

INDEX

Numerics

802.1p/Q, 152

A

access management, 260
access points, security
 vulnerabilities, 247
ACELP, 15
accounting, CDRs, 212–213
adding new features to VoIP
 deployment, 40
advanced call routing, 39
Algebraic Code Excited Linear
 Predictive (ACELP), 15
analog telephones, 11
analyzing ROI, 43–44
 benefits of VoIP, 32
 convergence, 41–42
 cost savings, 32–35, 37
 hard benefits, 32
 new features, 39–40
 productivity savings, 37–38
 soft benefits, 32
 obstacles to VoIP deployment, 42–43

Andress, Mandy, 228
annoyances, 253
application integration, 128
application management, 204
applications, transaction-oriented, 77
assembling VoIP deployment test
 plan, 116–118
assessing
 reliability, 67–69
 of hardware, 70–71
 of IT processes, 75–76
 of link and carrier, 72
 of network design, 73–75
 of software, 71
 VoIP readiness, 124
ATM (asynchronous transfer mode),
 QoS, 153–154
attacks
 annoyances, 253
 call hijacking, 252
 detecting, 243
 DoS, 252
 preventing, 241–242
 reacting to, 244–245
 signatures, 263
authentication, 259
authorization, 259

AV (antivirus) detection tools, 242

availability. *See also* reliability

- downtime costs, 183–184
- fault management, 197–200
- five nines, 181
- high availability, maintaining, 200–201
 - application management, 204*
 - monitoring servers, 201–204*
- SLA metric, 217–218

B

bandwidth

- codec performance, 22
- improving, 105–106
- modeling, 99–102

best practices

- fault management, 199
- QoS, 174–176
- security, securing central facilities, 254–258, 260

BHCA, 65

BHCC, 65

billing, 212–213

building pilot VoIP deployment, 109–110

- evaluating systems, 111–113
- solving echo problems, 113–114
- transcoding, 115

bursts, 91

busy hour, 65

busy hour calls attempted, 65

busy hour calls completed, 65

C

CAC (call admission control), 24

calculating

- downtime costs, 183–184
- long-distance savings in VoIP deployment, 34
- ROI, 48–53
 - investments, 50–53*
 - returns, 53–55*

call admission control, 106

call hijacking, 252

call quality

- maintaining, 205–207
 - performance factors, 207–208*
 - QoS, 209–211*
 - SLAs, 208–209*
- measuring, 79–85
- SLA metric, 220–221

call routing tables, maintaining, 192

call setup, VoIP calls, 13

- performance, SLA metric, 218–220
- protocols, 20
- response time, 219

call-quality assessment, performing, 97–99

cancelling SLA contracts, 234

CBR, 154

CBWFQ (Class-Based Weighted Fair Queuing), 163

CDRs (call detail records), 251

- accounting, 212–213

centralized call processing

- architectures, 37

Centrex solutions, 9

- change management, 253**
- chargeback, 212–213**
- checksum field (IP packet header), 18**
- CIR, 155**
- circuit-switched connections, 3**
- Class 5 switches, 7**
- classifying traffic, 145–149**
- closed-box systems, 23**
- clustering IP telephony servers, 24**
- codecs, 14–15**
 - bandwidth consumption, 22
 - compression techniques, 15
 - selecting, 85–87
 - transcoding, 25
- comma-separated value (CSV), 65**
- committed information rate (CIR), 155**
- compiling current telephony usage information, 64**
 - call flow analysis, 66
 - call volume statistics, 66
 - CDRs, 65
- components**
 - of PSTN, 5
 - PBXs, 8*
 - signaling, 10*
 - switches, 7*
 - telephones, 11*
 - voice encoding, 6–7*
 - of VoIP
 - call setup protocols, 20*
 - codecs, 14–15*
 - IP phones, 26–27*
 - IP telephony servers, 23–25*
 - PBXs, 23–25*
 - routers, 25*
 - softphones, 26–27*
 - switches, 26*
 - TCP/IP protocol stack, 15–18*
 - voice streaming protocols, 21–23*
 - VoIP gateways, 25*
- compression, lossy, 14**
- confidentiality, 248**
 - CDRs, 251
 - overheard conversations, 249–250
- configuration assessment, performing, 93, 95**
- configuration files, maintaining, 191–192**
- configuration management, 186**
 - maintaining critical files, 191
 - call routing tables, 192*
 - configuration files, 191–192*
 - program files, 193–194*
 - network inventory, 187–188
 - network topology, mapping, 189–190
- configuration proxy, 264**
- configuring QoS, 171–172**
- congestion, determining need for QoS, 146**
- constant bit rate (CBR), 154**
- convergence, 12**
 - measuring in VoIP deployment, 41–42
- COPS (Common Open Policy Service), 265**
- correlation between delay and data rate, 23**
- cost savings, measuring in VoIP deployment, 32**
 - expense savings, 33*

long-distance savings, 34–35

network infrastructure

savings, 35–37

productivity savings, 37–38

criteria

for integrator selection,

132–135

for MSP selection, 130–132

cRTP *see* **RTP (Real-time Transport Protocol)**

CSV, 65

D

data networks, security

vulnerabilities, 261–264

data rates, correlation to delay, 23

datagrams, 16

data-networking standards, 12

defining

roles for SLA implementation, 223

selecting relevant metrics,

224–226

SLA negotiations, 226–230

security policies, 270

exploiting vendor resources,

272–274

identifying security team,

270–271

performing postmortems,

271–272

delay, 87, 221

correlation to data rates, 23

effect on MOS score, 88–89

one-way, 88

delay variation. See jitter

denial of Service (DoS) attacks, 252

deploying VoIP

as major IT project, 44

ensuring reliability, 47–48

up-front planning, 45–46

assembling test plan, 116–118

building pilot deployment,

109–110

evaluating system, 111–113

solving echo problems,

113–114

transcoding, 115

ensuring profitability, 56–57

estimating ROI, 48–53

investments, 50–53

returns, 53–55

outsourcing, 122–123

application integration, 128

developing partnerships,

136–137

integrator selection criteria,

132–135

maintaining partnerships,

137

MSP selection criteria,

130–132

MSPs, 129

network tuning, 128

PBXs, 127

performing network

upgrades, 124–125

pilot deployments, 125–126

toll bypass, 126

troubleshooting, 129

VoIP-readiness assessment,

124

- planning phase, 62–63
 - assessing reliability*, 67–76
 - codec selection*, 85–87
 - compiling current telephony usage information*, 64–66
 - delay*, 87–89
 - evaluating call quality*, 76–85
 - jitter*, 90
 - lost data*, 91–93
 - performing readiness assessment*, 93–102

Destination Address field (IP packet header), 18

detecting security breaches, 242–243

devices

- codecs, 14–15
 - bandwidth consumption*, 22
 - compression techniques*, 15
 - transcoding*, 25
- eliminating equipment gaps, 108
- IP phones, security vulnerabilities, 248, 266–269
- softphones, security vulnerabilities, 248

DHCP, 10, 38, 75

dial tone response time, 219

DiffServ, 158

digital signal processor (DSP), 81

digital telephones, 11

DoS attacks, 252

downtime costs, 183–184

DSP, 81

Dynamic Host Control Protocol (DHCP), 10, 38, 75

E

Early Adopters phase, 31

Early Majority phase, 31

echo, troubleshooting in pilot deployment, 113–114

EFS (Encrypting File System), 258

eliminating equipment gaps, 108

E-model

- calculating R-value, 83–85
- call-quality assessment, 81
- measuring call quality, 82–85

employee training, outsourcing, 130

encryption, 269–270

end-to-end delay, 87

- effect on MOS score, 88–89

enforcing SLAs, 233–234

ensuring profitable ROI, 56–57

ensuring reliability of VoIP deployment, 47–48

Enterprise Management Associates, 129

erlang, 66

estimating

- cost of VoIP
 - deployment, 103
- ROI, 48–53
 - investments*, 50–53
 - returns*, 53–55
- training costs, 37

evaluating call quality, 76–79

- E-model, 82–85
- MOS, 80

event management, 194–197

- ensuring reliability of VoIP deployment, 47

events, 240

expense savings in VoIP
deployment, 33
external SLAs, 217

F

fault management, 197–200
fault tolerance, ensuring reliability of
VoIP deployment, 47
fields of RTP header, 21–22
firewalls, 242, 262
five nines, 3, 181
forensics, 244
Frame Relay, QoS, 155
Freeman, David, 242
full service MSPs, 129

G

G.107, 81
G.114, 88
G.711 standard, 6
G.729, 22
gatekeepers, 24
growth management, 184–185,
211–212
GUIs, policy console, 264

H

H.323 protocols, 20
hackers
advantages over physical intruders,
238–240
script kiddies, 240

hard benefits, 32
hardware, purchasing, 102
estimated costs, 103
header fields of RTP packets, 21–22
header format of IP packets, 18
HIDS (host-based intrusion detection
system), 243
high availability, maintaining,
200–201
application management, 204
monitoring servers, 201–204
hijacking, 252
Huizenga, Jared, 233

I

identifying security team, 270–271
IDS (intrusion detection system), 243
IEEE 802.1p/Q, 152
IETF, 12
implementing VoIP
as major IT project, 44
ensuring reliability, 47–48
up-front planning, 45–46
estimating ROI, 48, 50, 52–53
ensuring profitability, 56–57
investments, 50–53
returns, 53–55
SLAs, 223
defining responsibilities, 223
enforcement procedures,
233–234
measurement tools, 230, 233
negotiations, 226–230
selecting relevant metrics,
224–226
improving bandwidth, 105–106

incident tracking, 222
incremental cost of network ownership, 36
instant-messaging applications, 40
integrating new features into business applications, 40
interexchange carrier (IXC), 8
internal SLAs, 216
intrusion detection, 242
 reacting to intrusions, 244–245
inventories, essential features of, 187–188
investing in VoIP, 30
 estimating cost of VoIP
 deployment, 50–53
 planning stage, 30
 ROI
 analyzing, 43–44
 calculating, 48–55
IP (Internet Protocol), 12, 16
 packet header format, 18
 QoS techniques, 157
 DiffServ, 158
 IP Precedence, 157
 MPLS, 161
 RSVP, 159, 161
 TOS, 157
IP Centrex, 9–10
IP phones, 11, 26–27
 security vulnerabilities, 266–269
IP Precedence, 157
IP telephony servers, 23–25
IPSec, 269
IPv4, 16
IPv6, 16
IT project lifecycle, 45

ITU (International Telecommunications Union), 3
 G.107 recommendation, 81
ITU-T (Telecommunications Standardization Sector), 4
IXC (interexchange carrier), 8

J-K

jitter, 90, 221

Kaufman, David, 234
key systems, 9
KISS (keep it simple, stupid), 35
Kovar, Matthew, 241

L

latency, 87–89
LDAP (Lightweight Directory Access Protocol), 266
LECs (local exchange carriers), 7
LFI (Link Fragmentation and Interleaving), 156
LFN (log file monitor), 243
link-layer QoS techniques, 152
 ATM QoS, 153–154
 Frame Relay QoS, 155
 IEEE 802.1p/Q, 152
 LFI, 156
 RTP header compression, 155–156
load balancing, 70
local switches, 7

long-distance savings in VoIP

deployment, 34–35

lossy compression, 14

lost data, 91–93

lost packets, 221

M

maintaining

call quality, 205–207

performance factors,
207–208

SLAs, 208–209

SLQoSAs, 209–211

critical files

call routing tables, 192

configuration files, 191–192

program files, 193–194

high availability, 200–201

application management, 204

monitoring servers, 201–204

managing VoIP

availability, 200–201

application management, 204

monitoring servers, 201–204

configuration management, 186

maintaining critical files,
191–194

network inventory, 187–188

network topology, mapping,
189–190

event management, 194–197

fault management, 197–200

outsourcing, 122–123

application integration, 128

integrator selection criteria,
132–135

MSP selection criteria,
130–132

MSPs, 129

network tuning, 128

PBXs, 127

performing network

upgrades, 124–125

pilot deployments, 125–126

toll bypass, 126

troubleshooting, 129

VoIP-readiness

assessment, 124

measuring

benefits of VoIP, 31–32

convergence, 41–42

cost savings, 32–37

hard benefits, 32

new features, 39–40

productivity savings, 37–38

soft benefits, 32

call quality, 79–85

data loss, 91

obstacles to VoIP, 42

business risks, 43

cost investment, 42

SLAs, 230–233

Megaco (Media Gateway Control), 20

Metcalf, Bob, 144

metrics

incident tracking, 222

QoS, selecting, 145–147

SLAs, selecting, 216–217

availability, 217–218

call quality, 220–221

call setup performance,
218–220

modulation, PCM, 6

monitoring

- servers, 201–204
- SLAs, 230, 233

Moore, Geoffrey A., 30**MOS (mean opinion score), 220**

- measuring call quality, 80

MPLS (Multiprotocol Label Switching), 161**MSPs (managed service providers), 129****MTBF (mean time between failures), 222****MTTR (mean time to repair), 222****multiplexing, 7****N****necessity of VoIP management, 181–183**

- availability, 183–184
- scalability, 184–185

network access points, security vulnerabilities, 247**network infrastructure savings in VoIP deployment, 35–37****network tuning, 128****new features**

- adding to VoIP deployment, 40
- increasing ROI, 39

NIDS (network intrusion detection system), 243

- shunning, 263

non-repudiation, 259**number portability, 38****O****objective call quality****measurements, 80****one-way delay, 88****operating systems, Windows security features, 258****operations management**

- configuration management, 186
 - call routing tables, 192*
 - maintaining critical files, 191–192*
 - network inventory, 187–188*
 - network topology, 189–190*
 - program files, 193–194*
- event management, 194–197
- fault management, 197–200

out-of-band signals, 10**outsourcing VoIP project, 122–123**

- application integration, 128
- developing partnership, 136–137
- integrator selection criteria, 132–135
- maintaining partnership, 137
- MSP selection criteria, 130–132
- MSPs, 129
- network tuning, 128
- PBXs, 127
- performing network upgrades, 124–125
- pilot deployments, 125–126
- toll bypass, 126
- training, 130
- troubleshooting, 129
- VoIP-readiness assessment, 124

overheard conversations, 249–250**overprovisioning, 143****oversubscribing, 143–144**

P

packets, 16

- IP, header format, 18
- security vulnerabilities, 269–270

packet-switched connections, 13

packetization delay, 87

PAMS (Perceptual Analysis Measurement System), 81

partnership with VoIP integrator

- developing, 136–137
- maintaining, 137

PBXs, (private branch exchanges), 8, 23–25, 127

PCM (pulse code modulation), 6, 85

performance

QoS

- best practices*, 174–176
- identifying need for*, 146
- IP mechanisms*, 157–161
- link-layer mechanisms*, 152–156
- managing*, 209–211
- overprovisioning*, 143
- oversubscribing*, 143–144
- queuing*, 162–164
- selecting metrics*, 145–147
- testing*, 171–172
- traffic classification*, 145–149
- traffic shapers*, 165

requirements for voice

- applications, 144

SLAs

- availability metric*, 217–218
- call quality metric*, 220–221
- call setup performance metric*, 218–220
- implementing*, 223–230

incident tracking, 222

managing, 208–209

measurement tools, 230, 233–234

selecting metrics, 216–217

TCP/IP, tuning, 166–167

tuning, 128, 167–170

voice quality, MOS, 220

VoIP tuning, 167–170

performing

data network upgrades, 104–105, 124–125

changing network design, 107

eliminating equipment gaps, 108

obtaining more bandwidth, 105–106

postmortems, 271–272

QoS tuning, 108

replacing equipment, 106

VoIP readiness assessment, 93

bandwidth modeling, 99–102

call-quality assessment, 97–99

configuration assessment, 93–95

utilization assessment, 95–97

PESQ (Perceptual Evaluation of Speech Quality), 80

phone tag, 39

physical security, 254–256

pilot deployments, 125–126

building, 109–110

evaluating systems, 111–113

solving echo problems, 113–114

transcoding, 115

planning for VoIP deployment

30, 62–63

- as major IT project, 45–46
- assessing reliability, 67–69
 - of hardware, 70–71*
 - of IT processes, 75–76*
 - of link and carrier, 72*
 - of network design, 73–75*
 - of software, 71*
- compiling current telephony usage information, 64
 - call flow analysis, 66*
 - call volume statistics, 66*
 - CDRs, 65*
- ensuring reliability, 47–48
- evaluating call quality, 76–79
 - codec selection, 85–87*
 - delay, 87–89*
 - E-model, 82–85*
 - jitter, 90*
 - lost data, 91–93*
 - MOS, 80*
- growth management, 211–212
- readiness assessment, performing
 - bandwidth modeling, 99–102*
 - call-quality assessment, 97–99*
 - configuration assessment, 93–95*
 - utilization assessment, 95–97*

PLC (packet loss concealment), 15, 87

policies

- defining, 270
 - exploiting vendor resources, 272–274*

- identifying security team, 270–271*

- performing postmortems, 271–272*

- managing, 263–264

- repositories, 265

policy console, 264

policy-based network

management, 209

postmortems, performing, 271–272

POTS (plain old telephone service), 3

preventing security breaches, 241–242

prioritizing classified traffic, 149

proactive management activities, ensuring reliability of VoIP deployment, 47–48

productivity

- downtime costs, 183–184

- measuring potential savings in VoIP deployment, 37–38

profitability, ensuring in VoIP

project, 56–57

program files, maintaining, 193–194

protocols, 12

PSQM (Perceptual Speech Quality Measure), 80

PSTN (Public Switched Telephone Network), 3

- Centrex solutions, 9

- circuit-switched connections, 3

- components, 5

- PBXs, 8*

- signaling, 10*

- switches, 7*

- telephones, 11*

- voice encoding, 6–7*

five nines reliability, 3
 IXCs, 8
 stages of typical telephone call, 4

purchasing VoIP equipment, 102

estimated costs, 103

Q

QoS (quality of service), 142

configuring, 171–172
 identifying need for, 146
 IP, 157

DiffServ, 158

IP Precedence, 157

MPLS, 161

RSVP, 159–161

TOS, 157

link-layer, 152

ATM, 153–154

Frame Relay, 155

IEEE 802.1p/Q, 152

LFI, 156

RTP header compression,
 155–156

managing, 209, 211

overprovisioning, 143

oversubscribing, 143–144

queuing, 162

CBWFQ, 163

WFQ, 162–163

WRED, 164

recommended practices, 174–176

selecting metrics, 145–147

testing, 172

traffic classification, 145–149

prioritization, 149

traffic shapers, 165

voice applications, performance
 requirements, 144

queuing techniques, 162

CBWFQ, 163

WFQ, 162–163

WRED, 164

R

reacting to intrusions, 244–245

readiness assessment of VoIP

implementation, performing, 124

real-time monitoring, 203

recommendations (ITU-T), 4

recommended practices

QoS-related, 174, 176

security, securing central facilities,
 254–260

redundancy, 70

reliability

assessing, 67–69

of hardware, 70–71

of IT processes, 75–76

of link and carrier, 72

of network design, 73–75

of software, 71

ensuring, 47–48

five nines, 3

remote access points, security

vulnerabilities, 247

replacing equipment, 106

resources

overprovisioning, 143

oversubscribing, 143–144

sharing, 142

response time, 78

returns, estimating in VoIP
deployment, 53, 55

RFCs (Request For Comments), 12

ROI (return on investment), xvii
 analyzing, 43–44
 calculating, 48–55
 ensuring profitability, 56–57
 evaluating, 30
 investments, estimating, 50–53
 measuring benefits of VoIP, 31–32
business risks, 43
convergence, 41–42
cost investment, 42
cost savings, 32–37
hard benefits, 32
new features, 39–40
productivity savings, 37–38
soft benefits, 32

routers, 25

RSVP (Resource Reservation Protocol), 159–161

RTP (Real-time Transport Protocol), 78
 header compression, 105, 155–156
 header fields, 21–22
 lost data, 91–93
 multiplexing, 106

R-value, calculating, 82–85

S

scalability
 cost savings of VoIP network
 expansion, 36
 growth management, 184–185

planning for future growth,
 211–212

Schneier, Bruce, 238

SCP (Session Control Point), 10

script kiddies, 240

security, 238
 detecting breaches, 243
 events, 240
 forensics, 244
 hackers versus physical intruders,
 238–240
 intrusion detection, 242
 intrusions, 240
 prevention, 241–242
 reacting to intrusions, 244–245
 recommended practices, securing
 central facilities, 254–258, 260
 vulnerabilities of VoIP
annoyances, 253
call hijacking, 252
confidentiality, 248–251
data network, 261–264
DoS attacks, 252
IP phones, 266–269
packets, 269–270
toll fraud, 246–248
undefined processes,
270–274

selecting
 codecs, 85–87
 integrators, criteria, 132–135
 metrics for SLAs, 216–217
availability, 217–218
call quality, 220–221
call setup performance,
218–220
 MSPs, criteria, 130–132

- self service MSPs, 129**
 - self-healing networks, 74**
 - Sequence Number field (RTP header), 21**
 - servers**
 - gatekeepers, 24
 - hardening, 256–258
 - security vulnerabilities, 247–248
 - sharing drives, 259**
 - sharing network resources, 142**
 - overprovisioning, 143
 - oversubscribing, 143–144
 - performance requirements, 144
 - shunning, 263**
 - signaling, 10**
 - signatures, 263**
 - silence suppression, 105**
 - single network infrastructure savings in VoIP deployment, 35–37**
 - SIP (Session Initiation Protocol), 20**
 - SIV (system integrity verifier), 243**
 - SLAs (service-level agreements), 216**
 - cancelling contracts, 234
 - ensuring reliability of VoIP deployment, 48
 - implementing, 223
 - defining responsibilities, 223*
 - enforcement procedures, 233–234*
 - measurement tools, 230, 233*
 - negotiations, 226–230*
 - selecting relevant metrics, 224–226*
 - incident tracking, 222
 - managing, 208–209
 - selecting metrics, 216–217
 - availability, 217–218*
 - call quality, 220–221*
 - call setup performance, 218–220*
 - soft benefits, 32**
 - softphones, 26–27**
 - security vulnerabilities, 248
 - Source Address field (IP packet header), 18**
 - Source ID field (RTP header), 22**
 - SS7 (Signaling System 7), 10**
 - stages of telephone call, 2**
 - standards, 3**
 - data-networking, 12
 - G.711, 6
 - stateful inspection, 262**
 - STP (Signal Transfer Point), 10**
 - subjective call quality measurements, 80**
 - switches, 7, 26**
 - Class 5–7
 - tandem, 8
- T**
- T1 (trunk level 1), 6**
 - tandem switches, 8**
 - TCP (Transmission Control Protocol), 16**
 - TCP/IP protocol stack, 15, 18**
 - TCP, 16
 - performance tuning, 166–167
 - UDP, 17
 - technology adoption process, 31**

telephone calls, stages of, 41
telephony standards, 3
 G.711, 6
terminating SLA contracts, 234
test plan for VoIP deployment,
 assembling, 116–118
testing QoS, 171–172
tie lines, 9
Time Stamp field (RTP header), 22
toll bypass, 34, 126
toll fraud, 246, 248
topologies, mapping, 189–190
TOS (Type of Service) field, 157
 IP packet header, 18
traffic classification, 145–149
 congestion, 146
 prioritization, 149
traffic shapers, 165
training costs
 estimating, 37
 outsourcing, 130
transaction-oriented applications, 77
transcoding, 25, 115
troubleshooting network problems,
 outsourcing, 129
trunk lines, 7
TTL (Time to Live) field (IP packet
 header), 18
tuning network performance, 128
 TCP/IP performance, 166–167
 VoIP performance, 167–170

U

UDP (User Datagram Protocol), 17
undefined processes as security
 vulnerability, 270–274
unified messaging, 24, 39, 250
upgrading data network components,
 104–105
 achieving higher bandwidth,
 105–106
 changing network design, 107
 QoS tuning, 108
upgrading network before VoIP
 deployment, 124–125
utilization assessment, performing,
 95, 97

V

VAs (vulnerability assessments), 241
vendor resources, exploiting, 272, 274
voice encoding, 6–7
 PCM, 6
voice quality
 maintaining, 205–208
 QoS, 209–211
 SLAs, 208–209
 MOS, 220
voice streaming protocols, 21–23
VoIP components
 call setup protocols, 20
 gateways, 25
 IP phones, 26–27
 IP telephony servers, 23, 25
 PBXs, 23, 25
 replacing, 106

- routers, 25
- softphones, 26–27
- switches, 26
- TCP/IP protocol stack, 15, 18
 - TCP*, 16–17
- voice streaming protocols, 21–23
- VPNs (virtual private networks), 269**
- vulnerabilities of VoIP security**
 - annoyances, 253
 - call hijacking, 252
 - confidentiality, 248
 - CDRs*, 251
 - overheard conversations*, 249–250
 - data networks, 261–264
 - DoS attacks, 252
 - IP phones, 266–269
 - packets, 269–270
 - toll fraud, 246–248
 - undefined processes, 270–274

W

- Wetzel, Kevin, 273**
- WFQ (weighted fair queuing), 162–163**
- why this book was written, xvi**
- Windows operating system, security features, 258**
- wireless access points, security vulnerabilities, 247**
- wiring costs, measuring in VoIP deployment, 36**
- WRED (weighted random-early detection), 164**