Volume SECOND EDI

# and network applications! cos communications

# Networking APIs: Sockets and XTI

The only guide to Unix network programming APIs you'll ever need!

Whether you write Web servers, client/server applications, or any other network software, you need to understand networking APIs—especially sockets—in greater detail than ever before. You need UNIX Network Programming, Volume 1, Second Edition.

In this book, leading Unix networking expert, W. Richard Stevens, offers unprecedented, start-to-finish guidance on making the most of sockets, the de facto standard for Unix network programming—as well as extensive coverage of the X/Open Transport Interface (XTI).

Stevens begins by introducing virtually every basic capability of TCP and UDP sockets, including socket functions and options, I/O multiplexing, and name and address conversions. He presents detailed coverage of the Posix.1g standard for sockets and Posix.1 threads. He also introduces advanced techniques for:

- . 1Pv4/1Pv6 interoperability
- Nonblocking I/O
- Routing sockets
- · Broadcasting and multicasting
- · IP options

- · Multithreading
- Debugging techniques
- Unix domain protocols
- · Raw sockets
- Client/server design alternatives

Learn how to choose among today's leading client/server design approaches, including TCP iterative, concurrent, preforked and prethreaded servers. Master the X/Open Transport Interface, including XTI TCP clients and servers, name and address functions, options, streams, and additional functions.

The Internet/intranet revolution has dramatically increased the demand for developers with a sophisticated understanding of network programming APIs, especially sockets. One book contains all you need to know: UNIX Network Programming, **Volume 1, Second Edition.** 

### **ABOUT THE AUTHOR**

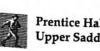
W. RICHARD STEVENS is author of UNIX Network Programming, First Edition, widely recognized as the classic text in Unix networking. He is also the author of Advanced Programming in the UNIX Environment and the TCP/IP Illustrated Series. He is an acknowledged Unix and networking expert, sought-after instructor, and occasional consultant.

PRENTICE HALL Upper Saddle River, NJ 07458

http://www.phptr.com











Find authenticated court documents without watermarks at <u>docketalarm.com</u>.

Stevens, W. Richard

UNIX network programming / by W. Richard Stevens. -- 2nd ed.

p. cm.

Includes index.
ISBN 0-13-490012-X

1. UNIX (Computer file) 2. Computer networks. 3. Internet programming. I. Title.
QA76.76.063S755 1997

005.7'127768--dc21 97-31761

Editorial/Production Supervision: Eileen Clark

Acquisitions Editor: Mary Franz Marketing Manager: Miles Williams

Buyer: Alexis R. Heydt Cover Design: Scott Weiss

Cover Design Direction: Jerry Votta Editorial Assistant: Noreen Regina



© 1998 Prentice Hall PTR Prentice-Hall, Inc. A Simon & Schuster Company Upper Saddle River, NJ 07458

Prentice Hall books are widely used by corporations and government agencies for training, marketing, and resale. The publisher offers discounts on this book when ordered in bulk quantities. For more information, contact

Corporate Sales Department,

Phone: 800-382-3419; FAX: 201-236-7141 E-mail (Internet): corpsales@prenhall.com

Or write: Prentice Hall PTR

Corp. Sales Department One Lake Street

Upper Saddle River, NJ 07458

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

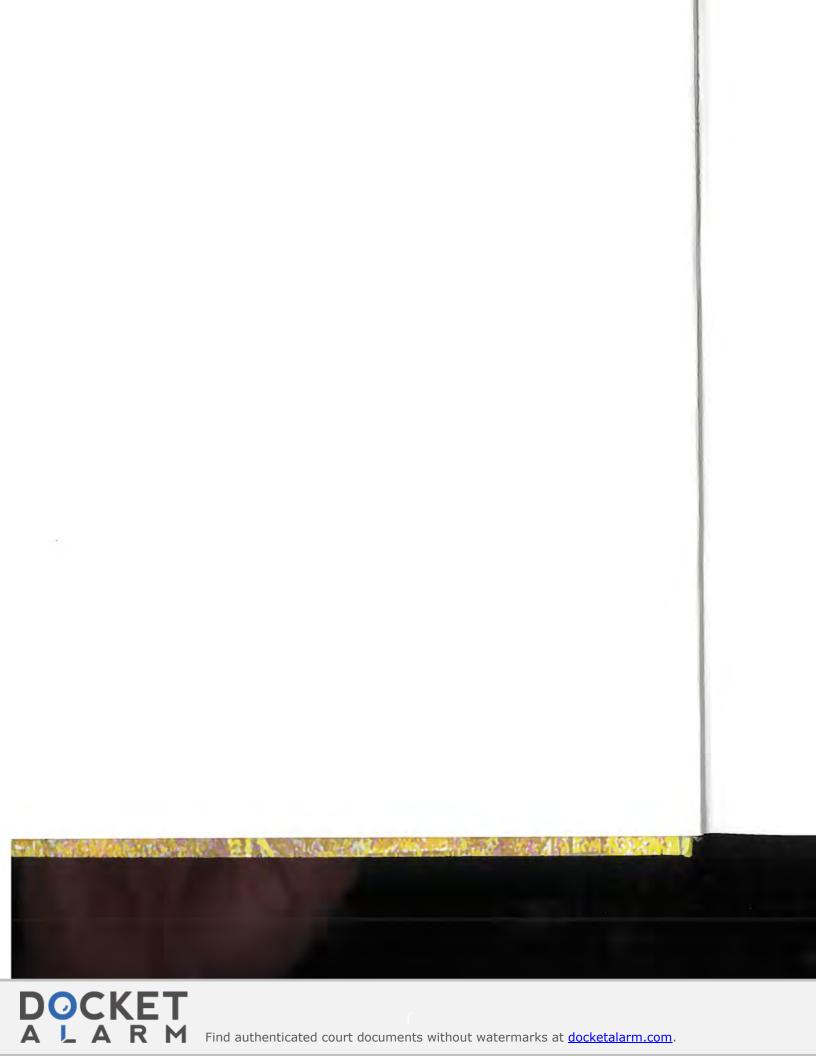
1098765

ISBN 0-13-490012-X

Prentice-Hall International (UK) Limited, London
Prentice-Hall of Australia Pty. Limited, Sydney
Prentice-Hall Canada Inc., Toronto
Prentice-Hall Hispanoamericana, S.A., Mexico
Prentice-Hall of India Private Limited, New Delhi
Prentice-Hall of Japan, Inc., Tokyo
Simon & Schuster Asia Pte. Ltd., Singapore
Editora Prentice-Hall do Brasil, Ltda., Rio de Janeiro

003





2.11 2.12	Protocol Usage by Common Internet Applications 52 Summary 52	
Part 2. Ele	ementary Sockets	55
Chapter 3.	Sockets Introduction	57
3.1	Introduction 57	
3.2	Socket Address Structures 57	
3.3	Value-Result Arguments 63	
3.4	Byte Ordering Functions 66	
3.5	Byte Manipulation Functions 69	
3.6	inet_aton, inet_addr, and inet_ntoa Functions 70	
3.7	inet_pton and inet_ntop Functions 72	
3.8	sock_ntop and Related Functions 75	
3.9	readn, writen, and readline Functions 77	
3.10	isfdtype Function 81	
3.11	Summary 82	
Chapter 4.	Elementary TCP Sockets	85
4.1	Introduction 85	
4.2	socket Function 85	
4.3	connect Function 89	
4.4	bind Function 91	
4.5	listen Function 93	
4.6	accept Function 99	
4.7	fork and exec Functions 102	
4.8	Concurrent Servers 104	
4.9	close Function 107	
4.10	getsockname and getpeername Functions 107	
4.11	Summary 110	
Chapter 5.	TCP Client-Server Example	111
5.1	Introduction 111	
5.2	TCP Echo Server: main Function 112	
5.3	TCP Echo Server: str_echo Function 113	
5.4	TCP Echo Client: main Function 113	
5.5	TCP Echo Client: str_cli Function 115	
5.6	Normal Startup 115	
5.7	Normal Termination 117	
5.8	Posix Signal Handling 119	
5.9	Handling SIGCHLD Signals 122	
5.10	wait and waitpid Functions 124	





2.6

2.7

2.8

2.9

TIME\_WAIT State

41

Buffer Sizes and Limitations

TCP Port Numbers and Concurrent Servers

46

44

Port Numbers

# DOCKET

# 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.

