



Numbers

- 4+1 redundancy schemes, 913, 920
- 8+1 (7+1) redundancy schemes, 913, 919–920
- 911 calls, 381–383, 694

A

- a (CODEC compression algorithm), 243
- AAA functions (RADIUS), 788
- Accept parameter (SIP), 494
- Accounting function (RADIUS), 788
 - Accounting-Request messages, 789
 - Accounting-Response messages, 789
- ACM (Acknowledgement Messages), ISUP, 355
- acoustic echos, 558
- active call monitoring, 610
- active resources, 625
- activity count field (COPS protocol), 631
- adaptation layer protocols
 - M3UA, 356, 392
 - SUA, 356, 392
- add line command, 454
- addapln command, 926
- addbearertrace command, 605
- addbearertraceendpt command, 605
- addbearertracesrvprof command, 605
- addcon command, 452
- addconip command, 459
- addendpt command, 458
- addfaxprof command, 604
- addipsecikepeer command, 858
- addipsecikeprop command, 858
- addipsecikeproxassoc command, 858
- addipsecikexform command, 858
- addipsecnwif command, 859
- addipsecprop command, 857
- addipsecprxfassoc command, 858
- addipsecxform command, 857
- addmgcip command, 460
- addttyprof command, 603
- advbdpdprof command, 603
- addxcppprof command, 463
- admission control
 - load balancing, 930–933
 - troubleshooting, 932
- admission control (DQoS)
 - debugging DQoS to find information on, 712
 - policies, 693
- admitted resources, 625
- AF (Access Function)
 - AF-DF communication
 - communicating information to CMSS, 814
 - communicating information to CMTS, 811–812
 - communicating information to MG, 813
 - overview of, 809–811
 - call details, 807
- AH (Authentication Header), 843
- alarms (BTS), 329
- allocation state (gates), 623
- Allow parameter (SIP), 494
- AM (application manager), 735
- AMID (Application Manager Identifiers), 746
- analog lines, 207
- analog modem transport, 561–562
- ANC (Announcement Controllers), 40
- ANM (Answer Messages), ISUP, 355
- announcement servers, access points as
 - endpoints, 207
- anonymizers, 510
- ANSI (American National Standards Institute)
 - specifications, 10, 954–956
- anti-reply (IPsec), 843
- APP (application-specific functions), RTCP, 589, 592–593
- application servers, 357, 734
 - ASP, 357, 392
 - ITP configuration, 393–394
- AP-REQ trace, 169
- architectures, 483
- AS. *See* application servers
- ASN.1 (Abstract Syntax Notation One), 815
- ASP (Application Server Processes), 357, 392
- ATM ports, 450
- ATM VC redundancy (MG), 926
- AUCX (Audit Connection) command (MGCP), 215

audio CODEC

- bandwidth constraints, 579
- bit rates, 549
- BV16, 546, 573
- delays, 551
 - backbone*, 554–555
 - backbone-to-listener*, 555–556
 - end-to-end*, 552
 - speaker-to-backbone*, 552–554
- DTMF digit transport, 559–560
- echo, 556–558
- G.711, 541–543, 573
 - RTP packet size*, 578
 - RTP packet traces*, 576
- G.728, 543–544, 573
 - RTP packet size*, 578
 - RTP packet traces*, 576
- G.729E, 545, 573
 - RTP packet size*, 579
 - RTP packet traces*, 577
- iLBC, 546, 573
- narrowband voice, 540
- negotiation, 547–548
- quantization, 540
- sampling process, 540
- troubleshooting voice paths, 559
- VBD transport, 560
 - analog modem transport*, 561–562
 - facsimile transport*, 562–563
 - teletype technology transport*, 564
- voice quality, 549
 - ITU E-model*, 551
 - MOS (Mean Opinion Score) ratings*, 549
 - PAMS*, 550
 - PESQ*, 551
 - PSQM*, 550
 - R-factors*, 551
- wideband, 546

Audio Server Protocol (PKT-SP-ASP)

specifications (PacketCable 1.5), 20

auditing media gateways, 330**AUEP (Audit Endpoint) command (MGCP), 214****authentication**

- Authentication function (RADIUS), 788
- HMAC, 844
- IPsec, 843
- Kerberos, 80
- MTA requirements, 30

Authentication function (RADIUS), 788**authorization block parameters, 643****Authorization function (RADIUS), 788****authorization state (gates), 623****authorized resource envelopes, 625****automatic/manual switchovers (router processors), 912****B****BAC (Broadband Access Centers), 49**

- CMTS configurations, 82
- CNR, 52
- configuration file utility, 195
- configuring, 846–847
- DPE, 51–52
- KDC, 52
- RDU, 50–51
- templates, 191–195

backbone delays (audio CODEC), 554–555**backbone QoS, 875, 878**

- DOCSIS QoS, tying to, 695–696
- DSCP codepoints, 879
 - packets originating from CMS*, 881–883
 - packets originating from CMTS*, 879–880
 - packets originating from MG*, 883–884
- MPLS, 885–886
- policy configuration, 884

backbone-to-listener delays (audio CODEC), 555–556**bandwidth**

- CMTS, allocating upstream bandwidth, 34
- failures, 1017

Basic method (MTA provisioning), 161–163**batch processing, 789****Battery Backup MIBs (CL-SP-MIB-BB) specifications (PacketCable 1.5), 19****BCID (Billing Correlation Identifiers), 789****BE (Best Effort) services**

- DOCSIS, 738–741
- service flow parameters, 739

bearer channel information thefts (security threats), 842**bearer stream security, 638****bearer tracing, 605**

- bearertracestart command, 605**
- bearertracestop command, 605**
- BERT (bit error rate testing), 604, 610**
- billing files**
 - BTS 10200, displaying in, 334–336
 - event messaging, 803
- bit rates, 549**
- BLA (Blocking Acknowledge) messages, 355**
- BLO (Blocking) messages, 355**
- BML (Business Management Layers), 48**
- BOOTP**
 - chaddr field, 65
 - ciaddr field, 64
 - flags field, 64
 - giaddr field, 65
 - siaddr field, 64
 - yiaddr field, 64
- BPI+ (Baseline Privacy Initialization Plus), 136-138, 840–841**
- BPKM-Request Authorization Request, 136**
- BTS**
 - DNS, 908
 - DQoS, 719–724
 - high availability architectures, 907–909
- BTS 10200 CMS (Call Management Server), 597**
 - bulk configuration configuration, 286
 - CALEA servers, 53
 - event messaging configurations
 - billing file recovery, 803*
 - enabling EM sending, 802*
 - Media Alive message configuration, 803*
 - retrieving EM measurements, 803*
 - RKS definitions, 800–801*
 - subscriber billing type configuration, 803*
 - variable modification, 801–802*
 - media gateway profile parameters, 597
 - NCS configuration, 284
 - assigning associate subscribers to features, 327*
 - assigning associate subscribers to services, 327*
 - basic/core configuration tasks, 287–295*
 - call feature configuration tasks, 323–327*
 - configuring call agent variables, 290–294*
 - configuring MTA, 313–315*
 - configuring MTA characteristics, 302–313*
 - configuring MTA-connected CMTS, 301–302*
 - configuring NCS endpoints, 315–316*
 - configuring PacketCable subscriber characteristics, 320–321*
 - configuring subscriber characteristics, 319*
 - configuring subscriber QoS parameters, 316–319*
 - defining call agent characteristics, 287–289*
 - defining call agents, 289–290*
 - defining destination tables, 299*
 - defining dial plan characteristics, 299–300*
 - defining dial plans, 300*
 - defining digit maps, 298*
 - defining exchange codes, 298*
 - defining feature servers, 323–324*
 - defining features, 324–325*
 - defining national destination codes, 297*
 - defining office codes, 298*
 - defining POP, 295*
 - defining services, 326*
 - defining vertical service codes, 325–326*
 - dial plan configuration tasks, 295–300*
 - entering MTA into service, 322–323*
 - entering NCS endpoints into service, 322–323*
 - MTA configuration tasks, 300–316*
 - subscriber configuration tasks, 316–321*
- OFFNET call routing dial plan configurations
 - carrier definitions, 438*
 - destination definitions, 438–439*
 - dial plan entry definitions, 439–440*
 - policy-based routing route guide definitions, 437–438*
 - trunk group route definitions, 436–437*
- quality of service parameters, 597–598
- RKS, 53
- security configurations, 847
 - COPS signaling security, 852–854*
 - NCS signaling security, 847–852*
 - RADIUS signaling security, 852–854*
 - RTP/RTCP security, 855–856*
 - TGCP signaling security, 852–854*

- SIP CMSS signaling
 - destinations, defining, 523–524*
 - dial plans, defining, 524*
 - trunk group fields, table of, 521–522*
 - trunk group profile fields, table of, 518–520*
 - trunk group routes, defining, 523*
 - trunk groups, running, 522*
 - SG configuration
 - call control route definitions, 410*
 - destination point code definitions, 404–405*
 - enabling SCTP associations, 411*
 - ISUP network variant definitions, 409*
 - ISUP routing key definitions, 410*
 - SCTP association definitions, 406–409*
 - SCTP parameter definitions, 405*
 - SG definitions, 402*
 - SG group definitions, 403*
 - SG process definitions, 403–404*
 - switch origination point code definitions, 404*
 - TCAP configurations, 411
 - enabling SCTP associations, 415*
 - enabling subsystems/subsystem groups, 415*
 - modifying call agent configurations, 414*
 - SCCP network definitions, 412*
 - SLHR characteristic definitions, 414*
 - SLHR definitions, 414*
 - subsystem characteristic definitions, 412*
 - subsystem definitions, 412–413*
 - TCAP/SCCP route definitions, 413*
 - TCAP/SCCP routing key definitions, 413*
 - TGCP configurations, 415
 - enabling endpoints, 435–436*
 - enabling MG, 434*
 - enabling trunk groups, 435*
 - endpoint configurations, 425–426*
 - MG characteristic configurations, 416–424*
 - MG configurations, 424*
 - trunk configurations, 433–434*
 - trunk group characteristic configurations, 428–431*
 - trunk group configurations, 431–433*
 - trunk group QoS parameter configurations, 426–428*
 - trunk group route definitions, 436–437*
 - troubleshooting, 327, 467–472*
 - accessing log files, 329–330*
 - collecting traffic statistics, 332–334*
 - dial/ring tones, 337–338*
 - displaying billing records, 334–336*
 - displaying EMS database transaction queue, 330*
 - displaying events/alarms, 329*
 - displaying running processes, 328–329*
 - DNS, 337*
 - missing DQoS information, 338–339*
 - out of service MTA, 336–337*
 - parameter negotiations, 339*
 - post dial delays, 339*
 - ring back tones, 338*
 - running diagnostics, 330–331*
 - SDP, 339*
 - unestablished DQoS, 338–339*
 - validating call routing, 331–332*
 - voice paths/one way voice, 338*
 - trunking MG configurations, 440–443*
 - PXM configurations, 443–444*
 - RPM configurations, 445–449*
 - VXSM/VISM configurations, 449–463*
- BTS 10200 Softswitches, 40-42**
- burst size limitations (load balancing), 935**
- bursts (RTCP-XR), 595**
- busy hour utilization (capacity planning/traffic engineering), 900–901**
- BV16 (BroadVoice 16), 546**
- BV16 CODEC**
- bandwidth constraints, 579
 - RTP, 573
- BYE (end of participation indicator), 589, 593**

C

- cable gateways, 32**
- cable intercept feature (CMTS), 964**
- cable linecards, 898**
- cable modems. *See* CM (cable modems)**
- cable monitor feature (CMTS)**
 - configuring, 966
 - diagram of, 964
 - disabling packets, 966
 - DOCSIS packets, decoding, 964–966
 - multiple instances, defining, 966

CableLabs, 7**CALEA (Communications Assistance for Law Enforcement Act), 805**

- cnfcalea command, 831
- cnfxgpcalea command, 831
- dspxgpcaleacalls command, 831
- servers, 53

call agents, 39

- AM as, 735
- ANC, 40
- BTS 10200 CMS configuration, 414
- BTS 10200 Softswitches, 40-42
- CMS, 39
- connections, creating/deleting, 208
- gateways, 206
- GC, 39
- MGC, 39
- MGCP, 210-211, 230
- NCS configurations in BTS 10200
 - defining characteristics in, 287-289*
 - defining in, 289-290*
 - variables configuration, 290-294*

Call Answer messages (event messaging), 790**Call Content Connection Identifier (es-cci) parameter, 813****Call Content Destination (es-ccd) parameter, 813****Call Content wiretaps, 54****call control routes, defining, 410****Call Detail wiretaps, 53****call details, 807****Call Disconnect messages (event messaging), 790****call features, defining, 323-325****call flows, 985**

- call forwarding, 1005
- call waiting, 999-1001, 1004
- DQoS, 665
 - basic ONNET calls, 666-688*
 - VAD, 689-693*
- event messaging, 792-799
- feature calls, NCS role in, 261-284
- lawful intercept examples
 - suspect with call content tap originates call, 823-825*
 - suspect with call content tap receives call, 826-828*

suspect with call data tap originates call, 819-821

suspect with call data tap receives call, 821-822

NCS role in

- feature calls, 261-284*
- ONNET calls, 248-261*

no bandwidth calls, 1017

OFFNET-to-ONNET calls, 991

ONNET calls, 248-261

ONNET-to-OFFNET calls, 988, 991

ONNET-to-ONNET calls, 985-986

ONNET-to-SIP/CMSS calls, 994-996

PSTN, 369

Emergency 911, 381-383

OFFNET-to-ONNET, 376-380

ONNET-to-OFFNET, 369-376

schematics, generating via Ethereal packet sniffer (CMTS), 972-974

SIP, 495-505

SIP CMSS, 513-517

SIP/CMSS-to-ONNET calls, 997

three-way calling, 1009

call forwarding, 1005**call histories, 699****call ID parameter (CRCX command), 222****Call Management Server provisioning (PKT-SP-CMSPROV) specifications (PacketCable 1.5), 20****call routing, validating, 331-332****call signaling**

characterizing traffic (QoS), 866-869

in-band communication, 347

MGCP, 218-219

NCS, 239, 247-248

BTS 10200 configuration, 284, 287-327

CODEC LCO parameters, 243

command header formats, 240

DQoS LCO parameters, 244-246

endpoint naming conventions, 240-241

feature calls, 261-284

ONNET calls, 248-261

package events/signals, 241-242

packetization period parameter (p), 243

SDP attributes, 247

security LCO parameters, 246

out-of-band signaling, 347-348

- PSTN
 - Emergency 911 call flows, 381–383*
 - OFFNET-to-ONNET call flows, 376–380*
 - ONNET-to-OFFNET call flows, 369–376*
 - overview of, 345–347*
- specifications (PacketCable 1.0), 17
- SS7
 - COT, 383–384*
 - ISUP layers, 354*
 - link types, 350–351*
 - MTP layers, 352–353*
 - overview of, 348–350*
 - point codes, 349*
 - routes, 351–352*
 - SCCP layers, 353*
 - SCP, 348, 351*
 - SSP, 348, 351–352*
 - STP, 348, 350–351*
 - TCAP layers, 353*
- call waiting, 999–1001, 1004**
- call waiting/caller ID feature call flows, 261–272**
- Call-ID parameter, 493**
- capacity planning, 886**
 - busy hour utilization, 900–901
 - cable linecards, 898
 - call capacities of DOCSIS upstream service flows, determining, 887–894
 - CMS, 903–904
 - CMTS, 902–903
 - CODEC changes, effects of, 895–896
 - erlang metric, 898–901
 - line usage, 898–901
 - packetization interval changes, effects of, 894–895
 - PHS implementation, effects of, 896–897
 - security implementation, effects of, 897
 - TGCP, 904
 - traffic patterns, 898–901
 - VAD implementation, effects of, 897
- carriers, 438**
- CAS (channel-associated signaling)**
 - endpoint configurations, 458
 - overview of, 357–358
 - VXSM/VISM, configuring, 452–453
- CBC (Cisco Broadband Configuration)**
 - CLI interface, 185
 - GUI, 182–184
- CCC (call content connection), 807, 829**
- CDC (call data connections), 807, 829**
- CDR (call detail records) pairs, 789**
- CELP (Code Excited Linear Predictive), 544**
- centralized architectures, 483**
 - distributed architectures versus, 206
 - intelligence in, 29
 - simple devices in, 29
- CF (Collection Function), 807**
 - call flow examples, 819–828
 - capturing call content, 829–830
 - capturing call data, 815–818
- CG2P2WB cable gateways, 32**
- CGA (Circuit Group Block Acknowledge)**
 - messages, ISUP, 355
- CGB (Circuit Group Block) messages, ISUP, 355**
- CGU (Circuit Group Unblock) messages, ISUP, 355**
- CGUA (Circuit Group Unblock Acknowledge)**
 - messages, ISUP, 355
- chaddr field, 65**
- characterizing call signaling traffic (QoS), 866–869**
- ciaddr field, 64**
- CIC COT, 383–384**
- CLASS (Custom Local Area Signaling Service), 999–1001, 1004**
- Classifier Activation State field (DOCSIS classifiers), 649**
- Classifier Reference/Classifier Identifier field (DOCSIS classifiers), 648**
- classifiers**
 - basic ONNET calls, 676
 - DOCSIS, 648–649, 658
 - NCS QoS on DOCSIS networks, 873–875
 - PCMM, 748
- clear crypto sa command, 864**
- clear packetcable gate counter commit multimedia command, 776**
- CLI, 285**
- Client Type 1 (Pull model) multimedia clients, 734**
- Client Type 1 (QoS unaware) multimedia clients, 734**
- Client Type 2 (Push model) multimedia clients, 734**
- Client-Class configurations (DHCP), 85**

- clock rates (payloads), 572**
 - CL-SP-MIB-BB (Battery Backup MIBs) specifications (PacketCable 1.5), 19**
 - CM (cable modems), 33, 737**
 - CM2P2B, 31
 - DOCSIS provisioning, 111
 - BPI+*, 136–138
 - configuration information transfers*, 131
 - IP connectivity*, 120–129
 - ranging*, 116–120
 - registration*, 131–134
 - scanning/downstream synchronization*, 112–113
 - ToD establishment*, 130
 - upstream parameters*, 114–115
 - eMTA, 33
 - network connections, 33
 - QoS, CMTS policy configuration, 34
 - CM2P2B cable modem, 31**
 - CMS (Call Management Servers), 39**
 - BTS 10200, 597
 - accessing log files*, 329–330
 - auditing media gateways*, 330
 - bulk configuration*, 286
 - collecting traffic statistics*, 332–334
 - dial/ring tones*, 337–338
 - displaying billing records*, 334–336
 - displaying EMS database transaction queue*, 330
 - displaying events/alarms*, 329
 - displaying running processes*, 328–329
 - DNS, 337
 - event messaging configurations*, 800–803
 - media gateway profile parameters*, 597
 - missing DQoS information*, 338–339
 - NCS configuration*, 284, 287–327
 - OFFNET call routing dial plan configuration*, 436–440
 - out of service MTA*, 336–337
 - parameter negotiations*, 339
 - post dial delays*, 339
 - quality of service parameters*, 597–598
 - ring back tones*, 338
 - running diagnostics*, 330–331
 - SDP, 339
 - security configurations*, 847–856
 - SG configuration*, 402–411
 - TCAP configuration*, 411–415
 - TGCP configuration*, 415–437
 - troubleshooting*, 327–339, 467–472
 - trunking MG configurations*, 440–463
 - unestablished DQoS*, 338–339
 - validating call routing*, 331–332
 - voice paths/one way voice*, 338
 - capacity planning/traffic engineering, 903–904
 - COPS protocol
 - activity count field*, 631
 - electronic surveillance parameters objects*, 633
 - error code objects*, 633
 - event generation information objects*, 632–633
 - gate identifier objects*, 631
 - gate specification field*, 631
 - header formats*, 626
 - initializing*, 627–628
 - keepalive messages*, 629
 - reason objects*, 633–634
 - session class field*, 632
 - subscriber identifier objects*, 631
 - transaction identifier objects*, 630–631
 - DQoS, 621
 - basic ONNET calls*, 680–681, 686–688
 - resource authorization*, 635–638
 - MTA communications
 - call signaling*, 29
 - communication loss*, 172–173
 - QoS signaling*, 29–30
 - MTA initialization, 167–171
 - MTA-to-CMS call signaling packets (IPsec), 840
 - QoS, DSCP codepoints, 881–883
 - redundancy, 906–908
 - SIP, 840
 - TLS, 840
- CMS to CMS Signaling (PKT-SP-CMSS) specifications (PacketCable 1.5), 19**
- CMSS (Call Management Server Signaling), 483–486**
- anonymizers, 510
 - architecture, sample of, 485
 - BTS 10200
 - destinations, defining*, 523–524
 - dial plans, defining*, 524

- trunk group fields, table of, 521–522*
- trunk group profile fields, table of, 518–520*
- trunk group routes, defining, 523*
- trunk groups, running, 522*
- call flows, 513–517
- device subscriptions, 512
- DQoS extensions, 509–510
- INVITE messages, 514–515
- INVITE method, 512
- lawful intercept, 814
- NOTIFY method, 512
- P-DCS-BILLING-INFO extension, 511
- P-DCS-LAES extension, 511
- P-DCS-OSPS extension, 511
- P-DCS-REDIRECT extension, 511
- P-DCS-TRACE-PARTY-ID extension, 511
- privacy extensions, 510
- REFER method, 512
- REGISTER method, 513
- Replaces header, 512
- RFC, 486–488
- SUBSCRIBE method, 512
- tel URI, 512
- timers, 513
- troubleshooting, 524–531
- UPDATE method, 512
- updating parameters, 512
- CMTS (Cable Modem Termination System), 34, 736–737**
 - admission control policies, 693
 - baseline privacy, debugging, 138
 - cable intercept feature, 964
 - cable linecards, 898
 - cable monitor feature
 - configuring, 966*
 - decoding DOCSIS packets, 964–966*
 - defining multiple instances, 966*
 - diagram of, 964*
 - disabling packets, 966*
 - call histories, displaying, 699
 - capacity planning/traffic engineering, 902–903
 - CM QoS via policy configuration, 34
 - CMTS, 81
 - COPS protocol
 - activity count field, 631*
 - electronic surveillance parameters objects, 633*
 - error code objects, 633*
 - event generation information objects, 632–633*
 - gate identifier objects, 631*
 - gate specification field, 631*
 - header formats, 626*
 - initializing, 627–628*
 - keepalive messages, 629*
 - reason objects, 633–634*
 - session class field, 632*
 - subscriber identifier objects, 631*
 - transaction identifier objects, 630–631*
 - DQoS, 621
 - authorization, 659*
 - BTS configurations, 719–722*
 - BTS, verifying/troubleshooting on, 723–724*
 - cable line card information, displaying, 708–709*
 - configuring on, 696–698*
 - debugging, 709–716*
 - displaying active gate information, 701–702*
 - displaying service flow information, 702–704*
 - DOCSIS SID information in upstream service flows, 704–706*
 - downstream capacity, displaying, 707–708*
 - resource authorization, 635–638*
 - statistical information on DOCSIS DSX messages on Downstream Channel, 708*
 - testing, 716–718*
 - troubleshooting on, 707–718*
 - upstream capacity, displaying, 707*
 - upstream statistics, displaying, 706*
 - verifying on, 698–706*
 - Ethereal packet sniffer
 - call flow schematics, generating, 972–974*
 - configuring port monitoring, 977*
 - decoding DOCSIS packets, 967*
 - downloading, 963*
 - installing, 963*
 - MTA provisioning, 968–970*
 - OFFNET packet traces, examining, 980*

- PacketCable COPS DQoS packets, examining, 978*
- PacketCable Event Messaging packets, examining, 980*
- PacketCable Lawful Intercept packets, examining, 981–982*
- phone calls, examining, 971–972*
- RPT streams, examining, 975–976*
- event messaging
 - configuring on, 804*
 - element ID, configuring, 696*
 - troubleshooting on, 804*
- lawful intercept, 811–812
- MTA communications, 29–30
- MTA-connected CMTS configurations, 301–302
- PacketCable operation, enabling on, 696
- PacketCable settings, verifying, 700
- PCMM
 - configuration, 773–774*
 - troubleshooting, 774–779*
 - verifying, 774–779*
- provisioning configurations, 81
 - BAC, 82*
 - CNR, 82*
 - CNR, DHCP, 83–84, 87–88, 91*
 - CNR, DNS, 92–96*
 - CNR, DPE, 101–102*
 - CNR, KDC, 103–104*
 - CNR, RDU, 96–101*
- QoS, DSCP codepoints, 879–880
- redundancy
 - HFC redundancy, 912–914, 917–922*
 - processor redundancy, 911–912*
 - system redundancy, 909–910*
 - WAN redundancy, 922–923*
- responsibilities of, 34–35
- RF analyzers, 966–967
- security configurations, 859–864
- uBR10012, 37–38
- uBR7246VXR, 35–37
- upstream bandwidth, allocating, 34
- cnfbearersec command, 859**
- cnfcacparams command, 610**
- cnfcalea command, 831**
- cnfcasendpt command, 458**
- cnfciphersuite command, 859**
- cnfclksrc command, 927**
- cnfcodejtrdelay command, 607–608**
- cnfcodecneg command, 607**
- cnfcodecnego command, 599**
- cnfcodeccparam(s) command, 599**
- cnfcodeccparams command, 607**
- cnfcodectmpl command, 606**
- cnfconprotect command, 926**
- cnfdnssrvr command, 460**
- cnfdspparam command, 602**
- cnfdtmfrxsnoop command, 600**
- cnfdtmftxsnoop command, 600**
- cnfdynamicpayload command, 608**
- cnfecanenable command, 608**
- cnfecanrec command, 608**
- cnfecantail command, 608**
- cnfendptcadence command, 608**
- cnferl command, 608**
- cnfeventmapping command, 602**
- cnffaxjtrdelay command, 607**
- cnffaxprof command, 604**
- cnfgwis command, 473**
- cnfjtrmode command, 607–608**
- cnfln command, 457**
- cnflnis command, 457**
- cnflnoos command, 457**
- cnflnsig command, 457**
- cnflntoneplan command, 608**
- cnflntonetimeout command, 609**
- cnfpath command, 455–457**
- cnfprotocolport command, 462**
- cnfrtccpprepint command, 609**
- cnfrtrpxtimer command, 609**
- cnft38xlco command, 609**
- cnft38nsettimeout command, 609**
- cnft38params command, 609**
- cnftonegen command, 601**
- cnfttyprof command, 603**
- cnfvbdcodec command, 609**
- cnfvbdpol command, 609**
- cnfvbdprof command, 603**
- cnfvifcas command, 458**
- cnfvifec command, 600**
- cnfvifeventmapping command, 604**
- cnfvifparam command, 600**
- cnfvifvad command, 600**
- cnfvoiptimerparam command, 610**

cnfvoiptransparams command, 608**cnfxgcp command, 463****cnfxgcpcalea command, 831****cnfxgcpdtmf command, 599****cnfxgcpprofttone command, 601****CNR (Cisco Network Registrar), CMTS****configurations, 52, 82**

DHCP, 83–84, 87–88, 91

DNS, 92–96

DPE, 101–102

KDC, 103–104

RDU, 96–101

CODEC

audio

*bandwidth constraints, 579**bit rates, 549**BV16, 546, 573**delays, 551–556**DTMF digit transport, 559–560**echo, 556–558**G.711, 541–543, 573, 576–578**G.728, 543–544, 573, 576–578**G.729E, 545, 573, 577–579**iLBC, 546, 573**narrowband voice, 540**negotiation, 547–548**quantization, 540**sampling process, 540**troubleshooting voice paths, 559**VBD transport, 560–564**voice quality, 549–551**wideband, 546*

capacity planning/traffic engineering, 895–896

CELP, 544

compression algorithm (a), 243

LCO

*NCS, 243**TGCP, 367*

MG

*VISM, 606–607**VXSM, 598*

RSVP flow specifications parameters table, 638

vocoders, 543

waveform encoders, 543

collection function (RTCP-XR), 593**comfort noise packets, 580****commands (MGCP)**

AUCX, 215

AUEP, 214

concatenating multiple commands, 230

CRCX, 221–224

DLCX, 226–227

endpoint names, 210–211

ensuring delivery of, 230

header format, 209

MDCX, 224–226

NTFY, 219–221

RQNT, 217–219

RSIP, 213–214

TIDs, 210

verbs, 210

commitment state (gates), 624–625**committed resource envelopes, 625–626****compound RTCP packets, 590****Conference Party Change messages (event messaging), 790****confidentiality (data), IPsec, 843****configuring**

BAC, 846–847

backbone QoS policies, 884

event messaging in BTS 10200

*billing file recovery, 803**enabling EM sending, 802**Media Alive message configuration, 803**retrieving EM measurements, 803**RKS definitions, 800–801**subscriber billing type configuration, 803**variable modification, 801–802*

event messaging on CMTS, 804

ITP, 385, 396

*group implementation, 386–387, 395, 403, 410**PSTN, 388–391**router requirements, 385**SG mated pair implementation, 388, 394,**399, 403–404, 410**web resources, 401*

NCS in BTS 10200, 284

*assigning associate subscribers to features, 327**assigning associate subscribers to services, 327**basic/core configuration tasks, 287–295**call feature configuration tasks, 323–327*

- configuring call agent variables, 290–294*
- configuring MTA, 313–315*
- configuring MTA characteristics, 302–313*
- configuring MTA-connected CMTS, 301–302*
- configuring NCS endpoints, 315–316*
- configuring PacketCable subscriber characteristics, 320–321*
- configuring subscriber characteristics, 319*
- configuring subscriber QoS parameters, 316–319*
- defining call agent characteristics, 287–289*
- defining call agents, 289–290*
- defining destination tables, 299*
- defining dial plan characteristics, 299–300*
- defining dial plans, 300*
- defining digit maps, 298*
- defining exchange codes, 298*
- defining feature servers, 323–324*
- defining features, 324–325*
- defining national destination codes, 297*
- defining office codes, 298*
- defining POP, 295*
- defining services, 326*
- defining vertical service codes, 325–326*
- dial plan configuration tasks, 295–300*
- entering MTA into service, 322–323*
- entering NCS endpoints into service, 322–323*
- MTA configuration tasks, 300–316*
- subscriber configuration tasks, 316–321*
- OFFNET call routing, dial plan configurations
 - in BTS 10200, 436
 - carrier definitions, 438*
 - destination definitions, 438–439*
 - dial plan entry definitions, 439–440*
 - policy-based routing route guide definitions, 437–438*
 - trunk group route definitions, 436–437*
- PCMM on CMTS, 773–774
- security in BTS 10200
 - COPS signaling security, 852–854*
 - NCS signaling security, 847–852*
 - RADIUS signaling security, 852–854*
 - RTP/RTCP signaling security, 855–856*
 - TGCP signaling security, 852–854*
- security in CMTS, 859–864
- security in VXSM, 857–859
- SG in BTS 10200
 - call control route definitions, 410*
 - destination point code definitions, 404–405*
 - enabling SCTP associations, 411*
 - ISUP network variant definitions, 409*
 - ISUP routing key definitions, 410*
 - SCTP association definitions, 406–409*
 - SCTP parameter definitions, 405*
 - SG definitions, 402*
 - SG group definitions, 403*
 - SG process definitions, 403–404*
 - switch origination point code definitions, 404*
- TCAP in BTS 10200, 411
 - enabling SCTP associations, 415*
 - enabling subsystems/subsystem groups, 415*
 - modifying call agent configurations, 414*
 - SCCP network definitions, 412*
 - SLHR characteristic definitions, 414*
 - SLHR definitions, 414*
 - subsystem characteristic definitions, 412*
 - subsystem definitions, 412–413*
 - TCAP/SCCP route definitions, 413*
 - TCAP/SCCP routing key definitions, 413*
- TGCP in BTS 10200, 415
 - enabling endpoints, 435–436*
 - enabling MG, 434*
 - enabling trunk groups, 435*
 - endpoint configurations, 425–426*
 - MG characteristic configurations, 416–424*
 - MG configurations, 424*
 - trunk configurations, 433–434*
 - trunk group characteristic configurations, 428–431*
 - trunk group configurations, 431–433*
 - trunk group QoS parameter configurations, 426–428*
 - trunk group route definitions, 436–437*

- trunking MG in BTS 10200 CMS, 440–443
 - PXM configurations*, 443–444
 - RPM configurations*, 445–449
 - VXSM/VISM configurations*, 449–463
 - connection mode parameter (CRCX command), 223**
 - connections (MGCP), 208**
 - Contact parameter (SIP), 493**
 - Content-Length parameter (SIP), 494**
 - Content-Type parameter (SIP), 494**
 - control call_agent command, 882**
 - control command, 285, 883**
 - COPS (Common Open Policy Service)**
 - activity count field, 631
 - DQoS
 - debugging via*, 712–716
 - session verifications*, 698–699
 - troubleshooting protocol issues*, 724
 - electronic surveillance parameters objects, 633
 - error code objects, 633
 - event generation information objects, 632–633
 - gate identifier objects, 631
 - gate specification field, 631
 - header formats, 626
 - initializing, 627–628
 - IKE, 841
 - IPsec, 841
 - keepalive messages, 629
 - PCMM, 741–743
 - AMID*, 746
 - classifiers*, 748
 - event-generation-info objects*, 751
 - extended classifiers*, 748
 - gate identifiers*, 747
 - gate specification*, 747–748
 - gate state objects*, 753
 - gate time info objects*, 752
 - gate traffic profiles*, 749–751
 - gate usage info objects*, 752
 - header formats*, 742
 - initialization process*, 743
 - Msg Receipt Key objects*, 754
 - object formats*, 742
 - opaque data objects*, 752
 - PacketCable error objects*, 752–753
 - PEP to PDP heartbeats*, 743
 - PSID objects*, 754
 - subscriber identifiers*, 747
 - Synch Options objects*, 754
 - time-based usage limit objects*, 751
 - transaction IDs*, 744–746
 - version info objects*, 754
 - volume-based usage limit objects*, 751
 - PDP, 737
 - Msg-Receipt messages*, 746
 - PDP-Config messages*, 746
 - PEP to PDP heartbeats in PCMM*, 743
 - Synch-Report messages*, 746
 - Sync-Request messages*, 746
 - PEP, 737
 - Gate-Report-State messages*, 746
 - Msg Receipt Key object*, 754
 - PEP to PDP heartbeats in PCMM*, 743
 - Synch Options object*, 754
 - Synch-Complete messages*, 746
 - reason objects, 633–634
 - session class field, 632
 - signaling security, 852–854
 - subscriber identifier objects, 631
 - transaction identifier objects, 630–631
 - cops listener access-list command, 863**
 - COT (continuity tests), 383–384**
 - CRCX command (MGCP), 221**
 - call ID, 222
 - connection mode, 223
 - LCO, 223–224
 - cryptology, Kerberos, 79**
 - cs7 inhibit command, 465**
 - cs7 uninhibit command, 465**
 - Cseq parameter (SIP), 493**
-
- ## D
-
- data confidentiality (IPsec), 843**
 - data integrity (IPsec), 843**
 - data origin authentication (IPsec), 843**
 - Database Query messages (event messaging), 790**
 - debug command, 811**
 - debug crypto engine command, 864**
 - debug crypto ipsec command, 864**
 - debug crypto isakmp command, 864**
 - debug packetcable gate command, 804**

- debug packetcable gate control command, 777, 832**
- debug packetcable subscriber command, 804**
- debug packetcable subscriber verbose command, 777**
- debugging**
 - CMTS baseline privacy, 138
 - DQoS
 - admission control information, finding, 712*
 - COPS messages, 712–716*
 - DOCSIS Dynamic Service Flow messages during calls, 709–712*
- delays (audio CODEC), 551**
 - backbone, 554–555
 - backbone-to-listener, 555–556
 - end-to-end, 552
 - minimizing (QoS), 865
 - speaker-to-backbone, 552–554
- destination codes (national), 297**
- destination tables, 299**
- destinations, defining, 438–439**
- device-level configuration data (MTA configuration files), 186**
- device-level service data (MTA configuration files), 187**
- Device Provisioning (PKT-SP-PROV) specifications (PacketCable 1.0), 17**
- DF (Delivery Function), 807**
 - AF-DF communication
 - communicating information to CMSS, 814*
 - communicating information to CMTS, 811–812*
 - communicating information to MG, 813*
 - overview of, 809–811*
 - DF-CF communication, 815, 819
 - call flow examples, 819–828*
 - capturing call content, 829–830*
 - capturing call data, 815–818*
- DHCP (Dynamic Host Configuration Protocol), 63**
 - chaddr field, 65
 - ciaddr field, 64
 - Client-Class configurations, 85
 - CMTS configurations, 83–84, 87–88, 91
 - configuration options, 88*
 - embedded policies, 88*
 - named policies, 87*
 - Discover packets, 63
 - flags field, 64
 - giaddr field, 65
 - IP connectivity, troubleshooting, 125–129
 - leases, 63
 - options field, 65
 - option #43, 66*
 - option #60, 67–68*
 - option #82, 69*
 - option #122, 70–71*
 - packet formats, 64
 - scope configurations, 83
 - selection tags, 83
 - siaddr field, 64
 - yiaddr field, 64
- diagnostics, BTS, 330–331**
- dial plans**
 - defining, 300
 - defining characteristics, 299–300
 - entry definitions, 439–440
 - OFFNET call routing configurations, 436–440
- dial tones, troubleshooting, 337–338**
- digit maps, 298**
- digital certificates, 79–80**
- digital channels (DS0), 207**
- Discover packets (DHCP), 63**
- display alarms command, 455**
- display line alarm command, 454**
- display line command, 453**
- display lines command, 454**
- disruption of service (security threats), 843**
- distributed architectures, 206, 483**
- DLCX (Delete Connection) command (MGCP), 226–227**
- DN (domain names), configuring**
 - IP address configuration, 461
 - trunking MG configurations in BTS 10200 CMS, 458–460
- DNS (Domain Name Server), 73–74**
 - BTS, redundancy, 908
 - CMTS configurations, 92–96
 - configuring, 460
 - resource records, creating, 96
 - troubleshooting, 337
- Do Not Disturb feature, 507**

DOCSIS (Data-Over-Cable Service Interface Specification), 10

- authorization block parameters, 643
- BPI+, 840–841
- cable modem provisioning, 111
 - BPI+*, 136–138
 - configuration information transfers*, 131
 - IP connectivity*, 120–129
 - ranging*, 116–120
 - registration*, 131–134
 - scanning/downstream synchronization*, 112–113
 - ToD establishment*, 130
 - upstream parameters*, 114–115
- call capacities of upstream service flows, determining (capacity planning/traffic engineering), 887–894
- DOCSIS 1.0, 11–14
- DOCSIS 1.1, 14–15
- DOCSIS 2.0, 15
- DOCSIS 3.0, 16, 936
- DQoS, 620
 - active resources*, 625
 - admitted resources*, 625
 - gates*, 622
 - provisioned files*, 625
 - troubleshooting protocol issues*, 726
- Dynamic Service Flow messages, debugging during calls, 709–712
- dynamic service flows, 641–642
- headers, 639–641
- NCS packet QoS, 869
 - Backbone QoS, tying to*, 695–696
 - classifiers*, 873–875
 - downstream service flows*, 872–873
 - nRTPS service flows*, 871–872
 - premium best effort service flows*, 870–871
 - primary service flows*, 869
- packets
 - decoding via cable monitor (CMTS)*, 964–966
 - decoding via Ethernet packet sniffer*, 967
- PCMM
 - BE services*, 738–741
 - nRTPS*, 739–741
 - RTPS*, 739–741
 - service class names*, 741
- PHS, 649, 652–653
- service class name method (gate traffic profiles)
 - PCMM*, 750
- service flow conversion to RSVP flow specifications, 653–658
- service flow parameters
 - downstream parameters*, 647–648, 656–657
 - generic parameters*, 644–645
 - packet assignments*, 648–649
 - upstream parameters*, 645–647, 654
- VAD, 689–693
- website, 11
- downloading Ethernet packet sniffer, 963**
- downstream gate specifications, 672**
- DPE (Device Provisioning Engines), 51–52, 101–102**
- DQoS (Dynamic Quality of Service), 34, 619**
 - 911 calls, 694
 - active gate information, displaying, 701–702
 - active resources, 625
 - admission control policies, 693
 - admitted resources, 625
 - architecture of, 620
 - bandwidth reservation, 1017
 - BTS
 - configurations*, 719–722
 - verifying/troubleshooting on*, 723–724
 - cable line card information, displaying, 708–709
 - call flows, 665
 - basic ONNET calls*, 666–688
 - VAD*, 689–693
 - calls, elements of, 620
 - CMS, 621
 - CMSS SIP, 509–510
 - CMTS, 621
 - authorization*, 659
 - configuring on*, 696–698
 - event messaging element ID, configuring*, 696
 - maximum number of allocated gates, specifying*, 697
 - time values, specifying*, 697
 - troubleshooting on*, 707–718

- UGS-AD flows, switching to RTPS scheduling, 698
- UGS-AD flows, timing out, 698
- verifying on, 698–706
- COPS protocol
 - activity count field, 631
 - electronic surveillance parameters objects, 633
 - error code objects, 633
 - event generation information objects, 632–633
 - gate identifier objects, 631
 - gate specification field, 631
 - header formats, 626
 - initializing, 627–628
 - keepalive messages, 629
 - reason objects, 633–634
 - resource authorization, 635–638
 - session class field, 632
 - subscriber identifier objects, 631
 - transaction identifier objects, 630–631
- debugging
 - COPS messages, 712–716
 - DOCSIS Dynamic Service Flow messages during calls, 709–712
 - finding admission control information, 712
- DOCSIS, 620
 - authorization block parameters, 643
 - classifiers, 648–649, 658
 - converting service flows to RSVP flow specifications, 653–658
 - DOCSIS QoS tying to Backbone QoS, 695–696
 - downstream service flow parameters, 647–648, 656–657
 - dynamic service flows, 641–642
 - generic service flow parameters, 644–645
 - headers, 639–641
 - PHS, 649, 652–653
 - provisioned files, 625
 - SID information in upstream service flows, 704–706
 - upstream service flow parameters, 645–647, 654
- downstream capacity, displaying, 707–708
- DSCP, 620
- eMTA, 621
- gates, 622–626
 - allocation state, 623
 - authorization state, 623
 - commitment state, 624–625
 - converting DOCSIS classifiers to gate classifiers, 658
 - reservation state, 624
- LCO parameters
 - dq-qi, 244–245
 - dq-rd, 246
 - dq-ri, 246
 - dq-rr, 245
 - NCS, 244–246
- message types table, 630
- MPLS, 620
- resource envelopes
 - authorized, 625
 - committed, 625–626
 - creating, 635–638
 - reserved, 625–626
- Resource Reservation Failure, 508
- RKS, 621
- service flow information, displaying, 702–704
- statistical information on DOCSIS DSX messages on Downstream Channel, displaying, 708
- testing, 716–718
- timers, 635, 719
- troubleshooting
 - BTS 10200, 338–339
 - COPS protocol issues, 724
 - DOCSIS protocol issues, 726
 - gate deletion from Gate-Close messages, 724–725
 - gate deletion from Gate-Delete messages, 726
 - upstream capacity, displaying, 707
 - upstream statistics, displaying, 706
 - variables, 719–721
- dq-qi (DQoS Gate ID) parameter, 244–245**
- dq-rd (DQoS Reserve Destination) parameter, 246**
- dq-ri (DQoS Resource ID) parameter, 246**
- dq-rr (DQoS Resource Reservation) parameter, 245**
- DS0 (digital channels), 207**

- DS0 trunks, 383–384
- DS1 trunks, 359, 364
- DS3 trunks, 359, 364
- DSA-REP, 677
- DSA-REQ (Dynamic Service Addition Requests)
 - basic ONNET calls
 - downstream information in*, 676
 - upstream information in*, 675
 - UGS-AD, 689
- DSCP (Differentiated Services Code Point), 620, 875, 879
 - DSCP to IPv4 TOS conversions table, 875, 878
 - packets originating from CMS, 881–883
 - packets originating from CMTS, 879–880
 - packets originating from MG, 883–884
- DSC-REP, 683
- DSD-REQ (Dynamic Service Deletion Requests), 687
- dspcasbuiltinvars command, 452
- dspcasvars command, 453
- dspcd command, 472
- dspcds command, 925
- dspcodecjtrdelays command, 607
- dspcodecneg command, 607
- dspcodecnego command, 599
- dspcodeccparam(s) command, 598
- dspcodeccparams command, 607–608
- dspcodectmpls command, 606
- dspcon command, 451, 473
- dspconcac command, 473
- dspconvbdpol command, 609
- dspdns command, 459–460
- dspdspparam command, 602
- dspdtmfsnoop command, 600
- dspdynamicpayload command, 608
- dspeventmappings command, 602
- dspfapxprof(s) command, 604
- dspiptos command, 883
- dspln command, 455, 457
- dsplnalm command, 457
- dsplndsp command, 608
- dsplnstate command, 457
- dsplntonentimeout command, 609
- dsplntoneplan command, 608
- dsplog -sl command, 472
- dspmgcs command, 460
- dspmoinecanendpt command, 608
- dsppath command, 456
- dsppathalm command, 457
- dspprotocolport command, 462
- dsprtpercent command, 610
- dspt38fxlco(s) command, 609
- dspt38nsettimeout(s) command, 609
- dspt38params command, 609
- dsptoneplans command, 608
- dspttyprof(s) command, 603
- dspvbdcodec command, 609
- dspvbdprof(s) command, 603
- dspvifec(s) command, 600
- dspvifeventmapping(s) command, 604
- dspvifvad(s) command, 600
- dspvismdn command, 459
- dspvismparam command, 605–606, 609
- dspvoipparams command, 608–610
- dspxgcpcalea command, 831
- dspxgcpcaleacalls command, 831
- dspxgcpcalls command, 476
- dspxgcpccons command, 476
- dspxgcpcdetailents command, 476
- dspxgcpcdtmf command, 599
- dspxgcpcendptcons command, 475
- dspxgcpcplncons command, 476
- dspxgcpcprofttone command, 601
- dspxgcpcendptcon command, 475
- DTMF (dual-tone multiple frequency) digit
 - transport (audio CODEC), 559–560
 - MG
 - VISM*, 608
 - VXSM*, 599
 - RTP payloads, 580, 583
- dynamic payloads, RTP message format, 571–572
- Dynamic RTP, 608
- Dynamic Service Change Action field (DOCSIS classifiers), 649
- dynamic service flows, 641–642

E

- E1 trunks, 359
- E3 trunks, 359
- EBP (Exterior Border Proxies), 486

- echo (audio CODEC), 556–558**
 - VISM, 608
 - VXSM, 600
- EH (extended headers), 639–641**
- electrical echos, 558**
- electronic surveillance parameters objects (COPS protocol), 633**
- embedded policies, 88**
- Emergency 911 call flows, 381–383, 694**
- EMID (Event Message Identifier), 790–791**
- EML (Element Management Layers), 48**
- EMS (Element Management Systems), 285**
 - CLI, accessing, 285
 - displaying database transaction queue, 330
 - EML, 48
 - TMN, 48
- eMTA (embedded MTAs), 29, 181**
 - cable modems, 33
 - CG2P2WB cable gateways, 32
 - CM2P2B cable modem, 31
 - configuration files
 - BAC configuration file utility, 195*
 - BAC templates, 191–195*
 - configuring after initialization, 197*
 - device-level configuration data, 186*
 - device-level service data, 187*
 - notification receivers, 191*
 - per-CMS configuration data, 189–190*
 - per-endpoint configuration data, 188–189*
 - per-realm configuration data, 189*
 - TLV entry tags, 185*
 - DQoS, 621
 - MIB, 181–182
 - provisioning, 30, 61, 111, 139
 - Basic method, 161–163*
 - Hybrid method, 164–166*
 - secure method, 62, 139–144, 147–149, 152–161*
 - QoS, 33
- encoding names (payloads), 572**
- encoding parameters (payloads), 572**
- endpoints**
 - announcement server access points as, 207
 - CAS endpoints, adding to lines, 458
 - connections, 208
 - DS0 endpoints, adding to lines, 458
 - IVR, 208
 - naming, 210–211
 - TGCP, 425–426
 - TGCP configuration, 435–436
 - TGCP naming conventions, 361–364
 - types of, 207
- end-to-end delays (audio CODEC), 552**
- ensuring high availability (QoS), 865**
- erlang metric (capacity planning/traffic engineering), 898–901**
- error codes (COPS protocol), 633**
- error traces (SIP), 506**
 - calls not answered, 506–507
 - Do Not Disturb feature, 507
 - DQoS Resource Reservation Failure, 508
- es-ccd (Call Content Destination), 368, 813**
- es-cci (Call Content Connection Identifiers), 368, 813**
- ESP (Encapsulation Security Payload), 844**
- ESS (Electronic Surveillance Server) table, 830**
- Ethernet packet sniffer**
 - call flow schematics, generating, 972–974
 - decoding DOCSIS packets, 967
 - downloading, 963
 - installing, 963
 - MTA provisioning, 968–970
 - OFFNET packet traces, examining, 980
 - PacketCable COPS DQoS packets, examining, 978
 - PacketCable Event Messaging packets, examining, 980
 - PacketCable Lawful Intercept packets, examining, 981–982
 - phone calls, examining, 971–972
 - port monitoring, configuring, 977
 - RTP streams, examining, 975–976
- event generation information objects (COPS protocol), 632–633**
- event handling, 230**
- Event Management Mechanism (PKT-SP-MEM) specifications (PacketCable 1.5), 20**
- event messaging**
 - background of, 788
 - batch processing, 789
 - BCID, 789
 - BTS 10200 configuration, 800
 - billing file recovery, 803*
 - enabling EM sending, 802*

- Media Alive message configuration, 803*
- retrieving EM measurements, 803*
- RKS definitions, 800–801*
- subscriber billing type configuration, 803*
- variable modification, 801–802*
- Call Answer messages, 790
- Call Disconnect messages, 790
- call flow example, 792–799
- CDR, 789
- CMTS, 804
- Conference Party Change messages, 790
- Database Query messages, 790
- element ID, 696
- EMID, 790–791
- FEID, 789
- IKE, 841
- Interconnect Start messages, 790
- Interconnect Stop messages, 790
- inter-domain calls, 790
- intra-domain calls, 790
- IPsec, 841
- lawful intercept, 809–811
- Media Alive messages, 790, 803
- Media Report messages, 790
- Media Statistics messages, 790
- motivation for, 788
- MSO, 789
- PCMM, 772
- PKT-SP-EM (PacketCable Event Messaging)
 - specification, 788
- Policy Delete messages, 792
- Policy Request messages, 792
- Policy Update messages, 792
- QoS_Commit messages, 791
- QoS_Release messages, 791
- QoS_Reserve messages, 791
- RADIUS
 - Accounting function, 788*
 - Accounting-Request messages, 789*
 - Accounting-Response messages, 789*
 - UDP, 789*
- record generation, 789
- Redirection messages, 791
- Service Activation messages, 791
- Service Deactivation messages, 791
- Service Instance messages, 791
- Signal Instance messages, 791

- Signaling Start messages, 791
- Signaling Stop messages, 791
- Surveillance Stop messages, 791
- Time Change messages, 791
- TLV pairs, 788–789
- Event Messaging (PKT-SP-EM) specifications (PacketCable 1.0), 18**
- event-generation-info objects, 751**
- events**
 - BTS, 329
 - MGCP, 216, 230
 - TGCP, 364–365, 367
- exchange codes, 298**
- extended classifiers, PCMM, 748**

F

- facsimile transport, 562–563**
- fax relays (T.38), 584–589**
- FCAPS (Fault, Configuration, Account, Performance and Security management), 47**
- feature call flows, NCS role in, 261–284**
- feature servers, defining, 323–324**
- features, assigning associate subscribers, 327**
- FEID (Financial Entity Identifiers), 789**
- flags field, 64**
- From parameter (SIP), 493**

G

- G.711 CODEC, 541–543**
 - bandwidth constraints, 579
 - RTP, 573
 - packet size, 578*
 - packet traces, 576*
- G.728 CODEC, 543–544**
 - bandwidth constraints, 579
 - RTP, 573
 - packet size, 578*
 - packet traces, 576*
- G.729E CODEC, 545**
 - bandwidth constraints, 579
 - RTP, 573
 - packet size, 579*
 - packet traces, 577*

- gaming consoles, 735**
- gaps (RTCP-XR), 595**
- Gate Alloc Err messages, 624**
- Gate Alloc messages, 623**
- Gate allocation messages. *See* Gate-Report-State messages**
- Gate Close messages. *See also* Gate-Report-State messages**
 - DQoS, 687
 - troubleshooting gate deletion from, 724–725
- Gate Delete messages, 726, 745**
- gate identifiers**
 - AM, 735
 - COPS protocol, 631
 - PCMM, 747
- Gate Info messages, 745**
- Gate Open messages. *See* Gate-Report-State messages**
- Gate-Report-State messages, 685, 745-746**
- Gate Set Ack messages, 624, 673–674**
- Gate Set Error messages, 624**
- Gate Set messages, 624, 745**
 - 911 calls, Ethereal trace of, 694
 - DQoS, 670
- gate specification, 747–748**
- gate specification field (COPS protocol), 631**
- gate state objects, 753**
- gate time info objects, 752**
- gate traffic profiles, 749–751**
- gate usage info objects, 752**
- gates, 622, 626**
 - allocation state, 623
 - authorization state, 623
 - commitment state, 624–625
 - components of, 623
 - converting DOCSIS classifiers to gate classifiers, 658
 - COPS protocol
 - activity count field, 631*
 - electronic surveillance parameters objects, 633*
 - error code objects, 633*
 - event generation information objects, 632–633*
 - gate identifier objects, 631*
 - gate specification field, 631*
 - header formats, 626*
 - initializing, 627–628*
 - keepalive messages, 629*
 - reason objects, 633–634*
 - session class field, 632*
 - subscriber identifier objects, 631*
 - transaction identifier objects, 630–631*
- CTMS, 697
- DQoS
 - active gate information, displaying, 701–702*
 - downstream gate specifications, Ethereal traces, 672*
 - Gate-Close messages, Ethereal traces, 687*
 - Gate-Open messages, Ethereal traces, 685*
 - Gate-Set messages, Ethereal traces, 670*
 - Gate-Set-Ack messages, Ethereal traces, 673–674*
 - troubleshooting gate deletions from Gate-Close messages, 724–725*
 - troubleshooting gate deletions from Gate-Delete messages, 726*
 - upstream gate specifications, Ethereal traces, 671*
- Gate Alloc Err messages, 624
- Gate Alloc messages, 623
- Gate-Report-State messages, 685, 745-746
- Gate Set Ack messages, 624, 673–674
- Gate Set Error messages, 624
- Gate Set messages, 624, 670, 694, 745
- reservation state, 624
- test packetcable gate create command, 718
- test packetcable gc gate-alloc command, 717
- test packetcable gc gate-delete command, 717
- test packetcable gc gate-info command, 717
- test packetcable gc gate-set command, 717–718
- gateways**
 - call agent relationships, 206
 - endpoints (MGCP), 207
 - MGCP, 218
- GC (Gate Controllers), 39**
- giaddr field, 65**
- giaddr fields, 81**
- GRA (Circuit Group Reset Acknowledge) messages, ISUP, 355**
- Grants per Interval parameters (service flow parameters), 647**
- GRS (Circuit Group Reset) messages, ISUP, 355**
- GTT (Global Title Translation), 354**

H

hccp channel-switch command, 920
hccp protect command, 920
hccp rfs witch-group command, 920
hccp switch command, 921
hccp working command, 920
headers
 DOCSIS, 639–641
 PHS, 649, 652–653
HFC (Hybrid Fiber Coaxials), 28
HFC redundancy (CMTS), 912–914, 917–922
high availability, ensuring (QoS), 865
HMAC (Hashed Message Authentication Code), 844
HTTP (Hypertext Transfer Protocol), 74–75
Hybrid method (MTA provisioning), 164–166

I

IAM (Initial Address Messages), ISUP, 354
IAP (Intercept Access Points), 806
 AF, 807–814
 call details, 807
IBP (Interior Border Proxies), 486
IETF RFC (Internet Engineering Task Force Request For Comments), 9, 949–953
IKE (Internet Key Exchange), 840
 COPS, 841
 event messaging, 841
iLBC (Internet Low Bitrate Codec), 546
 bandwidth constraints, 579
 RTP, 573
in-band communication, 347
init(d) state (IP connectivity), troubleshooting, 123
init(io) state (IP connectivity), troubleshooting, 123–124
installing Ethernet packet sniffer, 963
integrity (data), 843
interception (lawful intercept), 806
Interconnect Stop messages (event messaging), 790
Interconnect Start messages (event messaging), 790
inter-domain calls, 790
interface queues, load balancing, 935
intra-domain calls, 790
INVITE messages, 514–515
INVITE method, 512
IP addresses
 DN IP address configurations, 461
 trunking MG configurations, 459
IPsec (IP Security), 843–845
 AH, 843
 anti-reply, 843
 COPS, 841
 data confidentiality, 843
 data integrity, 843
 data origin authentication, 843
 ESP, 844
 event messaging, 841
 MTA-to-CMS call signaling packets, 840
 RTCP, 841
 RTP, 841
 SA, 844
 transport mode, 844
 tunnel mode, 844
IPv4, DSCP to IPv4 TOS conversions table, 875, 878
ISUP (ISDN User Part) layers
 ACM, 355
 ANM, 355
 BLA, 355
 BLO, 355
 CGA, 355
 CGB, 355
 CGU, 355
 CGUA, 355
 GRA, 355
 GRS, 355
 IAM, 354
 network variant definitions, 409
 REL, 355
 RES, 355
 RLC, 355
 routing key definitions, 410
 RSC, 355
 SS7, 354
 SUS, 355
 UBA, 355
 UBL, 355

ITP (IP Transfer Point), 42

configuring, 385, 396
group implementation, 386–387, 395, 403, 410
PSTN, 388–391
router requirements, 385
SG mated pair implementation, 388, 394, 399, 403–404
Sigtran, 391–394
web resources, 401
 troubleshooting, 464–467

ITU (International Telecommunication Union) specifications, 10, 954–956

E-model (audio CODEC voice quality), 551
 network management models
FCAPS, 47
TMN, 48

IVR endpoints, 208**J-K****jitter buffers, 556, 607–608****jitter variations, minimizing (QoS), 865****KDC (Key Distribution Centers), 52**

CMTS configurations, 103–104
 Kerberos, 80

keepalive command, 921**keepalive messages, 629****Kerberos, 78–80**

authentication, 80
 digital certificates, 79–80
 KDC, 80
 public/private key cryptology, 79
 realms, 79

keygen, 104**L****lawful intercept**

AF, 807–814
 architecture of, 808
 CALEA, 805
 call details, 807
 call flow examples, 819

suspect with call content tap originates call, 823–825

suspect with call content tap receives call, 826–828

suspect with call data tap originates call, 819–821

suspect with call data tap receives call, 821–822

CCC, 807, 829

CDC, 807, 829

CF, 807, 815–830

CMSS, 814

CMTS, 811–812

configuring, 830–831

DF, 807

AF-DF communication, 809–814

DF-CF communication, 815–830

event messaging, 809–811

IAP, 806

Lawful Intercept (PKT-SP-ESP) specifications
 (PacketCable 1.5), 20

LCO, 367–368

MG, 813

PCESP, 815–818

surveillance types, 806

troubleshooting, 832

LCO (Local Connections Options)

CODEC, 243

CRCX command, 223–224

DQoS

dq-qi, 244–245

dq-rd, 246

dq-ri, 246

dq-rr, 245

NCS, 244–246

sc-rtcp parameter, 845, 855

sc-rtp parameter, 845, 855

security, 246

TGCP, 367–368

leases (DHCP), 63**line echos, 558****line usage (capacity planning/traffic engineering), 898–901****linecards, 898****linksets, 390****load balancing, 928–930**

admission control, 930–933

- burst size limitations, 935
- interface queues, 935
- spectrum management, 933–934
- log files (BTS), 329–330**

M

- M3UA protocol, 356, 392**
- manual/automatic switchovers (router processors), 912**
- Max-Forwards parameter (SIP), 493**
- maximizing voice quality (QoS), 865**
- Maximum Sustained Traffic Rate parameters (service flow parameters), 648, 740**
- Maximum Traffic Burst parameters (service flow parameters), 648**
- MDCX (Modify Connection) command (MGCP), 224–226**
- Media Alive messages (event messaging), 790, 803**
- Media Gateways. *See* MG (Media Gateways)**
- Media Report messages (event messaging), 790**
- Media Statistics messages (event messaging), 790**
- Media Stream Transport and Encoding (PKT-SP-CODEC) specifications (PacketCable 1.0), 17**
- message bodies (SIP), 494**
- message flow templates (PCMM), 755–771**
- message headers (SIP), 492–494**
- MG (media gateways), 43. *See also* MGCP (Media Gateway Control Protocol)**
 - AS5000 series, 46
 - auditing, 330
 - characteristic configurations, 416–424
 - configuring, 424
 - enabling, 434
 - IKE, 840
 - lawful intercept, 813
 - MGX 8000 series, 43
 - PXM cards*, 44
 - RPM cards*, 44
 - SRM cards*, 45
 - VISM cards*, 45–46
 - VXSM cards*, 45–46
 - QoS, 883–884
 - redundancy, 927
 - ATM VC redundancy*, 926
 - PXM redundancy*, 924

- SRM redundancy*, 924
- VXSM/VISM redundancy*, 925–926
- trunking MG configuration in BTS 10200 CMS, 440–443
 - PXM configurations*, 443–444
 - RPM configurations*, 445–449
 - VXSM/VISM configurations*, 449–463
- VISM, 605
 - active calls, monitoring*, 610
 - BERT testing*, 610
 - CODEC options, configuring*, 606–607
 - DTMF relays, configuring*, 608
 - dynamic RTP payload types, negotiating*, 608
 - echo parameters, adjusting*, 608
 - jitter buffers, adjusting*, 607–608
 - RTCP parameters, setting*, 609
 - Silence Suppression parameters, adjusting*, 610
 - T.38 facsimile parameters, configuring*, 609
 - tone plans, configuring*, 608
 - VBD, detecting*, 609
- VXSM, 598
 - bearer tracing*, 605
 - BERT testing*, 604
 - CODEC options, configuring*, 598
 - DTMF relays, configuring*, 599
 - echo parameters, adjusting*, 600
 - RTCP parameters, setting*, 602
 - silence suppression parameters, adjusting*, 600
 - tone parameters, configuring*, 601
 - VBD options, configuring*, 602–604
- MGC (Media Gateway Controllers), 39**
- MGCP (Media Gateway Control Protocol)**
 - call agents, 210–211, 230
 - call signaling, 218–219
 - commands
 - AUCX*, 215
 - AUEP*, 214
 - concatenating multiple commands*, 230
 - CRCX*, 221–224
 - DLCX*, 226–227
 - endpoint names*, 210–211
 - ensuring delivery of*, 230
 - header format*, 209

- MDCX*, 224–226
- NTFY*, 219–221
- RQNT*, 217–219
- RSIP*, 213–214
- TIDs*, 210
- verbs*, 210
- connections, 208
- endpoints, 207
 - announcement server access points as*, 207
 - connections*, 208
 - IVR*, 208
 - naming*, 210–211
 - types*, 207
- events, 216, 230
- gateways, 218
- messages, 208
- MTA and CMS communications, 29
- NCS variations, 239, 247
 - CODEC LCO parameters*, 243
 - command header formats*, 240
 - DQoS LCO parameters*, 244–246
 - endpoint naming conventions*, 240–241
 - package events/signals*, 241–242
 - packetization period parameter (p)*, 243
 - SDP attributes*, 247
 - security LCO parameters*, 246
- packages, 216, 230
- parameters, 211–212
- quarantine event handling, 230
- reason codes, 228–229
- responses, 227
 - acknowledgements*, 230
 - buffering*, 230
 - concatenating multiple responses*, 230
 - ensuring delivery of*, 230
 - provisional response notifications*, 230
 - response codes*, 228–229
- signals, 216–217, 230
- TGCP variations, 360, 368
 - command header formats*, 361
 - endpoint naming conventions*, 361–364
 - LCO*, 367–368
 - package events/signals*, 364–367
 - SDP*, 368
- MGW-PROFILE table**, 850
- MIB**, 181–182
- minimizing**
 - delay (QoS), 865
 - jitter variations (QoS), 865
 - packet loss (QoS), 865
- Minimum Reserved Rate Packet Size parameters (service flow parameters)**, 648
- Minimum Reserved Traffic Rate parameters (service flow parameters)**, 648
- Minimum Reserved Traffic Rate service flow parameter**, 740
- modem-mac-address**, 709
- modems**
 - CM, 737
 - CMTS, 736–737
- MOS (Mean Opinion Score) ratings, audio CODEC voice quality**, 549
- MPLS (Multiprotocol Label Switching)**
 - backbone QoS, 885–886
 - DQoS, 620
- Msg Receipt Key objects (PCMM)**, 754
- Msg-Receipt messages (PCMM)**, 746
- MSO (Multiple Systems Operator)**, 789
- MTA (Multimedia Terminal Adapters)**, 28. *See also eMTA*
 - authentication requirements, 30
 - characteristic configurations, 302–315
 - CMS communications
 - call signaling*, 29
 - communication loss*, 172–173
 - QoS signaling*, 29–30
 - CMS initialization, 167–171
 - CMTS configurations, 301–302
 - configuration files, 610–611
 - DQoS, 635–638
 - entering NCS endpoints into service, 322–323
 - modem-mac-address, 709
 - MTA-to-CMS call signaling packets (IPsec), 840
 - NCS endpoints configuration, 315–316
 - out of service MTA, troubleshooting, 336–337
 - provisioning, 968–970
 - redundancy, 924
 - responsibilities of, 29–30
 - security, 30, 218–219
 - sMTAs, 29
 - voice packets, transmitting, 637
- MTP (Message Transfer Part) layers**, 352–353

multimedia. See also PCMM

- clients, 734
- COPS objects, 743–746
- PacketCable Multimedia specifications, 20–22, 960
- test packetcable gc initiate command, 718

N**named policies, 87****narrowband voice, 540****national destination codes, 297****NCS (Network-based Call Signaling)**

- 911 calls, 694
- BTS 10200 configuration, 284
 - assigning associate subscribers to features, 327*
 - assigning associate subscribers to services, 327*
 - basic/core configuration tasks, 287–295*
 - call feature configuration tasks, 323–327*
 - configuring call agent variables, 290–294*
 - configuring MTA, 313–315*
 - configuring MTA characteristics, 302–313*
 - configuring MTA-connected CMTS, 301–302*
 - configuring NCS endpoints, 315–316*
 - configuring PacketCable subscriber characteristics, 320–321*
 - configuring subscriber characteristics, 319*
 - configuring subscriber QoS parameters, 316–319*
 - defining call agent characteristics, 287–289*
 - defining call agents, 289–290*
 - defining destination tables, 299*
 - defining dial plan characteristics, 299–300*
 - defining dial plans, 300*
 - defining digit maps, 298*
 - defining exchange codes, 298*
 - defining feature servers, 323–324*
 - defining features, 324–325*
 - defining national destination codes, 297*
 - defining office codes, 298*

defining POP, 295

defining services, 326

defining vertical service codes, 325–326

dial plan configuration tasks, 295–300

entering MTA into service, 322–323

entering NCS endpoints into service, 322–323

MTA configuration tasks, 300–316

subscriber configuration tasks, 316–321

call flow usage examples, 248

feature calls, 261–284

ONNET calls, 248–261

DQoS, 666–688

endpoint configuration (MTA), 315–316

MGCP variations, 239, 247

CODEC LCO parameters, 243

command header formats, 240

DQoS LCO parameters, 244–246

endpoint naming conventions, 240–241

package events/signals, 241–242

packetization period parameter (p), 243

SDP attributes, 247

security LCO parameters, 246

MTA and CMS communications, 29

QoS on DOCSIS networks

classifiers, 873–875

downstream service flows, 872–873

nRTPS service flows, 871–872

premium best effort service flows, 870–871

primary service flows, 869

signaling security, 847–852

network design

capacity planning/traffic engineering, 886

busy hour utilization, 900–901

cable linecards, 898

call capacities of DOCSIS upstream

service flows, determining, 887–894

CMS, 903–904

CMTS, 902–903

CODEC changes, effects of, 895–896

erlang metric, 898–901

line usage, 898–901

packetization interval changes, effects of, 894–895

PHS implementation, effects of, 896–897

security implementation, effects of, 897

TGCP, 904
traffic patterns, 898–901
VAD implementation, effects of, 897
 load balancing, 928–930
 admission control, 930–933
 burst size limitations, 935
 interface queues, 935
 spectrum management, 933–934
 QoS
 backbone QoS, 875, 878–886
 characterizing call signaling traffic, 866–869
 DSCP codepoints, 879–884
 metrics of, 865
 NCS packets on DOCSIS networks, 869–875
 redundancy, 905
 4+1 schemes, 913, 920
 8+1 (7+1) schemes, 913, 919–920
 CMS, 906–908
 CMTS, 909–914, 917–923
 MG, 924–927
 MTA, 924
 OSS servers, 928
 RPR, 911–912
 RPR+, 911–912
 SG, 927
 security
 BAC configuration, 846–847
 BTS 10200 configurations, 847–856
 CMTS configurations, 859–864
 IPsec, 843–845
 requirements, 840–841
 threats, 841–843
 VXSM configurations, 857–859
network service thefts (security threats), 841–842
NML (Network Management Layers), 48
NMS (Network Management Systems), 48
no bandwidth calls, 1017
no hccp reverttime command, 921
no keepalive command, 921
nodestat command, 328–329
Nominal Grant Interval parameters (service flow parameters), 647
Nominal Polling Interval parameters (service flow parameters), 647, 740
notification receivers, 191

NOTIFY method, 512
nRTPS (non Real-Time Polling Services)
 DOCSIS, 739–741
 NCS QoS on DOCSIS networks, 871–872
 service flow parameters, 739
NTFY (Notified Entity) command (MGCP), 219–221

O

OC-1 (Optical Carrier - Level 1), 359
OC-3 (Optical Carrier - Level 3), 362–364
office codes, 298
OFFNET
 OFFNET-to-ONNET call flows, 376–380
 OFFNET-to-ONNET calls, 991
 packet traces, 980
 routing, 909
OID (Object Identification Number), 181
one way voice, troubleshooting, 338
ONNET call flows
ONNET calls
 DQoS, 666–681
 downstream service flows, activating, 682
 upstream service flows, activating, 682–688
 VAD, 689–693
 NCS role in, 248–261
 ONNET-to-OFFNET call flows, 369–376
 ONNET-to-OFFNET calls, 988, 991
 ONNET-to-ONNET calls, 985–986
 ONNET-to-SIP/CMSS calls, 994–996
opaque data objects, 752
Operational Support Systems specifications (PacketCable 1.0), 18
options field (DHCP), 65
 option #43, 66
 option #60, 67–68
 option #82, 69
 option #122, 70–71
origin authentication (data), IPsec, 843
OSS servers, 928
OSS/BSS (Operational Support System/Business Support System) BackOffice components, 47
 BAC, 49
 CNR, 52

DPE, 51–52
KDC, 52
RDU, 50–51
 BTS 10200 databases, 53
 ITU network management models
FCAPS, 47
TMN, 48

out-of-band signaling, 347–348

P

p (packetization period parameter), 243

P-DCS-BILLING-INFO extension, 511

P-DCS-LAES extension, 511

P-DCS-OSPS extension, 511

P-DCS-REDIRECT extension, 511

P-DCS-TRACE-PARTY-ID extension, 511

packages

MGCP, 216, 230

TGCP, 364–367

packet loss, minimizing (QoS), 865

PacketCable

ANSI specifications, 10

architecture of, 8–9

DOCSIS specifications, 10

DOCSIS 1.0, 11–14

DOCSIS 1.1, 14–15

DOCSIS 2.0, 15

DOCSIS 3.0, 16

website, 11

error objects, 752–753

Event Messaging packets, 980

future of, 935–937

IETF RFC, 9

ITU specifications, 10

Lawful Intercept packets, 981–982

motivations behind, 5–7

PacketCable 1.0, 16

architectural diagram, 27

Call Signaling, 17

Device Provisioning, 17

Event Messaging (PKT-SP-EM), 18

Media Stream Transport and Encoding

(PKT-SP-CODEC), 17

Operational Support Systems, 18

PKT-SP-EC-MGCP, 17

PKT-SP-ISTP, 17

PKT-SP-MIB-CLABDEF, 18

PKT-SP-MIB-MTA, 18

PKT-SP-MIBS, 18

PKT-SP-MIB-SIG, 18

PKT-SP-TGCP, 17

PKT-TR-ARCH, 18

PKT-TR-CF-ON-ON, 19

PKT-TR-CF-ON-PSTN, 19

PKT-TR-CF-PSTN-ON, 19

PKT-TR-MGCP-PKG, 19

PKT-TR-OSS, 19

Quality of Service (PKT-SP-DQOS), 18

Security and Privacy (PKT-SP-SEC), 18

standards/specifications, 957–958

PacketCable 1.5, 19

Audio Server Protocol (PKT-SP-ASP), 20

Battery Backup MIBs (CL-SP-MIB-BB),

19

Call Management Server provisioning

(PKT-SP-CMSPROV), 20

CMS to CMS Signaling (PKT-SP-CMSS),

19

Event Management Mechanism (PKT-SP-

MEM), 20

Lawful Intercept (PKT-SP-ESP), 20

Primary Line Support (PKT-SP-AIP), 19

standards/specifications, 958–960

PacketCable 2.0, 22

PacketCable Multimedia, 20–22, 960

Telcordia specifications, 10

packetization

LCO, 367

packetization period parameter (p), 243

packetization periods, 542

PAM (Pulse Amplitude Modulation), 540

PAMS (Perceptual Analysis/Measurement System), 550

parameter negotiations, troubleshooting in

BTS 10200, 339

payloads

clock rates, 572

DTMF relays, 580, 583

dynamic, 571–572

encoding parameters, 572

encoding names, 572

formats of, 573

- payload types, 572
- static, 571–572
- types, 572
- PCESP (PacketCable Electronic Surveillance Protocol), 815–818**
- PCMM (PacketCable Multimedia), 731**
 - AM, 735
 - call agents, 735*
 - gaming consoles, 735*
 - gate identifiers, 735*
 - policy servers, 736*
 - web servers, 735*
 - AS, 734
 - CM, 737
 - CMTS, 736–737
 - configuration on, 773–774*
 - troubleshooting on, 774–779*
 - verifying on, 774–779*
 - COPS, 741–743
 - AMID, 746
 - classifiers, 748
 - event-generation-info objects, 751*
 - extended classifiers, 748*
 - gate identifiers, 747*
 - Gate Set messages, 745*
 - gate specification, 747–748*
 - gate state objects, 753*
 - gate time info objects, 752*
 - gate traffic profiles, 749–751*
 - gate usage info objects, 752*
 - header formats, 742*
 - initialization process, 743*
 - Msg Receipt Key objects, 754*
 - object formats, 742*
 - opaque data objects, 752*
 - PacketCable error objects, 752–753*
 - PEP to PDP heartbeats, 743*
 - PSID objects, 754*
 - Synch Options objects, 754*
 - time-based usage limit objects, 751*
 - transaction IDs, 744–746*
 - version info objects, 754*
 - volume-based usage limit objects, 751*
 - DOCSIS
 - BE services, 738–741*
 - nRTPS, 739–741*
 - RTPS, 739–741*
 - service class names, 741*
 - event messaging, 772*
 - Gate Delete messages, 745*
 - Gate Info messages, 745*
 - Gate Report State messages, 745*
 - Gate-Report-State messages, 746*
 - message flow templates, 755–771*
 - Msg-Receipt messages, 746*
 - multimedia clients, 734*
 - overview of, 731–732*
 - PDP-Config messages, 746*
 - RKS, 737*
 - security, 772*
 - subscriber identifiers, 747*
 - Synch-Complete messages, 746*
 - Synch-Report messages, 746*
 - Synch-Request messages, 746*
- PDP (Policy Decision Points), 737**
 - Msg-Receipt messages, 746
 - PDP to PEP heartbeats, 743
 - PDP-Config messages, 746
 - Synch-Report messages, 746
 - Synch-Request messages, 746
- PDP-Config messages, 746**
- pen and trace (lawful intercept), 806**
- pen register (lawful intercept), 806**
- PEP (Policy Enforcement Points), 737**
 - Gate-Report-State messages, 746
 - Msg Receipt Key object, 754
 - PEP to PDP heartbeats in PCMM, 743
 - Synch Options object, 754
 - Synch-Complete messages, 746
- per-CMS configuration data (MTA configuration files), 189–190**
- per-endpoint configuration data (MTA configuration files), 188–189**
- per-realm configuration data (MTA configuration files), 189**
- PESQ (Perceptual Evaluation of Speech Quality), 551**
- PHS (Payload Header Suppression)**
 - capacity planning/traffic engineering, 896–897
 - DOCSIS, 649, 652–653
- PHSF (PHS Field) parameter (PHS), 650**
- PHSI (PHS Index) parameter (PHS), 651**
- PHSM (PHS Mask) parameter (PHS), 651**
- PHSS (PHS Size) parameter (PHS), 651**

- PHSV (PHS Verify) parameter (PHS), 651**
- PKT-SP-AIP (Primary Line Support) specifications, 19**
- PKT-SP-ASP (Audio Server Protocol) specifications, 20**
- PKT-SP-CMSPROV (Call Management Server provisioning) specifications, 20**
- PKT-SP-CMSS (CMS to CMS Signaling) specifications, 19**
- PKT-SP-CODEC (Media Stream Transport and Encoding) specifications, 17**
- PKT-SP-DQOS (Quality of Service) specifications, 18**
- PKT-SP-EC-MGCP specifications, 17**
- PKT-SP-EM (PacketCable Event Messaging) specification, 18, 788**
- PKT-SP-ESP (Lawful Intercept) specifications, 20**
- PKT-SP-ISTP specifications, 17**
- PKT-SP-MEM (Event Management Mechanism) specifications, 20**
- PKT-SP-MIB-CLABDEF specifications, 18**
- PKT-SP-MIB-MTA specifications, 18**
- PKT-SP-MIBS specifications, 18**
- PKT-SP-MIB-SIG specifications, 18**
- PKT-SP-PROV (Device Provisioning) specifications, 17**
- PKT-SP-SEC (Security and Privacy) specifications, 18**
- PKT-SP-TGCP specifications, 17**
- PKT-TR-ARCH specifications, 18**
- PKT-TR-CF-ON-ON specifications, 19**
- PKT-TR-CF-ON-PSTN specifications, 19**
- PKT-TR-CF-PSTN-ON specifications, 19**
- PKT-TR-MGCP-PKG specifications, 19**
- PKT-TR-OSS specifications, 19**
- pkteSigDefCallSigTos, 879**
- pkteSigDefMediaStreamTos, 879**
- pkteSigTosFormatSelector, 879**
- point codes, 349**
 - destination code definitions, 404–405
 - ITP configuration, 389, 404
- policies**
 - embedded policies, 88
 - named policies, 87
 - options, configuring, 88
- policy-based routing, 437–438**
- Policy Delete messages (event messaging), 792**
- policy domains, 738**
- Policy Request messages (event messaging), 792**
- policy servers**
 - PDP, 737
 - Msg-Receipt messages, 746*
 - PDP to PEP heartbeats in PCMM, 743*
 - PDP-Config messages, 746*
 - Synch-Report messages, 746*
 - Sync-Request messages, 746*
 - PEP, 737
 - Gate-Report-State messages, 746*
 - Msg Receipt Key object, 754*
 - PEP to PDP heartbeats in PCMM, 743*
 - Synch Options object, 754*
 - Synch-Complete messages, 746*
- Policy Update messages (event messaging), 792**
- POP (Points of Presence), 295**
- port monitoring, 977**
- post dial delays, troubleshooting, 339**
- Primary Line Support (PKT-SP-AIP) specifications, 19**
- privacy extensions, 510**
- private/public key cryptology, 79**
- processor redundancy (CMTS), 911–912**
- provisioned files, 625**
- provisioning**
 - CMTS configurations, 81
 - BAC, 82*
 - CNR, 82*
 - CNR, DHCP, 83–84, 87–88, 91*
 - CNR, DNS, 92–96*
 - CNR, DPE, 101–102*
 - CNR, KDC, 103–104*
 - CNR, RDU, 96–101*
 - Device Provisioning specifications (PacketCable 1.0), 17
 - DHCP, 63
 - chaddr field, 65*
 - ciaddr field, 64*
 - Discover packets, 63*
 - flags field, 64*
 - giaddr field, 65*
 - leases, 63*
 - options field, 65*
 - options field, option #43, 66*

- options field, option #60, 67–68*
 - options field, option #82, 69*
 - options field, option #122, 70–71*
 - packet formats, 64*
 - siaddr field, 64*
 - yiaddr field, 64*
 - DNS, 73–74
 - DOCSIS cable modem, 111
 - BPI+, 136–138*
 - configuration information transfers, 131*
 - IP connectivity, 120–129*
 - ranging, 116–120*
 - registration, 131–134*
 - scanning/downstream synchronization, 112–113*
 - ToD establishment, 130*
 - upstream parameters, 114–115*
 - DPE, 51–52
 - eMTA, 30, 61–62, 111
 - HTTP, 74–75
 - Kerberos, 78–80
 - MTA, 139
 - Basic method, 161–163*
 - Ethereal packet sniffer (CMTS), 968–970*
 - Hybrid method, 164–166*
 - secure method, 139–161*
 - MTA to CMS communication loss, 172–173
 - MTA to CMS initialization, 167–171
 - provisioning groups, 50
 - SNMP, 76–77
 - syslog protocol, 75–76
 - TFTP, 74
 - ToD protocol, 75
 - proxy servers**
 - SIP, 486, 489
 - stateful/stateless, 489
 - PS (policy servers), 736**
 - PSID objects, 754**
 - PSQM (Perceptual Speech Quality Measure), 550**
 - PSTN (Public Switched Telephone Networks)**
 - call flows, 369
 - Emergency 911, 381–383*
 - OFFNET-to-ONNET, 376–380*
 - ONNET-to-OFFNET, 369–376*
 - CAS, 357–358
 - ITP configuration, 388
 - controllers, 389*
 - linksets, 390*
 - point codes, 389*
 - route tables, 391*
 - serial interfaces, 390*
 - overview of, 345–347
 - public/private key cryptography, 79**
 - Pull model multimedia clients, 734**
 - Push model multimedia clients, 734**
 - PVC, 450–452**
 - PXM (Processor Switch Module) cards, 44**
 - redundancy (MG), 924
 - trunking MG configurations in BTS 10200 CMS, 443–444
-
- Q**
-
- QoS (Quality of Service). *See also* DQoS (Dynamic Quality of Service)**
 - backbone QoS, 875, 878
 - DSCP codepoints, 879*
 - DSCP codepoints, CMS, 881–883*
 - DSCP codepoints, CMTS, 879–880*
 - DSCP codepoints, MG, 883–884*
 - MPLS, 885–886*
 - policy configuration, 884*
 - cable modems, 34
 - characterizing call signaling traffic, 866–869
 - configuring subscriber parameters, 316–319
 - DSCP codepoints, 879
 - packets originating from CMS, 881–883*
 - packets originating from CMTS, 879–880*
 - packets originating from MG, 883–884*
 - eMTA, 33
 - metrics of, 865
 - NCS packets on DOCSIS networks, 869
 - classifiers, 873–875*
 - downstream service flows, 872–873*
 - nRTPS service flows, 871–872*
 - premium best effort service flows, 870–871*
 - primary service flows, 869*
 - trunk group QoS parameter configurations, 426–428
 - QoS_Ccommit messages (event messaging), 791**
 - QoS Parameter Set Type (service flow parameters), 644**

QoS Release messages (event messaging), 791
QoS_Reserve messages (event messaging), 791
QoS signaling, 29–30
QoS unaware multimedia clients, 734
Quality of Service (PKT-SP-DQOS) specifications (PacketCable 1.0), 18
quantization, 540

R

RADIUS

AAA functions, 788
 EMID, 790–791
 event messaging, 793
 show radius statistics command, 805
 signaling security, 852–854
 UDP event messaging, 789

RCD (Resource Control Domains), 738

RCL (Release Complete Messages), ISUP, 355

RDU (Regional Distribution Unit), 50–51, 96

Class of Service configuration, 100
 device management, 97
 DHCP Criteria configuration, 98
 external file management, 101
 MTA configuration, 98

realms (Kerberos), 79

reason codes (MGCP), 228–229

reason objects (COPS protocol), 633–634

Record-Route parameter (SIP), 494

redirect servers (SIP), 489

Redirection messages (event messaging), 791

redundancy, 905

4+1 schemes, 913, 920
 8+1 (7+1) schemes, 913, 919–920
 CMS, 906–908
 CMTS, 909
 HFC redundancy, 912–914, 917–922
 processor redundancy, 911–912
 system redundancy, 909–910
 WAN redundancy, 922–923

MG, 927

ATM VC redundancy, 926

PXM redundancy, 924

SRM redundancy, 924

VXSM/VISM redundancy, 925–926

MTA, 924

OSS servers, 928

RPR, 911–912

RPR+, 911–912

SG, 927

redundancy groups, adding MG to, 462–463

REFER method, 512

REGISTER method, 513

registrar servers (SIP), 489

REL (Release Messages), ISUP, 355

report measurement_em_summary command, 803

report-billing-record command, 334–336

reporting function (RTCP-XR), 593

repudiation (security threats), 843

Request/Transmission Policy parameters (service flow parameters), 646, 739–740

Require parameter (SIP), 493

RES (Resume Messages), ISUP, 355

reservation state (gates), 624

reserved resource envelopes, 625–626

resource envelopes

 authorized, 625

 committed, 625–626

 creating, 635–638

 reserved, 625–626

resource records, creating, 96

responding function (RTCP-XR), 593

response codes (MGCP), 228–229

responses (MGCP), 227

 acknowledgements, 230

 buffering, 230

 concatenating multiple responses, 230

 ensuring delivery of, 230

 provisional response notifications, 230

retransmission, 513

RF analyzers, 966–967

R-factors (Rating factors), 551

RFC (Request For Comments), 9, 486–488

rf-switch name command, 918

rf-switch snmp-community command, 918

ring back tones, troubleshooting, 338

ring tones, troubleshooting, 337–338

route tables, 391

routers

 automatic/manual switchovers, 912

 ITP configuration requirements, 385

 RPR, 911–912

 RPR+, 911–912

- routes**
 - policy-based routing route guide definitions, 437–438
 - SS7, 351–352
 - trunk group route definitions, 436–437
- routing keys, 357**
 - ISUP definitions, 410
 - ITP configuration, 393–394
 - TCAP/SCCP route definitions, 413
 - TCAP/SCCP routing key definitions, 413
- RPM (Route Processor Module) cards, 44–45, 445–449**
- RPR (router processor redundancy), 911–912**
- RPR+ (router processor redundancy plus), 911–912**
- RQNT (Notification Request) command (MGCP), 218–219**
 - parameters, 217
- RR (receiver reports), RTCP, 589**
- RRKS (Record Keeping Servers), 53, 737**
 - defining, 800–801
 - DQoS, 621
- RSC (Reset Circuit) messages, ISUP, 355**
- RSIP (ReStart In Progress) command (MGCP), 213–214**
- RSPEC (resource descriptions), 636–637**
- RSVP (Resource Reservation Protocol)**
 - CODEC flow specification parameters table, 638
 - DOCSIS service flow conversions to RSVP flow specifications, 653–658
 - DQoS resource authorization, 635–638
 - flow specification method (gate traffic profiles), 636, 749–751
 - SDP conversions to RSVP flow specifications, 637–638
- RTCP (Real-time Transport Control Protocol), 841**
 - functions of, 589
 - message format, 590–591
 - NCS, 246
 - packet traces, 591–593
 - packet types, 589–590
 - port numbers, 570
 - sc-rtp LCO parameter, 845, 855
 - security, 855–856
 - VXSM security, 859
 - X-pc-csuides-rtcp, 845
 - X-pc-secret, 845
- RTCP parameters**
 - VISM, 609
 - VXSM, 602
- RTCP-XR (RTP Control Protocol Extended Reports)**
 - bursts, 595
 - collection function, 593
 - gaps, 595
 - reporting function, 593
 - responding function, 593
 - VoIP extended metrics, 593–596
- RTP (Real-time Transport Protocol), 569, 841**
 - comfort noise packets, 580
 - Ethereal packet sniffer (CMTS), examining streams via, 975–976
 - fax relays, 584–589
 - message format, 570
 - header format, 570*
 - payloads, 571–573*
 - sequence numbers, 574*
 - SSRS (Synchronization Source) parameter, 574–575*
 - timestamps, 574*
 - packet sizes
 - CODEC bandwidth constraints, 579*
 - G.711 CODEC, 578*
 - G.728 CODEC, 578*
 - G.729E CODEC, 579*
 - packet traces, 575
 - fax relays, 588*
 - G.711 CODEC, 576*
 - G.728 CODEC, 576*
 - G.729E CODEC, 577*
 - payloads, 580, 583
 - port numbers, 570
 - sc-rtp LCO parameter, 845, 855
 - security, 855–856
 - silence suppression, 580
 - UDP protocol, 569
 - VXSM security, 859
 - X-pc-csuides-rtp, 845
 - X-pc-nrekey, 845
 - X-pc-secret, 845

RTPS (Real-Time Polling Services)

DOCSIS, 739–741
 scheduling, 698
 service flow parameters, 739

Rule Priority field (DOCSIS classifiers), 649**S****SA (Security Associations), 844****sampling process, 540****SBC (Session Border Controllers), 486, 490****SCCP (Signaling Connection Control Part) layers**

BTS 10200 configuration, 413
 network definitions, 412
 SS7, 353

SCD (Service Control Domains), 738**scope configurations (DHCP), 83****SCP (Service Control Points), 348, 351****sc-rtcp LCO parameter, 246, 845, 855****sc-rtp LCO parameter, 246, 845, 855****SCTP (Stream Transport Control Protocol), 356**

association definitions, 406–409
 associations, enabling, 411, 415
 M3UA protocol, 356
 parameter definitions, 405
 SUA protocol, 356

SDES (source description), RTCP, 589, 592–593**SDP (Session Description Protocol), 231–233**

NCS, 247
 parameters, 231
 RSVP flow specifications, converting to,
 637–638
 TGCP, 368
 troubleshooting, 339

secure method (MTA provisioning), 139

configuration information transfers, 152–158
 eMTA provisioning, 62
 IP connectivity establishment, 140–142
 MTA to CMS initialization, 167–169
 registration, 158–161
 security establishment, 143–144, 147–149, 152

security

BAC, 846–847
 BTS 10200 configurations, 847
COPS signaling security, 852–854
NCS signaling security, 847–852

RADIUS signaling security, 852–854

RTP/RTCP signaling security, 855–856

TGCP signaling security, 852–854

call signaling, 218–219

capacity planning/traffic engineering, 897

CMTS configurations, 859–864

HMAC, 844

IPsec, 843–845

AH, 843

anti-reply, 843

data confidentiality, 843

data integrity, 843

data origin authentication, 843

ESP, 844

SA, 844

transport mode, 844

tunnel mode, 844

LCO parameters

NCS, 246

sc-rtcp, 246, 845, 855

sc-rtp, 246, 845, 855

TGCP, 367

MTA provisioning, 30, 143–144, 147–149, 152

PCMM, 772

requirements, 840–841

SIP, 490

threats

bearer channel information thefts, 842

network service thefts, 841–842

repudiation, 843

service disruption, 843

signaling channel information thefts, 842

VXSM configurations, 857–859

X-pc-csuites-rtcp, 845

X-pc-csuites-rtp, 845

X-pc-nrekey, 845

X-pc-secret, 845

Security and Privacy (PKT-SP-SEC)**specifications, 18****selection tags, 83****sequence numbers (RTP message format), 574****serial interfaces, ITP configuration, 390****Service Activation messages (event messaging), 791****service class name method (gate traffic profiles), 750****service class names, 741**

- Service Deactivation messages (event messaging), 791**
- service disruption (security threats), 843**
- Service Flow Identifier (service flow parameters), 644**
- service flow parameters**
 - DOCSIS
 - downstream parameters, 647–648, 656–657*
 - generic parameters, 644–645*
 - packet assignments, 648–649*
 - upstream parameters, 645–647, 654*
 - Maximum Sustained Traffic Rate, 740
 - Minimum Reserved Traffic Rate, 740
 - Nominal Polling Interval, 740
 - Request/Transmission Policy, 739–740
 - Service Flow Scheduling Type, 739
 - Service Identifier, 739
 - Tolerated Poll Jitter, 740
 - Traffic Priority, 740–741
- Service Flow Reference service flow parameter, 644**
- Service Flow Reference/Service Flow Identifier field (DOCSIS classifiers), 649**
- Service Flow Scheduling Type service flow parameter, 646, 739**
- Service Identifier service flow parameter, 646, 739**
- Service Instance messages (event messaging), 791**
- services**
 - assigning associate subscribers, 327
 - defining, 326
- session class field (COPS protocol), 632**
- sessions (SIP), 488**
- set ip address command, 921**
- set protection {4/8} command, 921**
- set snmp community read-write command, 921**
- set switchover-group command, 921**
- setrev command, 463**
- SG (Signaling Gateways), 42. *See also* ITP**
 - BTS 10200 configuration, 402
 - call control route definitions, 410*
 - destination point code definitions, 404–405*
 - enabling SCTP associations, 411*
 - ISUP network variant definitions, 409*
 - ISUP routing key definitions, 410*
 - SCTP association definitions, 406–409*
 - SCTP parameter definitions, 405*
 - SG definitions, 402*
 - SG group definitions, 403*
 - SG process definitions, 403–404*
 - switch origination point code definitions, 404*
- ITP, 42
- mated pair implementation, 388
 - ITP configuration, 394, 399, 403–404, 410*
 - ITP group implementation versus, 388*
- redundancy, 927
- Sigtran protocols
 - application servers, 357, 393–394*
 - ITP configuration, 388–392*
 - ITP group implementation, 395, 403*
 - M3UA, 356, 392*
 - mated pair configuration, 394*
 - routing keys, 357, 393–394*
 - SCTP, 356*
 - SUA, 356, 392*
 - web resources, 356*
- show cable calls command, 699–700**
- show cable modem calls command, 700**
- show cable modem command, 706**
- show cable modem mac-address command, 336**
- show controller cable command, 708**
- show controller cable downstream command, 777**
- show cops servers command, 774**
- show crypto isakmp sa command, 863–864**
- show cs7 group state command, 466**
- show cs7 matched-sg command, 466**
- show hccp command, 921**
- show interface cable command, 708–709**
 - downstream option, 707–708
 - mac-scheduler option, 707
 - service flow option, 702–704
 - upstream option, 706
- show interface cable sid command, 704**
- show packetcable gate command, 701**
 - counter option, 701
 - summary option, 701–702
- show packetcable gate counter multimedia command, 776**
- show packetcable global command, 774**

- show radius statistics command, 805**
- show tcp brief command, 699, 774**
- siaddr field, 64**
- Signal Instance messages (event messaging), 791**
- signaling channel information thefts (security threats), 842**
- signaling gateways. See SG (Signaling Gateways)**
- Signaling Start messages (event messaging), 791**
- Signaling Stop messages (event messaging), 791**
- signals**
 - MGCP, 216–217, 230
 - TGCP, 364–365, 367
- Sigtran protocols**
 - application servers, 357, 393–394
 - ASP, 357, 392
 - ITP configuration, 388–389
 - ASP, 392
 - interface definitions, 391
 - M3UA definitions, 356, 392
 - SUA definitions, 356, 392
 - ITP group implementation, 395
 - routing keys, 357, 393–394
 - SCTP, 356
 - SG mated pair implementation, 394
 - web resources, 356
- silence suppression, 689–693. See also VAD (voice activity detection)**
 - MG, 600, 610
 - RTP, 580
- SIP (Session Initiation Protocol), 483, 486**
 - Accept parameter, 494
 - Allow parameter, 494
 - architecture, sample of, 485
 - call flows, 495–505
 - Call-ID parameter, 493
 - CMS, 840
 - CMSS, 483–484
 - anonymizers, 510*
 - BTS 10200, 518*
 - BTS 10200, defining destinations, 523–524*
 - BTS 10200, defining dial plans, 524*
 - BTS 10200, defining trunk group fields, 523*
 - BTS 10200, running trunk groups, 522*
 - BTS 10200, trunk group fields table, 521–522*
 - BTS 10200, trunk group profile fields table, 518–520*
 - call flows, 513–517*
 - device subscriptions, 512*
 - DQoS extensions, 509–510*
 - INVITE messages, 514–515*
 - INVITE method, 512*
 - NOTIFY method, 512*
 - P-DCS-BILLING-INFO, 511*
 - P-DCS-LAES, 511*
 - P-DCS-OSPS, 511*
 - P-DCS-REDIRECT, 511*
 - P-DCS-TRACE-PARTY-ID, 511*
 - privacy extensions, 510*
 - REFER method, 512*
 - REGISTER method, 513*
 - Replaces header, 512*
 - SUBSCRIBE method, 512*
 - tel URI, 512*
 - timers, 513*
 - troubleshooting, 524–531*
 - UPDATE method, 512*
 - updating parameters, 512*
 - Contact parameter, 493
 - Content-Length parameter, 494
 - Content-Type parameter, 494
 - Cseq parameter, 493
 - EBP (Exterior Border Proxies), 486
 - error traces
 - calls not answered, 506–507*
 - Do Not Disturb feature, 507*
 - DQoS Resource Reservation Failure, 508*
 - From parameter, 493
 - IBP, 486
 - Max-Forwards parameter, 493
 - message bodies, 494
 - message headers, 492–494
 - parameters, table of, 492–494
 - proxy servers, 486, 489
 - Record-Route parameter, 494
 - redirect servers, 489
 - registrar servers, 489
 - Require parameter, 493
 - RFC, 486, 488
 - SBC, 486
 - security, 490
 - sessions, 488

- SIP-T, 484
- start lines, 491–492
- Supported parameter, 493
- TLS protocol, 489
- To parameter, 493
- user agents, 488
- User-Agent parameter, 494
- Via parameter, 492
- SIP/CMSS-to-ONNET calls, 997**
- SIP-T (Session Initiation Protocol-Telephone), 484**
- SLC (Signaling Link Code), 390**
- SLHR (service logic host routes), 414**
- SML (Service Management Layers), 48**
- sMTA (standalone MTAs), 29**
- SNMP (Simple Network Management Protocol), 76–77**
- SNMPv3 (Simple Network Management Protocol version 3), 840**
- Softswitches. See call agents**
- SONET (Synchronous Optical Network Technology), 359**
 - OC-1, 359
 - OC-3, 362–364
 - STS-1, 359, 362–363
 - VT*, 360
 - VTG*, 360–364
- speaker-to-backbone delays (audio CODEC), 552–554**
- specifications/standards**
 - ANSI, 954–956
 - IETF RFC, 949–953
 - ITU, 954–956
 - obtaining, 949
 - PacketCable 1.0, 957–958
 - PacketCable 1.5, 958–960
 - PacketCable Multimedia, 960
 - Telcordia, 954–956
- spectrum management, 933–934**
- SR (sender reports), RTCP, 589–591**
- SRM, redundancy (MG), 924**
- SS7 (Signaling System 7)**
 - COT, 383–384
 - ISUP layers
 - ACM*, 355
 - ANM*, 355
 - BLA*, 355
 - BLO*, 355
 - CGA*, 355
 - CGB*, 355
 - CGU*, 355
 - CGUA*, 355
 - GRA*, 355
 - GRS*, 355
 - IAM*, 354
 - REL*, 355
 - RES*, 355
 - RLC*, 355
 - RSC*, 355
 - SUS*, 355
 - UBA*, 355
 - UBL*, 355
 - ITP configuration, 388
 - controllers*, 389
 - linksets*, 390
 - point codes*, 389
 - route tables*, 391
 - serial interfaces*, 390
 - link types, 350–351
 - MTP layers, 352–353
 - overview of, 348–350
 - point codes, 349
 - routes, 351–352
 - SCCP layers, 353
 - SCP, 348, 351
 - SG
 - BTS 10200 configuration*, 402–411
 - overview of*, 356–357
 - SCTP*, 356
 - Sigtran protocols*, 356–357
 - Sigtran protocols
 - application servers*, 357, 393–394
 - ASP*, 357, 392
 - ITP group implementation*, 395
 - M3UA*, 356, 392
 - routing keys*, 357, 393–394
 - SCTP*, 356
 - SG mated pair configuration*, 394
 - SUA*, 356, 392
 - web resources*, 356
 - SSP, 348
 - routes*, 351–352
 - TCAP layers*, 353
 - STP, 348–351

- TCAP layers, 353
- TUP layers, 356
- ssh show packetcable gate command, 774**
- SSP (Service Switching Points), 348, 351–352**
- SSRC (Synchronization Source) parameter, 574–575**
- standard classifiers (PCMM), 748**
- standards/specifications**
 - ANSI, 954–956
 - IETF RFC, 949–953
 - ITU, 954–956
 - obtaining, 949
 - PacketCable 1.0, 957–958
 - PacketCable 1.5, 958–960
 - PacketCable Multimedia, 960
 - Telcordia, 954–956
- start lines (SIP), 491–492**
- stateful/stateless proxy servers, 489**
- static payloads, 571–572**
- static resource record configurations, 96**
- status aggr command, 339**
- status commands, 285**
- status dpc id command, 467**
- status sctp-assoc id command, 467**
- status trunk-termination tgn-id command, 467**
- STP (Signaling Transfer Points), 348–351**
- STS-1 (Synchronous Transport Signal - Level 1), 359, 362–363**
 - VT, 360
 - VTG, 360–364
 - VXSM/VISM configurations, 455–457
- SUA protocol, 356, 392**
- SUBSCRIBE method, 512**
- subscriber identifiers**
 - COPS protocol, 631
 - PCMM, 747
- subscribers**
 - assigning to features, 327
 - assigning to services, 327
 - configuring characteristics of, 319
 - configuring PacketCable subscribers, 320–321
 - configuring QoS parameters, 316–319
- Supported parameter (SIP), 493**
- surveillance (lawful intercept)**
 - AF, 807–814
 - architecture of, 808
 - call details, 807
 - CCC, 807, 829
 - CDC, 807, 829
 - CF, 807, 815–830
 - CMSS, 814
 - CMTS, 811–812
 - configuring, 830–831
 - DF, 807
 - AF-DF communication, 809–814*
 - DF-CF communication, 815–830*
 - event messaging, 809, 811
 - IAP, 806
 - MG, 813
 - PCESP, 815–818
 - troubleshooting, 832
 - types of, 806
- Surveillance Stop messages (event messaging), 791**
- SUS (Suspend Messages), ISUP, 355**
- suspect with call content tap originates call (lawful intercept call flow example), 823–825**
- suspect with call content tap receives call (lawful intercept call flow example), 826–828**
- suspect with call data tap originates call (lawful intercept call flow example), 819–821**
- suspect with call data tap receives call (lawful intercept call flow example), 821–822**
- switchovers (routers), 912**
- Synch Options objects (PCMM), 754**
- Synch-Complete messages (PCMM), 746**
- Synch-Report messages (PCMM), 746**
- Sync-Request messages (PCMM), 746**
- syslog (System Logging) protocol, 75–76**
- system redundancy (CMTS), 909–910**

T

T.38 fax relay standard

- parameters, 609
- RTP, 584–589

T1 trunks, 359

T3 timeouts, 117

T3 trunks, 359

TCAP (Transaction Capabilities Application

Part), BTS 10200 configuration, 411

- enabling SCTP associations, 415
- enabling subsystems/subsystem groups, 415

- modifying call agent configurations, 414
- SCCP network definitions, 412
- SLHR characteristic definitions, 414
- SLHR definitions, 414
- SS7, 353
- subsystem characteristic definitions, 412
- subsystem definitions, 412–413
- TCAP/SCCP route definitions, 413
- TCAP/SCCP routing key definitions, 413
- TDM (time-division multiplexing) circuits**
- trunks, 359
 - DS0*, 383–384
 - DS1*, 359, 364
 - DS3*, 359, 364
 - E1*, 359
 - E3*, 359
 - SONET*, 359
 - T1*, 359
 - T3*, 359
- VXSM, enabling in, 453
- Telcordia specifications, 10, 954–956**
- teletype technology transport, 564**
- templates, message flow templates, 755–771**
- test connection command, 452**
- test packetcable gate create command, 718**
- test packetcable gc client-accept command, 717**
- test packetcable gc gate-alloc command, 717**
- test packetcable gc gate-delete command, 717**
- test packetcable gc gate-info command, 717**
- test packetcable gc gate-set command, 717–718**
- test packetcable gc initiate command, 718**
- testing DQoS via CMTS, 716–718**
- tests, COT, 383–384**
- TFTP (Trivial File Transfer Protocol), 74**
- TGCP (Trunk Gateway Control Protocol), 359**
 - BTS 10200 configuration, 415
 - enabling endpoints*, 435–436
 - enabling MG*, 434
 - enabling trunk groups*, 435
 - endpoint configurations*, 425–426
 - MG characteristic configurations*, 416–424
 - MG configurations*, 424
 - trunk configurations*, 433–434
 - trunk group characteristic configurations*, 428–431
 - trunk group configurations*, 431–433
 - trunk group QoS parameter configurations*, 426, 428
 - trunk group route definitions*, 436–437
 - trunking MG configurations*, 440–463
- capacity planning/traffic engineering, 904
- DS0 trunks, 383–384
- DS1 trunks, 359, 364
- DS3 trunks, 359, 364
- E1 trunks, 359
- E3 trunks, 359
- MGP variations, 360, 368
 - command header formats*, 361
 - endpoint naming conventions*, 361–364
 - LCO*, 367–368
 - package events/signals*, 364–367
 - SDP*, 368
- signaling security, 852–854
- SONET, 359
 - OC-1*, 359
 - OC-3*, 362–364
 - STS-1*, 359, 362–363
- T1 trunks, 359
- T3 trunks, 359
- three-way calling, 1009**
 - NCS role in, 273–284
- TIDs (transaction IDs), 210**
- Time Change messages (event messaging), 791**
- time-based usage limit objects (PCMM), 751**
- Timeout for Active QoS Parameters (service flow parameters), 645**
- Timeout for Admitted QoS Parameters (service flow parameters), 645**
- timers**
 - DQoS, 635
 - BTS configurations*, 719
 - specifying*, 697
 - SIP CMSS, 513
- timestamps (RTP message format), 574**
- TLS (Transaction Layer Security) protocol**
 - CMS, 840
 - SIP, 489
- TLV (Tag/Length/Value) pairs**
 - event messaging, 788–789
 - MTA configuration files, 185
- TMN (Telecommunications Management Network), 48**
- To parameter (SIP), 493**

ToD (Time-of-Day) protocol, 75**Tolerated Grant Jitter parameters (service flow parameters), 647****Tolerated Poll Jitter parameters (service flow parameters), 647, 740****tone parameters, 601****tone plans, 608****traffic engineering, 886**

busy hour utilization, 900–901

cable linecards, 898

call capacities of DOCSIS upstream service flows, determining, 887–894

CMS, 903–904

CMTS, 902–903

CODEC changes, effects of, 895–896

erlang metric, 898–901

line usage, 898–901

packetization interval changes, effects of, 894–895

PHS implementation, effects of, 896–897

security implementation, effects of, 897

TGCP, 904

traffic patterns, 898–901

VAD implementation, effects of, 897

traffic patterns (capacity planning/traffic engineering), 898–901**Traffic Priority parameters (service flow parameters), 647****Traffic Priority service flow parameter, 740–741****traffic profiles (gates), 749–751****traffic statistics, 332–334****transaction identifier objects (COPS protocol), 630–631****transaction IDs, 744–746****transport layer protocols, 356****transport mode (IPsec), 844****traps and traces, 806****troubleshooting**

admission control, 932

audio CODEC, 559

BTS 10200, 327

*accessing log files, 329–330**auditing media gateways, 330**collecting traffic statistics, 332–334**dial/ring tones, 337–338**displaying billing records, 334–336**displaying EMS database transaction queue, 330**displaying events/alarms, 329**displaying running processes, 328–329**DNS, 337**missing DQoS information, 338–339**out of service MTA, 336–337**parameter negotiations, 339**post dial delays, 339**ring back tones, 338**running diagnostics, 330–331**SDP, 339**unestablished DQoS, 338–339**validating call routing, 331–332**voice paths/one way voice, 338*

BTS 10200 CMS, 467–472

dial tones, 337–338

DNS, 337

DQoS on BTS, 338–339, 723–724

DQoS on CMTS

*cable line card information, displaying, 708–709**COPS protocol issues, 724**debugging COPS messages, 712–716**debugging DOCSIS dynamic service flow messages during calls, 709–712**debugging DQoS to find admission control information, 712**DOCSIS protocol issues, 726**downstream capacity, displaying, 707–708**gate deletion, 724–726**statistical information on DOCSIS DSX messages on Downstream Channel, displaying, 708**testing DQoS functionality, 716–718**upstream capacity, displaying, 707*

event messaging, 804

IP connectivity

*DHCP, 125–129**init(d) state, 123**init(io) state, 123–124*

ITP, 464–467

lawful intercept, 832

MTA, 336–337

one way voice, 338

parameter negotiations, 339

PCMM on CMTS, 774–779

post dial delays, 339
 ring back tones, 338
 ring tones, 337–338
 SDP, 339
 SIP CMSS, 524–531
 VISM cards, 472–476
 voice paths
 BTS 10200, 338
 crackling, 559
 garbled voice, 559
 no voice, 559
 one-way voice, 559
 robotized voice, 559
 VXSM cards, 472–476
trunking gateways. See TGCP
trunks, 207, 359
 BTS 10200 CMS configuration, 415
 configuring MG, 440–463
 enabling endpoints, 435–436
 enabling MG, 434
 enabling trunk groups, 435
 endpoint configurations, 425–426
 MG characteristic configurations,
 416–424
 MG configurations, 424
 trunk configurations, 433–434
 trunk group characteristic configurations,
 428–431
 trunk group configurations, 431–433
 trunk group QoS parameter
 configurations, 426–428
 trunk group route definitions, 436–437
 capacity planning/traffic engineering, 904
 DS0 trunks, 383–384
 DS1 trunks, 359, 364
 DS3 trunks, 359, 364
 E1 trunks, 359
 E3 trunks, 359
 naming conventions, 361–364
 SONET
 OC-1, 359
 OC-3, 362–364
 STS-1, 359, 362–363
 T1 trunks, 359
 T3 trunks, 359
TSpec (traffic descriptions), 636
tstcon commands, 473

tunnel mode (IPsec), 844
TUP (Telephony User Part) layers, 356

U

UBA (Unblock Acknowledge) messages, ISUP, 355
UBL (Unblock) messages, ISUP, 355
uBR710012 CMTS (Cable Modem Termination System), 37–38
uBR7246VXR CMTS (Cable Modem Termination System), 35–37
UDP (User Datagram Protocol)
 RADIUS, 789
 RTP, 569
UGS (Unsolicited Grant Services), 645
 defining
 Grants per Interval parameters, 647
 Nominal Grant Interval parameters, 647
 Nominal Polling Interval parameters, 647
 Request/Transmission Policy parameters,
 646
 Service Flow Scheduling Type parameters,
 646
 Service Identifier parameters, 646
 Tolerated Grant Jitter parameters, 647
 Tolerated Poll Jitter parameters, 647
 Unsolicited Grant Size parameters, 647
 eMTA QoS, 33
UGS-AD (Unsolicited Grant Service with Activity Detection), 645
 defining
 Grants per Interval parameters, 647
 Nominal Grant Interval parameters, 647
 Nominal Polling Interval parameters, 647
 Request/Transmission Policy parameters,
 646
 Service Flow Scheduling Type parameters,
 646
 Service Identifier parameters, 646
 Tolerated Grant Jitter parameters, 647
 Tolerated Poll Jitter parameters, 647
 Unsolicited Grant Size parameters, 647
 DSA-REQ, Ethereal traces, 689
 Ethereal trace of, 690
 RTPS scheduling, switching flows to, 698

- timing out flows, 698
- VAD, 689–693
- unit numbers, 361**
- unit types, 361**
- Unsolicited Grant Size parameters**
(service flow parameters), 647
- up line command, 453**
- UPDATE method 512**
- uppath command, 456**
- upstream gate specifications, 671**
- URI (Uniform Resource Identifiers), 488**
- user agents, 488**
- User-Agent parameter (SIP), 494**

V

- VAD (voice activity detection), 689–693, 897**
- variables (DQoS), 719–721**
- VBD (Voice Band Data)**
 - analog modem transport, 561–562
 - facsimile transport, 562–563
 - MG
 - VISM*, 609
 - VXSM*, 602–604
 - teletype technology transport, 564
- verbs, MGCP commands, 210**
- verifying PCMM on CMTS, 774–779**
- version command, 831**
- version info objects (PCMM), 754**
- vertical service codes, 325–326**
- Via parameter (SIP), 492**
- VISM (Voice Interworking Service Module), 45–46, 605**
 - active calls, monitoring, 610
 - ATM ports, enabling, 450
 - ATM VC redundancy (MG), 926
 - BERT testing, 610
 - CAS variants, configuring, 452–453
 - CODEC options, configuring, 606–607
 - DTMF relays, configuring, 608
 - dynamic RTP payload types, negotiating, 608
 - echo parameters, adjusting, 608
 - jitter buffers, adjusting, 607–608
 - Operating Mode, 450–455
 - PVC, configuring, 450–452
 - redundancy (MG), 925–926
 - resources, enabling, 450
 - RTCP parameters, setting, 609
 - Silence Suppression parameters, adjusting, 610
 - T.38 facsimile parameters, configuring, 609
 - tone plans, configuring, 608
 - troubleshooting, 472–476
 - trunking MG configurations in BTS 10200 CMS, 449–455
 - adding CAS endpoints to lines*, 458
 - adding DS0 endpoints to lines*, 458
 - adding MG to redundancy groups*, 462–463
 - configuring line/path parameters*, 457
 - domain name configurations*, 458
 - domain name IP address configurations*, 461
 - domain names/domain name servers configurations*, 460
 - enabling lines*, 457
 - IP address configurations*, 459
 - xGCP parameters*, 463
 - VBD, detecting, 609
- vocoders, 543**
- voice interfaces, 458**
- voice packets**
 - header formats, 649, 652–653
 - transmitting, 637
- voice paths, troubleshooting, 338, 559**
- voice quality (audio CODEC), 549**
 - ITU E-model, 551
 - MOS (Mean Opinion Score) ratings, 549
 - PAMS, 550
 - PESQ, 551
 - PSQM, 550
 - R-factors, 551
- voice quality, maximizing (QoS), 865**
- volume-based usage limit objects (PCMM), 751**
- VTG (virtual tributary groups, 360–364**
- VXSM (Voice Switch Service Module), 45–46, 598**
 - ATM VC redundancy (MG), 926
 - bearer tracing, 605
 - BERT testing, 604
 - CAS variants, configuring, 452–453
 - CODEC options, configuring, 598
 - DTMF relays, configuring, 599
 - echo parameters, adjusting, 600
 - PVC, configuring, 450–452

- redundancy (MG), 925–926
- security configurations, 857–859
- RTCP parameters, setting, 602
- silence suppression parameters, adjusting, 600
- TDM lines, enabling, 453
- tone parameters, configuring, 601
- troubleshooting, 472–476
- trunk naming conventions, 362
- trunking MG configurations in BTS 10200
 - CMS, 449–455
 - adding MG to redundancy groups, 462–463*
 - configuring line/path parameters, 457*
 - domain name configurations, 458*
 - domain name IP address configurations, 461*
 - domain names/domain name server configurations, 460*
 - enabling lines, 457*
 - enabling STS-1 paths, 455–457*
 - IP address configurations, 459*
 - voice interface definitions, 458*
 - xGCP parameters, 463*
- VBD options, configuring, 602–604

X-pc-secret, 845

yiaddr field, 64

zone configurations, 94

W

WAN redundancy (CMTS), 922–923

waveform encoders, 543

web servers, 735

wideband CODEC, 546

wildcards

- control commands, 285

- status commands, 285

- TGCP naming conventions, 364

wiretaps. *See also* lawful intercept

- Call Content, 54

- Call Detail, 53

X-Y-Z

xGCP parameters, 463

X-pc-csuites-rtcp, 845

X-pc-csuites-rtp, 845

X-pc-nrekey, 845