

# Firewalls and Internet Security, Second Edition

---



Licensed under a Creative Commons Attribution-Non-Commercial-  
NoDerivatives 4.0 International (CC BY-NC-ND 4.0) license  
<https://creativecommons.org/licenses/by-nc-nd/4.0/>

## Addison-Wesley Professional Computing Series

---

Brian W. Kernighan and Craig Partridge, Consulting Editors

Matthew H. Austern, *Generic Programming and the STL: Using and Extending the C++ Standard Template Library*

David R. Butenhof, *Programming with POSIX® Threads*

Brent Callaghan, *NFS Illustrated*

Tom Cargill, *C++ Programming Style*

William R. Cheswick/Steven M. Bellovin, *Firewalls and Internet Security, Second Edition: Repelling the Wily Hacker*

David A. Curry, *UNIX® System Security: A Guide for Users and System Administrators*

Stephen C. Dewhurst, *C++ Gotchas: Avoiding Common Problems in Coding and Design*

Erich Gamma/Richard Helm/Ralph Johnson/John Vlissides, *Design Patterns: Elements of Reusable Object-Oriented Software*

Erich Gamma/Richard Helm/Ralph Johnson/John Vlissides, *Design Patterns CD: Elements of Reusable Object-Oriented Software*

Peter Hagggar, *Practical Java™ Programming Language Guide*

David R. Hanson, *C Interfaces and Implementations: Techniques for Creating Reusable Software*

Mark Harrison/Michael McLennan, *Effective Tcl/Tk Programming: Writing Better Programs with Tcl and Tk*

Michi Henning/Steve Vinoski, *Advanced CORBA® Programming with C++*

Brian W. Kernighan/Rob Pike, *The Practice of Programming*

S. Keshav, *An Engineering Approach to Computer Networking: ATM Networks, the Internet, and the Telephone Network*

John Lakos, *Large-Scale C++ Software Design*

Scott Meyers, *Effective C++ CD: 85 Specific Ways to Improve Your Programs and Designs*

Scott Meyers, *Effective C++, Second Edition: 50 Specific Ways to Improve Your Programs and Designs*

Scott Meyers, *More Effective C++: 35 New Ways to Improve Your Programs and Designs*

Scott Meyers, *Effective STL: 50 Specific Ways to Improve Your Use of the Standard Template Library*

Robert B. Murray, *C++ Strategies and Tactics*

David R. Musser/Gillmer J. Derge/Atul Saini, *STL Tutorial and Reference Guide, Second Edition: C++ Programming with the Standard Template Library*

John K. Ousterhout, *Tcl and the Tk Toolkit*

Craig Partridge, *Gigabit Networking*

Radia Perlman, *Interconnections, Second Edition: Bridges, Routers, Switches, and Internetworking Protocols*

Stephen A. Rago, *UNIX® System V Network Programming*

Curt Schimmel, *UNIX® Systems for Modern Architectures: Symmetric Multiprocessing and Caching for Kernel Programmers*

W. Richard Stevens, *Advanced Programming in the UNIX® Environment*

W. Richard Stevens, *TCP/IP Illustrated, Volume 1: The Protocols*

W. Richard Stevens, *TCP/IP Illustrated, Volume 3: TCP for Transactions, HTTP, NNTP, and the UNIX® Domain Protocols*

W. Richard Stevens/Gary R. Wright, *TCP/IP Illustrated Volumes 1-3 Boxed Set*

John Viega/Gary McGraw, *Building Secure Software: How to Avoid Security Problems the Right Way*

Gary R. Wright/W. Richard Stevens, *TCP/IP Illustrated, Volume 2: The Implementation*

Ruixi Yuan/ W. Timothy Strayer, *Virtual Private Networks: Technologies and Solutions*

Please see our web site (<http://www.awprofessional.com/series/professionalcomputing>) for more information about these titles.

Firewalls and Internet Security, Second Edition  
Repelling the Wily Hacker

---

William R. Cheswick  
Steven M. Bellovin  
Aviel D. Rubin

◆ Addison-Wesley

---

Boston • San Francisco • New York • Toronto • Montreal  
London • Munich • Paris • Madrid  
Capetown • Sydney • Tokyo • Singapore • Mexico City  
Arisia • Trantor • Middle Earth

Many of the designations used by manufacturers and sellers to distinguish their products are claimed as trademarks. Where those designations appear in this book, and Addison-Wesley was aware of a trademark claim, the designations have been printed in initial capital letters or in all capitals.

The authors and publisher have taken care in the preparation of this book, but make no expressed or implied warranty of any kind and assume no responsibility for errors or omissions. No liability is assumed for incidental or consequential damages in connection with or arising out of the use of information or programs contained herein.

The publisher offers discounts on this book when ordered in quantity for bulk purchases and special sales.

For more information, please contact:

U.S. Corporate and Government Sales  
(800) 382-3419  
corpsales@pearsontechgroup.com

For sales outside of the U.S., please contact:

International Sales  
(317) 581-3793  
international@pearsontechgroup.com

Visit Addison-Wesley on the Web: [www.awprofessional.com](http://www.awprofessional.com)

*Library of Congress Cataloging-in-Publication Data*

Cheswick, William R.

Firewalls and Internet security: repelling the wily hacker / William  
R. Cheswick, Steven M. Bellovin and Aviel D. Rubin—2nd ed.  
p. cm.

Includes bibliographical references and index.

ISBN 020163466X 1. Firewalls (Computer Security) I. Bellovin, Steven M. II. Rubin,  
Aviel D. III. Title.

TK5105.875.157C44 2003  
005.8—dc21

Copyright © 2003 by AT&T and Lumeta Corporation

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form, or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior consent of the publisher. Printed in the United States of American. Published simultaneously in Canada.

For information on obtaining permission for use of material from this work, please submit a written request to:

Pearson Education, Inc.  
Rights and Contracts Department  
75 Arlington Street, Suite 300  
Boston, MA 02116  
Fax: (617) 848-7047

ISBN: 0-201-63466-X

Text printed on recycled paper

∞—CRS—0706050403

Last printing, April 2023

*For my mother, Ruth Cheswick, whose maiden name shall not be revealed because this is a security book, and for my father, Richard Reid Cheswick, who taught me about Monday mornings, and many other things. And to Terry, Kestrel, and Lorette, who had to put up with lengthy spates of grumpy editing sessions.*

—W.R.C.

*To my parents, Sam and Sylvia Bellovin, for everything,  
and to Diane, Rebecca, and Daniel, for all the best reasons in the world.*

—S.M.B

*To my wife, Ann, my favorite person in the world; and to my children, Elana,  
Tamara, and Benny, the three best things that ever happened to me.*

—A.D.R