

# THE COMPLETE HANDBOOK OF THE INTERNET

# The Complete Handbook of the Internet

by

**W.J. Buchanan**

*Napier University*



Springer Science+Business Media, B.V.

A C.I.P. Catalogue record for this book is available from the Library of Congress.

ISBN 978-1-4613-4999-0

ISBN 978-0-306-48331-8 (eBook)

DOI 10.1007/978-0-306-48331-8

---

*Printed on acid-free paper*

All Rights Reserved

© 2002 Springer Science+Business Media Dordrecht

Originally published by Kluwer Academic Publishers, Boston 2002

Softcover reprint of the hardcover 1st edition 2002

No part of this work may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, microfilming, recording or otherwise, without written permission from the Publisher, with the exception of any material supplied specifically for the purpose of being entered and executed on a computer system, for exclusive use by the purchaser of the work.

# Contents

<b>Preface</b>	<b>xix</b>
<b>A1 Introduction</b>	<b>1</b>
A1.1 Introduction	1
A1.2 History	1
A1.3 System classification	4
A1.4 System definitions	7
A1.5 Computer architecture	9
A1.6 Bits, bytes and words	12
A1.7 Data representation	16
<b>A2 Distributed elements</b>	<b>21</b>
A2.1 Introduction	21
A2.2 Conversion to digital	23
A2.3 Communications model	24
A2.4 Cables	25
A2.5 Peer-to-peer and client/server	29
<b>A3 Operating systems</b>	<b>33</b>
A3.1 Introduction	33
A3.2 Multitasking and threading	41
A3.3 Example operating system components (Microsoft Windows)	45
A3.4 Interrupts (on PC systems)	50
A3.5 Example operating systems	55
<b>A4 Processes and scheduling</b>	<b>61</b>
A4.1 Introduction	61
A4.2 Scheduling	62
A4.3 Higher-level primitives	68
A4.4 Signals, pipes and task switching (UNIX)	69
A4.5 Messages	70
A4.6 Microsoft Windows scheduling	71
A4.7 UNIX process control	71
A4.8 Microsoft Windows task manager	75
A4.9 Finite-state machines	75
<b>A5 Distributed processing</b>	<b>79</b>
A5.1 Introduction	79
A5.2 Interprocess communication	81
A5.3 Flags and semaphores	82
A5.4 RPC	90
A5.5 Multi-processor systems	97
<b>A6 Distributed file systems</b>	<b>107</b>
A6.1 Introduction	107
A6.2 NFS	110
A6.3 Other distributed file systems	121

<b>A7</b>	<b>Agents</b>	<b>123</b>
A7.1	Introduction	123
A7.2	Agent types	125
A7.3	Why Java for mobile agents?	131
A7.4	Agents and security	133
A7.5	Monitoring software quality	134
A7.6	Mobile agents and network management	134
A7.7	User agents	135
A7.8	Agent development tool	136
A7.9	Practical agent implementation	137
A7.10	Mobile agent development tool	142
A7.11	Tracy	143
<b>B1</b>	<b>Data communications</b>	<b>147</b>
B1.1	Introduction	147
B1.2	History	147
B1.3	Background	151
B1.4	Data transfer	153
B1.5	Data transfer rates	154
B1.6	Electrical signals	155
B1.7	Bandwidth	156
B1.8	Bandwidth requirements	157
B1.9	Noise and signal distortion	158
B1.10	Capacity	159
B1.11	Modulation	161
B1.12	Digital modulation	163
B1.13	Multiplexing	165
B1.14	Frequency carrier	167
B1.15	Routing of data	169
<b>B2</b>	<b>Real-time data and compression</b>	<b>173</b>
B2.1	Introduction	173
B2.2	Conversion to digital	176
B2.3	Sampling theory	177
B2.4	Quantization	178
B2.5	Compression methods	179
B2.6	Entropy encoding	181
B2.7	Source compression	187
B2.8	Fax transmission	201
B2.9	Video signals	203
B2.10	GIF coding	215
B2.11	TIFF coding	224
<b>B3</b>	<b>Error coding</b>	<b>227</b>
B3.1	Error coding principles	227
B3.2	Error correction	237
B3.3	Error (Detection)	244
<b>B4</b>	<b>RS-232</b>	<b>259</b>
B4.1	Introduction	259
B4.2	Electrical characteristics	259

B4.3	Communications between two nodes	264
B4.4	Programming RS-232	269
B4.5	RS-232 programs	273
B4.6	RS-232 for Windows	277
B4.7	RS-232 in Delphi	288
<b>B5</b>	<b>Modems</b>	<b>295</b>
B5.1	Introduction	295
B5.2	RS-232 communications	296
B5.3	Modem standards	297
B5.4	Modem commands	297
B5.5	Modem set-ups	300
B5.6	Modem indicator	302
B5.7	Profile viewing	302
B5.8	Test modes	303
<b>C1</b>	<b>Introduction to networks</b>	<b>307</b>
C1.1	Introduction	307
C1.2	Advantages and disadvantages of networks	309
C1.3	OSI model	313
C1.4	Foundations of the OSI model	316
C1.5	Internetworking	321
C1.6	Broadcasts	325
C1.7	Bits, frames, packets and segments	326
<b>C2</b>	<b>Networking types</b>	<b>327</b>
C2.1	Introduction	327
C2.2	Network topologies	328
C2.3	Token ring	331
C2.4	Ethernet	333
C2.5	LAN components	336
C2.6	Cabling standards	346
C2.7	Important networking definitions	353
<b>C3</b>	<b>Ethernet</b>	<b>355</b>
C3.1	Introduction	355
C3.2	IEEE standards	356
C3.3	Ethernet – media access control (MAC) layer	357
C3.4	IEEE 802.2 and Ethernet SNAP	359
C3.5	OSI and the IEEE 802.3 standard	361
C3.6	Novell NetWare and Ethernet	362
C3.7	Ethernet transceivers	363
C3.8	Ethernet types	364
C3.9	Twisted-pair hubs	365
C3.10	100 Mbps Ethernet	366
C3.11	Gigabit Ethernet	371
C3.12	Bridges	375
C3.13	ARP	376
C3.14	RARP	380
C3.15	Spanning-Tree Protocol	381
C3.16	Additional	382

C3.17	Network interface card design	383
C3.18	82559-based Ethernet	387
C3.19	Comparison of fast Ethernet with other technologies	390
<b>C4</b>	<b>Network design, switches and vLANs</b>	<b>391</b>
C4.1	Introduction	391
C4.2	Network design	391
C4.3	Hierarchical network design	393
C4.4	Switches and switching hubs	397
C4.5	vLANs	402
<b>C5</b>	<b>Token Ring</b>	<b>409</b>
C5.1	Introduction	409
C5.2	Operation	409
C5.3	Token Ring - media access control (MAC)	410
C5.4	Token Ring maintenance	412
C5.5	Token Ring multistation access units (MAUs)	413
C5.6	Cabling and connectors	414
C5.7	Repeaters	414
C5.8	Jitter suppression	415
<b>C6</b>	<b>FDDI</b>	<b>417</b>
C6.1	Introduction	417
C6.2	Operation	418
C6.3	FDDI layers	418
C6.4	SMT protocol	420
C6.5	Physical connection management	420
C6.6	Fault tolerance method	420
C6.7	FDDI token format	421
C6.8	FDDI Frame format	421
C6.9	MAC protocol	423
C6.10	Applications of FDDI networks	424
C6.11	FDDI backbone network	424
C6.12	FDDI media	424
C6.13	FDDI attachments	425
C6.14	FDDI specification	427
C6.15	FDDI-II	427
C6.16	Standards	428
C6.17	Practical FDDI network – EaStMAN	429
<b>C7</b>	<b>ATM</b>	<b>431</b>
C7.1	Introduction	431
C7.2	Objectives of ATM	432
C7.3	ATM versus ISDN and PCM-TDM	433
C7.4	ATM cells	434
C7.5	Routing cells within an ATM network	434
C7.6	Virtual channels and virtual paths	436
C7.7	Statistical multiplexing, ATM signalling and call set-up	438
C7.8	ATM and the OSI model	440
C7.9	ATM physical layer	441
C7.10	AAL service levels	441

C7.11	ATM flow control	445
C7.12	Practical ATM networks	447
<b>C8</b>	<b>HDLC</b>	<b>451</b>
C8.1	Introduction	451
C8.2	HDLC protocol	452
C8.3	Transparency	456
C8.4	Flow control	456
C8.5	Derivatives of HDLC	458
<b>C9</b>	<b>ISDN</b>	<b>461</b>
C9.1	Introduction	461
C9.2	ISDN channels	462
C9.3	ISDN physical layer interfacing	463
C9.4	ISDN data link layer	465
C9.5	ISDN network layer	469
C9.6	Speech sampling	471
C9.7	ISDN router programming	472
C9.8	HDLC encapsulation	472
<b>C10</b>	<b>X.25</b>	<b>473</b>
C10.1	Introduction	473
C10.2	Packet-switching and the OSI model	474
C10.3	X.25 packets	476
C10.4	X.25 packet flow	479
C10.5	Packet switching routing	483
C10.6	Logical channels	484
C10.7	X.25 node addressing	484
<b>C11</b>	<b>Wireless Networks (IEEE 802.11b)</b>	<b>487</b>
C11.1	Introduction	487
C11.2	Basic specification	487
C11.3	Wireless network connections	489
C11.4	IEEE 802.11b settings	491
C11.5	Encryption	493
<b>D1</b>	<b>IP</b>	<b>495</b>
D1.1	Introduction	495
D1.2	Data encapsulation	496
D1.3	TCP/IP gateways and hosts	496
D1.4	Functions of the IP protocol	497
D1.5	Internet datagram	498
D1.6	TCP/IP internets	500
D1.7	Internet naming structure	511
D1.8	Domain name system	512
D1.9	Example network	513
D1.10	IP addresses for routers	515
D1.11	IP multicasting	515
D1.12	IP Version labels	516
D1.13	IPv6	516
D1.14	Allocating IP addresses	519
D1.15	Domain name server and DHCP	520



D1.16	ICMP	521
D1.17	Additional material	524
D1.18	Class A subnet masks	530
<b>D2</b>	<b>TCP/UDP</b>	<b>531</b>
D2.1	Introduction	531
D2.2	Functions of the transport layer	533
D2.3	TCP/IP model	536
D2.4	Transmission control protocol	537
D2.5	UDP	540
D2.6	TCP specification	541
D2.7	Connection states	543
D2.8	Opening and closing a connection	546
D2.9	TCP user commands	547
D2.10	TCP/IP services reference	549
<b>D3</b>	<b>SPX/IPX</b>	<b>551</b>
D3.1	Introduction	551
D3.2	NetWare architecture	553
D3.3	NetWare protocols	555
D3.4	Novel NetWare set-up	564
<b>D4</b>	<b>NetBEUI and NetBIOS</b>	<b>567</b>
D4.1	Introduction	567
D4.2	NetBIOS	568
D4.3	NetBIOS over TCP/IP (NetBT)	570
D4.4	NWLink IPX/SPX/NetBIOS Compatible Transport Protocol	571
<b>D5</b>	<b>PPP, SLIP and VPN's</b>	<b>575</b>
D5.1	Introduction	575
D5.2	Frame format	578
D5.3	Point-to-Point Protocol over Ethernet (PPPoE)	580
D5.4	PPP operation	580
D5.5	Remote scripts	584
D5.6	PPP programming for routers	592
D5.7	Securing a PPP connection	593
<b>D6</b>	<b>TCP/IP Commands</b>	<b>595</b>
D6.1	Introduction	595
D6.2	ping	597
D6.3	ftp (file transfer protocol)	598
D6.4	tracert	598
D6.5	nslookup	600
D6.6	Windows programs	601
<b>D7</b>	<b>Socket programming</b>	<b>605</b>
D7.1	Introduction	605
D7.2	WinSock using C++	605
D7.3	Visual Basic socket implementation	614
D7.4	Client/server VB program	620
D7.5	Server connecting to multiple clients	626
D7.6	Java sockets	629
D7.7	Java networking methods	634

D7.8	Delphi sockets	642
<b>E1</b>	<b>Routers</b>	<b>653</b>
E1.1	Introduction	653
E1.2	Router types	653
E1.3	Router specifications	656
E1.4	Router configuration and start-up	657
E1.5	Router commands	659
E1.6	Cisco discovery protocol	668
E1.7	Cisco router commands	670
<b>E2</b>	<b>Routing protocols</b>	<b>673</b>
E2.1	Introduction	673
E2.2	Routing fundamentals	674
E2.3	Classless interdomain routing, route summarization and supernetting	676
E2.4	Variable-length subnet masks	677
E2.5	Routing protocol techniques	678
E2.6	RIP	684
E2.7	OSPF	685
E2.8	IGRP	687
E2.9	EGP/BGP	687
E2.10	BGP specification	690
E2.11	BGP configuration	695
<b>E3</b>	<b>Security</b>	<b>697</b>
E3.1	Introduction	697
E3.2	Firewalls	698
E3.3	Application-level gateways	700
E3.4	Ring-fenced firewalls	701
E3.5	Encrypted tunnels	702
E3.6	Filtering routers	703
E3.7	Security	705
E3.8	Viruses	712
E3.9	AAA	715
<b>E4</b>	<b>Router programming and ACLs</b>	<b>717</b>
E4.1	Router programming	717
E4.2	ACLs	719
E4.3	Network address translation	726
E4.4	Programming dynamic NAT	727
<b>E5</b>	<b>Encryption</b>	<b>731</b>
E5.1	Introduction	731
E5.2	Encryption and the OSI model	731
E5.3	Legal issues	732
E5.4	Random number generators	733
E5.5	Cryptography	733
E5.6	Government pressure	735
E5.7	Cracking the code	736
E5.8	Letter probabilities	737
E5.9	Basic encryption principles	738
E5.10	Message hash	747

E5.11	Private-key	747
E5.12	Letter probability program	756
E5.13	Occurrences of English letters, digrams, trigrams and words	757
<b>E6</b>	<b>Public-key encryption</b>	<b>759</b>
E6.1	Introduction	759
E6.2	Authentication	771
E6.3	Internet security	779
E6.4	VB RSA program	788
<b>F1</b>	<b>Electronic mail</b>	<b>793</b>
F1.1	Introduction	793
F1.2	Shared-file approach versus client/server approach	794
F1.3	Using an e-mail client	795
F1.4	Electronic mail overview	796
F1.5	SMTP	797
F1.6	MIME	803
F1.7	Post Office Protocol (POP)	811
F1.8	Smilies and acronyms	812
<b>F2</b>	<b>WWW and HTTP</b>	<b>815</b>
F2.1	Introduction	815
F2.2	Advantages and disadvantages of the WWW	817
F2.3	Client/server architecture	818
F2.4	Web browsers	818
F2.5	Universal resource locators (URLs)	819
F2.6	Web browser design	823
F2.7	HTTP	824
F2.8	HTTP reference	832
F2.9	Example conversation	838
<b>F3</b>	<b>SNMP, Wins, Bootp, DNS and DHCP</b>	<b>841</b>
F3.1	Introduction	841
F3.2	SNMP	842
F3.3	SNMP for Windows	851
F3.4	RMON (Remote Monitoring)	851
F3.5	EASE (Embedded Advanced Sampling Environment)	852
F3.6	Bootp protocol	852
F3.7	DHCP	854
F3.8	Domain name server	858
F3.9	WINS	860
<b>F4</b>	<b>FTP/HTTP/Telnet set up and programming</b>	<b>863</b>
F4.1	FTP	863
F4.2	Telnet	864
F4.3	FTP programming	868
F4.4	HTTP programming	873
<b>G1</b>	<b>Networking Operating Systems</b>	<b>875</b>
G1.1	Introduction	875
G1.2	Microsoft Windows	875
G1.3	Active Directories	886
G1.4	Internet connection sharing	887

<b>G2</b>	<b>UNIX</b>	<b>889</b>
G2.1	Introduction	889
G2.2	File attributes	889
G2.3	TCP/IP protocols	892
G2.4	Directory structure	894
G2.5	On-line manual	895
G2.6	Changing directory	896
G2.7	Listing directories	897
G2.8	File attributes	898
G2.9	Special characters ( *, ? and [])	901
G2.10	Listing contents of a file	902
G2.11	Copying, moving and listing	903
G2.12	Standard input and output	905
G2.13	File manipulation commands	907
G2.14	File locations	911
G2.15	Date	912
G2.16	XDR format	912
<b>G3</b>	<b>Novell NetWare and NDS</b>	<b>919</b>
G3.1	Novell NetWare	919
G3.2	NDS	926
<b>H1</b>	<b>Software Development</b>	<b>941</b>
H1.1	Introduction	941
H1.2	Integrated development environment	946
H1.3	Procedural or modular programming	946
H1.4	Event-driven programming	948
H1.5	Object-oriented programming	949
H1.6	Interpreted languages	951
H1.7	Compiled languages	955
H1.8	Assembled languages	965
H1.9	Cross compiler	967
H1.10	Three layers of programming	967
<b>H2</b>	<b>WWW programming</b>	<b>969</b>
H2.1	Introduction	969
H2.2	Languages which integrate with HTML	972
H2.3	VBScript	973
H2.4	JavaScript	973
H2.5	ASP	973
H2.6	JSP	974
H2.7	PHP	975
H2.8	CGI	975
H2.9	XML	976
H2.10	WML	976
H2.11	Java and WWW pages	977
H2.12	CSS	978
<b>H3</b>	<b>HTML</b>	<b>979</b>
H3.1	Links	979
H3.2	Lists	980

H3.3	Colors	984
H3.4	Background images	985
H3.5	Displaying images	986
H3.6	Horizontal lines	988
H3.7	Anchors	989
H3.8	Tables	991
H3.9	Forms	994
H3.10	Multimedia	998
<b>H4</b>	<b>JavaScript</b>	<b>1001</b>
H4.1	Introduction	1001
H4.2	Maths operations	1007
H4.3	Language basics	1009
H4.4	Examples	1011
H4.5	Various examples	1014
H4.6	Functions called from events	1015
H4.7	Linking with forms	1017
H4.8	JavaScript and Flash	1019
H4.9	JavaScript reference	1020
H4.10	Objects, properties, methods and event handlers	1023
<b>H5</b>	<b>PHP</b>	<b>1027</b>
H5.1	Introduction	1027
H5.2	PHP examples	1029
H5.3	Strings	1055
H5.4	PHP details	1060
<b>H6</b>	<b>PHP (sessions and databases)</b>	<b>1063</b>
H6.1	Cookies	1063
H6.2	Forms	1064
H6.3	Session details	1065
H6.4	Session logging	1066
H6.5	COM	1067
H6.6	Databases	1072
H6.7	Getting details from a form	1075
H6.8	Emailing details from a form	1077
H6.9	Database creation, addition and recall	1078
H6.10	Flash	1080
H6.11	Networking	1081
<b>H7</b>	<b>ASP</b>	<b>1085</b>
H7.1	Introduction	1085
H7.2	ASP objects	1087
H7.3	ASP basics	1087
H7.4	File system access	1100
H7.5	ASP reference	1107
H7.6	FSO Reference	1113
<b>H8</b>	<b>ASP (form, sessions and databases)</b>	<b>1117</b>
H8.1	ASP forms	1117
H8.2	Session object	1119
H8.3	Databases	1120

H8.4	ASP installable components	1126
<b>H9</b>	<b>Java</b>	<b>1131</b>
H9.1	Introduction	1131
H9.2	Standalone programs	1133
H9.3	Comments	1134
H9.4	Java reserved words	1134
H9.5	Numbers and representations	1134
H9.6	Data types	1135
H9.7	Characters and strings	1136
H9.8	Declaration of variables	1138
H9.9	Java operators	1139
H9.10	Precedence	1144
H9.11	Data type conversion	1145
H9.12	Selection statements	1146
H9.13	Loops	1150
H9.14	Objects and Classes	1156
H9.15	Java Class Libraries and Arrays	1165
<b>H10</b>	<b>Java (applets and events)</b>	<b>1175</b>
H10.1	Java applets	1175
H10.2	Java mouse and Keyboard methods	1179
H10.3	Java graphics and sound	1192
H10.4	Java buttons and menus	1200
<b>H11</b>	<b>Java (date, strings and multithreading)</b>	<b>1221</b>
H11.1	Java text and date	1221
H11.2	Strings	1231
H11.3	Exceptions	1239
H11.4	Multithreading	1244
<b>H12</b>	<b>XML</b>	<b>1253</b>
H12.1	Introduction	1253
H12.2	XML syntax	1256
H12.3	XML/Flash	1259
H12.4	Reusable component	1264
H12.5	XML-based component	1264
H12.6	DOM	1267
<b>H13</b>	<b>DHTML</b>	<b>1271</b>
H13.1	Introduction	1271
H13.2	Filters	1277
H13.3	z-index	1285
H13.4	<DIV> tag	1285
<b>H14</b>	<b>CSS (Cascadable Style Sheet)</b>	<b>1291</b>
H14.1	Introduction	1291
H14.2	CSS file definitions	1292
H14.3	Link attributes	1293
H14.4	Redefining standard styles	1294
H14.5	CSS Properties	1294
H14.6	CSS Length Units	1299

<b>H15</b>	<b>WAP</b>	<b>1301</b>
H15.1	Introduction	1301
H15.2	WML reference	1304
H15.3	Input Elements	1309
H15.4	ASP/PHP interfaces with WML	1311
H15.5	References	1315
<b>I1</b>	<b>Multimedia</b>	<b>1317</b>
I1.1	Introduction	1317
I1.2	Multimedia development	1320
I1.3	Content design and delivery	1322
I1.4	CD-ROMs	1326
I1.5	Audio components for multimedia	1330
<b>I2</b>	<b>Databases and data storage</b>	<b>1333</b>
I2.1	Introduction	1333
I2.2	Database creation steps	1335
I2.3	Relationships	1336
I2.4	SQL query	1337
I2.5	Data Protection	1340
I2.6	Personalization and Data Mining	1341
I2.7	Examples	1346
I2.8	SQL reference	1347
I2.9	Database Management Systems (DBMS)	1350
<b>I3</b>	<b>Design Tips (Part 1)</b>	<b>1351</b>
I3.1	Introduction	1351
I3.2	Paint strokes	1351
I3.3	Focal point graphics	1351
I3.4	Xmas, and seasonal graphics	1351
I3.5	Producing sharp graphics	1353
I3.6	Distorting graphics and transparency	1354
I3.7	Mouse-over events and layers	1356
I3.8	Enhancing metafiles	1356
I3.9	Bullets	1357
I3.10	Graphic file formats	1357
I3.11	Adding opacity to a background image	1358
I3.12	Column corners	1359
I3.13	Transparent backgrounds	1360
I3.14	Lines in tables	1361
I3.15	Animating objects	1363
I3.16	Creating pop-up message boxes	1363
I3.17	Drawing lines in diagrams	1366
I3.18	Scaling graphics for text	1368
I3.19	Designing for easy configuration	1371
I3.20	Creating icons for program files	1372
I3.21	Pencil first, package later	1374
I3.22	From sketch to graphic	1376
<b>I4</b>	<b>Design Tips (Part 2)</b>	<b>1379</b>
I4.1	From photo to graphic	1379

I4.2	To Matte or not to matte	1383
I4.3	From Vector to Graphic	1384
I4.4	Animation	1385
I4.5	Tracing designs	1385
I4.6	Logo Mania	1387
I4.7	Animating the Alien	1390
I4.8	Experimenting with designs	1391
I4.9	XML and reuse	1393
I4.10	Showing text where to go	1396
I4.11	Fade-in, fade-out	1398
I4.12	Programming with Flash	1398
I4.13	Dragging events in Flash	1400
I4.14	Reusing forms	1402
I4.15	Other examples	1403
<b>Ap1</b>	<b>Modem codes</b>	<b>1405</b>
Ap1.1	AT commands	1405
Ap1.2	Result codes	1408
Ap1.3	S-registers	1409
<b>Ap2</b>	<b>HTML Reference</b>	<b>1415</b>
Ap2.1	Introduction	1415
Ap2.2	Document structure and block structuring	1419
Ap2.3	Elements	1421
Ap2.4	ISO Latin-1 Character Set	1422
Ap2.5	Additional Named Entities for HTML	1428
Ap2.6	Character Entities for Special Symbols	1432
Ap2.7	Character Set Recognition	1433
<b>Ap3</b>	<b>ASCII Reference</b>	<b>1437</b>
Ap3.1	Standard ASCII	1437
Ap3.2	Extended ASCII code	1439
<b>Ap4</b>	<b>Glossary</b>	<b>1441</b>
<b>Ap5</b>	<b>Abbreviations</b>	<b>1461</b>
<b>Ap6</b>	<b>Quick reference</b>	<b>1473</b>
Ap6.1	Miscellaneous	1473
Ap6.2	Windows NT architecture	1481
<b>Ap7</b>	<b>Quick questions</b>	<b>1483</b>
<b>Ap8</b>	<b>Ethernet monitoring system</b>	<b>1501</b>
<b>Ap9</b>	<b>Java reference</b>	<b>1503</b>
Ap9.1	Package java.applet	1503
Ap9.2	Package java.awt	1504
Ap9.3	Package java.awt.datatransfer	1524
Ap9.4	Package java.awt.event	1525
Ap9.5	Package java.awt.image	1529
Ap9.6	Package java.io	1529
Ap9.7	Package java.lang	1540
Ap9.8	Package java.net	1553
Ap9.9	Package java.util	1555



<b>Ap10 NIS, NFS, RC, FTP and DNS</b>	<b>1561</b>
Ap10.1 Example Internet domain name server files	1561
Ap10.2 TCP/IP services	1563
Ap10.3 netnfsrc file	1565
Ap10.4 rc file	1569
Ap10.5 FTP commands	1573
Ap10.6 Telnet	1574
<b>Ap11 RFC's</b>	<b>1575</b>
<b>Ap12 Assigned number values</b>	<b>1591</b>
Ap12.1 IP Special addresses	1591
<b>Index</b>	<b>1611</b>

# Preface

This is one of the most exciting times in technology, ever, and the Internet has the potential to change the way that people work and play, in a way that few technological areas have ever done before. It will soon become part of the fabric of our life, in the same way that the motor car, the telephone and the television have done in the past. The greatest problem is that Internet technology is moving so fast that it is difficult to keep up with it. Thus, it is important to understand the key underlying principles of it, which allows everyone to learn new developments. This book, and the associated WWW site and CD-ROM, will hopefully help provide this foundation. It contains over 1600 pages within 74 chapters and appendices, arranged in nine main sections. These sections are:

- A. **Distributed Systems.** These chapters contain information on the underlying operating systems, and how resources are shared over local systems, and also over networks.
- B. **Data Communications.** These chapters contain information on the basic principles of transmitting data over an electronic connection.
- C. **Networks.** The Internet could not exist without the connection of nodes to networks. These chapters discuss many of the main networking technologies, such as Ethernet, ATM, ISDN, and modem connections.
- D. **Network Protocols.** These chapters outline some of the protocols that are used to transfer data from one node to another over the Internet.
- E. **Routers and Security.** Routers are important devices on the Internet and allow data to be routed from one node to another. Along with routers, the main elements of security are covered in these sections. These chapters include coverage of firewalls, proxy servers, and encryption.
- F. **Session Protocols.** Session layer protocols are important in the reliable transmission of data over the Internet, as they allow two nodes to negotiate a connection, and then pass information about the session. The main session protocols which are supported on the Internet are electronic mail, the WWW, and FTP/Telnet. These chapters cover the operation of these important protocols.
- G. **Networking Operating Systems.** The Internet could not really exist in its current form without an underlying network operating system which integrates the network, networking protocols, and other devices to produce an integrated system. These chapters cover the three main network operating systems: Microsoft Windows, Novell NetWare and UNIX.
- H. **WWW fundamentals.** These chapters cover the key principles of WWW presentation, and the methods which are used to add extra functionality to the WWW.
- I. **Multimedia and databases.** These chapters outline how multimedia can be used over the Internet, and how databases operate in a distributed system.

The appendices include reference material on related subjects, such as server configuration, and reference guides for important commands. Along with the book, the associated CD-ROM contains a fully searchable version of the book. It also contains the associated source code, and RFC documents.

Help is provided by the author from the e-mail address of:

w.buchanan@napier.ac.uk

or from the associated WWW site at:

[http://www.soc.napier.ac.uk/~bill/hand\\_int.html](http://www.soc.napier.ac.uk/~bill/hand_int.html)

or

[http://buchananweb.co.uk/hand\\_int.html](http://buchananweb.co.uk/hand_int.html)

Dr William Buchanan,  
Senior Lecturer,  
School of Computing,  
Napier University,  
Edinburgh. UK.