

# Expert Android



Satya Komatineni  
Dave MacLean

Apress®

## Expert Android

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*To my 10-year-old son Narayan Komatineni, who teaches me to think fearlessly on a daily basis.*

*To my wife Rosie, for her patience and support, and mostly for keeping me sane.*

*And to my son Mike, who makes me a prouder Dad every day.*



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# About the Authors

**Satya Komatineni** has been programming for more than 20 years in the IT and Web space. He has had the opportunity to work with Assembly, C, C++, Rexx, Java, C#, Lisp, HTML, JavaScript, CSS, SVG, relational databases, object databases, and related technologies. He has published more than 30 articles touching on many of these areas, both in print and online. He has been a frequent speaker at O'Reilly Open Source Conference, speaking on innovations around Java and the Web. Satya has done a considerable amount of original work in creating *Aspire*, a comprehensive open-source Java-based Web framework, and has explored personal Web productivity and collaboration tools through his open-source work for [KnowledgeFolders.com](http://KnowledgeFolders.com). Satya holds a Master's degree in Electrical Engineering from Indian Institute of Technology, New Delhi, and a Bachelor's degree in Electrical Engineering from Andhra University, India. You can find his website at [SatyaKomatineni.com](http://SatyaKomatineni.com). His current research is Mobile, Cloud, and the Web.

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# About the Technical Reviewer



**Rick Boyer** is a Senior Software Engineer with over 20 years of experience ranging from desktop and Web to mobile development. Ever since his first experience with a PDA, he has had a passion for mobile development, which has included Windows CE, Windows Phone, and Android. He was the technical reviewer for two other Android books, and he runs a consulting business, NightSky Development. NightSky Development provides Android consulting services to startup companies. You can contact him at [about.me\RickBoyer](http://about.me/RickBoyer).



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We have also been ably assisted by the various Android forums that have provided answers to our questions as well as valuable advice. And finally, but certainly not least, we extend our thanks to our readers. We greatly appreciate your picking up our books, asking us questions, and keeping us on our toes. We are better for it, and we hope our work can somehow help you achieve your goals.

We especially want to thank the readers of our books, as you give us reason to write and excel. We worked very hard on this *Expert Edition* of Android. We really hope you will learn a lot from it, as we did. If you are not fully satisfied just hang on, as we are committed to gain your laurels by working twice as hard for the next book on Android, which we would like to see in your hands as well.



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# Introduction

As a programmer, designer, or architect, you may be lulled into thinking that the Android API is merely what you use to write mobile programs for the Android mobile platform—which, of course, is true. However, we believe that the Android architecture has an undercurrent that makes it a key pillar in the cloud-based Google computing era that is beckoning all of us! When you learn deeply about the Android API, you are gaining a pass to the future of Google, and perhaps to the future of all of us.

This book, *Expert Android*, is our fifth book on Android in the last four years. In the first four books, published under the Pro Android name, we covered increasingly new material on the core Android API. *Expert Android* is the outcome of our deepest desire and commitment to bring you the essentials for writing compelling and impactful Android applications at a faster pace.

In *Expert Android*, you will find more difficult topics that are not covered anywhere else. You will discover ways that help you extend Android and companion topics that will enhance your Android mobile applications. You also will find information that is applicable for any release of Android.

## Is This Book for You?

As authors, the first question we want to answer is whether this book is for you. Yes, this book is for you if you are transitioning from learning about Android and writing stock applications to writing applications that are impactful. Yes, it's for you if you also want to release those applications to the market quickly.

A key focus of *Expert Android* is to write components that extend Android, especially UI components. This is important, for two reasons. First, you can write reusable components that are specific to your suite of applications or problem space. Second, there are increasingly reusable open-source components that you can borrow along with their source codes. Often, or even only occasionally, you will need to tweak these components to meet your needs. You will then need to understand how the source codes of these custom components work. This book will guide you through the details of these customized components. The first three chapters on customizing views, and the fourth chapter on OpenGL, serve this Android UI customization goal.

There is an advantage in the mobile space if you can release applications quickly into the marketplace, a topic that we address in *Expert Android*. The chapter on JSON shows you a really cool and quick way to use persistence, which is so essential for all mobile applications.

Additionally, many mobile applications are form based. The chapter on advanced form processing makes writing form-based applications really easy. And the three chapters on Parse will further expedite your writing of collaborative mobile applications in record time.

Yes, this book is for you if you want to push the mobile programming practice to the next level, using the best tools and approaches available.

## What You Need to Know Before You Begin

*Expert Android* assumes that you are familiar with Java and Android. The basis for most of Android programming is Java. However, if you know any high-level object-oriented programming language, you should be able to pick up Android programming fairly quickly. Having experience with Eclipse or IntelliJ would be quite helpful. This book further assumes that you know the basics of Android and that you have written a few simple applications. There are a number of books to get you to this stage, including our Pro Android series from APress. In short, we assume you will have worked with Java, Eclipse or IntelliJ, and Android for a year or two. With that said, here's a brief, quick overview of what is in *Expert Android*, chapter by chapter.

## What's in This Book

We start *Expert Android* by documenting in depth how you can customize Android UI by customizing the views, controls, and layouts. You will see over 100 pages of this material spread over the first three chapters.

In Chapter 4, we provide a practical way to persist the application state with JSON. This allows you to write small to medium mobile applications really quickly, as it makes persistence super-simple. Just quickly browse through this chapter if you are skeptical.

In Chapter 5, we address an essential question of how to write a mobile application that works well on multiple mobile form factors.

Continuing the theme of practical guidance for mobile applications, in Chapter 6 we present an advanced form-processing framework to write form-based mobile applications using really simple principles.

A mobile device is a phone too, which we tend to forget. Chapter 7 covers the telephony API of Android.

With the memory and power consumption of mobile devices always at a premium, you want your applications to run as efficiently as possible. In Chapter 8, we cover the debugging approaches and tools available for ensuring this is the case.

OpenGL has a come a long way on Android, now with substantial support for the new generation of programmable GPUs. Android has been supporting ES 2.0 for sometime. In Chapter 9, we have over 100 pages covering OpenGL. With this chapter on OpenGL, we start at the beginning and explain all the concepts without needing to refer to external books, although we do provide an extensive

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bibliography on OpenGL. We cover ES 2.0, and we provide guidance to combine OpenGL and regular views to pave the way for 3D components.

Federated search protocol of Android is powerful, as you can use it in quite a few imaginative ways. The search experience is also shifting and pivoting with each release of Android so as to reach its full potential. Chapters 10, 11, and 12 fully explore the fundamentals of the search protocol and also offer some alternative ways to optimally use this Android facility.

And if our intuitions are correct, mobile applications will increasingly be collaborative, so they will need to store data in the cloud and also collaborate among users. Chapters 13, 14, and 15 present Parse-related material. In short, we have taken a successful cloud platform called Parse, and have engaged it for user management, cloud storage, and push notifications. With Parse now being part of Facebook, this coverage of Parse is a valuable addition to our book, for two reasons: its synergy with Facebook, and how easy it is to take collaborative applications to the marketplace. Mobile in the cloud is the future. We are proud to have taken a good first step toward exploring this potential in *Expert Android*.

## How to Prepare for Expert Android

Although we have used the latest Android release (4.2) to write and test *Expert Android*, the contents of this book are fairly independent of any Android release. Most, if not all, sample programs and code should work even in future releases. Especially, the concepts and approaches presented here should be valid across all Android releases.

To heighten the readability of these chapters, among other improvements we have reduced the typical pages and pages of source code. Instead, the source code for each chapter is available both on [Apress.com](http://Apress.com) and at our supporting site, [androidbook.com](http://androidbook.com). You will be able to download each chapter's source code and load it into Eclipse directly. If you are using IntelliJ or another editor, you can unzip each chapter and build the code by importing the projects manually into your favorite IDE.

Furthermore, we have broken some of the bigger topics into more manageable shorter chapters. For example, we have the discussion of custom views spread out in three chapters. Coverage of [Parse.com](http://Parse.com) is spread across three chapters as well. We've done the same to explain Android Search. Although most chapters are self-contained in terms of their examples, you may occasionally need to refer to the earlier chapters on that topic.

If you are programming using any of the topics that we have covered in any of our books, including *Expert Android*, remember that our websites [androidbook.com](http://androidbook.com) and [satyakomatineni.com](http://satyakomatineni.com) have dedicated knowledge folders for each topic. These knowledge folders document various items in each topic. For example, you will see in this book the Android API links you will need as you develop code in that context. In short, we use these sites often to grab code snippets and also quickly get to the Android API links.

We have written *Expert Android* in such a way that we expect you will read through it like a novel, chapter by chapter, and grasp an idea before implementing it. You can then come back to the book for clarification or additional reference when you start implementing these ideas.

## How to Reach Us

We can be reached readily via our respective e-mail addresses: Satya Komatineni at [satya.komatineni@gmail.com](mailto:satya.komatineni@gmail.com), and Dave MacLean at [davemac327@gmail.com](mailto:davemac327@gmail.com). Also, keep this URL in your bookmarks: <http://androidbook.com/expertandroid>. Here you will find links to source code, links to downloadable projects, key feedback from readers, full contact information, future notifications, errata, news on our future projects, a reading guide, additional resources—even some future alpha chapters and perhaps more.