



Preface

Welcome to the dynamic world of Android smartphone and tablet app development with the Android Software Development Kit (SDK), the Java™ programming language, the Eclipse-based Android Development Tools IDE, and the new and rapidly evolving Android Studio IDE.

Android for Programmers: An App-Driven Approach, 2/e, Volume 1 presents leading-edge mobile computing technologies for professional software developers. At the heart of the book is our *app-driven approach*—we present concepts in the context of *seven complete working Android apps* rather than using code snippets. Chapters 2–8 each present one app. We begin each of these chapters with an introduction to the app, an app test-drive showing one or more sample executions and a technologies overview. Then we proceed with a detailed code walkthrough of the app’s source code. All of the source code is available at www.deitel.com/books/AndroidFP2. We recommend that you have the source code open in the IDE as you read the book.

Sales of Android devices and app downloads have been growing exponentially. The first-generation Android phones were released in October 2008. A study by Strategy Analytics showed that by October 2013, Android had 81.3% of the global smartphone market share, compared to 13.4% for Apple, 4.1% for Microsoft and 1% for BlackBerry.¹ According to an IDC report, by the end of the first quarter of 2013 Android had 56.5% of the global tablet market share, compared to 39.6% for Apple’s iPad and 3.7% for Microsoft Windows tablets.²

There are now over one billion Android smartphones and tablets in use,³ and more than 1.5 million Android devices are being activated daily.⁴ According to IDC, Samsung is the leading Android manufacturer, accounting for nearly 40% of Android device shipments in the third quarter of 2013.

Billions of apps have been downloaded from Google Play™—Google’s marketplace for Android apps. The opportunities for Android app developers are enormous.

Fierce competition among popular mobile platforms and carriers is leading to rapid innovation and falling prices. Competition among the dozens of Android device manufacturers is driving hardware and software innovation within the Android community.

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All of the Android code and Android apps in the book are copyrighted by Deitel & Associates, Inc. The sample Android apps in the book are licensed under a Creative Commons Attribution

1. <http://blogs.strategyanalytics.com/WSS/post/2013/10/31/Android-Captures-Record-81-Percent-Share-of-Global-Smartphone-Shipments-in-Q3-2013.aspx>.
2. <http://www.idc.com/getdoc.jsp?containerId=prUS24093213>.
3. <http://www.android.com/kitkat>.
4. <http://www.technobuffalo.com/2013/04/16/google-daily-android-activations-1-5-million>.

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Intended Audience

We assume that you're a Java programmer with object-oriented programming experience. Because of the improved Android development tools, we were able to eliminate almost all XML markup in this edition. There are still two small, easy-to-understand XML files you'll need to manipulate. We use only complete, working apps, so if you don't know Java but have object-oriented programming experience in languages like C#/.NET, Objective-C/Cocoa or C++ (with class libraries), you should be able to master the material quickly, learning a good amount of Java and Java-style object-oriented programming along the way.

This book is *not* a Java tutorial, but it presents a significant amount of Java in the context of Android app development. If you're interested in learning Java, check out our publications:

- *Java for Programmers, 2/e* (www.deitel.com/books/javafp2)
- *Java Fundamentals: Parts I and II* LiveLessons videos (www.deitel.com/books/LiveLessons).
- *Java How to Program, 10/e* (www.deitel.com/books/jhttp10)

If you're not familiar with XML, see these online tutorials:

- <http://www.ibm.com/developerworks/xml/newto>
- http://www.w3schools.com/xml/xml_what_is.asp
- http://www.deitel.com/articles/xml_tutorials/20060401/XMLBasics
- http://www.deitel.com/articles/xml_tutorials/20060401/XMLStructuringData

Key Features

Here are some of this book's key features:

App-Driven Approach. Chapters 2–8 each present one completely coded app—we discuss what the app does, show screen shots of the app in action, test-drive it and overview the technologies and architecture we'll use to build it. Then we build the app's GUI and resource files, present the complete code and do a detailed code walkthrough. We discuss the programming concepts and demonstrate the functionality of the Android APIs used in the app.

Android SDK 4.3 and 4.4. We cover various new Android Software Development Kit (SDK) 4.3 and 4.4 features.

Fragments. Starting with Chapter 5, we use Fragments to create and manage portions of each app's GUI. You can combine several fragments to create user interfaces that take ad-

vantage of tablet screen sizes. You also can easily interchange fragments to make your GUIs more dynamic, as you'll do in Chapter 8.

Support for multiple screen sizes and resolutions. Throughout the app chapters we demonstrate how to use Android's mechanisms for automatically choosing resources (layouts, images, etc.) based on a device's size and orientation.

Eclipse-Based Android Development Tools (ADT) IDE coverage in the print book. The free Android Development Tools (ADT) integrated development environment (IDE)—which includes Eclipse and the ADT plugin—combined with the free Java Development Kit (JDK) provide all the software you'll need to create, run and debug Android apps, export them for distribution (e.g., upload them to Google Play™) and more.

Android Studio IDE. This is the preferred IDE for the future of Android app development. Because it's new and evolving rapidly, we put our discussions of it online at:

<http://www.deitel.com/books/AndroidFP2>

We'll show how to import existing projects so you can test-drive our apps. We'll also demonstrate how to create new apps, build GUIs, modify resource files and test your apps. If you have any questions, contact us at deitel@deitel.com.

Immersive Mode. The status bar at the top of the screen and the menu buttons at the bottom can be hidden, allowing your apps to fill more of the screen. Users can access the status bar by swiping down from the top of the screen, and the system bar (with the back button, home button and recent apps button) by swiping up from the bottom.

Printing Framework. Android 4.4 KitKat allows you to add printing functionality to your apps, such as locating available printers over Wi-Fi or the cloud, selecting the paper size and specifying which pages to print.

Testing on Android Smartphones, Tablets and the Android Emulator. For the best app-development experience, you should test your apps on actual Android smartphones and tablets. You can still have a meaningful experience using just the Android emulator (see the Before You Begin section), however it's processor-intensive and can be slow, particularly with games that have a lot of moving parts. In Chapter 1, we mention some Android features that are not supported on the emulator.

Multimedia. The apps use a broad range of Android multimedia capabilities, including graphics, images, frame-by-frame animation and audio.

Uploading Apps to Google Play. Chapter 9, Google Play and App Business Issues, walks you through the registration process for Google Play and setting up a merchant account so you can sell your apps. You'll learn how to prepare apps for submission to Google Play, find tips for pricing your apps, and resources for monetizing them with in-app advertising and in-app sales of virtual goods. You'll also find resources for marketing your apps. Chapter 9 can be read after Chapter 1.

Features

Syntax Coloring. For readability, we syntax color the code, similar to Eclipse's and Android Studio's use of syntax coloring. Our syntax-coloring conventions are as follows:

comments appear in green
 keywords appear in dark blue
 constants and literal values appear in light blue
 all other code appears in non-bold black

Code Highlighting. We emphasize the key code segments in each program by enclosing them in yellow rectangles.

Using Fonts for Emphasis. We use various font conventions:

- The defining occurrences of key terms appear in **bold maroon** for easy reference.
- On-screen IDE components appear in **bold Helvetica** (e.g., the **File** menu).
- Program source code appears in Lucida (e.g., `int x = 5;`).

In this book you'll create GUIs using a combination of visual programming (point and click, drag and drop) and writing code.

We use different fonts when we refer to GUI elements in program code versus GUI elements displayed in the IDE:

- When we refer to a GUI component that we create in a program, we place its class name and object name in a Lucida font—e.g., “Button saveContactButton.”
- When we refer to a GUI component that's part of the IDE, we place the component's text in a **bold Helvetica** font and use a plain text font for the component's type—e.g., “the **File** menu” or “the **Run** button.”

Using the > Character. We use the > character to indicate selecting a menu item from a menu. For example, we use the notation **File > New** to indicate that you should select the **New** menu item from the **File** menu.

Source Code. All of the book's source code is available for download from:

www.deitel.com/books/AndroidFP2
www.informit.com/title/0133570924

Documentation. All the Android and Java documentation you'll need to develop Android apps is available free at <http://developer.android.com> and <http://www.oracle.com/technetwork/java/javase/downloads/index.html>. The documentation for Eclipse is available at www.eclipse.org/documentation. The documentation for Android Studio is available at <http://developer.android.com/sdk/installing/studio.html>.

Chapter Objectives. Each chapter begins with a list of learning objectives.

Figures. Hundreds of tables, source code listings and Android screen shots are included.

Software Engineering. We stress program clarity and performance, and concentrate on building well-engineered, object-oriented software.

Index. We include an extensive index for reference. The page number of the defining occurrence of each key term in the book is highlighted in the index in **bold maroon**.

Working with Open-Source Apps

There are numerous free, open-source Android apps available online which are excellent resources for learning Android app development. We encourage you to download open-

source apps and read their source code to understand how they work. **Caution: The terms of open-source licenses vary considerably.** Some allow you to use the app's source code freely for any purpose, while others stipulate that the code is available for personal use only—not for creating for-sale or publicly available apps. **Be sure to read the licensing agreements carefully.** If you wish to create a commercial app based on an open-source app, you should consider having an intellectual property attorney read the license; be aware that these attorneys charge significant fees.

Android for Programmers: An App-Driven Approach, Second Edition, Volume 2

Volume 2, which will be published in 2014, contains additional app-development chapters that introduce property animation, Google Play game services, video, speech synthesis and recognition, GPS, the Maps API, the compass, object serialization, web services, audio recording and playback, Bluetooth®, HTML5 mobile apps and more. **For the status of Volume 2 and for continuing book updates, visit**

<http://www.deitel.com/books/AndroidFP2>

Android Fundamentals, Second Edition LiveLessons Video Training Products

Our *Android Fundamentals, Second Edition* LiveLessons videos show you what you need to know to start building robust, powerful Android apps with the Android Software Development Kit (SDK) 4.3 and 4.4, the Java™ programming language and the Eclipse™ and Android Studio integrated development environments (IDEs). It will include approximately 20 hours of expert training synchronized with *Android for Programmers, Second Edition* (Volumes 1 and 2). The videos for Volume 1 will be available spring 2014. For additional information about Deitel LiveLessons video products, visit

www.deitel.com/livelessons

or contact us at deitel@deitel.com. You can also access our LiveLessons videos if you have a subscription to Safari Books Online (www.safaribooksonline.com).

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Contacting the Authors

We'd sincerely appreciate your comments, criticisms, corrections and suggestions for improvement. Please address all questions and other correspondence to:

deitel@deitel.com

We'll respond promptly, and post corrections and clarifications on:

www.deitel.com/books/AndroidFP2

and on Facebook, Twitter, Google+, LinkedIn and the *Deitel® Buzz Online*.

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- Receive information on our *Dive Into® Series* instructor-led programming language training courses offered at customer sites worldwide

Acknowledgments

Thanks to Barbara Deitel for long hours devoted to this project—she created all of our Android Resource Centers, and patiently researched hundreds of technical details.

This book was a cooperative effort between professional and academic divisions of Pearson. We appreciate the efforts and 18-year mentorship of our friend and professional colleague Mark L. Taub, Editor-in-Chief of the Pearson Technology Group. Mark and his team handle all of our professional books and LiveLessons video products. Kim Boedigheimer recruited distinguished members of the Android community and managed the review team for the Android content. We selected the cover art and Chuti Prasertsith and Sandra Schroeder designed the cover. John Fuller manages the production of all of our Deitel Developer Series books.

We also appreciate the guidance, wisdom and energy of Tracy Johnson, Executive Editor, Computer Science. Tracy and her team handle all of our academic textbooks. Carole Snyder recruited the book's academic reviewers and managed the review process. Bob Engelhardt manages the production of our academic publications.

We'd like to thank Michael Morgano, a former colleague of ours at Deitel & Associates, Inc., now an Android developer at Imerj™, who co-authored the first editions of this book and our book, *iPhone for Programmers: An App-Driven Approach*. Michael is an extraordinarily talented software developer.

Reviewers of the Content from Android for Programmers: An App-Driven Approach and Android How to Program Recent Editions

We wish to acknowledge the efforts of our first and second edition reviewers. They scrutinized the text and the code and provided countless suggestions for improving the presentation: Paul Beusterien (Principal, Mobile Developer Solutions), Eric J. Bowden, COO (Safe Driving Systems, LLC), Tony Cantrell (Georgia Northwestern Technical College), Ian G. Clifton (Independent Contractor and Android App Developer, Daniel Galpin (Android Advocate and author of *Intro to Android Application Development*), Jim Hathaway (Application Developer, Kellogg Company), Douglas Jones (Senior Software Engineer, Fullpower Technologies), Charles Lasky (Nagautuck Community College), Enrique Lopez-Manas (Lead Android Architect, Sixt, and Computer Science Teacher at the Univer-

sity of Alcalá in Madrid), Sebastian Nykopp (Chief Architect, Reaktor), Michael Pardo (Android Developer, Mobiata), Ronan “Zero” Schwarz (CIO, OpenIntents), Arijit Sen-gupta (Wright State University), Donald Smith (Columbia College), Jesus Ubaldo Quevedo-Torrero (University of Wisconsin, Parkside), Dawn Wick (Southwestern Community College) and Frank Xu (Gannon University).

Well, there you have it! *Android for Programmers: An App-Driven Approach, Second Edition, Volume 1* will quickly get you developing Android apps. We hope you enjoy reading the book as much as we enjoyed writing it!

Paul Deitel
Harvey Deitel
Abbey Deitel

About the Authors

Paul Deitel, CEO and Chief Technical Officer of Deitel & Associates, Inc., is a graduate of MIT, where he studied Information Technology. He holds the Java Certified Programmer and Java Certified Developer certifications, and is an Oracle Java Champion. Through Deitel & Associates, Inc., he has delivered hundreds of programming courses worldwide to clients, including Cisco, IBM, Siemens, Sun Microsystems, Dell, Fidelity, NASA at the Kennedy Space Center, the National Severe Storm Laboratory, White Sands Missile Range, Rogue Wave Software, Boeing, SunGard Higher Education, Nortel Networks, Puma, iRobot, Invensys and many more. He and his co-author, Dr. Harvey M. Deitel, are the world’s best-selling programming-language textbook/professional book/video authors.

Dr. Harvey Deitel, Chairman and Chief Strategy Officer of Deitel & Associates, Inc., has more than 50 years of experience in computing. Dr. Deitel earned B.S. and M.S. degrees in Electrical Engineering from MIT and a Ph.D. in Mathematics from Boston University. In the 1960s, through Advanced Computer Techniques and Computer Usage Corporation, he worked on the teams building various IBM operating systems. In the 1970s, he built commercial software systems. He has extensive college teaching experience, including earning tenure and serving as the Chairman of the Computer Science Department at Boston College before founding Deitel & Associates, Inc., in 1991 with his son, Paul Deitel. The Deitels’ publications have earned international recognition, with translations published in Simplified Chinese, Traditional Chinese, Korean, Japanese, German, Russian, Spanish, French, Polish, Italian, Portuguese, Greek, Urdu and Turkish. Dr. Deitel has delivered hundreds of programming courses to corporate, academic, government and military clients.

Abbey Deitel, President of Deitel & Associates, Inc., is a graduate of Carnegie Mellon University’s Tepper School of Management where she received a B.S. in Industrial Management. Abbey has been managing the business operations of Deitel & Associates, Inc. for 16 years. She has contributed to numerous Deitel & Associates publications and, together with Paul and Harvey, is the co-author of *Android for Programmers: An App-Driven Approach, 2/e*, *iPhone for Programmers: An App-Driven Approach*, *Internet & World Wide Web How to Program, 5/e*, *Visual Basic 2012 How to Program, 6/e* and *Simply Visual Basic 2010, 5/e*.

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Deitel & Associates, Inc., founded by Paul Deitel and Harvey Deitel, is an internationally recognized authoring and corporate training organization, specializing in Android and iOS app development, computer programming languages, object technology and Internet and web software technology. The company's clients include many of the world's largest corporations, government agencies, branches of the military, and academic institutions. The company offers instructor-led training courses delivered at client sites worldwide on major programming languages and platforms, including Android app development, Objective-C and iOS app development, Java™, C++, Visual C++®, C, Visual C#®, Visual Basic®, XML®, Python®, object technology, Internet and web programming and a growing list of additional programming and software development courses.

Through its 37-year publishing partnership with Prentice Hall/Pearson, Deitel & Associates, Inc., publishes leading-edge programming professional books, college textbooks and *LiveLessons* video courses. Deitel & Associates, Inc. and the authors can be reached at:

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