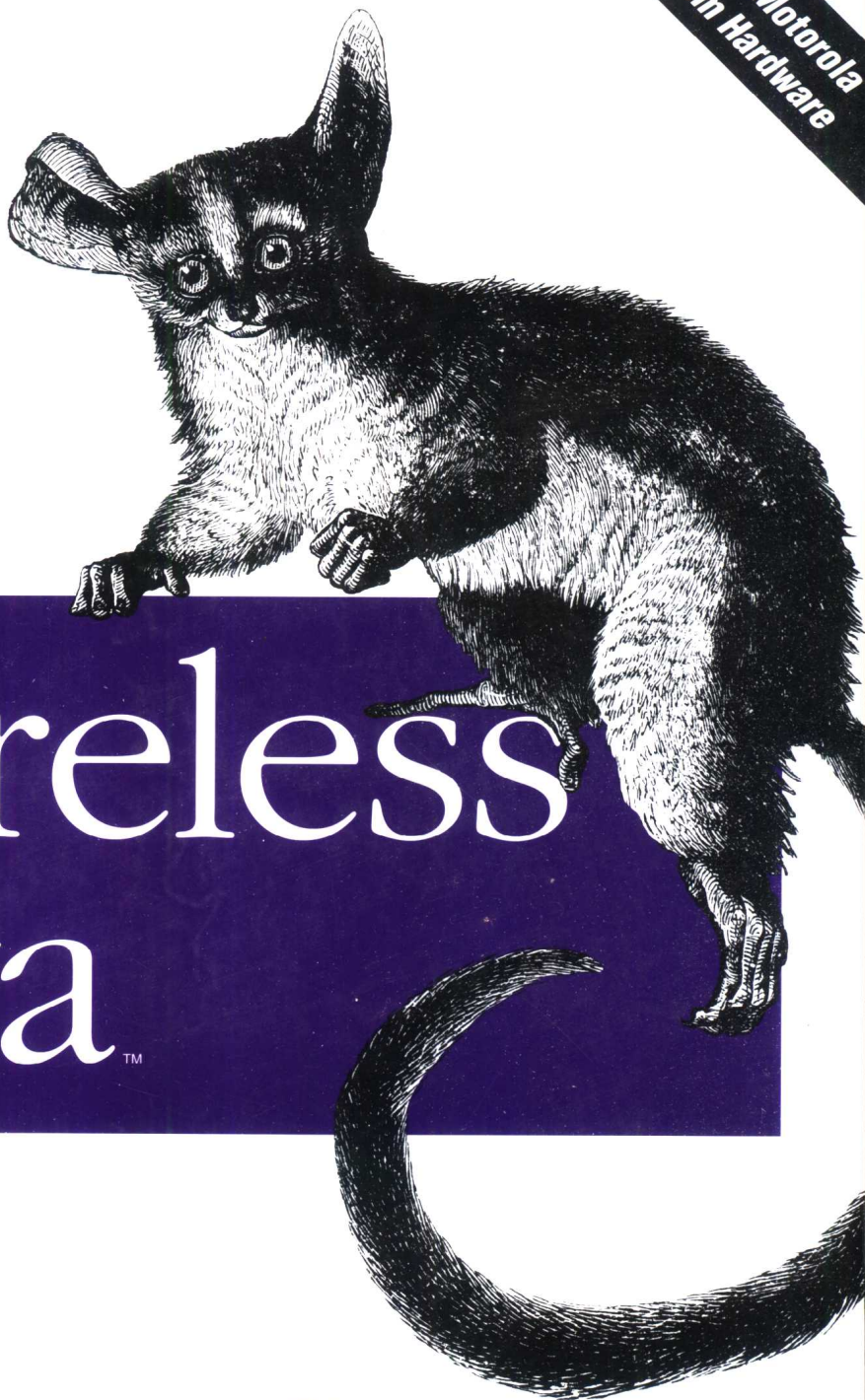


无线Java™入门(影印版)

Covers Motorola
& Palm Hardware



Learning

Wireless Java™

O'REILLY®



Qusay H. Mahmoud 著

清华大学出版社

无线Java™ 入门(影印版)

Learning Wireless Java™



O'REILLY®

Beijing • Cambridge • Farnham • Köln • Paris • Sebastopol • Taipei • Tokyo

O'Reilly & Associates, Inc. 授权清华大学出版社出版

清华大学出版社

图书在版编目 (CIP) 数据

无线 Java™ 入门: / (美) 马哈默德 (Mahmoud, H. Q.) 著 — 影印版. — 北京: 清华大学出版社, 2002.11

书名原文: Learning Wireless Java

ISBN 7-302-05953-5

I . 无 ... II . 马 ... III . 移动通信 - Java 语言 - 程序设计 - 英文 IV . TN929.5
中国版本图书馆 CIP 数据核字 (2002) 第 077173 号

北京市版权局著作权合同登记

图字: 01-2002-4632 号

©2002 by O'Reilly & Associates, Inc.

Reprint of the English Edition, jointly published by O'Reilly & Associates, Inc. and TsingHua University Press, 2002. Authorized reprint of the original English edition, 2002 O'Reilly & Associates, Inc., the owner of all rights to publish and sell the same.

All rights reserved including the rights of reproduction in whole or in part in any form.

英文原版由 O'Reilly & Associates, Inc. 出版 2002。

英文影印版由清华大学出版社出版 2002。此影印版的出版和销售得到出版权和销售权的所有者——O'Reilly & Associates, Inc. 的许可。

版权所有, 未得书面许可, 本书的任何部分和全部不得以任何形式重制。

本书封面贴有清华大学出版社激光防伪标签, 无标签者不得销售。

书 名 / 无线 Java™ 入门 (影印版)

书 号 / ISBN 7-302-05953-5/TP · 3542

责任编辑 / 冯志强

封面设计 / Ellie Volckhausen, 张健

出版发行 / 清华大学出版社 (www.tup.tsinghua.edu.cn)

地 址 / 北京清华大学学研大厦 (邮政编码 100084)

经 销 / 各地新华书店

印 刷 / 北京艺辉印刷有限公司

开 本 / 787 毫米 × 980 毫米 16 开本 16.5 印张

版 次 / 2002 年 11 月第一版 2002 年 11 月第一次印刷

印 数 / 0001-1500 册

定 价 / 99.00 元 (册)

Related titles from O'Reilly

Database Programming with
JDBC™ and Java™

Developing Java Beans™

Enterprise JavaBeans™

Java™ 2D Graphics

Java™ & XML

Java™ and XSLT

Java™ Cookbook

Java™ Cryptography

Java™ Distributed Computing

Java™ Enterprise in a Nutshell

Java™ Examples in a Nutshell

Java™ Foundation Classes in a Nutshell

Java™ I/O

Java™ in a Nutshell

Java™ Internationalization

Java™ Message Service

Java™ Network Programming

Java™ Performance Tuning

Java™ Programming with Oracle SQLJ

Java™ Security

JavaServer™ Pages

JavaServer™ Pages Pocket Reference

Java™ Servlet Programming

Java™ Swing

Java™ Threads

Learning Java™

Java™ RMI

Also available

The Java™ Enterprise CD Bookshelf

O'Reilly & Associates 公司介绍

O'Reilly & Associates 公司是世界上在 UNIX、X、Internet 和其他开放系统图书领域具有领导地位的出版公司，同时是联机出版的先锋。

从最畅销的*The Whole Internet User's Guide & Catalog*(被纽约公共图书馆评为20世纪最重要的50本书之一)到GNN(最早的Internet门户和商业网站),再到WebSite(第一个桌面PC的Web服务器软件), O'Reilly & Associates 一直处于Internet发展的最前沿。

许多书店的反馈表明, O'Reilly & Associates 是最稳定的计算机图书出版商——每一本书都一版再版。与大多数计算机图书出版商相比, O'Reilly & Associates 公司具有深厚的计算机专业背景,这使得O'Reilly & Associates 形成了一个非常不同于其他出版商的出版方针。O'Reilly & Associates 所有的编辑人员以前都是程序员,或者是顶尖级的技术专家。O'Reilly & Associates 还有许多固定的作者群体——他们本身是相关领域的技术专家、咨询专家,而现在编写著作, O'Reilly & Associates 依靠他们及时地推出图书。因为O'Reilly & Associates 紧密地与计算机业界联系着,所以O'Reilly & Associates 知道市场上真正需要什么图书。

出版说明

计算机网络与通信技术的成熟和广泛应用,以及 Internet 与 Web 的迅速发展,为人类的工业生产、商业活动和日常生活都带来了巨大的影响。网络与通信技术在我国的很多领域也已经广泛应用,并且取得了巨大的效益。然而,该领域的技术创新的速度之快也是有目共睹的。为了帮助国内技术人员和网络管理人员在第一时间掌握国外最新的技术,清华大学出版社引进了美国 O'Reilly & Associates 公司的一批在计算机网络理论和应用方面代表前沿技术领域的著作,以飨读者。本套丛书采用影印版的形式,力求与国外图书“同步”出版,“原汁原味”地展现给读者各种权威技术理论和技术术语,适合于相关行业的高级技术人员、科研机构研究人员和高校教师阅读。

首批图书包括以下几种:

- 《Web 安全与电子商务》
- 《无线 Java 入门》
- 《Web 缓存》
- 《BEEP 权威指南》
- 《802.11 无线网络权威指南》
- 《大规模局域网设计》
- 《IP 路由》
- 《DNS 与 BIND》

Preface

Most Internet technologies are designed for desktop computers or enterprise servers running on reliable networks with relatively high bandwidth. Handheld wireless devices, on the other hand, have a more constrained computing environment. They tend to have less memory, less powerful CPUs, different input devices, and smaller displays.

Since the mid-1990s, various architectures and protocols have been introduced to deal with these constraints. The Wireless Application Protocol (or WAP), which is a specification developed by the WAP Forum (<http://www.wapforum.org>), takes advantage of several data-handling approaches already in use. Developing wireless applications using WAP technologies is similar to developing Web pages with a markup language (e.g., HTML or XML) because WAP technologies are browser-based.

Another approach to developing wireless applications is to use the Java 2 Platform, Micro Edition (J2ME™). The Java™ programming language already plays an important role in modern programming. With WAP, you can use Java servlets and JavaServer Pages™ to generate Wireless Markup Language (WML) pages dynamically. However, with J2ME, you can now write applications in Java and store them directly on a cell phone. This adds a whole new dimension to wireless programming.

Audience

This book is about programming with J2ME on wireless devices. If you're already familiar with the architecture, you probably noticed that the Connected Limited Device Configuration (CLDC) and the Mobile Information Device Profile (MIDP) classes are not large. Therefore, this book is correspondingly compact in size. The book acts as a quick guide for programmers who are familiar with the Java 2 Standard Edition (J2SE™) and want to get up to speed quickly with the J2ME. We assume that you are familiar with Java programming and have worked with the J2SE

classes. In addition, we assume that you are familiar with setting up Java to work under various environments (Windows or Unix platforms), as well as compiling and running Java applications.

The book also serves as a quick reference for Java programmers who are interested in developing wireless software applications. The examples presented throughout the book are a good starting point for working with all the MIDP features, including user interface, networking, and databases. However, we should point out that this book is *not* a rehash of the entire J2SE class library. Several of the classes of `java.io`, `java.lang`, and `java.net` are included in the CLDC and MIDP libraries, but are less bulky than their J2SE counterparts. We assume that you already know how to use these classes, although we have included them in the API reference for completeness.

Contents of This Book

This book is divided into three parts. Part I, *Introducing Java 2 Platform, Micro Edition (J2ME)*, gives an overview of the J2ME and includes information about its architectural components: namely, configurations and profiles. Part I also presents detailed coverage of the CLDC and the MIDP.

Chapter 1, *Overview of J2ME*

This chapter introduces the J2ME environment and also explains configurations and profiles. In addition, it shows you how to set up the J2ME Wireless Toolkit to compile, preverify, and run a simple MIDlet using the command line with the Wireless Toolkit emulator.

Chapter 2, *The Connected Limited Device Configuration (CLDC)*

This chapter discusses the CLDC, including its requirements, limitations, and the differences between its classes and the classes of the J2SE. In addition, it looks briefly at the standalone CLDC and KVM distribution.

Chapter 3, *The Mobile Information Device Profile (MIDP)*

This chapter introduces the requirements, limitations, and classes of the MIDP, as well as introducing MIDlets and their associated Java Application Descriptor (JAD) files.

Part II, *Programming with the CLDC and the MIDP*, contains programming details of the MIDP. It shows you how to program the phone interface, handle events, make network connections, and work with databases.

Chapter 4, *Working with MIDlets*

This chapter picks up where Chapter 3 left off, explaining the MIDlet lifecycle methods, the Java application manager, and showing how to use the KToolbar application inside the J2ME Wireless Toolkit to simplify MIDlet development. We also discuss how to deploy MIDlets and include step-by-step instructions on how to download a MIDlet into a Motorola i85s or i50x J2ME-enabled phone.

Chapter 5, *MIDP GUI Programming*

This chapter introduces the MIDP GUI model and its associated classes. In addition, it gives detailed coverage of both the high-level and low-level MIDP GUI APIs.

Chapter 6, *MIDP Events*

This chapter continues the discussion of the MIDP GUI APIs by describing how various events take place surrounding the graphical components and commands. In addition, we cover the `CommandListener` and `ItemStateListener` interfaces, as well as low-level event handling.

Chapter 7, *Networking*

This chapter discusses the Generic Connection Framework provided by the CLDC and shows how to implement an HTTP connection across the Internet, using a MIDlet. The chapter also includes examples of how to send data to CGI scripts and Java servlets across a network. Finally, the chapter briefly discusses wireless session tracking and security for MIDlet data traveling across the airwaves.

Chapter 8, *Database Programming*

This chapter introduces the concept of data stores, which are simple databases that MIDP applications can use to store persistent data beyond the lifetime of the MIDlet that created them. In addition, the chapter includes a MIDlet that can be used to download stock information from a remote web site.

Chapter 9, *The MIDP for Palm OS*

This chapter gives a quick introduction to the MIDP implementation on the Palm Connected Organizers, including step-by-step instructions on how to deploy MIDlets to a PalmPilot.

Part III, *API Quick Reference*, contains several chapters that are quick references for the J2ME CLDC and MIDP APIs. There is also an appendix that contains bibliographic information and URLs to J2ME specifications, white papers, wireless software development kits, and other information that is important to developers.

Conventions Used in This Book

This book uses the following typographical conventions:

A Constant Width font is used for:

- Anything that might appear in a Java program, including keywords, data types, constants, method names, objects, variables, class names, and interface names
- All Java code examples
- Attributes that might appear in a manifest or JAD file

An *italic* font is used for:

- New terms where they are defined
- Pathnames, filenames, directory names, and program names (unless the program name is the name of a Java class; then it appears in constant width, like other class names)
- Internet addresses, such as domain names, URLs, and email addresses

A **boldface** font is used for:

- Example lines of Java code to which we wish to draw attention

Comments and Questions

The information in this book has been tested and verified, but you may find that features or libraries have changed, or you may even find mistakes. You can send any errors you find, as well as suggestions for future editions, to:

O'Reilly and Associates, Inc.
1005 Gravenstein Highway North
Sebastopol, CA 95472
(800) 998-9938 (in the United States or Canada)
(707) 829-0515 (international/local)
(707) 829-0104 (fax)

You can also send electronic messages. To be put on the mailing list or to request a catalog, send email to:

info@oreilly.com

To ask technical questions or comment on the book, send email to:

bookquestions@oreilly.com

I would be pleased to receive feedback on this book. You can contact me by email at:

qmahmoud@javacourses.com

The O'Reilly web site for this book is located at <http://www.oreilly.com/catalog/wirelessjava> and contains all the source examples for this book.

In addition, we have created another web site, <http://www.javacourses.com/wireless>, that includes links to material that supports the use of this book for training and personal study. This web site provides the following supplements:

- Additional source code for new applications
- Links to online J2ME material, and information on other related books
- J2ME tips and tricks

- A set of overhead projector transparencies for instructors interested in using the book in their training courses
- Up-to-date information on topics presented in the book

Acknowledgments

I am deeply grateful to my editor, Robert Eckstein, for all his comments, suggestions, and guidelines throughout the development of this book. I did not know about all the contributions an editor can make to a book until I worked with Bob. Thanks, Bob! Thanks also to the production team at O'Reilly for their hard work on this book.

Special thanks also to Monica Pawlan, Jenny Pratt, Dana Nouri, and Lauren Hudson of the Java Developer Connection (JDC), who either provided comments or edited some of the examples used in this book when they first appeared on the JDC. Also, thanks to the thousands of JDC members who sent in comments and suggestions regarding my articles. Thanks also to the following people who reviewed the contents of this book for accuracy: Ben Griffin, Marc Loy, and Jeff Cunningham.

I would also like to thank my family for their support during my studies, especially my brother, Dr. Mohammad H. Hamdan, for teaching me the value of hard work.

Finally, thanks to my wife, Reema, for her love, support, tolerance, and coffee, and my baby son Yusef, who was born on October 14, 2001, for providing a fun home environment while I finished this book.

About the Author

Qusay H. Mahmoud is an independent contractor for Sun Microsystems. He has written several articles for the Java Developer Connection that cover J2ME, including the MIDP and the CLDC APIs. He has also presented tutorials on developing wireless applications at a number of international conferences. He is the author of *Distributed Programming with Java* (Manning Publications).

Colophon

Our look is the result of reader comments, our own experimentation, and feedback from distribution channels. Distinctive covers complement our distinctive approach to technical topics, breathing personality and life into potentially dry subjects.

The animal on the cover of *Learning Wireless Java* is a Senegal galago. Galagos, also called bush babies, are native to forest and bush regions of sub-Saharan Africa, including the island of Zanzibar. Galagos have lightly built bodies with long hind legs for leaping. The flattened tips of their toes are padded with thick skin for gripping tree trunks and branches, and on each of their back feet, the index toe has an extended claw for grasping. Galagos leap from branch to branch, tree to tree, sometimes jumping as far as 15 feet.

The galago has soft, woolly fur, either brown or gray in color. Its face is small and pointy, with large eyes that allow it to see well in the dark. Its large, mobile ears can move either independently or simultaneously. The combination of the galago's huge eyes and mobile ears not only give the animal its trademark quizzical expression, but also aid the nocturnal galago after dark. At night, families of up to 20 galagos defend territories 15 to 20 acres in size. When a predator approaches, the galago emits a rasping shout that sounds much like an excited child. During the day, each family crowds into an enclosed space, such as a hollowed tree trunk, to sleep.

Galagos eat mostly insects, such as grasshoppers, dung beetles, and caterpillars, but they are also quick enough to catch mice, lizards, and small birds. In addition, they eat fruit, seeds, and flowers, sometimes aiding in pollination. In some parts of Africa, the *Galago senegalensis*, or "lesser bush baby," is kept as a pet.

Claire Cloutier was the production editor and copyeditor for *Learning Wireless Java*. Sue Willing was the proofreader. Ann Schirmer and Jeff Holcomb provided quality control. Judy Hoer wrote the index. Edie Shapiro, Derek Di Matteo, and Phil Dangler provided composition assistance.

Ellie Volckhausen designed the cover of this book, based on a series design by Edie Freedman. The cover image is a 19th-century engraving from *The Royal Natural History*. Emma Colby produced the cover layout with QuarkXPress 4.1, using Adobe's ITC Garamond font.

Melanie Wang designed the interior layout, based on a series design by David Futato. Mihaela Maier converted the files from Microsoft Word to FrameMaker 5.5.6, using tools created by Mike Sierra. The text font is Linotype Birka; the heading font is Adobe Myriad Condensed; and the code font is LucasFont's TheSans Mono Condensed. The illustrations that appear in the book were produced by Robert Romano and Jessamyn Read using Macromedia FreeHand 9 and Adobe Photoshop 6. The tip and warning icons were drawn by Christopher Bing. Linley Dolby and Rachel Wheeler wrote this colophon.

Whenever possible, our books use a durable and flexible lay-flat binding.

Table of Contents

Preface	xi
----------------------	-----------

Part I. Introducing Java 2 Platform, Micro Edition (J2ME)

1. Overview of J2ME	3
What Is J2ME?	3
Downloading the J2ME Wireless Toolkit	9
A Simple Example	10
2. The Connected Limited Device Configuration (CLDC)	19
Examining the CLDC in Detail	19
Using the Standalone CLDC and KVM	27
CLDC Next Generation	30
3. The Mobile Information Device Profile (MIDP)	31
Mobile Information Devices	31
More About MIDlets	35

Part II. Programming with the CLDC and the MIDP

4. Working with MIDlets	43
The Application Manager	44
Creating MIDlets	46

5. MIDP GUI Programming	59
Why Not Reuse the AWT?	59
The MIDP GUI APIs	60
The High-Level MIDP APIs	63
Creating Low-Level GUI Components	87
6. MIDP Events	94
Screen Navigation	94
Handling Low-Level Events	108
7. Networking	113
Generic Connections	113
MIDP Connectivity	116
The HTTP Programming Model	119
Invoking Remote Applications from MIDlets	120
Wireless Session Tracking	134
MIDlet Networking Security	135
8. Database Programming	136
The Record Management System	136
Programming with the RMS	138
9. The MIDP for Palm OS	155
Installing the MIDP for Palm OS on the Windows Platform	155
Developing New Applications	159
PRC Command-Line Conversion	165
Advanced Java Applications	166
A Final Thought	169

Part III. API Quick Reference

A. The java.io Package	173
B. The java.lang Package	182
C. The java.util Package	198

D. The javax.microedition.io Package	205
E. The javax.microedition.lcdui Package	210
F. The javax.microedition.midlet Package	224
G. The javax.microedition.rms Package	226
H. Resources	230
Index	233

Introducing Java 2 Platform, Micro Edition (J2ME)

Part I is an introduction to the Java 2 Micro Edition (J2ME) and J2ME programming. These chapters will give you an overview of the J2ME, and quickly teach you everything you need to know to get started with J2ME programming.

Chapter 1, *Overview of J2ME*

Chapter 2, *The Connected Limited Device Configuration (CLDC)*

Chapter 3, *The Mobile Information Device Profile (MIDP)*