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Hello, Android

Introducing Google’s Mobile Development Platform, Fourth Edition

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Introducing Google's Mobile Development Platform

Fourth Edition

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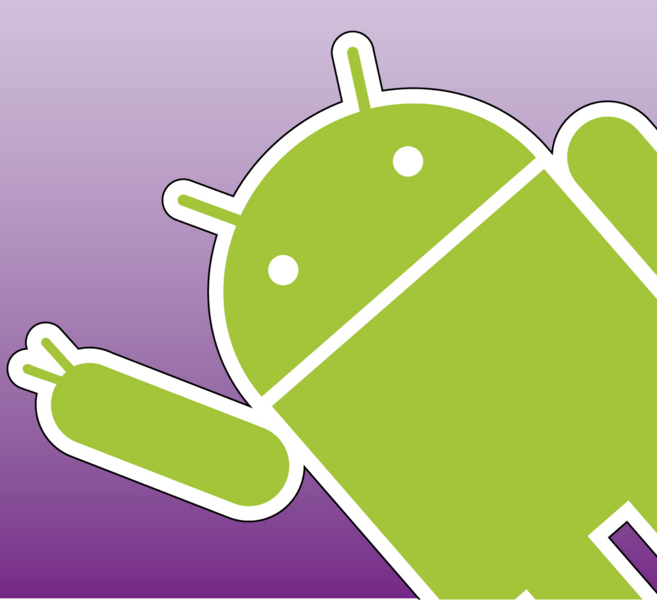

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Preface

Android is an open source operating system for mobile phones and tablets that was created by Google and its partners and contributors. It's inside over a billion cell phones and other mobile devices, making Android the #1 platform for application developers. Whether you're a hobbyist or a professional programmer, whether you're doing it for fun or for profit, you need to learn more about developing for Android. This book will help you get started.

What Makes Android Special?

Many other mobile platforms are available on the market today, including iOS, Windows, Tizen, Firefox OS, and more. So why do people choose Android over the others? What's the difference?

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

- *An 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 ways not originally envisioned by the developer. You can even replace built-in components with your own improved versions. This has unleashed a new round of creativity in the mobile space.

- *Tons of services out of the box:* Location-based services use GPS or cell tower triangulation to allow you to 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 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 provide a high level of system stability. The end user doesn't have to worry about what applications are active or close some programs so that others can run. Android is optimized for low-power, low-memory devices in a fundamental way that no previous platform has attempted.
- *High-quality graphics and sound:* Smooth, antialiased 2D and 3D-accelerated graphics have enabled 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 ART ahead-of-time compiler or 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, game pads, 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're going to write for it. This book will help you get off to a great start.

Who Should Read This Book?

This book is for developers new to the Android platform who are looking for a quick way to get started. In a just few minutes, you'll be installing the development tools and writing your first program. By the time you finish you'll be able to write complete, engaging Android applications. But more importantly, you'll be equipped to locate and understand more advanced material that you'll need in your journey.

Before tackling this book, you should understand the basic concepts of programming in Java, including classes, methods, scope, and inheritance. You'll 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 one of these:

- *Java Precisely [Ses05]*
- *Head First Java [SB05]*
- *Effective Java [Blo08]*
- *The Java Programming Language [AGH05]*
- *Java in a Nutshell [EF14]*

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. However, some exposure to an integrated development environment (IDE) such as IntelliJ IDEA, Eclipse, or Visual Studio would come in handy.

What's in This Book?

Hello, Android is divided into four main 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 Ultimate Tic-Tac-Toe game. By gradually adding features to the game, you'll learn about many aspects of Android programming, including user interfaces, multimedia, and the Android Activity and Fragment life cycles.

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 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: display, input, multimedia, and animation. These features will be used in many of the programs you write.

Part III digs deeper into the Android platform. Here we'll explore making your app compatible with multiple Android devices and versions. You'll also learn how to publish your app on the Google Play Store.

Part IV wraps things up with a discussion of more advanced topics, including embedding HTML pages, accessing web services, using Google Play Services, and storing data with the built-in SQLite database.

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 Fourth Edition?

The fourth edition has been updated to support all versions of Android from 4.1 through Android 5.1 and beyond. Version 4.1 (Jelly Bean) is the first of what I call the “modern” versions of Android.

What Came Before

Android 2.3 (Gingerbread) was the last of the old generation that worked only with phones. Version 3.0 (Honeycomb) was a major departure, but only supported tablets and saw limited adoption. (However, the Honeycomb statue at Google’s campus is arguably the best.) 4.0 (Ice Cream Sandwich) combined the phone and tablet lines together like chocolate and vanilla but offered very little else in the way of functionality compared to 3.0.

New for Android 4.1 (Jelly Bean)

On the other hand, version 4.1 represented a major effort on Google’s part to improve Android’s usability and performance. Under the code name “Project Butter,” Google added new ways to measure the speed and efficiency of the entire system, and then they optimized how each millisecond was used.[1]

New for Android 4.2 (Jelly Bean MR1)

Buoyed by the success of 4.1, Google decided to keep the same name for the next two releases. Version 4.2 continued performance improvements, added multiuser support, and included the ability to wirelessly mirror your screen to a remote display using the Miracast standard.[2]

New for Android 4.3 (Jelly Bean MR2)

The focus of version 4.3 was security. SE (Security Enhanced) Linux was used as the underlying operating system, and restricted profiles allowed different users to have different permissions set up by the primary owner. This version also was the first to include support for OpenGL ES 3.0.[3]

[1] http://d.android.com/sdk/api_diff/16/changes.html

[2] http://d.android.com/sdk/api_diff/17/changes.html

[3] http://d.android.com/sdk/api_diff/18/changes.html

New for Android 4.4 (KitKat)

The most important new feature in Android 4.4 was the replacement of the old WebKit-based WebView with the Chromium engine, the same one used in the Chrome browser.[4]

New for Android 4.4W (KitKat for Watches)

Android Wear, the operating system for smart watches, required a few changes and fixes to support wearable devices.[5]

New for Android 5.0 (Lollipop)

A new design language called "Material Design" was the most visible change in Android 5.0. Under the covers, the Dalvik VM that was used on every version of Android up to this point was replaced by a system called ART, which relied on ahead-of-time compilation to get better performance. Finally, a new effort called "Project Volta" was started to do the same for battery life that Project Butter did for performance.[6]

New for Android 5.1 (Lollipop MR1)

Support for multiple SIM cards was added, as well as a way for carrier provisioning apps to be distributed through Google Play. In addition, the AndroidHttpClient class and a large number of org.apache.http classes were deprecated.[7]

If I remember my alphabet correctly, after L comes M, N, O, and P (or "eleminopea" as I was taught to sing it). If you follow the advice in this book, your programs will run on future versions of Android with little or no effort. Chapter 8, *Write Once, Test Everywhere*, on page ? covers how to create a single program that supports multiple versions.

See the Android Device Dashboard[8] for the latest market share of active Android devices in the wild. All the examples in this book have been tested on versions 4.1 through 5.1.

This edition of the book doesn't cover versions earlier than 4.1 because they represent a small and shrinking portion of the market. Nor does it spend much time on the customizations possible in 5.1 since there aren't many

[4] http://d.android.com/sdk/api_diff/19/changes.html
[5] http://d.android.com/sdk/api_diff/20/changes.html
[6] http://d.android.com/sdk/api_diff/21/changes.html
[7] http://d.android.com/sdk/api_diff/22/changes.html
[8] http://d.android.com/resources/dashboard/platform-versions.html

devices running that version as of this writing. Only the topics needed by most Android programs are included to keep the book short and concise.

Online Resources

At the website for this book[9], you'll find the following:

- The full source code for all the sample programs used in this book, along with resources such as sounds and images
- 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're 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 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 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 ?—gets you started with a very simple Android program. Chapter 2, *Key Concepts*, on page ? takes a step back and introduces you to the basic concepts and philosophy of Android, and Chapter 3, *Opening Moves*, on page ? introduces the Tic-Tac-Toe example and 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, Chapter 9, *Publishing to the Play Store*, on page ? will show you how to take that final step.

[9] http://pragprog.com/book/eband4