility with OMA Download.

Table 10-7. OMA Download compatibility table

Browser/platform	OMA Download compatibility
Safari	No
Android browser	No
Symbian/S60	Yes
Nokia Series 40	Yes
webOS	No
BlackBerry	Depends on the device
NetFront	Yes
Openwave (Myriad)	Yes
Internet Explorer	Depends on the device
Motorola Internet Browser	Depends on the device
Opera Mobile	No
Opera Mini	No

Application and Games Delivery

In the beginning, the mobile content delivery world centered around ringtones and wallpapers. To deliver this kind of content, we should rely on what we have seen before: if we deliver the proper MIME type, the file will be saved by the mobile phone. For current devices, ringtones are generally MIDI or MP3 files, while there are other audio formats suitable for low-end and older devices. A wallpaper can be a JPG, an animated GIF, or even a Flash Lite file for compatible devices.



You can use any dynamic image resizing library to generate a wallpaper with the right dimensions for the device. The best solution is to have three templates of the same image to avoid deformation: a vertical, a horizontal, and a square version of the same image, in a large size. Then, using the WURFL properties, you can use the correct version and resize it as needed.

The next content that appeared on the market was games, followed by applications (the difference is not technical).

Applications delivery can be useful:

- If you are creating a game or application store
- If you are developing a mobile website for a current application
- If you have a richer version of your mobile website available as a widget or application
- If you are providing a shortcut for your website embedded as an application

The formats that you can deliver from a website are:

- Java ME (formerly J2ME)
- Flash Lite
- Symbian native applications
- Widgets
- Android applications
- Windows Mobile applications
- BlackBerry applications

We cannot deliver iOS native applications for iPhone, iPad, or iPod directly to users, as the App Store is the unique public way to install and deliver applications for this OS. However, we can link to the App Store native application with the app we want the user to buy or download onscreen.

There are similar restrictions on delivering webOS applications.

For widgets and Android, Symbian, and Windows Mobile applications, we just need to use the right MIME type when delivering the file. No special mechanism is used.

Charging for Content

You may be wondering how you can charge for content using the user's bill or available credit. There is no simple or standard solution for this; to do it universally you would have to have a contract with every carrier in every country in which you wish to sell your content, and every carrier has its own charging method.

The classic method is to send an HTTP request to the carrier's server with an XML or any other standard file defining the user's ID or phone number, the content type, and the amount to charge for the content. The server responds with a status code indicating whether the payment has gone through or if there has been a problem. This method implies that we receive the user's ID or phone number in a header.

More modern methods involve sending a redirect with parameters from your website to the carrier's site, where the user will be prompted to pay for the content. If the payment goes through, the user will then be redirected again back to your server, where you provide the content.

The GSM Association's OneAPI is trying to standardize this process across carriers. More information about this API can be found at <http://gsma.securespsite.com/access>.

You can, of course, use other classic payment methods, like PayPal or credit card processing. PayPal offers Mobile Checkout, an API for mobile commerce. If you have a PayPal account, go to API Permissions and enable mobile checkout. More information is available at <http://www.mobilexweb.com/go/paypal>.

Google Checkout is also available for mobile devices, and it requires no additional setup if you already have an account: it will work with mobile devices automatically.

Bango (<http://www.bango.com>) also offers mobile billing through operators, even for users connecting via WiFi, in over 150 countries.

In Chapters 12 and 14, we will explore how you can monetize your website with other options, such as store distribution or advertising for mobile websites.

Java ME

Java ME was the preferred language for games and applications for years. Its usage is declining, but it is still the most widespread platform in the world. It is compatible with Nokia, non-Android Motorola, LG, Samsung, Sony Ericsson, BlackBerry, and many other devices.

A Java ME project is shipped as a *JAR* (Java ARchive) file, which is just a ZIP file containing the application (compiled classes and resources). It must be delivered using the MIME type `application/java-archive`. Many phones accept this file type directly, although the best (and 100% compatible) way of delivering Java ME games or apps is to first deliver a *JAD* (Java Application Descriptor) file. The JAD file is just a text file served with the MIME type `text/vnd.sun.j2me.app-descriptor` that contains metadata about the application, similar to OMA Download's download descriptor files (in fact, OMA download took this approach from Java).

So, the device first downloads the JAD file and shows the information to the user (name of the application, size, format, etc.). If the user accepts, the JAR file is then downloaded and installed. The Java ME developer usually generates the JAD file, and we receive it in its final state. However, as it is a text file, we can generate it ourselves or change it using a server-side script.



If you are delivering games or advanced applications, it is common to create different versions for different device sets, to deal with portability problems and differences between platforms. In this situation, you will need to be sure to deliver the right JAD and JAR file versions for the current device, if they exist.

At the time of this writing, there are two major versions of the Java ME platform for mobile devices: MIDP 1.0 and MIDP 2.0. There are more subversions and differences in APIs and configurations, but this is beyond the scope of this book. If we're providing the same application or game in both versions (e.g., basic and advanced versions), we should first check the device's compatibility with Java ME and then deliver the correct JAD and JAR files. WURFL has properties to check if MIDP 1 or MIDP 2 is available.

Serving JAD files

Let's analyze a part of the MIDP 1.0 version of the JAD file sent to the device when a user tries to download Opera Mini 3:

```

MIDlet-Version: 3.1
MIDlet-1: Opera Mini 3, /i.png, Browser
MIDlet-Data-Size: 10240
MIDlet-Description: Opera Mini
MIDlet-Icon: /i.png
MIDlet-Info-URL: http://mini.opera.com/
MIDlet-Install-Notify: http://mini.opera.com/n/13045Bviprdome_en
MIDlet-Jar-Size: 58800
MIDlet-Jar-URL: opera-mini-3.1.13045-basic-en.jar
MIDlet-Name: Opera Mini 3
MIDlet-Vendor: Opera Software ASA
Content-Folder: Applications
MicroEdition-Configuration: CLDC-1.0
MicroEdition-Profile: MIDP-1.0

```

The emphasized parts of the code are the ones that we need to care about when delivering Java ME applications.



There are a lot of other standard and vendor-specific JAD attributes that can be defined, from virtual keyboard support on touch-screen devices to digital signatures.

MIDlet-Jar-URL defines the relative or absolute URL of the JAR file. We can insert the JAR file directly here, or, if we want to secure and log the download, we can use a URL to a dynamic script including a URL parameter included in the JAD generation.

MIDlet-Install-Notify is the same as the `installNotifyURI` parameter in OMA Download. It is an optional parameter that defines a URL that will receive by `POST` the same codes as in OMA Download (from 900 to 906), as seen in [Table 10-6](#).



There is another optional JAD attribute, **MIDlet-Delete-Notify**, that defines a URL that will receive by `POST` a notification when the user deletes the application from the device. Using this attribute is not recommended; it is not reliable, and the user may not want to connect to the Web when deleting an application.

Starting with MIDP 2.0 (the version compatible with almost all Java ME devices on the market today), the standard added new codes that we can receive in the **MIDlet-Install-Notify** URL. The added status codes are shown in [Table 10-8](#).

Table 10-8. Additional MIDP 2 status codes

Code	Message	Description
907	Invalid JAR	The JAR (executable package) is invalid and could not be installed.
908	Invalid Configuration or Profile	The device is not compatible with the versions of the libraries used in the package.
909	Application Authentication Failure	A security problem has occurred.

Code	Message	Description
910	Application Authorization Failure	A security problem has occurred.
911	Push Registration Failure	A push notification registered in the JAD file is invalid.
912	Deletion Notification	The user has deleted the application from the device (used when MIDlet-Delete-Notify was defined).
913	Required Package Not Supported by the Device	A package or API marked as required by the application is not available on the device.

In the `MIDlet-Icon` and `MIDlet-1` parameters, you can find an icon URL (the same path appears twice). This deserves an explanation.

Icon definition. A Java ME application (called a *MIDlet*, because it is a MIDP application) can define an icon to be placed in the applications menu of the mobile device once it has been installed. This icon is placed inside the JAR archive, and we define it in the JAD file. What's the problem? Every platform has its own preferred icon size. Even on different devices based on the same OS, the icon size can change. In addition, the developer wants the user to have the best possible experience (as do we), and a broken, small, or pixelated icon creates a bad user experience.

There are two solutions:

- The Java developer creates n packages for each device or group of devices.
- The Java developer creates one or more packages with all the possible icon sizes inside the JAR and then we, as the web developers, use a device library to dynamically define in the JAD which icon is the best for the current device.

Custom properties

Java ME allows us to define custom properties in the JAD file as string values. Each property can then be read by the Java ME application when it's executed. A custom property is just a `key: value` line in the JAD file. This technique must be coordinated with the Java ME developer. These values cannot be changed by the user and are fixed with the application until it is deleted or updated.

This can be useful for providing any of the following:

- A download ID for future identification
- User agent or device information that the server knows but Java ME does not
- A username or user ID for transactions
- Key codes for nonstandard keys that the server knows but Java ME does not
- IP or server addresses
- Other useful or dynamic parameters

Java ME for BlackBerry

Newer BlackBerry devices accept the same JAD and JAR files that we've been examining. However, the most compatible way to serve Java ME files on these devices is to use BlackBerry's own format for JAR files: COD files.

BlackBerry uses the same JAD files, with two new mandatory attributes: **RIM-COD-URL** and **RIM-COD-Size**. The COD file must be served as `application/vnd.rim.cod`, and it is generated using a free tool from RIM that converts a JAR into a COD file.

Flash Lite Content

Flash Lite movies, games, or applications are just SWF files. The problem with this format is that a SWF file is not “an installed application”; it is managed like any other document on the device, as a file in the filesystem. For Flash Lite content to be installed as an application, it should be contained in another format, such as:

Nokia Flash Lite (NFL)

Nokia provides a packager for Flash Lite for Series 40 devices.

Symbian SIS

There are many Flash packagers for Symbian that can embed Flash content in a Symbian native format.

Widget for Symbian

For compatible devices, you can embed a Flash application in a widget. We will cover this technology in [Chapter 12](#).

Capuchin

The Capuchin Project is an API compatible with Sony Ericsson devices that allows the usage of a SWF file inside a Java ME application.

The NFL format is just a ZIP file with a `.nfl` extension, served as `application/vnd.nokia.flashlite-archive`, with a minimum of three files inside: a SWF, an icon file, and a `descriptor.inf` text file. The contents of the text file look something like this:

```
FL-Version: 1.0
FL-Icon: image.png
FL-Name: Super Game
FL-Root: supergame.swf
```



An XML-based file that represents a bookmark is available on some Nokia, LG, and Sony Ericsson devices. Check for support in the Accept header by looking for the MIME type `application/x-wap-prov.browser-bookmarks`.

iPhone Applications

If you have your own application that has already been accepted for distribution via the App Store, or if you want to provide users with a link to buy or download an application, game, ebook, music file, movie, or TV show, you can use a special iTunes link that will open iTunes or the App Store automatically, displaying the desired content.

You can create one of these links using the web service *iTunes Link Maker*, available at <http://www.apple.com/itunes/linkmaker>. You can select which country's App Store to look for the content in, and then search for the content you want to link.



Android Market, one of the application stores for the Android OS, has its own URL scheme for linking to an application or searching the store from a website. The format is `market://search?q=<search>`, using the application name in the `<search>` field.

For example, to provide a link that the user can visit to buy the movie *Terminator Salvation*, we can use the code provided by the iTunes Link Maker:

```
<a href="http://itunes.apple.com/WebObjects/MZStore.woa/wa/viewMovie?id=338372479
&s=143441&uo=6" target="itunes_store"></a>
```

Multimedia and Streaming

Serving audio and video content to mobile devices is very important for many portals and content providers. Unfortunately, there are so many formats and distribution methods and the landscape is changing so fast that it's difficult to provide up-to-date information in this book.

We can provide multimedia content in three formats:

- Downloadable content
- On-demand streaming content
- Live streaming content

For downloadable content, there are many formats and codecs that we can use. Not all devices support all of them, so we should check the documentation for our target devices or use WURFL properties to check for support on the fly.

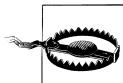
Video and audio files come with two technologies: a container format and one or more codecs inside. The most compatible container formats for mobile devices are 3GP and 3GP2, created by the 3GPP organization (formed with 3G companies). They are very similar to the MPEG-4 (MP4) format, so many devices support both.

There are also devices with support for MPEG, Flash Video, AVI, Real Audio, Real Video, MOV, and Windows Media Audio/Video containers. Most devices support the H.263 and H.264 codecs.

In the audio world, the most standard formats today are MP3 and MIDI, but some devices also support MP4, Real Audio, WAV, AAC, and other audio formats.

Delivering Multimedia Content

If we want to deliver multimedia content, we need to first look at the `Accept` header or WURFL properties to determine whether the device supports the format we're using. If so, we can use the delivery methods defined earlier. Depending on the device's capabilities, it may download the entire file before playing it or it may try to play it while downloading using HTTP streaming techniques.



Multimedia files are generally large. If we deliver noncompatible files, the user will be paying for non-useful traffic and will not be happy with us.

For the best HTTP streaming technique, we need the server to support partial downloads. If your server doesn't support it, there is a great PHP script available at <http://www.mobilexweb.com/go/phppartial>.

The direct download technique works in almost every compatible phone: Symbian, iPhone, Android, Nokia Series 40, etc.

Embedding Audio and Video

Not all devices support embedded multimedia in web pages. On some devices, the display and CPU constraints make this feature impossible.

Flash Video

Flash Lite (from version) 3.0 and Flash Player for mobile devices support Flash Video format (FLV). For the compatible devices (see [Table 6-20](#) in [Chapter 6](#)), like Symbian devices from 3rd edition FP1, you can embed any Flash content, although it is better if you compile your SWFs for Flash Player 8. In fact, the YouTube desktop version works well on Flash Lite 3-enabled devices (it's a bit slow on some devices, but it works).

Object embedding

You can use an `object` tag to include a video in a web page:

```
<object data="video.mp4" type="video/mp4" width="300" height="300" />
```

Safari will show an image with a play button. When the user presses play, the video will open in a full-screen QuickTime Player window instead of being embedded in the browser.

An alternative is the `embed` tag, preferred for iOS 1 and 2.X:

```
<embed src="poster.jpg" href="video.m4v" type="video/x-m4v" />
```

The `object` tag also works on Symbian devices.

HTML 5

Although at the time of this writing they are only compatible with some mobile browsers, such as Safari on iOS 3.0 and later, the `audio` and `video` tags defined in HTML 5 can also be used to embed multimedia content. The behavior is similar to using the `object` tag. The `video` element supports the usage of a `source` child tag that allows us to define different media files in different codecs and bit rates for best compatibility. The normal syntax is:

```
<video src="url"
       poster="some_optional_picture.png"
       controls="true"
       width="320"
       height="240" />
```

Safari supports the formats 3GP, MOV, and MPEG-4, and the H.264 and AAC-LC codecs.

Reference movies for iPhone

Safari on iOS also supports “reference movies,” created with QuickTime Pro or a similar tool. A reference movie provides a list of movie URLs with different bit rates (for example, for WiFi, 3G, or EDGE), so QuickTime can select the correct one for the device. In our `embed` or `video` tag, we point to this new file.



At <http://www.mobilexweb.com/go/refmovie> you can find an Objective-C Mac tool provided by Apple to generate iPhone reference movie files from the command line.

Streaming

Streaming audio or video is a difficult solution if we want to be compatible with all devices. Different platforms support different streaming technologies.

Some devices, including Symbian, Windows Mobile, and BlackBerry devices, support the Real Time Streaming Protocol (RTSP). When a link with this protocol is used (e.g., `rtsp://server/content`), the default media player—Real Player, Windows Media, etc.

—is opened. The content can be a file to be streamed (a prerecorded audio or video file) or a live event (radio or TV show, sports event, etc.).



RTSP is an open standard for establishing and controlling sessions between two points. Most platforms use the Real-time Transport Protocol (RTP) for media streaming (audio and video) and can deliver either live events or on-demand multimedia content.

We should expect more Flash streaming services for mobile devices when the full Flash Player is available for mobile devices. Today, Flash Lite 3.0 devices should work with Adobe Flash Media Server or the Red5 open source alternative (<http://www.osflash.org/red5>).

For general audio and video streaming there are also other streaming solutions, like the commercial Helix Media Delivery Platform (<http://www.realnetworks.com>) and QuickTime Streaming Server (<http://www.apple.com/quicktime/streamingserver>).

Apple also maintains an open source alternative called Darwin Streaming Server. (<http://developer.apple.com/opensource/server/streaming>).

A streaming server uses TCP or UDP but generally does not use HTTP. Some proxies may have problems redirecting the server's TCP or UDP packages, so HTTP has some advantages. However, it also has more overhead than TCP or UDP and it is not prepared for live streaming events. Some mobile devices that use HTTP have to download the entire file before playing it. Other devices will start playing the file while downloading it.

HTTP Live Streaming

Apple has created a new way to deliver live streaming using HTTP, called HTTP Live Streaming, which it has presented to the IETF as a proposed Internet standard. It is supported by iOS 3.0 and allows the transmission of live events using the same HTTP protocol we know. In fact, this is the only streaming solution that works on the iPhone.

Implementing HTTP Live Streaming requires some changes on the web server end. The simplified explanation of the protocol is that on the server, the live stream is buffered in little packages sent to the client. It's like transmitting a live radio show by sending a series of 10-second MP3s.



The well-known Akamai application acceleration service provider offers live streaming services for the iPhone from <http://iphone.akamai.com>. Influxis (<http://www.influxis.com>) also offers mobile streaming services as a shared hosting solution, for the iPhone/iPad and BlackBerry and Android devices.

HTTP Live Streaming supports the H.264 codec for video and AAC or MP3 for live audio streaming, as well as a bandwidth switcher for different qualities. However, the best feature is that it passes any firewall or proxy because it is HTTP-based.



Carson McDonald has developed an open source Ruby and C solution for doing HTTP Live Streaming from a server, and even using Amazon S3 services. You can check out his blog at <http://www.ioncannon.net> or read more about the project at <http://www.mobilexweb.com/go/httplive>.

Apple offers a prerelease toolkit for this solution called HTTP Live Streaming Tools. You need to be part of the Apple Developer Connection to download it. The open source IceCast Server also supports iPhone streaming, from version 2.3.2. You can find more information at <http://www.icecast.org>.



For Android, iPhone, and Flash Lite 3 or Flash Player 10 devices, we can safely upload video content to YouTube and embed it in our websites. The devices will render this content properly using the internal Flash Player or a native YouTube application.

Content Adaptation

Content adaptation is a technique for changing the markup delivered by the server depending on the device's capabilities. The alternative solution is content splitting, where you redirect the user to different folders or domains depending on the device used.

Once we know how to detect capabilities and how to deliver content to the client, we need to decide how we are going to do the content adaptation. Content adaptation has the great advantage that the same source code can be used for all devices; the framework takes care of the adaptation. Therefore, making updates is a one-place modification.

Custom solutions are the most adaptable. My suggestions if you want to develop your own framework are:

- Create or use a master page or template framework. You will need to define several master pages (e.g., for low-end devices, mid-end devices, smartphones, and perhaps the iPhone).
- Create standard markup templates for the content of each page. Use headers, paragraphs, unordered lists, and whatever other standard markup you need.
- Create a different CSS file for each master page.
- Create a different JavaScript controller file for each master page. Some templates may not have any JavaScript.

- Create a different JavaScript controller file for the iPhone, using a specific UI library.
- For the iPhone and other smartphones, change and add behavior using JavaScript in the `onload` event. If you will create a very different experience for iPhone (and perhaps Android) devices, you will need to create separate content files.
- For Ajax-compatible devices, use a JavaScript `onclick` handler to override normal links with Ajax compatibility.
- Make special methods or classes to deliver the best markup for some noncompatible features, like call-to links and file upload.
- Make your best effort to maintain your content in one source code file.
- Make one different WML version for WML-only devices. If you use only `ul`, `p`, and `header` tags, you even can use the same content files and only change the master page.

Adaptation Frameworks

There are some different solutions for content adaptation on the market. These solutions generally involve not using full markup, but rather using some special markup that will be translated to XML, HTML, XHTML, or some version thereof.

WALL Next Generation

The existence of a Next Generation (a very Trekkie phrase) implies that there was an older version. That is the case with WALL (the Wireless Abstraction Library by Luca). The WALL framework, a JSP library created in 2003 by Luca Passani (whom you may remember from earlier in this chapter; he is also the developer behind WURFL), allows developers to write mobile applications using a generalized markup. Then, by querying WURFL capabilities, WALL transparently determines the best markup to send to the requesting device—WML, XHTML MP, or cHTML (for i-mode devices)—and generates the appropriate markup.

It is still available, but has now been deprecated. You can find it at <http://sourceforge.net/projects/wurfl/files/WALL>.



There is a PHP implementation of WALL (the older version) that works pretty similarly, but because it's a bit older it doesn't provide good markup for modern smartphones. Wall4PHP can be found at <http://wall.laacz.lv>.

WALL Next Generation (WNG) is an update to the platform that adds support for more recent devices (iPhone, Android, etc.) and heavy-CSS sites, while maintaining fallback support for legacy platforms. In WNG, every tag is also a component (an ob-

ject) that you can use in any situation—even to create pages programmatically without tags.

WNG markup can be used to generate WML, simple XHTML MP, and advanced XHTML MP. The controls render differently depending on which markup is selected for delivery to the requesting device. A typical WNG document looks like this:

```
<%@ taglib uri="http://wurfl.sourceforge.net/wng" prefix="wng"%>
<%@ tag lib uri="http://java.sun.com/jsp/jstl/core" prefix="c"%>
<wng:document>
    <wng:head>
        </wng:head>
        <wng:body>
            </wng:body>
    </wng:document>
```

CSS styles are also defined in WNG tags or components. For example:

```
<wng:css_style>
    <wng:css selector="body">
        <wng:css_property name="margin" value="0" />
        <wng:css_property name="border" value="0" />
        <wng:css_property name="font-family" value="serif" />
        <wng:css_property name="color" value="#8AE" />
    </wng:css>
```

This declaration may be rendered differently on different devices. Furthermore, because of some bugs and known problems in some browsers, the rendered CSS may include some hacks and additional styles that will reduce the impact of those bugs and produce a result similar to the one desired. Of course, the WML version will have no CSS declarations.



The WNG package can be downloaded from <http://wurfl.sourceforge.net/wng> and installed on every Java server platform. A Tutorial and a Reference Guide are also available on the same website.

The component library in WNG has support for many tags. The most common of these are listed in [Table 10-9](#).

Table 10-9. Most common WNG component tags

Tag (with wng: prefix)	Description
br	Like in HTML
banner_row	Page header with images and optional links
billboard	Banner advertisement
css	Advanced CSS style management
document	Main tag of the document (equivalent to HTML or WML)

Tag (with wng: prefix)	Description
form	Like in HTML
grid_menu	Menu or icons organized in a matrix (depending on the width of the device)
head	Like in HTML
hr	Like in HTML
illustrated_item	An image with a caption and text below
input	Like in HTML
link	Hyperlink
listItem	Link with styles and with optional text below
navigation_bar	Textual navigation bar to use at top or bottom of the website
select/option	Like in HTML
rack_menu	Two-dimensional list of links
text	Text container without styling or markup rendering
textarea	Like in HTML
textblock	Text block for large contents
title	Similar to billboard

Microsoft ASP.NET Mobile Controls

With ASP.NET 1.1, Microsoft created a really comfortable solution for mobile website creation. Similarly to WALL, this framework allows us to create WML, XHTML, and cHTML content from a single source, called a Mobile Form.

The best thing about Mobile Controls is that it has design support in Visual Studio. The main problem is that this framework was deprecated in 2005, in favor of using the main ASP.NET framework and control adapters. That is why you will not find it in Visual Studio 2008 or 2010 amongst the New Website templates. Mobile Controls also does not work with ADO.NET 2.0 and the great additions of .NET Framework 2.0.



ComponentOne has a suite of commercial ASP components to create visual iPhone applications using ASP.NET, available at <http://www.componentone.com/SuperProducts/StudioiPhone>.

If you want, you can still use it, and you can find more information at <http://www.asp.net/mobile>. Microsoft has not offered an alternative adaptation solution, and if you are using ASP.NET you should probably look at creating an MVC application for better markup management.

mobileOK Pythia

mobileOK Pythia (<http://www.w3.org/2009/11/mobileOKPythia>) is a W3C tool for PHP to create mobileOK-compatible content. mobileOK is a W3C test that we will cover in [Chapter 13](#).

mobileOK Pythia includes open source plug-ins for Joomla!, WordPress, and Moodle for e-learning, as well as *AskPythia*, a WURFL implementation using the Device Description Repository Simple API W3C Recommendation.

It also includes *TransPythia*, a transcoding tool that adapts content to fit the properties of the requesting device. It uses actions as components that we can reuse. These actions include image resizing, content pagination, script suppression for noncompatible devices, table support adaptation, and CSS adaptation. You create an HTML string and the actions will transcode it to be compatible with the current device.

Here is some sample code for using this library:

```
// Prerequisites: Prepare AskPythia
$service = ServiceFactory::newService(
    'WURFL',
    'http://www.w3.org/2008/01/ddr-core-vocabulary',
    array('wurfl_path'=>'[path to WURFL]'));
$evidence = $service->newHTTPEvidenceM($_SERVER);

// Step 1: Create the transcoder
$transcoder = new Transcoder($service);

// Step 2: Add required transcoding actions
$trans = $transcoder->newTranscodingAction('ResizeIMG');
$transcoder->addTranscodingAction($trans);

$trans = $transcoder->newTranscodingAction('DeletePopup');
$transcoder->addTranscodingAction($trans);

$trans = $transcoder->newTranscodingAction('LinearTables');
$trans->setOption('layout', true);
$transcoder->addTranscodingAction($trans);

// Step 3: Apply transcoder to HTML content
// $content should have all the HTML we want to use
$adaptedContent = $transcoder->apply($content, $evidence);
```

Yahoo! Blueprint

Yahoo! offers an open self-adapted mobile development platform that includes not only a new markup language, but hosting and advertisement services, too. Blueprint (<http://mobile.yahoo.com/developers>) is an XML-based solution that converts your code to the proper markup for thousands of devices.

To start, you can download the SDK from <http://mobile.yahoo.com/devcenter/downloads> and extract the contents of the ZIP package. The package includes samples, templates, XML schemas to validate your website, and a PHP class to generate valid markup for Blueprint.



If you want to use your own domain name for your Blueprint website, you can add a CNAME DNS entry in your domain for *m.domain.com* pointing to `<widget-id>.bpapps.com`, where `<widget-id>` is the ID received by Yahoo! when publishing your package.

Visitors will be able to access your site from the browser, as a mobile widget for Yahoo! Go 3.0 (the richer experience for mobile browsers), and also as a standalone mobile application using the Blueprint Runtime for Mobile Apps (in preview at the time of this writing).

Creating and publishing a Blueprint site is free, and log reports analyzing the usage of your website are available.

A Blueprint application is a ZIP package consisting of a *config.xml* file containing metadata information about your site (including your server URL for sending requests), a *gallery.xml* file containing metadata information to help users find your site via Yahoo! Go and the search engine, and all the image files.



The content file will be hosted on your own server, so it will not be inside the package to be published. Yahoo! offers a PHP builder for easy web-site generation.

The user connects to the Yahoo! servers, which connect to your server using normal HTTP requests. Your script should receive different actions and parameters and respond with a Blueprint page served with the MIME type `application/x-blueprint+xml`.

There is not enough space in this book to talk about all the features of Blueprint, but you should know that it supports components of different kinds—containers, visual controls, helper elements, and inline elements—all in an XML file served by your server statically or using the PHP `Writer` class. Using Blueprint, you can localize the user, define actions, capture events, define form elements, map visualizations, and more.

Mobilizing WordPress and Other CMSs

If you are using a commercial or open source Content Management System (CMS), you probably don't have easy support for integrating mobile detection and adaptation techniques. Here are some plug-ins that will automatically add mobile support to your website.



Figure 10-3. A blog in Spanish about web development using WordPress and the plug-in for mobile device adaptation.

WordPress

For the popular WordPress blog engine, there are several mobile plug-ins available.

One of the most useful ones is the WordPress Mobility Pack, available at <http://wordpress.org/extend/plugins/wordpress-mobile-pack>. This is a free plug-in that automatically switches mobile users to a mobile version of your blog, like the one shown in Figure 10-3. There are clear installation instructions and steps on the website.



If you want to provide an installable widget for your blog that will work on many devices, you can create a free widget using only your blog URL at <http://www.widgen.com>.

The main features of the WordPress Mobility Pack are:

- Mobile switcher, to change versions from desktop to mobile and vice versa
- Image rescaling
- Mobile ads and analytics support
- QR code (called the Barcode widget) in the desktop site for easy access
- XHTML MP 1.0–compatible markup
- Page splitting for large articles

Another good solution is to use the free Mobile Press (<http://mobilepress.co.za>), which allows you to customize the stylesheet for every platform.



There are some automatic mobilizing solutions available, even as WordPress plug-ins, that can redirect the user to another server that analyzes your desktop website in real time and creates a mobile version, like a transcoder. I don't recommend this solution, though, as you don't have much control over the rendering engine or the server.

Joomla!

Joomla! is a more complex CMS that also implements many mobile solutions. You can find a full list at <http://extensions.joomla.org/extensions/core-enhancements/mobile>.

One of the most complete is OSMOBI (<http://www.osmobi.com>), which also works with the Drupal CMS. Free and premium commercial versions are available.

Other Joomla! mobile plug-ins can be found at http://sourceforge.net/projects/joomla_mobileplus.

phpBB

There is a mobile compatibility plug-in for the forum phpBB available at <http://sourceforge.net/projects/phpbbmobileaddo>.



If you are working with another CMS, check in the plug-ins directory for a mobile solution. If you don't find one, it's an opportunity to create one!

Geolocation and Maps

One of the great features of mobile devices is that they can go everywhere with us. That is why the *where* is a very important context to be considered by our websites. Knowing the user's location can help us to show useful contextual information. If I live in London, why should I receive a banner promotion from a shop in New York? Likewise, if I am on holiday in Singapore and I search for "pizza," I would like to receive relevant information about where I can get it.

Location-based services (LBS) are one of the key features of modern mobile web applications. From our mobile websites, we can get the user's location using many techniques. Mapping and LBS services are very popular right now, so it is easy to find web services and APIs from different providers and integrate them into our mobile websites.

Location Techniques

There are different techniques that we can use to determine the geographical location of a device, based on the platform, the browser, the operator, and so on. Most technologies involve server detection, but others depend on client detection, and we may even rely on the user's input.

Accuracy

Every location technology has some accuracy error. This is usually specified in a distance metric, like meters or kilometers, but in some techniques accuracy is defined according to levels such as *city accuracy* or *country accuracy*.

Indoor Location

When we think about geolocation, we tend to think about the outside location—that is, where on the planet the user is located. Recently, there has been some interest in services that will locate a user inside a building (for example, a shopping mall or an office building). The idea is that we can offer better services for the users inside the

building if we can pinpoint what floor they are on or what department they are in. These services may be local services on the Internet, or even services provided on an intranet with the user using a Wireless LAN connection.

Augmented Reality, the Promise

Augmented Reality (AR) is a very popular technology today. It involves the usage of the camera preview with additional information on the screen about the objects and places we are seeing. One of the AR solutions is geographical-based, allowing us to see, for example, the camera preview and a tag over every building and Point of Interest (POI), with more information displayed about those places.

This solution involves accelerometer, high-accuracy geolocation (e.g., GPS), digital compass, and camera support. Unfortunately, a web application cannot access all of these features from the mobile device, so we cannot create AR web applications right now. Such applications must be created as native apps, like an Objective-C application for iPhone or a Java application for Android.

Client Techniques

Devices support a wide variety of approaches to figuring out where they are. Different approaches may yield different results.

GPS

The Global Positioning System (GPS) is the first technique most people think of when location detection is mentioned. GPS was created by the United States government as a system for locating devices, using between 24 and 32 satellites orbiting the Earth. Many mobile devices come with a built-in GPS receiver that can read satellite data to determine location information (data must be received from a minimum of four satellites). In mobile devices, the accuracy error is between 2m and 100m. The user needs to have a sky view (outside), and it can take between 5 seconds and 5 minutes to calculate the location.

A-GPS

Assisted GPS is a software-based system available for mobile phones connected to carrier networks that can help the devices to determine their locations. The assistance can be in the form of helping the device to find a better satellite signal, or providing less-accurate information about the location of the user until the GPS has connected successfully.

In 2006, I started to use a Nokia N95 with GPS support. In my city, it took 5 minutes to get my location using GPS (with an accuracy error of 10 meters). A firmware update later added A-GPS support to the same hardware, allowing the same device in the same city to connect in 10 seconds, with an initial accuracy error of 100 meters.

Cell information

Using the operator network's cellular towers, the carrier can triangulate the position of a mobile device. The accuracy will depend on how many cells are in range (the more densely populated your location is, the more towers will be in range and the more accurate the reading will be). The carrier knows every cell tower's position, so it can make the calculations to detect the device's location.

Even knowing which cell tower a device is connected to can provide an idea of its location (near the location of the tower). This might be accurate to within a block, or up to some kilometers in rural areas.

Getting the Cell Location Without the Carrier's Assistance

It is possible to detect a mobile device's position using cell information without the cooperation of the carrier. OpenCellID (<http://www.opencellid.org>) is an open source project aiming to create a complete database of cell IDs worldwide. If we can get the IDs of every cell in range and calculate the distances to those cells, we can triangulate the device's position.

For example, Google Maps can locate even non-GPS-equipped devices anywhere in the world, and with some carrier agreements for cell detection.

WiFi Positioning System

If you have a notebook with WiFi and Google Chrome 2.0 or Firefox 3.5 or newer, go to <http://maps.google.com> and click on the blue circle. If you are in a large city, you will probably be located very accurately. You were just geolocated, and unless you have a 3G netbook chances are your notebook doesn't have GPS. This technique also works on a WiFi-connected iPod Touch. But how?

The WiFi Positioning System (WPS) is a very clever technique that detects your location using the list of wireless routers that are available in your area (even if you are not connected to them). This method relies on a pre-existing database of routers and their geographical locations. Skyhook Wireless (<http://skyhookwireless.com>) is the leading provider, offering developer programs for most mobile and desktop platforms. Google has its own database and is the provider used by Firefox.

The main problem for us is that as yet there are no mobile browsers that give us the hotspot list.

Server Techniques

On the server, we can get the HTTP request headers. This is our opportunity to locate the user without using any client technology such as GPS, and in a way that works even for low-end devices.

IP address

The main server technique for locating a user is reading the client's IP address. However, this is not as straightforward as it may sound. Depending on the user's connection type (2G, 3G, WiFi), the IP address we receive may be the operator's WAP gateway address, a dynamic IP address in the operator's range, or the IP address of the WiFi connection.

To further complicate our work, we need to bear in mind proxied browsers (discussed in [Chapter 2](#)). These browsers use a proxy server to connect to the Internet and to our servers. For example, if the user is browsing using Opera Mini, we will receive the requests from the Opera server instead of from the user's device. Likewise, if the user has a BlackBerry device and is using a corporate Internet connection, we will receive the requests from that connection, which could be based thousands of miles from the actual user's location.

What should we do with the IP address? There are public lists of operators' IP addresses, and there are public and commercial solutions for determining the location of an IP address. The accuracy of this method can be country-level to city-level, although in some special situations, like when the user is using a public WiFi network, we can pinpoint the exact location.

Carrier connection

Some worldwide operators offer developer programs (both open and private) for web portals that allow any request made from a user to your web server to carry additional headers containing information about the user (e.g., identity, location, and billing services). The GSM Association, which encompasses almost all the operators around the world, has launched an initiative called *OneAPI* that aims to provide web applications with access to all this carrier information through its APIs.

Language

A less-accurate mechanism is to use the accepted language of the browser. If the user has set up his device correctly, it should send a header indicating the preferred language, from which we can infer the country of the user (for example, the browser may send us en-CA as the accepted language, meaning English from Canada). This results in at best country-level accuracy.

Indoor location

When users are connecting via WiFi hotspots in a single building, we can configure our routers to be queried about those users. Every WLAN user has a unique IP address in the network, so we can tell which hotspot a given user is connected to. With that information, we can identify the floor and zone where the user is located.

Nokia set up the first indoor location implementation trial in the Kamppi shopping center in Finland, shown in [Figure 11-1](#). Anyone inside the shopping center can access

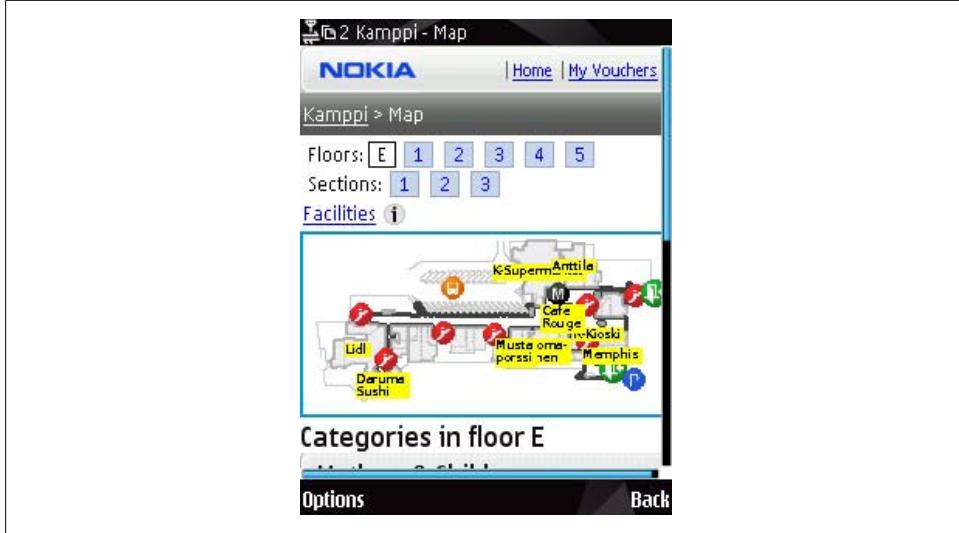


Figure 11-1. Nokia was one of the first providers offering indoor position detection from a web browser, in a shopping center in Finland.

indoor maps, information, vouchers, and even their friends' locations by going to a website using any mobile browser from an S60 device.

Asking the User

If you need to offer web-based location-based services, the last location mechanism available if all the others fail is to *ask the user*. Even if you have identified the location using another algorithm, you may be able to increase the accuracy by asking the user, as shown in Figure 11-2.



The user may know her location, or not. For example, if the user is visiting a foreign city, she may not know her current location.

So, what should we be asking users? We should allow them to select from a closed list, or to type the location in an open text box. We can query our databases for city names, addresses, POIs (like parks, hotels, or restaurants), or zip codes. We can also query public databases using web APIs like Yahoo! PlaceMaker and Yahoo! GeoPlanet. To pinpoint the location, we can then use a geocoding query to convert the string into a latitude/longitude pair.



Figure 11-2. Google Local Search uses automatic geolocation if available; if not, it tries to determine your location by IP, your location history, and a search feature to define it manually.

We should allow the users to select their current location from amongst the following:

Home

If the users need to log into the website, we can ask them where they live when they install the application and store this information in our database for future use.

Favorite places

We can make a user's favorite places database.

History

We can allow the users to select places where they have been recently, ordering the list by frequency.

Records of all of these locations may be stored in a database on our server attached to the user's credentials (for login-based solutions), in a cookie on the client, or even in client storage in supported devices.

Detecting the Location

Let's take a look at some samples of the different techniques, and a multiplatform solution that will work for almost all devices. [Table 11-1](#) analyzes browser compatibility with the different client techniques.

Table 11-1. Client geolocation API support list

Browser/platform	Client geolocation support
Safari	W3C Geolocation API from iOS 3.0
Android browser	Gears from Android 1.5
	W3C Geolocation API from Android 2.0
Symbian/S60	No support (available in widgets)
Nokia Series 40	No support
webOS	No support (available in offline applications)
BlackBerry	BlackBerry Location since 4.1
	Gears since 5.0
	W3C Geolocation API announced from 6.0
NetFront	No support
Openwave (Myriad)	No support
Internet Explorer	No support (Gears optionally, if it's installed)
Motorola Internet Browser	No support
Opera Mobile	No support (Gears optionally, if it's installed)
Opera Mini	No support

W3C Geolocation API

The World Wide Web Consortium is working on a standard way to query the user's position from JavaScript, called the Geolocation API. The API is still in draft at the time of this writing, but the draft status has not stopped some providers from using it: it has been implemented in Firefox since version 3.5, in mobile Safari since iOS version 3.0, and in the Android browser since 2.0. We should expect it to be implemented in more browsers in the future.

The Geolocation API doesn't rely on one location technology. Instead, it allows the browser to decide which method it will use.

With this API implemented in a mobile browser, the `navigator` object in JavaScript will have a read-only property called `geolocation` that will allow us to interact with the API.



The Iris Browser (recently acquired by BlackBerry), the Bondi Widgets 1.0 API, the Nokia JavaScript Platform 2.0, the webOS DoJo framework, and Safari on iOS 3.0 are the mobile platforms currently supporting the W3C Geolocation API.

Location querying is an asynchronous process. It can take some time to get the user's location (like in GPS); that's why the API relies on callback functions to give us the latitude and longitude.

The user will need to give the site permission to obtain the geolocation data using the API, as shown in [Figure 11-3](#).

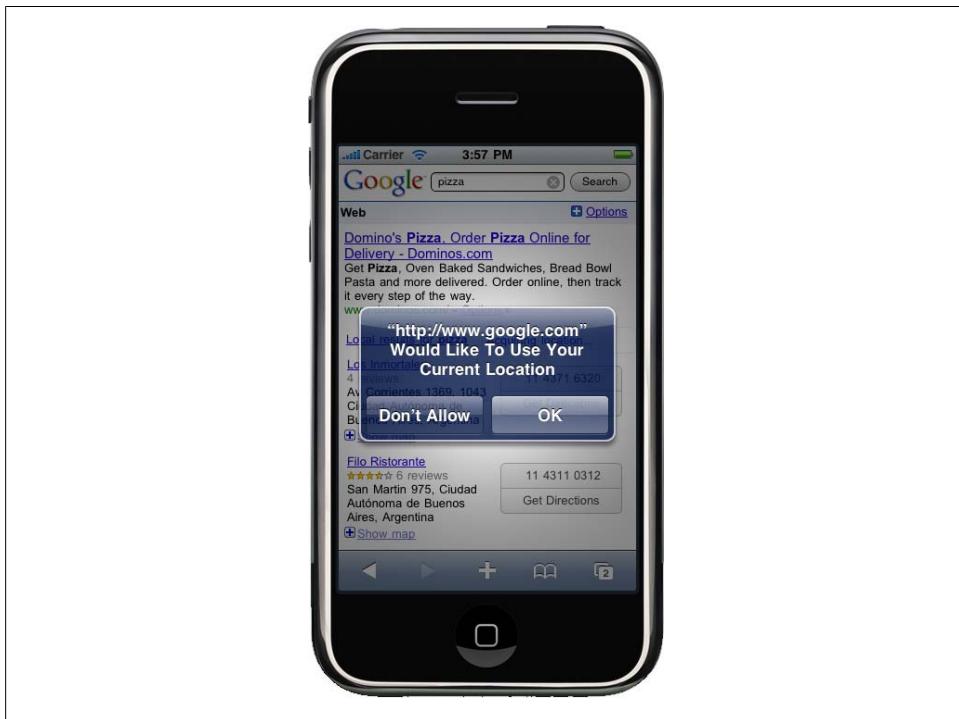


Figure 11-3. We cannot get the user's location unless permission was granted the first time we tried to get it.

Getting the position

The first way to use the Geolocation API is to get the user's location, using the `getCurrentPosition` function of the `geolocation` object. It receives two callbacks: the function that will receive the position, and an error-handling function. The latter is optional.

Optionally, it may also receive an object that configures some additional properties; this third parameter will be discussed shortly.

Let's look at an example:

```
navigator.geolocation.getCurrentPosition(userLocated, locationError);
```

The first callback will receive one parameter as the `position` object with a `coordinate` property. The error callback will receive an error code:

```
function userLocated(position) {
    var latitude = position.coords.latitude;
    var longitude = position.coords.longitude;
    var timeOfLocation = position.timestamp;
}

function locationError(error) {
    alert(error.code);
}
```

The `coords` property has the following attributes, defined in the W3C standard:

- `latitude`
- `longitude`
- `altitude` (optional)
- `accuracy`
- `altitudeAccuracy` (optional)
- `heading` (optional) in degrees clockwise
- `speed` (optional) in meters per second

Handling error messages

The parameter received in the error handler is an object of class `PositionError` having a `code` and a `message` (useful for logging). The class also has some constant values to be compared with the `code` property. The constants are shown in [Table 11-2](#).

Table 11-2. PositionError constants in the W3C Geolocation API

Error constant	Description
UNKNOWN_ERROR	The location couldn't be retrieved.
PERMISSION_DENIED	The user has denied permission to the API to get the position.
POSITION_UNAVAILABLE	The user's position couldn't be determined due to a failure in the location provider.
TIMEOUT	The user's position couldn't be determined before the timeout defined in the options.

To use these constants, we should make a switch for each value:

```
function locationError(error) {
    switch(error.code) {
        case error.PERMISSION_DENIED:
            // error handling
            break;
        case error.POSITION_UNAVAILABLE:
```

```
        // error handling
        break;
    case error.TIMEOUT:
        // error handling
        break;
    }
}
```

Tracking the location

The second way to use the W3C Geolocation API is to track the user's location. With tracking support, we can receive notifications about location changes. For instance, we can make a sports website that tracks the user's steps, make speed and distance calculations, and store this information either locally or on our server using Ajax.



For this to work, the user needs to keep the website open in the browser. Many browsers also stop JavaScript execution when the browser is in the background.

The tracking process involves the `watchPosition` method of the `navigator.geolocation` object, which receives two handlers (for location detection and error management) and returns a `watchId`. The handler function will receive the same parameter as the `getCurrentPosition` function that we saw earlier. To stop the location tracking we can call `clearWatch`, passing the previously received `watchId`:

```
// Global variable to store the watch ID
var watchId = false;

// This function may be called by an HTML element
function trackingButtonClick() {
    if (watchId==false) {
        // Tracking is off, turn it on
        var watchId = navigator.geolocation.watchPosition(userLocated,
                                                          locationError);
    } else {
        // Tracking is on, turn it off
        navigator.geolocation.clearWatch(watchId);
        watchId = false;
    }
}
```

Detecting API availability

Detecting whether the W3C Geolocation API is available is as simple as querying whether the `navigator.geolocation` object exists. For example:

```
if (navigator.geolocation==undefined) {
    alert("Geolocation API is not present");
}
```

Defining optional attributes

The third parameter of the `getCurrentPosition` and `watchPosition` functions can receive an object with the optional properties outlined in [Table 11-3](#).

Table 11-3. Optional properties for `getCurrentPosition` and `watchPosition`

Property	Type	Default value
<code>enableHighAccuracy</code>	Boolean	<code>false</code>
<code>timeout</code>	Long (in milliseconds)	<code>Infinity</code>
<code>maximumAge</code>	Long (in milliseconds)	<code>0</code>

If the `enableHighAccuracy` property is defined as `true`, the provider should force the best accuracy in determining the user's location.

The `maximumAge` attribute is useful for using location data cached on the device. If the device has recently acquired a location, we can get that location using this property, defined as the maximum milliseconds we want. If the property is defined as `0` (the default value), the device must acquire a new location. A typical usage might look like this:

```
navigator.geolocation.getCurrentPosition(userLocated, locationError,  
{timeout:10000, maximumAge: 30000, enableHighAccuracy:false});
```

Google Gears

Google Gears is a browser plug-in preinstalled on some devices and optionally available on others. It is just a stopgap and will become obsolete as soon as HTML 5 becomes a standard. In the mobile world, we can find Google Gears in the Android browser from version 1.5 of the OS, in Opera Mobile from version 9.5, in Windows Mobile as an optional download for Internet Explorer, and in BlackBerry devices since version 5.0 of the OS.

Getting the position

Gears includes a Geolocation API that is similar to the W3C's. To use the Gears API, first we need to load it into JavaScript using the `script` tag:

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

We can then query the location using the `getCurrentPosition` method of a previously created `geolocation` object. This method receives a handler for success, a handler for failure, and a third optional parameter (discussed in the upcoming section “[Customizing location preferences](#)” on page 380):

```
var geolocation = google.gears.factory.create('beta.geolocation');  
geolocation.getCurrentPosition(userLocated, locationError);
```

The first callback receives one parameter as the `position` object with `latitude` and `longitude` properties. The error callback receives an error code:

```
function userLocated(position) {
    var latitude = position.coords.latitude;
    var longitude = position.coords.longitude;
    var altitude = position.coords.altitude;
    var timeOfLocation = position.timestamp;
}

function locationError(error) {
    alert(error.message);
}
```

Once the location has been obtained, we can access it again using the `lastPosition` object (it will be `null` if the location has not previously been queried):

```
var lastPosition = geolocation.lastPosition;
```

Obtaining permission

As with the W3C Geolocation API, the user has to give permission to a website to use this feature. However, Gears offers us a way to query the user at any time, as shown in [Figure 11-4](#), using the `geolocation` object created using the `google.gears.factory` method. This object has a `hasPermission` property that we can query to see whether the user has already granted us permission.

To get permission we can use the `getPermission` method, which receives three optional parameters: the `siteName`, an `imageUrl`, and an `extraMessage` used to give the user information in the pop-up window. This method returns `true` if the user has granted access and `false` if not:

```
hasPermission = Geolocation.getPermission("Geolocation.com", "images/logo.gif",
    "Give us permission to filter your results based on your location");
```

Customizing location preferences

As with the W3C API, we can define an optional third parameter that can receive an object with the attributes shown in [Table 11-4](#).

Table 11-4. Google Gears optional attributes for geolocation

Property	Type	Default value
<code>enableHighAccuracy</code>	Boolean	<code>false</code>
<code>timeout</code>	Int (in milliseconds)	<code>Infinity</code>
<code>maximumAge</code>	Int (in milliseconds)	<code>0</code>
<code>gearsRequestAddress</code>	Boolean	<code>false</code>
<code>gearsAddressLanguage</code>	String	Default language
<code>gearsLocationProviderUrls</code>	String[]	<code>null</code>

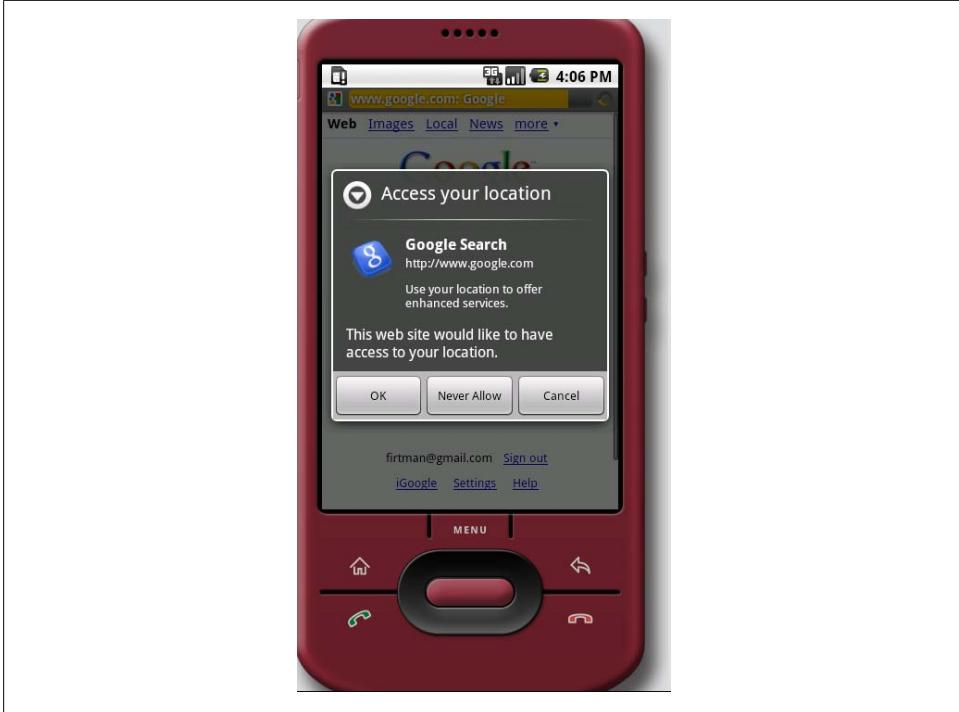


Figure 11-4. The Android browser showing the permission dialog for geolocation using Gears. The Gears Geolocation API allows for more customization of the permission dialog than the W3C one used in iPhone devices.

As you can see, Gears supports the same properties as the W3C API, and three other attributes prepared for reverse geocoding. If `gearsRequestAddress` is defined as true, Gears will try to add address information to the position by performing a reverse geocoding, converting the latitude and longitude into address information (street, city, country). The `gearsAddressLanguage` property defines an RFC 3066 string language code, like "en-GB" for British English or "es-MX" for Mexican Spanish, to use for the address information. By default Gears uses Google as the provider for the reverse geocoding service, but we can provide our own provider URLs using the `gearsLocationProviderUrls` array.



The BlackBerry browser has supported the Gears Geolocation API for high-accuracy requests since OS 5.0. Alternatively, we can use the proprietary `blackberry.location` object, which is faster and less battery-intensive but provides less accuracy and information than Gears. We'll look at the BlackBerry Location API shortly.

Reading the address

If we turn on reverse geocoding, the position object received in the handler will have a `gearsAddress` attribute with the following string properties:

- `street`
- `streetNumber`
- `premises`
- `city`
- `region`
- `country`
- `countryCode`
- `postalCode`

This sample gives the street information to the user:

```
function userLocated(position) {  
    if (position.gearsAddress!=null) {  
        var address = position.gearsAddress;  
        alert("You are located at " + address.streetNumber +  
              " " + address.street + " " + address.city);  
    } else {  
        alert("Your address couldn't be determined");  
    }  
}
```

Handling errors

Gears only supports the following W3C error codes in the error handler parameter:

- `PositionError.POSITION_UNAVAILABLE`
- `PositionError.TIMEOUT`

Remember that we can find out whether the user has granted permission by querying the `hasPermission` property of the `geolocation` object.

Tracking the location

We can also track the user's location over time using the same technique as the W3C API. The only difference is that the `watchPosition` method has an optional third parameter allowing us to select optional preferences, just like the third parameter for the `getCurrentLocation` method.

BlackBerry Location API

Since Device Software version 4.1, the BlackBerry browser has included a proprietary `blackberry.location` object. To determine whether a BlackBerry device has GPS support, we should check the Boolean property `blackberry.location.GPSSupported`.

The best way to get the user's location is to use the `onLocationUpdate(callback, stringCallback)` method, which receives a callback function as the first parameter and a string for callback information as the second.



In BlackBerry software before 4.6 the callback method in `onLocationUpdate` must be passed as a string.

The `removeLocationUpdate(callback)` method will remove the callback, and `refreshLocation` requests an update of the location by calling the previously defined `onLocationUpdate` callback method.

Once we receive a callback call, we can read the position using `blackberry.location.latitude` and `blackberry.location.longitude`.

We can define the method to obtain the GPS location using `blackberry.location.setAidMode(mode)`, using one of the following modes:

- Cellsite (mode 0), the fastest and least accurate mode
- Assisted (mode 1), using some kind of A-GPS
- Autonomous (mode 2), using only GPS

Therefore, for tracking the user's location, the following sample will be useful:

```
if (blackberry.location!= undefined) {  
    // It's a Blackberry with Location support  
    blackberry.location.onLocationUpdate(userLocated);  
}  
  
function userLocated() {  
    var latitude = blackberry.location.latitude;  
    var longitude = blackberry.location.longitude;  
    var timeOfLocation = blackberry.location.timestamp;  
}
```

Widget APIs

Almost all widget APIs (covered in [Chapter 12](#)) have geolocation support from JavaScript. Remember that in these cases the user will not be using the browser explicitly.

GSMA OneAPI

OneAPI is a cross-operator API organized by the GSM Association. At the time of the writing of this book, the API is still under development, and fewer than 10 operators worldwide are connected. With this API we can access the user's location from our servers, using his phone number. The website to register as a developer and obtain a token to access the OpenAPI web services is <http://oneapi.aepona.com>. The API supports SOAP Web Services and REST using HTTP.

One of the services supported by OpenAPI is geolocation. With the Location API, we can get a user's longitude and latitude using the mobile operator's cells' positions. To use the API we need to get a key from the website. Then, if we want to use REST, we can create an HTTP request to a URL like the following:

```
https://developer.aepona.com/TerminalLocationService/Proxy/REST/<key>?address=tel:<tel>&accuracy=coarse
```

where `<key>` is the key assigned to our developer account and `<tel>` is the international number of the phone we want to geolocate. If the request is successful, we will receive a response like the following:

```
<response timestamp="2010-06-06T12:31:07.014Z" longitude="10.22244"
latitude="54.601505" altitude="10.0" accuracy="200"/>
```

The list of supported operators is on the website, and the goal is to have all the operators worldwide using the same API.



Loki.com offers an API for developers based on a geolocation plug-in for desktop browsers and an IP Geolocation service that can be used from a mobile device.

Multiplatform Geolocation API

geo-location-javascript is a multiplatform framework designed for mobile browsers. It is available as an open source project hosted in Google Code (<http://code.google.com/p/geo-location-javascript/>).

The framework is compatible with the iPhone and other devices that use the W3C Geolocation API, devices that use the Google Gears Geolocation API (including Android and Windows Mobile devices), and BlackBerry devices. It also works with the Nokia Web Runtime widget engine, Palm Pre for webOS, and other browsers with less market share.

This framework allows us to use the same code for all platforms. To use the framework, we just need to download the JavaScript file, host it on our servers, and include it in our websites:

```
<script src="http://code.google.com/apis/gears/gears_init.js"
       type="text/javascript"></script>
<script src="geo.js" type="text/javascript"></script>
```



To support Gears on compatible devices, we must insert the `gears_init` script in the HTML document. We can create a function that inserts this script only on compatible devices using DOM.

The API creates a global variable called `geo_position_js` with an `init` method that returns a Boolean indicating whether the device is compatible with geolocation.

Once we are sure that geolocation is available we should call `getCurrentPosition`, passing two callbacks (the position handler and the error handler):

```
if (geo_position_js.init()){
    geo_position_js.getCurrentPosition(userLocated, locationError);
} else{
    alert("GeoLocation not available");
}
```

The callback parameters are aligned with the W3C API, so we can use the same handlers:

```
function userLocated(position) {
    var latitude = position.coords.latitude;
    var longitude = position.coords.longitude;
    var timeOfLocation = position.timestamp;
}

function locationError(error) {
    alert(error.code);
}
```

If the real implementation supports other options (like `altitude`), we can read them in the callback parameter.

Simulating movement

To assist us in development phase, the framework also allows us to simulate users moving without a real device actually moving. To simulate movement we should insert a second script:

```
<script src="js/geo_position_js_simulator.js" type="text/javascript"
charset="utf-8"></script>
```

Then, we can create an array of locations and initiate the simulation:

```
var simulation=new Array();

// These are Barcelona's positions from the simulator sample
simulation.push({ coords:{latitude:41.399856290690956,
    longitude:2.196106910705664}, duration:5000 });
simulation.push({ coords:{latitude:41.400634242252046,
    longitude:2.1971797943115234}, duration:5000 });
simulation.push({ coords:{latitude:41.40124586762545,
    longitude:2.197995185852051}, duration:5000 });

// Initiate the simulation
geo_position_js_simulator.init(simulation);
```



The framework does not support a tracking system, so if we want to use it to track users' movements we should implement a `setTimeout` or `setInterval` timer to call `getCurrentPosition` frequently.

IP Geolocation

There are a lot of free and commercial IP address geolocation services available for use on our servers. When using such a solution, we need to remember that a BlackBerry can browse through a corporate network, so the IP address will be the network IP address and not the user's. The same applies to proxied browsers like Opera Mini.

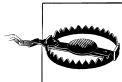
Reading the IP address

We can read the IP address from the host using the appropriate mechanism for the server platform. For example, in PHP we read the address using:

```
$IP = $_SERVER['REMOTE_ADDR'];
```

However, we must remember that this IP address may belong to a renderer proxy. For example, when an Opera Mini user accesses our website the IP address will be always the same, because the client contacting our server is actually the Opera Mini server. Fortunately, Opera Mini servers offer us another HTTP header that provides the actual IP address of the requesting mobile device: the **X-Forwarded-For** header contains a CSV list of the IP addresses of all the proxy servers the request has passed through on its way from the device to the Mini proxy. The last IP address will be the address of the original requestor (the mobile device).

Once we have the IP address to query, we can use a web service to get the country/city details, or download the Geo-IP open source database from <http://software77.net/geo-ip>.



We need to keep in mind that IP geocoding is useful only to get the user's country for devices connected to the Internet via 2.5G or 3G, because what we'll receive is the operator's gateway IP address. If the user is using WiFi, depending on the zone, we can usually get more accurate details.

Google's ClientLocation object

Google provides a set of Ajax APIs (Maps, Search, etc.) that can be used to create feature-rich dynamic websites. Whenever one of these APIs is loaded on a client, the Ajax API loader attempts to geolocate the user using the device's IP address.

To use the Ajax APIs, we need to get an API key, freely available from the website <http://code.google.com/apis/ajaxsearch/signup.html>. Once we have an API key, we need to insert this script:

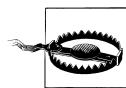
```
<script type="text/javascript"
       src="http://www.google.com/jsapi?key={key}"></script>
```

To use the client location feature, we must then load an API. For example:

```
<script type="text/javascript">
  google.load("search", "1");
</script>
```

Once we've loaded the API, the `google.loader.ClientLocation` object will be populated with properties like the following:

- `latitude`
- `longitude`
- `address.city`
- `address.country`
- `address.country_code`
- `address.region`



This technique works only on compatible devices and should be used only if we are going to make use of one of the Ajax APIs (Ajax Search, Maps, Ajax Feeds, Earth, Data, Visualization, Friend Connect, or Ajax Language).

Showing a Map

Once we have located the user (via a client or server solution), we may want to display a map showing the user's position, and/or a list of points of interest or other information superposed on the map.

To do this, we should use one of the available public maps APIs: Google Maps, Bing Maps from Microsoft, Yahoo! Maps, or OVI Maps from Nokia. However, if we analyze mobile compatibility, there is really only one choice: Google Maps. Compatibility for the others may increase in the future, but at present Google's API is by far the best supported.

There are actually two Google APIs that are useful for mobile browsers: the Google Maps API v3 and the Google Maps Static API. The first one is the same service that we can find in any website using Google Maps. However, it is currently compatible only with iPhone and Android devices; on other devices, this API will not work properly. The Static API will allow us to show a static map compatible with any mobile browser.



Yahoo! APIs will be compatible if we use the Point of Interest (POI) search or even the geocoding services. Microsoft also offers Bing Maps Web Services with similar solutions.

Google Maps API v3

If we are sure that the device is an iPhone or Android device, we should use the Google Maps API version 3, as shown in [Figure 11-5](#).

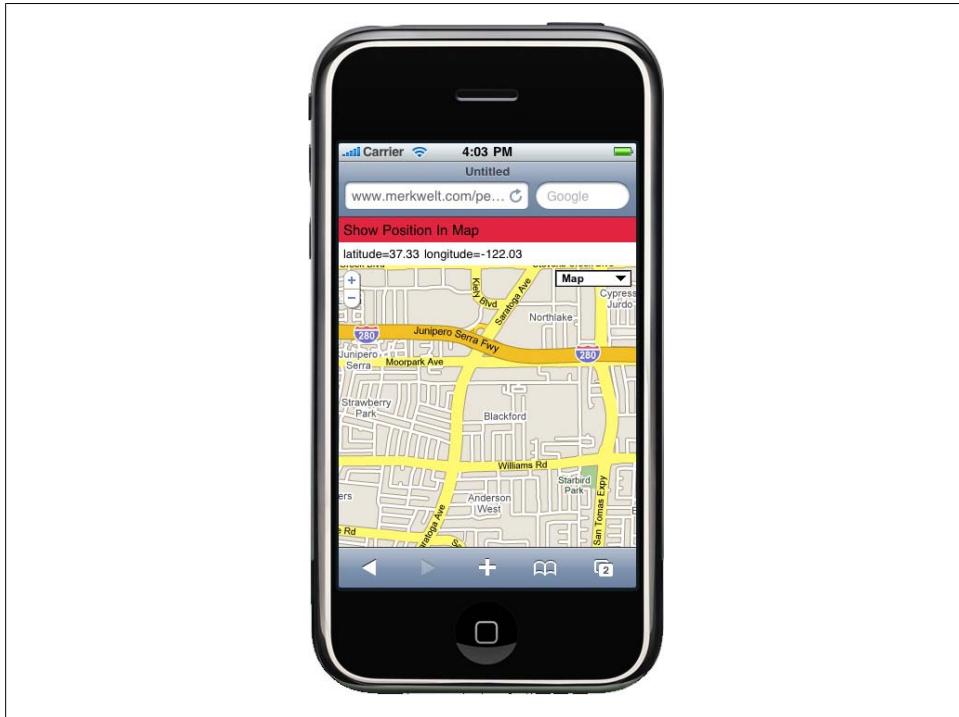


Figure 11-5. Here we can see the Google Maps API on an iPhone showing the user's current location using the multiplatform framework.

To use the API, we first need to include the script loader:

```
<script type="text/javascript"  
src="http://maps.google.com/maps/api/js?sensor=true">
```

The `sensor` value must be `true` if the device has geolocation support via the operating system (this is the case on both iPhone and Android devices). We should check whether the device is compatible either on the server, as discussed in [Chapter 10](#), or using JavaScript.

Then, we need to create a `div` tag in our HTML and define its dimensions as 100%:

```
function showMap() {  
    var useragent = navigator.userAgent;  
    var divMap = document.getElementById("map");  
  
    if (useragent.indexOf('iPhone') != -1 || useragent.indexOf('Android') != -1 ||  
        useragent.indexOf(iPod) != -1) {
```

```

        divMap.style.width = '100%';
        divMap.style.height = '100%';
        // ...
    } else {
        // Google Maps not compatible with this mobile device
    }
}

```



We should use the Google Maps API only for iPhone or Android devices. On other devices, this will not work and we will need to use the Google Maps Static API instead.

The other requirement for iPhone and Android from version 1.5 is to define the `meta` tag to work without user zooming and with an initial scale of `1.0`. This is necessary to avoid usability problems with the map zooming. So, in the `head` we should add:

```
<meta name="viewport" content="initial-scale=1.0, user-scalable=no" />
```

A full sample looks like this:

```

<html>
<head>
<meta name="viewport" content="initial-scale=1.0, user-scalable=no" />
<script type="text/javascript"
        src="http://maps.google.com/maps/api/js?sensor=true"></script>
<script type="text/javascript">
    function init() {
        var useragent = navigator.userAgent;
        var divMap = document.getElementById("map");

        if (useragent.indexOf('iPhone') != -1 ||
            useragent.indexOf('Android') != -1 ||
            useragent.indexOf('iPod') != -1 ) {
            divMap.style.width = '100%';
            divMap.style.height = '100%';
            position = getPosition(); // This needs to be implemented
            var latlng = new google.maps.LatLng(position.latitude,
                                                position.longitude);
            var options = {
                zoom: 7,
                center: latlng,
                mapTypeId: google.maps.MapTypeId.ROADMAP
            };
            var map = new google.maps.Map(document.getElementById("divMap"),
                                         options);
        } else {
            // Google Maps not compatible with this mobile device
        }
    }
</script>
</head>
<body onload="init()">
    <div id="divMap"></div>

```

```
</body>  
</html>
```

To see the full Google Maps API documentation, go to <http://code.google.com/apis/maps/documentation/v3>.

Google Maps Static API

If we need compatibility with all mobile devices, even the ones without JavaScript support, we can use the free Google Maps Static API, which allows us to show a map as a static image without any automatic interaction.



To use this API you will need to sign up for a free API key at <http://code.google.com/apis/maps/signup.html>.

This API is very simple and doesn't require any JavaScript or server code. We will use it inside an HTML `image` tag, in the source URL. The URL will look like this:

```
http://maps.google.com/maps/api/staticmap?parameters
```

To use this API we need to get the location from the server or the client and generate the image URL dynamically using JavaScript on compatible devices. We need to remember that we may not want to show the user's location, but rather a map of some other place.



With the Google Maps Static API we can show a map on any mobile phone on the market, even those without JavaScript or Ajax support.

The common parameters include:

`sensor`

Must be true for a mobile device.

`center`

May be a position using `latitude`, `longitude`, or a city name.

`zoom`

The level of zoom required, from `0` (world view) to `21` (building view).

`size`

The size in pixels of the image required (e.g., `220x300`). We should get the device's screen size from the server or from JavaScript.

`format`

Accepts `GIF`, `JPEG`, or `PNG`. The default is `PNG`, which is suitable for mobile devices.

mobile

Marking this parameter as `true` creates different rendering images optimized for viewing on mobile devices. Google suggests using `false` in the case of iPhone or Android devices.



The API is more complex, and it can even show marks and routes over the map. To see the full documentation, go to <http://code.google.com/apis/maps/documentation/staticmaps/>.

For example, if we are using PHP and we just have the latitude and longitude (acquired by any method), we should use:

```
<?php  
// $latitude and $longitude already acquired  
$url = "http://maps.google.com/maps/api/staticmap?center=$latitude,  
$longitude&zoom=14&size=220x300&sensor=true&key=API_KEY";  
?>  

```

Following LBS

Location-based services are great. We can create very useful applications combining maps, places (Points of Interest), the user's location, and even other users' locations. Some good books about LBS and geographical services are available for marketers and developers. I encourage you to look more deeply into this topic, so you can create better mobile web experiences.

Widgets and Offline Webapps

Mobile websites can run like native installed applications on any platform. This technique is present today in every vendor's roadmap, and many devices are already compatible with some kind of solution for this.

The mobile community hasn't settled on a single name for this kind of application yet; some platforms call them "widgets" and others "offline applications," "JavaScript applications," "mobile web applications," "HTML 5 apps," or simply "webapps." I personally like the term "mobile widget," but there is no common agreement on this yet. The only disadvantage I see of using the term "widget" is that it is always related to a small application, and as this platform evolves we may prove to be underestimating it.

All that said, to simplify our discussion of this kind of application in this chapter, from here on out I will refer to them as widgets (call it the power of the author).



The W3C is working on some recommendations for mobile web application development, available at <http://www.w3.org/TR/mwabp>.

Alex Nicolaou, Engineering Manager at Google Mobile, said this in the Google Mobile blog about mobile web application design:

A growing number of mobile devices ship with an all-important feature: a modern web browser. And this is significant for two reasons:

1. As an engineering team, we can build a single app with HTML and JavaScript, and have it "just work" across many mobile operating systems. The cost savings are substantial, not to mention the time you can re-invest in user-requested features.
2. Having a web application also means we can launch products and features as soon as they're ready. And for users, the latest version of the app is always just a URL and a refresh away.*

* <http://googlemobile.blogspot.com/2009/12/iterative-web-app-feature-rich-and-fast.html>.

Of course, this also introduces some practical problems, but Nicolaou recognized that they could work on those issues to create a better version of Gmail for modern browsers.

Mobile Widget Platforms

We'll define a mobile widget as an application entirely developed using web technologies (HTML, CSS, JavaScript, Ajax) that is installed on the device's home screen or in the applications menu and that the user can use when offline as well as online. The usage of web technologies is invisible to the user, and the application can work just like any other software installed on the device.



If you are working with Android native applications and webOS applications, the term "widget" is used for another purpose: to define visual controls we can use on the screen.

Pros and Cons

Widgets are the future for most mobile applications, for a number of reasons:

1. The mobile world is fragmented and will be more fragmented in the future. [Chapter 1](#) covered all the platforms available today and likely to be available in the future. Java ME is no longer the king of portability; today, if you want wide coverage you need to create an iPhone, an Android, a Palm Pre, a Windows Mobile, a Symbian, a Bada, and also a Java ME application, and you still won't be covering all the platforms.
2. The Web 2.0 environment demands speed to market: we cannot wait months before releasing our mobile application clients. Widgets can be developed quickly.
3. Every vendor roadmap has a widget or similar technology implemented or slated to be implemented in the near future.
4. The majority of a widget's code can be shared between all operating systems.
5. A widget can be a great addition to a mobile website, sharing the same code as the "mobile client" version but offering different possibilities, such as integration with the device.
6. Widgets can be on the users' screens all the time, without requiring them to open the browser and type a URL.
7. Carriers are also entering the widget development world with their own platforms.
8. Widgets are built using well-known technologies (HTML, JavaScript, CSS, and Ajax) for which a lot of human and technical resources are available.
9. We can use any Web 2.0 API for widget development, without waiting for mobile APIs to appear.
10. Porting is less painful with widgets than with native applications.

11. It is easy to port mobile widgets from and to desktop widgets (Adobe AIR, Windows Vista Gadgets and others).
12. We can distribute widgets freely or sell them in vendors' stores.
13. They can be self-updated.
14. We can access platform services through new JavaScript APIs not available in mobile web browsers.

However, not everything is golden, and we will face some problems when using this technology:

1. Porting is required between platforms.
2. Debugging is painful.
3. Widgets are not native applications, so the performance will not be the best compared to other solutions.
4. Widgets are not suitable for all kinds of applications and games.
5. Widgets are not simple websites, but complete applications using JavaScript; best practices and good programming techniques are mandatory.
6. On most platforms, we cannot create background applications.
7. 3D effects are not possible (or at least, not recommended).
8. It is difficult or impossible today to implement CPU-intensive processes, like image recognition, augmented reality, or voice recognition, in mobile widgets.
9. Have I said yet that there are too many platforms? Certainly more than we want!

Architecture

We can define the architecture of a mobile widget application as described in [Figure 12-1](#).

Meta configuration

Every platform has some kind of meta configuration file where we generally define the name of the application, the icon to be used for the applications menu, the main HTML or JavaScript file to load when the widget is launched, and other metainformation.

There are widget/webapp platforms using all of the following for meta configuration:

- `meta` tags
- XML files
- JSON files
- Property list (`.plist`) files



Figure 12-1. Architecture of mobile widget development.

Platform access

Platform access refers to the ability to connect to platform services using JavaScript APIs. Depending on the device platform, our code may be able to access any of the following:

- Messaging
- Calendar and events
- Filesystem
- Camera
- Geolocation
- Home screen
- Battery and signal level
- Accelerometer
- Installed applications

Data storage

Widgets are not simple mobile websites; they are applications. And like all applications, they need to store information—databases, configurations, login data, statistics, or whatever else—in some sort of persistent store.

We have several data-storage options, including:

- HTML 5 storage
- Google Gears
- JavaScript API extensions

Network access

To access the Internet we can use standard Ajax requests, just like any JavaScript code, or any other similar solution, like JSONP requests. Most widget platforms accept cross-platform Ajax requests (to any web server, regardless of the origin of the widget code). For some platforms, we may need a proxy for third-party servers; we'll discuss proxies further in the next chapter.

Logic

The entire model, the controller, and the UI logic will be JavaScript code, and using best practices and high-performance object-oriented code will be mandatory. If you want to learn about JavaScript internals, hacks, and how you can write better code, I strongly suggest that you read the excellent book *JavaScript: The Good Parts* (O'Reilly), written by Douglas Crockford (<http://crockford.com>), a JavaScript architect at Yahoo!.

The first fear about this is, if the source code is plain JavaScript, can't other people look at and even steal our code? The answer is yes, but it shouldn't be a problem. Every Ajax website today (Gmail, Facebook, Hotmail) is JavaScript code that anyone can look at. Nothing stops us from using typical obfuscating techniques for our JavaScript code before we package it up, so it will be the same as unpacking a Java ME JAR file or an iPhone native application and trying to decompile the classes. Widgets are no less secure than native applications.

User interface

The user interface will be defined using all the technologies we've already talked about in this book: XHTML, CSS, images, `canvas`, SVG, and even Flash on supported devices. Some mobile widget platforms will offer us some kind of UI library to create native-like controls from JavaScript.

Some platforms also allow us to define native menus to be used, just like in any other installed application.

Package

Every platform offers some kind of package system where we will include all the static assets for our widgets: HTML, JavaScript, CSS, images, text files, configuration files, and any other required resources. Most packages are just ZIP files with a different extension and MIME type. Some platforms can embed a mobile web application inside a native application, and some others will use the HTML 5 offline behavior (the manifest file) to define a virtual package.

Distribution

Finally, when we have our package ready to distribute, we can deliver it to users. Options include Over-the-Air (OTA) delivery (with the appropriate MIME type applied), providing a URL from which the user can access the application for downloading, or distributing it in stores. (As we'll see later in this chapter, many stores are now accepting mobile widgets for free delivery or for sale.)

Standards

The standards in this area are still emerging, but we can identify some official and de facto standards in the mobile widget world.

Packaging and Configuration Standards

First, for packaging and for the configuration file, the W3C has the Widget Packaging and Configuration standard, defined at <http://www.w3.org/TR/widgets> (not only for mobile widgets). The W3C standard defines a ZIP file as the package format, with a configuration file and an optional icon included in the root folder of the package.

The configuration file must be named *config.xml*. Here's a sample file:

```
<?xml version="1.0" encoding="UTF-8"?>
<widget xmlns="http://www.w3.org/ns/widgets"
        id="http://mobilexweb.com/widget">
    <name short="Example 2.0">
        The example Widget!
    </name>
    <description>
        A sample widget to demonstrate some of the possibilities.
    </description>
    <icon src="icons/example.png"/>
    <content src="myWidget.html"/>
</widget>
```

The other de facto standard is the Apple Dashboard Widget, used for Mac OS X widget development. It also uses a ZIP file, and a property list file (*info.plist*) is used for configuration.

The property list format stores serialized objects in a file with a *.plist* extension. The contents are in XML format, but without the typical XML tag usage.

In a property file, objects are stored along with their properties. Each property can be a string, a number, a Boolean, an array, a key/value dictionary, or some other type, depending on the system. For each property, we define the name as one key tag and the value as another tag, depending on the type. For example:

```
<?xml version="1.0" encoding="UTF-8"?>
<plist version="1.0">
    <dict>
        <key>Numeric Property</key>
```

```
<integer>2010</integer>  
  
<key>String Property</key>  
<string>Value</string>  
  
<key>Boolean Property</key>  
<true/>  
</dict>  
</plist>
```

Platform Access

For mobile platform access standards, we have already talked about HTML 5, Google Gears, and the W3C Geolocation API. To that list, we can add the BONDI standard, the de facto PhoneGap standard, and a proposed standard by Nokia called Nokia Platform Services.

BONDI

BONDI (<http://bondi.omtp.org>) is a standard for mobile platform access from JavaScript including security policies defined and published by the Open Mobile Terminal Platform (OMTP) organization, now taken into the Wholesale Applications Community (WAC) and integrated with JIL and GSMA OneAPI. BONDI is supported by many companies, including ACCESS (NetFront), Myriad (Openwave), Sony Ericsson, LG, Opera, T-Mobile, Orange, and Vodafone. It supports access from a widget or even the browser.

Devices supporting the BONDI platform for widget development began entering the market in 2010. At the time of this writing there are two versions of the standard, 1.0 and 1.1, and the full API can be found on the website.

An open source independent SDK provided by the LiMo foundation is available at <http://bondisdk.limofoundation.org>, and every vendor should provide its own SDK (like LG, as we will see in the following pages). The LiMo SDK is Eclipse-based and includes a Phone View with some kind of BONDI emulator, as well as an incorporated debugger. This SDK also includes a debugger for testing WRT-based widgets (the Symbian format).



Remember that mobile widgets are just like any other HTML, CSS, and JavaScript code. We can even create something like a product catalog or a small data application that synchronizes with the server using Ajax without using any special API.

A BONDI widget is a ZIP package following the W3C widget standard, so it includes a *config.xml* file, a startup HTML file, and all the required resources. In order to be recognized as a BONDI widget, the ZIP file extension must be changed to *.wgt* and the file must be served as *application/widget*.

The API defined in the 1.0 and 1.1 standards manages all functionality with a `bondi` global object that is available in compatible devices. It includes the modules described in [Table 12-1](#). You can access a module if you define it in the `feature` tag of the `config.xml` file. This is to allow the user to know what features you will use when installing the widget.

Table 12-1. BONDI widget modules

Module name	Module object	Allows us to...
Application Launcher	<code>bondi.applauncher</code>	Launch any application installed, including standard ones (browser, email, phone, SMS, or media player)
Messaging	<code>bondi.messaging</code>	Send SMS, MMS, and email messages
User Interaction	<code>bondi.ui</code>	Define navigation mechanisms, configure soft keys and native menus, access effects (vibration, sounds, and lights), change the orientation, and fire some application events
File System	<code>bondi.filesystem</code>	Browse and manage files in known folders (documents, images, videos) or in any path in local or external memory
Gallery	<code>bondi.gallery</code>	Access media files on the device
Device Status	<code>bondi.devicestatus</code>	Access properties of the device
Application Configuration	<code>bondi.appconfig</code>	Change and read application settings defined by the developer
Geolocation	<code>location</code>	Implement the W3C Geolocation API
Camera	<code>bondi.camera</code>	Access video recording and photo snapshot capabilities
Communication Log	<code>bondi.commlog</code>	Access the list of recent messages and calls
Contact	<code>bondi.contact</code>	Access the SIM card and stored phone contacts
Calendar	<code>bondi.pim.calendar</code>	Access the device's calendars
Task	<code>bondi.pim.task</code>	Access the device's tasks list

Many methods support event listeners and JSON-style object parameters.

For example, the JavaScript code for sending an email with attachments taken from the filesystem from a BONDI widget would look like this:

```
<script type="text/javascript">
function send() {
    var file=bondi.filesystem.resolve("/Photo.jpg");
    var email = bondi.messaging.createEmail({
        from: "info@mobilexweb.com",
        to: document.getElementById("email"),
        subject: "Sent from a widget",
        body: "Hi! This is our message from a widget with an attachment",
        attachments: file
    });
    bondi.messaging.sendEmail(function() {
        // Sent handler
        alert('Your message was sent');
    });
}
```

```
    }, function() {
        // Error handler
    }, email);
}
```



For testing purposes, you can download a widget from the BONDI Reference Implementation, a Windows Mobile 6.x official implementation. You can also download testing SDKs and emulators for other vendors, such as LG.

The BONDI JavaScript API should also work in the future on normal browser-based websites, but we may first ask for permission using `bondi.requestFeature(success_callback, error_callback, module_name)`. The browser usage is not yet implemented on any platform.

At the time of this writing LG, Samsung, and Sony Ericsson are starting to support BONDI widgets. There are also some wrappers and open source projects to make them work on Symbian, Android, and other devices.

PhoneGap

If you know about PhoneGap, you may wonder why I am talking about it here, in the API standards section. PhoneGap (<http://www.phonegap.com>) is an open source framework for creating mobile web applications in HTML and JavaScript while still taking advantage of the core features of native applications in some platforms. It is becoming a de facto standard for iPhone, Android, and BlackBerry devices and is entering into the webOS, Symbian, Maemo, and Windows Mobile world.



Other similar projects are RhoMobile (<http://rhomobile.com>) and Titanium Mobile (<http://appcelerator.com>).

PhoneGap has two main features:

1. A JavaScript API for usage in our code
2. The ability to embed our web applications in native projects

PhoneGap applications are native applications that open a full-screen embedded browser with our mobile web code running inside. This framework provides a bridge between JavaScript and the native runtime, providing support for additional features not available in JavaScript.



You can create PhoneGap-like projects easily for every platform by using the web browser control that each platform offers in its native environment, and opening your HTML code inside. The disadvantage of not using PhoneGap is that you will not have access to any mobile-specific JavaScript APIs.

PhoneGap supports several new JavaScript native objects when you are running inside a PhoneGap project. The objects are listed in [Table 12-2](#).

Table 12-2. PhoneGap native objects

Object	Description
Geolocation	Provides similar functionality to the W3C Geolocation API
Accelerometer	Provides listeners for the accelerometer
Camera	Provides access to the camera
Notification	Provides access to sound, vibrate, and other notification options
Contacts	Allows you to manage contacts from the user's agenda
File	Enables you to read, write, and manage files on the filesystem
SMS	Lets you send SMS messages
Phone	Lets you make a call
Maps	Allows you to open a map
Audio	Allows you to record and play audio files
Settings	Gets information about the device
HTTP	Makes a GET request to an URL

For example, to take a picture we will use a code similar to this:

```
function takePicture() {
    navigator.camera.getPicture(function(image) {
        // This function is called with the picture data in base64 format
        document.getElementById("img").src="data:image/base64;" + image;
    }, null, {quality: 8});
}
```

Nokia Platform Services 2.0

Nokia has developed its own standard based on the Symbian WRT widget engine, which we will look at in the next section. This standard is an easy-to-use JavaScript API for accessing device services and is intended to be a future standard for many other vendors.

Apple Dashboard

Apple Dashboard, as one of the first widget engines for desktops, is the de facto standard for a global `widget` object in JavaScript. The most widely compatible methods are `openURL`, for opening the browser, and the persistent storage methods `preferenceForKey` and `setPreferenceForKey`, which we will cover later.

Platforms

Widgets come in a lot of different varieties, as the technology has emerged from different vendors and organizations at different times.

Symbian/Nokia

We will start with Nokia and Symbian Foundation devices, because they are the ones with the oldest mobile widget platform and the most experience in this field. Since Series 60 3rd edition Feature Pack 2 (and for some FP1 devices with a firmware update), every Nokia device supports a version of the Web Runtime (WRT) engine. These devices hit the market starting in 2007.

WRT is a first-class citizen mobile widget engine. When a WRT widget is installed it appears like any other Symbian or Java ME installed application, and might look like [Figure 12-2](#). From the user's perspective, there is no difference between widgets and native installed applications. And, of course, the widgets are created entirely using web technologies.

As a Symbian technology, WRT is also available in non-Nokia devices, such as Samsung and Sony Ericsson devices.

At the time of this writing, the platform is divided into the following versions:

- WRT 1.0 for Series 60 3rd
- WRT 1.1 for Series 60 5th
- WRT 7.1 with optional home screen support (Nokia N97, N97 Mini)
- WRT 7.2 with optional multipage home screen support (Nokia N8)

Home screen support (also known as MiniView) refers to the ability of a widget to stay on the device's home screen all the time, with visual updates possible. This is an excellent solution for applications related to social media, news, or any other information that can benefit from being regularly updated on the user's home screen.

The 7.1 and 7.2 numbers come from the version of the browser that is installed on those devices.

The platform access JavaScript API does not follow any of the standards we have seen so far, but it has many similarities to Apple's Dashboard Widget API.



Figure 12-2. A WRT widget looks like any other application. It even has native menu support created using JavaScript.

WRT Using Another JavaScript API

As JavaScript is a dynamic language, it is easy (almost magical) to create JavaScript wrappers to translate some other API into a WRT one. That is why we can find many wrappers for WRT for compatibility with other technologies. To use them, you have to include a script that will create all the global wrapper objects:

- For BONDI on WRT, you can use the BONDI JavaScript standard API (not the package standard) inside a Symbian widget.
- For PhoneGap on Symbian, there is a PhoneGap API for WRT 1.1.
- For Nokia Platform Services 2.0 for WRT 1.X, there is an optional library for WRT that simplifies the usage of the platform's JavaScript API.

You can find all these libraries for WRT at <http://www.mobilexweb.com/go/wrt>.

Package

A WRT widget is a ZIP file with a `.wgz` extension, served as `application/x-nokia-widget`. The configuration file follows the Apple Dashboard standard, so it is a property list (`info.plist`) with some mandatory information:

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE plist PUBLIC "-//Nokia//DTD PLIST 1.0//EN"
 "http://www.nokia.com/NOKIA_COM_1/DTDs/plist-1.0.dtd">
<plist version="1.0">
<dict>
    <key>DisplayName</key>
    <string>Widget Name</string>
    <key>Identifier</key>
    <string>com.mobilexweb.widget_unique_id</string>
    <key>MainHTML</key>
    <string>Main.html</string>
    <key>Version</key>
    <string>1.0</string>
    <key>AllowNetworkAccess</key>
    <false/>
    <key>MiniViewEnabled</key>
    <true/>
</dict>
</plist>
```

The `DisplayName` is the name that the user will see on the screen; the `Identifier` is an inverse-URL mechanism to identify an application inside the device; the `MainHTML` is the first HTML file that will be opened with the application; the `Version` is used by the Application Manager when the user is downloading the application again; and if we define `AllowNetworkAccess` as `false`, we will not have any access to the Web (Ajax or resource loading). `MiniViewEnabled` is for compatible devices only.

The icon must be in PNG format (the recommended size for the best compatibility is 88×88 pixels), must be named `icon.png`, and must be located in the root folder of the package.



Nokia also offers a map widgets platform called App on Maps. App on Maps widgets are small web applications that can be installed in OVI Maps (the map solution from Nokia) and can interact with a map. More information can be found at <http://forum.nokia.com/ovi>.

Features

The Forum Nokia Library (<http://library.forum.nokia.com>) has great documentation on WRT, in the section Web Developer's Library→Web Runtime widgets. WRT creates three new global objects: `widget`, `device`, and `menu`.



WRT allows you to define multilanguage applications; the version corresponding to the user's defined language will automatically be selected.

In WRT 1.0 we also have a `sysinfo` object to access the System Information API, which allows us to access properties from battery, network information, lights, vibration, beep tone, memory, and filesystem information and system language information services. WRT 1.0 doesn't have access to other APIs.



Platform Services 2.0 supports was added as a firmware update for Nokia N97 and Nokia N97 Mini and is included in newer devices. For other devices, we can add support by including the library.

The `device` object allows us to use the Platform Services API library in WRT 1.1. The standard version of Platform Services is 1.0; if we are using Platform Services 2.0, we can use some new APIs. [Table 12-3](#) lists the available APIs.

Table 12-3. Nokia Platform Services APIs

API	Allows us to...
AppManager	List applications and launch a specific application or the default handler for a document type.
Calendar	Create, access, and manage Calendar entries.
Contact	Create, access, and manage Contact entries. In Platform Services 2.0, you can also access Contact Groups.
Landmarks	Create, access, and manage Landmark entries that are used by many map applications inside the device.
Location	Retrieve information about the user's location.
Logging	Retrieve information about call, messaging, and data logs.
Media Management	Retrieve information about media files stored on the device.
Messaging	Send and receive messages.
Sensors	Access physical sensors on the device (like the accelerometer)
System Information	Retrieve system information (similar to WRT 1.0's System Information API).
Camera (2.0)	Launch the camera application and retrieve information on pictures taken (Platform Services 2.0 only).
Landmarks (2.0)	Access to the Landmarks local database.

In Platform Services 1.0, you have access to an API using the `device.getServiceObject` method. It receives the API name and an interface that every API defines in the documentation. For example:

```
var so = device.getServiceObject("Service.Messaging", "IMessaging");

// Get all messages from the Inbox
var criteria = new Object();
```

```

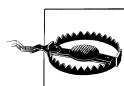
criteria.Type = 'Inbox';
criteria.Filter = new Object();
criteria.Filter.MessageTypeList = new Array();
criteria.Filter.MessageTypeList[0] = 'MMS';
criteria.Filter.MessageTypeList[1] = 'SMS';

var result = so.IMessaging.GetList(criteria);

var iterator = result.returnValue;
iterator.reset();
var item;
while ((item = iterator.getNext()) != undefined){
    // Access every message's properties using item
}

```

As you can see, it is a bit hard to implement simple actions. That is why Platform Services 2.0 was developed.



Every Platform Services 1.0 API call should be enclosed in a `try/catch` expression to handle error situations.

If you are targeting devices with WRT 1.X, you can add support for Platform Services 2.0. To do that, download the API and include a `platformservices.js` file in your package and code. You will then be able to access any API using the shortcut `nokia.device.load(interface_name)`.



You can create hybrid applications for Symbian and Maemo devices using the QtWebKit project. You can find information about porting WRT widgets to QtWebKit at <http://wiki.forum.nokia.com>.

For example:

```
var calendar = nokia.device.load("calendar");
```

The same SMS list sample is much simpler in 2.0:

```

var so = nokia.device.load("messaging");
transactionid = so.getList(listHandler, {type: "sms"},
    so.SORT_BY_DATE, so.SORT_ASCENDING, errorHandler);

function listHandler(iterator) {
    while (var sms = iterator.getNext() )
    {
        var message = sms.message;
        var sender = sms.sender;
    }
}

```

JavaScript API

The `widget` object has the following methods and properties:

Table 12-4. Methods and properties of the native widget object

Method/property	Description
<code>openURL(<i>url</i>)</code>	Opens the specified URL in a browser window, leaving our widget in the background.
<code>setPreferenceForKey(<i>value, key</i>)</code>	Stores a persistent object (<i>the value</i>) for a specific <i>key</i> that can be read by the same widget anytime. Note that the parameter order is <i>value, key</i> .
<code>preferenceForKey(<i>key</i>)</code>	Retrieves a stored preference for a key, or returns <code>undefined</code> if the key doesn't exist.
<code>prepareForTransition("fade")</code>	Blocks any update on the UI until <code>performTransition</code> is invoked. This is useful if we are going to change the UI for some controls and we don't want a flick effect.
<code>performTransition()</code>	Updates the UI with the changes made since the <code>prepareForTransition</code> call.
<code>setNavigationEnabled(<i>Boolean</i>)</code>	Toggles the navigation mode between the default (cursor-based with a pointer on the screen) and focus (tabbed) navigation.
<code>setNavigationType(<i>mode</i>)</code>	Changes the navigation mode (you can select <code>cursor</code> , <code>tabbed</code> , or <code>none</code>). If <code>none</code> is selected, all the key events can be handled by our code. Available since WRT 7.1.
<code>openApplication(<i>uid, param</i>)</code>	Launches an S60 application, identified by its hexadecimal number. There is a list of common UIDs in the documentation.
<code>setDisplayLandscape()</code>	Changes the UI to the landscape orientation.
<code>setDisplayPortrait()</code>	Changes the UI to the portrait orientation.
<code>onshow</code>	Fired when the application comes to the foreground.
<code>onhide</code>	Fired when the application goes to the background.
<code>onexit</code>	Fired when the user presses Exit.
<code>isrotationsupported</code>	Boolean indicating whether we can change the orientation on this device.

With the `menu` object and the `MenuItem` class we can create native menus, and we can define the label and handler for the left soft key with `menu.setLeftSoftkeyLabel(label, handler)`. The right soft key is by default handled by the platform with an "Exit" label, but after WRT 7.1 you can override it using `menu.setRightSoftkeyLabel(label, handler)`. You can also hide and show the soft key labels using `showSoftkeys()` and `hideSoftkeys()`.



It is expected that WRT will support HTML 5 in the future, and that MeeGo/Maemo devices will support WRT widgets.

The `onShow` event of the `menu` object will fire when the user opens the menu.

If you don't define a left soft key, by default it will be an "Options" submenu displaying the native menu you created. A `MenuItem` can have a `label`, an `id` for finding the element, an `onSelect` event, and optionally child `MenuItem` objects for submenus. For example:

```
// We define a label and a menu ID
var option1 = new MenuItem("Refresh", 2);
var option2 = new MenuItem("New item", 3);

// We can use the same handler and use the ID to know
// which one was pressed
option1.onSelect = menuSelected;
option2.onSelect = menuSelected;

// We append the first option
menu.append(option1);

// We create a third option with a submenu
menu.append(new MenuItem("Submenu", 4));
// We can search for a MenuItem using the ID
menu.getMenuItemById(4).append(option2);

function menuSelected(id) {
    switch (id) {
        // We can query the id to decide what to do
    }
}
```



After WRT 1.1, the widget object has a `wrt` property that we can query for getting information about the current device and platform, including `widget.wrt.version`, `widget.wrt.platform.model` and `widget.wrt.platform.romVersion`.

MiniView

The MiniView, or home screen widget, allows us to display a widget's content (continuously updated) on the user's device home screen, as shown in [Figure 12-3](#). On compatible devices (Nokia N97, N97 Mini and N8 at the time of this writing), the widget is installed as normal, but if the `MiniViewEnabled` property is defined as `true` in the `info.plist` file the user can opt to add it to the home screen.



Figure 12-3. With the MiniView, users can add our mobile web content to their home screens. Using JavaScript, the information displayed in the widget can be updated on a regular basis.

When a widget is displayed on the home screen, it shows the same HTML file it would if it were being viewed as a full-screen application. It is up to us to detect the window size change and maybe show and hide a div depending on the situation. At the time of this writing, the MiniView size is 312×82 pixels, so we can use a `div` with those proportions when we detect that our widget is being displayed on the home screen. When the user clicks on the widget in the home screen it will change to a full-screen display, and when the user exits the widget it will again become small (without actually exiting). The script will be running all the time, so to save the device's battery we should keep our background code to the minimum.



When the user adds a widget to the home screen, he will receive a confirmation dialog that will allow the widget to make any API call at any time in the future without new confirmation dialogs. So, we can safely use any API (with care, please) in the background.

To update the home screen UI, we can have a timer defined in JavaScript that updates the UI by querying a server via Ajax, or we can use any other API available on the device (like Location).

You can use the `onshow`, `onhide`, and `onresize` events to detect whether the widget is in full or MiniView mode.



Some devices, like the Nokia N8, allow multipage home screen support, so the user has more space to add widgets to the home screen.

Tools and libraries

We can use any tools to create WRT widgets, starting with any text editor and a ZIP packager. However, Nokia offers free plug-ins for the most used IDEs in the web world that will help us with JavaScript API code hinting, emulation, and widget packaging.



Keep in mind that the emulation environments provided for widgets are really just Safari or Firefox modified to work with the APIs. The rendering engine and the JavaScript runtime are not exactly the same, and you should expect differences on real devices. You can use any S60 emulator in Windows environments for widget testing, too.

Plug-ins are available for:

- Aptana Studio
- Adobe Dreamweaver
- Visual Studio

Symbian Foundation also released an Eclipse-based IDE called WRT Tools available for free for Windows, Linux and Mac.

All of these can be found at <http://www.mobilexweb.com/go/widgets>.

From Aptana Studio you can use the Install Additional Features dialog, selecting the Nokia WRT plug-in.

We've already discussed the usage of Ajax UI libraries, and their shortcomings. For example, jQuery effects don't have smooth results on the WRT engine. For that purpose, Nokia has developed two libraries: WRTKit and Guarana UI.



WRT supports widget localization to provide content in different languages, switching automatically to the right language. To take advantage of this you should provide image and string alternatives in a `xx.lproj` folder, with `xx` being the language code (for example, `pt.lproj` for Portuguese). You can find more information at <http://wiki.forum.nokia.com>.

WRTKit is the most suitable for WRT 1.0 devices (non-touch), and it allows us to avoid using HTML and CSS for the application design. We can instead use a library of controls that we create and define in JavaScript, like a Java SE application.



The wiki from Forum Nokia (<http://wiki.forum.nokia.com>) has several articles about porting different widget technologies to WRT, with samples.

For newer devices, Guarana UI is a better solution. It is a jQuery UI-based solution that works perfectly with WRT widgets and also has support for creating nice home screen widgets.

Both libraries are available for free at <http://wiki.forum.nokia.com> (you can find direct links at <http://www.mobilexweb.com/go/widgets>).

The APIBridge runtime

Nokia guys don't rest when it comes to widget runtime evolution. They have recently developed APIBridge (http://wiki.forum.nokia.com/index.php/APIBridge_Web_Runtime_API), a Symbian native application that opens an HTTP server locally that we can contact using Ajax from our widget code. They also provide a JavaScript API file that does that work for us and have added the following widget capabilities (valid in all versions of WRT):

- File upload support
- Enhanced file service
- File reading
- Image resizing
- Image thumbnail creation
- Logging service
- Location service
- Media management

The only disadvantage is that a widget created with APIBridge needs to be packed as a native SIS file that will include the server required for this API to work. A SIS file must be signed before it can be installed on the device, and this requires a bit of Symbian knowledge.

Widget distribution

A WRT widget can be distributed in many ways, including OTA installation from your own server, offline installation from a desktop, and distribution for free or as a premium application in the Ovi Store.

The Ovi Store is the official Nokia distribution channel, where any registered developer can sell and promote applications in different formats: Symbian, Java ME, Flash Lite, Maemo, and WRT widgets. Once you've published a widget to the store you can select which markets you want to distribute it in, the price (can be free), and the compatible

devices, and after a short QA revision period your widget will be available to anyone who visits <http://store.ovi.com> or uses the Ovi Store application that comes with all new Nokia devices.



Nokia Series 40 devices do not currently support any widget technologies, unless you consider the Nokia Flash Lite (NFL) packages, which also use web technologies (Flash), as a kind of widget. You will need to use Java ME to develop shortcuts or little widget applications for these devices. You can also use my free service, Widgen (<http://www.widgen.com>), for creating small applications.

If you want to publish your widgets to the Ovi Store, you should get a Publisher account at <http://publish.ovi.com>. The initial fee at the time of this writing is 50 euros. Users can pay for premium content by credit card or, in some countries, via their operators' billing systems. You will receive 70% of the revenue if the user pays with a credit card and about 40-50% of the revenue if the user pays with operator billing.

Widgets available through the Ovi Store have the potential to reach a large audience. As an example, without any promotion or marketing budget I've received more than 60,000 downloads in a couple of months for Widgen, a dynamic widget generation engine that I developed and have made available for free through the store.

iPhone, iPod, and iPad

To create widgets or JavaScript applications for the iOS, we have two possible solutions:

- Create a webapp.
- Create a hybrid solution (e.g., a PhoneGap or similar native project).



A hybrid is a mix between a web and a native application, having the best of both worlds available at the same time.

Webapp creation

The advantages of a webapp are:

- We don't need a Mac-based computer.
- We can host, manage, and change the webapp whenever we want.
- We can create any kind of application, including those that Apple doesn't accept as native applications (for example, adult content or private corporate applications for small- and medium-size companies).
- The application will have an icon in the Home menu.

- The application will be full-screen, and the user will never know it is a web application.
- We can use all the HTML 5, geolocation, and CSS extensions we've already seen.

However, there are also some cons:

- We cannot distribute or sell a webapp through the App Store (the official Apple store).
- We will not have access to the accelerometer, camera, or filesystem.
- It is not easy to determine whether a webapp is already installed on the system.
- Many users still don't know how to install webapps.



With iOS 4.0, Apple created iAd, an advertising program for iOS native applications. The ads are created using HTML 5 and some JavaScript extensions. If we want to create these kinds of ads we can use iAd JS, a JavaScript library available at <http://developer.apple.com/iad>.

A webapp is just a typical iPhone website that can be used offline (using AppCache, discussed in [Chapter 9](#)) and is included in the Home menu. Some new `meta` tags for full-screen mode are available for webapps. The new `meta` tags are available in iPhone OS 2.1 and later; for lower versions the webapp will just work as a website with the Safari toolbar.



If you create a webapp, you can submit it to the Apple Webapp Gallery at <http://www.apple.com/webapps> for free promotion.

Full-screen metatags. First, we must use the `viewport` and `webclip` tags to provide a 1-scale interface and an icon for the home screen:

```
<meta name="viewport" content="width=device-width; initial-scale=1.0;
    maximum-scale=1.0; user-scalable=0;" />
<link rel="apple-touch-icon" href="/Icon.png" />
```

To hide the entire Safari interface when the application is opened from the home screen, we can use the `apple-mobile-web-app-capable` metatag:

```
<meta name="apple-mobile-web-app-capable" content="yes" />
```

This tag will make no difference if the site is opened in the browser. We can query the `window.navigator.standalone` JavaScript object to see if we are working in standalone mode (`true`) or in browser mode (`false`). Another possibility is to check the window size, as in standalone mode the height will be either 460 or 480 pixels (depending on whether the status bar is transparent or not) in iPhone or iPod Touch. The standalone and browser versions of the VoiceCentral webapp are shown in [Figure 12-4](#).

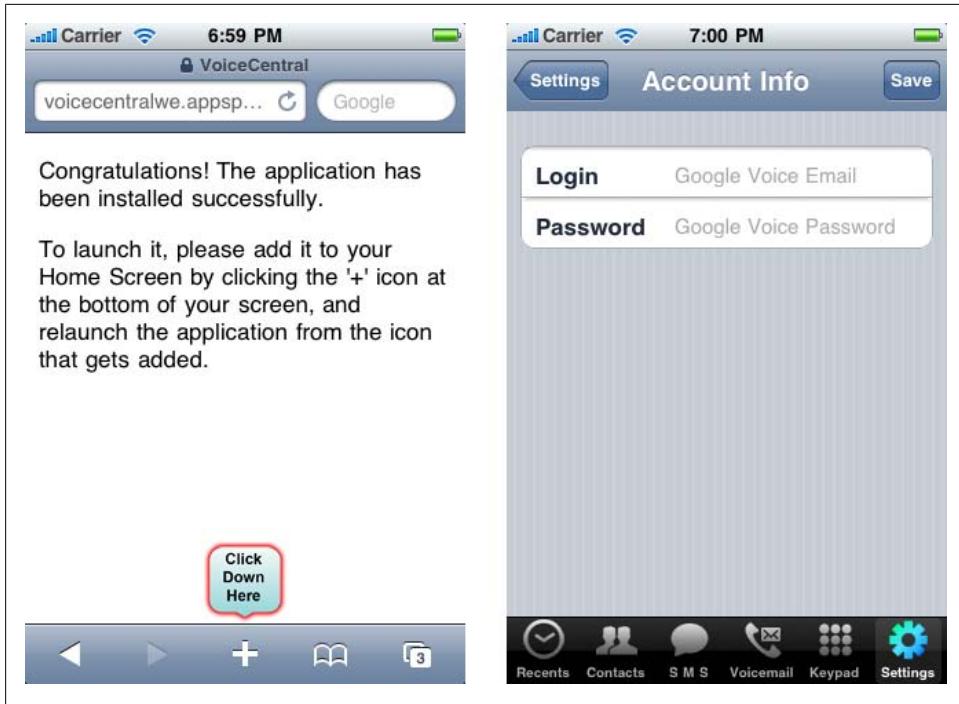


Figure 12-4. VoiceCentral is a webapp that detects if the user has accessed it using the browser or the home screen icon. This is the same HTML file, but the version on the right (the version opened from the home screen) looks like any other native app.

We cannot hide the 20-pixel-high top status bar (40-pixel-high in iPhone 4 and other high-DPI devices), but we can change the appearance to be compatible with our design. We do this with the new `apple-mobile-web-app-status-bar-style` metatag. This tag allows values of `black`, `default`, or `black-translucent`, and it only works if we have already defined a standalone mode with the previous metatag.

When `black` or `white`, our website will have a height of 460 pixels in low DPI devices, like iPhone 3GS. If we use the `black-translucent` value we will have the entire 480 pixels available, and the toolbar will be at the top of the website with an alpha value in the first 20 pixels of the page. Dimensions are different if we are targeting other iOS devices, like iPad.



Apple offers a free IDE for webapp creation, including a JavaScript library, along with the iPhone SDK. The tool is DashCode, and you can use it for free if you have Mac OS X.

From iOS 3.0, Safari also supports a *startup image*, which is a 320×460-pixel (for iPhone/iPod), or a 1004×768-pixel (for iPad) PNG to be used as the initial image before the HTML and JavaScript loads. We should detect on the server which device is to deliver the right image. The application launcher also uses it for the zoom-in animation when you click on the icon. If you don't supply a startup image, it will use a screenshot from the last time the app was used:

```
<link rel="apple-touch-startup-image" href="/startup.png" />
```

Distribution. As a webapp is a normal web application with AppCache support, the user will not “install” it as such; the “installation” just involves adding the website to the home screen. However, it is still useful to provide a Setup assistant.



Remember that there are people who don't use English as the main language. If you are going to give instructions to the user for widget installation, try to provide different language versions, as is done for the device menus.

First, we need to decide if we are going to accept usage of the webapp from the browser or only as a standalone application. If the last option is our objective, we should provide a single HTML file that detects where the user is accessing it from and either presents the installation link or the app itself, depending on whether it's accessed from the browser or the home screen.

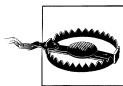
In the webapp HTML file, we first check whether the user is accessing it from the browser or not. If so, we provide instructions for installing the application. For example:

- Press the + button.
- Use the “Add to Home Screen” option.
- The application will be installed on your home screen for future usage.

The webapp HTML will include:

- All the metatags provided before
- An offline manifest file
- A short title, for use as the application name on the home screen

We can use any iPhone UI library (like iUI or jQTouch) to provide a native-like interface inside the webapp.



Remember that when in standalone mode, the user will not have access to the Back, Forward, or Reload buttons, or to the address bar. Therefore, you should provide all of these navigation items in your design.

PastryKit: The Hidden Gem

We've already covered many iPhone UI libraries, including iUI and jQTouch. They provide native-like Cocoa Touch controls and enable easy navigation between views using a top toolbar. There is only one problem—the top toolbar scrolls with the contents and doesn't stay fixed at the top (like a frame), as it would in a native application.

Then someone spotted that the URL <http://help.apple.com/iphone/3/mobile> (seen from an iPhone) uses very smooth scroll visualization, and the top toolbar stays anchored at the top. Developers discovered that it was using a (up to this writing) hidden official Apple library called *PastryKit*. The JavaScript API is obfuscated, but many developers have started analyzing it, figuring out how it works, and even incorporating ideas from it into their own projects.

PastryKit implements its own object-oriented framework, has JavaScript objects for many CSS extensions, includes inline images in a JSON file for icons and other data, and implements a very complex set of modules and classes emulating the Objective-C Cocoa Touch framework, changing the original UI prefix to a PK prefix (i.e., UITableView is here PKTableViewCell).

PastryKit is the best library for creating an iPhone webapp experience. There is no official documentation or license information available at this time, but unofficial documentation and samples created by various developers can be found at <http://www.mobilexweb.com/go/pastrykit>.

Apple also appears to have developed an iPad-only JavaScript library, internally called AdLib, for creating native-like interfaces for websites.

PhoneGap projects

A PhoneGap iPhone project has the ability to work like a standalone webapp, but it is really a native application with a full-screen Safari inside. The benefit of using PhoneGap is that you can use the PhoneGap JavaScript API to access features that a normal webapp can't, like the accelerometer, the camera, or the filesystem.

To create a PhoneGap project, you need an Intel-based Mac OS computer. Download the SDK at <http://github.com/phonegap/phonegap> and use the *iphone* folder inside the package.

You will need to download the iPhone SDK for Mac OS X (you'll already have it if you've installed the iPhone Simulator) and use the IDE XCode to open the *PhoneGap.xcodeproj* file.

You can replace the two files inside the *www* subfolder with all your HTML, CSS, JavaScript, and image resources. You don't need to use HTML 5's manifest file inside a PhoneGap project, as any files are already in offline mode.

In your main HTML file you should include the PhoneGap library with the following *script* tag (you don't need to have the *.js* file):

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

You can change all of the project's properties as needed in the *PhoneGap.plist* file and then build your project. Building an iPhone native application for delivery is a more complicated topic and is outside the scope of this book.



Jo is a lightweight JavaScript framework designed for HTML 5 webapps and works well with PhoneGap for iPhone. You can use it for free by downloading the library from <http://grrok.com/jo>.

Distribution. To distribute your PhoneGap application, you need to join the iPhone Developer Program (<http://developer.apple.com/iphone/program>). A standard account costs \$99 per year, and a corporate account (open to companies with 500+ iPhones) costs \$299 per year. Without an account, your application will only work on the Simulator.

Once your membership has been approved you will have the ability to test your application on real devices, or you can define up to 100 beta testers.

If you apply for a standard account, you will also have the ability to digitally sign your application to be published to the App Store, as a free or premium application. For premium applications, you will receive 70% of the revenue received.

webOS

The new webOS created by Palm (acquired by HP) is the first operating system where all possible native applications are developed using web technologies. Every application on a webOS device is created using HTML, CSS, and JavaScript, possibly with C and C++ plug-ins using the Plug-in Development Kit (PDK).

You can download the SDK, the PDK, and all the documentation from <http://developer.palm.com>. You'll also find an Eclipse-based plug-in for code hinting and help in the design of these applications here.



webOS has the only web-based IDE solution for creating mobile applications. Ares (<http://ares.palm.com/Ares/about.html>) is a free mobile development environment with code support where you can visually design webOS applications.

A native web application for webOS is also called a *Mojo* application. Mojo is a JavaScript UI library based on the popular Dojo library that is generally used for creating webOS applications.

Every webOS application has a main HTML base file, an icon file, a configuration file (*appinfo.json*), a list of source files (*sources.json*), and an *app* folder with all the contents

of each scene. A *scene* is a screen that shows information to the user, divided into an *assistant* (a JavaScript file for the behavior) and the *view* (an HTML file).

The *appinfo.json* file looks like this:

```
{  
  "id": "com.mystuff.hello",  
  "version": "1.0.0",  
  "vendor": "My Company",  
  "type": "web",  
  "main": "index.html",  
  "title": "Hello World",  
  "icon": "icon.png"  
}
```

Every application is packaged in an *.ipk* file, created either with the Eclipse plug-in or using the *palm-package* command-line tool provided by the SDK.



Dojo application development is a big topic, and we don't have the space to cover it in detail in this book. If you want to get deeper into this web technology, look at Mitch Allen's *Palm webOS* (O'Reilly).

Mojo allows JavaScript applications to have access to all the features of the phone using the Service APIs: Accelerometer, Accounts, Alarms, Application Manager, Audio, Browser, Calendar, Camera, Contacts, Document Viewers, Download Manager, Email, GPS, Maps, Messaging, People Picker, Photos, System Properties, Video, and more.



If you don't like the Mojo framework, you can use other frameworks for the UI. There is even a PhoneGap implementation for Palm webOS with instructions available at <http://wiki.phonegap.com>.

The Mojo framework also includes many UI controls designed for optimal visualization in the operating system. You can use it using an empty `div` with the `x-mojo-element` attribute. For example:

```
<div x-mojo-element="ToggleButton" id="button"></div>
```

Distribution

You cannot serve an IPK package from your own website. The end-user devices can only install applications from a trusted source, such as the official store. To publish an application in the store, you will first need to apply for a Palm Developer Program account (free for open source projects and with a \$99 fee for a full account).

Once you have an account, you can publish your applications to the App Catalog, the official webOS store. The applications can be distributed as free or premium content.

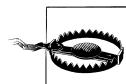
If you want to distribute an application from your own website instead, you can use the Web Distribution mechanism, which allows you to publish your IPK file without Palm review approval. You will receive a unique URL to give to users on your website to install the application. Again, the application can be distributed as either free or premium content, but there is no fee associated with this publishing method.

For premium content, you will receive 70% of the revenue generated by your application. You will be paid through PayPal. All the application links are offered as public RSS files to anyone that wants to integrate them in their websites.

HTML 5 applications

For the webOS browser, you can also create HTML 5 applications that the user can add as favorite websites without any Palm Developer Program subscription needed. These applications will not have access to the Mojo toolkit or the other advantages of full native applications. However, they will be able to use AppCache, offline storage, and possibly geolocation features.

Remember to use a short title for the webapp. You should encourage the user to add the webapp to the Launcher using Web→Page→Add to Launcher. Unfortunately, webOS does allow us to define an icon; it will use the title and a little top-left corner screenshot of the website to identify it. You can insert an icon there to emulate icon definition. When the user has added your webapp, it will be available as an icon in the applications menu.



There is no way to know if the user has already added the webapp to the Launcher, or if it was opened using that icon or the URL.

The user can also use the Bookmark feature, which displays a screenshot of the page as the icon.

Android

Android devices don't yet have an iPhone-similar way to create full-screen webapps using only markup. So, for mobile widget development, we have two options:

- Create an HTML 5 webapp that will finally open inside the browser.
- Use a hybrid solution like PhoneGap.

HTML 5 webapp

Creating a webapp for Android devices is similar to creating one for Palm devices: you can develop an HTML 5 application that uses AppCache, offline storage, and maybe some Google Gears APIs, and the user can add it to the bookmarks. Once it's been bookmarked, we can provide instructions to the user to add the application's icon to

the home screen. The instructions vary depending on the Android version. For Android 1.x devices:

1. Add this page to bookmarks using Menu→Bookmarks→Add to Bookmark.
2. Long press the new bookmark entry and select “Add shortcut to Home.”

For Android 2.X devices, like the Motorola Droid or Nexus One:

1. Add this page to bookmarks using the bookmark icon (you can even provide a visual icon to the user) and select Add Bookmark.
2. Long press the new bookmark entry and select “Add shortcut to Home.”

The home screen shortcut will use the icon specified in the `apple-touch-icon-precomposed` link tag as the first option for the high-quality icon or the favicon, as described in [Chapter 6](#).



In [Chapter 14](#) we will talk about a shortcut technique that creates a simple-to-install solution for opening webapps that will work on Android, Java ME, and other devices.

PhoneGap solution

If you want to use PhoneGap, you should download the package and download the Android SDK, as discussed in [Chapter 4](#). In Eclipse (with the Android plug-in already installed), go to File→New Project→Android and point it to the *android* folder in the PhoneGap package.

Copy all your HTML, CSS, JavaScript, and image files to the *android_asset* folder (you can leave the demo files already in that folder or replace them).

Then, edit the */res/value/strings.xml* file and change the value of the `url` field to `file:///android_asset/index.html`.

Build and test your application.



Android also supports home widgets as applications that run in the background and show their contents on the home screen, similar to the home screen widgets in Symbian. These are not web applications, but rather Android Java applications, available since version 1.5.

Distribution. You can distribute your PhoneGap Android application via your own website, serving the *.apk* file with the right MIME type: `application/vnd.android.package-archive`.

You can also distribute your application in the Android Market, the official store from Google. Other stores will be available soon, from other companies like Motorola.

You can apply for an Android Market account at <http://market.android.com/publish>; the initial fee is \$25. You will be able to publish free applications from anywhere and premium applications if you are located in one of the available premium application countries (the U.S. and the UK, at the time of this writing). You will receive 70% of the revenue from your premium web applications.

You can also distribute your Android applications via Motorola's official store, Shop4Apps. You can create a free publisher account at <http://developer.motorola.com/shop4apps>.

Windows Mobile

Microsoft added official support for widgets in Windows Mobile 6.5. For Windows Mobile 5.X and 6.0, we can create hybrids using PhoneGap or a simple web view .NET project.



Sony Ericsson offers the XPERIA Panels as a widget platform for XPERIA devices with Windows Mobile. You can download the SDK at <http://www.mobilexweb.com/go/xperia>.

Widgets

When creating widgets, you can download a Windows Mobile 6.5 emulator to test them. Windows Mobile widgets support the W3C widget standard for packaging and configuration file support. So, we will use the `config.xml` file and an icon file, and we will zip all the content into a package with a `.widget` extension. The standard supports localization for multiple language support and a JavaScript API for platform access. The MSDN documentation is available at <http://msdn.microsoft.com/en-us/library/dd721906.aspx>. ActiveX plug-ins such as Adobe Flash and Windows Media Player are also supported.



The widget can be used with touch navigation or using the D-pad available on some devices. There is a bug in the D-pad navigation, though, that forces us to add a `tabindex` attribute to every element that we want to be focusable by the keys. Without this attribute, the navigation will not work.

The global `widget` JavaScript object allows us to read information from the `config.xml` file and access other useful information, like the `width`, `height`, and `menu` of the device. A `systemState` object is also available, exposing properties like `DisplayRotation` (portrait or landscape), `PhoneRoaming`, `PhoneSignalStrength`, and `PhoneBatteryStrength`.

We can use the `widget.menu` object to create a menu and to assign it to one of the soft keys:

```
// We create a menu with an ID for future identification
var option = widget.menu.createMenuItem(1001);
option.text = "Refresh";
option.onSelect = menuHandler;

// This assigns the menu to the soft key
widget.menu.setSoftKey(option, menu.leftSoftKeyIndex);

// This assigns the menu option to the Menu submenu
Widget.menu.append(option);

function menuHandler(id) {
    // Do something
}
```



Windows Mobile 6.5 supports native XMLHttpRequest, so in widgets you don't need to create ActiveX objects.

The persistent storage mechanism is the same as in Symbian WRT widgets: we use `widget.setPreferenceForKey` and `widget.preferenceForKey`. There is a limit of 4,000 bytes per key. The `widget` object also supports the `onshow` and `onhide` events to be handled.

This platform doesn't have any other API to access Platform Services, but we can create an ActiveX plug-in if we want to use it. In fact, the BONDI team has developed an ActiveX alpha plug-in that enables the use of BONDI features on Mobile Internet Explorer.



Widget files allows cross-domain Ajax requests to any server. The widget ID will be included in the User-Agent header, if you want to check on your server that the connection was from your widget.

Distribution. Distribution of Windows Mobile widgets can be done through Windows Marketplace for Mobile, the official online store for Microsoft. You can apply for a Marketplace publisher account at <http://developer.windowsphone.com>; there is a fee of \$99 per year cost, and a cost per application submission (\$99 at the time of this writing).

The operating system doesn't support Over-the-Air installation and doesn't detect the `.widget` file as an installation package. However, Microsoft does provide detailed information in the documentation about how to install widgets, by copying the `.widget` file and changing a Registry entry for automatic widget installation using the `wmwidgetinstaller.exe` application provided by the OS. I hope future updates of the operating system will support a better way to install widgets without the store.

Hybrid solutions

The other solution for creating a mobile web application for Windows Mobile 5 or 6 is to use a hybrid approach. You can create a full web view project or download PhoneGap.

To compile a *.cab* .NET application for Windows Mobile, you need Visual Studio Professional. Using PhoneGap is experimental at the time of this writing. You should download the PhoneGap project and use the *winmo* folder to store your C# classes and WebForm design. In the *www* folder, you will put all the HTML, JavaScript, and resource classes.

These solutions can be distributed as *.cab* files in any store or from your own website.

BlackBerry

BlackBerry launched a new widget engine in 2009 as a first-class citizen of the operating system, starting in Device Software 5.0. For older devices (and newer ones), you can also use a hybrid PhoneGap solution.

The BlackBerry widget engine is similar to all the others mentioned in this chapter, with a Widget API for extending normal JavaScript capabilities. You can download the BlackBerry Widget SDK, including a packager, an emulator, and sample code, from <http://blackberry.com/developers/widget> free of charge.

The BlackBerry Packager (included in the SDK) creates the final *.cod* file (the package) and an *.alx* distribution file. You can also download and use a free IDE for web development that will help in the whole process (the BlackBerry Web Plug-in for Eclipse). The COD file must be signed to be installed on a device.



With BlackBerry Web Signals, a push technology that we will cover in [Chapter 14](#), you can insert an icon and an associated text on the device's home screen.

A BlackBerry widget is a *.zip* file containing a configuration file, an icon, an HTML file, and any other resources that the widget uses. We can use Google Gears APIs inside the widget, with the exception of LocalServer, which is not fully supported. The BlackBerry Widget API can also be used to access some resources and to install a widget on the user's home screen. Some APIs require signatures from a BlackBerry Signing Authority Tool.

Widget API

The Widget API supports the features listed in [Table 12-5](#), if they have previously been defined in the permissions area of the configuration file (in the `feature` tag). To this

API we should add Gears and the normal BlackBerry API browser extensions discussed earlier.

Table 12-5. BlackBerry Widget API objects

Feature	Object	Allows us to...
Application	<code>blackberry.app</code>	Access functions and properties for the application, like the background and foreground and home screen support
File I/O	<code>blackberry.io</code>	Access to files and directories
Identity	<code>blackberry.identity</code>	Access user identification information (IMEI, PIN, phone number)
Invoke	<code>blackberry.invoke</code>	Interact with other installed applications
Messaging	<code>blackberry.messaging</code>	Send email
PIM	<code>blackberry.pim</code>	Manage the Calendar, Contacts, Tasks, and Memos
Push	<code>blackberry.push</code>	Manage the listener for information pushed from the server
System	<code>blackberry.system</code>	Get and set system information and event listeners
User Interface	<code>blackberry.ui</code>	Manage new JavaScript dialogs and native menus
Utility	<code>blackberry.utils</code>	Access useful utility functions like blob converters or URL parsers

For example, to add an item to the native menu, we should use:

```
var item = new blackberry.ui.menu.MenuItem(false, 1, "Refresh", menuHandler);
blackberry.ui.menu.addMenuItem(item);
```

Configuration file

The configuration file is a *config.xml* file that follows the W3C widget standard, with some additions. This file must have an **access** tag for each Internet domain that we are going to contact using AJAX or some other resource request and a **feature** tag for each API that we are going to use:

```
<?xml version="1.0" encoding="utf-8" ?>
<widget xmlns="http://www.w3.org/ns/widgets"
         xmlns:rim="http://www.blackberry.com/ns/widgets"
         version="1.0.0">
    <name>This is a widget</name>
    <description>BlackBerry Widget</description>
    <author href="http://www.mobilexweb.com" email = "yourname@email.com">
        Maximiliano Firtman
    </author>
    <content src="index.html" />
    <feature id="blackberry.system" />
    <access url="http://mobilexweb.com" subdomains="true" />
</widget>
```

Distribution

You can distribute a widget just as you would any other Java application (in fact, they are both .cod files). You can push it from the BlackBerry Enterprise Server, you can

make an offline installation, you can serve the file from your server, or you can distribute it via the official BlackBerry store, App World.



BlackBerry offers an Application Web Loader, which is an Internet Explorer ActiveX plug-in that allows a website to deploy an application or widget to a BlackBerry device from a desktop computer.

To publish applications in App World, you'll need to create an account at <http://na.blackberry.com/eng/developers/appworld>. Paying a \$200 administrative fee will allow you to make 10 application submissions (a new version counts as a new submission). When you reach this limit, you can pay another \$200 for 10 more submissions.

PhoneGap

The other solution for BlackBerry is to use a hybrid approach, such as PhoneGap. This also works with some BlackBerry devices running Device Software versions prior to 5.0. You'll need to have the BlackBerry JDE IDE installed and the PhoneGap package downloaded, and then you can follow similar steps to those used with the other platforms. You can find more information on the Community tab of the PhoneGap site.



Motorola WebUI was a widget platform created by Motorola before its Android movement. It was a great platform, but it is now unofficially deprecated, with only two devices on the market. If you want more information on this platform, see <http://developer.motorola.com/platforms/webui>.

LG Mobile

Starting in 2010, LG Mobile is offering on its devices a widget platform supporting the W3C widget standard, a subset of the BONDI APIs, and some LG proprietary APIs.

You can download an SDK at <http://developer.lgmobile.com>. The SDK includes a project creator, a widget validator, a packager, and a widget emulator. The emulator allows us to configure emulation data for the device API, like the gallery or contact list. It also supports a DOM Inspector, JavaScript debugger, and Memory Viewer, as any Firebug developer will want.

An LG widget includes the typical files (HTML, icon, and *config.xml* files), and a mandatory *wgt.dat* file for persistent storage. The best way to create them is using the SDK. The LG extensions support the `widget` object with the `preferenceForKey` and `setPreferenceForKey` methods we've seen in other platforms. It also supports the `openURL` method to open the browser, and a localized string framework for multiple languages.

The additions to the BONDI APIs include:

- Call support
- Camera support
- Access to the media player
- Speed dial manager
- Contact groups

Distribution

A *wgt* package can be distributed for free via the LG Widget Gallery, available on the developer website, or you can upload it to the Business Proposals section to see if LG knows how to make money from your widget.

Samsung Mobile

Samsung is a pioneer in widget development, providing widget support from all of its TouchWiz UI devices. TouchWiz is a toolbar on the left side of the home screen where all widgets are installed, as shown in [Figure 12-5](#). When the user drags your widget to an empty space in the home screen it will appear as a non-full-screen application, sharing the screen with other widgets. If you need more space to show details, you can resize the widget or open a mobile website in the browser. You can see how widgets will be displayed at <http://www.yourwidgetworld.com>.

The widget platform is cross-compatible between Symbian, Windows Mobile, and proprietary OS Samsung devices. It may also be compatible with the new Bada platform.

The widget platform is based on the W3C package specification and has different property support in Windows Mobile and in the other platforms. Check the documentation for details.

Every widget has an icon that can be one of the following:

- Long vertical
- Long horizontal
- Square

This icon will be available in the lefthand scrolling list of widgets. Every widget also has a first depth size (the normal size when the user activates the widget) and an optional second depth size (for more detailed information). You can update the information displayed using a timer and maybe an AJAX request to a server.

Samsung's widget platform supports the `widget` object with some known features, such as the key/value storage we've already discussed, the `openURL` mechanism, and a



Figure 12-5. Samsung widgets can be dragged to the home screen and they share the available space with other widgets.

`widget.window.resizeWindow(w, h)` method to resize the widget so there is more space on the screen.

Starting with Samsung Mobile Widget SDK 1.2 the platform supports full BONDI APIs, so it will be easier to port between platforms.



If the Samsung widget is running on the Symbian OS, it also has full support for WRT APIs for calling all the Platform Services. These are not compatible with the Windows Mobile and Samsung OS devices on which the same widget can run.

Distribution

The `.wgt` file can be served from your code as `application/vnd.samsung.widget` or can be installed by any other offline method. You can also distribute Samsung widgets in the U.S. and Europe via the Samsung Apps official store, by registering as a seller at <http://seller.samsungapps.com> for a fee of \$1 (yes, one dollar). You will receive a 70% revenue share.

If your widget is free, you can offer it globally using the “More Widgets” feature available on every compatible device. You can also submit a proposal to the Market.Dev section of the website to receive business feedback from Samsung.

JIL

Joint Innovation Lab (JIL) is a joint-venture company created by China Mobile, SoftBank (Japanese carrier), Vodafone, and Verizon Wireless, covering more than 1 billion customers worldwide. The company has created a widget engine that works on a variety of devices.



JIL offers a widget porting engine to automatically port Symbian, Opera, and Dashboard widgets to the JIL widget standard, uploading your original package to the website.

You can download the SDK for Windows or Linux from the official website, <http://jil.org>. Each operator should use its own trademark for widget development; for example, Vodafone 360 uses <http://360.com> as the end-user website and <http://jil.vodafone-developer.com> for the developer SDK and documentation.

JIL uses a modified W3C widget API package standard with a *.wdgt* or a *.wgt* extension served as `application/widget`. It supports the Dashboard `Widget` object with the cross-platform methods and some widget event handlers. JIL also supports the Opera CSS conditional query extensions and a new conditional for touch devices, `-o-touch`.

A typical `config.xml` file will look like this:

```
<?xml version="1.0" encoding="utf-8" ?>
<widget xmlns="http://www.jil.org/ns/widgets" id="http://jil.org/myWidget"
    version="01.00.Beta" height="150" width="100">
    <name>Widget Example</name>
    <icon src="icon.png"/>
    <access network="true" localfs="true" remote_scripts="false"/>
    <content src="main.html"/>
    <feature name="http://jil.org/apis/api.DeviceInfo" required="true"/>
    <feature name="http://jil.org/apis/api.CalendarItem" required="false"/>
    <billing required="true"/>
</widget>
```

The widget engine supports a JIL JavaScript API with the following modules:

- Telephony
- PIM
- Multimedia
- Device (including File and Application)
- Messaging

The framework includes a Charging API for payment processing and usage authorization. You can distribute your widget for free or as premium content. You can also use the JIL Advertising Program for monetizing.

At the end of 2009 many vendors announced that they would support JIL, including RIM, LG, Samsung, and Sharp.

At the time of this writing, JIL widgets can be distributed in the Vodafone Store for free or as premium content. The widgets will soon be available in the other operators' stores, and possibly other independent application stores. You can sign the application from the JIL website before posting it to the stores.

Opera Widgets

The Opera browser also has a widget engine that works in desktop and mobile environments using the same widget package. An Opera widget in the mobile environment works with Opera Mobile (Windows Mobile and Symbian) and with the optional runtime (Widget Manager). In 2010, Opera announced that the widgets will also work under the Opera Mini engine, so widgets should soon work on almost every device on the market, from low-end devices to smartphones.

Some operators use this platform to offer widgets to their users along with the runtime or browser that comes preinstalled on devices purchased from those operators. That is the case with T-Mobile, for which Opera has developed a widget engine with additional APIs, including integration with the idle (home) screen and access to the devices' features.

You can download the Opera Widgets SDK and the T-Mobile Developer SDK from <http://dev.opera.com/sdk>, and you will find the documentation at <http://dev.opera.com/articles/widgets>.

Opera uses a ZIP package file with `.wgt` extension, served as `application/x-opera-widgets`. Its `config.xml` configuration file is very similar to the W3C standard:

```
<widget>
  <widgetname>
    First Opera Widget
  </widgetname>
  <width>
    300
  </width>
  <height>
    300
  </height>
</widget>
```

In JavaScript, the `widget` object exists with the now well-known `openURL` and the `preferenceForKey/setPreferenceForKey` storage mechanism. It also supports a user notification mechanism and the `onshow` and `onhide` events.



The Opera Widgets SDK supports a CSS extension for conditional media queries to define different styles depending on the running mode of the widget—application, docked, or fullscreen—using the `-o-widget-mode` condition.

Distribution

You can distribute the widget via your own server, in the Opera widget gallery, or through some operators' stores (like T-Mobile's). There is also an *autodiscover* mechanism that works when the user is browsing your website using Opera and you want to share a widget. If you define a link in the head, the browser should detect the widget and suggest the download to the user:

```
<link type="application/x-opera-widgets" rel="alternate"
      href="http://mobilexweb.com/widget.wgt"
      title="Mobile Web Client" />
```

Operator-Based Widget Platforms

Many providers offer widget engines to operators to serve content to their end users. Two classic browser companies, ACCESS (NetFront) and Myriad (Openwave), offer widget engines for operators and manufacturers, like Opera Mobile.

NetFront Widgets (<http://widgets.access-company.com>) is a widget platform whose player is currently available for Windows Mobile 5.X/6.X and Symbian S60 3rd edition devices and will support new platforms in the future. Download the NetFront Widgets Content Development Tools, including a packager and a viewer, from the website.

Myriad also offers a widget engine for low-end devices (available at <http://www.myriadgroup.com/Mobile-Operators/Mobile-Widgets.aspx>), but no information is available for developers at the time of this writing.

Qualcomm Plaza (<http://plaza.qualcomm.com>) is a multiplatform widget engine for operators (actually already available through some carriers) that uses the W3C widget standard and a free distribution channel for end users.

Obigo (<http://obigo.com>) created the widget framework that is the base for the LG widget platform.

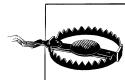
Finally, Orange created Djinngo (<http://publisher.djinngo.com>), a Java ME client to install widgets created using JavaScript and a VRML language.

Widget Design Patterns

Widget development requires new design patterns to solve the challenges presented. We need to think of a widget as an application, not a website, so some of the techniques we've used for websites will not be useful in these applications.

Multiple Views

The first problem stems from the lack of a browser's toolbar for navigation. We will not talk about pages; we will talk about screens or views. Typical web links are bad practice because the user will see a flicker effect, and the back feature needs to be implemented by us.



Widgets are JavaScript-based applications, so you should create simple code and avoid highly complex algorithms and high-frequency timers.

That is why in a widget, we will generally have only one HTML file and then, using JavaScript, will change the view, using static hidden `divs`, dynamic content generated by code, AJAX replacements, or other similar solutions.

We will generally use one of the following multiview mechanisms:

- Tab navigation (top or bottom)
- Top toolbar for going back
- Key and touch paginating for sequential views (like a slideshow)

Layout

Even if we are working with only one widget platform, we need to support different screen sizes, orientation modes, and physical screen dimensions. We'll need to decide whether to use a fixed or a liquid design.

Input Method

The same problem as in the mobile web appears here: the devices on which our widgets are used can have a variety of input methods (touch, keyboards, pads, etc.), and we will need to handle all of this by code, supporting all the possible input methods and perhaps changing the layout if it is a touch device (for larger components).

One-View Widget

A one-view widget is the simplest (and sometimes the most powerful) kind of widget that we can create. It generally has an information view and, optionally, a second view for configuring the details for the main view. This is suitable for weather, financial, social networking, news, and corporate indicators.

Dynamic Application Engine

As JavaScript is a dynamic language, we can easily execute code received by a server (using `eval` or a JSONP request). With this in mind, we can easily create a widget that is only a little engine (like a web browser) that will receive instructions from our server.

All the code (including access to private APIs) can be delivered from the server and optionally cached locally in persistent storage. Thus, we can create a self-updating widget mechanism so that no intervention is required from the user to receive the latest version of the application.

There are some security risks and problems, but for most platforms we can easily create a self-update mechanism.

Multiplatform Widgets

In theory, the widget is a multiplatform application, but we have already seen that there are a lot of engines, each one following different (but similar) approaches for the same purposes. The lack of a standard affects the portability of the widgets.



Widgen is a free service-based solution for dynamic mobile widget generation, available at <http://www.widgen.com>.

However, as we are talking about dynamic languages, it is possible to reuse almost all the code for all the platforms, creating a multiplatform widget engine. We need to use a JavaScript wrapper API to access the core features for all the platforms, create all the possible configuration files, and create every package dynamically, changing the extension and serving it using the right MIME type (or the right `meta` tags and JavaScript code for iPhone, Android, and Palm webapps).



The body class pattern allows us to define (using JavaScript) a class for the `body` tag that will be used by the CSS file to define different styles for platform and orientation variants. Another solution is to have one base CSS file and other different CSS files for each platform, to avoid having a big CSS file to be rendered all at once with all the platforms' styles.

It is possible, in theory, to create a multiplatform widget generator engine using both server-side and client-side detection mechanisms. Follow the blog at <http://www.mobileweb.com> for news about this kind of multiplatform solution.

Testing, Debugging, and Performance

Testing, debugging, and performance optimization are the three scariest activities in the mobile web development world, but don't worry. There are lots of ways to tame them.

Testing and Debugging

In [Chapter 4](#), we talked about emulators and simulators and how can they help us to see how our websites will be rendered on real devices. These tools are very useful and provide a simple, fast, and fairly accurate testing solution. If it doesn't work in the emulator, it probably will not work on the real device, and if it works in the emulator, it probably will work on the real device (probably, again probably!).

There are some problems with this testing approach, though. For one thing, there are hundreds of differences between real devices, and hundreds of bugs. Furthermore, there are several platforms without emulation. That is why real device testing is mandatory.

But how can we get access to multiple real devices? Here are a few suggestions:

- Acquire as many friends as you can (with different devices, if possible).
- Buy or rent devices. Some vendors offer promotions for buying or renting devices for developers and their partners.
- Use a testing house company. This is an expensive solution and not recommended for mobile web developers; we need to be as close as possible to the devices.



Mob4Hire (<http://www.mob4hire.com>) is a mobile social network aimed at joining testers with mobile devices around the world and developers who want to test applications or websites using a payment service. You can search for testers by country, operator, and device to access the devices you want.

- Create a beta tester program, for receiving feedback.
- Use a remote lab.

The last item of the previous list sounds good: a remote lab. What is this?

Remote Labs

“Any sufficiently advanced technology is indistinguishable from magic,” said sci-fi writer Arthur C. Clarke in 1961. When I demonstrate some of these remote labs in my classes, I see a lot of astonished faces.

A remote lab is a web service that allows us to use a real device remotely without being physically in the same place. It is a simple but very powerful solution that gives us access to thousands of real devices, connected to real networks all over the world, with a single click. You can think of it as a remote desktop for mobile phones.

There are three kinds of remote lab solutions for mobile devices:

- Software-based solutions, using a resident application on the device that captures the screen, sends it to the server, and emulates keyboard input or touches on the screen.
- Hardware-based solutions, using some technology (magic, I believe) to connect the server to the hardware components of the device (screen, touchscreen, keypad, lights, audio, etc.).
- Mixed solutions, having some hardware connection, some software additions, and maybe a video camera for screen recording.



As these are real devices, only one user can make use of them at any given time. As such, the devices are a limited resource.

Let’s take a look at some of the remote lab solutions currently on the market.

Remote Device Access

Forum Nokia offers a free (yes, free!) remote lab solution for Symbian and Maemo devices called Remote Device Access (RDA), shown in Figures 13-1 and 13-2. To use the service, you can access <http://www.mobilexweb.com/go/rda> (you’ll need to have already created a Forum Nokia account). You will need Java Runtime 5.0 or newer, because RDA is a WebStart Java application.

At present, usage is limited to eight hours per day. The main features are:

- Complete usage of the device
- 3G and WiFi connection support

Remote Device Access

[Phones](#) [Reservations](#) [Profile](#) [News](#) [About Service](#) [User Guide](#)

Phones available to you

» Change your local time: 28 Jan 17:48 » List all phones (reset filter)

Move your mouse on top of a phone, choose reservation length and click Start. A Java application will be downloaded to your computer for using the phone.
You can make about 8 hours worth of reservations today

Available now

	Nokia 5320 XpressMusic 354826020021572 +358504877263 SW 5.16		Nokia 5630 XpressMusic 004401104982661 +358504877463 SW 12.020		Nokia 5700 XpressMusic 353864012506416 +358504877884 SW 4.21		Nokia 5800 XpressMusic 353205037190392 +358504877459 SW +21.0.025
	Nokia 6110 Navigator 356415010444907 +358504858039 SW 6.01		Nokia 6220 classic 352921020020674 +358504877454 SW 5.15		Nokia 6700 slide 004401108384534 +358504803321 proto		Nokia 6710 Navigator 004401107215770 +358504877451 SW 22.013
	Nokia E50 351892010679178 +358504877264 SW 07.36.0.0		Nokia E51 357663010071110 +358504858037 SW 40.34.011		Nokia E52 355216030014834 +358504858032 SW 22.009		Nokia E55 355217030010376 +358504864234 SW 22.009
	Nokia E61 356211000550494 +358504877460 SW 3.0633.09.04		Nokia E61i 351879010031427 no SIM SW 3.0633.69.00		Nokia E65 353261011601102 +358504858038 SW 4.0633.74.00		Nokia E66 352942020103922 +358504860320 SW 300.21.012
	Nokia E70 357580000766980 +358504858033 SW 3.0633.09.04		Nokia E71x 004401102970270 no SIM SW 3.28 (AT&T variant)		Nokia E75 359557010007850 +358504877461 SW 202.12.01		Nokia N73 3597380005547841 +358504860325 SW 3.0935.0.0.6
	Nokia N80 352764013029256 +358504877447 SW 5.0719.0.2		Nokia N81 356442012837609 +3584876541 SW 20.0.036		Nokia N85 355708021600191 +358504868764 SW 31.002		Nokia N93 358842000505101 +358504877455 SW 20.0.059

Figure 13-1. Remote Device Access is a free and simple way to test on real Symbian and Maemo devices.

- Application installation
- Device rebooting
- Changing screen orientation
- Browser and widget WRT support
- Reservation of devices for future usage
- Usage of devices with SIM cards connected in Europe
- Saving screenshot images
- Incoming calls and SMS available

At the time of this writing, there are more than 50 devices available. There is no audio or accelerometer support, and depending on your network bandwidth you can select the video quality you want.

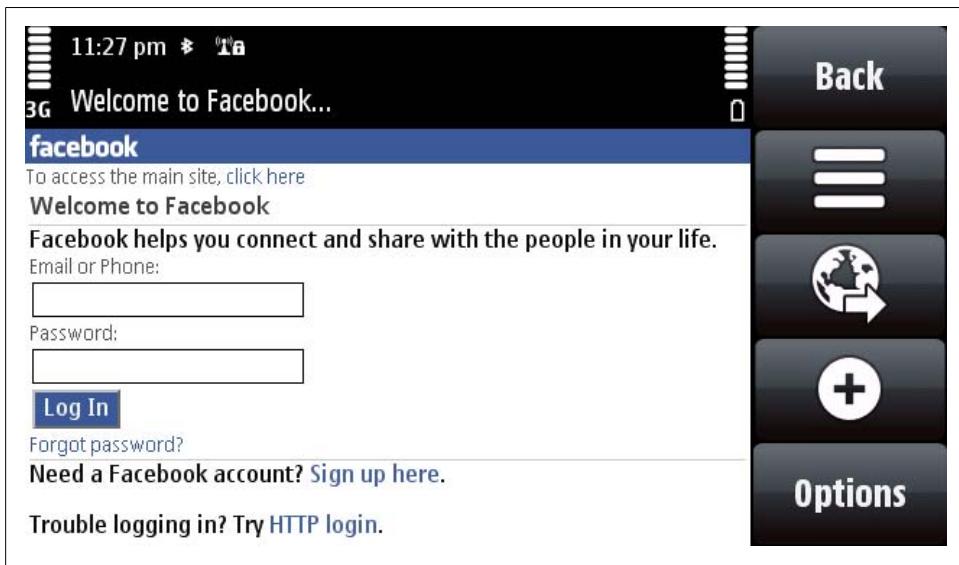
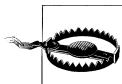


Figure 13-2. The devices are connected to real 3G networks (you can even call them), so you can accurately test speeds and transfers.



There is a bug in the display recording mechanism in RDA that doesn't show the cursor arrow over non-touch devices. This makes web browsing difficult. You can include the `meta` tag to apply focus navigation (as seen in [Chapter 6](#)) to solve this problem.

Samsung Lab.Dev

Samsung also offers a free remote lab web service, using the same solution provider as Nokia's RDA, called Lab.Dev. It includes some Windows Mobile devices. Depending on your membership with Samsung (free or partner) you will have access to more duplicated devices for testing purposes.



Using some commercial products (<http://www.projectaphone.com>) and even using a simple webcam and following some instructions (<http://www.gotomobile.com/archives/diy-gotomobiles-mobile-cam>), you can create a small testing lab with real devices that can take screenshots and save videos of a real mobile screen. There are also some software-based solutions.

Lab.Dev has the same features as RDA, so you can test web applications and widgets using this solution. The devices don't have SIM cards, though, so you can only test WiFi connections (not 3G).

You can access this remote lab from <http://www.mobilexweb.com/go/labdev>.

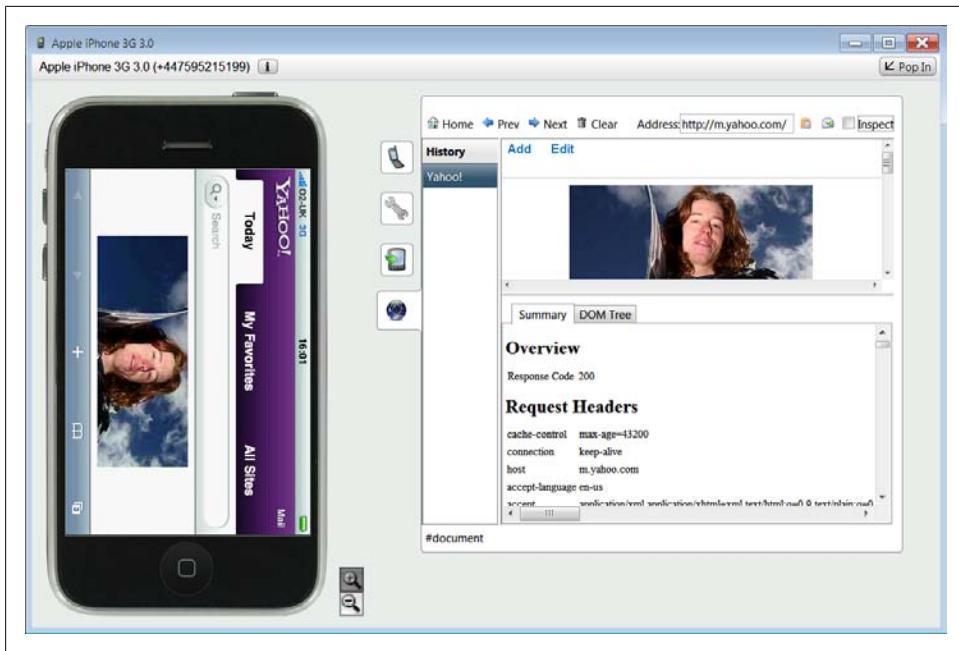


Figure 13-3. With DeviceAnywhere you can use thousands of devices with pixel-perfect resolution, and optionally with a DOM Inspector and an HTTP headers sniffer.

DeviceAnywhere

DeviceAnywhere is the leader and pioneer in remote lab solutions for mobile testing. It offers a hardware solution that allows any device (low-end, mid-end, or smartphone, from any vendor) to plug into the architecture.



DeviceAnywhere is the selected provider for this book's testing suites, and for some of the screenshots taken.

This is a commercial solution, with different price models depending on the package. DeviceAnywhere Test Center offers more than 2000 devices (iPhone, Android, Nokia, Motorola, Sony Ericsson, Samsung, BlackBerry, LG, Sanyo, Sharp, HTC, and more) connected to 50 live networks all over the world.

You can apply for a free trial at <http://www.deviceanywhere.com>. The IDE (Device Anywhere Studio) is a Java application, so it should work on any OS. Easy-to-install packages are available for Windows and Mac OS X, as shown in [Figure 13-3](#). The company offers a special plan prepared for mobile web testing.

The solution includes:

- Access to the registered packages and devices from DA Studio
- Access to all hardware features (lock/unlock, close and open, change orientation, power off and on)
- Ability to place calls, send and receive SMS messages, access the carrier's portal, and buy premium content (as the devices are on live networks)
- Pixel-based perfect image rendering, so you can save screenshots and videos of your testing for offline review (audio is also supported as an optional feature)
- Ability to manage multiple devices at the same time
- Virtual onscreen keyboard, and shortcuts to use your own desktop keyboard for testing
- Team management for testing a device and sharing the screen with other users
- DOM Inspector and HTTP headers viewer using an included proxy

Many manufacturers and carriers have selected DeviceAnywhere as the official testing solution for their Virtual Developer Labs (VDLs). Some of the Virtual Lab solutions include:

- Forum Nokia VDL (Series 40 and S60)
- Sony Ericsson VDL
- Palm VDL (Palm OS, Windows Mobile, and webOS)
- Motorola VDL (Motorola OS, Windows Mobile, and Android)
- BlackBerry VDL
- Symbian VDL (Nokia, Motorola, Samsung, Sanyo, Sony Ericsson)

If you want to access VDL websites, you can see a list at <http://www.mobilexweb.com/go/vdl>.

To use DeviceAnywhere, you'll need to subscribe to one or more packages. On top of the monthly subscription fee (averaging \$100), you will pay on a per-hour-basis or subscribe to a prepaid plan. On a per-hour-basis, the maximum price is \$16/hr. There are also other promotions available on the website, and different manufacturers' VDLs can have different pricing models.



If you apply for a free trial, you will get 3 or 5 hours of free usage and you will have to enter valid credit card details. It is safe to add this information, and it is a requirement because this is a live network where you can buy premium content.

The time spent on the system is calculated beginning from when you open a device and finishing when you release it, in 6-minute-minimum time slots.

Package options include:

Carrier package

You select a carrier and a country (for example, Verizon in the U.S. or Orange in France), and you will have access to all the devices available.

Manufacturer package

You select a vendor, and you will have access to several devices from that manufacturer.

Official VDL

You select a vendor or a carrier's official package.

Web Developer package

This is a special package for web developer testing. You can select U.S. or Europe-based devices (from a range of manufacturers).



For independent developers, there is a special package called the Independent Developer Plan that provides access to iPhone and Android devices. The fee is \$30 per month, and \$20 per hour.

Usage for mobile web testing. As DeviceAnywhere uses real devices from different manufacturers, you will need to learn to use every operating system interface to access the web browsers. You will generally find an icon in the home or applications menu labeled "Browser," "Internet," or even the name of the carrier's online service (for example, "MediaNET," the AT&T Wireless service).

When in the mobile browser you will need to type your URL using the phone's features: a numeric keypad, a QWERTY keyboard, or an onscreen touch keyboard. DeviceAnywhere also offers a feature where you can type or paste any URL and then press a button to automatically generate all the keypresses required on the hardware to type the URL.

In numeric keypad devices the URL typing process can be slow, so it's better if you first minimize the URL using a shortener service, like <http://www.mobiletinyurl.com>.

For mobile web debugging purposes, DeviceAnywhere includes an excellent proxy-based browsing solution that brings into the IDE an HTTP sniffer and a DOM Inspector so you can see what markup is actually rendered on the device.



Remember that these are real devices on real networks. If you want to test an application or installable widget you will need first to upload it to a web server (DA offers a solution) and then access the URL from the browser, typing it or sending it by SMS to the device.

Testing automation. DeviceAnywhere offers many advanced features. One of them is testing automation, a premium service that allows you to create testing scripts and schedule them to be tested on several devices automatically. You can then access the results via a web report.

Perfecto Mobile

Perfecto Mobile (<http://www.perfectomobile.com>) is a new company offering a software/hardware hybrid solution for mobile testing, shown in Figure 13-4. Perfecto Mobile uses a video camera for screen recording. A good point for Perfecto Mobile is that the whole environment is built on top of the Adobe Flash Player, so you don't need to install anything, and it works from any desktop browser. You can try the system by registering for a free trial; it will be activated in minutes.



Figure 13-4. With Perfecto Mobile you can manage real phones (here, a Nexus One and a Motorola Droid) with a Flash-compatible browser. The images are from cameras pointing at the devices.

With this service, you have access to the whole list of devices and carriers from the same pricing policy. The devices are on real networks in Canada, Israel, the U.S., the UK, and France. The company also has an agreement with the French company PACA Mobile Center (<http://www.pacamobilecenter.com>), where you can access 1100 devices connected to French operators with a 10-hour trial promotion.



If you are using non-touch devices, for website scrolling it is better to have a key pressed down for a long time. You can emulate this using the Control key on your desktop keyboard.

Pricing structure. Perfecto Mobile has a simple pricing model. There is no monthly fee or other package costs, and you can access the full cloud of devices from \$16/hr, or with a prepaid plan starting at \$12/hr. There is also an Android-only option (the Droid Cloud) that you can access at a rate of \$9/hr, or \$99 for 20 hours (without the hours expiring). The charging is done in 1-minute time slots.



In both DeviceAnywhere and Perfecto Mobile you can use two or more devices at the same time. Your per-minute charges will be counted separately, so you will be spending two or more minutes at a time.

Main features. The main features of Perfecto Mobile for mobile web testing are:

- When you take screenshots it uses the real screen image, not the camera one.
- You can record videos and share or embed them easily.
- You can send an SMS or invoke a call to the device from the UI.
- You can transfer files to the device (if file transfer is supported).
- There is an OTA mechanism where you can upload your app or widget and the device will receive an SMS link to download it within a 15-minute timeslot.
- You can easily share a URL, so customers and coworkers can see what you are doing with the device via live streaming. The only requirement for the other parties is that they use a browser with Adobe Flash Player support.
- You can request Automation, a macro-like recording feature that supports advanced actions and wait conditions using screen recognition and OCR (for example, “go to this URL, wait for the word “Hello” to appear on the screen, then take a snapshot”).
- In Automation, there is a ScriptOnce technology that includes multiplatform templates for common actions.
- You can test how your mobile website is rendering on multiple devices at the same time without your intervention. This feature, called Website Validation, is shown in [Figure 13-5](#).

Server-Side Debugging

To debug server-side detection, adaptation, or content delivery scripts, we can use some HTTP tools before turning to real devices. The most useful tool is the User Agent Switcher, a free plug-in for Firefox that you can install from <http://www.mobilexweb.com/go/uaswichter> (see [Figure 13-6](#)).

Figure 13-5. This is what the Website Validation report looks like in the Perfecto Mobile service.

Figure 13-6. With the User Agent Switcher you can test websites using any mobile user agent.



The User Agent Switcher doesn't emulate all the headers of a mobile device, including the accepted MIME types, so you should not rely on this plug-in for testing this kind of detection. You can use other plugins, such as Tamper Data or Modify Headers, to change HTTP headers.

When you've installed this plug-in, you will find a new submenu in the Tools menu of Firefox using the name of the current user agent (it starts with "Default User Agent"). The plug-in changes the user-agent string that Firefox uses for making HTTP requests to the server. It comes with some user agents preinstalled, such as iPhone 3.0, and you can add as many others as you want using the Edit User Agent option.



I've created a list of mobile user-agent IDs that you can import when editing the list. You can also download this list from <http://www.mobileweb.com/go/uaswichter>.

You can then browse to any website and see how the server manages the user agent and which content it serves. Remember to go back to the default user agent after finishing the debug session, or you may encounter problems in your browser.



Opera and Safari for desktop also offer native features to change the user agent without any plug-ins required.

When using real devices, it will be useful while debugging to store in some log all the request and response headers from the server-side code, so you can see the data the device is sending and receiving. DeviceAnywhere includes a solution for this purpose for all devices, or you can use any emulator that supports HTTP sniffing, like the Nokia and BlackBerry emulators (see [Figure 13-7](#)).

If you work with the ASP.NET platform on the server, you can activate the remote tracing mechanism and you will see every header and response from your mobile devices.

Markup Debugging

There is no automatic way to debug XHTML. This is a manual operation on every emulator, device, or remote device you can access. Safari on iOS has a console window that we can check for markup errors (we'll cover it in a minute), but before doing this it is a good practice to validate the code using one of the online tools available for mobile markup.

W3C mobileOK Checker

The W3C offers a mobile markup checker that you can use for free at <http://validator.w3.org/mobile>. You can upload a file, copy and paste the code, or use a URL if you already have your mobile site on your server.

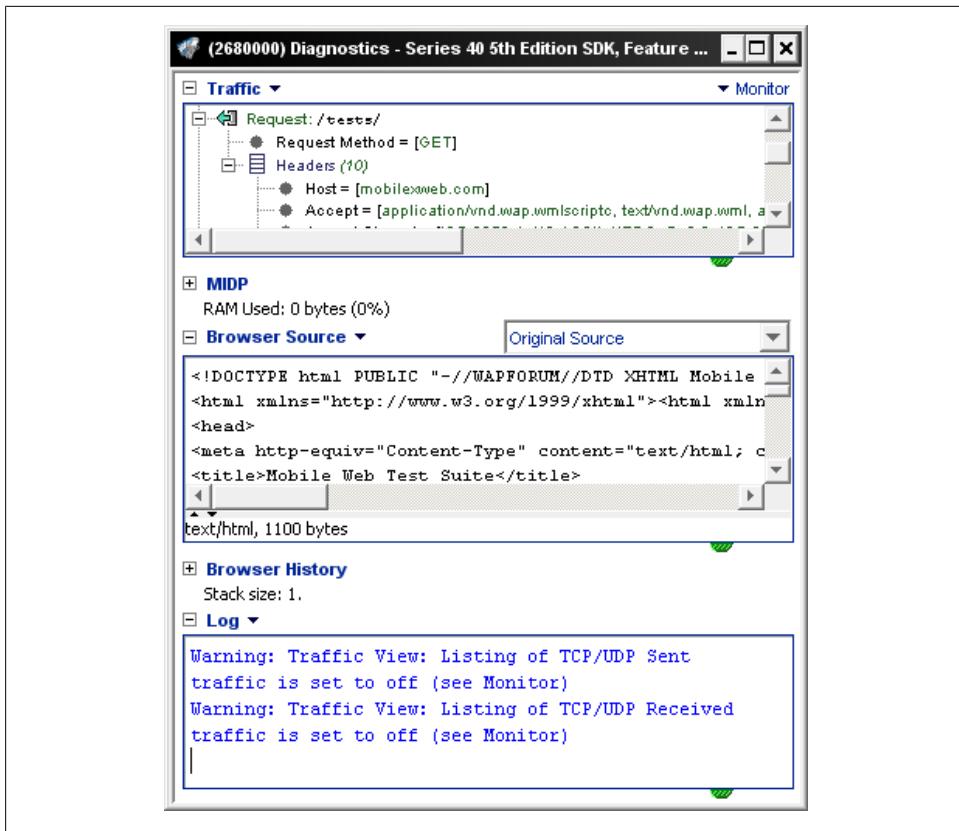
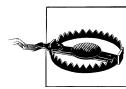


Figure 13-7. The Nokia emulator has a Diagnostics tool where we can see the HTTP headers and markup.



Mobile Interactive Testing Environment (MITE) is a piece of software from Keynote for testing, validating, and monitoring mobile websites using thousands of simulated devices. You can download it from <http://mite.keynote.com>.

This markup checker is based on best practices published in the Mobile Web Best Practices standard defined at <http://www.w3.org/TR/mobile-bp>. It doesn't guarantee that your code will work perfectly on all mobile devices if it passes; it is just intended to help you find possible problems in your code and areas that don't conform to best practices.

The checker validates:

- HTTP headers
- MIME types and DOCTYPES
- Markup (against XHTML Basic 1.1 and XHTML MP 1.2)

- Cache usage
- Tag usage
- Image, table, and frame usage

ready.mobi

The dotMobi team has created a free validator that includes the W3C mobileOK Checker tests and some others, plus some emulators and detailed error reports with suggestions. The validator is available at <http://www.ready.mobi>. You can use it for a single document by providing a URL or copying and pasting the code, or to report on an entire site, including site-wide testing (registration is required for this last function). You can see a sample in Figure 13-8.

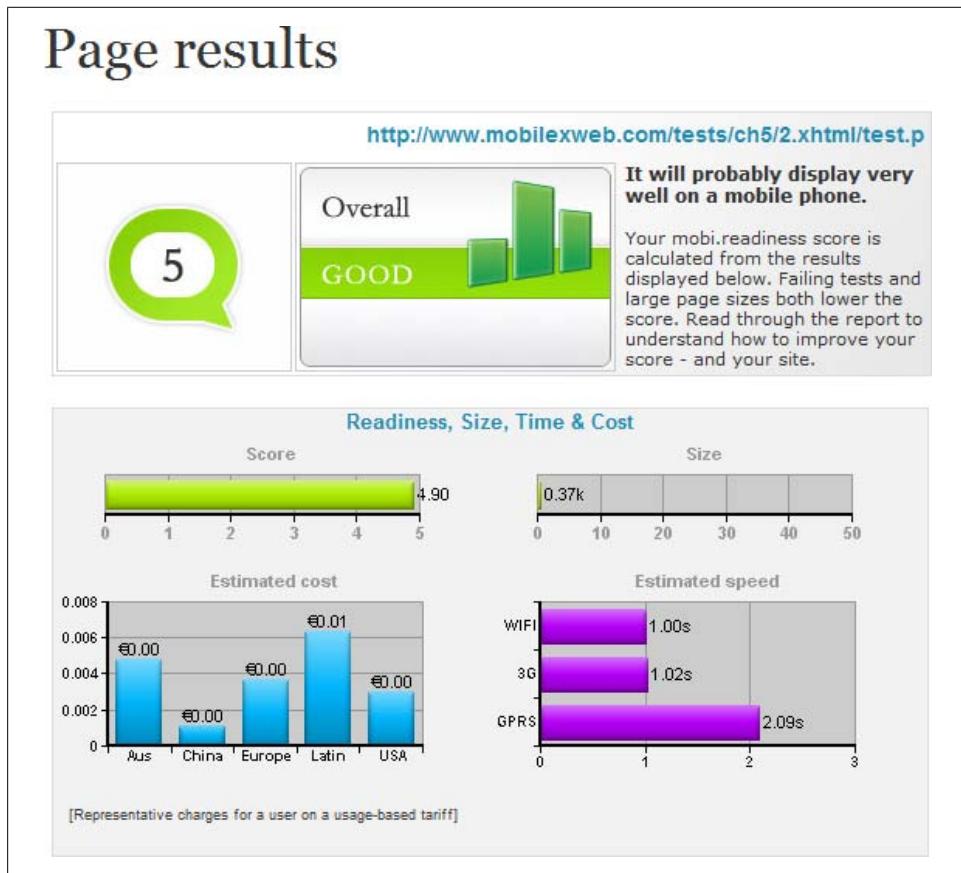


Figure 13-8. ready.mobi is a good service for markup validation, although it may not have the best score for an HTML 5 or iPhone webapp.

As an advanced feature, you can specify the user agent that we want the checker to use, and a list of accepted MIME types.



dotMobi offers, through the Prometric testing service, a mobile web developer certification that will certify your mobile web knowledge. You can take the exam from anywhere in the world. More information can be found at <http://prometric.com/dotMobi>.

After analyzing your document, ready.mobi will assign you a score on a scale of 1 (very bad) to 5 (excellent). It will also report on the size of your document and resources and the estimated time and download costs for the user.

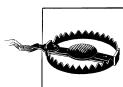
Firefox plug-ins

There is a plug-in for Firefox that will allow this browser to support the XHTML MP MIME type (not supported by default). You can download the plug-in from <http://xhtmlmp.mozdev.org>.

Client-Side Debugging

JavaScript debugging is one of the most painful activities in mobile web development. Every browser has a different JavaScript engine, and sometimes code that works on one device doesn't work on another.

Typical desktop JavaScript techniques should be used first to debug logic problems in our code. This includes using the developer tools from Chrome, Safari, or Internet Explorer, or the classic Firebug for Firefox (<http://getfirebug.com>). But just because everything works in a desktop browser doesn't mean that it will work in a mobile browser. Rich Internet Application techniques are the worst problem areas.



One problem we will have is that if a JavaScript error is encountered, many devices don't show any notice and the code simply ends its execution.

Browser-based solutions

Some mobile browsers offer developer tools for JavaScript debugging or console logging features.



There is a free and simple web application that allows us to evaluate JavaScript on a mobile browser for testing purposes. To try it, just point your browser to <http://www.jsconsole.com>.

Safari on iOS Debug Console. Safari includes a debugging console that we can activate (both in simulators and on real devices) by going to Settings→Safari→Developer→Debug Console. With the debug console activated, you will find a new 60-pixel-high toolbar below the top toolbar of the browser.



The Symbian browser has script error logging disabled by default. You can activate it from the Settings menu inside the browser.

Clicking this toolbar opens a full-screen Console window, as shown in Figure 13-9, where you can see advice, warnings, errors, and console output, which you can filter into HTML, JavaScript, and CSS categories. For better detail reading, use landscape orientation.



Figure 13-9. When you activate the debug console you will see the console toolbar (left), which you can click on to access a details list (right).

From JavaScript, you can send messages to the console using the `log`, `warn`, `error`, and `info` methods of the `console` global object available in the iPhone browser. All of these methods receive a string. The difference between them is the icon used to show the text. For example:

```
console.log("This text will appear on the Console");
```

Opera Dragonfly. From Opera Mobile 9.5, we can debug mobile web applications using the remote debugging tool Dragonfly. To use this tool you will need Opera 9.5 or later on your desktop. You can open Dragonfly by going to Tools→Advanced→Developer Tools and checking the Remote Debug option.

When you're done, enter `opera:debug` in your Opera Mobile browser and specify your desktop IP address (public or private, if you are connected using WiFi to the same LAN). You will then have access to the same debugging features (DOM, CSS, and JavaScript) that you would if you were debugging a local desktop file.

You can also debug Opera widgets with this tool. Complete instructions and tips can be found at <http://www.mobilexweb.com/go/dragonfly>.

Android Debug Bridge. Android doesn't have as nice a console output as Safari on iOS, but we can still read the console errors and even use the same `console` object using the Android Debug Bridge (`adb`). `adb` is a command-line application available in the `tools` folder of your SDK.

You can find more information on how to use this console at <http://www.mobilexweb.com/go/adb>.

BlackBerry web development tools. BlackBerry offers two plug-ins that can be used to develop and also to debug, profile, and package web applications. Both provide JavaScript debugging with breakpoints, Ajax requests visibility, and time-to-load reporting for web content. You can download the BlackBerry Web Plug-in for Eclipse and BlackBerry Web Plug-in for Visual Studio from <http://www.mobilexweb.com/go/bbdebug>.

Widget debuggers. The BONDI SDK for widgets offers a remote debugging feature that can be used from the Google Chrome Developer Tools. WRT plug-ins for Aptana Studio and Visual Studio also support debugging over the emulator (remember that it is not the real engine). The LG SDK and the BlackBerry web development tools have great debugging tools for widgets, too.

JavaScript solutions

There are some scripts that work as a kind of debugger, including DOM and CSS inspectors and some that work for JavaScript debugging, too. The mobile compatibility for these tools is complicated, though, because of the lack of space on the screen to show all the information. There are also some Ajax-based solutions that will work better, allowing you to view the debug results and panes from a desktop.

Creating a simple log console is easy, using a floating `div` or another visual element to show messages sent by a `console.log` call.



Using alert windows for logging and debugging is annoying and a bit intrusive. Try to use another solution.

For example:

```
if (console==undefined) {
    var console = new Object();
    console.log = function(text) {
        if (document.getElementById("console")==undefined) {
            document.getElementsByTagName("body")[0].innerHTML =
                "<div id='console'></div>";
        }
        document.getElementById("console").innerHTML += "<p>" + text + "</p>";
    }
}
```

With some CSS to the `console` and `console p` selectors, you can see a console. With some scripts, you can also create an object browser and a console JavaScript execution engine using `eval`.



You can check whether `window.onerror` is available and catch every error before blocking all the rest of the script.

The JavaScript Debug Toolkit (JSDT) is an Ajax-based JavaScript debugging tool that works with mobile devices as a desktop standalone application or an Eclipse plug-in. It is available at <http://code.google.com/p/jsdt>.

Another option is Firebug Lite (<http://getfirebug.com/lite.html>), a plug-in that makes some Firebug tools available on non-Firefox browsers if you add a JavaScript file and a CSS file on your website. It works in many mobile browsers and widget engines (including Symbian, Safari, Android, and Palm), but the navigation is very complicated when the Firebug Lite view is open.

Performance Optimization

Performance is the key to mobile web success. People want high-performance websites. We hate to wait on our desktops, and the situation is far worse on mobile devices, with their constrained resources. I could write a whole book about mobile web performance, but for now I will just try to distill some best practices and share some hacks that you can easily apply to enhance your website's performance.

Performance has recently become a hot topic in the desktop web world. In general mobile web developers should follow the same practices, but there are some new ones to keep in mind as well, and some desktop web best practices that will not work on these devices.



If you're just getting started with performance optimization, the first thing you should do is read two excellent books from Steve Souders (<http://stevesouders.com>), *High Performance Websites* and *Even Faster Websites*, both from O'Reilly. Then, you should follow the Yahoo! and Google performance team blogs at <http://developer.yahoo.com/performance> and <http://code.google.com/speed>.

Mobile browsers aren't the same as desktop web browsers, and not all mobile browsers are created equal. Specifically, the quantity of resources that can be downloaded in parallel and the cache functionality differ. Nevertheless, it is better to approach mobile performance optimization from here than from the ground.



If you want to know more about high-performance mobile websites and mobile browser behavior, check out <http://www.mobilexweb.com/go/performance>.

Measurement

The first thing we need to do is to measure. If we cannot measure, we cannot optimize. However, measuring mobile websites is not easy. Typical desktop measurement and profiling tools don't work for mobile devices, and HTTP sniffers are difficult to implement for mobile browsers.



Nokia provides a free tool for profiling the battery energy used by an application. You can download the Nokia Energy Profiler for free from <http://forum.nokia.com>.

Advanced memory and process profiling for JavaScript is still more of a dream than a reality. However, Yahoo! has created a simple JavaScript profiler called the Yahoo! UI Profiler, available at <http://developer.yahoo.com/yui/profiler>, that will work on any A-grade browser (Symbian, iPhone, Android), and you can always use `new Date().getMilliseconds()` to get the time differences between two moments in your JavaScript code.

If you are using an emulator or a real device with WiFi capabilities, you can use any HTTP sniffer proxy, configuring the emulator and your device with your desktop IP address and port as the proxy for navigation. There are dozens of tools for doing this, but the one I like best is called the Charles Web Debugging Proxy. A full-featured free trial for Windows, Mac, and Linux is available at <http://www.charlesproxy.com>.

Once you've installed it, you can use the proxy (by default on port 8888) in your mobile emulator or device, and you will see every request, including the headers and the order

and simultaneity of requests made on each browser to optimize the final download time for resources. You can also see Ajax requests with JSON and XML browser support.

If you have a dedicated server (or even your own development computer with full inbound access to port 80), you can install one of these proxies and a web server and browse your website from any phone on any network to analyze how it is rendering and requesting resources.

Nokia emulators (Series 40 and Symbian) also have a great network sniffer that enables you to see all the requests that the browser is making, including the headers.

Best Practices

Here are some global best practices you should always have in mind:

- Keep it simple.
- Reduce the HTTP requests to the minimum possible.
- Implement Ajax requests if you can, and if the device supports them.
- Make the cache your friend.



HTTP request headers are generally larger in mobile websites because of the large `User-Agent`, `Accept`, and other headers. Remember that these headers are sent with each and every request your page makes. That is why it is important to keep the number of requests to the minimum.

Reducing requests

There are plenty of tips for reducing network requests:

- Use only one CSS and JavaScript external link per page.
- If the script and/or CSS is only for one document, don't use external code; instead, embed it in the page.
- Use inline images whenever you can.
- Use CSS Sprites.
- Reduce the use of images for effects, titles, and text. Try to meet all of these needs using only CSS.
- Use multipart documents when compatible.
- Download only the initially required code and resources and then, after the `onload` event, download all the rest on Ajax devices (lazy loading).



Every mobile browser supports a cache for resources and you should definitely use it, with a long-lived expiry for each static resource. Analyze how the cache works (this is outside the scope of this book) and make it your friend, not your enemy!

Compressing

Compression is a necessity, and there are different techniques you can use for it:

- Minimize your XHTML files, removing spaces, comments, and non-useful tags.
- Minimize your CSS files, removing spaces and comments.
- Minimize your JavaScript files, removing spaces and comments and obfuscating the code.
- Use HTTP 1.1 compression for delivering static and dynamic text-based files (XHTML, JavaScript, CSS, XML, JSON).
- Use a cookie-free domain (or alias domain) for static content files.

For minimizing files, there are plenty of online and offline tools, like JSMin (<http://crockford.com/javascript/jsmin>) and YUI! Compressor (<http://developer.yahoo.com/yui/compressor>).

Going Beyond JavaScript Compression

There are plenty of good JavaScript obfuscators and minimizing tools out there, but Google has taken an extra step and created *Closure Compiler*, a new concept in JavaScript programming. It is not just a minimizing and obfuscating tool, but it is also a compiler: it compiles JavaScript code into better JavaScript code and it is very helpful for mobile websites.

You can download the compiler at <http://code.google.com/closure/compiler> or use the web application compiler at <http://closure-compiler.appspot.com>.

The code will be rewritten to be lighter and quicker to execute. The resulting code will not be suitable for human reading because it will not use good programming practices, but that is not the goal. We are not going to edit the resulting code; we will always work with the original code (with comments and all the best practices) and recompile it before sending it to the server.

HTTP compression

HTTP 1.1 added compression (using GZIP and deflate) as an optional possibility when delivering a file to the client. Using this option is strongly recommended for text-based files on most mobile devices, because it will reduce the traffic between the server and the client by up to 80%. It will add some overhead on the client (to uncompress the content), but it's well worth it. Network traffic will be one of our worst problems if the user is not connected to a WiFi network. Even with 3G connections, the network can have latency problems.



If you work with ASP.NET Web Forms, you should be careful about the usage of the ViewState, which generates big hidden input tags in the HTML. Deactivate the ViewState on the controls where you won't use it.

You will find plenty of resources on the Web about how to configure HTTP compression for Apache, Internet Information Server, and other products. The most important thing you need to remember is to also compress dynamic scripts delivering markup, like PHP scripts, which by default do not use HTTP compression in Apache.

Other tips

Here are some other tips to keep in mind:

- Compress images and choose the best format and color palette. You can use the free online tool Smush.it from Yahoo!, available at <http://www.smushit.com>.
- Deliver small images for small screens. You can use a dynamic resizing tool, or the free online service at <http://www.tinysrc.net>.
- Keep files under 25k because, if not, they will have problems to be cached on some devices.
- Reduce the initial load time as much as possible. You want the web application to be ready as soon as possible.
- Minimize DOM access and simplify your document structure.
- Use HTML 5 storage for caching data and resources in base64.
- Flush the buffer early, using `flush()` in PHP or `Response.Flush()` in ASP.NET, after `</header>` and after big blocks of visual components.
- Avoid redirects between pages, especially in the home page.
- Create a quick and simple home page.
- Put `script` tags at the bottom to avoid resource download delays.
- Use a content delivery network or a static server for static content if you have a lot of images or other static content.
- Remove any non-useful headers from the server responses (like server identification or “powered by”).

Deferred JavaScript Evaluation

The Gmail team, in conjunction with Charles Jolley (<http://blog.sproutcore.com>), has created a very clever and simple way of reducing the initial payload time of JavaScript execution. The solution is to deliver the JavaScript code inside a comment block (`/* */`). This means the JavaScript isn't executing while loading, and it doesn't freeze the UI or block other resources.

When you need to execute that library or code, you just get the script by ID, get its content, remove the comment characters, and make an `eval` of that code. Pretty smart, isn't it? On iPhone OS 2.2, 200 KB of JavaScript code adds 2.6 seconds to the initial page load time, while if it is comment it adds just 240 ms. After all the initial loading is done (or later, whenever you need it) you can parse it.

JavaScript performance

Again, keep your code simple. Here are some other specific tips for mobile JavaScript coding:

- Don't use `try/catch` expressions for expensive code.
- Avoid using `eval`, even in situations where you might not think about it being used, like when using a string in `setTimeout` instead of a function.
- Avoid using `with`.
- Minimize the usage of global variables.
- Minimize the number of changes in the DOM, and make the changes in the same operation. Many browsers repaint the whole screen on each change.
- Implement a timeout for Ajax calls.
- Compress (and if you want, compile with Closure Compiler) your code.

You can find an excellent article about JavaScript performance tips for mobile browsers at http://wiki.forum.nokia.com/index.php/JavaScript_Performance_Best_Practices. You should also check out Nicholas Zakas's *High Performance JavaScript* (O'Reilly).

Distribution and Social Web 2.0

So, you've finished your mobile web application and you are ready to go to market (or so you think). However, your work isn't over yet. In this chapter, we are going to analyze some search engine optimization tips, and talk about how to get users to actually visit our mobile websites and encourage them to come back again and again.

We will also explore how to monetize mobile websites using advertising and how to merge our applications with some social features, such as SMS, RSS, and social networks.

Mobile SEO

Search engine optimization (SEO) refers to a set of best practices that you can follow to allow your website to be in the best possible place in a search engine.

In general, typical desktop SEO techniques apply to mobile websites, too, but some extra care must be taken. As we've already discussed, generating too much code (metadata) and too much text for keyword crawling is not the best solution for the mobile web.

The first thing we need to understand is that mobile search users are not the same as desktop search users. Mobile users are typically searching for something very specific, and we should do our best to facilitate access to those resources.

Mobile search engines (Google, Yahoo!, Bing) localize the search results, so if your service is location-based, you should make sure that your location is properly defined in your text and code. In mobile search engines, the user only types a few characters and the engine tries to suggest the best possible results based on location and previous results, with mobile-specific content given priority.



If your mobile website gets content using Ajax, you should implement Google's proposal for making the content being indexed crawlable. You can find more information about this at <http://code.google.com/web/ajaxcrawling>.

Search engines like Google will try to serve mobile-specific content first, but if someone is looking for the exact name of your application and Google doesn't know that you have a mobile website, the user will be redirected to your desktop site or to a transcoded mobile version of it produced by a Google server.

If you appear in the search engine's databases, you will also be found using the native applications that many search engines are developing, including voice-powered search applications.

Spiders and Discoverability

The first problem is how to make your mobile website known to the search engines. This can be different depending upon whether you already have a desktop website that has been crawled or not.

If you already have a desktop website, you can give search engines the URL of your mobile site using the alternate link method:

```
<link rel="alternate" media="handheld" href="http://m.yoursite.com" />
```

You can also add your mobile site manually, using these URLs:

- Yahoo! (<http://siteexplorer.search.yahoo.com/mobilesubmit>)
- Bing (<http://bing.com/webmaster>)
- Google (<http://google.com/addurl>)

Mobile Sitemaps

Google has created an extension to the Sitemap protocol (<http://sitemaps.org>) for mobile web content discoverability, called Mobile Sitemaps. After creating an account in Google Webmaster Central (<http://www.google.com/webmasters>), you can add your mobile site to Google's database. You will need to verify that you are the owner of the site, by inserting a temporal metatag or HTML file in your site.



Googlebot-Mobile uses the `Accept` HTTP header to determine whether a site delivers mobile content types. If you want to be sure that the bot can access your site, you can also check that the `User-Agent` header contains `Googlebot-Mobile`. Some sites will only allow access to mobile devices, and while Googlebot-Mobile tries to emulate such a device it is not always successful in gaining access unless it is specifically allowed.

Once your site has been validated, you can submit a Sitemap for it. If your mobile site is targeted to only one country using a non-country top-level domain (like *.com* or *.mobi*), you can also define the geographic target for which your mobile site is prepared.



Check the Sitemaps documentation at <http://sitemaps.org> for full tag and option support.

A Mobile Sitemap is an XML file, based on the Sitemap standard, that lists the mobile URLs for your site (XHTML, XHTML MP, WML, cHTML). You can provide URLs for both mobile and non-mobile versions depending on the headers, but you should not list non-mobile-only URLs. A sample Sitemap file looks like this:

```
<?xml version="1.0" encoding="UTF-8" ?>
<urlset xmlns="http://www.sitemaps.org/schemas/sitemap/0.9"
         xmlns:mobile="http://www.google.com/schemas/sitemap-mobile/1.0">
    <url>
        <loc>http://m.yourdomain.com/</loc>
        <mobile:mobile/>
    </url>
</urlset>
```

You should provide one *url* element for each mobile URL and page, including the *mobile:mobile* empty tag. If you have many versions using different URLs (for iPhone, WML, etc.), you should provide them all in the same file.



To check whether your website is listed in Google Mobile, visit <http://m.google.com> with a mobile device and use the search operator *site:your_domain*.

The Google Webmaster Team also suggests detecting Googlebot-Mobile in your desktop site and redirecting it to the mobile-specific version of the same page. For example, for information about a product X in your desktop site, you should redirect the bot to the mobile URL displaying information about that product. Otherwise, Google will use a transcoder on the desktop page, as shown in [Figure 14-1](#).

How Users Find You

Search engines are not the only way for users to discover your mobile website. Obviously, offline marketing is always welcome, but there are also other online features we should implement to facilitate discoverability. These include advertising the new mobile website to your current desktop visitors and implementing newsletters and feed readers.



Figure 14-1. If you don't provide a mobile version of your website, Google will use its transcoder for users with low- or mid-end devices. Here is the O'Reilly home page transcoded.

The first problem to tackle is simplifying the user's first access to the mobile website. Many mobile users still don't know how to go to a URL if it is not on the carrier's home page, and many others will not want to type a long URL on a numeric keypad device.

SMS invitation

A good solution is to include in your desktop website a form to collect the user's phone number and then send him a WAP Push or an SMS link. A WAP Push is a special message with a URL inside. This is generally a premium SMS, and some carriers don't allow sending them from a website.

An SMS link is just a normal SMS with a link inside. Almost every modern device with a browser will autodetect a URL inside a text message if it begins with `www` or `http://` and will convert the URL into a link that the user can click after receiving the SMS (see Figure 14-2).

The big question, is how do we send an SMS from a website? The answer is not what you might expect—there isn't a simple or free way to do it. We have to use an SMS provider or gateway that, with a simple web service call, will send the message to users in one country or worldwide. We will have to pay for that SMS, but depending on the business, a new mobile web user will probably be worth the small expense.



Some SMS gateway providers also allow inbound SMS messages that will be routed to your scripts or will be accessible via an API. This could be an excellent solution to receive queries by SMS to your service.



Figure 14-2. Modern devices detect URLs inside an inbound SMS and allow the user to access them with a click.

Some SMS gateway providers include:

- Lleida (<http://www.lleida.net>)
- Clickatell SMS Gateway (<http://www.clickatell.com>)
- BulkSMS (<http://www.bulksms.com>)

Alternatively, you can install a 3G or GPRS modem on your server or in any machine and develop a little SMS gateway of your own, with a corporate or personal account. A widget or an application on your device could also work, although this is not the preferred way.



Zeep Mobile (<http://www.zeepmobile.com>) offers a free, ad-supported SMS API for sending and receiving messages, but it only works in the United States at the time of this writing. You can also pay for an ad-free plan.

You can also use carrier developer networks and the up-and-coming OneAPI to send messages to known networks.

Email invitation

For newer smartphones with email support, an alternative to SMS is to send the user a free email message containing the mobile URL.

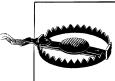
Mobile Tiny URL

To enable the user to type your URL easily, you can use the free service Mobile Tiny URL (<http://www.mobletinyurl.com>), shown in Figure 14-3. It converts any URL into a short form that can be typed with only 13 keypresses on a numeric keypad. By default the generated short URL doesn't work in desktop browsers or on iPhone devices, but you can add desktop and iPhone support. These short URLs are useful for publication on desktop websites and in printed advertising.

The screenshot shows the homepage of Mobile Tiny URL. At the top, it says "Mobile Tiny URL" and "3190558 mobile keypresses saved!" with a "SAVE your FINGERS!" button. Below that, a heading says "Not only shorter, optimized for faster typing". A sub-section titled "Why is it mobile optimized?" explains that it uses one keypress per character. A text input field is labeled "Enter or Paste a long address to create a mobile optimized URL". To its right is a "Make Mobile Tiny URL" button. Below the input field, a note says "You can use any mobile compatible content, like an (x)HTML, WML, Image, Video, Flash Lite, Java ME, Symbian, Widget. Be sure to use the URL on a compatible device for each file type." A yellow box contains the original URL "ad.ag/admtgp" and its shortened version "ad.ag/admtgp". It notes that the original URL needs 70 keypresses and the shortened URL needs 13. A QR code is provided for scanning. On the right, there's an optional configuration section with checkboxes for desktop browser, iPhone, temporary URL, stats, and info updates, with a "Save" button and a "Remember my settings" checkbox.

Figure 14-3. With the Mobile Tiny URL service, developed in 2009, you can generate valid web address that can be entered using only the first characters of a numeric keypad.

For example, instead of typing m.safaribooksonline.com, a mobile user can type **ad.ag/admtgp** (saving 57 keypresses). As you can see, the generated URL uses only the first letters associated with every key on the keypad, to speed up entry. Even apparently simple URLs like google.com will require 37 keypresses on a mobile phone, and you can save 24 by using the compressed URL (**ad.ag/tgtmjg**).



The Mobile Tiny URLs aren't intended to be URLs that you will remember; they are intended for you to have in front of you while you are typing them in.

QR codes

A QR code is a two-dimensional barcode (also called a *matrix code*) that allows the storage of several bytes in a graphic. These codes have many uses, one of which is to provide a URL that can be read by devices with bar code readers. Many Nokia and Android devices come with these readers preinstalled, but on other devices, users will need to download one. A sample QR code is shown in Figure 14-4.



Figure 14-4. Google Maps created the Favorite Places campaign, sending stickers like this one to businesses (like restaurants) that the users can scan with their mobile devices to access information, reviews, etc. Today, the service is known as Google Places.



A QR code can contain 4296 alphanumeric characters, or 2953 bytes for binary data. Some devices also support other data inside, like contact information (for example, a vCard file).

They are well known in mobile advertising; many campaigns use these codes in newspapers, on street signs, and even on t-shirts.

To create a QR code, you can use any of these free services:

- <http://qrcode.kaywa.com>
- <http://createqr.com/appspot.com>
- <http://mobilecodes.nokia.com>
- <http://www.mobiletinyurl.com>

If you need to generate a QR code dynamically, there are libraries for almost all server-side platforms that will generate the right image for you.

The free Google Chart API (<http://code.google.com/apis/chart>) allows you to generate free QR codes using an XHTML `img` tag with parameters.

There is also WordPress plug-in (<http://wordpress.org/extend/plugins/qr-code-tag>) that creates a QRCode widget for inserting in your blog.

User Fidelizing

Once you've gotten a user to your mobile website, how do you encourage her to come back and maintain an interest in your service? If you are not providing a must-use service (such as online banking or email), you may want to implement some of the following techniques to "fidelize" your users:

- Encourage the user to add your site to her bookmarks, or to the home screen on selected browsers (like iPhone or Android).
- Offer the user a widget or mobile client with richer features.
- Offer the user a shortcut to download for the applications or home menu.
- Offer the user a home widget on supported devices, with automatic updates.
- Create a mobile RSS news feed.
- Provide an SMS alert subscription.

Creating a widget for your mobile website (as discussed in [Chapter 12](#)) could be the key to getting the user back, via the icon in her applications menu. This can be useful even if the widget is just a void container for the same website.



A great feature to incorporate into a widget or mobile client is friend recommendation using the Contacts and SMS APIs available on some platforms.

Web shortcuts

A *web shortcut* is a native application or widget that has an icon in the menu that launches the browser when it is activated, like the one shown in [Figure 14-5](#). Adding

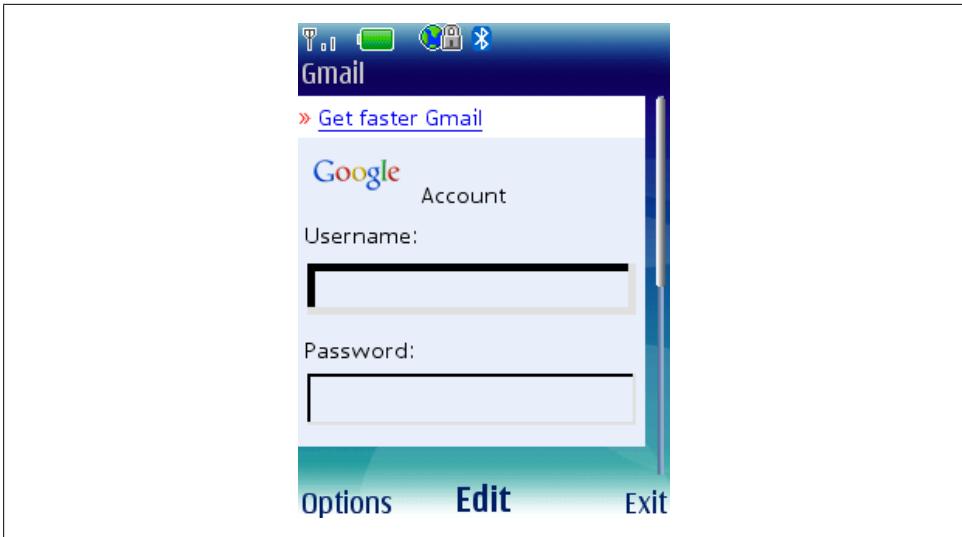


Figure 14-5. In Gmail, you can access the mobile website or download a richer client (“Get faster Gmail”). The same technique is used for downloading a shortcut.

a shortcut is better than adding a bookmark, because it will be installed just like any other application.

You can create Java ME, Windows Mobile, BlackBerry, and widget versions to cover all the possible shortcut platforms.



You can create a free shortcut for your website using the free <http://www.widgen.com> service.

RSS

Some browsers (Opera, Bolt, NetFront, Symbian) detect feed metatags and offer the user the option to subscribe to the feeds to get updates on the sites that provide them. To offer this service, you should provide an RSS file with a mobile web link inside:

```
<link rel="alternate" type="application/rss+xml" title="Mobile RSS"  
      href="http://mobilexweb.com/rss.xml" />
```

If you have an RSS file for your mobile content, you can create a free mobile client reader at <http://www.widgen.com> and offer it as a download from your site.

Open Search

If your website provides a search engine, you should supply an Open Search description protocol file that will allow users of compatible devices to add your engine to the list of possible search engines. Not too many mobile browsers support this format at the

time of this writing, but a mobile extension is in draft by the Open Search organization (<http://opensearch.org>).

To define an Open Search declaration for discoverability, use the following link tag:

```
<link rel="search" type="application/opensearchdescription+xml"
      href="http://mobilexweb.com/opensearch.xml" />
```

The Open Search descriptor file will look like this:

```
<?xml version="1.0" encoding="UTF-8"?>
<OpenSearchDescription xmlns="http://a9.com/-/spec/opensearch/1.1/">
    <ShortName>Mobile Web Search</ShortName>
    <Description>Search in our mobile web</Description>
    <Url type="text/html"
        template="http://mysite.com/?q={searchTerms}"/>
    <Image height="64" width="64" type="image/png">
        http://example.com/icon.png
    </Image>
    <Language>en-us</Language>
</OpenSearchDescription>
```

BlackBerry Web Signals

RIM offers a push service called Web Signals that can push real-time information to BlackBerry devices. The customer has to follow an opt-in process to subscribe to your content. When you want to push information you send an icon and a URL to the RIM servers, and they deliver the information to the subscribed users. The mechanism can be used for public information for end users (news, weather, traffic) or for private information (corporate alerts).

To see more information and start providing Web Signals to users, go to <http://www.mobilexweb.com/go/websignals>.



Apple, Android from 2.2, and Palm offer push service notifications for applications distributed in their stores. We can also use these if we provide hybrid web applications.

Mobile Web Statistics

With your website online, you will want to gather some statistics about usage, visitors, and even mobile browsers accessing your site. Typical desktop web statistics systems don't work well with mobile sites, because they don't have mobile user agents in mind when analyzing logs and don't work on non-JavaScript devices or other kinds of services.

However, there are some free and commercial solutions available for mobile web statistics.

Google Analytics for Mobile

Google Analytics is one of the most used (and most powerful) free web statistics tool for mobile websites, but it is based on JavaScript code that, in the mobile world, only works on high-end devices.

Google Analytics for Mobile Websites (<http://code.google.com/mobile/analytics/docs/web>) works on all web-enabled browsers, with or without JavaScript support. The technology supports script code for PHP, ASP.NET, Perl, and JSP.



Google Analytics is also available for Android and iPhone native applications, supporting tracking of pages and events.

To use the mobile service, you should apply for a normal Google Analytics account at <http://www.google.com/analytics>. Create a new Website Profile and, in the Advanced section, select “A site built for a mobile phone,” select your server language, and follow the instructions.

Yahoo! Web Analytics

Yahoo! Web Analytics (<http://web.analytics.yahoo.com>) supports mobile devices, giving the following statistics about your mobile users:

- Mobile device manufacturer
- Mobile device model
- Model device screen size
- Carrier name

You will find these statistics in the Mobile Reports section.

Mobilytics

Mobilytics (<http://www.mobilytics.net>) provides free and premium metric and visual indicators about your mobile web visitors. Mobilytics offers scripts for PHP, ASP.NET, JSP, and other server-side platforms. Transcoder detection, mobile device detection, and other capabilities are available in premium plans.

Motally Web Analytics

Motally (<http://www.motally.com>) offers mobile web analytic services with a patent-pending algorithm to track mobile user visits. It provides statistics about the devices, operators, and location of your users, and detects the use of proxies and transcoders.

Motally is available in a free community version and a commercial version with more advanced features. There are server-side code snippets for PHP, JSP, ASP.NET, Perl, and Ruby on Rails.

Pion for Mobile Web

Atomic Labs offers a commercial service for mobile web logging and statistics including mobile session replay, where you can see exactly what your users are doing on your mobile website. More information can be found at <http://www.atomiclabs.com/pion-web-analytics/mobile-web-analytics.php>.

Mobile Web Advertising

You've put a lot of work into build your site. How can you make a return on that investment? One solution could be advertising.

Monetizing Your Website

If you have a free mobile website and you want to monetize it with advertisements, there are a few solutions that you can use.



For more information about mobile advertising, visit the Mobile Marketing Association at <http://www.mmaglobal.com>.

Google AdSense for mobile content

With Google AdSense, you can easily insert mobile-optimized ads for mobile devices. To use it, log in or sign up at <http://www.google.com/adsense> and select “AdSense for Mobile Content” on the Account Setup tab.



When you define a mobile campaign for Google AdWords, you can use the Keyword tool to access information about mobile searches in the Google ecosystem.

It is possible to select only advertisements for iPhone and high-end devices, or for all devices (including ads in XHTML, cHTML, and WML format), using server-side code. When you add the server code (for example, PHP) you should start seeing mobile advertisements on your site within 48 hours.



The standard Google AdSense account also works on smartphones with HTML and JavaScript support.

AdMob

AdMob is the pioneer in mobile web advertisement, and as Google acquired it in 2009 it will probably be joining the AdSense service soon. AdMob offers multiple ad formats to use in mobile websites, inserted using simple codes. To sign up, register for an account at <http://www.admob.com/publish>.

Other Companies

Other companies offering mobile advertising solutions include DeckTrade (<http://www.decktrade.com>), AdModa (<http://www.admoda.com>), and Quattro Wireless (<http://www.quattrowireless.com>).



If you want to promote your mobile web application to mobile users and you have a marketing budget to spend, you can create a mobile campaign through Google AdWords (<http://www.google.com/adwords>), AdMob (<http://www.admob.com>), GetJAR (<http://developer.getjar.com>), or GameJump (<http://www.gamejump.com>). You will begin receiving visits from mobile applications, games, and search engines within minutes.

Mobile Web Social Features

Your mobile website will not be complete if you don't add some social features to it. In the current Web 2.0 and social networking era, social integration is a must-have feature to implement.

Facebook

Facebook offers *Facebook Connect for Mobile Web*, a PHP library that lets our applications log users in using their Facebook accounts. With this API you can:

- Create a login mechanism easily.
- Get user session data.
- Call methods from the Facebook Platform API and prompt for extended permissions (access friends list, send private messages).
- Post on the Facebook stream.

To use it, you will need to get an API key at <http://developer.facebook.com> and configure your mobile web settings and URLs for callbacks. Once you've done this, you can download the API for PHP (including sample code), create the MySQL table, and use the API.

Your application can also be integrated into the mobile Facebook website (<http://m.facebook.com>) like a desktop Facebook application. The mobile version is a subset of the desktop one, and you can use Facebook Markup Language (FBML) to create it. This is a whole new topic and is outside the scope of this book, but you can get more information at <http://wiki.developer.facebook.com>.

Share Content

For any content you are serving in your mobile website, you can offer a *Share* service to publish the URL via Twitter, Facebook, and other social networks.

For most social networks, you should use the same URL you would use for the desktop website. On the server, the social network scripts will redirect users to the mobile website.

For Twitter, you can use a link like this:

```
http://twitter.com/home?status=<your message here>
```

Remember that Twitter has a limit of 140 characters, including an optional URL using `http://`, which should be URL-encoded in the status variable. For long URLs, you should use a shortener service API.



In [Chapter 6](#) we discussed how to open any installed native Facebook or Twitter applications on iPhone and Android devices.

For Facebook, you can share a link using:

```
http://m.facebook.com/sharer.php?u=<url to share>&t=<title of content>
```

You can also use the AddThis service, shown in [Figure 14-6](#), which is compatible with mobile browsers when you use the standard button and not the JavaScript button. AddThis offers sharing links and icons for dozens of sharing services. It includes a special design for most mobile devices and for iPhone devices. To create your own code for sharing services, go to <http://www.addthis.com>.

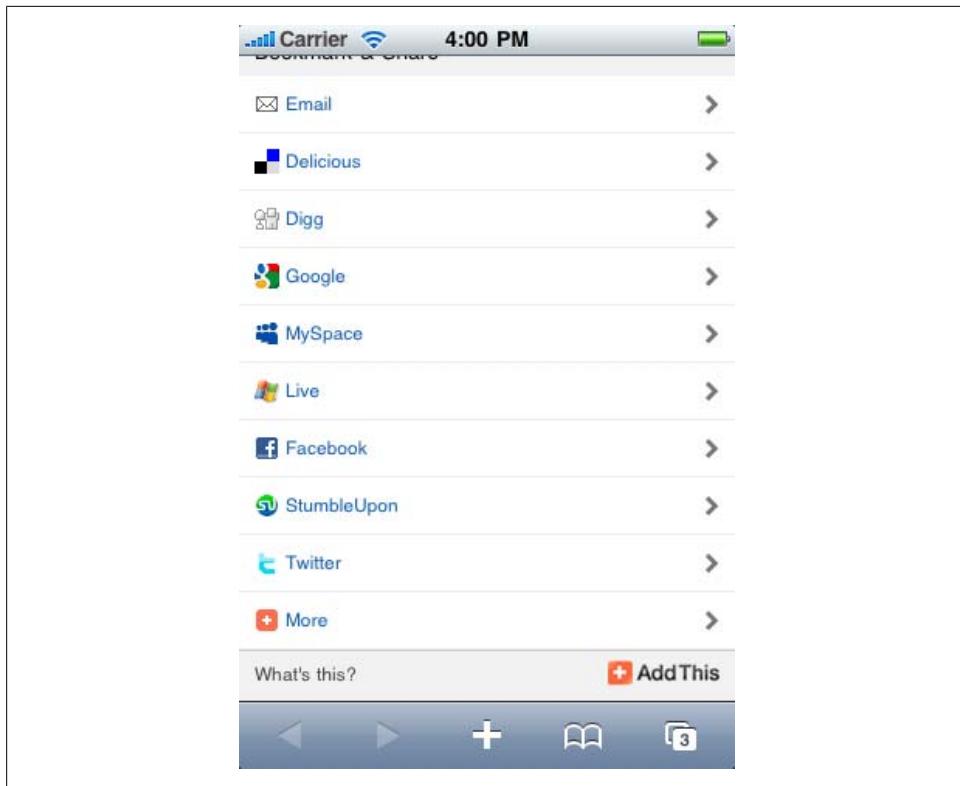


Figure 14-6. The free service AddThis detects mobile phones and offers an optimized interface for sharing links.

MIME Types for Mobile Content

Markup and Script MIME Types

Table A-1. Markup and script MIME types

Format	Typical extension	MIME type
WML	.wml	text/vnd.wap.xml
WMLScript	.wmls	text/vnd.wap.wmlscript
HTML 3/4/5	.html	text/html
cHTML	.html	text/html
XHTML	.html, .xhtml	application/xhtml+xml, text/xml, text/html
XHTML MP	.html, .xhtml	application/vnd.wap.xhtml+xml, application/xhtml+xml, text/xml, text/html
JavaScript	.js	text/javascript, application/ecmascript, application/javascript
CSS2, CSS3, WAP CSS, and CSS MP	.css	text/css
Multipart document		multipart/mixed, application/vnd.wap.multipart.mixed

Image MIME Types

Table A-2. Image MIME types

Format	Typical extension	MIME type
GIF	.gif	image/gif
JPEG	.jpeg, .jpg	image/jpeg, image/jpg
PNG	.png	image/png
SVG	.svg	image/svg+xml

Format	Typical extension	MIME type
Compressed SVG	.svgz	image/svg+xml
WBMP	.wbmp	image/vnd.wap.wbmp
Nokia Wallpaper		image/vnd.nok-wallpaper

Mobile Content MIME Types

Table A-3. Mobile content MIME types

Format	Typical extension	MIME type
Java ME Application Descriptor	.jad	text/vnd.sun.j2me.app-descriptor
Java ME Archive	.jar	application/java-archive
BlackBerry Archive	.cod	application/vnd.rim.cod
Android Application	.apk	application/vnd.android.package-archive
Windows Mobile Application	.cab	application/cab
Garnet OS Application (old Palm devices)	.prc	application/vnd.palm
Symbian Application	.sis	application/vnd.symbian.install
Symbian Application	.sisx	x-e poc/x-sisx-app
vCalendar	.vcalendar	
iCalendar	.icalendar	
Nokia Flash Format	.nfl	
Adobe Flash Movie	.swf	application/x-shockwave-flash
XML	.xml	text/xml
JSON	.json	application/json, text/json, text/javascript
RSS	.rss, .xml	application/rss+xml
Open Search Description	.xml	application/opensearchdescription+xml
Mobile Sitemap	.xml	text/xml
Multimedia Message	.mms, .smil	application/vnd.wap.mms-message
Bookmark		application/x-wap-prov.browser-bookmarks
Sony Ericsson MMSTemplate	.tpl	application/vnd.sonyericsson.mms-template
OMA Download		application/vnd.oma.dd+xml

Audio and Video MIME Types

Table A-4. Audio and video MIME types

Format	Typical extension	MIME type
3GPP	.3gp, .3gpp	video/3gpp
3GPP 2	.3gp2, .3gpp2	video/3gpp2
QuickTime MOV	.mov	video/quicktime
Windows Media Video	.wmv	video/x-ms-wmv
Windows Media Audio	.wma	audio/x-ms-wma
Real Video	.rv	video/vnd.rn-realvideo
Real Audio	.ra, .ram	audio/x-pn-realaudio
MP3	.mp3	audio/mp3
Flash Video	.flv	video/x-flv

Widget and Webapp MIME Types

Table A-5. Widget and webapp MIME types

Format	Typical extension	MIME type
Symbian WRT widget	.wgz	application/x-nokia-widget
Samsung widget	.wgt	application/vnd.samsung.widget
JIL widget	.wgt	application/widget
Opera widgets	.wgt	application/x-opera-widgets
Manifest file	.manifest	text/cache-manifest
Yahoo! Blueprint response	.xml	application/x-blueprint+xml

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About the Author

Maximiliano Firtman is a developer focused on mobile and Web 2.0 development. He is a professor of web and mobile technologies, and founder of ITMaster Professional Training. He is the author of many books in Spanish, including books on Java ME, ASP.NET, Ajax, and iPhone development.

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Colophon

The animal on the cover of *Programming the Mobile Web* is a jerboa, a small jumping rodent of the family Dipodidae. The 33 species of jerboa are found in deserts of Asia and North Africa. They feed on the leaves and roots of desert plants; many species also eat insects. They extract water from their food so efficiently that they do not need to drink.

Jerboas' powerful hind legs may be four times longer than their front legs and enable them to hop up to three meters. Their tails, which are often tufted, are longer than their bodies and are used for balance. Their ears vary from species to species—they may be small and mouselike or broad and rabbitlike.

Jerboas are well adapted to their harsh desert environments. They are nocturnal and hide in burrows, which they may plug for protection against the elements, during the day. Some jerboas living in hot regions enter a state of torpor (estivation) during the hottest months; jerboas living in cold regions hibernate during the winters.

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