



Series 40 可扩展应用程序开发

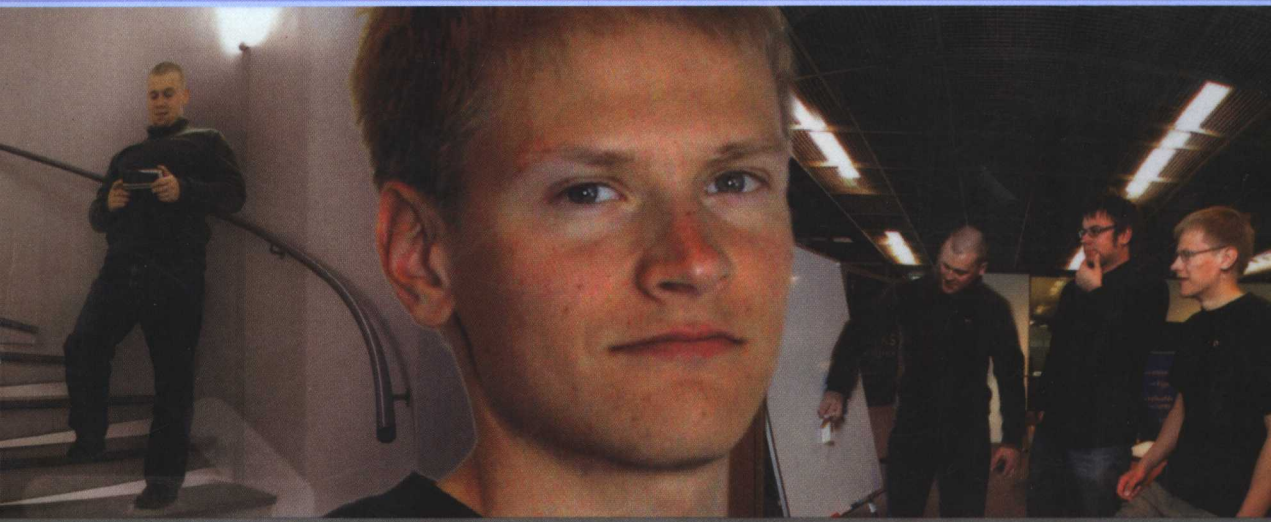
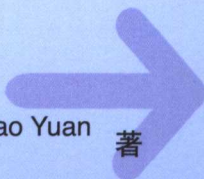
Developing Scalable Series 40 Applications
A Guide for Java Developers

(英文版)



(美) Michael Juntao Yuan
Kevin Sharp

著



机械工业出版社
China Machine Press

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Foreword for Reprint Edition

If there is a paradise on earth for mobile phone application developers, that place would be in China. With more than 400 million mobile phone users (growing to 600 million by 2009), China is posed to be the world's largest market for mobile applications and services. Chinese mobile phone users are also technically savvy. They are eager to try out cutting-edge devices and services beyond simple voice calls. That provides a fertile ground for new mobile applications. When I visited China, everyone seems to have a fancy mobile handset, and people are using mobile applications (e.g., games, messaging, taking pictures) everywhere—in the office, in the park, on the bus... A successful mobile application in China can make a ton of money for its investors and developers.

Nokia has a big presence in China. With more than 30% of the market share, all mass market mobile applications must run well on Nokia devices. The Nokia Series 40 devices, with more than 70 phone models on the market today, are by far the most popular mobile phones for the affluent urban Chinese. The most popular Series 40 phones include the 6265, 6230, and 7210. Tens of millions of those phones are in active use in China. The sheer volume of those devices make them a critical platform for any mobile application developer. Nokia Series 40 phones feature crispy color screens, cameras, media players (music, photo, and video). They can connect to the Internet via 2.5G / 3G mobile data networks, including both GSM and CDMA networks. More importantly, all Nokia Series 40 phones have an open programming interface based on Java ME (previously known as J2ME). It allows Java developers to write application that runs directly on the phone and leverages data services on the Internet.

A big advantage Java ME applications have over WAP browser-based applications is the rich user experience. Java ME applications can render fancy UI effects (e.g., animations, transparent widgets, full screen display, audio / video, etc) and respond to custom keypad shortcuts. The Java ME UI is multi-threaded and hence does not freeze the phone when the application executes a long running task (e.g., to retrieve some data from the Internet). In addition, Java ME applications have access to special phone features such as the camera, the media players, the messaging system, and the

Bluetooth radio. A good example of such rich mobile applications is Google Local Mobile — it allows mobile users to view any street map in the USA; you can zoom in, zoom out and pan the maps via an intuitive UI; you can also search for local businesses and overlay driving directions on the map. While Google Local Mobile is not yet available in China, it represents the type of mobile application that would really shine on mass market mobile phones such as the Nokia Series 40.

This book teaches you how to write production-ready Java ME applications for Nokia devices. While the title of this book is “Developing Scalable Series 40 Applications”, it actually covers both the Nokia Series 40 phones and the very popular Nokia Series 60 smartphones, since the Java ME APIs on those two series are similar. In fact, since Java ME is a standard-based technology, much of the information in the book applies to all Java ME developers, and most sample applications in the book runs on non-Nokia handsets just fine.

The book is fully reviewed and approved by Nokia. We cover all important Java ME APIs available on Nokia Series 40 and Series 60 devices, including MIDP 2.0, the Wireless Messaging API, the Mobile Media API, the Bluetooth API, and much more. Issues and quirks that are specific to Nokia’s Java ME implementation are explained and discussed. Some of those issues arise due to vague language in the Java ME specification, and others are simply due to the hardware limitations on various Nokia devices. Besides the standard APIs, this book also covers extension APIs available on Nokia devices. Those “Nokia insider” information makes this book a must-read for any serious Nokia mobile application developer.

Throughout the book, we provide more than 10 sample applications. You can build those applications, run them, and then simply add / change features to make your own applications. Using those sample applications, we discuss real world coding tips, design patterns and best practices for Java ME developers.

Now, it is your turn to come up with the best mobile application ideas. Hopefully, this book will help you bring those ideas to market. Let the smartest mobile application developers rule!

Michael Juntao Yuan

Foreword

It started as a wild idea, emerged as a standard, and grew into a phenomenon. Applications that go with you, whenever and wherever you are, and the infrastructure that lets you find them, buy them, and use them. With hundreds of millions of mobile Java-capable devices out there, the potential for developers is really amazing, and because the market is still young, there is still lots of room for innovative applications. There is still plenty of opportunity to get in on the "ground floor" of this industry and then ride the wave...to the top.

Ever since we first developed the DoCoMo Java architecture that started it all, people have been asking me "What is the killer application for mobile Java?" My answer has stayed pretty much the same... it is the application *right now* that solves a need that a user has *right now*! So what do users want? What will they pay for? How do you learn how to build it? And who do you partner with? The answers are here in this book, in readable, practical form.

So what will you build? To date we have seen a tremendous growth in the availability of high-quality, entertainment-focused applications for the mobile marketplace. These applications have been very successful in delivering a good experience to the user even though they have not tried to create an online- or community-based entertainment experience. Using MIDP 2.0, the next generation of applications can take advantage of the capability of the newer mobile devices to connect to other local devices and the wider service network. This will enhance existing types of entertainment applications and facilitate the creation of new communication and community applications that are interesting for both the consumer and the business user.

Who do you partner with? Nokia developer platforms offer the highest volume opportunity for mobile developers, with an installed base measured in the hundreds of millions. Series 40 Developer Platform offers the highest volume opportunity in the family, and offers a robust technical platform, including secure communications, mobile media, messaging, graphics, and Bluetooth (MIDP 2.0, JSR 120, JSR 135, JSR 82).

How do you build it? *Developing Scalable Series 40 Applications* is an end-to-end solutions guide for Java programmers focusing on Nokia's Series 40

Developer Platform. It brings together two of the largest segments of the mobile marketplace—Nokia Series 40 handsets and the worldwide mobile Java developer community—and provides thorough and specific information on how to create scalable mobile applications. These applications will work on the newest Series 40 handsets (based on MIDP 2.0), serve the large installed base of MIDP 1.0 handsets, and scale up to serve owners of smartphones based on Series 60 Developer Platform, enterprise communicators based on Series 80 Developer Platform, and rich media devices based on Series 90 Developer Platform.

Developing Scalable Series 40 Applications details the technical underpinnings of the Series 40 Developer Platform. It includes not only the available APIs but also coding best practices, architectural considerations, and fully tested sample applications ready for download. This book includes plenty of specific tips; for example, pointing out the choices Nokia made when implementing optional APIs.

This book goes beyond presentation of methods and classes. Mobile devices serve a variety of highly specialized customer segments, and some differentiation among devices is necessary to create the high-volume opportunity developers can now tap. Additional differentiation occurs as new devices add features on top of existing feature sets. To serve the mobile mass market at a profit, the right technical approach is critical to avoid fragmenting an application's code base. This book addresses development approaches that allow applications to scale across devices and time. The authors devote a full chapter to code management, sharing tips on how to optimize the mobile experience for a variety of users without fragmenting the code base.

The authors and Nokia are uniquely positioned to guide developers through the process of profitable end-to-end Java application development. Nokia has offerings at all levels: clients (Series 40 through Series 60, 80 and 90); servers (SMSC, MMSC, Nokia Mobile Services SDK); and technology leadership, including the specification leadership of a number of JSRs involving communication, UI, mobile management, and architecture. Author Michael Juntao Yuan is a developer and software architect for open-source mobile software. Kevin Sharp is a consultant and professional engineer specializing in mobile logistics and supply chain infrastructure. Both authors are frequent contributors to Forum Nokia and have had extensive access to and support from Nokia software designers, technical architects, tools developers, and technical support teams throughout the company.

Developing Scalable Series 40 Applications steps the Java developer through the process of end-to-end application development for today's highest volume mobile platform. It includes lots of code and examples, plus 11 end-to-end projects including client-side source code, server code, and tips on how to scale the client side to encompass other device families including Series 60 Developer Platform. Every code sample has been tested and is available for download. Developers can just load a sample and get started on projects of their own.

I have had the good fortune to be involved with mobile Java from the very beginning and I know what it takes to be successful in this marketplace. I believe that this book can really help you be successful with mobile Java application design and development. If you take the information in this book and sprinkle it with some imaginative application ideas, I think you will have a winning combination. I have seen from the inside how committed Nokia is to make a successful developer community, and I think that passion shows in this book and the other resources available from Forum Nokia.

Go fast... Go mobile.

Jon Bostrom, Sr. Director,
CTO Java Technology Platforms,
Nokia

Preface

Developing Scalable Series 40 Applications covers key technologies that you will need to develop smart applications and deliver content to more than 100 million Nokia Series 40 devices. A key focus of this book is the Java 2 Micro Edition (J2ME) Mobile Information Device Profile (MIDP) technology on Nokia devices. Compared with other J2ME/MIDP books, this book distinguishes itself in several important aspects.

- **It covers Nokia specific details:** Although MIDP and related optional packages are standard technology, the specifications are deliberately vague in many places to accommodate the different requirements and user interface (UI) conventions of different device manufacturers. The challenge for mobile developers is to figure out the exact Java runtime behavior on each target device and optimize the applications accordingly. In this book, we cover the Nokia implementation of the MIDP runtime in detail. We also cover the subtle differences between the Nokia Series 40 and Series 60 Java environments.
- **It teaches advanced programming techniques:** Learning the J2ME specification and APIs is only the first step toward writing compelling mobile applications. In this book, we show how to use the application program interfaces (APIs) and tools in non-obvious ways to complete advanced tasks, such as animation, canvas scrolling, cross-platform builds, visual background threads, Java object serialization, network security, backend service integration, and much more. We also cover techniques to take advantage of specific Nokia features in the Series 40 device Java environment.
- **It has many real-world examples:** Instead of using simple applications or code snippets to show isolated API usage, whenever possible we use fully functional applications to illustrate how different components of the application work together. In Chapter 3, we use a photo viewer application to get you started and then refactor the application in subsequent chapters to add additional functionality. For action game developers, the sample application in Chapter 5 could serve as a blueprint for your own games. In Chapters 11 through 13, we use a complete end-to-end application to discuss advanced topics such as design patterns and project management.
- **It focuses on scalable applications for Nokia Series 40 devices and beyond:** A key challenge in mobile application development is to achieve the balance point between portability and deep device-specific optimization. In this book, we use a complete example to discuss various design patterns and organizational techniques to simultaneously improve application performance and scalability.

Of course, the Nokia Developer Platform is more than just J2ME/MIDP. In this book, we also discuss how to develop Multimedia Messaging Service (MMS) and Wireless Application Protocol (WAP) based thin-client applications for Nokia devices. We cover the entire end-to-end solution from application servers (for instance, HTTP-based content servers), network services servers (such as MMSC and WAP Gateway) to Nokia Series 40 device clients (such as MMS viewers and WML/XHTML browsers). This is the first book available to cover MMS application development using Nokia tools.

Who This Book Is For

This book is designed to be useful to mobile Java developers at all levels.

- For junior developers, this book offers a gentle introduction to Nokia's J2ME/MIDP, MMS and WAP technologies using examples. We offer practical suggestions and techniques to get you up-to-speed quickly.

- For senior developers, the coverage of Nokia-specific optimization techniques, end-to-end design patterns, scalability best practices, and test/debug techniques should prove useful when implementing complex applications for Nokia Series 40, Series 60, and other target devices.
- For system architects, the detailed comparison of technologies supported on the Nokia Developer Platform will help you to design solutions that take advantage of all mobile delivery channels. The design patterns and best practices are crucial for designing scalable mobile solutions from the bottom up.

What You Will Need

The Forum Nokia's Tools section provides the device-related tools used in this book. You can download the following suite of tools free of charge from <http://www.forum.nokia.com/main/0,6566,033,00.html>:

- The Nokia Developer's Suite for J2ME
- The Nokia Series 40 Developer Platform SDK and any other SDKs for your target devices
- The Nokia Connectivity Framework
- The Nokia Developer Suite for MMS
- The Nokia Mobile Internet Toolkit
- The Nokia Mobile Server Services SDK

A number of freely available third-party tools are also used in this book to provide build management support and server side application support. These tools and their corresponding URLs are

- The Apache Ant project provides the key tools for cross-platform and multiple target built management: <http://ant.apache.org/>
- The Antenna project extends Ant to support J2ME: <http://antenna.sourceforge.net/>
- The Sun J2ME Wireless Toolkit is required by Antenna: <http://java.sun.com/products/j2mewtoolkit/>
- The Apache Tomcat project provides a servlet engine to run our server side applications: <http://jakarta.apache.org/tomcat/>
- The MIDPLogger utility supports on-device logging for debugging: <http://www.mobilelandscape.uklinux.net/j2medownload/MIDPLogger.php>
- The J2MEUnit is a J2ME-based unit testing framework: <http://j2meunit.sourceforge.net/>
- The Google developer program provides a free Java library and authorization code to access Google's Web service interface: <http://www.google.com/apis/>

How This Book Is Organized

Developing Scalable Series 40 Applications is organized into 15 chapters.

Chapter 1, "Mobility Explained," discusses the challenges and opportunities in mobile commerce. It also contains a section on the technical challenges developers face when migrating from desktop applications to devices.

Chapter 2, "Introducing Nokia Developer Platforms," is a comprehensive introduction of the Nokia Developer Platforms, specifically the Series 40 Developer Platform. Here the important technologies are covered and compared against each other.

Chapter 3, "Getting Started," introduces the basic concepts of MIDlet using a photo viewer application. By going through the process of building and deploying the application, you will also learn key development tools and Over-The-Air Provisioning options.

Chapter 4, "MIDP User Interface," discusses the MIDP UI. It covers not only the API but also advanced techniques. Screenshots from both Series 40 and Series 60 devices are provided to contrast the UI presentation differences on the two device platforms.

Chapter 5, "Developing Action Games," covers the MIDP 2.0 Game API package. Using a real-world example, it covers special techniques for animation and game engine design.

Chapter 6, "Handling Application Data," includes a discussion of Java object serialization and de-serialization. The byte array representation of Java objects can then be stored in the on-device Record Management System (RMS) for future use.

Chapter 7, "Data Connectivity," focuses on network applications. It discusses visual background threads for lengthy network applications as well as advanced network topics such as session tracking and security.

Chapter 8, "Wireless Messaging," covers the Wireless Messaging API (WMA), which allows J2ME applications to send SMS messages to each other. We also discuss the forthcoming WMA 2.0, which supports MMS messaging.

Chapter 9, "Multimedia," introduces the Mobile Media API (MMAPI). It covers the capabilities of MMAPI on Series 40 and Series 60 devices. Three example applications, including a networked mobile web log application, are provided.

Chapter 10, "The Bluetooth API," discusses the Bluetooth API, which enables short-range device communication.

Chapter 11, "End-to-End Design Patterns," uses a complete end-to-end application to show how various design patterns improve the performance and code maintainability of mobile Java applications.

Chapter 12, "Developing Scalable Applications," provides a set of systematic approaches to use the Antenna tool to build scalable applications for multiple device targets without sacrificing quality.

Chapter 13, "Debugging and Testing," discusses on-device debugging and unit testing. The UI testing guidelines for mobile applications are provided.

Chapter 14, "Multimedia Messaging Service," introduces the MMS technologies and applications with coverage of business opportunities, key enabling technologies, and development tools.

Chapter 15, "Browser Applications," discusses how to develop WAP applications using WML/XHTML as well as the special features in WAP gateways.

Acknowledgments

The inspiration, knowledge, and sheer work required to produce a book such as this is *more than any two mortals can muster*. Our perspectives, which we provide throughout this book, have been guided and shaped by our many professional and academic mentors. Our experience is richer for the clients we have had the privilege to serve. And the hours that we have devoted to working on this project were only made available to us through the understanding of family and friends.

The management guidance for this project that occurs behind the scenes has been outstanding. Colleen Romero of Nokia and Patrick Ames of BookVirtual can be credited with conceiving the Nokia Mobile Developer Series. The numerous aspects of the authoring and publishing process were managed by Bonnie Trei at Zen Consulting, and Mary Franz and Jim Markham of Addison-Wesley. These mentors kept the project on track with both a sense of humor and a vision of which roadblocks we needed to push through and which obstacles were best avoided.

We would also like to thank the following individuals for their work, including Greg Costikyan of Nokia and independent game developer Tom Park for their significant contributions to Chapter 5. Dr. Sam Taylor of Nokia provided great insights for Chapters 4 and 5. Juergen Fey of Xerpent made significant contributions to Chapter 10. Additionally, John Papageorge of Media Overdrive provided the initial designs and some of the art used in the trivia game featured in Chapters 11, 12, and 13.

Throughout the book we have attempted to provide useful code. We could not have done this without the assistance of Juergen Fey of Xerpent. Every line of code you see, Juergen tested—sometimes multiple times.

The code and the technical material throughout the book are better because of the extraordinary access we were given to collaborate with Nokia experts. Each chapter and code snippet was reviewed by the best and brightest individuals at Nokia. In many cases the architects responsible for the features and capabilities we have described were able to review our work. These people provided valuable insight—sometimes in the middle of their own deadline pressures. The reviewers include:

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And finally, we are sure that there are other individuals to whom we owe a debt of gratitude. Please know the omission of your name does not diminish the contribution you have made.

Michael Juntao Yuan & Kevin Sharp
December 2004

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