



Symbols

- ! wildcard, 65
- # (pound sign), stripping from digit string, 113
- . wildcard, 87
- == operator, 90
- @ wildcard, 64, 86–87

Numerics

- 7-digit dialing, 97–99
- 10-10 dialing, 96
- 10-digit route patterns, 98
 - eliminating interdigit timeout, 99
- 24-hour Outbound SMDI Message Count counter, 443
- 24-hour Inbound SMDI Message Count counter, 443
- 900 numbers, blocking, 99–101, 179
- 911 call routing, 209–210
 - calling search space configuration, 212
 - configuring lobby phone route pattern, 180–181
 - partition configuration, 212
 - route filter configuration, 212
 - route group configuration, 211
 - route list configuration, 211
 - route pattern configuration, 212–213
 - urgent call routing, 80

A

- abandoned calls,
 - identifying associated CDR, 537
 - logging, 506
- access codes
 - adding to redialed numbers, 198–199
 - prepending to missed calls (Cisco IP Phones), 137–143
- accessing
 - CallManager features from H.323 gateways, 280
 - CDRs from central database, 547–550
 - SQL database tables, 547
 - Terminal Services Client, 456
- ACF (Admission Confirm) messages, 276
- active connections, device registration process, 401–402
- Ad Hoc conferencing, 357–358
 - Conference button, 580–582
 - Confrn soft key, 580–582
 - streams, availability, 360
- adding
 - access codes
 - to missed calls, 137–143
 - to redialed numbers, 198–199
 - audio sources to MOH servers, 377
 - participants to conferences
 - Ad Hoc, 357–358
 - Meet-Me, 358–359
 - phones to existing CallManager systems
 - with BAT, 409, 411–412
 - with CSV files, 410
- address resolution between CallManager clusters, 279
- address translation, 59–60
- Administrative Reporting Tool. *See* ART
- admission control, 47–48
 - H.323 gatekeeper, 53–54
 - locations, 51–52
- AdvanceCallForwardHopFlag service parameter, 563
- Aggregator Layer, 30
- alarm definitions (Cisco CallManager Serviceability)
 - event levels, 421
 - viewing, 422
- alerts (ART), 419
- algorithms
 - call preservation, 398
 - switchback, 399–400
- ALI (automatic location identification), 209
- allocating
 - conference bridge resources, 350
 - media resources
 - MRGLs, 338
 - MRGs, 335–337
 - MRM, 339
- Analog Access gateways, counters, 434–435
- analog connections, H.323 gateways, 278
- analyzing SDI trace output, 424, 428–430
- anonymous device configuration, 279
- Answer/Release, 559–560

- APIs (application programming interfaces), 254–256
 - Cisco IP Phones productivity services, 576
 - database API, 584
- application infrastructure, 253–254
 - CTI layer, 256–257
- applications. *See also* tools
 - call preservation support, 397–398
 - Cisco AVVID IP Telephony
 - Applications SDK, 627–629
 - ART, 617
 - AST, 618–619
 - BAT, 617
 - Cisco CallManager Serviceability, 618
 - Cisco Customer Response, 621
 - Cisco DPA voice mail gateways, 619–620
 - Cisco IP AA, 629–630
 - Cisco IP ICD, 622
 - Cisco IP Phone Configuration Web page, 631–632
 - Cisco IP SoftPhone, 632–633
 - Cisco IP/VC, 623–625
 - Cisco IPCC, 622
 - Cisco IVR, 630–631
 - Cisco Personal Assistant, 625
 - Cisco Unity, 625–626
 - Cisco WebAttendant, 634–635
 - Cisco XML SDK, 623
 - CiscoWorks2000, 626–627
 - CMI, 634
 - LDAP support, 636
 - TAPS, 618
- applying
 - dialing transformations, 105–107
 - outside dial tone, 81–85
- architecture
 - CallManager layers, 30–31
 - conference resources, 348
 - CTI, 253
 - application layers, 254
 - CTI layer, 256–257
 - MOH subsystem, 375–376
- area codes, metro dialing, 97–98
- AREA-CODE tag, 97
- ARJ (Admission Reject) messages, 276
- ARQ (RAS Admission Request) messages, 275
- ART (Administrative Reporting Tool), 413, 559, 617
 - alerts, 419
 - call detail reports, 418
 - call reports, 417
 - gateway reports, 417
 - pregeneration of reports, 416
 - QoS monthly summary reports, 414–415
 - QoS reports, 418
 - system overview reports, 418
 - traffic summary reports, 417
 - user reports, 417
- assigning
 - account codes to external calls, 199–202
 - gateways to route groups, 150–151
 - MOH stream sources, order of precedence, 386
 - resources to MRGs, 343–346
 - route groups to route lists, 152–154
 - route patterns to devices, 64
- AST (Admin. Serviceability Tool), 431–434, 618–619
 - counters, monitoring, 432–434
 - icons, 432
 - opening HTTP connections to devices, 432
- Attendant DN, 117–118
- AUCX (audit connection) command (MGCP), 283
- audio sources (MOH), 374–376
 - adding, 377
 - play mode, configuring, 378–379
 - stream connection errors, 379
- audio source IDs, 374
- AUEP (audit endpoint) command (MGCP), 283
- authentication, Cisco CallManager Serviceability users, 421
- authorization codes, implementing, 199–202
- Auto Answer, 560, 583
- automatic discovery, 275
- automatic location identification (ALI), 209
- auto-registration, 354–355
- availability
 - of conference bridges, 350, 360
 - of conference servers, 353
 - of counters and objects on AST, 434
 - of media processing resources, 359–360
 - of transcoders, 368–372

B

- background mode, 510
- background noise, 321
- bandwidth consumption, voice codecs, 320
- bandwidth messages (H.225), fields, 305–306
- BAT (Bulk Administration Tool), 407–408, 561, 617
 - adding users with CSV files, 410–412
 - goal of using, 408
 - managing established CallManager systems, 409
 - misconfiguration, 408–409
 - setting up CallManager database, 408–409
 - TAPs (Tool for Auto-Registered Phones Support), 412
- billing, OnNet versus OffNet calls, 551
- bit rates, voice codecs, 320
- blades, 19
- blind transfers, 609
- block structure of CallManager, 316
- blocking calls, 79
 - 900 numbers, 99–101, 179
 - international calls, 96
 - long distance carrier selection, 96
- Bridged Telnet, 495–496
- broadcast paging support, 560
- bulk transactions, performing with CSV files, 410–412
- busy signals, no-circuits available call treatment, 276

C

- call admission control messages, fields, 302–305
- call appearances, 206
- call attempts during switchover/switchback conditions, 400
- Call Control, processing gateway directory numbers, 551
- Call Control Layer, 31, 228, 269, 315–317
- call control signaling, H.323 gateways, 273
- call detail reports (ART), 418
- call establishment
 - in circuit-switched networks, 7–9
 - in Cisco AVVID IP Telephony networks, 22–24
 - media exchange phase, 9
 - session establishment, 7
- call forwarding, 562–565
 - Call Forward Busy, 564
 - Call Forward No Answer, 564–565
 - enabling, 167
 - for third-party applications, 565
 - reason codes, 561
- call forwarding search space, 166–167
- call leg IDs, 517
- call legs, 322, 517
- Call Management Records (CMRs), 501.
 - See also* CDR data
- Call Park, 566
 - configuring, 566–567
- Call Pickup, 567–568
- call preservation, 388–390, 568–569
 - algorithms, 398
 - examples, 393–396
 - supported devices, 397–398
- call reports (ART), 417
- call routing
 - address translation, 59–60
 - by organization, 60, 156
 - by security level of user, 157
 - calling search spaces, 62
 - delays, troubleshooting, 222
 - dialing behavior, 66–67
 - dialing transformations, 62
 - endpoint determination, 58
 - geographical routing, 183–196
 - individualized routing, 60
 - overlapped sending, 76–77
 - partitions, 62
 - route filters, 62–64, 87–88, 92–95
 - 7-digit dialing, 99
 - for North American numbering plan, 95–102
 - INTERNATIONAL-ACCESS DOES-NOT-EXIST, 96
 - length limitations, 88
 - toll-free numbers, 99
 - route lists, 62
 - route patterns, 62–64
 - . wildcard, 87

- @ wildcard, 86–87
 - constraining, 95
 - examples, 68–75
 - operators, 90–91
 - tags, 88–90
 - urgent calls, 79–80
- routing by class of calling user, 177–182
- stages, 105–107
- transformations on terminating device, 122–126
- translation patterns, 62, 126–128
- call signaling
 - Cisco IP Phones, 241–248
 - H.323, 273, 291–297
 - H.323 gateways, 276
 - path, 232
 - session establishment, 8–9
- CallDiagnosticsEnabled service parameter, 506–507
- called party transformations, 104, 155–156
 - application of, 105–107
 - digit discarding instructions, 120–121
 - prefix digits, 121
- Caller ID, 118
- callIdentifier field (CMR), 533
- calling entities, 160–161
- calling party transformations, 103, 121–122, 155–156
- calling search spaces, 62, 128, 156–158, 160–161, 588
 - behavior, 159
 - call appearances, 206–209
 - configuring, 166
 - example, 161–166
 - interaction with unified messaging systems, 168–177
- callingPartyNumber field (CDR), 519
- callingPartyNumberPartition field (CDR), 519
- CallManager Administration, 572
 - change notification, 585–586
 - device search, 588
- CallManager database
 - full capacity alert, configuring, 418
 - performing bulk operations, 407–408
 - purging, 418
 - setting up with BAT, 408–409
- CallManager Group Mapping Table, objects, 463
- CallManager Group Table, objects, 460
- CallManager list, 397
- CallManager Serviceability, 572–573
 - AST, 431–434
 - component version information, displaying, 431
 - Control Center, 431
- CallManager Table, objects, 461–462
- CallManagerHeartBeat counter, 435
- CallParkReversionTimeout service parameter, 567
- calls less than 1 second. *See* abandoned calls
- CallsActive counter, 435
- CallsAttempted counter, 435, 441, 450
- CallsCompleted counter, 435, 444–445
- CallsInProgress counter, 436, 441
- CallWaitingEnable service parameter, 570
- CallWaitingTimeout service parameter, 570
- campus networks, CallManager deployment strategies, 40–41
- capability sets (H.245), 280
- case studies
 - routing by class of calling user, 177–182
 - routing by geographic location, 183–196
- Catalyst 4000 conference bridges, mixed-mode conference bridge support, 352
- Catalyst 6000 conference bridges, mixed-mode conference bridge support, 351
- CCM MIB extension agent, 459
- CCM traces, 423–424
- ccmAlarmSeverity object, 489
- ccmCallManagerAlarmEnable object, 486
- ccmCallManagerFailed notification MIB, 492
- ccmClusterID object, 463
- ccmCTIDeviceAppInfo object, 484
- ccmCTIDeviceDescription object, 483
- ccmCTIDeviceDirNum object, 485
- ccmCTIDeviceDirNumIndex object, 485
- ccmCTIDeviceDirNumTable, objects, 485
- ccmCTIDeviceIndex object, 482
- ccmCTIDeviceInetAddress object, 484
- ccmCTIDeviceInetAddressType object, 484
- ccmCTIDeviceName object, 483
- ccmCTIDevicePoolIndex object, 483
- ccmCTIDeviceStatus object, 483
- ccmCTIDeviceTable, objects, 482–484
- ccmCTIDeviceType object, 483
- ccmDescription object, 461
- ccmDevicePoolGroupIndex object, 465

- ccmDevicePoolIndex object, 465
- ccmDevicePoolName object, 465
- ccmDevicePoolRegionIndex object, 465
- CcmDevicePoolTimeZoneIndex object, 465
- ccmFailCauseCode object, 490
- ccmGatekeeperDescription object, 481
- ccmGatekeeperDevicePoolIndex object, 481
- ccmGatekeeperIndex object, 480
- ccmGatekeeperInetAddress object, 482
- ccmGatekeeperInetAddressType object, 482
- ccmGatekeeperName object, 481
- ccmGatekeeperStatus object, 481
- ccmGatekeeperTable, objects, 480–482
- ccmGatekeeperType object, 481
- ccmGatewayAlarmEnable object, 486
- ccmGatewayDescription object, 475
- ccmGatewayDevicePoolIndex object, 475
- ccmGatewayFailCauseCode object, 491
- ccmGatewayFailed notification MIB, 492
- ccmGatewayIndex object, 474
- ccmGatewayInetAddress object, 476
- ccmGatewayInetAddressType object, 475
- ccmGatewayLayer2Change notification MIB, 493
- ccmGatewayName object, 474
- ccmGatewayPhysIfIndex object, 491
- ccmGatewayPhysIfL2Status object, 491
- ccmGatewayStatus object, 475
- ccmGatewayTable, objects, 473–476
- CcmGatewayTrunkIndex object, 476
- CcmGatewayTrunkName object, 477
- CcmGatewayTrunkStatus object, 478
- CcmGatewayTrunkType object, 477
- ccmGatewayType object, 474
- ccmGatewayTrunkTable, objects, 476–477
- CcmGroupIndex object, 460
- ccmGroupMappingTable, objects, 463
- ccmGroupName object, 461
- ccmGroupTable, objects, 460
- ccmGroupTftpDefault object, 461
- CcmIndex object, 461
- CcmIndexOrZero object, 461
- CcmInetAddress object, 462
- ccmInetAddressType object, 462
- CcmLineLinkState counter, 452
- ccmMediaDeviceDescription object, 479
- ccmMediaDeviceDevicePoolIndex object, 479
- ccmMediaDeviceIndex object, 478
- ccmMediaDeviceInetAddress object, 480
- ccmMediaDeviceInetAddressType object, 480
- ccmMediaDeviceName object, 479
- ccmMediaDeviceStatus object, 479
- ccmMediaDeviceTable, objects, 478–480
- ccmMediaDeviceType object, 479
- ccmMediaResourceListExhausted notification MIB, 492
- ccmMediaResourceListName object, 491
- ccmMediaResourceType object, 491
- ccmName object, 461
- ccmPhoneDescription object, 466
- ccmPhoneE911Location object, 467
- ccmPhoneExtension object, 469
- ccmPhoneExtensionIndex object, 469
- CcmPhoneExtensionInetAddress object, 470
- ccmPhoneExtensionInetAddressType object, 469
- ccmPhoneExtensionIpAddress object, 469
- ccmPhoneExtensionMultiLines object, 469
- ccmPhoneExtensionTable, objects, 468–470
- ccmPhoneFailCauseCode object, 472
- ccmPhoneFailed notification MIB, 492
- CcmPhoneFailedAlarm object, 487
- ccmPhoneFailedIndex object, 470
- ccmPhoneFailedInetAddress object, 471
- ccmPhoneFailedInetAddressType object, 471
- ccmPhoneFailedName object, 470
- ccmPhoneFailedStorePeriod object, 487
- ccmPhoneFailedTable, objects, 470–472
- ccmPhoneFailedTime object, 470
- ccmPhoneFailures object, 491
- ccmPhoneIndex object, 466
- ccmPhoneInetAddress object, 468
- ccmPhoneInetAddressType object, 468
- ccmPhoneIpAddress object, 467
- ccmPhoneLastError object, 467
- ccmPhoneLoadID object, 467
- ccmPhonePhysicalAddress object, 466
- ccmPhoneStatus object, 467
- ccmPhoneStatusPhoneIndex object, 473
- ccmPhoneStatusUpdate notification MIB, 492
- ccmPhoneStatusUpdateAlarmInterv object, 488
- ccmPhoneStatusUpdateIndex object, 473
- ccmPhoneStatusUpdateStorePeriod object, 488

- ccmPhoneStatusUpdateTable, objects, 472–473
- ccmPhoneStatusUpdateTime object, 473
- ccmPhoneStatusUpdateType object, 473
- ccmPhoneTable, objects, 465–468
- ccmPhoneTimeLastError object, 467
- ccmPhoneTimeLastRegistered object, 467
- ccmPhoneType object, 466
- ccmPhoneUpdates object, 491
- ccmPhoneUserName object, 467
- ccmRegionAvailableBandwidth object, 464
- ccmRegionIndex object, 463
- ccmRegionName object, 463
- ccmRegionPairTable, objects, 464
- ccmRegionTable, objects, 463
- ccmRouteListExhausted notification MIB, 492
- ccmRouteListName object, 491
- ccmStatus object, 462
- ccmTable, objects, 461–462
- ccmTimeZoneIndex object, 464
- ccmTimeZoneName object, 464
- ccmTimeZoneOffset object, 464
- ccmTimeZoneTable, objects, 464–465
- CcmTrunkGatewayIndex object, 477
- ccmVersion object, 461
- CDP (Cisco Discovery Protocol), 496
- CDP MIB extension agent, 459–460
- CDR data, 501–502. *See also* CDRs
 - CMRs, field definitions, 532–535
 - generating service parameters, 505
 - storing in central database, 507–508
- CdrEnabled parameter, enabling/disabling CDR data generation, 505
- CdrEnabled service parameter, 505–506
- CdrLogCallsWithZeroDurationFlag service parameter, 506
- CDRMoveIntervalInSeconds service parameter, 508–509
- cdrRecordType field (CDR), 518
- cdrRecordType field (CMR), 532
- CDRs (Call Detail Records)
 - abandoned calls, identifying, 537
 - accessing from central database, 547–550
 - account codes, assigning to external calls, 199–202
 - associated CMRs, identifying, 535
 - calls between endpoints, identifying, 536
 - fields, 518–525
 - call leg IDs, 517
 - directory numbers, 517
 - duration field, 518
 - partitions, 517–518
 - for zero duration calls, 537
 - GCIDs, 515–516
 - IP Phone malfunction, identifying, 538
 - maintaining
 - administrator’s responsibility, 549
 - storage limitations, 549
 - processing guidelines, 550
 - service parameters, 508
 - short calls, identifying, 537
 - storage, troubleshooting, 552–553
 - storing data types, 511–513
 - unused fields, 511
- centralized call processing, 26
- centralized dial plan, H.323 gatekeepers, 279
- centralized system administration, 572
- certified servers for CallManager installation, 15–17
- CFwdAll soft key, 562–564
- CgpnScreeningIndicator service parameter, 111
- change notifications, 585–586
- Channel 1 Status counter, 445
- Channel 2 Status counter, 445
- circuit switched networks, 4
 - call establishment, 7–8
 - media exchange phase, 9
 - endpoints, 9
 - line cards, 7
 - PCM, 6
 - trunk cards, 7
 - versus packet switching, 6
- Cisco Applications SDK, 627–629
- Cisco AVVID (Architecture for Voice, Video, and Integrated Data) IP Telephony networks, 3, 9–10
 - applications
 - Applications SDK, 627–629
 - ART, 617
 - AST, 618–619
 - BAT, 617
 - Cisco CallManager Serviceability, 618
 - Cisco Customer Response, 621
 - Cisco DPA voice mail gateways, 619–620
 - Cisco IP AA, 629–630
 - Cisco IP Contact Center, 622

- Cisco IP ICD, 622
- Cisco IP Phone Configuration Web page, 631–632
- Cisco IP SoftPhone, 632–633
- Cisco IP/VC, 623–625
- Cisco IVR, 630–631
- Cisco Personal Assistant, 625
- Cisco Unity, 625–626
- Cisco Web Attendant, 634–635
- Cisco XML SDK, 623
- CiscoWorks2000, 626–627
- CMI, 634
- LDAP support, 636
- TAPS, 618
- call establishment, 22–24
- Cisco-certified servers, 15–17
- clustering, 25–26
 - centralized call processing, 26
 - distributed call processing, 26
 - ICCS, 29
 - in fully meshed topologies, 28
- device redundancy, 26–27, 32–33
- QoS, 45–47
 - admission control, 47–48
 - H.323 gatekeeper, 53–54
 - IP precedence, 48–49
 - locations, 51–52
 - regions, 49–50
 - traffic classification, 46
 - traffic prioritization, 46
- reliability, 26
- Windows 2000 services, 17–18
- Cisco Bridged Telnet, 495–496
- Cisco CallManager
 - counters, 435–440
 - history of, 10
 - Multimedia Manager 1.0, 11
 - release 3.0, 13–14
 - release 3.1, 15
 - Selsius-CallManager 1.0, 11–12
- Cisco CallManager Administration, MOH configuration, 382–385
- Cisco CallManager Serviceability, 419–420, 618
 - alarm configuration, 421
 - alarm definitions, viewing, 422
 - SDI tracing, 423–424
 - SDL tracing, 424
 - Trace Analysis, 428–430
 - Trace Collection, 431
 - trace configuration, 425–427
 - user authentication, 421
- Cisco CTIManager, counters, 440
- Cisco Customer Response, 621
- Cisco Discovery Protocol, 496
- Cisco DPA voice mail gateways, 619–620
- Cisco IP AA (IP Auto Attendant), 629–630
- Cisco IP ICD (IP Integrated Contact Distribution), 622
- Cisco IP Phone 7910, 574–575
- Cisco IP Phone 7935, 18
- Cisco IP Phone 7940, 18, 238–239, 574
- Cisco IP Phone 7960, 18, 238–239, 573
- Cisco IP Phone Configuration Web page, 631–632
- Cisco IP Phone Configuration Web pages, 575
- Cisco IP Phone Expansion Module 7914, 575
- Cisco IP Phone Productivity Services, 576
- Cisco IP Phones, 235–237
 - Answer/Release, 559–560
 - call signaling, 241–248
 - Confirm soft key, 357
 - Dial soft key, 136
 - EditDial soft key, 138
 - failure, troubleshooting, 538
 - i button, context-sensitive help, 560
 - Missed Calls menu, 136–137
 - Placed Calls menu, adding access codes to
 - redialed numbers, 198–199
 - Received Calls menu, 136–137
 - registration, 239–241
 - services, 248
 - soft keys, 253
 - unregistration sequence requirements, 401
 - visual ring indicators, 611
 - volume controls, 611
 - XML data types, 249–252
- Cisco IP SoftPhone, 576, 632–633
- Cisco IP Voice Media Streaming Application, 357
 - counters, 441–442, 448–449
- Cisco IP/VC (IP Videoconferencing), 623–625
- Cisco IPCC (IP Contact Center), 622
- Cisco IVR (Interactive Voice Response), 630–631
- Cisco MCS-7825-800 server, 16
- Cisco MCS-7835-1000 server, 16
- Cisco Media Termination Points, counters, 442–443
- Cisco Personal Address Book, 577

- Cisco Personal Assistant, 625
- Cisco SoftPhone, 237
- Cisco SW Conference Bridges, counters, 450–451
- Cisco Unity, 625–626
- Cisco WebAttendant, 578, 634–635
 - counters, 452–454
- Cisco XML SDK, 623
- Cisco-CCM-MIB
 - ccmCTIDeviceDirNumTable, objects, 485
 - ccmCTIDeviceTable, objects, 482–484
 - ccmDevicePoolTable, objects, 465
 - ccmGatekeeperTable, objects, 480–482
 - ccmGatewayTable, objects, 473–476
 - ccmGatewayTrunkTable, objects, 476–477
 - ccmGroupMappingTable, objects, 463
 - ccmGroupTable, objects, 460
 - ccmMediaDeviceTable, objects, 478–480
 - ccmPhoneExtensionTable, objects, 468–470
 - ccmPhoneFailedTable, objects, 470–472
 - ccmPhoneStatusUpdate, objects, 472–473
 - ccmPhoneTable, objects, 465–468
 - ccmRegionPairTable, objects, 464
 - ccmRegionTable, objects, 463
 - ccmTable, objects, 461–462
 - ccmTimeZoneTable, objects, 464
 - notification MIBs, 492–493
 - traps, enabling/disabling, 485–486
- Cisco-certified servers for running AVVID, 15–17
- CiscoWorks2000, 456, 626–627
 - PathTool, 458
 - Syslog Analysis tools, 457
- Class 5 switches, 4
- class of service field (802.1Q packets), packet classification, 48–49
- CLID (Calling Line Identification), 570–571
- client devices
 - gateway devices, 19
 - media processing devices, 19–20
 - station devices, 18–19
- closest match routing, 70–72, 204
 - blocking 900 numbers, 100
 - troubleshooting, 223
- clustering, 10, 25–26, 271
 - address resolution, 279
 - admissions control, H.323 gatekeeper, 53–54
 - central database architecture, 507–508
 - centralized call processing, 26
 - communication between nodes, 29
 - devices
 - redundancy, 32–33
 - registration, 354–355
 - distributed call processing, 26
 - enterprise deployment, 40
 - combined multiple-site model, 45
 - multiple-site IP WAN model with distributed call processing, 42–44
 - multiple-site model with centralized call processing, 45
 - multiple-site model with independent call processing, 43
 - single-site model, 40–41
 - ICCS, 29
 - in fully meshed topologies, 28
 - inserting transcoders, guidelines, 369–372
 - intracluster communication, 32
 - media resources, organizing, 342–346
 - multiple tenant applications, extension mapping, 143–146
 - node-to-node communication failure, handling, 393
 - nodes, fault tolerance, 510
 - reliability of, 26–27
 - server deployment, 33
 - 10,000 users or more, 36, 39
 - 2500 to 5000 users, 36–37
 - 2500 users or less, 34–36
 - 5000 to 10,000 users, 36–38
 - topologies, 285–286
- cluster-to-cluster communication, 284
 - H.323 intercluster trunks, 285–286
 - transcoding, 286
- CMI (Cisco Messaging Interface), 169, 634
 - counters, 443
 - service parameters, 170
- cmPhoneDevicePoolIndex object, 468

- CMRs (Call Management Records), 501, 504.
 - See also* CDR data
 - associated CDRs, identifying, 535
 - enabling/disabling generation, 506–507
 - field definitions, 532–535
 - unused fields, default value, 511
- CNID (Calling Party Name Identification), 571
- codecs, 6–7
 - mixed-mode conferences, 350
 - transcoding, 322, 326
 - voice codecs, 318–320
- combined multiple-site topology, 45, 286
- comfort noise, 321
- commands, MGCP, 283
- communication
 - between CallManager nodes, 29
 - Cisco CallManager-to-device
 - failure, handling, 393
 - intercluster, 284
 - H.323 intercluster trunks, 285–286
 - transcoding, 286
 - node-to-node failure, handling, 393
- Compaq Insight Agent, 458
- Compaq servers, Cisco-certified for CallManager
 - installation, specifications, 17
- comparing
 - IP telephony and traditional telephone networks, 3–7
 - redundancy of traditional telephone systems and Cisco AVVID IP Telephony, 26–27
- complex MOH configurations, 385–386
- Computer Telephony Interface. *See* CTI API
- conference bridges
 - availability, 359–360
 - Catalyst 4000, mixed-mode conference support, 352
 - Catalyst 6000, mixed-mode conference support, 351
 - Cisco IP Voice Media Streaming
 - Application, 357
 - configuring, 355–357
 - DSP farms, 356
 - registration, 354
 - resources
 - allocating, 350
 - availability, 350
 - device control process, 349
 - hardware-based, codec support, 350
- Conference button, 580–582
- conference calls. *See* conferencing
- conference controllers, 353, 580–581
 - Ad Hoc conferences, 357
- conference resources, architecture, 348
- conference servers
 - availability, 353
 - default configuration, 353–354
- conferencing
 - Ad Hoc, 357–359
 - Conference button, 580–582
 - Confrn soft key, 580–582
 - CDRs, GCIDs, 516
 - examples, 544–545
 - maximum participation, 352
 - extending, 353
 - Meet-Me, 358–359, 599
 - mixed-mode, 350
 - on hold, 385
 - unicast, 610
- configuring
 - Ad Hoc conferencing, 357–359
 - call appearances, 206–209
 - call forwarding, 167
 - call park, 566–567
 - calling search spaces, 166
 - calling user restrictions, case study, 177–196
 - CDR data transfer interval, 509
 - codec packet generation, 318–319
 - conference bridges, 355–357
 - device registration, 354–355
 - dialing alias, 129–130
 - digital gateways, 118–119
 - geographical routing
 - inbound dialing, 195–196
 - outbound dialing, 187–195
 - H.323 endpoints, 259
 - gatekeepers, 53–54, 259
 - gateways, 286
 - hotlines, 131–133
 - Meet-Me conferencing, 358–359
 - MOH servers, 374–376
 - audio source play mode, 378–379
 - examples, 383–385
 - MTPs, 372–373
 - Multicast MOH, 380–381
 - outside dial tone, 81–85
 - PSTN fallback routing, 54

- SNMP trap receivers, 485
- transcoders, 372–373
- translation patterns, 127–128
- user restrictions, 178–179
 - lobby phones, 180–181
- Confm soft key, 357, 580–582
- connections
 - call legs, 322, 517
 - call preservation, 388–390
 - transcoding, 332
- ConnectionState counter, 442, 449–450
- constraining route patterns, 95
- consultation transfers, 609
- context-sensitive help, 560
- continuous play mode (MOH), configuring, 378
- Control Center (CallManager Serviceability), 431
- controlling
 - allocation of media resources, 333
 - MRGLs, 338
 - MRGs, 335–337
 - MRM, 339
 - silence suppression, 321
- converting signed integer values to IP addresses, 512–514
- corporate networks, address translation through PSTN, 59–60
- counters
 - descriptions, viewing, 434
 - for Analog Access gateways, 434–435
 - for Cisco CallManager, 435–440
 - for Cisco CTIManager, 440
 - for Cisco Media Streaming App, 441–442
 - for Cisco MGCP FXO trunks, 443
 - for Cisco MGCP FXS stations, 444
 - for Cisco MTPs, 373, 442–443
 - for Cisco WebAttendant, 452–454
 - for CMI, 443
 - for H.323 devices, 440–441
 - for lines, 441
 - for MGCP gateways, 444
 - for MGCP PRI gateways, 445–448
 - for MOH devices, 381–382, 387–388, 448–449
 - for TFTP servers, 451–452
 - monitoring from AST, 432–434
 - transcoder-related, 373
 - Unicast conference resources, 361–362
- country codes, 217
- CRCX (create connection) command (MGCP), 283

- creating
 - CDR data, service parameters, 505
 - conference bridge resources, 349, 359–360
- CSV (comma separated value) files, creating for bulk transactions, 410–412
- CTI API (Computer Telephony Interface), 233
 - architecture, 253
 - application layers, 254
 - CTI layer, 256–257
 - auto-answer with zip tone, 583
 - Call Forward on Failure, 584
 - Cisco Personal Assistant support, 583
 - enhancements, 582–584
- CTIQBE, 255
- customizing
 - Microsoft Performance, 494–495
 - traces, 425

D

- data types, 511–513
- database (SQL)
 - automated change notification, 584–585
 - CDRs. *See also* CDRs; CDR data
 - accessing, 547–550
 - data transfer interval, configuring, 509
 - data types, 511–513
 - fields, 518–525
 - GCID, 515
 - centralized architecture, 507–508
 - full capacity alert configuration, 418
 - publisher/subscriber, 27
 - purging, 418
 - service parameters, 508
- database layer, 508
 - background mode, 510
- dateTimeDisconnect field (CDR), 525
- dateTimeStamp field (CMR), 533
- debug trace level settings, 425
- default configuration
 - media resources, 334
 - MOH, 385
 - of conference servers, 353–354
- delivering voicemail to correct mailbox number, 172–174

- deploying
 - CallManager in enterprise networks, 40
 - combined multiple-site model, 45
 - multiple-site IP WAN model with distributed call processing, 42–44
 - multiple-site model with centralized call processing, 45
 - multiple-site model with independent call processing, 42–43
 - single-site model, 40–41
 - servers within CallManager clusters, 33
 - 10,000 users or more, 36, 39
 - 2500 to 5000 users, 36–37
 - 2500 users or less, 34–36
 - 5000 to 10,000 users, 36–38
- destCallTerminationOnBehalfOf field (CDR), 523
- destCause_location field, field definitions, 527
- destCause_location field (CDR), 524
- destCause_value field, field definitions, 527–530
- destConversationId field (CDR), 523
- destDeviceName field (CDR), 522
- destinations (route patterns), selecting, 66–67
- destIpAddr field (CDR), 522
- destIpPort field (CDR), 522
- destLegIdentifier field (CDR), 522
- destMediaCap_g723BitRate field (CDR), 525
- destMediaCap_maxFramesPerPacket field (CDR), 525
- destMediaCap_payloadCapability field (CDR), 525
- destMediaTransportAddress_IP field (CDR), 525
- destMediaTransportAddress_Port field (CDR), 525
- destNodeId field (CDR), 522
- device-based filtering, 425
- deviceName field (CMR), 532
- devices
 - call preservation support, 397–398
 - calling search spaces, 160–161
 - example, 161–166
 - Cisco IP Phone 7940, 238–239
 - Cisco IP Phone 7960, 238–239
 - Cisco IP Phones, 235–237, 321–322
 - Answer/Release, 559–560
 - call signaling, 241–248
 - Confrn soft key, 357
 - counters, 450
 - registration, 239–241
 - services, 248
 - soft keys, 253
 - unregistration sequence requirements, 401
 - XML data types, 249–252
- Cisco SW Conference Bridge
 - counters, 450–451
- clusters, 271
 - registration, 354–355
- codexs, transcoding, 322
- conference bridges
 - availability, 359–360
 - Cisco IP Voice Media Streaming Application, 357
 - configuring, 355–357
 - DSP farms, 356
 - registration, 354
- control process, 349, 372
- endpoints, handling failure of, 393
- gateways, 19, 229, 270–271
 - registration, 286–288
- H.323 endpoints, 233–234, 258
 - configuring, 259
 - RAS protocol support, 264–266
- H.323 gateways, 277
 - analog connections, 278
 - counters, 440–441
 - digital connections, 278
 - gatekeeper control, 274–277
 - gatekeepers, 279
 - MTPs, 282
- inter-CallManager replication, 29
- intracluster communication, 32
- mapping tools, 587
- media processing devices, 19–20
 - handling failure of, 392–393
 - MOH resources, 20
 - MTP resources, 20
 - transcoding resources, 19
 - unicast conferencing devices, 20
- media resource registration sequence, 330
- MTPs, 324–325
 - hardware-based, 326
 - software-based, 325–326
- opening HTTP connections, 432
- pools, 587

- recovering after failure, 397
- redundancy, 32–33
- registration, 372
 - during active connections, 401–402
 - switchback, 399–400
 - switchover, 397
- route patterns, 62–63
 - assigning, 64
- Skinny Protocol, 234
- station devices, 18–19, 229
 - supported by Cisco CallManager, 108, 229–230
 - TFTP functionality, 266–267
- terminal endpoints, 229
- time-matching, 423
- transcoders, 322, 326
 - as alternative to codecs, 367
 - availability, 368–372
 - configuring, 372–373
 - inserting into clusters, 369–372
 - logical connections between IP Phones, 332
- trunks, 108–109
- unicast conferencing bridges, 323–324
- voice codecs, 318–319
 - bandwidth consumption, 320
- device-to-device communication failure, handling, 393
- diagnosing. *See* tracing; troubleshooting
- Dial soft key (Cisco IP Phones), 136
- dial tone, troubleshooting
 - early, 222
 - late, 221–222
- dialing behavior, 66–67
 - alias, configuring, 129–130
 - enblock dialing, 116
 - outside dial tone, 81–85
 - overlapped dialing, 116
 - urgent route patterns, 79–80
- dialing plans
 - address translation, 59–60
 - U.K., 80–81
- dialing transformations, 62, 102
 - applying, 105–107
 - masking, 109
 - on terminating device, 122–126
 - service parameters, 110
 - CgpnScreeningIndicator, 111
 - MatchingCgpnWithAttendantFlag, 111–112
 - NumberingPlanInfo, 113–114
 - OverlapReceivingForPriFlag, 112–113
 - StripPoundCalledPartyFlag, 113
 - UnknownCallerID, 113
 - versus translation patterns, 102
- DID (direct inward dial), 103, 588
- digit discarding instructions, 87, 96, 120–121
 - troubleshooting, 223
- digital gateways, 118–119
 - H.323, 278
- directories button (Cisco IP Phone 7960/7940), 589–590
- directory, specifying for MOH audio source file, 377
- Directory data type (XML), 251
- Directory Number Configuration Screen, 114
 - calling search space, 166
 - Display field, 103
 - Voice Message Box field, 172–174
- directory numbers, 517
- directoryNum field (CMR), 533
- disabling
 - CMR generation, 506–507
 - silence suppression, 321
- discovery process, 275
- disengage messages (H.225), fields, 308–309
- Display field (Directory Number Configuration screen), 103
- displaying
 - alarm definitions (Cisco CallManager Serviceability), 422
 - component version information (CallManager Serviceability), 431
 - counter descriptions, 434
 - SNMP MIBs, end user interface, 459
- distributed call processing, 26
- distributed resource sharing, 590–591
- distributing media processing load, 341
- DLCX (delete connection) command (MGCP), 283
- DOD (Direct Outward Dial), 588
- DOES-NOT-EXIST operator, 90
- dotted decimal notation, 512
- downloading MIBs, 460

- DSPs (digital signal processors), 7
 - resources, transcoding, 346–348
- duration field (CDR), 518, 526
- Dutch numbering plans, 216
 - local numbers, 220–221

E

-
- E911 solutions, 591
 - 911 call routing, 80
 - calling search space configuration, 212
 - partition configuration, 212
 - route filter configuration, 212
 - route group configuration, 211
 - route list configuration, 211
 - route pattern configuration, 212–213
 - enhanced 911 support, 209–210
 - early dial tone, troubleshooting, 222
 - EditDial soft key (Cisco IP Phone), 138
 - emergency services. *See* E911 solutions
 - empty capability set (H.245), 281–282, 365
 - emulating PBXs, 111–112
 - enabling
 - CDR data generation, 505
 - CMR generation, 506–507
 - SNMP traps, 485–486
 - enbloc dialing, 116
 - encoding schemes, codecs, 6–7
 - endpoint determination, 58
 - endpoints, 9
 - associating with media resources, 333
 - call legs, 322
 - H.323, 233–234
 - logical channels, 281–282
 - handling failure of, 393
 - logical channels, 318, 331–332
 - MGCP, 282
 - originating, 331
 - terminating, 331
 - toll restriction, 156
 - enhanced 911 support. *See* E911 solutions
 - enterprise deployment of CallManager clusters, 40
 - combined multiple-site model, 45
 - multiple-site IP WAN model with distributed call processing, 42, 44
 - multiple-site model with centralized call processing, 45
 - multiple-site model with independent call processing, 43
 - single-site model, 40–41
 - establishing
 - calls
 - in circuit-switched networks, 7–9
 - in Cisco AVVID IP Telephony networks, 22–24
 - media exchange phase, 9
 - conferences, 580–581
 - Event Viewer, 454–455
 - events, 283
 - examples
 - of call preservation, 393–396
 - of conference calls, 544–545
 - of GCID usage in call transfer, 516
 - of held calls, 546
 - of Meet-Me conference calls, 545
 - of MOH configuration, 383–385
 - of parked calls, 543
 - of route patterns, 67
 - simple call routing, 68–72
 - wildcards matching multiple digits, 72–75
 - of transferred calls, 539–543
 - exceeding maximum conference participation, 360
 - Excel spreadsheets, creating CSV files for bulk transactions, 410–412
 - EXISTS operator, 90
 - exporting trace results to file, 425
 - extending
 - conference participation, 352–353
 - conference resource availability, 360
 - extension agents, updating
 - CCM MIB, 459
 - CDP MIB, 459–460
 - extension mapping multiple tenant applications, 143–144
 - intertenant calls, 144–146

- extension mobility, 592
- external access codes, adding to missed calls (Cisco IP Phones), 137–143
- external calls, assigning account codes, 199–202
- external phone number masks, 114–115
- External Route Plan Wizard, 153, 183
 - fallback, 188
- external route plan wizard, 592

F

- failed devices, recovering, 397
- failures. *See* system failure
- fallback routing, 204–205
 - External Route Plan Wizard, 188
- fast busy, 276
- fault tolerance
 - central database, 509–510
 - nodes, 510
- features
 - Answer/Release, 559–560
 - ART, 559
 - Auto Answer, 560
 - automated change notification, 584–585
 - BAT, 561
 - broadcast paging support, 560
 - call connection, 561
 - call forward reason codes, 561
 - call forwarding, 562–565
 - Call Forward Busy, 564
 - Call Forward No Answer, 564–565
 - for third-party applications, 565
 - Call Park, 566
 - configuring, 566–567
 - Call Pickup, 567–568
 - call preservation, 568–569
 - call status per line, 569
 - call waiting/retrieve, 569
 - calling search spaces, 588
 - CallManager Administration, 572
 - CallManager Serviceability, 572–573
 - CDRs/CMRs, 561
 - centralized system administration, 572
 - Cisco IP Phone Configuration Web pages, 575
 - Cisco IP Phone Expansion Module 7914, 575
 - Cisco IP Phone support, 573–575
 - Cisco IP Phone 7935, 575
 - Cisco IP SoftPhone support, 576
 - Cisco Personal Address Book, 577
 - Cisco WebAttendant, 578
 - CLID, 570–571
 - CNID, 571
 - context-sensitive help, 560
 - CTI API enhancements, 582–584
 - database API, 584
 - device mapping tools, 587
 - device pools, 587
 - device search, 588
 - Device wizard, 588
 - DHCP IP address assignment, 588
 - DID (Direct Inward Dial), 588
 - directories, 589–590
 - distinctive rings, 590
 - distributed environment, 590
 - distributed resource sharing, 590–591
 - DOD (Direct Outward Dial), 588
 - downloadable upgrades, 587
 - DSP resource alignment, 591
 - E911 solutions, 591
 - EndCall soft key, 592
 - extension mobility, 592
 - gain attenuation, 593
 - group call pickup, 593
 - GSM-EFR/FR, 594
 - H.232 supplementary services, 607
 - Hold/Resume, 595–596
 - HTTPD server support, 596
 - IP ICD, 597
 - lines, 597–598
 - Meet-Me conferencing, 599
 - message waiting indicator, 600–601
 - MOH, 601
 - MRGL support, 599
 - Mute button, 601
 - New Call soft key (Cisco IP Phone 7940/7960), 602
 - off-hook dialing, 602
 - overlap sending, 602
 - paperless phone, 602
 - partitions, 588
 - performance monitoring, 603
 - privacy, 603
 - QoS statistics, 603
 - redial, 603

- remote site survivability, 603–604
- settings button, 604–606
- speakerphone, 606
- speed dial, 606–607
- T1-CAS support, 607
- TAPI/JTAPI redundancy, 608
- Tone on Hold, 608
- transfer, 609–610
- unicast conferences, 610
- visual ring indicator, 611
- wideband stereo codec (Cisco IP Phone 79xx), 611
- Y2K compliance, 612
- zero cost phone moves/adds, 612
- field definitions
 - call admission control messages, 302–305
 - CDRs, 518–525
 - destCause_location field, 527
 - destCause_value field, 527–530
 - in CMRs, 532–535
 - OnBehalfOf fields, 530–531
 - origCause_location field, 527
 - origCause_value field, 527–530
 - directory numbers, 517
 - duration field, 518
 - H.225 RAS bandwidth messages, 305–306
 - H.225 RAS disengage messages, 308–309
 - H.225 RAS information request messages, 309–311
 - H.225 RAS location request messages, 306–307
 - H.225 RAS messages, 297–299
 - OnBehalfOf, 530–531
 - registration request messages, 299–301
 - unregistration messages, 301–302
- file format of NANP, 214–215
- files, MOH audio sources, adding, 377
- filtering
 - ISDN Layer 3 protocol messages, 497
 - traces, 429–430
- finalCalledPartyNumber field (CDR), 524
- finalCalledPartyNumberPartition field (CDR), 524
- Finland, TLAs, 76
- firmware, upgrading, 587
- fixed data sources, for MOH servers, 376
- ForwardMaximumHopCount service parameter, 563
- full capacity alert, CallManager database configuration, 418
- fully meshed topologies, clustering, 28

- fundamentals of call routing, 60–62
 - dialing behavior, 66–67
 - overlapped sending, 76–77
 - route filters, 62–64
 - wildcards, 64–65
 - route patterns, 62–64
 - comparing to grep(1), 65–66
 - examples, 68–75
- FXO (Foreign Exchange Office) trunks, 278
 - counters, 443
- FXOPortsActive counter, 436, 445
- FXOPortsInService counter, 436, 445
- FXS (Foreign Exchange Station) ports, 278
 - broadcast paging support, 560
 - counters, 444
- FXSPortsActive counter, 436, 445
- FXSPortsInService counter, 436, 445

G

- G.711 voice codecs, bandwidth consumption, 320
- G.723.1 voice codecs, bandwidth consumption, 320
- G.729a voice codecs, bandwidth consumption, 320
- gatekeeper control, H.323, 274–275
- gatekeepers
 - discovery process, 275
 - H.323, 279
 - anonymous device configuration, 279
 - system parameters, 279–280
- gateway reports (ART), 417
- gateways, 270–271
 - Analog Access
 - counters, 434–435
 - assigning to route groups, 150–151
 - Cisco DPA voice mail gateways, 619–620
 - devices, 19, 229
 - digital, 118–119
 - directory numbers, processing, 551
 - endpoints, 150
 - H.323, 272–273, 277
 - accessing CallManager features, 280
 - analog connections, 278
 - call control signaling, 273
 - call signaling protocols, 291–297
 - digital connections, 278
 - gatekeeper control, 274–275, 277

- gatekeepers, 279
- initialization, 286–288
- messaging, 276
- supplementary services, 607
- troubleshooting, 312
- MGCP, 282
 - counters, 444
 - events, 283
 - overlapped dialing, 79
 - registration during active connection, 401–402
 - signals, 283
 - troubleshooting, 311–312
- MGCP PRI, counters, 445–448
- Q.921 Layer 2 parameters, 289
- Q.921 Layer 3 parameters, 290
- registration, 286–288
- route lists, 62
- GCF (Gatekeeper Confirm) messages, 275
- GCIDs (global call IDs), 515–516
- generating CDR data, service parameters, 505
- geographical routing, 183–184
 - case study, 183–196
 - inbound dialing, 195–196
 - outbound dialing, 187–195
 - troubleshooting, 184–187
- globalCallId_callId field (CDR), 519
- globalCallId_callId field (CMR), 533
- globalCallId_callManagerId field (CDR), 515
- globalCallId_callManagerId field (CMR), 532
- globalCallId_ClusterID field (CDR), 519
- globalCallId_ClusterID field (CMR), 532
- graceful switchback algorithm, 399
- graceful switchover algorithm, 398
- GraphicMenu data type (XML), 251
- grep(1), comparing to route patterns, 65–66
- GRJ (Gatekeeper Reject) messages, 275
- group call pickup, 593
- GRQ (Gatekeeper Request) messages, 275
- GSM voice codecs, bandwidth consumption, 320
- GSM-EFR/FR (Groupe Speciale Mobile-Enhanced Full Rate/Full Rate), 594
- guard timers, 400
- guidelines for CDR processing, 550

H

- H.225 recommendation, 273
 - call signaling messages, 292–297
- RAS
 - bandwidth messages, 305–306
 - call admission control messages, 302–305
 - disengage messages, 308–309
 - information request messages, 309–311
 - location request messages, 306–307
 - messages, 297–299
 - registration messages, 299–301
 - terminal/gateway discovery messages, 298–299
 - unregistration messages, 301–302
- RAS gatekeeper support, 274–275
- signaling, 260–263
- unregistration messages, 301–302
- H.245 empty capability set, 280–282
- H.323 gateways, 259, 277
 - analog connections, 278
 - CallManager features, accessing, 280
 - call signaling protocol, 272–273, 291–297
 - with gatekeeper control, 276
 - clusters, 271
 - configuring, 286
 - counters, 440–441
 - devices, 108
 - digital connections, 278
 - empty capability sets, 365
 - endpoints, 233–234, 258
 - configuring, 259
 - configuring as gatekeeper, 259
 - RAS protocol support, 264–266
 - gatekeeper control, 53–54, 274–277
 - gatekeepers, 279
 - anonymous device configuration, 279
 - system parameters, 279–280
 - initialization, 286–288
 - intercluster trunking, 285–286
 - logical channels, 281–282
 - MTPs, 282
 - supplementary services, 607
 - troubleshooting, 312
 - trunking devices, 291
 - voice message box management, 172, 174

- handling system failure
 - Cisco CallManager-to-device communication, 393
 - endpoint failure, 393
 - media processing device failure, 392–393
 - node failure, 391–392
 - node-to-node communication, 393
 - hardware-based conference bridges
 - registration during active connections, 401
 - resources, codec support, 350
 - Unicast, 324
 - hardware-based media processing resources, 328–329
 - hardware-based MTPs, 326
 - HeartBeat counter, 442–443, 451–452
 - held calls, examples, 546
 - high order bit, 511
 - high-bandwidth codecs, 319
 - history of Cisco CallManager, 10
 - Multimedia Manager 1.0, 11
 - release 3.0, 13–14
 - release 3.1, 15
 - Selsius-CallManager 1.0, 11
 - Skinnny Protocol, 12
 - Hold button, 595–596
 - hold types, 383
 - hotlines, configuring, 131–133
 - HTTPD (HTTP Daemon), 596
 - hub-and-spoke topologies, CallManager cluster deployment strategies, 45
-
- i button
 - Cisco IP Phone 7940, 574
 - Cisco IP Phone 7960, 573
 - context-sensitive help, 560
 - ICCS (Intracluster Control Signaling), 29
 - icons, AST window, 432
 - identifying CDRs
 - abandoned calls, 537
 - associated CMRs, 535
 - call between endpoints, 536
 - IP Phone malfunction, 538
 - short calls, 537
 - IECs (interexchange carriers), 4
 - immediate switchback algorithm, 399
 - immediate switchover algorithm, 398–399
 - implementing authorization codes, 199–202
 - inbound dialing, configuring, 195–196
 - Inbound SMDI Message Count counter, 443
 - individualized routing, 60
 - information request messages (H.225), fields, 309–311
 - initial configuration, MOH, 385
 - initialization
 - failures, ccmPhoneFailedTable objects, 470–472
 - H.323 gateways, 286–288
 - MOH servers, 379
 - Input data type (XML), 252
 - Insert Phones/Users screen, 409–410
 - inserting
 - access codes in redialed numbers, 198–199
 - transcoders into clusters, rules, 369–372
 - installing
 - Cisco-certified servers, 15–17
 - Terminal Services Client, 456
 - inter-CallManager replication, 29
 - intercluster communication, 284
 - H.323 intercluster trunks, 285–286
 - transcoding, 286
 - intercluster trunking, 25, 36
 - interdigit timeouts, 75, 99
 - interexchange carriers (IECs), 4
 - international calls, blocking, 96
 - international country codes, 217
 - INTERNATIONAL-ACCESS DOES-NOT-EXIST
 - route filters, 96
 - intertenant calls, 144–146
 - intracluster communication, 32
 - IOCTL Errors counter, 442
 - IP addresses, converting from signed integer values, 512–514
 - IP Centrex, 143
 - IP ICD (IP Integrated Contact Distribution), 597
 - IP Phones, 235, 237, 321–322
 - Answer/Release, 559–560
 - call signaling, 241–248
 - Cisco IP Phone 7940, 238–239
 - Cisco IP Phone 7960, 238–239
 - Confrm soft key, 357
 - counters, 450

- Dial soft key, 136
- EditDial soft key, 138
- failure, troubleshooting, 538
- Missed Calls menu, 136–137
- Placed Calls menu, adding access codes to
 - redialed numbers, 198–199
- Received Calls menu, 136–137
- registration, 239–241
- services, 248
- soft keys, 253
- unregistration sequence requirements, 401
- XML data types, 249–252

IP precedence, 48–49

IP Telephony, 3. *See also* Cisco AVVID IP

- Telephony
 - packet-switching, 6
 - versus traditional telephone networks, 3–7

ISDN (Integrated Services Digital Network)

- digital gateways, 118–119

- Q.921

- Layer 2 parameters, 289

- Layer 3 parameters, 290

- Q931 Translator, 497–498

- timers, 288

J-L

Java applets, AST. *See* AST

jitter field (CMR), 534

JoinOnBehalfOf field (CDR), 522

JTAPI, 254, 256

key systems, 3

large conference support, 352

lastRedirectDn field (CDR), 521

lastRedirectDnPartition field (CDR), 521

lastRedirectRedirectOnBehalfOf field (CDR), 522

lastRedirectRedirectReason field (CDR), 522

LATA (Local Access and Transport Area), 183

late dial tone, troubleshooting, 221–222

latency field (CMR), 535

layers of CallManager functionality, 30–31

- state machines, 31–32

LEC (local exchange carrier), 4

length limitations on route filters, 88

limitations

- on conference participation, 352, 355–356

- on database record storage, 549

line cards, 7

lines, counters, 441

link layer, 30

lobby phones, configuring user restrictions, 180–181

local calls

- 7-digit dialing, 97

- fallback, 188

local numbers, Dutch numbering plan, 220–221

LOCAL-AREA-CODE tag, 97

location request messages (H.225), fields, 306–307

logging calls less than 1 second, 506

logical channels, 318, 331–332

long distance and international fallback, 188

long distance carriers

- blocking selection of, 96

- IECs, 4

low-bandwidth codecs, 319

M

maintaining CDR/CMR records

- administrator's responsibility, 549

- storage limitations, 549

malfunctioning IP phone, identifying associated CDR, 538

manageability tools

- ART, 413

- alerts, 419

- call detail reports, 418

- call reports, 417

- gateway reports, 417

- pregeneration of reports, 416

- QoS monthly summary reports, 414–415

- QoS reports, 418

- system overview reports, 418

- traffic summary reports, 417

- user reports, 417

- BAT, 407–408

- adding users with CSV files, 410–412

- goal of using, 408

- managing established CallManager systems, 409

- misconfiguration, 408–409

- setting up CallManager database, 408–409
 - TAPS (Tool for Auto-Registered Phones Support), 412
- managing conference bridge resources, 349
- manual discovery, 275
- mapping public phone numbers to internal numbering scheme, 133–136
- masking, 109
 - external phone number mask, 114–115
- MatchingCgpnWithAttendantFlag service parameter, 111–112
- MaxCdrRecords service parameter, 508
- MaxForwardsToDn service parameter, 564
- maximum conference participation, 352
 - exceeding, 360
- MCL (Media Control Layer), 30, 228, 269, 315–317, 330–331
 - DSP resources, transcoding, 346–348
- MCS-7825-800 server, 16
- MDCX (modify connection) command (MGCP), 283
- Media Control Layer. *See* MCL
- media exchange phase of call establishment, 9
- media processing, 317
 - conference resources
 - Protocol Layer, 348
 - Supplementary Services Layer, 348
 - devices, handling failure of, 392–393
 - distributing processing load, 341
 - redundancy, 397
 - resources, 322–323, 327
 - allocation on MRGLs, 338
 - allocation on MRGs, 335, 337
 - allocation through MRM, 339
 - availability, 359–360
 - conference bridges, configuring, 356–357
 - conference servers, default configuration, 353–354
 - conferencing limitations, 355–356
 - controlling allocation of, 333
 - default configuration, 334
 - device registration, 354–355
 - hardware-based, 328–329
 - MOH, 20, 326
 - MRGs, 334–335
 - MTPs, 20, 324–326
 - Null MRGs, 335
 - organizing allocation, 342–346
 - registration, 330
 - selecting, 329
 - selecting from MRGs, 339–341
 - selecting MRGs from MRGLs, 339
 - software-based, 328–329
 - transcoding, 19, 326
 - unicast conferencing resources, 20, 323–324
- Media Resource Group List (MRGL), 335
- Media Resource Manager. *See* MRM
- media streams, 319
- MediaTermPointsOutOfResources counter, 436
- MediaTermPointsResourceActive counter, 436
- MediaTermPointsResourceAvailable counter, 436
- Meet-Me conferencing, 358–359, 599
 - examples, 545
 - streams, availability, 360
- membership to partitions, 160
- Menu data type (XML), 249
- message waiting indicator, 174–177, 600–601
- messages
 - ACF (Admission Confirm), 276
 - ARJ (Admission Reject), 276
 - ARQ (RAS Admission Request), 275
 - call admission control, 302–305
 - GCF (Gatekeeper Confirm), 275
 - GRJ (Gatekeeper Reject), 275
 - GRQ (Gatekeeper Request), 275
 - H.225 call signaling, 292–297
 - H.225 RAS
 - bandwidth, 305–306
 - disengage, 308–309
 - information request, 309–311
 - location request, 306–307
 - RAS (Registration, Admission, and Status), 274–275
 - registration request, fields, 299–301
 - Resource Allocation Response, 340–341
 - SNMP traps, 459
 - receivers, configuring, 485
 - unregistration, fields, 301–302
- messaging systems, CMI, 169
 - interaction with calling search spaces, 168–177
 - service parameters, 170
- metro dialing, 97–98

- MGCP (Media Gateway Control Protocol)
 - gateways, 282
 - CMRs, 504
 - commands, 283
 - counters, 444–448
 - endpoints, 282
 - events, 283
 - devices, 108
 - overlapped dialing, 79
 - registration during active connections, 401–402
 - signals, 283
 - troubleshooting, 311–312
- MIBs (Management Information Bases), 458–461
 - Cisco-CCM-MIB
 - CallManager Group Table, 460
 - ccmCTIDeviceDirNumTable, 485
 - ccmCTIDeviceTable, 482–484
 - ccmDevicePoolTable, 465
 - ccmGatekeeperTable, 480–482
 - ccmGatewayTable, 473–476
 - ccmGatewayTrunkTable, 476–477
 - ccmGroupMappingTable, 463
 - ccmMediaDeviceTable, 478–480
 - ccmPhoneExtensionTable, 468–470
 - ccmPhoneFailedTable, 470–472
 - ccmPhoneStatusUpdateTable, 472–473
 - ccmPhoneTable, 465–468
 - ccmRegionPairTable, 464
 - ccmRegionTable, 463
 - ccmTable, 461–462
 - ccmTimeZoneTable, 464
 - traps, 485–486
 - objects, AST-generated, 433–434
 - SYSAPPL-MIB, additional support, 493–494
- Microsoft Event Viewer, 454–455
- Microsoft Performance, 494–495
- migrating users from another PBX, 204–205
- misconfiguration of BAT, 408–409
- Missed Calls menu (Cisco IP Phones), 136–137
- Missing Device Driver Errors counter, 442
- mixed-mode conferences, 350
 - support for on Catalyst 4000 conference bridges, 352
 - support for on Catalyst 6000 conference bridges, 351
- MOH (Music On Hold), 374, 601
 - architecture, 375–376
 - Audio Translator, 376–377
 - complex configuration, 385–386
 - configuring with Cisco CallManager Administration, 382–385
 - default configuration, 385
 - devices, counters, 448–449
 - hold types, 383
 - initial configuration, 385
 - Network Stream Source, 386
 - placing conference participants on hold, 385
 - play mode configuration, 378–379
 - resources, 20, 326
 - servers
 - audio source, 374, 376
 - audio sources, adding, 377
 - capabilities summary, 380
 - configuring, 374–376
 - counters, 449
 - initialization, 379
 - Multicast configuration, 380–381
 - performance counters, 381–382, 387–388
 - service parameters, 377
 - stream connection errors, 379
 - stream source selection process, 383
 - User Hold Stream Source, 386
- MOHHighestActiveResources counter, 448
- MOHMulticastResourceActive counter, 436, 448
- MOHMulticastResourceAvailable counter, 436, 449
- MOHOutOfResources counter, 437, 449
- MOHTotalMulticastResources counter, 437, 449
- MOHTotalUnicastResources counter, 437, 449
- MOHUnicastResourceActive counter, 437, 449
- MOHUnicastResourceAvailable counter, 437, 449
- monitoring. *See also* monitoring tools
 - performance counters
 - Microsoft Performance, 494–495
 - MOH server, 381–382, 387–388
 - MTPs, 373
 - transcoders, 373
 - Unicast conference resources, 361–362
- monitoring tools
 - Cisco CallManager Serviceability, 419–420
 - alarm configuration, 421
 - AST, 431–434
 - component version information, displaying, 431
 - Control Center, 431
 - SDI tracing, 423–424

- SDL tracing, 424
- Trace Analysis, 428–430
- Trace Collection, 431
- trace configuration, 425–427
- user authentication, 421
- viewing alarm definitions, 422
- CiscoWorks2000, 456
 - PathTool, 458
 - Syslog Analysis tools, 457
- Microsoft Event Viewer, 454–455
- Microsoft Performance, 494–495
- SNMP
 - MIBs, 458–461
 - traps, 485
- Terminal Services Client, 456
- MRGL (Media Resource Group List), 334, 599
 - MRGs, selecting, 339
 - organizing resource allocation, 342–346
- MRGs (Media Resource Groups), 334–335
 - device control process, 339
 - Null MRGs, 335
 - organizing resource allocation, 342–346
 - resources, selecting, 339–341
 - selecting from MRGLs, 339
- MRM (Media Resource Manager), 317
 - media resource allocation, 339
 - Resource Allocation Response messages, 340–341
- MTP resources, 20
- MTPs (media termination points), 282, 322–325
 - availability, 368–372
 - configuring, 372–373
 - hardware-based, 326
 - inserting into clusters, 369–372
 - performance counters, 373
 - software-based, 325–326
- Multicast MOH, configuring, 380–381
- Multimedia Manager 1.0, 11
- multiple call appearances, 206–207
- multiple digit matches, 72–75
- multiple line appearances, 232
- multiple tenant applications
 - calling search spaces, 161–166
 - extension mapping, 143–144
 - intertenant calls, 144–146

- multiple-site IP WAN model
 - with centralized call processing, 45, 285
 - with distributed call processing, 42–44, 285
 - with independent call processing, 42–43
- music on hold. *See* MOH
- music stream source assignments (MOH), order of precedence, 386
- Mute buttons, 601

N

- national numbering plans, blocking calls, 79
- Netherlands numbering plan
 - local numbers, 220–221
 - service calls, 219–220
- Network hold, 383
- Network Stream Source (MOH), 386
- Network Time Protocol Daemon (xNTPD), time-matching Cisco CallManager-related devices, 423
- New Call soft key, 602
- NMSs (network management systems),
 - CiscoWorks2000, 456
 - PathTool, 458
 - Syslog Analysis tools, 457
- no-circuits-available call treatment, 276
- nodeId field (CMR), 533
- nodes
 - active connections, device registration, 401
 - communication, regions, 49–50
 - conference bridge registration, 354
 - device registration, 372
 - failure, 391–392, 510
 - recovery objectives, 390–391
 - role in call preservation, 389
- node-to-node communication failure, handling, 393
- non-North American numbering plans
 - Finland, 76
 - Netherlands
 - local numbers, 220–221
 - service calls, 219–220
- non-SMDI unified messaging systems,
 - service parameters, 171
- normal calls, 503

North American numbering plan

- @ wildcard, 213–214
- 10-10 dialing, 96
- 10-digit dialing, 98–99
- 7-digit dialing, 97–99
- digit discarding instructions, 120–121
- file format, 214–215
- metro dialing, 97–98
- replacing, 215–216
- route filters, 95–96
 - 10-digit dialing, 98–99
 - blocking 900 numbers, 99–102
 - blocking international calls, 96
 - blocking long distance carrier selection, 96
 - elimination of interdigit timing, 99
 - metro dialing, 97–98
 - routing only local numbers, 96–97
 - routing toll-free numbers, 99
- tags, 88–90
- notification MIBs, 492–493
- NOT-SELECTED operator, 90
- NTFY (notify) command (MGCP), 283
- Null MRGs, 335
- null partition, 160
- numbering plans
 - country codes, 217
 - Netherlands, 216
 - local numbers, 220–221
 - service calls, 219–220
 - overlapped sending, 76–77
 - replacing, 215–216
 - tags, 88–89
- NumberingPlanInfo service parameter, 113–114
- numberOctetsReceived field (CMR), 534
- NumberOfActiveAudioSources counter, 449
- NumberOfActiveConferences counter, 450
- NumberOfActiveConnections counter, 442
- NumberOfActiveStreams counter, 442, 449–450
- NumberOfAvailableStreams counter, 442, 449–450
- NumberOfLostConnections counter, 443, 450
- numberPacketsLoss field (CMR), 534
- numberPacketsReceived field (CMR), 533
- numberPacketsSent field (CMR), 533
- numeric data, storing in database, 511

O

- objectives for system failure recovery, 390–391
- objects, 458
 - AST-generated, 433–434
 - counters
 - for Analog Access gateways, 434–435
 - for Cisco CallManager, 435–440
 - for Cisco CTIManager, 440
 - for Cisco Media Streaming App, 441–442
 - for Cisco Media Termination Points, 442–443
 - for CMI, 443
 - for FXO trunks, 443
 - for FXS stations, 444
 - for H.323 devices, 440–441
 - for lines, 441
 - MIBs, downloading, 460
 - monitoring from AST, 433–434
- off-hook dialing, 602
- office personnel, blocking 900 numbers, 179
- OffNet calls, processing, 551
- OnBehalfOf fields, 530–531
- one shot play mode (MOH), configuring, 379
- OnNet calls, processing, 551
- opening HTTP connections to devices (AST), 432
- operators, 90–91
 - configuring, 131
 - stringing together, 91
- organizing resource allocation, 342–346
- origCalledPartyRedirectReason field (CDR), 523
- origCallTerminationOnBehalfOf field (CDR), 521
- origCause_location field (CDR), 520, 527
- origCause_value field (CDR), field definitions, 527–530
- origCause_value field (CDR), 520
- origDeviceName field (CDR), 519
- originalCalledPartyNumber field (CDR), 523
- originalCalledPartyNumberPartition field (CDR), 523
- originating calls from H.323 endpoints, H.225 signaling, 260–263

originating device dialing transformations

- Attendant DN, 117–118
- Caller ID Enable, 118
- expected digits, 117
- external phone number mask, 114–115
- num digits, 117
- prefix digits, 116

 originating endpoints, 331

- origIpAddr field (CDR), 519
- origIpPort field (CDR), 519
- origLegCallIdentifier field (CDR), 519
- origMediaCap_maxFramesPerPacket field (CDR), 521
- origMediaCap_payloadCapability field (CDR), 521
- origMediaTransportAddress_IP field (CDR), 520
- origMediaTransportAddress_port field (CDR), 521
- origNodeId field (CDR), 520
- origSpan field (CDR), 520

 Out of Streams counter, 442

- outbound calls, routing, 203–204
- outbound dialing, configuring, 187–195
- Outbound SMDI Message Count counter, 443
- OutboundBusyAttempts counter, 435, 444

 outside dial tone

- configuring, 81–85
- suppressing, 85

 overlapped dialing, 116

- overlapped receiving, enabling, 112–113
- overlapped sending, 76–77, 602

 OverlapReceivingForPriFlag service parameter, 112–113

P

packets, 6

- streams, 319
- transmission over codecs, configuring, 318–319

 packet-switching, 6

- codecs, 6–7
- softswitches, 9–10
- versus circuit switching, 6

 panes (AST window), monitoring counters, 432–434

- paperless phone, 602

parameters. *See also* service parameters

- for MOH servers, 377
- Q.921 Layer 2, 289
- Q.921 Layer 3, 290

 parked calls, examples, 543

- participation in conferences, extending, 352–353
 - Ad Hoc conferencing, 357–358
 - Meet-Me conferencing, 358–359
 - restrictions, 355–356
- partitions, 62, 159, 517–518, 588
 - analogies to, 158
 - calling search spaces, 160–161
 - configuring call appearances, 206–209
 - example, 161–166
 - membership, 160
- party transform masks, 126
- party transformations, 102
- PathTool, 458
- PBXs (private branch exchanges), 4–5
 - emulating, 111–112
- PCM (pulse code modulation), 6

 performance

- CDR processing, 548
- counters
 - for Analog Access gateways, 434–435
 - for Cisco CallManager, 435–440
 - for Cisco CTIManager, 440
 - for Cisco Media Streaming App, 441–442
 - for Cisco Media Termination Points, 442–443
 - for Cisco Phones, 450
 - for Cisco SW Conference Bridges, 450–451
 - for Cisco WebAttendant, 452–454
 - for CMI, 443
 - for FXO trunks, 443
 - for FXS stations, 444
 - for H.323 devices, 440–441
 - for lines, 441
 - for MGCP gateways, 444
 - for MGCP PRI gateways, 445–446
 - for MGCP T1 CAS gateways, 447–448
 - for MOH devices, 448–449
 - for MOH servers, 381–382, 387–388, 449
 - for MTPs, 373
 - for TFTP servers, 451–452

- for transcoders, 373
- for Unicast conference resources, 361–362
- viewing descriptions, 434
- monitoring, 603
 - Microsoft Performance, 494–495
 - reporting tools, ART, 413–419
- performing bulk operations on CallManager database, 407–408
- pink noise, 321
- Placed Calls menu (Cisco IP Phones), inserting access codes in redialed numbers, 198–199
- placing calls from H.323 endpoints, H.225 signaling, 260–263
- placing conference participants on hold, 385
- PLAR (private line automatic ringdown), 116
 - configuring, 131–133
- play mode, MOH configuration, 378–379
- plus sign (+) wildcard, 65
- policies, QoS, 45–46
 - H.323 gatekeeper, 53–54
 - IP precedence, 48–49
 - locations, 51–52
 - regions, 49–50
- PortsOutOfService counter, 435
- PortStatus counter, 444
- POTS (plain old telephone service)
 - circuit switched networks, 4
 - call establishment, 7–9
 - endpoints, 9
 - Class 5 switches, 4
 - IECs, 4
 - PBXs, 4–5
 - PCM, 6
 - versus IP telephony, 3
- prefix digits, 116, 121
- pregeneration of ART reports, 416
- prepending access codes to missed calls (Cisco IP Phones), 137–143
- PRChannelsActive counter, 437, 445
- primary CallManager, 397
- PRISpansInService counter, 437, 445
- privacy, 603
- processing
 - call attempts during switchover/switchback, 400
 - CDRs, impact on system performance, 548
 - gateway directory numbers, 551

- processing load, distributing over media resource servers, 341
- Protocol Layer, 30, 348
- Protocol/Aggregation Layer, 269–270
- PSAPs (Public Safety Answering Points), 209
- PSTNs
 - dialing plans, address translation, 59–60
 - fallback routing, configuring, 54
- Publisher databases, 27
- purging CallManager database, 418

Q

- Q.921
 - Layer 2 parameters, 289
 - Layer 3 parameters, 290
- Q931 Translator, 497–498
- QBE (Quick Buffer Encoding), 255
- QoS (quality of service), 45–46
 - admission control, 47–48
 - admissions control
 - H.323 gatekeeper, 53–54
 - IP precedence, 48–49
 - locations, 51–52
 - monthly summary reports (ART), 414–415
 - regions, 49–50
 - reports (ART), 418
 - traffic classification, 46
 - traffic prioritization, 46
- question marks (?), wildcards, 65

R

- range notation, wildcards, 65
- RAS (Registration, Admission, and Status), 297–299
 - automatic gatekeeper discovery, 275
 - bandwidth messages, 305–306
 - call admission control messages, 302–305
 - disengage messages, 308–309
 - information request messages, 309–311
 - location request messages, 306–307
 - registration messages, 299–301
 - support for H.323 endpoints, 264–266
 - terminal/gateway discovery messages, 298–299
 - unregistration messages, 301–302

- reason codes, call forwarding, 561
- Received Calls menu (Cisco IP Phones), 136–137
- records
 - call leg IDs, 517
 - CDRs
 - abandoned calls, identifying, 537
 - accessing from central database, 547–550
 - associated CMR, identifying, 535
 - calls between endpoints, identifying, 536
 - field definitions, 518–525
 - IP phone malfunction, identifying, 538
 - maintaining, 549
 - processing, 550
 - processing, impact on system
 - performance, 548
 - short calls, identifying, 537
 - storage, limitations, 549
 - storage, troubleshooting, 552–553
 - CMRs
 - associated CDRs, identifying, 535
 - field definitions, 532–535
 - maintaining, 549
 - storage limitations, 549
 - fields
 - call leg identifiers, 517
 - data type conversions, 512–514
 - directory numbers, 517
 - duration, 518
 - GCIDs, 515–517
 - partitions, 517–518
 - partitions, 517–518
- recovering failed devices, 397
- recovery objectives after system failure, 390–391
- Redial button, 603
- redialed numbers, adding access codes, 198–199
- redundancy
 - CDR data storage, 507–508
 - clustering, fully meshed topologies, 28
 - comparing traditional telephone systems and Cisco AVVID IP Telephony, 26–27
 - CTI API, 582
 - in Cisco AVVID IP Telephony architecture, 32–33
 - TAPI/JTAPI, 608
- redundant call processing, 397
- Region Pair Table, objects, 464
- Region Table, objects, 463
- regions, 49–50
- Registered MGCPGateway counter, 437
- RegisteredAnalogAccess counter, 437
- RegisteredDigitalAccess counter, 437
- RegisteredHardwarePhones counter, 437
- RegisteredOtherStationDevices counter, 437
- registration process, 372
 - Cisco IP Phones, 239–241
 - conference bridge servers, 349
 - conference bridges, 354
 - during active connections, 401–402
 - gateways, 286–288
 - of media processing resources, 330
 - switchover, 397
 - call attempts, 400
 - graceful switchover algorithm, 398
 - immediate switchover algorithm, 398–399
- registration request messages, fields, 299–301
- release 3.0 (Cisco CallManager), 13–14
- release 3.1 (Cisco CallManager), 11, 15
- reliability of Cisco AVVID IP Telephony, 26
- Remote Serviceability tools, 495–496
- remote site survivability, 603–604
- reorder tone, 276
- replacing numbering plans, 215–216
- reports, ART
 - call detail reports, 418
 - call reports, 417
 - gateway reports, 417
 - pregeneration, 416
 - QoS monthly summary reports, 414–415
 - QoS reports, 418
 - system overview reports, 418
 - traffic summary reports, 417
 - user reports, 417
- Resource Allocation Response messages, 340–341
- resources
 - conference
 - architecture, 348
 - Protocol Layer, 348
 - Supplementary Services Layer, 348
 - conference bridges
 - allocating, 350
 - availability, 350
 - configuring, 356–357
 - device control process, 349
 - hardware-based, 350

- DSP, transcoding, 346–348
- media processing, 322–323, 327
 - allocation, 335, 337–339
 - assigning to MRGs, 343–346
 - availability, 359–360
 - availability of conference servers, 353
 - conference servers, default configuration, 353–354
 - conferencing limitations, 355–356
 - controlling allocation of, 333
 - default configuration, 334
 - device registration, 354–355
 - distributing processing load, 341
 - hardware-based, 328–329
 - MOH, 326
 - MRGs, 334–335
 - MTPs, 324–326
 - Null MRGs, 335
 - organizing allocation, 342–346
 - selecting from MRGs, 339–341
 - selecting MRGs from MRGLs, 339
 - software-based, 328–329
 - transcoders, 326
 - Unicast conferencing resources, 323–324
 - Unicast, monitoring, 361–362
- MRM, allocating, 317
- restrictions on conference participation, 352
- Resume soft key, 595–596
- roughly, 408
- route filters, 62–64, 87–88, 92–95
 - 7-digit dialing, 99
 - for North American numbering plan, 95–96
 - 10-digit dialing, 98–99
 - blocking 900 numbers, 99–102
 - blocking long distance carrier selection, 96
 - blocking international calls, 96
 - elimination of interdigit timing, 99
 - metro dialing, 97–98
 - routing only local numbers, 96–97
 - routing toll-free numbers, 99
- INTERNATIONAL-ACCESS-DOES-NOT-EXIST, 96
- length limitations, 88
- LOCAL-AREA CODE tag, 97
- toll-free numbers, 99
- wildcards, 64–65
- route groups
 - 911 routing configuration, 211
 - assigning gateways to, 150–151
 - assigning to route lists, 152–154
 - behavior, 147–150
- route lists, 62
 - 911 routing configuration, 211
 - behavior, 147–150
 - route groups, assigning to, 152–154
- Route Pattern Configuration screen, 60–61
- Urgent Priority check box, 80
- route patterns, 62–64. *See also* translation patterns
 - . wildcard, 87
 - @ wildcard, 86–87
 - called party transformations, 155–156
 - calling party transformations, 155–156
 - closest matching patterns, troubleshooting, 223
 - constraining, 95
 - destinations, selecting, 66–67
 - examples, 67
 - closest match routing, 70–72
 - simple call routing, 68–69
 - wildcards matching multiple digits, 72–75
 - filtering, 92–95
 - operators, 90–91
 - partitions, 159
 - tags, 88–90
 - urgent calls, 79–80
 - versus translation patterns, 128
 - wildcards, 64–65
- routing
 - by class of calling user, case study, 177–182
 - by geographic location, case study, 183–196
 - by organization, 156
 - by security, 157
 - outbound calls, 203–204
 - over a specific gateway, 203–204
- routing loops, troubleshooting, 223–224
- RQNT (notification request) command (MGCP), 283
- RSIP (restart in progress) command (MGCP), 283

S

- sample U.K. dialing plan, 80–81
- saving traces to file, 425
- scalability of CallManager, 23–26
- schedule-time switchback algorithm, 399
- screening indicator field, specifying value of, 111
- SDI tracing, 423–424
- SDL (Signal Distribution Layer), 13
- SDL (Specification and Description Language), 11
- SDL tracing, 424
- security
 - authorization codes, implementing, 199–202
 - Cisco CallManager Serviceability, user authentication, 421
- selecting
 - media processing resources, 329
 - MOH server as audio source file destination, 377
 - MRGs from MRGLs, 339
 - resources from MRGs, 339–341
 - route pattern destinations, 66–67
- Selsius-CallManager 1.0, 11–12
- servers
 - Cisco-certified for CallManager installation, 15–17
 - clustering, 10
 - conference servers
 - availability, 353
 - default configuration, 353–354
 - registration with CallManager, 349
 - deployment within clusters, 33
 - 10,000 users or more, 36, 39
 - 2500 to 5000 users, 36–37
 - 2500 users or less, 34–36
 - 5000 to 10,000 users, 36, 38
 - MCS-7825-800, 16
 - media resource, distributing processing load, 341
 - MOH, 326
 - audio source, 374, 376
 - Audio Translator, 376–377
 - capabilities summary, 380
 - complex configurations, 385–386
 - configuring, 374–376
 - configuring with Cisco CallManager Administration, 382–385
 - counters, 449
 - default configuration, 385
 - hold types, 383
 - initial configuration, 385
 - initialization, 379
 - multicast configuration, 380–381
 - performance counters, 381–382, 387–388
 - placing conference participants
 - on hold, 385
 - service parameters, 377
 - stream connection errors, 379
 - stream source selection process, 383
 - TFTP, counters, 451–452
 - time-matching, 423
 - trace configuration, 425
 - Unicast conference, 323
- service calls, 219–220
- service parameters
 - Call Forwarding-related, 563–564
 - Call Park, 567
 - call waiting-related, 570
 - CallDiagnosticsEnabled, 506–507
 - CDR database-related, 508
 - CDR data-related, 505
 - CdrEnabled, 506
 - CdrLogCallsWithZeroDurationFlag, 506
 - CDRMoveIntervalInSeconds, 509
 - Cisco WebAttendant, 579
 - CLID-related, 571
 - CMI, 170
 - controlling silence suppression, 321
 - dialing transformations, 110
 - CgpnScreeningIndicator, 111
 - MatchingCgpnWithAttendantFlag, 111–112
 - NumberingPlanInfo, 113–114
 - OverlapReceivingForPriFlag, 112–113
 - StripPoundCalledPartyFlag, 113
 - UnknownCallerID, 113
 - MOH server-related, 377
 - StatisticsEnable, 434
 - Tone on Hold, 608
 - voice messaging, 171
- services, Cisco IP Phones, 248
- session establishment, 7
- set notation, wildcards, 65
- setting up CallManager database with BAT, 408–409

- settings button (Cisco IP Phones 7910/7940/7960), 604–606
- shared line appearances, 231
- short calls, identifying associated CDR, 537
- sign bit, 511
- Signal Distribution Layer, 13
- signaling
 - call legs, 322
 - H.225, 260–263, 273
 - intracluster communication, 32
 - MGCP, 283
- signaling layers
 - Call Control Layer, 269, 315–317
 - MCL, 330–331
 - transcoding DSP resources, 346–348
 - Media Control Layer, 269, 315–317
 - Protocol/Aggregation Layer, 269–270
- signed integer values, converting to IP addresses, 512–514
- silence suppression, 320–321
- simple call routing, 68–69
- single-site topology, 40–41, 285–286
- Skippy Client Control Protocol. *See* Skippy Protocol
- Skippy Protocol, 233
 - devices, 108, 234
 - voice message box management, 172
- SNMP (Simple Network Management Protocol)
 - MIBs, 458–461
 - Cisco-CCM-MIB, 460–485
 - downloading, 460
 - notification MIBs, 492–493
 - SYSAPPL-MIB, 493–494
 - traps, 459
 - enabling/disabling, 485–486
 - receivers, configuring, 485
- soft keys
 - CFwdAll, 562–564
 - Cisco IP Phones, 253
 - Confrn, 357, 580–582
 - End Call, 592
 - New Call, 602
 - Resume, 595–596
- SoftPhone, 237
- softswitches, 9–10
- software applications
 - Unicast conference bridges
- software-based conference bridges
 - large conference support, 352
 - Unicast conference bridges, 324, 357
- software-based media processing resources, 328–329
- software-based MTPs, 325–326
- source 51, 327
- speakerphones, 606
 - Cisco IP Phone 7935, 18
- Specification and Description Language, 11
- specifications
 - Cisco-certified Compaq servers, 17
 - Cisco MCS-7825-800 server, 16
 - H.323, 259
- specifying
 - directory path for MOH audio source file, 377
 - value of screening indicator field, 111
- speed dialing, 606–607
 - Redial button, 603
- spreadsheets, creating CSV files for bulk transactions, 410–412
- SQL database, accessing tables, 547
- stages of call routing, 105–107
- StartTime counter, 442–443, 451–453
- state machines, 31
 - intracluster communication, 32
- station devices, 18–19, 108, 229–231
 - H.323 endpoints, 258
 - configuring, 259
 - gatekeeper functionality, 259
 - RAS protocol support, 264–266
 - multiple line appearances, 232
 - shared line appearances, 231
 - supported by Cisco CallManager, 229–230
 - TFTP functionality, 266–267
- StatisticsEnable service parameter, 434
- stored calls (Cisco IP Phones), prepending access codes, 136–143
- storing database records
 - central database, 507–508
 - data types, 511–513
 - system limitations, 549
 - troubleshooting, 552–553

- streaming
 - availability for conferencing, 360
 - Cisco Media Streaming App, counters, 441–442
 - failure signals, reporting, 402
 - fixed data sources for MOH servers, 376
 - H.323, 281–282
 - logical channels, 318, 331–332
 - MOH audio sources, 374
 - connection errors, 379
 - continuous play mode, 378
 - music stream source assignments, order of precedence, 386
 - one shot play mode, 379
 - MTPs, 322, 324–325
 - hardware-based, 326
 - software-based, 325–326
 - transcoders, 326
 - voice data streams, 319–320
 - stripping # from digit string, 113
 - StripPoundCalledPartyFlag service parameter, 113
 - subscriber databases, 27
 - substituting numbering plans, 215–216
 - Supplementary Services Layer, 31, 348
 - supported client devices, 21–22, 107–108
 - station devices, 108
 - trunk devices, 108–109
 - suppressing outside dial tone, 85
 - switchback, 397
 - algorithms, 399–400
 - call attempts, 400
 - guard timers, 400
 - switchover, 397
 - call attempts, 400
 - graceful switchover algorithm, 398
 - immediate switchover algorithm, 398–399
 - SYSAPPL-MIB, 493–494
 - Syslog Analysis tools, 457
 - system administrator
 - controlling media resources, 333
 - MRGLs, 338
 - MRGs, 335–337
 - MRM, 339
 - maintaining CDR/CMR records, 549
 - system failure
 - call preservation, 388–390
 - Cisco CallManager-to-device communication handling, 393
 - endpoints, handling, 393
 - failed devices, recovering, 397
 - media processing devices, handling, 392–393
 - node failure, handling, 391–392
 - recovery objectives, 390–391
 - system overview reports (ART), 418
 - system parameters, H.323 gatekeepers, 279–280
-
- ## T
-
- T1ChannelsActive counter, 438, 445
 - T1SpansInService counter, 438, 445
 - tables (SQL database), accessing, 547
 - tags, 88–90
 - AREA-CODE, 97
 - INTERNATIONAL ACCESS, 96
 - LOCAL-AREA-CODE, 97
 - TAPI, 254–256
 - redundancy, 608
 - TAPS (Tool for Auto-Registered Phones Support), 412, 618
 - TCD (Telephony Call Dispatcher) service, 452
 - TCP (Transmission Control Protocol), CallManager communication, 30
 - Telealue (TLA), 76
 - terminal endpoints, 229
 - Terminal Services Client, 456
 - terminal/gateway discovery messages, H.225 RAS, 298–299
 - terminating endpoints, 331
 - Text data type (XML), 250
 - TFTP servers
 - counters, 451–452
 - functionality for station devices, 266–267
 - third-party applications, call forwarding, 565
 - time-matching Cisco CallManager devices, 423
 - timers
 - ISDN, 288
 - Q.921 Layer 2, 289
 - Q.921 Layer 3, 290
 - TLA (Telealue), 76

- toll bypass, 60
 - External Route Plan Wizard, 183
 - fallback, 188
- toll restriction, 60, 156
- toll-free numbers, 99
- Tone on Hold, 385, 608
- ToneOnCallForward service parameter, 564
- tools
 - ART, 413
 - alerts, 419
 - call detail reports, 418
 - call reports, 417
 - gateway reports, 417
 - pregeneration of reports, 416
 - QoS monthly summary reports, 414–415
 - QoS reports, 418
 - system overview reports, 418
 - traffic summary reports, 417
 - user reports, 417
 - BAT, 407–408
 - adding users with CSV files, 410–412
 - goal of using, 408
 - managing established CallManager systems, 409
 - misconfiguration, 408–409
 - setting up CallManager database, 408–409
 - TAPS (Tool for Auto-Registered Phones Support), 412
 - CallManager Serviceability, 419–421
 - alarm configuration, 421
 - AST, 431–434
 - component version information, displaying, 431
 - Control Center, 431
 - SDI tracing, 423–424
 - SDL tracing, 424
 - Trace Analysis, 428–430
 - Trace Collection, 431
 - trace configuration, 425–427
 - viewing alarm definitions, 422
 - CiscoWorks2000, 456
 - PathTool, 458
 - Syslog Analysis tools, 457
 - Microsoft Event Viewer, 454–455
 - Remote Serviceability, 495–496
 - Terminal Services Client, 456
- topologies, deployment strategies
 - CallManager clusters, 285–286
 - combined multiple-site model, 45
 - multiple-site model
 - with centralized call processing, 45
 - with distributed call processing, 42–44
 - with independent call processing, 42–43
 - single-site model, 40–41
- TotalActiveCalls counter, 453
- TotalActiveLines counter, 453
- TotalCalls counter, 453
- TotalChangeNotifications counter, 451
- TotalClients counter, 453
- TotalCtiRoutePoints counter, 453
- TotalIdleLines counter, 453
- TotalLines counter, 453
- TotalNumberOfConferences counter, 451
- TotalNumberOfConnections counter, 443
- TotalNumberOfStreams counter, 443, 450–451
- TotalOnlineClients counter, 453
- TotalRedirectedCalls counter, 453
- TotalRegisteredClients counter, 454
- TotalSegmentsAcknowledged counter, 451
- TotalSegmentsSent counter, 451
- TotalTftpRequests counter, 451
- TotalTftpRequestsAborted counter, 451
- TotalTftpRequestsLocal counter, 451
- TotalTftpRequestsNotFound counter, 452
- TotalTftpRequestsOverFlow counter, 452
- tracing
 - customization, 425
 - effect on performance, 424, 430
 - filtering, 429–430
 - device-based, 425
 - SDI, 423–424
 - ISDN Layer 3 protocol messages, filtering, 497
 - SDL, 424
 - time-matching on Cisco CallManager devices, 423
- traditional telephone networks
 - circuit-switched, 4
 - call establishment, 7–9
 - endpoints, 9
 - Class 5 switches, 4

- comparing to IP telephony, 3–7
 - IECs, 4
 - key systems, 3
 - packet-switched, codecs, 6–7
 - PBXs, 4–5
 - PCM, 6
 - redundancy, 26–27
 - traffic
 - classification, 46
 - prioritization, 46
 - summary reports (ART), 417
 - TranscoderOutOfResources counters, 438
 - TranscoderResourceActive counter, 438
 - TranscoderResourceAvailable counter, 438
 - transcoding, 19, 286, 322, 326
 - as alternative to codecs, 367
 - availability, 368–372
 - configuring, 372–373
 - DSP resources, 346–348
 - logical connection between IP Phones, 332
 - mixed-mode conferences, 350
 - MOH audio sources, 376–377
 - performance counters, 373
 - registration during active connection, 401
 - Transfer button (Cisco IP Phone 12SP+), 609
 - transferred calls, example, 539–543
 - transformations, 102–103s
 - called party transformations, 104
 - masking, 109
 - on terminating device, 122–126
 - service parameters, 110
 - CgpnScreeningIndicator, 111
 - MatchingCgpnWithAttendantFlag, 111–112
 - NumberingPlanInfo, 113–114
 - OverlapReceivingForPriFlag, 112–113
 - StripPoundCalledPartyFlag, 113
 - UnknownCallerID, 113
 - TRANSIT-NETWORK-ESCAPE tag, 96
 - TRANSIT-NETWORK-ESCAPE tags, 96
 - Translation Pattern Configuration screen, 63
 - translation patterns, 62, 126–128
 - calling search space, 128
 - dialing alias, configuring, 129–130
 - hotlines, 131–133
 - mapping public phone numbers to internal numbering scheme, 133–136
 - mapping public phone numbers to private numbering scheme, 133–136
 - troubleshooting, 224
 - versus dialing transformations, 102
 - versus route patterns, 128
 - traps, 459
 - receivers, configuring, 485
 - troubleshooting. *See also* tracing
 - call delays, 222
 - call routing loops, 223–224
 - CDR storage, 552–553
 - Cisco IP Phone failure, 538
 - closest matching patterns, 223
 - digit discarding instructions, 223
 - early application of outside dial tone, 222
 - geographical routing, 184–187
 - H.323 gateways, 312
 - late application of outside dial tone, 221–222
 - MGCP gateways, 311–312
 - outside dial tone, 84
 - translation patterns, 224
 - trunk cards, 7
 - trunk devices, 108–109
 - H.323, 291
 - type of service field (802.1Q packets)
 - packet classification, 48–49
- ## U
-
- UDP (User Datagram Protocol), CallManager communication, 30
 - umbrella specifications, H.323, 272–273
 - unicast conference bridges, 20, 323
 - hardware-based, 324
 - software-based, 324
 - unicast conferencing, 610
 - UnicastHardwareConferenceActiveParticipants counter, 438
 - UnicastHardwareConferenceCompleted counter, 439
 - UnicastHardwareConferenceOutOfResources counter, 439
 - UnicastHardwareConfResourceActive counter, 438
 - UnicastHardwareConfResourceAvailable counter, 438
 - UnicastSoftwareConferenceActiveParticipants counter, 439

- UnicastSoftwareConferenceCompleted counter, 439
- UnicastSoftwareConferenceOutOfResources counter, 440
- UnicastSoftwareConfResourceActive counter, 439
- UnicastSoftwareConfResourceAvailable counter, 439
- unified messaging systems
 - CMI, 169–170
 - delivering voicemail to correct mailbox number, 172–174
 - interaction with calling search spaces, 168–177
 - non-SMDI, service parameters, 171
- UNIX, comparing grep(1) to route patterns, 65–66
- UnknownCallerID service parameter, 113
- UnknownCallerId service parameter, 571
- UnknownCallerIdFlag service parameter, 571
- UnknownCallerIdText service parameter, 571
- unregistration messages, field definitions, 301–302
- unregistration process
 - IP Phones, requirements for, 401
 - switchback, 397
 - algorithms, 399–400
 - guard timers, 400
- updating
 - CCM MIB extension agent, 459
 - CDP MIB extension agent, 460
 - established CallManager systems, 409
- upgrading firmware, 587
- uptime-delay switchback algorithm, 400
- urgent route patterns, 79–80
- user authentication, 421
- User hold, 383
- User Hold Stream Source (MOH), 386
- user reports (ART), 417
- user restrictions
 - configuring, 178–179
 - lobby phones, configuring, 180–181
- UUIE (user-user information element), 291

V

- VAD (voice activity detect), 320–321
- variable-length numbering plans, 76
 - overlapped sending, 76–78
 - urgent route patterns, 80
- Version counters, 454

- VICs, blades, 19
- viewing
 - alarm definitions (Cisco CallManager Serviceability), 422
 - descriptions of counters, 434
 - SNMP MIBs, end user interface, 459
- virtual endpoint determination, 58
- visual ring indicator, 611
- voice codecs, 318–319
 - bandwidth consumption, 320
 - encoding, 6–7
- Voice Message Box field (Directory Number Configuration screen), 172–174
- voice streams, 319
 - transcoding, 322
- voice-messaging systems
 - delivering to correct mailbox number, 172–174
 - message waiting indicator, 174–177
 - non-SMDI, service parameters, 171
 - SDMI, 169
- VoIP, logical channels, 318

W

- WebAttendant, longest idle support, 578
- white noise, 321
- wideband stereo codec (Cisco IP Phone 79xx), 611
- wideband voice codecs, bandwidth consumption, 320
- wildcards, 64–65
 - ! (exclamation point), 65
 - ? (question mark), 65
 - . (period), 87
 - + (plus sign), 65
 - @, 64, 86–87
 - multiple digit matches, 72–75
 - range notation, 65
 - set notation, 65
 - X wildcard, 65
- Windows 2000 services for Cisco IP Telephony, 17–18
- Windows 2000 Administrative Tools, Microsoft Performance, 494–495
- wizards, 588
 - external route plan wizard, 592

X-Z

- X wildcard, 65
- XFER button (Cisco IP Phone 30VIP), 609
- XML data types (Cisco IP Phones), 249–252
- XML-formatted traces, 425
- xNTPD (Network Time Protocol Daemon),
 - time-matching CallManager-related devices, 423

- zero duration calls, CDRs, 537
- zip tones, 583