



Computer Networking Essentials

Debra Littlejohn Shinder
#1



Cisco Press
201 West 103rd Street
Indianapolis, IN 46290 USA

Computer Networking Essentials

Debra Littlejohn Shinder

Copyright © 2001 Cisco Systems, Inc.

Cisco Press logo is a trademark of Cisco Systems, Inc.

Published by:

Cisco Press

201 West 103rd Street

Indianapolis, IN 46290 USA

All rights reserved. No part of this book may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system, without written permission from the publisher, except for the inclusion of brief quotations in a review.

Printed in the United States of America 1 2 3 4 5 6 7 8 9 0

Library of Congress Cataloging-in-Publication Number: 2001090429

ISBN: 1-58713-038-6

Trademark Acknowledgments

All terms mentioned in this book that are known to be trademarks or service marks have been appropriately capitalized. Cisco Press or Cisco Systems, Inc., cannot attest to the accuracy of this information. Use of a term in this book should not be regarded as affecting the validity of any trademark or service mark.

Warning and Disclaimer

This book is designed to provide information about basic networking and operating system technologies. Every effort has been made to make this book as complete and as accurate as possible, but no warranty or fitness is implied.

The information is provided on an "as is" basis. The author, Cisco Press, and Cisco Systems, Inc., shall have neither liability nor responsibility to any person or entity with respect to any loss or damages arising from the information contained in this book or from the use of the discs or programs that may accompany it.

The opinions expressed in this book belong to the author and are not necessarily those of Cisco Systems, Inc.



Contents

| | | |
|------------------|---|----------|
| Part I | Introduction to Networking Concepts | 3 |
| Chapter 1 | Introduction to PC Networking | 5 |
| | A Brief History of PC Networking | 5 |
| | The First Communications Networks | 6 |
| | Disadvantages of Standalone Systems | 10 |
| | What Is a Network, Anyway? | 11 |
| | Why Network Computers? | 11 |
| | Benefits of Getting Connected | 12 |
| | The Birth of the Internet | 13 |
| | The Cost of Technology: More and More for Less and Less | 15 |
| | PC Networking Today | 16 |
| | Home Computing | 16 |
| | Web Presence and E-commerce | 16 |
| | High-Performance Business Solutions | 16 |
| | Online Learning | 17 |
| | Tomorrow's Networks | 17 |
| | "Smart" Appliances and Homes | 17 |
| | Phoning Home | 18 |
| | The Wired Workplace | 19 |
| | Schools of the Future | 20 |
| | Networking Health Care | 20 |
| | Technology and the Law | 21 |
| | Intergalactic Networking? | 21 |
| | A Brief Overview of Networking Terminology | 21 |
| | Concept-Related Terminology | 22 |
| | Network Hardware-Related Terminology | 22 |
| | Software-Related Terminology | 23 |
| | Design and Topology Terminology | 24 |
| | Measurement-Related Terminology | 24 |
| | What This Book Covers and What It Doesn't | 25 |
| | Networking Certifications | 26 |
| | Vendor-Specific Certifications | 26 |
| | Non-Vendor-Specific Certifications | 26 |
| | This Book and Certification | 27 |

| | | |
|------------------|--|-----------|
| | Summary | 27 |
| | Further Reading | 28 |
| | Review Questions | 28 |
| Chapter 2 | Categorizing Networks | 33 |
| | Categorizing Networks by Physical Scope | 33 |
| | Characteristics of a LAN | 34 |
| | Characteristics of a MAN | 35 |
| | Characteristics of a WAN | 37 |
| | Categorizing Networks by Administrative Method | 38 |
| | Servers and Clients | 39 |
| | Characteristics of Peer-to-Peer Networks | 44 |
| | Characteristics of Server-Based Networks | 47 |
| | Categorizing Networks by NOS | 49 |
| | Windows Networks | 50 |
| | NetWare Networks | 50 |
| | UNIX Networks | 50 |
| | Hybrid Networks | 51 |
| | Categorizing Networks by Protocol | 52 |
| | NetBEUI Networks | 52 |
| | IPX/SPX Networks | 52 |
| | TCP/IP Networks | 53 |
| | Other LAN Protocols Used in Networks | 53 |
| | Categorizing Networks by Topology | 54 |
| | Linear Bus Networks | 55 |
| | Ring Networks | 56 |
| | Star Bus Networks | 57 |
| | Mesh Networks | 59 |
| | Hybrid Topologies | 60 |
| | Categorizing Networks by Architecture | 61 |
| | Ethernet Networks | 62 |
| | Token Ring Networks | 67 |
| | AppleTalk Networks | 68 |
| | ARCnet Networks | 68 |
| | Summary | 70 |
| | Further Reading | 70 |
| | Review Questions | 71 |

| | | |
|------------------|--|------------|
| Chapter 3 | Networking Concepts, Models, and Standards | 75 |
| | Computer Communication Concepts | 75 |
| | The Language of the Machine | 76 |
| | Common Numbering Systems | 76 |
| | Using Packets | 80 |
| | A Layered Communication Process | 82 |
| | Networking Models | 84 |
| | The Purpose of Models | 84 |
| | The OSI Model | 85 |
| | The DoD Model | 97 |
| | Vendor-Specific Models | 99 |
| | Networking Standards and Specifications | 99 |
| | Why Standardize? | 100 |
| | Standards-Setting Bodies | 100 |
| | Summary | 104 |
| | Further Reading | 104 |
| | Review Questions | 105 |
| Chapter 4 | Networking Communications Methods | 109 |
| | Signaling Methods and Characteristics | 109 |
| | Analog and Digital | 109 |
| | Baseband and Broadband | 112 |
| | Multiplexing | 113 |
| | Asynchronous and Synchronous Transmission | 115 |
| | Simplex, Half-Duplex, and Full-Duplex Transmission | 116 |
| | Signaling and Communications Problems | 118 |
| | Electromagnetic Interference | 119 |
| | Radio Frequency Interference | 119 |
| | Crosstalk | 119 |
| | Attenuation | 120 |
| | Bandwidth Capacity Issues | 121 |
| | Media Access Methods | 121 |
| | CSMA/CD | 122 |
| | CSMA/CA | 123 |
| | Token Passing | 123 |
| | Demand Priority | 125 |
| | Summary | 126 |
| | Further Reading | 126 |
| | Review Questions | 127 |

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.