

BLUETOOTH

Connect Without Cables

SECOND EDITION

Bluetooth 1.1's ◀
dramatic improvements in
interoperability and reliability

Includes thoroughly revised ◀
coverage of Bluetooth security
and power conservation

New Bluetooth profiles— ◀
*including the long-awaited
Personal Area Networking profile!*

**Jennifer Bray and
Charles F Sturman**

Foreword by Tom Siep, General Manager of Bluetooth SIG, Inc.

Connect Without Cables
Second Edition

Jennifer Bray
Charles F. Sturman



Prentice Hall PTR
Upper Saddle River, New Jersey 07458
www.phptr.com



ISBN 0-13-066106-6
1. Bluetooth technology. 2. Telecommunication—Equipment and supplies. 3. Computer network protocols. I. Sturman, Charles F. II. Title.

TK5103.3 .B72 2002
004.6'2—dc21

2001054573

Publisher: Bernard Goodwin
Editorial Assistant: Michelle Vincenti
Marketing Manager: Dan DePasquale
International Product Manager: Mike Vaccaro
Manufacturing Buyer: Alexis Heydt-Long
Cover Design: Talar Agasyan-Booruju
Cover Design Director: Jerry Votta
Cover Photograph: Charles F. Sturman
Compositor/Production Services: Pine Tree Composition, Inc.



© 2002 by Prentice Hall PTR
Prentice-Hall, Inc.
Upper Saddle River, NJ 07458

BLUETOOTH is a trademark owned by Bluetooth SIG, Inc., USA.

All products or services mentioned in this book are the trademarks or service marks of their respective companies or organizations.

Some material in Chapter 10 © ETSI 1999, TS 101 369 v3 is the property of ETSI. Further use, modification, redistribution is strictly prohibited and must be the subject of another Copyright Authorisation. The above-mentioned standard may be obtained from the ETSI Publication Office, publications@etsi.fr, Tel: +33 (0)4 92 94 42 41 or downloaded from the website at <http://www.etsi.org/eds/eds.htm>

All rights reserved. No part of this book may be reproduced, in any form or by any means, without permission in writing from the publisher.

Printed in the United States of America

ISBN 0-13-066106-6

Pearson Education Ltd., *London*
Pearson Education Australia Pty, Limited, *Sydney*
Pearson Education Singapore, Pte. Ltd,
Pearson Education North Asia Ltd. *Hong Kong*
Pearson Education Canada, Ltd., *Toronto*
Pearson Educación de Mexico, S.A. de C.V.
Pearson Education—Japan, *Tokyo*
Pearson Education Malaysia, Pte. Ltd.

Contents

Foreward to the Second Edition	xvii
Foreward to the First Edition	xix
Preface to the Second Editon	xxi
Preface to the First Editon	xxiii
Acknowledgments	xxv
Introduction	xxvii
1 Overview	1
1.1 Bluetooth's Origins	2
1.2 The Bluetooth SIG	2
1.3 Aims	4
1.4 The Protocol Stack	5
1.5 Security	12
	v

1.9	Test and Qualification	18
1.10	Bluetooth in Context	19
1.11	Summary	22

Protocol Stack Part 1—The Bluetooth Module

2	Antennas	25
2.1	Radiation Pattern	25
2.2	Gains and Losses	27
2.3	Types of Antennas	28
2.4	Ceramic Antennas	30
2.5	On-chip Antennas	30
2.6	Antenna Placement	31
2.7	Summary	31
3	Radio	32
3.1	Introduction	32
3.2	Frequency Hopping	33
3.3	Modulation	33
3.4	Symbol Timing	34
3.5	Power Emission and Control	34
3.6	Radio Performance Parameters	35
3.7	Simple RF Architecture	36
3.8	RF System Timing	39
3.9	Blue RF	39
3.10	Summary	40
4	Baseband	41
4.1	Introduction	41
4.2	Bluetooth Device Address	42

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.