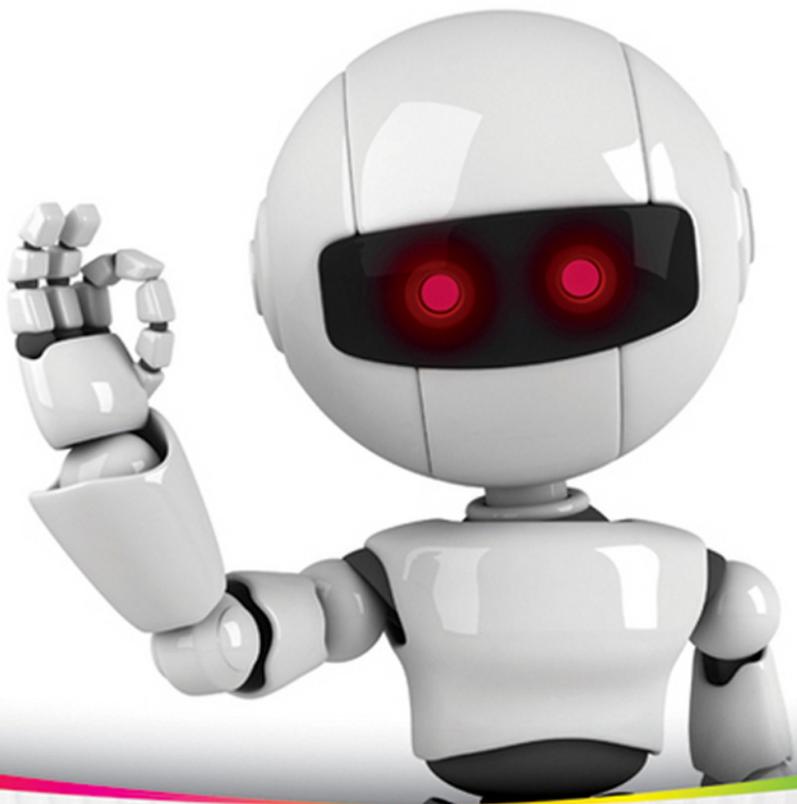


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Beginning  
**Android™ 4**  
Application Development

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Wei-Meng Lee



# BEGINNING ANDROID™ 4 APPLICATION DEVELOPMENT

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**BEGINNING**

# **Android™ 4 Application Development**



BEGINNING

# Android™ 4 Application Development

Wei-Meng Lee



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# Beginning Android™ 4 Application Development

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*To my family:*

*Thanks for the understanding and support  
while I worked on getting this book ready.*

*I love you all!*



## ABOUT THE AUTHOR

**WEI-MENG LEE** is a technologist and founder of Developer Learning Solutions ([www.learn2develop.net](http://www.learn2develop.net)), a technology company specializing in hands-on training on the latest mobile technologies. Wei-Meng has many years of training experience and his training courses place special emphasis on the learning-by-doing approach. This hands-on approach to learning programming makes understanding the subject much easier than reading books, tutorials, and other documentation.

Wei-Meng is also the author of *Beginning iOS 5 Application Development* (Wrox, 2010) and *Beginning Android Application Development* (Wrox, 2011). Contact Wei-Meng at [weimenglee@learn2develop.net](mailto:weimenglee@learn2develop.net).

## ABOUT THE TECHNICAL EDITOR

**CHAIM KRAUSE** is a Simulation Specialist at the US Army's Command and General Staff College where he develops various software products on a multitude of platforms, from iOS and Android devices to Windows desktops and Linux servers, among other duties. Python is his preferred language, but he is multilingual and also codes in Java and JavaScript/HTML5/CSS, and others. He was fortunate to begin his professional career in the software field at Borland where he was a Senior Developer Support Engineer for Delphi. Outside of computer geek stuff, Chaim enjoys techno and dubstep music and scootering with his two sled dogs, Dasher and Minnie.



# CREDITS

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**WRITING THIS BOOK HAS** been a roller-coaster ride. Working with just-released software is always a huge challenge. When I first started working on this book, the Android 4 SDK had just been released; and wading through the documentation was like finding a needle in a haystack. To add to the challenge, the Android emulator for the tablet is extremely slow and unstable, making the development process very laborious.

Now that the book is done, I hope your journey will not be as eventful as mine. Like any good guide, my duty is to make your foray into Android tablet development an enjoyable and fruitful experience. The book you are now holding is the result of the collaborative efforts of many people, and I wish to take this opportunity to acknowledge them here.

First, my personal gratitude to Bob Elliott, executive editor at Wrox. Bob is always ready to lend a listening ear and to offer help when it's needed. It is a great pleasure to work with Bob, as he is one of the most responsive persons I have ever worked with! Thank you, Bob, for the help and guidance!

Of course, I cannot forget Ami Sullivan, my editor (and friend!), who is always a pleasure to work with. After working together on four books, we now know each other so well that we know the content of incoming e-mail messages even before we open them! Thank you, Ami!

Nor can I forget the heroes behind the scenes: copyeditor Luann Rouff and technical editor Chaim Krause. They have been eagle-eye editing the book, making sure that every sentence makes sense — both grammatically and technically. Thanks, Luann and Chaim!

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# INTRODUCTION

**I FIRST STARTED PLAYING WITH THE ANDROID SDK** before it was officially released as version 1.0. Back then, the tools were unpolished, the APIs in the SDK were unstable, and the documentation was sparse. Fast-forward three and a half years, Android is now a formidable mobile operating system, with a following no less impressive than the iPhone. Having gone through all the growing pains of Android, I think now is the best time to start learning about Android programming — the APIs have stabilized, and the tools have improved. One challenge remains, however: Getting started is still an elusive goal for many. What's more, Google has recently released their latest version of the Android SDK — 4.0, a unified mobile OS for both smartphones and tablets. The Android 4.0 SDK includes several new features for tablet developers, and understanding all these new features requires some effort on the part of beginners.

It was with this challenge in mind that I was motivated to write this book, one that could benefit beginning Android programmers and enable them to write progressively more sophisticated applications.

As a book written to help jump-start beginning Android developers, it covers the necessary topics in a linear manner so that you can build on your knowledge without being overwhelmed by the details. I adopt the philosophy that the best way to learn is by doing — hence, the numerous Try It Out sections in each chapter, which first show you how to build something and then explain how everything works. I have also taken this opportunity to further improve the previous edition of this book, addressing feedback from readers and adding additional topics that are important to beginning Android developers.

Although Android programming is a huge topic, my aim for this book is threefold: to get you started with the fundamentals, to help you understand the underlying architecture of the SDK, and to appreciate why things are done in certain ways. It is beyond the scope of any book to cover everything under the sun related to Android programming, but I am confident that after reading this book (and doing the exercises), you will be well equipped to tackle your next Android programming challenge.

## WHO THIS BOOK IS FOR

This book is targeted for the beginning Android developer who wants to start developing applications using Google's Android SDK. To truly benefit from this book, you should have some background in programming and at least be familiar with object-oriented programming concepts. If you are totally new to Java — the language used for Android development — you might want to take a programming course in Java programming first, or grab one of many good books on Java programming. In my experience, if you already know C# or VB.NET, learning Java is not too much of an effort; you should be comfortable just following along with the Try It Outs.

For those totally new to programming, I know the lure of developing mobile apps and making some money is tempting. However, before attempting to try out the examples in this book, I think a better starting point would be to learn the basics of programming first.



**NOTE** *All the examples discussed in this book were written and tested using version 4.0 of the Android SDK. While every effort is made to ensure that all the tools used in this book are the latest, it is always possible that by the time you read this book, a newer version of the tools may be available. If so, some of the instructions and/or screenshots may differ slightly. However, any variations should be manageable.*

## WHAT THIS BOOK COVERS

This book covers the fundamentals of Android programming using the Android SDK. It is divided into 12 chapters and three appendixes.

**Chapter 1: Getting Started with Android Programming** covers the basics of the Android OS and its current state. You will learn about the features of Android devices, as well as some of the popular devices on the market. You will also learn how to download and install all the required tools to develop Android applications and then test them on the Android emulator.

**Chapter 2: Activities, Fragments, and Intents** gets you acquainted with these three fundamental concepts in Android programming. Activities and fragments are the building blocks of an Android application. You will learn how to link activities together to form a complete Android application using intents, one of the unique characteristics of the Android OS.

**Chapter 3: Getting to Know the Android User Interface** covers the various components that make up the UI of an Android application. You will learn about the various layouts you can use to build the UI of your application, and the numerous events that are associated with the UI when users interact with the application.

**Chapter 4: Designing Your User Interface with Views** walks you through the various basic views you can use to build your Android UI. You will learn three main groups of views: basic views, picker views, and list views. You will also learn about the specialized fragments available in Android 3.0 and 4.0.

**Chapter 5: Displaying Pictures and Menus with Views** continues the exploration of views. Here, you will learn how to display images using the various image views, as well as display options and context menus in your application. This chapter ends with some additional cool views that you can use to spice up your application.

**Chapter 6: Data Persistence** shows you how to save, or store, data in your Android application. In addition to learning the various techniques to store user data, you will also learn file manipulation and how to save files onto internal and external storage (SD card). In addition, you will learn how to create and use a SQLite database in your Android application.

**Chapter 7: Content Providers** discusses how data can be shared among different applications on an Android device. You will learn how to use a content provider and then build one yourself.

**Chapter 8: Messaging** explores two of the most interesting topics in mobile programming — sending SMS messages and e-mail. You will learn how to programmatically send and receive SMS and e-mail messages, and how to intercept incoming SMS messages so that the built-in Messaging application will not be able to receive any messages.

**Chapter 9: Location-Based Services** demonstrates how to build a location-based service application using Google Maps. You will also learn how to obtain geographical location data and then display the location on the map.

**Chapter 10: Networking** explores how to connect to web servers to download data. You will see how XML and JSON web services can be consumed in an Android application. This chapter also explains sockets programming, and you will learn how to build a chat client in Android.

**Chapter 11: Developing Android Services** demonstrates how you can write applications using services. Services are background applications that run without a UI. You will learn how to run your services asynchronously on a separate thread, and how your activities can communicate with them.

**Chapter 12: Publishing Android Applications** discusses the various ways you can publish your Android applications when you are ready. You will also learn about the necessary steps to publishing and selling your applications on the Android Market.

**Appendix A: Using Eclipse for Android Development** provides a brief overview of the many features in Eclipse.

**Appendix B: Using the Android Emulator** provides some tips and tricks on using the Android emulator for testing your applications.

**Appendix C: Answers to Exercises** contains the solutions to the end-of-chapter exercises found in every chapter.

## HOW THIS BOOK IS STRUCTURED

This book breaks down the task of learning Android programming into several smaller chunks, enabling you to digest each topic before delving into a more advanced one.

If you are a total beginner to Android programming, start with Chapter 1 first. Once you have familiarized yourself with the basics, head over to the appendixes to read more about Eclipse and the Android emulator. When you are ready, continue with Chapter 2 and gradually move into more advanced topics.

A feature of this book is that all the code samples in each chapter are independent of those discussed in previous chapters. This gives you the flexibility to dive into the topics that interest you and start working on the Try It Out projects.

## WHAT YOU NEED TO USE THIS BOOK

All the examples in this book run on the Android emulator (which is included as part of the Android SDK). However, to get the most out of this book, having a real Android device would be useful (though not absolutely necessary).

## CONVENTIONS

To help you get the most from the text and keep track of what's happening, a number of conventions are used throughout the book.

### TRY IT OUT These Are Exercises or Examples for You to Follow

The Try It Out sections appear once or more per chapter. These are exercises to work through as you follow the related discussion in the text.

1. They consist of a set of numbered steps.
2. Follow the steps with your copy of the project files.

### *How It Works*

After each Try It Out, the code you've typed is explained in detail.

As for other conventions in the text:

- New terms and important words are *highlighted* in italics when first introduced.
- Keyboard combinations are treated like this: Ctrl+R.
- Filenames, URLs, and code within the text are treated like so: `persistence.properties`.
- Code is presented in two different ways:

We use a monospace type with no highlighting for most code examples.

We use **bolding** to emphasize code that is of particular importance in the present context.



**NOTE** Notes, tips, hints, tricks, and asides to the current discussion look like this.

## SOURCE CODE

As you work through the examples in this book, you may choose either to type in all the code manually or to use the source code files that accompany the book. All the source code used in this book is available for download at [www.wrox.com](http://www.wrox.com). When at the site, simply locate the book's title (use the Search box or one of the title lists) and click the Download Code link on the book's detail page to obtain all the source code for the book.

You'll find the filename of the project you need in a CodeNote such as this at the beginning of the Try it Out features:

*code snippet filename*

After you download the code, just decompress it with your favorite compression tool. Alternatively, go to the main Wrox code download page at [www.wrox.com/dynamic/books/download.aspx](http://www.wrox.com/dynamic/books/download.aspx) to see the code available for this book and for all other Wrox books.



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# 1

## Getting Started with Android Programming

### WHAT YOU WILL LEARN IN THIS CHAPTER

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- What is Android?
- Android versions and its feature set
- The Android architecture
- The various Android devices on the market
- The Android Market application store
- How to obtain the tools and SDK for developing Android applications
- How to develop your first Android application

Welcome to the world of Android! When I was writing my first book on Android (which was just less than a year ago), I stated that Android was ranked second in the U.S. smartphone market, second to Research In Motion's (RIM) BlackBerry, and overtaking Apple's iPhone. Shortly after the book went to press, comScore (a global leader in measuring the digital world and the preferred source of digital marketing intelligence) reported that Android has overtaken BlackBerry as the most popular smartphone platform in the U.S.

A few months later, Google released Android 3.0, code named *Honeycomb*. With Android 3.0, Google's focus in the new Software Development Kit was the introduction of several new features

designed for widescreen devices, specifically tablets. If you are writing apps for Android smartphones, Android 3.0 is not really useful, as the new features are not supported on smartphones. At the same time that Android 3.0 was released, Google began working on the next version of Android, which can be used on both smartphones and tablets. In October 2011, Google released Android 4.0, code named *Ice Cream Sandwich*, and that is the focus of this book.

In this chapter you will learn what Android is, and what makes it so compelling to both developers and device manufacturers alike. You will also get started with developing your first Android application, and learn how to obtain all the necessary tools and set them up so that you can test your application on an Android 4.0 emulator. By the end of this chapter, you will be equipped with the basic knowledge you need to explore more sophisticated techniques and tricks for developing your next killer Android application.

## WHAT IS ANDROID?

Android is a mobile operating system that is based on a modified version of Linux. It was originally developed by a startup of the same name, Android, Inc. In 2005, as part of its strategy to enter the mobile space, Google purchased Android and took over its development work (as well as its development team).

Google wanted Android to be open and free; hence, most of the Android code was released under the open source Apache License, which means that anyone who wants to use Android can do so by downloading the full Android source code. Moreover, vendors (typically hardware manufacturers) can add their own proprietary extensions to Android and customize Android to differentiate their products from others. This simple development model makes Android very attractive and has thus piqued the interest of many vendors. This has been especially true for companies affected by the phenomenon of Apple's iPhone, a hugely successful product that revolutionized the smartphone industry. Such companies include Motorola and Sony Ericsson, which for many years have been developing their own mobile operating systems. When the iPhone was launched, many of these manufacturers had to scramble to find new ways of revitalizing their products. These manufacturers see Android as a solution — they will continue to design their own hardware and use Android as the operating system that powers it.

The main advantage of adopting Android is that it offers a unified approach to application development. Developers need only develop for Android, and their applications should be able to run on numerous different devices, as long as the devices are powered using Android. In the world of smartphones, applications are the most important part of the success chain. Device manufacturers therefore see Android as their best hope to challenge the onslaught of the iPhone, which already commands a large base of applications.

## Android Versions

Android has gone through quite a number of updates since its first release. Table 1-1 shows the various versions of Android and their codenames.