tasks for the network analyst, 10

# Index

4 NOPs in a Row, 8, 331, 481, 718, See also

Twitter traffic analysis, 270
virus detection programs, phone hom- behavior of, 790
web browsing endpoint analysis, 227
application mapping, 760–62
Apply as Column feature, 88
Arkin, Ofir, 767
ARP analysis, 375–87 analyzing problems, 380 ARP cache, 346–47
broadcast, 346 capture filter syntax, 383 case study of troubleshooting, 385 display filter for requests, 251
display filter syntax, 383 example display filters, 383
gratuitous process, 379 local capture only, 376 not visible in IP address list, 231 opcodes, 382 overview, 343, 376 packet structure, 382 ping analysis, 740 poisoning, 380, 794 protocol settings, 172 proxy, 380 proxy response filter, 383 RFC 826, 376 scan analysis, 740 standard lookup requests, 377 static address bootup uses, 379
storm detection, 172, 381
target hardware address, 382
target protocol address, 382 unicast responses not seen, 380 attack signatures, 800–802 header signatures, 801 LDPinch Trojan Loader, 801 locations, 800

payload signatures, 801 sequence signatures, 801	C
Weevely PHP backdoor, 802 Win32 Rimecud Trojan, 802	CACE Technologies, 2
Win32 Sykipot Trojan Backdoor, 801	canonical name, 358, See also DNS analysis
automatic scrolling feature, warnings about, 164 avoiding detection of your Wireshark system, 725–28, 734	Capinfos, 828–30 examples of, 829 overview, 828 syntax, 828
В	<i>capture filters, 135–51</i> "Not my MAC" filter, application analysis
application launch and key tasks, 687 bootup sequence, 686 broadcasts and multicasts, 685 detecting unusual traffic by, 791 elements of, 685 idle time, 687, 695 key uses of, 684 login/logout sequences, 687 name resolution sessions, 688 overview, 684 protocols and applications, 685 saving traffic subsets, 309 suspect traffic does not match, 778 throughput tests, 688 VoIP communications, 689 web browsing sessions, 688 wireless connectivity, 689	with, 144 based on TCP flags, 141 byte offset, 146 cfilters file default <i>cfilters</i> file, 137 global settings, 156 in corporate profile, 298 in profiles, 296 in security profile, 300 in troubleshooting profile, 297 in VoIP profile, 299 in WLAN profile, 298 manually editing the <i>cfilters</i> file, 147 sample <i>cfilters</i> file, 148 update overrides, 158 DNS traffic, 145 exclusion filters, 144 filter by address or host name, 141
Bejtlich, Richard, 92	filter by application, 145 filtering by protocol, 141
Berkeley Packet Filter (BPF) format, 250, See also capture filters	identifier, 139 My MAC for application analysis, 143
Bjørlykke, Stig, 167	operators, 145 overview, 136
Bluetooth traffic, capturing, 38	portrange filter, 145
BOOTP. See DHCPv4 analysis	primitives, 140
broadband internet modem, troubleshooting, 130	profiles used in, 137
broadcasts addresses, 226 excessive numbers of, 401 lookups vs. announcements, 401 browsing problems with Flow Graphs, 235 buffer size, 126	qualifiers, 139 sample formats for, 140 sharing the <i>cfilters</i> file, 148 tcpdump filter syntax, 136 UDP for SIP and RTP traffic, 299 use in multiple interfaces, 138 warnings regarding, 136 warnings using "host", 143

Capture menu	restarting, 59
capture filters, 59	setting preferences, 162
capture interface list, 58	simultaneous multiple adapter capture, 120
capture options, 58	stopping, 59
capture traffic, 103–34	testing a hub, 107
AirPcap, 34–35	using the ring buffer, 125
analyzer placement for measuring	WinPcap, 34–35
round trip time, 104	Cascade Pilot, 34, 314
analyzer placement in WLAN	case studies
networks, 117–18	"Securely Invisible" Network, 22
analyzer placement overview, 104	Absolving the Network from Blame, 350
automatic stop, 125	Application Analysis
capture interfaces window, 119-20	Aptimize Website Accelerator, 238–42
default interface, 162	Capturing Traffic at Home, 130
dual captures, 119	Catching Keylogging Traffic, 804
half-duplex capture with a hub, 107	Catching Viruses and Worms, 271
half-duplex networks, analyzing, 107	Chatty Browser, 270
interface details, 120	Colorizing SharePoint Connections
interfaces not seen, 119	During Login, 191
interfering programs, 126	Connections Require Four Attempts, 489
libpcap, 34–35	Cooking the WLAN, 650–51
port mirroring. See port spanning	Cruddy Barcode Communications, 648–49
port spanning, 113	Customizing Wireshark for the
cheating, 116	Customer, 301
destination span port, 113	Dead-End Router, 439
egress traffic, 113	Death by ARP, 384
example span commands, 114	Declining Clients, 538–39
ingress traffic, 113	Detecting Database Death, 93–94
monitor port, 113	DNS Killed Web Browsing Performance,
source span port, 113	368–70
source span VLAN, 113	Dual Capture Points the Finger, 128–29
spanning VLANs, 115	Everyone Blamed the Router, 416
promiscuous mode	Expert Info Catches Remote Access
definition of, 117	Headaches, 333–36
enabling, 163	Finding VoIP Quality Issues, 243–44 Flooding Host, 803
errors on WLAN capture, 626 scanning with NetScanTools Pro, 727	Getting GETS and a Suspect, 843
	Graphing RTT to the Corporate
remote capture active and passive mode, 123	Office, 516–18
analyzer agents, 112	HTTP Proxy Problems, 575
example configuration, 121	It's Not the Network's Problem, 417
hosts permitted to access, 121	Kerberos UDP to TCP Issue, 149–50
overview, 121–23	Learning the Conficker Lesson, 770–71
rpcapd, 132	Login Log Jam, 690
rpcapd configuration parameters, 122	Lost VoIP Tones, 677–78
rpcapd daemon, 121	Non-Standard Web Server Setup, 176
saving capture configurations, 123	Passively Finding Malware, 805
54, 1115 captair configurations, 125	- 4001, 41, 1

Perfect Storm of Network Problems,	in WLAN profile, 299
715–18	update overrides, 158
Pruning the Puke, 21	copying vs. import/export, 184
Saving Subsets of Traffic to Isolate	default placement of new rule
Problems, 315–16	(Wireshark 1.8 and later), 185
Secret FTP Communications, 596–97	defaults, 55, 182
SMTP Problem - Scan2Email Job, 617	disable all, 183
Solving SAN Disconnects, 691	disabling checksum errors, 127
SSL/TLS Vulnerability Studied, 732–33	HSRP state change, 182
Tale of the Missing ARP, 385–86	HTTP error detection, 185
Testing QoS Policies, 519	identifying the source, 184
Time Column Spots Delayed ACKs,	importing/exporting, 184
214–15	incorrect coloring prior to
Troubleshooting Time Synchronization,	Wireshark 1.8, 330
452	LDPinch Loader Binary Request coloring
Unknown Host Identified, 288	rule, 801
Using Filters and Graphs to Solve Database	low time to live value, 182
Issues, 269	order of processing, 185
Watching Performance Levels Drop, 515	OS fingerprinting signatures, 766
cfilters file, 137, See also capture filters	OSPF state change, 182
Character Generator (chargen), 761	overview, 182
	reDuh backdoor coloring rule, 800
checksum errors coloring rule, 184	striped traffic, 428
disabling coloring rule, 127	TCP resets, 182
invalid IP header, 251	unusual traffic patterns, 730
newer Wireshark defaults, 127	using names for filtering, 325
task offloading, 120, 127	Weevely PHP backdoor coloring rule, 802
validation settings, 173	Win32 Rimecud.A coloring rule, 802
<del>-</del>	Win32 Sykipot GET coloring rule, 802
Cisco	Window Update excluded from
ACL rules, 72	Bad TCP, 55
Cisco IOS, 114	Colton, busy little dude, 8
Cisco Nexus 7000 Series switches, 34	columns
Cisco PIX firewall TCP sequence number	Apply as Column feature, 86
randomization issue, 617	Bug 6077 - Rearranging in
CSCsw70786 - SACK stripped off, 19	Preferences, 177
port security issues, 115	default, 161
span command example, 114	default packet length, 710
code_swarm, 30	display filtering on, 256
coloring rules, 181–96	hide/display, 60
ARP, 182	occurrence of a field, 86
bad TCP traffic, 182, 325	re-ordering, 161
colorfilters file	settings, 86
global version, 182	tcp.len, 710
in corporate profile, 298	Combs, Gerald, xxvii, xxxvi, 30, 32
in profiles, 296	Command and Control (C&C) servers, 724, 730,
in security profile, 300	779, See also security analysis
in troubleshooting profile, 297	
in VoIP profile, 299	

Comments in trace files. See Annotations	Client MAC Address field, 533
in trace files	client outside address lease time, 527
compare	Decline, 528
packets side-by-side, 56	Discover process, 447, 528
trace files in IO Graphs, 506	Discover-Offer-Request-Acknowledgment
using merged files to graph performance	sequence, 527
comparison, 506	display filter examples, 251, 537
using summaries for, 211	duplicate address problems, 530
connectivity tests, analyzing, 427	Hardware Length field, 532
conversations	Hardware Type field, 532
coloring, 187	Hops field, 532
definition of, 226	Information, 528
lists, 228	Lease Time (LT), 528
saving information, 314	Magic Cookie, 533
statistics, 226	Message Type field, 532
vs. endpoints, 65	Message Type field values, 528
copy feature, 85	Negative Acknowledgment, 528
	Next Server IP Address field, 532
Cummings, JJ, 92	Offer, 528
CVE-2009-3103 – malicious SMBv2 packets, 784	Options list, 533
	overview, 343, 526
D	packet structure, 532
<u>D</u>	Rebind Time (T2), 528
data link layer, two parts of, 15	rebinding state, 528
	relay agent display filter, 251
Data Protection Directive, European Union, 12	Relay Agent IP Address field, 533
database traffic	relay agents, 529
case study analyzing, 93	Release, 528
unique characteristics of, 229	Renewal Time (T1), 528
DCE RPC traffic, 791	Request, 528
decryption. See also SSL/TLS analysis	Request-Acknowledgment sequence, 527
key management, 628	Seconds Elapsed field, 532
SSL data tab, 574	Server Host Name field, 533
default gateway, location of, 346	Transaction ID field, 532
Degioanni, Loris, 30	Your (Client) IP Address field, 532
delta time analysis, 205, See also time analysis	DHCPv6 analysis, 534–36
	Advertise, 534
DHCPv4 analysis, 525–33	capture filter syntax, 537
Acknowledgment, 528	client and server ports, 534
analyzing problems, 530	display filter examples, 537
Boot File Name field, 533	message type list, 535
BOOTP Flags field, 532	multicast discovery address, 534
BOOTP-DHCP statistics, 536	overview, 534
capture filter syntax, 537	Request, 534
capture filter warning, 531	Solicit, 534
Cisco router as a Relay Agent, 529	Differentiated Services Code Point (DSCP), 300,
client and server ports, 526	396, 403, 676
client inside address lease time, 527	

disabling protocols disabled protos file in profiles, 296	expressions, 255 field names in status area, 259
warnings, 61	filter expression buttons, 51, 80, 170
discovery processes	filtering on offset and bytes, 252
analyzing scans, 745	filtering on time values, 701
application mapping with NULL	Firefox browser, display filter for, 557
probes, 761	identify existence of field, 261
idle scans using zombies, 753	IPv4 address, 266
OS fingerprinting	IPv6 address, 266
active process, 765	IPv6 examples, 415
coloring rules, 766	IRC JOIN packets, 781
display filters, 767	LDPinch Loader Binary Request filter, 801
ICMP-based, 767	macros, 264
passive process, 763	maximum entries to list, 80
sample display filter for, 300	offset filters, 262
signatures, 765	operators, 260
User-Agent information, 763–64	OS fingerprinting, 767
path discovery mechanisms, 757	overview, 36, 250
ping scan analysis, 742	parentheses, 261
port scans, 743	prepare as filter, 257
stealth scan signature, 744	recently used setting, 80
traceroute	reDuh backdoor filter, 800
ICMP, TCP and UDP variations, 428	reordering filter list, 267
overriding default TTL values, 399	saving, 254
· ·	syntax, 259, 415
Dispensa, Steve, 570	TCP analysis flags, 251, 261
display filters, 249–75	TCP conversation timestamp filtering, 702
application analysis, 270	TCP flag summary line, 479
Apply as Filter, 60, 257	upper or lower case ASCII, 263
applying to IP destination statistics, 231	use for comparing, 211
auto-complete, 253	used for coloring rules, 259
color coding of, 264	using expressions, 255
common mistakes, 266	using regular expressions (RegEx), 263
conversation directions, 258	using with Tshark, 252
conversations and endpoints, 258	validity checking mechanism, 253, 264
creating for Expert Info elements, 326	warning against using
dfilters file	frame.time delta displayed, 701
global settings, 156	Weevely PHP backdoor filter, 802
in corporate profile, 298	Win32 Rimecud.A filter, 802
in profiles, 296	Win32 Sykipot GET filter, 802
in security profile, 300	dissectors
in troubleshooting profile, 297	Decode As function, 61, 779
in VoIP profile, 299	dissector tables, 73
in WLAN profile, 298	for VoIP, 662
manually editing, 267	forcing, 61
update overrides, 158	handoff process, 36
dfilters_macros file, 264–65	learn to create, 35
DSCP example, 300	none available for application, 289
examples of expressions, 255	overview, 36

DNS analysis, 355–72	overview, 839
Additional RRs Count, 365 Answer Resource Record (RR) Count, 365	syntax of, 839
	-t to use separate threads, 840
authoritative answer, 364	Duplicate ACKs, 329, See also Expert Info
Authority RRs Count, 365	duplicate IPv4 addresses, 376, See also IPv4
cache, 781	analysis
cache timeout, 349	
cached information, 348	duplicate IPv6 addresses, 343, See also IPv6
canonical name (CNAME), 24, 358, 781	analysis
capture filter examples, 145	duplicate packets
concurrent resolution, 167	in dual captures, 128
display filter examples, 367	removal with Editcap, 831
DNS Transaction ID matching, 363	VPN client causes, 126
examples of problems, 429	Dynamic Host Configuration Protocol (DHCP).
filter on error responses, 367	See DHCPv4 analysis and DHCPv6 analysis
Flags field, 363	
host name filter, 251	${f E}$
mDNS filtering, 367	
network name resolution overview, 345	Edit menu, 47–51
No Such Name response, 359	configuration profiles, 50
overview, 343, 356	Edit or Add Packet Comment, 50
packet structure, 362	mark packets, 47
pointer query filter, 367	preferences, 50
ports used for UDP or TCP, 362	time reference, 48
problem examples, 359	time shift, 49
PTR queries from Wireshark, 53	Editcap, 831–33
Query format, 365	adjusting timestamps, 832
query process, 357	examples of use, 833
query type, 365	overview, 831
Question Count, 365	split a trace file, 832
recursion, 364	syntax, 831
Resource Record TTL field, 366	truncate packets, 832
response codes, 364	use in dual captures, 119
response process, 357 retries, 361	electronic surveillance, 12, See also legal issues
sample analysis process for, 24	_
Server Failure responses, 359	encrypted communications, 413, See also SSL/TLS analysis
Transaction ID field, 363	•
truncation, 364	encryption validation, use of, 789
unsolicited response packet, 768	endpoints
	definition of, 226
Domain Name System (DNS). See DNS analysis	lists, 228
Dual-Tone Multi-Frequency (DTMF), 660,	saving information, 314
See also VoIP analysis	Enhanced Interior Gateway Routing Protocol
Dumpcap, 839–40	(EIGRP), 752
examples of use, 840	Errors & Omissions, 12, See also legal issues
memory requirements, 127	

Ethereal creation of, 30 name change from, 30	Zero Window, 329 Zero Window Probe, 329 Zero Window Probe ACK, 329
Ethernet header structure, 262 Maximum Transmission Unit (MTU), 229	Expert Info Composite data files cannot be Window Updates, 330 exporting
packet sizes, 229 source address filter, 262	CSV format, 311 HTTP objects, 46
Ettercap, 795	HTTP objects warning, 46
Expert Info, 321–39 4 NOPs in a Row, 331 ACKed Lost Packet, 328 button color classifications, 322 chats, 41, 322 color coding of button, 41	packet bytes, 314 raw data format, 314 SSL Keys, 46 to Excel, 311–13
coloring scheme, 41	
debates regarding development, 327 depicting packet loss, 323 description, 468 Duplicate ACKs definition of, 328 graphing, 504 Time-Sequence graph depiction of, 514 duplicate IP addresses detected, 794 enabling LEDs, 323 errors, 41, 322 expanding packet lists, 323 Fast Retransmission, 330 Fast Retransmission and Retransmission under Notes (Wireshark 1.8 and	file identifiers, 283, See also reassembly  File menu, 43–46 export, 45 file set, 44 import, 44 merge, 43 open recent, 43  file sets, 44 booktcpset*.pcapng sample, 44 multiple stop criteria, 125 naming convention, 124 next file criteria, 124 overview, 124
later), 323	used for optimization, 126 viewing, 44
Fast Retransmissions moved to Notes, 322	working with large trace files, 226
Keep Alive, 328 Keep Alive ACK, 329	File Transfer Protocol (FTP). See FTP analysis
LEDs on tab labels, 41 notes, 41, 322	firewall effect on traffic, 17, See also security analysis, firewalls
Out-of-order, 330	fragmentation, 393, See also IPv4 analysis
overview, 322 Previous Segment Lost, 323, 328 Retransmissions, 327 TCP Ports Reused, 331 validating discoveries, 323 warnings, 41, 322 Window is Full, 331 Window Update, 330	frame sizes low Maximum Transmission Unit (MTU) size, 392, 423 Maximum Segment Size (MSS) option, 480 Maximum Segment Size (MSS) value, 229 small Maximum Segment Size (MSS) value, 471

frames vs. packets, 44	graphing, 495–521
FTP analysis, 581–99	advanced IO Graph
331 Password Required, 585	AVG(*) calc value, 503
425 Error—Possible bounce attack/FXP	COUNT(*) calc value, 504
transfer, 590	launching, 501
Active Mode file transfer, 588	LOAD(*) calc value, 505
capture filter syntax, 594	logarithmic comparison of analysis
client commands list, 583, 591	flags, 505
command channel, 283, 582, 585	MAX(*) calc value, 503
connection problems, 589	MIN(*) calc value, 503
CWD (change working directory)	overview, 501
command, 586	SUM(*) calc value, 501
data channel, 585	advanced IO Graphs
detect password errors, 799	MIN, MAX and AVG, 66
display filter examples, 594	Flow Graphs
display filter expressions, 255	saving in ASCII format, 234, 314
display filter syntax, 586, 594	spotting browsing problems, 235
NLST (directory list) command, 588	IO Graphs
overview, 582	appear empty, 496
packet structure, 591	beacon problems, 637
PASS (password) command, 585	color assumptions, 499
passive mode operations, 586	comparing trace files in, 506
passive mode problem, 589	logarithmic scale use, 500
PASV (passive mode) command, 586	overview of basic, 497
reassembling traffic, 595	printing, 501
resolution processes preceding, 344	save feature limitations, 314
response codes, 592	Smoothing, 500
RETR (retrieve) command, 586	styles, 499
secret connection case study, 596	TCP payload lengths, 710
server response codes, 583	tick interval, 497
single-byte transfer, 797	units and scale, 497
USER command, 585	use to prioritize problems, 503
	using colors in, 499
$\mathbf{C}$	using display filters with, 498
G	X axis and the Y axis, 500
C. In	overview of basic, 496
GeoIP mapping	RTT vs. delta graphing, 518
example of use, 227	TCP Round Trip Time graph
IPv6 support, 168, 228	depicting Duplicate ACKs, 509
MaxMind databases, 168	depicting packet loss, 509
overview, 168 step-by-step setup, 168	overview of, 508
support for, 50	TCP Time Sequence graph
suspicious flags on map, 228	tcptrace compared to Stevens graph, 51
unusual results, 228	TCP Time-Sequence graph
Go many 56–57	better than Window Scaling graph, 513
1.0 monu 16_1/	

Go to Corresponding Packet, 57

Load Distribution, 558

delayed ACKs on, 471 Methods list, 555 non-standard port case study, 176 empty, 511 overview, 546 **I** bar format, 511 interpreting the receive window, 511 packet counter, 236, 559 overview, 511 packet structures, 554 plotting direction, 511 port preference setting, 563, 781 POST problem, 553 Window Size graph, 511 preferences, 174 reassemble HTTP objects, 281 H redirection, 234 Request Modifiers, 555 Help menu, 74-76 requests, Flow Graphing, 236 configuration and program folders, 76 response codes, 236 Wireshark authors list, 32 round trip time evaulations, 208 Wireshark version, 75 slow download, 323 High Technology Crime Investigation spoofed User-Agent warning, 764 Association (HTCIA), 728 statistics, 68, 558 hosts file, 167, See also Wireshark, general Status Code list, 548 HTTP analysis, 545-77 User-Agent definition, 763 website's database problem, 552 301/302 redirections, 559 Wireshark default port numbers, 547 304 Not Modified status code, 550 403 Forbidden status code, 553 404 Not Found status code, 551, 559, 711 4xx Client Error detection, 559 5xx Server Error detection, 559 ICMPv4 analysis, 425-40 Allow subdissector to reassemble TCP Address Mask Requests, 767 streams setting, 174, 550 analyzing ICMP problems, 429 applying display filters to statistics, 558 black hole detection, 420 best TCP setting for analysis, 349 capture filter syntax, 438 capture filter for non-standard ports, 556 Code list, 431 capture filter syntax, 556 **Destination Unreachable** determining web site redirections and Destination Host Unknown dependencies, 559 responses, 432 display filter examples, 557 Destination Network Unknown display filter syntax, 556 responses, 432 error coloring rule, 551 display filter, 252 example of analyzing, 4 fragmentation problems, 432, 438 exporting objects, 281, 558 Host Unreachable or Network Flow Graphs, 561 Unreachable, 346 follow the stream of a POST process, 281 Port Unreachable responses, 360, 432 GET and POST, 68 protocol unreachable responses, 431 GET filter, 251 purpose of, 426 GET request for /., 548 display filter for unusual ping packets, 438 Host field, 555 display filter syntax, 438 If-Modified-Since modifier, 556 Echo Requests and Echo Replies listing requests, 559

("pings"), 427

errors in coloring rules, 182 excessive redirects, 429

Fragmentation Needed, but Don't Fragment	Internet Relay Chat (IRC). See IRC analysis
Bit Set, 393	Internet Storm Center (ISC), 743
ICMP-based pings, limitations of, 740	Intrusion Detection System (IDS), 724
Information Requests, 767	IO Graphs, 66, See also graphing, advanced
MTU size issues, 230	IO Graphs
OS fingerprinting display filter, 438	•
overview, 343, 426	IPsec
packet structure, 430	Authentication Header (AH), 413
path discovery, 757	Encapsulating Security Payload (ESP), 413
redirection, 346, 426, 429, 433, 793	IPv4 analysis, 391–421
required fields, 430	0.0.0.0 source address, 400
Router Advertisement, 439, 760	address conflict, 380
Router Solicitations, 439, 760	address details, 231
Timestamp Requests, 767	address display filter mistakes, 266
Type list, 430	capture filter syntax, 415
ICMPv6 analysis, 434–38	Destination Address field, 400
capture filter syntax, 438	Differentiated Services field, 396
code descriptions, 436	display filter examples, 415
display filter examples, 438	duplicate IP addresses
Echo Request/Reply example, 434	detection, 172, 343
errors in coloring rules, 182	disabling detection, 381
Neighbor Advertisement, 406	gratuitous ARPs, 379
Neighbor Solicitation, 406	enable GeoIP lookups, 413, See also GeoIP
overview, 343, 426, 434	mapping
registered type numbers, 434	Explicit Congestion Notification, 396
Router Advertisement, 406	filtering on fragments, 415
Router Solicitation, 406	Flags field, 397
IEEE OUI list, 165	fragmentation
	and the TTL field, 399
gnore packets, 42, 48	Don't Fragment bit, 397
nterface list. See also Wireshark, general	overview, 393
missing Details button, 628	overwriting, 796
opening, 38	problems, 394
Internals menu, 73–74	purpose, 393
dissector tables, 73	reassembly, 413
supported protocols, 74	Fragmentation
Internet Assigned Numbers Authority	Offset field, 398
(IANA), 91, See also Websites	Header Length field, 396
Internet Control Message Protocol (ICMP).	header structure, 262
See ICMPv4 analysis and ICMPv6 analysis	ID field, 397
Internet Explorer	idle scan, 754
causing client performance problems, 711	initializing the stack, 379
detected in User-Agent string, 764	invalid destination addresses, 786
HTTP User-Agent designations, 763	Mobile IP filter, 255
	Options field, 401
Internet Group Management Protocol (IGMP), 232	overview, 342, 392
	packet structure, 395
Internet Protocol (IP). See IPv4 analysis	preferences, 413
and IPv6 analysis	Protocol field, 400

protocol scans, 752	in protocol hierarchy, 225
sanitize IP addresses, 411	JOIN command, 779
Source Address field, 400	using non-standard port, 779
spoofed address detection, 769	
Total Length field, 397	T/
traffic overview, 393	K
TTL field, 399	
decremented by routers, 399	Keep Alive, 328, See also Expert Info
expiration, 399	Keep Alive ACK, 329, See also Expert Info
low value, 757	Kerberos troubleshooting, 149
starting values for, 399	keyboard shortcuts, 188
TTL Exceeded in Transit, 433	,
unusual addresses, 394	<b>▼</b>
Version field, 395	$\mathbf{L}$
IPv6 analysis, 402–11	
6to4 Tunneling, 409	Lamping, Ulf, 38
address compression, 405	large trace files, 124, See also file sets
address display filter, 266	latency
address display filter mistakes, 266	delay before FIN/Reset, 552
anycast address definition, 405	detect with the Time column, 52
basic addressing overview, 405	high latency paths, 466
broadcast not used in, 405	high server latency example, 209
capture filters for, 415	identify high TCP time deltas, 487
Classless Inter-Domain Routing (CIDR)	practice detecting issues, 703
representation, 405	queuing depicted by Round Trip Time
Destination IP Address field, 404	graph, 509
display filters for, 415	relationship to slow performance, 200
DNS AAAA record, 19	snapshot of, 208
Duplicate Address Detection (DAD) in	spotting client latency issues, 209
IPv6, 343, 406	spotting server latency issues, 209
extension headers, 404	unacceptable times, 699
Flow Label field, 403	LDPinch Trojan Loader, 801
Hop Limit field, 404	legal issues, 12
Intra-Site Automatic Tunnel Addressing	consult counsel, 12
Protocol (ISATAP), 411	Electronic Communications and Privacy
multicast address definition, 405	Act (ECPA), "Wiretap Act", 12
Next Header field, 404	Errors & Omissions rider, 12
overview, 342, 392, 402	Foreign Intelligence Surveillance Act
packet structure, 403	(FISA), 12
Payload Length field, 403	Health Insurance Portability and
sanitize addresses, 411	Accountability Act (HIPAA), 12
Source IP Address field, 404	local laws, 12
Teredo, 410	non-disclosure agreement, 11
Traffic Class field, 403	Personally Identifiable Information
unicast address definition, 405	(PII), 12
Version field, 403	policies regarding analysis, 11
IRC analysis	prison, avoiding, 12
display filter samples, 300	related to analysis, 11

Logmein, remote capture option, 121 loopback address, 394 Lotus Notes, misconfiguration of, 22 Lyon, Gordon "Fyodor", 731, 740	monitor mode, 117, See also WLAN analysis most active connections, detection of, 226 Mu Dynamics (pcapr.net sponsor), 38 multicast analysis address range, 401 Apple mDNS traffic, 356 burst statistics, 233
macros, 264, See also display filters	excessive, 401 IGMP support, 232
mailing lists, 90, See also Wireshark general, mailing lists	in endpoint window, 226
main toolbar, 77–79 capture toolbar icons, 77 color and scroll toolbar icons, 78 filter, color and configuration toolbar	multicast DNS (mDNS), 356 setting burst thresholds, 233 storms, 416 multifunctional device (MFD), case study of, 617 Multiprotocol Label Switching (MPLS), effect or
icons, 79 finding a packet, 78 help toolbar icon, 79 navigation toolbar icons, 77 trace file and print toolbar icons, 77	network traffic, 18
viewer toolbar icons, 78  manuf file	name resolution in basic communications, 345
editing, 165 overview, 156	MAC name resolution, 165 network name resolution
marked packets clearing, 188 fast navigation with, 47 for faster troubleshooting, 704 saving, 188 toggling on and off, 188 use for comparing, 211	disable for optimization, 126 DNS PTR queries, 167 in basic FTP communication, 343 performance impact, 167 warning, 53 resolve a single IP address, 88 settings, 165
Mathieson, Martin, 676	transport name resolution, 168 vulnerabilities, 781
memory requirements, Dumpcap vs. Tshark, 127	Wireshark capabilities, 53
merge trace files (GUI), 43–44  Mergecap, 119, 834–35  examples of, 835  overview, 834  syntax, 835	navigating corresponding packets, 57 find feature, 78 new packet window, 56
using with non-aggregating taps, 109	Network Address Translation (NAT), effect on network traffic, 17
MetaGeek Wi-Spy products, 117, 624, 623–25, 652–53, 850	network traffic, 17 network analysis, general definition, 2
Microsoft. See also SMB analysis different IPv6 settings, 408 Security Bulletin MS09-050, 785 Service Pack 2 for XP, 744	example analyzing HTTP sessions, 348 overview of tasks, 14 skills required for, 2
Mobile IP, filtering for, 255	Network Time Protocol. See NTP

Nmap analysis and use, 760–62, 765–67	other tools and products
ACK scan, 749	Amap, 760
address spoofing, 769 ARP scan, 740	Bit-Twist and Bit-Twiste (packet editing),
	411
coloring rule for detection, 730	Cain and Abel, 731, 794
commands, 757	Chanalyzer Pro and Wi-Spy, 623–25
dealing with connection number	Ettercap, 731, 794
restrictions, 744	Hping2, 731
detecting idle scans, 754	John the Ripper, 731
detecting through User-Agent, 764	Kismet, 731
FIN scan, 749	Macof, 787
get the Nmap book, 767	MetaGeek Wi-Spy and Chanalyzer, 624,
ICMP code field value, 729	See also MetaGeek Wi-Spy products
ICMP-based ping sweep, 731, 742	Metasploit Framework, 731
IP protocol scan, 752	Nessus, 731
sample scan, 98	Netcat, 731
syntax in this book, xxxiii	NetScanTools Pro
UDP scan, 752	OS fingerprinting, 729
using decoys, 769	overview, 726, 767
www.nmap.org site, 740	signature in ICMP Echo Requests, 768
Xmas scan, 748	top security tools, 731
normal network communications,	Nikto, 731
overview of, 343	Nmap. See also Nmap analysis and use
Norton virus detection signature updates, 790	Gordon Lyon, creator, 731, 740
•	Nmap Network Scanning book, 740
NTP	overview, 740
crossing time zones, 204	scan command examples, 757
overview, 119	SnagIt by TechSmith, 313
Nutter, Ron, 114	Snort, 731
	Suricata, 801
0	tepdump, 731
<u>U</u>	VLC Player, 279
Open Shortest Path First (OSPF) analysis,	Xprobe2, 767, 768
232, 343	Out-of-Order packets, 330, See also Expert Info
Open Systems Interconnection (OSI) model, 15	Out-oj-Oruer puckets, 330, see also expert injo
OpenStreetMap, 228, See also GeoIP mapping	D
	P
optimization	•
case study of removing unnecessary traffic, 21	packet loss, 327, See also TCP, packet loss
	analysis
of Wireshark, 125–27	packet number value, 77
optimization tasks for network analysts, 10	packet, building the, 347
OS fingerprinting, 765, See also discovery	packet-tcp.c file, 322
processes	pacaci tepic jue, our

panes	HTTP settings, 174
configuring, 40, 160	in corporate profile, 298
Packet Bytes pane, 40	in security profile, 300
Packet Details pane, 40	in troubleshooting profile, 297
Packet List pane, 40	in VoIP profile, 300
•	in WLAN profile, 299
Parsons, Keith (Institute for Network Professionals), 643	name resolution, 50
	open recent maximum files setting, 43
Patton, Michael (Ethernet Codes Master	overview, 157
Page), 165	overview of protocol settings, 172, 175
pcap-ng format, capability of, 163, See also	personal configuration files, 157
annotations in trace files	preferences file in profiles, 296
PhoneFactor, 570	printing, 50
POP analysis, 604–10	protocol settings using right click, 89
analyzing problems, 606	protocols, 51
capture filter syntax, 610	reassemble fragmented IP datagram, 398
DELE (delete) command, 605	restoring <i>preferences</i> file, 158
display filter syntax, 610	RTP settings, 174
-ERR response, 606	SSL settings, 174
overview, 604	statistics, 51
packet structure, 608	TCP settings, 173
Request command list, 608	user interface, 50
RETR command, 608	warning about sharing <i>preferences</i> file, 296
spam clogged mailboxes, 607	Previous Segment Lost, 328, See also Expert Info
port numbers	2
change defined, 780	printing, 305–20 packet formats, 310
ephemeral/temporary, 447	printing packets to a file, 310
resolution, 343–45	suggestions for best results, 310
portable Wireshark	troubleshooting, 214
download PortableApps, 106	<u>-</u>
overview, 105	profiles, 293–304
WinPcap use, 105	available at wiresharkbook.com, 298
Post Office Protocol (POP). See POP analysis	based on existing profiles, 296
Postel, Jon, 431	branch office example, 294
preference settings, 156–75	corporate office example, 298
capture, 50	create new, 42 directory contents, 50, 294, 296
customizing user interface settings, 159	overview, 294
duplicate IP address and ARP storm	security example, 300
detection, 172	sharing with others, 42
file open dialog, 159	Status Bar column, 42
file recent and display list, 159	troubleshooting example, 297
file sharing warnings, 42	VoIP example, 299
global preference files, 156	WLAN example, 298
global preferences recommended	• •
settings, 157	proxy server effect on network traffic, 17

Q	RFC 2001, Slow Start, Congestion Avoidance, Fast Retransmit, 470
QoS policies, testing, 519	RFC 2001, TCP Slow Start, Congestion
Quilty, Tom (BD Consulting and	Avoidance, Fast Retransmit, and Fast
Investigations), 12	Recovery Algorithms, 466
	RFC 2001, TCP Slow Start, Congestion Avoidance, Slow Start, 478
n	RFC 2018, TCP Selective
R	Acknowledgment Options, 467
D	RFC 2131, Dynamic Host Configuration
Rawshark, 841–42 overview, 841	Protocol, 526
-p for packet header timestamps, 841	RFC 2246, Transport Layer Security v1.0,
syntax of, 841	564
	RFC 2460, Internet Protocol, Version 6
Ray, Marsh, 570	(IPv6) Specification, 402
Realtime Transport Control Protocol (RTCP). See VoIP analysis, RTCP	RFC 2474, Definition of the Differentiated
-	Services Field (DS Field) in the IPv4
Realtime Transport Protocol (RTP). See VoIP analysis, RTP	and IPv6 Headers, 396
	RFC 2581, TCP Congestion Control, 466
reassembly, 277–92	RFC 2582, NewReno Modification to
coloring streams, 189 colorization of client and server traffic, 189	TCP's Fast Recovery, 466
common file identifiers, 283	RFC 2597, Assured Forwarding PHB
follow SSL streams, 189, 285	Group, 396 RFC 2598, an Expediting Forwarding
follow TCP streams, 63, 189, 280	PHB, 396
follow UDP streams, 63, 189, 278	RFC 2671, Extension Mechanisms for
overview of follow streams, 278	DNS (EDNSO), 356
rebuild HTTP object, 281	RFC 2818, HTTP over TLS, 564
video playback, unsupported formats, 279	RFC 3056, Connection of IPv6 Domains
recent file	via IPv4 Clouds, 409
in profiles, 296	RFC 3168, The Addition of Explicit
time display format setting, 51	Congestion Notification (ECN), 397
reload a trace file, 56	RFC 3261, Session Initiation Protocol
Remote Procedure Call (RPC), 225	(SIP), 667
RFCs	RFC 3264, An Offer/Answer Model with
2822, Internet Message Format, 611	the Session Description Protocol (SDP),
RFC 1027, Using ARP to Implement	663
Transparent Subnet Gateways, 380	RFC 3514, A Security Flag in the IPv4
RFC 1035, Domain Names –	Header, 413 RFC 3540, Robust Explicit Congestion
Implementation and Specification, 356	Notification (ECN) Signaling with
RFC 1122, Requirements for Internet Hosts	Nonces, 478
- Communication Layers, 471	RFC 3550, Real-time Transport Protocol,
RFC 1191, Path MTU Discovery, 710	666
RFC 1323, TCP Extensions for High Performance, 711	RFC 3665, Session Initiation Protocol
RFC 1730, IMAP, 604	(SIP) Basic Call Flow Examples, 667
RFC 1939, POP, 604	RFC 3697, IPv6 Flow Label Specification,
RFC 1945. HTTP/1.0. 556	403

Architecture, 402 RFC 4380, Tunneling IPv6 over UDP through Network Address Translations (NATs), 410 RFC 4566, Session Description Protocol (SDP), 663 RFC 4620, IPv6 Node Information Queries, 437 RFC 4861, Neighbor Discovery for IP version 6 (IPv6), 402 RFC 4884, Extended ICMP to Support Multi-Part Messages, 437 RFC 4941	analyzing routed networks, 116 asymmetrical indication of, 328 decrementing the time to live, 16 general forwarding behavior, 16 how traffic is forwarded, 16 overview of, 16 stripping off and reapplying a MAC header, 16  RSA key exchange, 285, See also SSL/TLS analysis
Privacy Extensions for Stateless Address Autoconfiguration in IPv6, 408 RFC 5214 Intra-Site Automatic Tunnel	sanitize IP addresses, 411 SANS, 743 saving in various formats, 310
Addressing Protocol (ISATAP), 411 RFC 5321, Simple Mail Transfer Protocol, 611 RFC 768, User Datagram Protocol, 446 RFC 791, Internet Protocol, 393 RFC 792, Internet Control Message Protocol, 426 RFC 793, Transmission Control Protocol, 458 RFC 826, Ethernet Address Resolution Protocol, 376 RFC 896, Congestion Control in IP/TCP Internetworks, 471 RFC 903, A Reverse Address Resolution Protocol, 382 RFC 959, File Transfer Protocol, 582	Secure Socket Layer (SSL). See SSL/TLS analysis security analysis. See also discovery processes bot-infected host processes, 790 brute force password crack attempts, 798 cfilters file use in, 300 clear text passwords, detecting, 789 dark destination addresses, 786 denial of service address spoofing uses, 769 flooding traffic, 787 ping attack, 426 SMBv2 vulnerability, 784 detecting unencrypted communications, 11 detecting unknown hosts, 288 dfilters file use in, 300
rfmon mode, 118, See also WLAN analysis	dictionary password crack attempts, 799 discovery and reconnaissance overview,
right-click functionality, 83–89 filtering, 256, 260 Riverbed Technology acquisition of CACE Technologies, 30 AirPcap, 118	elements of a security profile, 300 evidence handling procedures, 728 example of network forensics process, 8 find JOIN command, 781
Round Trip Time graph, 508, See also graphing	firewalls ACL rules, 72
route resolution identify local target, 346 identify remote target, 346 overview, 343 vulnerabilities, 783	case study, 575 effect on network traffic, 17 responses from firewalled hosts, 744 flooding traffic, 787

802

forensic tools list, 731, See also other tools Server Message Block (SMB). See SMB analysis and products Session Description Protocol (SDP). See VoIP gathering evidence, 724 analysis, SDP general issues, 11–12 Session Initiation Protocol (SIP). See VoIP host forensics, 724 analysis, SIP idle scan process, 753 Sharkfest conference, 8 LDPinch Loader Binary Request filter or coloring rule, 801 Sharpe, Richard, 38 malicious FTP program, 779 Simple Mail Transfer Protocol (SMTP). See maliciously malformed packets, 784 SMTP analysis man-in-the-middle attack, 380 Simple Network Management Protocol (SNMP). network floods, 787 See SNMP analysis network forensics, 724, 737 Sister Gerald, Head of Discipline, xxix password cracking attempts, 798 SLOCCount, value of Wireshark code, 32 password detection using Follow the TCP SMB analysis Stream, 789 filter for SMBv2 vulnerability, 785 phone home traffic, 790 object exporting, 47 placing Wireshark to analyze, 724 SMB header Process ID High field, 784 poisoning detection, 794 SMBv2 protocol vulnerability, 784 port resolution vulnerabilities, 779 SMBv2, Negotiate Protocol Request, 784 protecting trace files, 11 SMTP analysis, 611–17 reDuh filter or coloring rule, 800 553 Invalid Recipient, 614 spoofed address detection, 769 554 Transaction Failed, 613 spoofing a MAC address, 769 analyzing problems, 613 SSL/TLS vulnerabilities, 732 capture filter syntax, 616 Suricata IDS/IPS, 801 common reply code list, 615 suspect traffic, overview of, 778 default port, 611 SYN floods, 479 detecting a relay test, 613 tasks for the network analyst, 10 display filter examples, 616 TCP window size issues, 300 display filter syntax, 616 TLS renegotiation process flaw, 570 EHLO designation for mail extensions, 612 unassigned MAC addresses, 786 ESMTP mail extensions, 612 unknown hardware addresses, 107 HELO designation, 612 unusual traffic MAIL FROM command, 612 detecting protocols and applications, 791 overview, 611 recognizing patterns, 729 packet structure, 614 sample display for ICMP traffic, 300 RCPT TO command, 612 unwanted "sniffers", 11 using Nmap with decoys, 769 SnagIt screen capture utility, 511 vulnerabilities in flow diagram, 778 SNMP analysis vulnerabilities in the TCP/IP resolution default MIBs, 169 processes, 778 MIB dissection support, 169 Weevely PHP backdoor filter or coloring SNMP MIB path setting, 169 rule, 802 Spanning Tree Protocol (STP), 787 Win32 Rimecud. A filter or coloring rule, Win32 Sykipot GET filter or coloring rule,

protocol types, 232

SSL/TLS analysis, 564–74	protocol types, 232
analyzing communication, 568	Sametime, 68
cipher suites, 565	service response time, 66
colors when following stream, 189	settings, 171
decrypted stream, 286	summary, 65
decryption example, 285–87, 574	WLAN, 237
decryption with Wireshark, 174, 570	Statistics menu, 64–69
display filter for, 557	ANCP, 67
export SSL keys, 313	BACnet, 67
follow stream example, 285	HTTP, 68
handshake analysis, 565–69	IP Addresses, 68
handshake display filter, 565	IP Destinations, 68
HTTP preferences – SSL/TLS Ports, 563	IP Protocol Types, 68
HTTPS port setting, 174	ONC-RPC programs, 68
overview, 564	TCP stream graphs, 68
PhoneFactor files, 851	UDP multicast streams, 68
port number, non-standard, 565	WLAN traffic, 69
preferences, 174	Status Bar
random bytes, 565, 567	display filter information, 250
RSA key configuration, 570	dropped packet indication, 328, 787
RSA keys directory, 570	file information column, 41
stream index, 280	ignored packets, 48
TCP preferences affect on, 564	interpreting, 41
TCP preferences effect on, 174	packet information column, 42
vulnerability, 576, 732	profile column, 42, 294
statistics, 221–46	selected field names, 259
basic overview of, 222	Stevens graph, compared to teptrace graph, 511
BOOTP-DHCP, 67	subset operators, 262, See also display filters
Collectd, 67	•
compare, 67	summary information
conversation list, 66	comparing, 212
conversations, 65, 226, 228	overview, 210
destinations, 231	Suricata, 111
DHCP, 536	switched network analysis
endpoint list, 66	analyzing floods, 787
endpoints, 65	forwarding of broadcasts, 107
Flow Graphs, 67	forwarding of broadcasts and multicasts, 16
HART-IP, 67	forwarding of multicasts, 107
HTTP, 236	forwarding to unknown hardware
IO Graphs, 66	address, 107
IP addresses, 231	general forwarding behavior, 15–16
menu overview, 64	network analysis issues, 107
packet lengths, 65, 229	span example, 114
Protocol Hierarchy, 65, 222	spanning VLANs, 114–15
"Data" designation in, 792	use of MAC address table, 15
missing protocols, 223	,
overview, 222, 791	
using, 224	

T	disable relative sequence numbers, 463
1	display filter syntax, 482
TAP (Test Access Port), 108–12	dissector file, 327
aggregating, 110	End of Options List (EOL) option,
delays during capture, 108	332, 480
fail open, 108	exporting and graphing analysis flags, 313
full-duplex analysis, 108	failed connections, 473
in-line, 108	filtering on flag summary line, 479
installation of, 109	filtering on TCP-based problems, 326
intelligent, 112	FIN bit, 478
link aggregation, 112	FIN bit display filter, 479
non-aggregating, 109	FIN bit interpretation, 461, 479
regenerating, 111	FIN scan signatures, 749
viewing physical layer errors, 108	Flags field, 478
	full connect scan signatures, 746
task offloading, 127, See also checksum errors	graphing Duplicate ACKs, 66
TCP analysis, 457–91	graphing window size issues, 511
ACK bit, 478	half-open scan signature, 744
ACK bit display filter, 252, 478	handshake problems, 474
ACK bit interpretation, 478	handshake process, 459
ACK scan signatures, 749	Ignore TCP Timestamps setting, 487
Acknowledgment Number field, 477	indications of firewall blocking, 460
Allow Subdissector to Reassemble TCP	initial sequence number, 463
Streams setting, 483	invalid checksums, 251
analysis flags, 212	multiple handshake processes, 234
tcp.analysis.duplicate_ack,	Nagle algorithm, 471
graphing, 504	No Operation (NOP) option, 480
tcp.analysis.lost_segment, graphing, 504	Nonce field, 478
tcp.analysis.retransmission,	null scan signatures, 747
graphing, 504	Options, 480
Analyze TCP Sequence Numbers	overview, 342, 458
setting, 485	packet loss analysis
backoff algorithm, 467, 503	cause of packet loss, 327
Calculate Conversation Timestamps	congestion window changes, 470
setting, 488	graphing, 504
Calculated Window Size field, 87	locating the source of, 429
capture filter based on flags, 141	recovery process, 465
capture filter syntax, 482	recovery without SACK, 706
Checksum field, 479	Time-Sequence graph depiction of, 514
congestion window, 470	upstream or downstream, 706
Congestion Window Reduced (CWR)	packet structure, 477
flag, 478	port scans, 743
connection problems, 473	preference settings recommendation, 173
connection termination with FIN, 461	protocol settings, 483
conversations list for, 226	Push bit, 478
Data Offset field, 477	Push bit display filter, 478
delayed ACKs, 464, 471	Push bit interpretation, 478
Destination Port field, 477	receive window, 470

disable relative sequence numbers, 463

Scaling setting, 463, 486	window scaling calculation, 486 window scaling not calculated, 486
Reset bit, 478	Window Size field, 162, 479
Reset bit display filter, 479	Window Size field display filter, 251, 479
Reset bit interpretation, 479	window size small issue, 162
Retransmission Timeout (RTO) value, 467	Window Zero condition, 711
retransmissions, 327, See also Expert Info	xmas scan signatures, 748
advanced IO Graphing, 504	Zero Window case study, 515
IO Graphing, 498	TCP Ports Reused, 331, See also Expert Info
Retransmission Timeout (RTO)	TCP/IP, 341–52
value, 327	communications overview, 342
three identical ACKs trigger, 465	etc\services file, 779
Time-Sequence graph depiction of, 514	resolution process, 343
security evasion techniques, 797	Telephony menu, 70–71
security issues related to window size, 300	RTP, 70
Selective ACK	SIP, 70
left edge and right edge, 468	VoIP calls, 71
option during packet loss recovery, 481	Text2pcap, 836–38
SACK overview, 467	examples of, 838
SACK Permitted option, 481	overview, 836
Sequence Number field, 477	syntax, 837
sequence number randomization, 617	
sequencing/acknowledgment process, 463	throughput graphing, 510, See also graphing
service refusals, 460	time analysis
skipped sequence numbers, 465	*REF* designation, 48
sliding window, 470	adding Time columns, 206
Source Port field, 477	adjusting timestamps with Editcap, 832
splicing, 797	comparing time settings, 203
SYN bit, 478	date and time of day, 201, 203
SYN bit display filter, 479	delta time, 49
SYN bit interpretation, 479	differences between two instances of
SYN/ACK filter, 231	Wireshark, 109
SYN/FIN coloring rule, 184	how Wireshark applies timestamps, 200
TCP Stream Index value, 477	nanosecond time resolution, 203
TCP Timestamp option, 481	seconds since beginning of capture, 51, 202
Throughput graph overview, 510	seconds since Epoch, 201
Time-Sequence graphing, 511, See also	seconds since previous captured
graphing	packet, 202
traceroutes, 759	seconds since previous displayed
Track Number of Bytes in Flight issue, 487	packet, 52, 202
traffic to watch, 798	setting a time reference, 206
Urgent bit, 478	setting the Time column value, 201
Urgent bit display filter, 478	shifting trace file time with Capinfos, 507
Urgent bit interpretation, 478	time reference overview, 48
Urgent Pointer field, 479	Time Shift, 699
Validate the TCP Checksum setting, 483	time zones, exchanging trace files
watch the TCP handshake, 331, 481	across, 204
Window Scale (WSOPT) option, 480	

timestamp accuracy and resolution, 203 troubleshooting with time, 49	small payload sizes, 710 Step 1 - Plan, 6
	Step 2 - Capture, 6
Time-Sequence graphing, 511, See also graphing	Step 3 - Analyze, 6
Tools menu, 72–73	Step 4 – Repeat if Necessary, 7
Firewall ACL rules, 72	symptoms of performance problems, 698
Lua, 73	tasks for the network analyst, 9
trace files. See also Appendix A and end of	using the Time column, 699
chapters	Tshark
on www.pcapr.net, 38	define occurrence of a field, 819
on www.wiresharkbook.com, 852–911	examples of, 826
traffic shaping, definition of, 19	gather host names, 823
training	hosts file use, 818
booking courses, xxxvi	memory requirements, 127
Wireshark University, xxxvi	new -S for packet separator, 818
Transmission Control Protocol (TCP). See TCP	overview, 817
analysis	-P parameter to view packets, 818
Transport Layer Security (TLS). See SSL/TLS	protocol hierarchy statistics, 821
analysis	reports available (-G), 820
Trivial File Transfer Protocol (TFTP), 225, 791	service response types, 825
troubleshooting	statistics, 821
application faults, 10, See also application	syntax, 817
analysis	two-pass analysis, 817
bottom-up method, 698	-W n save extra file information, 820
columns to set, 87	
congestion, 711	TJ
dealing with intermittent problems, 315	U
elements of a troubleshooting profile, 297	UDB analysis 445 52
example of, 6–8	<i>UDP analysis, 445–53</i> capture filter for VoIP traffic, 299
filtering on delta times, 701	capture filter syntax, 451
filtering on the arrival time, 700	checksum value 0x0000, 451
filtering on time since reference or first	display filter syntax, 451
packet, 701	echo port, 761
finger pointing, 5	overview, 342, 446
identifying unacceptable traffic, 783	packet structure, 450
important note, 713	port fields, 450
misconfigurations, 708	port scans, 751
name resolution faults, 712	pseudo-header, 451
needle in the haystack issue, 13, 104	scan evidence, 448
overview, 698	traceroutes, 759
packet loss, 706, See also TCP analysis,	UltraVNC, remote capture option, 121
packet loss	• • •
prioritize problems, 503	update list of packets in real time, 126
redirections, 709	User Datagram Protocol (UDP). See UDP
resolution process issues, 698	analysis
slow communication example, 703	
slow processing times, 702	

$\mathbf{V}$	play back, 674 player markers, 675
<u> </u>	port numbers, 660
View menu, 51–56	preferences, 174
coloring rules, 55	stream analysis, 666
colorize conversations, 54	visible channels setting, 171
displayed columns, 54	SDP information in packets, 663
name resolution, 53	secure VoIP traffic, 660
reload, 56	signaling protocol purpose, 660
show packet in a new window, 56	SIP
time display format, 51	assured forwarding, 396
view packet counts without capturing, 58	colorizing response codes, 676
VLAN analysis, 114–15	Commands, 667
overview, 18	default port 5060, 660
troubleshooting case study, 21	display filter, 299
viewing tags, 115	Invite packet, 668
VLAN tagging with 802.1Q, 18	Response Codes, 668
VoIP analysis, 659–79	statistics, 671
4xx—Client Error response, 668	troubleshooting case study, 677
5xx—Server Error response, 668	troubleshooting example, 385
6xx—Global Failure, 668	wiki.wireshark.org/VoIP_calls, 938
adjust the jitter buffer value for	Wireshark dissectors for, 662
play back, 674	
analysis overview, 660	$\mathbf{W}$
analyzer placement, 660	
analyzing problems, 665	Walberg, Sean, 677
bandwidth requirements, 664	Warnicke, Ed., 38
call setup process, 661	
capture filter syntax, 676	websites, 90–91, 400–401
capture SIP and RTP traffic, 299	ask.wireshark.org, 90–91 bugs.wireshark.org/bugzilla, 32
case study of quality issues, 243	emergingthreats.net, 800
display filter examples, 676	ettercap.sourceforge.net, 731
display filter syntax, 676 display filter upper-case warning, 676	hecker.org/mozilla/eccn, 34
DTMF filter, 676	isc.sans.org, 743
DTMF telephony events, 660	multicastdns.org, 356
excessive jitter, 666	netcat.sourceforge.net, 731
G.729 audio data compression, 667	openpacket.org, 92
graph analysis, 71	sectools.org, 731
jitter, 666	standards.ieee.org/about/get/, 622
packet loss example, 665, 666	www.bdcon.net, 12
play back example, 675	www.chappellseminars.com, xxxvi
RTCP	www.chappellU.com, xxxvi
packet types, 673	www.cirt.net/nikto2, 731
port numbers, 660	www.gtk.org, 36
RTP	www.hping.org, 731
display filter, 299	www.htcia.org, 728
not decoded, 661	www.iana.org, 91, 382, 400-401, 430, 434
not recognized by Wireshark, 70	477, 533, 668

www.ietf.org, 91	Win32 Rimecud Trojan, 802
www.insecure.org, 862	Win32 Sykipot Trojan Backdoor, 802
www.kismetwireless.net, 731	Window Full, 331, See also Expert Info
www.law.cornell.edu, 12	Window Probe, 329, See also Expert Info
www.maxmind.com, 851	
www.metageek.net/wiresharkbook, xxxiv,	Window Update, 330, See also Expert Info
117, 624	Window Zero, 329, See also Expert Info
www.metasploit.com, 731	WinPcap
www.mibdepot.com, 169	Monitor Mode not supported, 118
www.nessus.org, 318, 731	rpcapd.exe, remote capture tool, 121
www.netoptics.com, 112 www.netscantools.com, 726, 731	wireless settings. See WLAN analysis
	Wireshark 1.8 and later
www.nmap.org, 360, 740, 767, 862 www.ntp.org, 119	capture filters on multiple interfaces, 138
www.nip.org, 119 www.oidview.com, 169	coloring rules placement, 185
www.openinfosecfoundation, 801	create profile based on existing profile, 296
www.openinfosecfoundation.org, 111	DNS Transaction ID added to Info
www.openmiloseeroundation.org, 111 www.openwall.com/john, 731	column, 363
www.oxid.it, 731	Expert Infos LEDs, 323
www.pcapr.net, 38	Fast Retransmissions and Retransmissions
www.phonefactor.com, 573, 576, 732	listed under Notes, 323
www.postel.org/postel.html, 431	filter expression buttons, 51, 80, 170
www.riverbed.com/us/products/cascade/air	GeoIP IPv6 support, 168, 228
pcap.php, 35	ignore TCP Timestamps in Summary, 487
www.securityfocus.com, 768	pcap-ng format default, 163
www.snort.org, 111, 731	Rawshark –p to use packet header
www.tcpdump.org, 34, 91, 126, 731	timestamps, 841
www.techsmith.com, 313, 511	Retransmissions moved to Notes, 322
www.thc.org, 760	saving Decode As settings, 62
www.videolan.org, 279	simultaneous multiple adapter capture, 120
www.vimeo.com/9329501, 30	-t in Dumpcap to use a separate thread per
www.winpcap.org, 34, 91	interface, 840
www.wirelesslanprofessionals.com, 643	TCP Stream Index value change, 477
www.wireshark.org, 91	Time Shift feature, 699 Tshark
www.wireshark.org/develop.html, xxxi	new –P for packet display, 818
www.wiresharkbook.com, xxxi	new –W n to save extra information to
www.wiresharktraining.com, xxxvi, 91	file, 820
Weevely PHP backdoor, 802	-S as a packet separator, 818
whining	two-pass analysis, 817
bad movies, Jaws III, 125	use of <i>hosts</i> file, 818
compare feature, 67	Window Update excluded from Bad TCP
ice skating, a horrible idea for geeks, 5	coloring rule, 55, 330
Mom Mom, 466	Wireshark Certified Network Analyst program,
no life, a bad thing?, 36	xxxv
Statistics menu clutter, 67	Wireshark University, xxxvi, 91
Wide Area Network (WAN) optimization, 19	" " Simile Omreibny, MAN, 11

Wireshark, general	services file
64-bit version issues, 169	manually editing, 54, 156
blog, 91	overview, 54, 156
Bug 2234 display filters when writing to	update overrides, 158
file with Tshark, 817, 827	SNMP <i>smi-modules</i> file, 156
bug reporting, 32–33	stable release and announcements, 31
bug tracker mailing list, 90	Start Page
colorfilters file global settings, 156,	Capture area, 38
See also coloring rules	Capture Help area, 38
complementing products, 34	Files area, 38
core developers list, 32	Online area, 38
creation of, 30	Subversion (SVN) number, 31
customized launch in Windows, 815	system requirements, 19
customizing the title bar, 39	training, 91
developer commits mailing list, 90	U3 version, 106
developers mailing list, 90	updates, 8, 31
development release, 31	USB version, 106
disabling the TCP/IP stack, 726	User's Guide, 38
DNS PTR queries, 725	users mailing list, 90
download the latest version, 30–31	version/capability information, 75
dropping packets, 125	WinPcap time resolution, 203
ethers file, 166	Wireshark.exe syntax, 813
export regulations, 33	Wiretap Library, 35
folder locations, 156	wiretapping, 12, See also legal issues
GIMP Toolkit (GTK+), 36, 39	WLAN analysis, 621–54
GNU General Public License, 30	802.11 frame example, 631
GUI elements, 39–42	802.11 frame example, 031 802.11n set up in 2.4 GHz band, 652
hosts file, 781, 818	A/V transmitter interference, 653
installation defaults, 812	adapter failed in promiscuous mode, 131
interface hiding, 163	address fields, 642
interface not shown, 38	
interface not shown, 38	
libpcap time resolution, 203	AirPcap
libpcap time resolution, 203	AirPcap adapter information, 627
	AirPcap adapter information, 627 Control Panel, 628
libpcap time resolution, 203 mailing lists, 90	AirPcap adapter information, 627 Control Panel, 628 multi-channel aggregator driver, 627
libpcap time resolution, 203 mailing lists, 90 manuf file	AirPcap adapter information, 627 Control Panel, 628 multi-channel aggregator driver, 627 analysis overview, 117
libpcap time resolution, 203 mailing lists, 90 manuf file contents, 156	AirPcap adapter information, 627 Control Panel, 628 multi-channel aggregator driver, 627 analysis overview, 117 analysis using a native adapter, 118
libpcap time resolution, 203 mailing lists, 90 manuf file contents, 156 update overrides, 158	AirPcap adapter information, 627 Control Panel, 628 multi-channel aggregator driver, 627 analysis overview, 117 analysis using a native adapter, 118 analysis using AirPcap adapters, 118
libpcap time resolution, 203 mailing lists, 90 manuf file contents, 156 update overrides, 158 new releases, announcement of, 90	AirPcap adapter information, 627 Control Panel, 628 multi-channel aggregator driver, 627 analysis overview, 117 analysis using a native adapter, 118 analysis using AirPcap adapters, 118 analyzer placement, 624, 626
libpcap time resolution, 203 mailing lists, 90 manuf file contents, 156 update overrides, 158 new releases, announcement of, 90 optimization techniques, 787	AirPcap adapter information, 627 Control Panel, 628 multi-channel aggregator driver, 627 analysis overview, 117 analysis using a native adapter, 118 analysis using AirPcap adapters, 118 analyzer placement, 624, 626 analyzing signal strength, 623
libpcap time resolution, 203 mailing lists, 90 manuf file contents, 156 update overrides, 158 new releases, announcement of, 90 optimization techniques, 787 performance issues, 164	AirPcap adapter information, 627 Control Panel, 628 multi-channel aggregator driver, 627 analysis overview, 117 analysis using a native adapter, 118 analysis using AirPcap adapters, 118 analyzer placement, 624, 626 analyzing signal strength, 623 association, disassociation and
libpcap time resolution, 203 mailing lists, 90 manuf file contents, 156 update overrides, 158 new releases, announcement of, 90 optimization techniques, 787 performance issues, 164 platforms supported, 30 preferences, 50, See also preference settings	AirPcap adapter information, 627 Control Panel, 628 multi-channel aggregator driver, 627 analysis overview, 117 analysis using a native adapter, 118 analysis using AirPcap adapters, 118 analyzer placement, 624, 626 analyzing signal strength, 623 association, disassociation and reassociation, 636
libpcap time resolution, 203 mailing lists, 90 manuf file contents, 156 update overrides, 158 new releases, announcement of, 90 optimization techniques, 787 performance issues, 164 platforms supported, 30 preferences, 50, See also preference settings Q&A forum – ask.wireshark.org, 90	AirPcap adapter information, 627 Control Panel, 628 multi-channel aggregator driver, 627 analysis overview, 117 analysis using a native adapter, 118 analysis using AirPcap adapters, 118 analyzer placement, 624, 626 analyzing signal strength, 623 association, disassociation and reassociation, 636 authentication/deauthentication, 636
libpcap time resolution, 203 mailing lists, 90 manuf file contents, 156 update overrides, 158 new releases, announcement of, 90 optimization techniques, 787 performance issues, 164 platforms supported, 30 preferences, 50, See also preference settings Q&A forum – ask.wireshark.org, 90 run locally, 105	AirPcap adapter information, 627 Control Panel, 628 multi-channel aggregator driver, 627 analysis overview, 117 analysis using a native adapter, 118 analysis using AirPcap adapters, 118 analyzer placement, 624, 626 analyzing signal strength, 623 association, disassociation and reassociation, 636 authentication/deauthentication, 636 baseline of RF activity, 624
libpcap time resolution, 203 mailing lists, 90 manuf file contents, 156 update overrides, 158 new releases, announcement of, 90 optimization techniques, 787 performance issues, 164 platforms supported, 30 preferences, 50, See also preference settings Q&A forum – ask.wireshark.org, 90	AirPcap adapter information, 627 Control Panel, 628 multi-channel aggregator driver, 627 analysis overview, 117 analysis using a native adapter, 118 analysis using AirPcap adapters, 118 analyzer placement, 624, 626 analyzing signal strength, 623 association, disassociation and reassociation, 636 authentication/deauthentication, 636

services file

probe frames, 637

profile example, 137

problems detected on wired network, 622

capture filter for beacon frames, 298 capture filter syntax, 641	promiscuous mode overview, 626
capture setup options, 117–18, 627	setting problems, 626
capturing probe response packets, 147	Radiotap
CCMP (WPA2) overhead, 640	header example, 633
control frames, 636, 638	header information, 631
cordless phone interference, 652	receive signal strength column, 635
CSMA/CA, 622	Retry bit, 642
data frames, 636	RF interference examples, 625
decryption	RF signal analysis, 623–25
modes, 629	rfmon mode, 626, See also Monitor Mode
disassociation frames display	signal strength levels, 635
filter example, 299	spectrum analyzer, 623, 652–53, 850
display filter	SSID display filter, 299
examples, 641	traffic overview, 636
syntax, 641	traffic statistics, 69
exporting and graphing	troubleshooting case study, 650
retransmissions, 313	variable length depending on the
exporting beacon frames, 312	encryption type, 640
Extensible Authorization Protocol	weak signal strength display filter
(EAPOL) for decryption, 629	example, 299
filtering on disassociation frames, 299	WEP
frame control types and subtypes, 642	decryption, 629
frame structure, 640	overhead, 640
frame types, 636, 644	WinPcap – no Monitor Mode support, 626
frequency/channel column, 299	wireless interface selection, 627
host capture syntax, 298	Wireless Toolbar, 40, 82
interference from jammer, 653	Wireless Toolbar not available in earlier
interference sources, 623	versions, 51
management frames, 636	WPA (TKIP) overhead, 640
monitor mode	WPA and WPA2
connectivity loss, 118	decryption, 629
overview, 117, 626	
overview of WLAN analysis, 622	7
packet sizes, 636	${f Z}$
PPI	7 777 6 1 11 1
header example, 634	Zenmap, 757, See also Nmap analysis and use
header information, 631	zero window condition. See Window Zero

zero window condition. See Window Zero Zero Window Probe ACK, 329, See also Expert Info