

Table of Contents

<i>Introduction</i>	1
About This Book	1
Conventions Used in This Book	2
Foolish Assumptions	2
How This Book Is Organized	3
Part I: TCP/IP from Names to Addresses	3
Part II: Getting Connected	3
Part III: Configuring Clients and Servers: Web, E-Mail, and Chat	4
Part IV: Even More TCP/IP Applications and Services	4
Part V: Network Troubleshooting and Security	4
Part VI: The Part of Tens	5
Icons Used in This Book	5
Where to Go from Here	6
<i>Part I: TCP/IP from Names to Addresses</i>	7
Chapter 1: Understanding TCP/IP Basics	9
Following Rules for the Internet: TCP/IP Protocols	10
Who's in charge of the Internet and TCP/IP?	10
Checking out RFCs: The written rules	12
Examining Other Standards Organizations That Add to the Rules	13
Distinguishing Between the Internet, an Internet, and an Intranet	13
Extending Intranets to Extranets	14
Introducing Virtual Private Networks	15
Exploring Geographically Based Networks	16
Networks connected by wires and cables	16
Wireless networks	17
The geography of TCP/IP	17
Chapter 2: Layering TCP/IP Protocols	19
Taking a Timeout for Hardware	19
Starting with network connection media	20
Colliding with Ethernet	20
Stacking the TCP/IP Layers	22
Layer 1: The physical layer	23
Layer 2: The data link layer	24
Layer 3: The internet layer	24
Layer 4: The transport layer	24
Layer 5: The application layer	25

Chewing through Network Layers: A Packet's Journey.....	25
Understanding TCP/IP: More than just protocols	27
Determining whether your network has a protocol, an application, or a service.....	27
Plowing through the Protocol List (In Case You Thought Only Two Existed).....	28
Physical layer protocols	29
Data link layer protocols.....	29
Internet layer protocols	29
Transport layer protocols	31
Application layer protocols.....	36

Chapter 3: Serving Up Clients and Servers 43

Understanding the Server Side	43
Examining the server's job	44
Identifying types of servers	44
Using dedicated servers.....	45
Understanding the Client Side	45
Defining a client.....	45
Clients, clients everywhere	46
Answering the Question "Are You Being Served?"	46
Supporting TCP/IP with Client/Server and Vice Versa	47
Recognizing Other Internetworking Styles: Peer-to-Peer Computing	47
Determining whether peer-to-peer workgroups are still handy	48
P2P applications — P2P across the Internet	48

Chapter 4: Nice Names and Appetizing Addresses 51

What Did You Say Your Host's Name Is?	52
Playing the numbers game	52
Identifying a computer as uniquely yours	53
Translating names into numbers	54
Taking a Closer Look at IP Addresses.....	54
Savoring Classful Addressing.....	55
Recognizing the Parts of an IP Address	56
Class A is for a few enormous networks	57
Class B is for lots of big networks.....	57
Class C is for millions of small networks	57
Class D is for multicasting	57
Biting Down on Bits and Bytes.....	58
Obtaining an IP Address	60
Choosing whether to go public or stay private	60
Obeying the network police	61
Obtaining a globally unique IP address	61
Acquiring a static address	62
Getting dynamic addresses with DHCP	62
Finding out your IP address	62

Resolving Names and Addresses with DNS.....	64
Understanding the minimum amount of information about DNS.....	64
Using DNS to “Do Nifty Searches”.....	65
Describing Fully Qualified Domain Names (FQDNs)	65
Branching out into domains	66
Stalking new domains.....	68
Determining Whether the Internet Will Ever Fill Up	68
Choking on bandwidth	68
Panicking about not having enough addresses	69
Dishing Up More Kinds of Addresses	69
MAC: Media Access Control	69
Port numbers.....	70

Chapter 5: Need More Addresses? Try Subnetting and NAT 73

Working with Subnets and Subnet Masks	74
Defining subnet masks	76
Why a network has a mask when it has no subnets.....	76
Subnetting 101	77
Letting the DHCP Protocol Do the Work for You	79
One administrator’s nightmare is another’s fantasy.....	80
Understanding how the DHCP protocol works — it’s client/server again	81
Being evicted after your lease expires	82
Sharing Addresses with Network Address Translation (NAT).....	83
Understanding how NAT works	83
Securing NAT	84
Using NAT and DHCP to work together	84
Swallowing NAT incompatibilities	86
Digesting NAT-PT (Network Address Translation-Protocol Translation)	87

Part II: Getting Connected 89

Chapter 6: Configuring a TCP/IP Network — the Software Side . . . 91

Installing TCP/IP? Probably Not	91
Detecting whether TCP/IP is installed.....	92
Determining whether it’s IPv4, IPv6, or both	92
Savoring TCP/IP right out of the box.....	93
Six Steps to a Complete TCP/IP Configuration.....	94
Step 1: Determining whether your computer is a client or server or both	95
Step 2: Gathering client information	95
Step 3: Setting up your NIC(s)	95



- Step 4: Deciding on a static IP address or a DHCP leased address 96
- Step 5: Choosing how your host will translate names into IP addresses 97
- Step 6: Gathering server information 97
- Setting TCP/IP Client Properties..... 97
 - Configuring TCP/IP on a Mac OS X client..... 98
 - Configuring TCP/IP on a Linux or Unix client..... 100
 - Configuring a TCP/IP client on Windows Vista 102
 - Configuring a TCP/IP client on Windows XP 103
- Setting TCP/IP Server Properties..... 104
- Installing TCP/IP from Scratch..... 105
- Feasting on Network Files..... 107
 - The local hosts file..... 107
 - The trusted hosts file, hosts.equiv 109
 - Freddie's nightmare: Your personal trust file 110
 - The services file 111
- Daemons Aren't Devils..... 113
 - Relishing your daemons..... 113
 - Finding the daemons on your computer 113

Chapter 7: Networking SOHO with Wireless 115

- Gulping the Minimum Hardware Details 116
 - NICs..... 116
 - Routers 117
- Setting Up a Home Wireless Network in Four Steps 118
 - Step 1: Choose your wireless hardware..... 118
 - Step 2: Connect your wireless router 120
 - Step 3: Set up your wireless router 121
 - Step 4: Connect your computers 124
- Securing Your Network..... 124
 - Securing the wired side..... 125
 - Securing the wireless side 125
- Broadband for Everyone? We Hope 128
 - Level 1: Using wireless hotspots..... 128
 - Level 2: Paying for broadband wireless service 129
 - Level 3: Going anywhere you want to connect to the Internet with WiMAX 129

Chapter 8: Advancing into Routing Protocols 131

- Understanding Routing Lingo 132
- Routing Through the Layers — the Journey of a Packet..... 135
 - A new message heads out across the Net 135
 - The message visits the router 137
 - Into an Internet router and out again..... 139
 - Reaching the destination 140

Getting a Handle on How Routers Work 143

Getting Started with Routers..... 146

Swallowing Routing Protocols 148

 Nibbling on IGP protocols..... 149

 Exterior Gateway Protocols (EGP) 152

Understanding How BGP Routers Work 154

Juicing Up Routing with CIDR 154

C Is for Classless 156

 CIDR pressing the routing tables 157

 You say “subnet,” aggregating.net says “aggregate”..... 159

Securing Your Router 159

 Coring the apple with Denial of Service (DoS) Attacks..... 160

 Hijacking routers..... 160

 Eavesdropping on BGP..... 161

 It’s so sad 161

 S-BGP (Secure BGP): Proposals to make BGP routing secure..... 161

Chapter 9: IPv6: IP on Steroids. 163

Say Hello to IPv6 163

 Digesting IPv4 limitations 164

 Absorbing IPv6 advantages 164

If It Ain’t Broke, Don’t Fix It — Unless It Can Be Improved 165

Wow! Eight Sections in an IPv6 Address? 165

 Why use hexadecimal? 166

 There’s good news and there’s bad news 166

 Take advantage of IPv6 address shortcuts..... 167

Special IPv6 Addresses 169

IPv6 — and the Using Is Easy..... 169

 Checking out the network with autodiscovery 170

 Ensuring that your address is unique 171

 Automatically assigning addresses 172

 Realizing that autoregistration says “Let us serve you” 172

IPv6 Installation 173

 Configuring IPv6 on Windows XP and Windows Server 2003..... 173

 Welcoming IPv6 to Mac OS X..... 175

 Getting started with IPv6 in Unix and Linux..... 175

Other Delicious IPv6 Morsels..... 176

 Security for all 176

 Faster, better multimedia 178

 Support for real-time applications..... 178

 Improved support for mobile computing 178

Share the Planet — IPv6 and IPv4 Can Coexist..... 179

 Stacking IPv4 and Iv6..... 179

 Tunneling IPv6 through IPv4 180

Whew — You Made It!..... 180

Chapter 10: Serving Up DNS (The Domain Name System) 181

Taking a Look at the DNS Components	182
Going Back to DNS Basics.....	183
Revisiting Client/Server with DNS	184
Dishing up DNS client/server definitions.....	184
Snacking on resolvers and name servers	184
Who's in charge here?.....	186
Serving a DNS client's needs	186
Oops! Can't help you	187
Who's Responsible for Name and Address Information?.....	187
Understanding Servers and Authority	189
Primary name server: Master of your domain	189
Secondary name servers.....	190
Caching servers.....	192
Understanding Domains and Zones	193
Problem Solving with Dynamic DNS (DYNDNS)	195
Diving into DNSSEC (DNS Security Extensions).....	195
Why does DNS need DNSSEC?.....	196
Glimpsing behind the scenes of DNSSEC.....	197

**Part III: Configuring Clients and Servers:
Web, E-Mail, and Chat..... 199****Chapter 11: Digesting Web Clients and Servers. 201**

Standardizing Web Services.....	201
Deciphering the Languages of the Web	202
HTML.....	202
HTML 4	204
XML.....	205
XHTML.....	205
HTML + MIME = MHTML	205
Java and other Web dialects	205
Hypertext and hypermedia.....	206
Understanding How Web Browsing Works	207
Serving up a Web page.....	207
Storing user information as cookies.....	209
Managing cookies with your browser	210
Dishing up multimedia over the Internet.....	212
Feeding Web Pages with Atom and RSS.....	214
Reducing the Web's Wide Waistline to Increase Speed.....	215
Proxy Serving for Speed and Security.....	218
Caching pages	219
Improving security with filtering	220
Setting up a proxy client	220
Finishing touches.....	223

Setting Up a Caching Proxy Server	223
Outlining the general steps for installing and configuring squid	223
Configuring squid for Microsoft Windows Server 2008	224
Browsing Securely	228
Ensuring that a site is secure	228
Using your browser's security features	229
Setting Up a Web Server	230
Setting up the Apache HTTP Server	231
Speeding up Apache	234
Making Apache more secure	234
Adding Security to HTTP	235
Taking a look at HTTPS	236
Getting up to speed on SSL	236
Stepping through an SSL Transaction	237
Using Digital Certificates for Secure Web Browsing	238

Chapter 12: Minimum Security Facilities. 239

What's the Worst That Could Happen?	239
Jump-Starting Security with the Big Three	240
Installing a personal firewall	241
Vaccinating your system with the anti-s	242
Encrypting data so snoopers can't read it	243
Adding a Few More Basic Protections	243

Chapter 13: Eating Up E-Mail 245

Getting the Big Picture about How E-Mail Works	245
Feasting on E-Mail's Client-Server Delights	246
E-mail clients	246
E-mail clients versus Web mail clients	247
E-mail servers	247
Postfix: Configuring the fastest-growing MTA	249
Sharpening the Finer Points of Mail Servers	252
Transferring e-mail by way of store-and-forward	253
Transferring e-mail by way of DNS MX records	254
Understanding How SMTP Works with MTAs	255
Defining E-Mail Protocols	255
Adding More Protocols to the Mix	256
POP3	256
IMAP4	257
HTTP	258
LDAP	258
DNS and its MX records	258

Chapter 14: Securing E-Mail 261

Common Sense: The Most Important Tool in Your Security Arsenal...	261
Being Aware of Possible Attacks	262
Phishing.....	263
Popping up and under.....	263
Getting spied on.....	263
Meeting malware.....	265
Bombing.....	265
Have you got anything without spam? Spam, spam, spam!	266
Spoofing.....	267
Finding Out Whether You're a Victim.....	267
Playing Hide-and-Seek with Your E-Mail Address.....	268
Layering Security	269
Layer 1: Letting your ISP protect your network.....	269
Layer 2: Building your own walls	270
Layer 3: Securing e-mail on the server side.....	271
Layer 4: Securing e-mail on the client side	274
Layer 5: Suitely extending e-mail security	278
Using Secure Mail Clients and Servers.....	278
Setting up a secure IMAP or POP client	279
Setting up a secure mail server.....	281
Encrypting e-mail	281

Chapter 15: Beyond E-Mail: Social Networking and Online Communities. 285

Thumbing to Talk About.....	286
Choosing a Communication Method.....	287
Getting together with IRC	288
Jabbering with XMPP	288
Feeding Your Craving for News	289
Getting Even More Social.....	290

Part IV: Even More TCP/IP Applications and Services 291**Chapter 16: Mobile IP — The Moveable Feast 293**

Going Mobile	294
Understanding How Mobile IP Works	294
Sailing into the Future: Potential Mobile IPv6 Enhancements	296
Mobilizing Security.....	297
Understanding the risks.....	297
Using basic techniques to protect your mobile devices	298

Chapter 17: Saving Money with VoIP (Voice Over Internet Protocol)	299
Getting the Scoop on VoIP	299
Getting Started Using VoIP	300
Step 1: Get broadband	300
Step 2: Decide how to call	301
Step 3: Make the call	302
Step 4: Convert the bits back into voice (with VoIP software)	303
Step 5: Converse	303
Yo-Yo Dieting: Understanding How VoIP Packets Move through the Layers	304
Trekking the Protocols from RTP to H.323	304
Talking the talk with the TCP/IP stack and more	305
Ingesting VoIP standards from the ITU	306
Vomiting and Other Vicious VoIP Vices	306
Securing Your Calls from VoIP Violation	306
You, too, can be a secret agent	307
Authenticating VoIP-ers	307
Keeping voice attacks separate from data	308
Defending with firewalls	308
Testing Your VoIP Security	308
 Chapter 18: File and Print Sharing Services	 309
Defining Basic File Sharing Terms	309
Using FTP to Copy Files	310
Understanding how FTP works	310
Using anonymous FTP to get good stuff	311
Choosing your FTP client	312
Transferring the files	312
Securing FTP file transfers	315
Using rcp or scp to Copy Files	316
Sharing Network File Systems	317
Nifty file sharing with NFS (Network File System)	317
Solving the buried file update problem with NFSv4	318
Examining the mount Protocol	319
Automounting	320
Configuring an NFS Server	320
Step 1: Edit the exports file	321
Step 2: Update the netgroup file	321
Step 3: Start the daemons	322
Configuring an NFS Client	323

Picking Up Some NFS Performance Tips	324
Hardware tips	324
Server tips	325
Client tips	325
Weighing performance against security	325
Getting NFS Security Tips	325
Sharing Files Off the Stack	326
Using Windows network shares	326
Using Samba to share file and print services	327
Working with Network Print Services	328
Valuing IPP features	329
Setting up Windows Server 2008 print servers over IPP	330
Printing with the Common Unix Print System (CUPS)	331

Chapter 19: Sharing Compute Power 333

Sharing Network Resources	333
Accessing Remote Computers	334
Using a telnet client	334
“R” you ready for more remote access?	335
Executing commands with rsh and rexec	335
Securing Remote Access Sessions	336
Taking Control of Remote Desktops	337
Sharing Clustered Resources	338
Clustering for high availability	338
Clustering for load balancing	338
Clustering for supercomputing	339
Sharing Compute Power with Grid and Volunteer Computing	339

Part V: Network Troubleshooting and Security 341

Chapter 20: Staying with Security Protocols 343

Determining Who Is Responsible for Network Security	344
Following the Forensic Trail: Examining the Steps for Securing Your Network	344
Step 1: Prescribing Preventive Medicine for Security	345
Step 2: Observing Symptoms of Malware Infection	347
Uncovering more contagions	348
Step 3: Diagnosing Security Ailments with netstat, ps, and Logging	355
Monitoring network use with ps	355
Nosing around with netstat	357
Examining logs for symptoms of disease	362
Syslog-ing into the next generation	363
Microsoft proprietary event logging	370

Chapter 21: Relishing More Meaty Security	373
Defining Encryption.....	374
Advancing Encryption with Advanced Encryption Standard (AES)	375
Peering into Authentication	376
Do you have any ID? A digital certificate will do	377
Getting digital certificates.....	377
Using digital certificates.....	378
Checking your certificates	379
Coping with certificate problems	380
IPSec (IP Security Protocol): More Authentication.....	381
Kerberos — Guardian or Fiend?	382
Understanding Kerberos concepts.....	382
Playing at Casino Kerberos.....	383
Training the dog — one step per head	384
Setting up a Kerberos server step by step	385
Setting up a Kerberos client step by step.....	387
 Chapter 22: Troubleshooting Connectivity and Performance Problems	 389
Chasing Network Problems from End to End	390
Getting Started with Ping.....	390
Pinging away with lots of options.....	391
And now, for “some-ping” completely different:	
Running ping graphically	393
Death by ping	395
Diagnosing Problems Step by Step.....	396
Pinging yourself and others.....	396
Using nslookup to query a name server	401
Using traceroute (tracert) to find network problems.....	403
Simplifying SNMP, the Simple Network Management Protocol.....	406
Just barely describing how SNMP works.....	406
Using SMNP programming free	407
 Part VI: The Part of Tens	 411
Chapter 23: Ten More Uses for TCP/IP	413
Chapter 24: Ten More Resources for Information about TCP/IP Security	417
 Index	 421