

Index

Numerics

- 4B/5B encoding, 38
- 802.2 Logical Link Control (LLC) field, 44

A

- A (Address) records, 390
- AAA (Authentication, Authorization, and Accounting), 18
- absolute load, calculating, 317
- absolute server load, calculating, 317–319
- absolute time, 275
- ACA (Arrowpoint Content Awareness), 315
- ACLs (access control lists), 15, 103. *See also* application inspection
 - basic, 105
 - reflexive, 105
- ACNS (Application and Content Networking Systems), 23, 472, 475
 - available solutions, 22–23
 - content distribution and routing, 24–25
 - content edge delivery, 23–24
 - channels of content, creating, 479, 482, 485
 - components of, 476
 - registering, 477–478
 - content prepositioning
 - acquiring content for, 485–486
 - multicast-push distribution trees, 488
 - unicast-pull distribution trees, 489
 - content request routing
 - Dynamic PAC, 494–496
 - SHR, 492–493
 - manifest files, 486–487
 - prepositioned content, distributing, 475
 - scheduled live and rebroadcast programs, creating, 500–502
 - streaming media, configuring, 497
 - streaming VoD content, 498–500
- acquiring content for prepositioning, 485–486
- address translation
 - destination translation, 99–100
 - PAT, 98
- administration as requirement for application development, 18–19
- age-out timer (CSS), modifying, 317
- ANNOUNCE message (RSTP), 271
- Anycast RP, 148
- AON (Cisco Application Oriented Network), applying XLS stylesheets, 210
- Apple QuickTime, 265–266
 - streaming live and scheduled rebroadcasts on ACNS networks, 497
- application development
 - requirements for
 - availability, 11–13
 - bandwidth and response times, 13
 - customization and prioritization, 14–15
 - monitoring and administration, 18–19
 - security, 15–18
 - security, auditing, and monitoring, 15
- application inspection, 106–107
- application layer (OSI model), 223
 - keep-alives, configuring on CSS, 328
- application layer protocols, 223
 - FTP, 250
 - HTTP, 224
 - authentication, 231–233
 - caching controls, 233
 - connection persistence, 227, 230
 - cookies, 230
 - explicit cache controls, 235–236
 - implicit cache controls, 233–235
 - methods, 225
 - return codes, 225–226

- load balancing, 320–321
- SSL, 249
- applications**
 - classifying, 160
 - with NBAR, 170*
 - for content distribution, 473
 - e-learning and corporate communications, 473*
 - software and file distribution, 474*
 - marking, 160
- applying**
 - QoS to streaming media, 276
 - XSL stylesheets with AON, 210
- ARP (Address Resolution Protocol), 48–50**
- ASR (Adaptive Session Redundancy), 341**
- assigning routers**
 - as BSR, 145
 - as RPs, 141–144
 - as RPs with BSR, 144–146
- ASX (Advanced Stream Redirector)**
 - meta-files, 264–265
- asymmetric key cryptography, 237**
- ATM CLP (Cell Loss Priority) bit**
 - marking, 165
- audio-video codecs, streaming media**
 - algorithms, 260–261
- auditing as requirement for network**
 - development, 15–17
- authentication, HTTP, 231–233**
 - end-to-end, 447
- automatic content transformation, 14**
- automatic RP-to-group mapping**
 - distribution, 141
- Auto-RP, configuring, 142–144**
- availability**
 - as requirement for network development, 10–13
 - calculating, 12

- avoiding unnecessary CEF processing**
 - overhead on outgoing traffic, 428**
- AVS (Cisco Application Velocity System), 106**

B

- back-channel multicast, 468**
- Back-End Encryption, 356**
- backplane, 110**
- balance least conn command, 314**
- bandwidth as requirement for network**
 - development, 13
- basic ACLs, 105**
- Berners-Lee, Tim, 203**
- BGP anycast, 394**
- BGP QoS policy propagation, 189**
- Bidir-PIM, 139–140**
- block ciphers, 237**
- Boomerang DNS racing, 400**
- Boomerang protocol, 398–400**
 - DD, configuring for use of, 402
 - DRP, configuring agents for use of, 402
- branch offices, content networking**
 - solutions, 20
- bridge-mode content switching, 300–307**
 - configuring, 302–305
- bridge-mode fault tolerance, configuring, 351**
- broadcast domains, 48**
- browsers**
 - Internet Explorer, 204
 - Mosaic, 204
 - Netscape, 204
 - user agents, 206
- BSR (bootstrap routers)**
 - assigning, 145
 - RP-to-group mappings, configuring, 144–146

bypass load enable command, 432

bypass persistence, 436

C

cable pinouts, UTP, 33

cache healing, 430

cache-hit, 437

cache-miss, 437

caching controls (HTTP), 233

explicit cache controls, 235–236

implicit cache controls, 233–235

caching topologies, configuring

forward transparent caching, 440–441

proxy caching, 437–439

reverse transparent caching, 441–444

calculating

absolute load, 317

availability, 12

committed burst, 185

probability of server farm failure, 12

required memory for NBAR connection maintenance, 166

server load

absolute load, 317–319

relative load, 315–316

campus network design

backplane, 110

redundant features of, 108–110

switch fabric, 110

CAR (Committed Access Rate), 160

configuring, 187–188

CAs (certificate authorities), 241

CBAC (context-based access control), 106

configuring, 107

CBWFQ (Class-based Weighted Fair

Queuing)

applying to streaming media, 276

with LLQ, configuring, 176–177

CDM (Content Distribution Manager), 475

CE_IPADDR_n macro, 495

CE_NAME_n macro, 495

CEF (Cisco Express Forwarding), 91–93

central building (campus networks), 109

CER (Canonical Encoding Rules), 244

certificate rsa command, 370

certificates, 240, 243–245

common formats of, 244

passphrase, 358

private key formats, 245

X.509 PEM, 245–246

CEs (content engines), 476

failures, recovering from, 429

overload bypass, configuring, 432

streaming media delivery, 455

streaming VoDs, 456–457

value-added services, enabling

content authentication and authorization, 448–449

ICAP, 450–452

SSL caching and tunneling, 449–450

TCP/IP parameter adjustments, 453–454

URL filtering, 452–453

WMT keys, installing, 459

CGMP (Cisco Group Management Protocol), 149–150

channels of content, creating on ANS, 479–485

CIR (committed information rate), traffic policing, 184–186

Cisco content edge delivery, 423

Cisco Content Networking Partner Program, 25–26

Cisco PIX Firewall, application inspection, 106

Cisco Streaming Engine, 498

Cisco Traffic Anomaly Detector, 108

class-based packet marking, 160–165

class-based policing, 160

configuring, 188

class-based traffic shaping, configuring, 187

classification, 160

classifying custom applications with NBAR, 170

codecs, 259

stills-based, 260

streaming media algorithms, 260–261

commands

balance least conn, 314

bypass load enable, 432

bypass persistence disable, 436

certificate rsa, 370

crypto ca authenticate, 365

crypto ca import, 366

dns-server zone, 411

dns-server zone load, 406

fair-queue, 192

fixup protocol rtsp, 274

- ftp-record, 358
- heartbeat-time, 351
- http cluster, 430
- interface vlan, 367
- ip director drp synchronized, 400
- ip director host priority, 400
- ip igmp last-member-query-count, 126
- ip igmp version 1, 125
- ip igmp version 3, 127
- ip nat service rtsp port, 274
- ip nbar custom, 170
- ip nbar protocol-discovery, 166
- ip pgm router, 155
- ip pim bidir-enable, 140
- ip pim bsr-candidate, 145
- ip pim rp-address, 135, 141
- ip pim send-rp-announce, 142
- ip pim ssm, 153
- ip protocol fixup, 106
- ip reflexive timeout, 105
- ip rtp header-compression, 276
- ip wccp, 424–425
- load step, 316
- load-teardown timer, 317
- persistence reset redirect, 287
- persistent rebalance, 287
- persistent reset, 436
- predictor leastconns, 314
- random-detect, 181
- RTCP, 270
- set qos-group, 165
- show port capabilities, 179
- spanning-packets, 285
- sticky netmask, 383
- wccp version, 425
- committed burst, 184–185**
- comparing**
 - HTML and XHTML, 208
 - HTTP 1.0 and HTTP 1.1, 224
 - input redirection and output redirection, 427–428
- components of ACNS, 475–476**
- composite video, 258**
- configuring**
 - Bidir-PIM, 140
 - bridge-mode fault tolerance, 351
 - cache healing, 430
 - CBAC, 107
 - CBWFQ with LLQ, 176–177
 - class-based traffic shaping, 187
 - CQ, 173
 - CSM
 - as DFP manager, 313
 - bridge mode, 302–305
 - least connections, 314
 - URL and header rewrite, 370
 - CSM-S, trust points, 364
 - CSS
 - firewalls, 372
 - high availability, 343–344
 - TCP keep-alives, 327
 - WRR, 312
 - CSS DNS-Sticky, 417–418
 - Stateful DNS Sticky, 419
 - CSS proximity-based load balancing, 410–411
 - DD, 395–398
 - for Boomerang protocol, 402
 - domain balancing, 435
 - domain hashing, 435
 - DRP, 399
 - agents for Boomerang protocol, 402
 - dynamic routing, 84–87
 - forward transparent caching, 440–441
 - FWLB
 - on CSM, 374–382
 - on CSS, 373–374
 - single-CSM FWLB, 379–382
 - GTS, 186
 - hash distribution, 320
 - IGMPv3, 127
 - input/output redirection, 427
 - inter-domain multicast with MSDP, 148
 - Layer 2 redirection, 426
 - leaf routers, 135
 - load balancing
 - CSS proximity-based, 410–411
 - per-flow, 326
 - VPN load balancing on CSM, 382–383
 - location trees, 480
 - multicast-to-multicast live splitting, 463
 - PQ, 172–173
 - PQ/WFQ, 175
 - proxy caching, 437–439

- QoS policy signaling, 189
 - BGP QoS policy propagation, 189*
 - RSVP, 190–191*
- reverse stickiness, 378–379
- reverse transparent caching, 441–444
- router-mode CSM, 309–310
- RP selection
 - Auto RP, 142–144*
 - with BSR, 144–146*
- RSVP, packet marking, 194
- server load, 315
- SSL Termination, 358–359
 - on CSM, 363–365*
 - on CSS, 358–362*
- static routing, 82
- static RP addresses, 141
- streaming media, 497
- traffic policing
 - CAR, 187–188*
 - class-based, 188*
 - two-rate, 189*
- URL filtering, 452–453
- virtual routers, 345
- VLAN trunking, 76–77
- VLANs, 76
- VPN load balancing on CSM, 382–383
- VRRP on VIPs, 345–347
- WCCP, 424
 - CE overload bypass, 432*
 - load distribution via hash buckets, 428–432*
 - load distribution via mask assignment, 432–433*
 - service groups, 424*
- WFQ, 174–176
- WRED, 180–183
- congestion avoidance**
 - TCP, 61–62
 - traffic policing, configuring, 184–186
 - CAR, 187–188*
 - class-based, 188*
 - two-rate, 189*
 - traffic shaping, configuring, 184–186
 - class-based, 187*
 - GTS, 186*
 - WRED, configuring, 180–183*
- congestion management, Layer 3 router packet queuing, 171**
 - CQ, 173
 - PQ, 172–173
 - PQ/WFQ, 175
 - WFQ, 174, 176
- connection persistence**
 - HTTP 1., 230
 - HTTP 1.1, 227
- connection processing hardware, 288**
- container files, 261–262**
 - linking users to, 263
 - media independence, 263
- content authentication and authorization, enabling on CEs, 448–449**
- content caching, 23–24**
- content distribution, 24–26, 480**
 - applications, 473
 - e-learning and corporate communications, 473*
 - software and file distribution, 474*
- content edge delivery**
 - content caching, 23–24
 - streaming media delivery, 24
- content filtering, 26**
- content management, 25**
- content providers, 26**
- content request routing, 491**
 - Dynamic PAC, 494–496
 - SHR, 492–493
- content scanning, 26**
- content switching, 282**
 - delayed binding, 284
 - destination-NAT mode forwarding, 283
 - dispatch mode forwarding, 283
 - hash distribution, configuring, 320
 - HTTP pipelining, 285
 - in FWLB applications, 21
 - in global server load balancing
 - applications, 22
 - in SLB applications, 21
 - in VPN load balancing applications, 21
 - inline mode, 299
 - load distribution
 - configuring, 435–436*
 - failover bypass, configuring, 436*
 - one-armed mode, 298
 - specifications, 294
 - SSL termination, 355–358
 - transparent redirection, configuring, 434–435
- content transformations, 14**
- content, preloading to CE, 445–446**
- control messages, RTSP, 270–271**

control processing hardware, 288
control processor (CSM), 297
controlled-load service (RSVP), 191
cookies, 230
 SYN cookies, preventing connection table flooding, 384
core layer (campus networks), redundant features, 108–110
CoS (Class of Service) field, marking, 165
CoS-to-DSCP value mappings, 178
CQ (custom queuing), configuring, 173
CRA (Content Routing Agents), configuring, 411
creating
 channels of content on ACNS, 479–485
 location trees, 480
 PIM-SM shared trees, 134
CRs (Content Routers), 476
crypto ca authenticate command, 365
crypto ca import command, 366
cryptology, 236
 certificates, 240, 243–245
 public key cryptography, 237–240
CSM (Content Switching Module), 295
 configuring as DFP manager, 313
 control processing hardware, 288, 297
 extension matching, 324
 FWLB, configuring, 374–382
 GSLB, 411–415
 hardware, 288
 high availability, configuring, 347, 350–351
 HTTP cookie inspection, configuring, 335
 least connections, configuring, 314
 load balancing, HTTP header load balancing, 323–325
 network processor architecture, 296
 packet processing stages, 297–298
 pipelined architecture, 296
 session persistence, 335
 SSL termination, configuring, 363–365
 sticky table, viewing contents of, 333
 TCP/UDP connection stage, 297
 URL and header rewrite, configuring, 370
CSMA/CD (carrier sensing multiple access/collision detection), 44
CSM-S (CSM with SSL Daughter Card Module)
 private/public keys, generating, 363
 SSL termination, 366–369
 trust points, configuring, 364

CSS (Content Services Switch), 213–215
 absolute load, calculating, 317
 ACA algorithm, 315
 age-out timer, modifying, 317
 application layer keep-alives, configuring, 328
 bridge mode, 300–307
configuring, 302–305
 certificates, importing, 358–360
 EQLs, 322–323
 firewalls, configuring, 372
 form factors, 292–293
 FWLB, 371
configuring, 373–374
 hardware, 288
 high availability, 341
configuring, 343–344
 I/O modules, 289
 keys, importing, 358–360
 load balancing, HTTP header load balancing, 321–322
 manual service sticky strings, enabling, 336
 modules, 289–290
 multisite load distribution, 405–407
 packet flow, 290–292
 proximity-based load balancing, 408–409
configuring, 410–411
multitiered proximity, 411
 router mode, 307–311
 SAM, 289
 SCM, 289
 SSL processing modules, 289
 SSL termination, configuring, 358–362
 TCP keep-alives, configuring, 327
 WRR, configuring, 312
CSS DNS-Sticky, 415–417
 configuring, 417–418
 stateful DNS, configuring, 419
customization as requirement for network development, 14–15

D

data centers
 content networking solutions, 20
 designing, 111–114
data encoding schemes
 4B/5B encoding, 38
 Manchester encoding, 37

Data field

- Ethernet, 44
- IP packet, 47

data link layer (OSI model), 42, 45

datapath, 288

day-zero attacks, 17

DD (distributed director) technologies, 394

- Boomerang protocol, configuring, 400–402
- configuring, 395–398
- DRP, 398–399
- example configuration, 404
- HTTP redirection, 402–404

delayed binding, benefits of, 285

delivering

- streaming media, 267
 - across CEs, 455*
- streaming VoDs, 456–457

dense mode (PIM), 132

DER (Distinguished Encoding Rules), 244

DESCRIBE message (RSTP), 271

descriptive markup languages, 200–201

Destination IP Address field (IP packets), 47

destination IP address hashing, 435

Destination Media Access Control address field (Ethernet), 43

destination translation, 99–100

destination-NAT mode forwarding, 283

DFP (Dynamic Feedback Protocol), 312

Differentiated Services Code Point (DSCP) field (IP packet), 46

directed mode forwarding, 283

dispatch-mode forwarding, 283

distributed director technologies, 394

distribution layer (campus networks), redundant features of, 108–110

distribution trees, 129

DMZ (demilitarized zone) in enterprise edge networks, 113

DNS (Domain Naming Service)

- Boomerang DNS racing, 400
- iterative DNS resolution, 390–392
- recursive DNS resolution, 392–393
- resource records, 389–390
 - A records, 390*
 - NS records, 390*
 - SOA records, 389*

dns-server zone command, 411

dns-server zone load command, 406

domain balancing, configuring, 435

domain hashing, configuring, 435

DRM (Digital Rights Management), 260

DRP (Director Response Protocol), 398

- Boomerang protocol as agent, configuring, 402
- configuring, 399

DSCP (Differentiated Services Code Point) field, marking, 162–165

DSCP-to-CoS value mappings, 178

DTD (Document Type Definition) file, 202–203

- for XHTML, 207

dynamic NAT, 97

Dynamic PAC (Proxy Auto-Configuration), 494–496

dynamic routing, configuring, 84–87

E

ECDNs (Enterprise Content Delivery Networks), 20

Echo request/responses (ICMP), 50

ECMP (Equal-Cost Multi-Path) load balancing, 326

EIM (Employee Internet Management), 17

e-learning, 474

- applications, 26

- as candidate for content distribution, 473

electrical properties of Ethernet, 37–42

elements (XML), creating tree structure with XPath, 212

enabling

- Anycast RP, 148
- HTTP request revalidation, 445
- IGMPv1 on last-hop routers, 125
- IGMPv2 on last-hop routers, 127
- IGMPv3 on last-hop routers, 127
- manual service sticky strings on CSS, 336
- mask assignment, 433
- RealProxy, 465
- RSVP, 191
- SSM, 153
- URD on last-hop router, 129
- WCCPv2 slow start, 431

end-to-end HTTP authentication, 447

enterprise campus networks, content networking solutions, 20

enterprise edge network design, 111–113

- content networking solutions, 20
- DMZ segment, 113
- private VLANs, 114
- public VLANs, securing, 113
- server groups, 111
- web hosting center, 114

EQLs (Extension Qualifier Lists), 322–323, 434**estimating probability of server farm****failure, 12****Ethernet**

- electrical properties of, 37–42
- over copper, mechanical properties, 32–34
- over fiber, mechanical properties, 35–36
- QoS, applying, 179–180

Ethernet II frame fields, 43–44**example DD configuration, 404****EXCLUDE messages (IGMPv3), 127****explicit cache controls, 235–236****explicit reservation scopes, 190****extension matching, 324****F****failover bypass, configuring, 436****fair-queue command, 192****fast recovery (TCP), 64****fast retransmit (TCP), 62****fast-forwarding media streams with RTSP, 275****fastpath, 288****fate sharing, 348****FCS field (Ethernet), 44****FF (Fixed Filter) reservations, 190****fiber optic technologies**

- connectors, 37
- light sources, 37
- MM fiber, 36
- SM fiber, 36
- total internal reflection, 35

fields

- of Ethernet II frames, 43–44
- of IP packet header, 46–47

FindProxyForURL function, 495**firewall load balancing, 106****firewalls**

- Cisco PIX Firewalls, application inspection, 106
- configuring on CSS, 372

fixup protocol rtsp command, 274**Flags field (IP packet), 46****forward transparent caching, configuring, 440–441****FPGAs (Field Programmable Gate Arrays), 296****Fragmentation Offset field (IP packet), 47****Frame Relay DE bit marking, 165****frames**

- Ethernet II, fields, 43–44
- giants, 44
- runts, 44

FTP, 250**ftp-record command, 358****full-duplex transmission, 45****FWLB (Firewall Load Balancing), 371**

- content switching applications, 21
- CSM FWLB, configuring, 374–382
- CSS FWLB, 371–374
- single-CSM FWLB, configuring, 379–382

G**GCA (Graphic Communications Association)****Gencode Committee, 201****generating public/private keys on****CSM-daughter, 363****GET_PARAMETER message (RSTP), 271****giants, 44****global server load balancing, content switching applications, 22****global synchronization, 181****GML (Generalized Markup Language), 201****goals of e-learning, 474****Goldfarb, Charles, 201****graded index fiber, 35****GSLB (Global Server Load Balancing), 387**

- CSM support, 411–415
- CSS DNS-Sticky, 415–417
 - configuring, 417–418*
 - stateful DSN Sticky, configuring, 419*
- CSS multisite load distribution, 405–407
- CSS proximity-based load balancing, 408
 - configuring, 410–411*

DD

- Boomerang protocol*, 400
- configuring*, 395–398
- DRP*, 398–399
- HTTP redirection*, 402–404
- distributed director technologies, 394
- DNS, 387
 - iterative DNS resolution*, 390–392
 - recursive DNS resolution*, 392–393
 - resource records*, 389–390
- DRP, 398–399

GSS (Global Site Selector), CRA configuration, 411

GTS (Generic Traffic Shaping), configuring, 186

guaranteed QoS service (RSVP), 191

H

H.323, 268

half-duplex transmission, 45

hash buckets, 428–429, 433

- CE failure recovery process, 429
- WCCP load distribution, configuring, 428–432

hash distribution, 319–320

hash load balancing, maintaining session persistence, 332

hashing, 232

- destination IP address hashing, 435
- source IP address hashing, 435

Header Checksum field (IP packet), 47

health checking

- in-band, 330–331
- OOB, 327–329

heartbeat-time command, 351

high availability, configuring

- on CSM, 347, 350–351
- on CSS, 341
- on CSSL, 343–344

hint tracks, 265

hot spots, 431

HTML, 203

- CSSs, 213–215
- file structure, 204–205
- importing content from XML, 210
- style sheets, 204
- versus XHTML, 208

HTML+, 204

HTTP, 224

- authentication, 231–233
- caching controls, 233
 - explicit cache controls*, 235–236
 - implicit cache controls*, 233–235
- connection persistence, 227, 230
- cookies, 230
 - maintaining session persistence*, 334–338
- end-to-end authentication, 447
- header load balancing, 321–325
- header rewriting, 357
- methods, 225
- pipelining, 285
- request revalidation, enabling, 445
- requests, rebalancing, 286
- return codes, 225–226
- similarity to RTSP, 270

http cluster command, 430

HTTP redirection, 402–404

- HTTP 302 redirection, 287

hub and spoke network design

- access technologies, 114
- QoS, 115–116

I

I/O modules, 289

ICAP (Internet Content Adaptation Protocol), 450–452

- enabling on CEs, 450–452
- RESMOD processing, 451

ICDNs (Internet Content Delivery Networks), 20, 116

ICMP (Internet Control Message Protocol), 51

- Echo requests/responses, 50
- redirect messages, 51
- unavailable port errors, 51

Identification field (IP packets), 46

IGMP Snooping, 150

IGMPv1 (Internet Group Management Protocol, version 1), 51, 124–125

IGMPv2, enabling on last-hop routers, 127

IGMPv3, 127

implicit cache controls, 233–235

in-band health checking, 330–331

INCLUDE messages (IGMPv3), 127

inline mode (content switches), 299

- input redirection, 427**
 - installing WMT key on CE, 459**
 - Intel IXP subprocessors, 296**
 - inter-domain multicast, configuring with MSDP, 148**
 - interface vlan command, 367**
 - internal WMS server**
 - rebroadcasts, scheduling, 464
 - stream splitting, configuring, 460
 - multicast-to-multicast live splitting, 463*
 - multicast-to-unicast live splitting, 462*
 - unicast-to-multicast live splitting, 464*
 - unicast-to-unicast live splitting, 461–462*
 - Internet data centers, content networking solutions, 20**
 - Internet Explorer, 204**
 - inter-packet arrival time, 185**
 - IP (Internet Protocol), 45, 47–48**
 - ARP, 48–50
 - frame header fields, 46–47
 - ICMP, 51
 - IGMP, 51
 - ip director drp synchronized command, 400**
 - ip director host priority command, 400**
 - IP DSCP field, marking, 162–165**
 - IP Header Length field (IP packet), 46**
 - ip igmp last-member-query-count command, 126**
 - ip igmp version 1 command, 125**
 - ip igmp version 3 command, 127**
 - IP multicast, 121**
 - address usage, 123
 - IGMPv1, 124
 - IGMPv3, 127
 - in switched environments
 - CGMP, 149–150*
 - IGMP Snooping, 150*
 - RGMP, 151*
 - inter-domain multicast, configuring with MSDP, 148
 - ISM, 122, 129
 - Bidir-PIM, 139*
 - distribution trees, 129*
 - PIM, 130*
 - PIM Sparse-Dense mode, 138*
 - PIM-DM, 132*
 - PIM-SM, 134–136*
 - multicast group selection, configuring, 141–146
 - per-group load balancing, configuring with Anycast RP, 148
 - PGM, 153–154
 - RP selection, configuring, 141–146
 - SSM, 151
 - enabling, 153*
 - limitations of, 152*
 - ip nat service rtsp port command, 274**
 - ip nbar custom command, 170**
 - ip nbar protocol-discovery command, 166**
 - IP Options field (IP packet), 47**
 - ip pgm router command, 155**
 - ip pim bidir-enable command, 140**
 - ip pim bsr-candidate command, 145**
 - ip pim rp-address command, 135, 141**
 - ip pim send-rp-announce command, 142**
 - ip pim ssm command, 153**
 - IP precedence value, marking, 161–162**
 - IP Protocol field (IP packets), 47**
 - ip protocol fixup command, 106**
 - ip reflexive-list timeout command, 105**
 - IP routing, 81**
 - ip rtp header-compression command, 276**
 - IP RTP Priority. *See* PQ/WFQ**
 - IP session filtering. *See* reflexive ACLs**
 - IP Version field (IP packet), 46**
 - ip wccp command, 424–425**
 - IP/TV Program Manager, 500**
 - ISM (Internet Standard Multicast), 122, 129**
 - distribution trees, 129
 - PIM, 130
 - Bidir-PIM, 139*
 - PIM Sparse-Dense mode, 138*
 - PIM-DM, 132*
 - PIM-SM, 134–136*
 - RPF, 130*
 - iterative DNS resolution, 390–392**
- ## J-L
- keep-alives (TCP), sconfiguring on CSS, 327**
 - large-scale software distribution processes, 474**
 - last-hop routers**
 - IGMPv2, enabling, 127

- IGMPv3, enabling, 127
 - URD, enabling, 129
 - Layer 2 multicast protocols**
 - CGMP, 149–150
 - IGMP Snooping, 150
 - Layer 2 packet marking, 166**
 - Layer 2 redirection, 426**
 - Layer 2 switches, applying QoS to Ethernet frames, 179–180**
 - Layer 2/3 traffic, redirecting with WCCP, 426–427**
 - Layer 3 packet marking, 161–162**
 - IP DSCP field, marking, 162–165
 - marking with IP QoS group value, 165
 - Layer 3 redirection, 427**
 - Layer 3 router packet queuing, 171**
 - CQ, 173
 - PQ, 172–173
 - PQ/WFQ, 175
 - WFQ, 174–176
 - leaf routers, configuring, 135**
 - least-connections algorithm, 313–314**
 - limitations of SSM, 152**
 - linking users to streaming container files, 263**
 - live events**
 - scheduling, 500–502
 - stream splitting, 457–459
 - live splitting**
 - enabling on RealProxy, 468
 - multicast-to-multicast, 463
 - multicast-to-unicast, 462
 - unicast-to-multicast, 464
 - unicast-to-unicast, 461–462
 - live streaming media, container files, 261–263**
 - load balancing**
 - ECMP, 326
 - EQLs, 322–323
 - firewall load balancing, 106
 - FWLB, 371
 - content switching applications, 21*
 - CSM FWLB, 374–382*
 - CSS FWLB, 371–374*
 - global server load balancing, content switching applications, 22
 - GSLB, 387
 - CSM support, 411–415*
 - CSS DNS-Sticky, 415–419*
 - CSS multisite load distribution, 405–407*
 - CSS proximity-based load balancing, 408–411*
 - distributed director technologies, 394–404*
 - DNS, 387–390*
 - DRP, 398–399*
 - GSS, 411*
 - iterative DNS resolution, 390–392*
 - recursive DNS resolution, 392–393*
 - HTTP header load balancing, 321–325
 - on application layer, 320–321
 - SLB, content switching applications, 21
 - VPN load balancing
 - content switching applications, 21*
 - on CSM, configuring, 382–383*
 - load distribution**
 - configuring with content switches, 435–436
 - configuring with hash buckets, 428–432
 - configuring with mask assignment, 432–433
 - hashing, 319–320
 - least-connections algorithm, 313–314
 - round robin algorithm, 311–313
 - load step command, 316**
 - load-teardown timer command, 317**
 - Local Director, 287**
 - location trees, 479–480**
 - Lorie, Raymond, 201**
- ## M
- MAC learning, 77–79**
 - macros, 495**
 - managed content, 423**
 - Manchester encoding, 37**
 - manifest files, 486–487**
 - manual service sticky string, enabling on CSS, 336**
 - marking packets, 160**
 - at Layer 2, 166
 - at Layer 3, 161–162
 - IP DSCP field, marking, 162–165*
 - marking with IP QoS group value, 165*
 - class-based packet marking, 160
 - markup languages, 199–200**
 - descriptive, 200
 - GenCode, 201*
 - GML, 201

- HTML, 203–204
 - procedural, 199
 - SGML, 201
 - DTD files*, 202–203
 - structural
 - HTML*, 203–205
 - XHTML*, 207
 - XML*, 205–206
 - style sheets, CSSs, 213–215
 - WAP, 208–210
 - mask assignment**
 - enabling, 433
 - load distribution, configuring, 432–433
 - MathML, 206**
 - mechanical properties of Ethernet**
 - over copper, 32–34
 - over fiber, 35–36
 - membership report message (IGMPv3), 127**
 - memory, calculating NBAR connection requirements, 166**
 - message digest, 232**
 - messages**
 - IGMPv1, 124
 - IGMPv3 membership report messages, 127
 - PIM, 131
 - SPMs, 153
 - meta-files, 264**
 - methods, HTTP 1.1, 225**
 - Microsoft WMT, 265–266**
 - MM (multimode) fiber, 35–36**
 - modifying**
 - age-out timer in CSS, 317
 - queue tail-drop thresholds, 180
 - monitoring/administration as requirement for network development, 15, 18–19**
 - Mosaic web browser, 204**
 - Mosher, Edward, 201**
 - MPEG (Motion Picture Experts Group) standards, 266–267**
 - MPEG4, 267**
 - MSDP (Multicast Source Discovery Protocol), configuring inter-domain multicast, 148**
 - MSISDN number sticky, maintaining session persistence, 340**
 - MSS (maximum segment size), 64**
 - multicast. See IP multicast**
 - multicast clouds, configuring in ACNS network, 488**
 - multicast groups, configuring per-group load balancing with Anycast RP, 148**
 - multicast-push distribution trees, 488**
 - multicast-to-multicast live splitting, configuring, 463**
 - multicast-to-unicast live splitting, configuring, 462**
- N**
- NAT (Network Address Translation), 95**
 - dynamic NAT, 97
 - static NAT, 96
 - NBAR (Network Based Application Recognition), 160**
 - application inspection, 107
 - classifying custom applications, 170
 - memory requirements for connection maintenance, calculating, 166
 - packet classification, 169
 - supported dynamic port applications, 168
 - supported non-TCP/UDP applications, 169
 - supported static port applications, 167–168
 - “near miss” content requests, 430**
 - NEAREST_PROXIES_n macro, 495**
 - Netscape, 204**
 - network development, requirements for**
 - bandwidth and response times, 13
 - customization and prioritization, 14–15
 - monitoring/administration, 18–19
 - scalability and availability, 10–13
 - security, auditing, and monitoring, 15–18
 - network layer (OSI model), corresponding TCP/IP protocols, 45–48**
 - ARP*, 48–50
 - ICMP*, 51
 - IGMP*, 51
 - network processor architecture, 296**
 - nonces, 231**
 - NPT (Normal Play Time), 275**
 - NRZ (Non-Return to Zero) signaling, 39–40**
 - NRZ-I (NRZ-Inverted) encoding, 40**
 - NS (Name Server) records, 390**
 - NTSC (National Television Standards Committee), 258**

O

- OIF (outgoing interface) list, 130**
- on-demand streaming media, container files, 261–263**
- one-armed mode (content switches), 298**
- one-way hash functions, 232**
- OOB health checking, 327–329**
- OPTIONS message (RSTP), 271**
- OSI reference model, 8**
 - application layer, 223
 - FTP, 250*
 - HTTP, 224–227, 230–236*
 - SSL, 249*
 - data link layer, 42, 45
 - layers associated with TCP/IP protocols, 31–32
 - network layer
 - ICMP, 51*
 - IGMP, 51*
 - IP, 45–50*
 - physical layer
 - Ethernet electrical properties, 37–42*
 - Ethernet over copper, mechanical properties, 32–34*
 - Ethernet over fiber, mechanical properties, 35–36*
 - transport layer, corresponding TCP/IP protocols, 52–66
- output redirection, 427–428**
- overload bypass, configuring, 432**

P

- PAC file template, macros, 495**
- packet filtering. *See* ACLs**
- packet flow through CSS, 290–292**
- packet forwarding hardware, 288**
- packet marking**
 - at Layer 2, 166
 - at Layer 3, 161–162
 - IP DSCP field, marking, 162–165*
 - marking with IP QoS group value, 165*
 - class-based packet marking, 160
 - with RSVP, 194
- packet switching, 87**
 - CEF, 91–93
 - fast switching path, 89–91
 - process switching path, 88
- page-sequence element (XSL-FO), 217**
- PAL (Phase Alternation Line), 258**
- PAM5 (Pulse Amplitude Modulation Level 5), 41**
- parsers, transforming XML to XHTML/HTML, 211**
- passive-FTP, 252**
- passphrases, 358**
- PAT (Port Address Translation), 98**
- pattern recognition, 108**
- PAUSE message (RSTP), 271**
- PBR (Policy-Based Routing), 160**
 - Layer 3 packet marking, 162
 - DSCP field, 162–165*
- PDLs (Packet Description Language Modules), 170**
- PEM (Privacy Enhanced Mail), 244**
- per-flow load balancing, configuring, 326**
- persistence reset redirect command, 287**
- persistent connections, 227, 230**
- persistent rebalance command, 287**
- persistent reset command, 436**
- PGM (Pragmatic General Multicast), 153–154**
- physical layer (OSI model)**
 - Ethernet electrical properties, 37–42
 - Ethernet over copper, mechanical properties, 32–34
 - Ethernet over fiber, mechanical properties, 35–36
- PIM (Protocol Independent Multicast), 51**
 - Auto-RP, configuring, 142–144
 - Bidir-PIM, 139–140
 - PIM Sparse-Dense mode, 138
 - PIM-DM, 132
 - PIM-SM, 134–136
 - Bidir-PIM, 139*
 - enabling, 134*
 - multicast group registration, 135*
 - shared trees, creating, 134*
 - RPF, 130
 - RPs, assigning, 141
- pipelined architecture (CSM), 296**
- PIX firewall ACLs, 106**
- PKCS (Public Key Cryptography Standard), 244**
- PKI (Public Key Infrastructure), 236**
 - certificates, 240, 243–245
 - cryptography, 236
 - public key cryptography, 237–240

PLAY message (RSTP), 271
policing, 14, 184–186
 CAR, configuring, 187–188
 class-based, configuring, 188
 two-rate, configuring, 189
policy-map command, 164
PQ/WFQ (priority queuing/weighted fair queuing), configuring, 172–175
Preamble field (Ethernet), 43
predictor leastconns command, 314
preloading content to CE, 445–446
prepositioning content, 475, 479
 multicast-push distribution trees, 488
 unicast-pull distribution trees, 489
prerecorded broadcasts, stream splitting, 457–459
prioritization as requirement for network development, 14–15
priority, 398
private key certificate formats, 245
private VLANs in enterprise edge networks, 114
private/public keys, generating on CSM-S daughter card, 363
probability of server farm failure, estimating, 12
procedural markup languages, 199
progressive downloading, 257
protocol analysis, 108
proxy caching, configuring, 437–439
public key cryptography, 237–240
publishing points, 461
pull-splitting, 459
push-splitting, 459

Q

QoS (quality of service), 47
 applying to streaming media, 276
 classification, 160
 in branch office networks, 115–116
 Layer 2 packet marking, 166
 marking, 160
at Layer 2, 166
at Layer 3, 161–165
class-based packet marking, 160
with RSVP, 194

on Layer 2 switches, applying to Ethernet frames, 179–180
 policy signaling, configuring, 189–191

QoS for VPNs, 161

queuing

Layer 3 router packet queuing, 171
CQ, 173
PQ, 172–173
PQ/WFQ, 175
WFQ, 174, 176
 tail-drop thresholds, modifying, 180
 transmit queues, modifying CoS assignments, 179

R

random-detect command, 181
raw streaming media video content, 260
RDF (Resource Description Framework), 206
Real Media, streaming, 464
real servers, 281
 health checking
in-band, 330–331
OOB, 327–329
 session persistence, maintaining
with hash load balancing, 332
with HTTP cookies, 334–338
with MSISDN number sticky, 340
with SIP caller ID, 340
with source IP stickiness, 332–333
with SSL sticky, 338–340
with URL sticky strings, 338
permanent session information storage, 340
RealNetworks, 265–266
RealProxy
 enabling, 465
 live stream splitting, configuring, 468
 VoDs, caching on Cisco CE, 467
real-time media transfer protocols, 267
 RTP, 268
 RTSP, 270, 274
control messages, 271
real-time server load, calculating, 315
rebalancing HTTP requests, 286
rebroadcasts
 scheduling, 500–502
on internal WMS servers, 464
 stream splitting, 457–459

receive queues, modifying tail-drop thresholds, 180

RECORD message (RSTP), 271

recovering from CE failures, 429

recursive DNS resolution, 392–393

REDIRECT message (RSTP), 271

redirect messages (ICMP), 51

redirecting traffic

input redirection, 427

Layer 2/3 traffic with WCCP, 426–427

output redirection, 427

transparent redirection

with content switches, 434–436

with WCCP, 423–426

reflexive ACLs, 105

refractive indices, 35

registering

ACNS network components, 477–478

with RP using PIM-SM, 135–136

relative server load, calculating, 315–316

Relax NG, 207

replay attacks, 232

request redirection, 14

requirements for network development

bandwidth and response times, 13

customization and prioritization, 14–15

monitoring/administration, 18–19

scalability and availability, 10–13

security, 15–18

reservations, 190

RESMOD processing (ICAP), 451

resource records

A records, 390

NS records, 390

SOA records, 389

response times as requirement for network development, 13

return codes, HTTP 1.1, 225–226

reverse stickiness, configuring, 378–379

reverse transparent caching, configuring, 441–444

reverse-proxy service versus web-cache service, 425

rewinding media streams with RTSP, 275

RGMP (Router-Port Group Management Protocol), 151

RHI (Route Health Injection), 414

Rice, Stanley, 201

round robin algorithm, 311–313

router mode content switching, 307–311

RPF (Reverse Path Forwarding), 51, 130

RPs (rendezvous points), 130

assigning, 141

per-group load balancing, configuring with

Anycast RP, 148

selecting

with Auto-RP, 142–144

with BSR, 144–146

static addresses, configuring, 141

RSTP (Real-Time Streaming Protocol),

control messages, 270–271

RSVP (Resource Reservation Protocol), 14, 190

applying to streaming media, 276

configuring, 191

controlled-load service, 191

enabling, 191

packet marking, 194

reservations, 190

RTCP (Real-time Control Protocol), 267–269

commands, 270

RTP (Real-time Transport Protocol), 267–268

RTCP, 267–270

RTSP (Real Time Streaming Protocol),

267, 274

control messages, 271

rewinding/fast-forwarding streams, 275

similarity to HTTP, 270

STP description files, 272

runts, 44

S

SAM (Session Acceleration Modules), 289

sample DTD file, 202–203

scalability

as requirement for network development,

10–11

of RTP, 268

scheduling

live events, 500–502

rebroadcasted events, 500–502

on internal WMS server, 464

schemas, 207

SCM (Switch Control Modules), 289

scopes, 190

- SDP (Session Description Protocol), 268**
- SE (Shared Explicit) reservations, 190**
- SECAM (Systeme Electronique Couleur Avec Memoire), 258**
- security**
 - AAA, 18
 - ACLs, 103
 - application inspection
 - CBAC, configuring, 107*
 - NBAR, 107*
 - as requirement for network development, 15–18
 - PKI, 236
 - certificates, 240, 243–245*
 - cryptography, 236*
 - public key cryptography, 237–240*
- selecting RPs**
 - with Auto RP, 142–144
 - with BSR, 144–146
- sequence number remapping, 285**
- server farms, 281**
 - failure, estimating probability of, 12
- server groups, enterprise edge network design, 111**
- server load**
 - absolute load, calculating, 317–319
 - configuring, 315
 - relative load, calculating, 315–316
- service groups (WCCP), configuring, 424**
- session persistence, maintaining**
 - with hash load balancing, 332
 - with HTTP cookies, 334–338
 - with MSISDN number sticky, 340
 - with SIP caller ID, 340
 - with source IP stickiness, 332–333
 - with SSL sticky, 338–340
 - with URL sticky strings, 338
 - permanent session information storage, 340
- session processing path, 288**
- sessions cookies, 231**
- “Set-Cookie” header, 231**
- set qos-group command, 165**
- SET_PARAMETER message (RSTP), 271**
- SETUP message (RSTP), 271**
- SGML (Standard Generalized Markup Language), 201**
 - DTD files, 202–203
- shaping, 14, 184–186**
- shared trees, 130**
 - PIM-SM, creating, 134
- show port capabilities command, 179**
- SHR (simplified hybrid routing), 492–493**
- signaling Ethernet, 38–39, 42**
- similarity of RTSP and HTTP, 270**
- single-CSM FWLB, configuring, 379–382**
- SIP (Session Initiation Protocol), 267**
 - caller ID, maintaining session persistence, 340
- SLB (Server Load Balancing), content switching applications, 21.**
 - See also load balancing*
- sliding windows (TCP), 57–58**
- slow start (TCP), 60**
- slowpath, 288**
- SM (single mode) fiber, 35–36**
- SMIL (Synchronized Multimedia Integration Language), 206, 268, 500**
 - meta-files, 264–265
- SMPTE relative time codes, 275**
- SNMP (Simple Network Management Protocol), 18**
- SOA records, 389**
- software and file distribution as candidate for content distribution, 474**
- solutions available to ACNSs, 22–23**
- source IP Address field (IP packets), 47**
 - hashing, 332, 435
- source IP stickiness, maintaining session persistence, 332–333**
- Source Media Access Control address field (Ethernet), 43**
- source trees, 129**
- spanning-packets command, 285**
- sparse mode (PIM), 136**
 - Bidir-PIM, 139
 - enabling, 134
 - multicast group registration, 135
 - shared trees, creating, 134
- sparse-dense mode (PIM), 138**
- specifications for CSS series content switches, 294**
- splitting live and prerecorded broadcasts, 457–459**
- SPMs (source path messages), 153**
- SR (sender reports), 269**

SSL (Secure Sockets Layer), 17, 249

caching and tunneling, enabling on CEs,
449–450

processing modules, 289

terminating, 355–357

on CSM, 363–365

on CSM-S, 366–369

on CSS, 358–362

versus TLS, 246

SSL sticky, maintaining session persistence, 338–340**SSLM (SSL services module), 363****SSM (Source Specific Multicast), 122, 151**

enabling, 153

limitations of, 152

stateful ACLs, 103–104**stateful DNS sticky, configuring, 419****stateless ACLs, 103****static NAT, 96****static routing, configuring, 82****static RP addresses, configuring, 141****step index fiber, 35****sticky netmask command, 383****sticky strings, 338****stills-based codecs, 260****storing session information, 340****STPs (shortest path trees), 129****stream ciphers, 237****stream splitting, configuring on internal****WMS server, 457–460**

multicast-to-multicast live splitting, 463

multicast-to-unicast live splitting, 462

unicast-to-multicast live splitting, 464

unicast-to-unicast live splitting, 461–462

streaming media, 24

audio-video codec algorithms, 260–261

configuring, 497

configuring on Cisco CEs, 455

container files, 261–263

delivery protocols, 24, 267

proprietary versions of, 266

RTP, 268

RTSP, 270–271, 274

meta-files, 264

MPEG standards, 266–267

progressive downloading, 257

QoS, applying, 276

raw video content, 260

Real Media, 464

vendors, 259–260, 265–266

WMT, 459

streaming VoD content

on ACNS network, 498–500

on Cisco CEs, configuring, 456–457

structural markup languages

HTML, 203

file structure, 204–205

XHTML, 207

XML, 205

languages based on, 206

parsing applications, 211

transforming to XHTML/HTML,

211–213

transforming to XSL-FO, 216–220

style sheets, 204

CSSs, 213–215

XSL-FO, importing XML content,

216–220

subnet masking, 82**SVG (Scalable Vector Graphics), 206****switch fabric, 110****switched environment multicasting**

CGMP, 149–150

IGMP Snooping, 150

RGMP, 151

symmetric key cryptography, 236**SYN, 299****SYN cookies, preventing connection table****flooding, 384****T****tail-drop thresholds, modifying, 180****TCP (Transmission Control Protocol), 52–54**

congestion avoidance, 61–62

fast recovery, 64

fast retransmit, 62

MSS, 64

over satellite, 64–65

sliding window, 57–58

slow start, 60

three-way handshake, 54–57

TCP/IP, 9. See also TCP/IP protocols

ACLs, 15–16

parameter adjustments, enabling on CEs,

453–454

TCP/IP protocols

- ARP, 48–50
- associated OSI model layers, 31–32, 45–48
- ICMP, 51
- IGMP, 51
- TCP, 52–54
 - congestion avoidance*, 61–62
 - fast recovery*, 64
 - fast retransmit*, 62
 - MSS*, 64
 - over satellite*, 64–65
 - sliding window*, 57–58
 - slow start*, 60
 - three-way handshake*, 54–57

UDP, 66

TEARDOWN message (RSTP), 271**third-party ICDNs, 117****three-level location tree, 480****three-way handshake, 54–57****Time To Live (TTL) field (IP packet), 47****topologies**

- hub and spoke
 - access technologies*, 114
 - QoS*, 115–116
- of ICDNs, 116

total internal reflection, 35**Total Packet Length field (IP packet), 46****traffic policing, 14, 184–186****traffic shaping, 14, 184–186**

- class-based, configuring, 187
- committed burst, calculating, 184
- GTS, configuring, 186

traffic-level anomaly detection, 108**transforming XML content**

- to WML files, 213
- to XHTML/HTML, 210
- to XSL-FO files, 216–220

transparent bridging, 94–95**transparent redirection, configuring, 423**

- via content switches, 434–435
 - failover bypass*, 436
 - load distribution*, 435–436
- via WCCP, 424–426
 - Layer 2/3 traffic, redirecting*, 426–427

transport layer (OSI model), corresponding**TCP/IP protocols, 48**

- TCP, 52–65
- UDP, 66

triangulation, 305**trust points, configuring on CSM-S, 364****TSIs (transport session identifiers), 153****Tunncliffe, William, 201****two-rate policing, configuring, 189****Type of Service (ToS) field (IP packet), 46****Type/Length field (Ethernet), 43****typesetting procedural markup tags, 199–200****U****UDP (User Datagram Protocol), 66****unicast-pull distribution trees, 489****unicast-to-unicast stream splitting, 461****unmanaged content, 423****URD (URL Rendezvous Directory), 128****URL balancing, 435****URL filtering, 452–453****URL hashing, 435****URL header rewriting, 357****URL sticky strings, maintaining session persistence, 338****user agents, 206****UTP (unshielded twisted pair), 33****V****Valid XML, 207****value-added services, enabling on CEs**

- content authentication and authorization, 448–449
- ICAP, 450–452
- SSL caching and tunneling, 449–450
- TCP/IP parameter adjustments, 453–454
- URL filtering, 452–453

vendors of streaming media products, 259–260, 265–266**video transmission protocols, 257****viewing CSM sticky table contents, 333****VIPs, VRRP, configuring, 345–347****virtual routers, configuring**

- as redundant VIP, 345
- as virtual interface, 345

virtual servers, 282**VLANs**

- configuring, 76
- trunking
 - configuring*, 76–77
 - MAC learning*, 77–79

VoDs

- RealNetworks VoD files, streaming on ACNS network, 499
- RealProxy, caching on Cisco CE, 467
- Windows Media VoDs, configuring on CE, 459

VPN load balancing

- content switching applications, 21
- on CSM, configuring, 382–383

VRRP (Virtual Router Redundancy Protocol), configuring on VIPs, 345–347**VTP (VLAN Trunking Protocol), 77–79****W****WAN access in branch office networks, 114****WAP (Wireless Application Protocol) markup languages, 208–210****WCCP (Web Cache Control Protocol), 423**

- CE overload bypass, configuring, 432
- configuring, 424
- hash buckets, 429
- hot spot handling, 431
- load distribution
 - via hash buckets, 428–432*
 - via mask assignment, 432–433*
- service groups, configuring, 424
- transparent redirection, configuring, 424–427

wccp version command, 425**WCCPv2, 431****web browsers. See browsers****web hosting centers in enterprise edge networks, 114****Well Formed XML, 207****WF (Wildcard Filter) reservations, 190****WFQ (weighted fair queuing), configuring, 174–176****wildcard reservation scopes, 190****Windows Media VoD, configuring on CE, 459****WML (Wireless Markup Language), 208****WMLScript language, 208****WMT (Windows Media Technology), 259**

- Windows Media VoD, configuring on CE, 459
- WMS server, configuring live stream splitting, 460–464
- streaming, 459

word processing applications, procedural markup tags, 200**WRED (weighted random early detection), configuring, 180–183****WRR (weighted round robin), 311****WTAI (Wireless Telephony Application Interface), 208****WXL-FO (Extensible StyleSheet Language-Format Object), 206****X-Z****X.509 certificates, 245–246****X.509 PEM (Privacy Enhanced Mail), 244****XHTML (Extensible HTML), 207**

- importing content from XML, 210
- versus HTML, 208

XHTML Basic, 209**XLink, 206****XML (eXtensible Markup Language), 205**

- languages based on, 206
- manifest files, 486–487
- parsing applications, 211
- schemas, 207
- SMIL, 264
- transforming
 - to XLS-FO, 216–220*
 - to XHTML/HTML, 210*

XPath, 206

- XML element tree structure, defining, 212

XQuery, 206**XSL (Extensible Stylesheet Language), 206**

- stylesheets, applying with AON, 210

XSL-FO (XSL Format Objects), importing content from XML, 216–220**XSLT (Extensible Stylesheet Transformation), 206**

- parsers, transforming XML to HTML, 211