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Hello, Android

Introducing Google's Mobile Development Platform, 3rd Edition

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Introducing Google's Mobile Development Platform

Third Edition







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Preface

Android is an open source software toolkit for mobile phones and tablets that was created by Google and the Open Handset Alliance. It's inside millions of cell phones and other mobile devices, making Android a major platform for application developers. Whether you're a hobbyist or a professional programmer, whether you are doing it for fun or for profit, it's time to learn more about developing for Android. This book will help you get started.

What Makes Android Special?

There are already many mobile platforms on the market today, including iOS, Windows Mobile, Symbian, WebOS, bada, and more. When I tell people about Android, their first question is often, What is different about Android? Where's the "wow"?

Although some of its features have appeared before, Android is the first environment that combines the following:

- A truly open, free development platform based on Linux and open source: Handset makers like it because they can use and customize the platform without paying a royalty. Developers like it because they know that the platform "has legs" and is not locked into any one vendor that may go under or be acquired.
- A component-based architecture inspired by Internet mashups: Parts of one application can be used in another in ways not originally envisioned by the developer. You can even replace built-in components with your own improved versions. This will unleash a new round of creativity in the mobile space.
- *Tons of built-in services out of the box*: Location-based services use GPS or cell tower triangulation to allow you customize the user experience depending on where you are. A full-powered SQL database lets you harness the power of local storage for occasionally connected computing and synchronization. Browser and map views can be embedded directly in

your applications. All these built-in capabilities help raise the bar on functionality while lowering your development costs.

- Automatic management of the application life cycle: Programs are isolated from each other by multiple layers of security, which will provide a level of system stability not seen before in smart phones. The end user will no longer have to worry about what applications are active or close some programs so that others can run. Android is optimized for low-power, lowmemory devices in a fundamental way that no previous platform has attempted.
- *High-quality graphics and sound*: Smooth, antialiased 2D vector graphics and animation inspired by Flash are melded with 3D-accelerated OpenGL graphics to enable new kinds of games and business applications. Codecs for the most common industry-standard audio and video formats are built right in, including H.264 (AVC), MP3, and AAC.
- *Portability across a wide range of current and future hardware*: All your programs are written in Java and executed by Android's Dalvik virtual machine, so your code will be portable across ARM, x86, and other architectures. Support for a variety of input methods is included, such as keyboards, touch, TV remotes, mice, and trackballs. User interfaces can be customized for any screen resolution and orientation.

Android offers a fresh take on the way mobile applications interact with users, along with the technical underpinnings to make it possible. But the best part of Android is the software that you are going to write for it. This book will help you get off to a great start.

Who Should Read This Book?

Before tackling this book, you should understand the basic concepts of programming in Java, including classes, methods, scope, and inheritance. You will also need to know the meaning of Java keywords such as import, static, final, public, and this. If you don't know what I'm talking about, then I recommend you start with a Java introductory book such as:

- Java Precisely [Ses05]
- Head First Java [SB05]
- Effective Java [Blo08]
- The Java Programming Language [AGH05]
- Java in a Nutshell [Fla05]

You don't need any prior experience developing software for mobile devices. In fact, if you do, it's probably best if you try to forget that experience. Android is so different that it's good to start with an open mind.

What's in This Book?

Hello, Android is divided into four parts. Roughly speaking, the book progresses from less advanced to more advanced topics, or from more common to less common aspects of Android.

Several chapters share a common example: an Android Sudoku game. By gradually adding features to the game, you'll learn about many aspects of Android programming including user interfaces, multimedia, and the Android life cycle.

In Part I, we'll start with an introduction to Android. This is where you'll learn how to install the Android emulator and how to use an integrated development environment (IDE) to write your first program. Then we'll introduce a few key concepts like the Android life cycle. Programming in Android is a little different from what you're probably used to, so make sure you get these concepts before moving on.

Part II talks about Android's user interface, two-dimensional graphics, multimedia components, and simple data access. These features will be used in most programs you write.

Part III digs deeper into the Android platform. Here you'll learn about connecting to the outside world, location-based services, the built-in SQLite database, and three-dimensional graphics.

Part IV wraps things up with a discussion on using advanced input techniques including multi-touch and extending your home screen with widgets and live wallpaper. Finally, we'll explore making your app compatible with multiple Android devices and versions and then publishing it on the Android Market.

At the end of the book, you'll find an appendix that covers the differences between Android and Java Standard Edition (SE), along with a bibliography.

What's New in the Third Edition?

The third edition has been updated to support all versions of Android from 1.5 through 2.3 and beyond. Here's a summary of the new features introduced in each version and the corresponding sections that cover those features.

New for Cupcake

Android 1.5 (Cupcake) introduced a large number of enhancements to the Android platform including support for soft (onscreen) keyboards, video recording, and application widgets. Under the covers, there were more than 1,000 changes to the Android API between 1.1 and 1.5.¹ Widgets are covered in Section 12.1, *Hello, Widget*, on page ?.

New for Donut

Android 1.6 (Donut) added support for high- and low-density displays, plus a number of minor changes that don't affect most developers.² You can learn how to support these different device form factors in <u>Section 13.5</u>, *All Screens Great and Small*, on page ?.

New for Eclair

Android 2.0 (Eclair) added support for multi-touch, virtual keys, centralized account management, synchronization APIs, docking, HTML5, and more.³ The 2.0 version was quickly replaced by Android 2.0.1 (also called Eclair), which contains all the changes in the 2.0 version plus a few bug fixes.⁴ Multi-touch is covered in Chapter 11, *Multi-Touch*, on page ?.

New for Eclair MR1

Android 2.1 (Eclair Maintenance Release 1) added support for live wallpapers, more HTML5 support, and other minor improvements.⁵ Home screen enhancements, including live wallpapers and widgets, are covered in <u>Chapter 12</u>, *There's No Place Like Home*, on page ?.

New for FroYo

Android 2.2 (FroYo) supports application installation on external storage (SD cards), a much faster Java virtual machine, OpenGL ES 2.0 APIs, and more.⁶ Section 13.6, *Installing on the SD Card*, on page ? explains how to set up your program to install on external storage and when you should and shouldn't do that.

^{1.} http://d.android.com/sdk/api_diff/3/changes.html

^{2.} http://d.android.com/sdk/api_diff/4/changes.html

^{3.} http://d.android.com/sdk/api_diff/5/changes.html

^{4.} http://d.android.com/sdk/api_diff/6/changes.html

^{5.} http://d.android.com/sdk/api_diff/7/changes.html

^{6.} http://d.android.com/sdk/api_diff/8/changes.html

New for Gingerbread

Android 2.3 (Gingerbread) added APIs for writing games with native C code.⁷

New for Gingerbread MR1 and Beyond

Android 2.3.3 (Gingerbread Maintenance Release 1) was the first version with full support for NFC (Near Field Communications).⁸

After Gingerbread comes Honeycomb, Ice Cream Sandwich, and Jelly Bean. At the time of this writing, though, they make up a very small percentage of the market. If you follow the advice in this book, your programs will run on future versions of Android with little or no effort. Chapter 13, *Write Once, Test Everywhere*, on page ? covers how to create a single program that supports multiple versions.

See the Android Device Dashboard⁹ for the latest market share of active Android devices in the wild. This edition of the book does not cover version 1.1 or earlier. All the examples in this book have been tested on versions through 2.3.3.

Online Resources

At the website for this book (http://pragprog.com/titles/eband3), you'll find the following:

- The full source code for all the sample programs used in this book
- An errata page, listing any mistakes in the current edition (let's hope that will be empty!)
- A discussion forum where you can communicate directly with the author and other Android developers (let's hope that will be full!)

You are free to use the source code in your own applications as you see fit. Note: If you're reading the ebook, you can also click the little gray rectangle before the code listings to download that source file directly.

Fast-Forward >>

Although most authors expect you to read every word in their books, I know you're not going to do that. You want to read just enough to let you get something done, and then maybe you'll come back later and read something

^{7.} http://d.android.com/sdk/api_diff/9/changes.html

^{8.} http://d.android.com/sdk/api_diff/10/changes.html

^{9.} http://d.android.com/resources/dashboard/platform-versions.html

else to let you get another piece done. So, I've tried to provide you with a little help so you won't get lost.

Each chapter in this book ends with a "Fast-Forward >>" section. These sections will provide some guidance for where you should go next when you need to read the book out of order. You'll also find pointers to other resources such as books and online documentation here in case you want to learn more about the subject.

So, what are you waiting for? The next chapter—Chapter 1, *Quick Start*, on page ?—drops you right into the deep end with your first Android program. Chapter 2, *Key Concepts*, on page ? takes a step back and introduces you to the basic concepts and philosophy of Android, and <u>Chapter 3</u>, *Designing the User Interface*, on page ? digs into the user interface, which will be the most important part of most Android programs.

Your ultimate goal will be to make your apps available for sale or free download in the Android Market. When you're ready, <u>Chapter 14</u>, <u>Publishing to the Android Market</u>, on page ? will show you how to take that final step.