



## Numerics

---

- 2B (two bearer) channels, 91
- 3GPP (3rd Generation Partnership Project), 36–37
  - publications, 601
  - SSNs, 248

## A

---

- “A” party, 6, 189
  - synchronization with B party, 14
- Abort messages (TCAP), 292–293
- access facilities, PSTN, 87–95
- access links, 64
- access signaling, 6
- Access Tandem (AT), 84
- ACM (Address Complete Message), 188, 204
- ACQ (All Call Query), 210
- ActivateSS operation (MAP), 396
- activateTraceMode (MAP), 391
- Active PIC, 338
- Address Complete message (ISUP), 525
- address signaling, 11
  - DTMF, 11–12
  - MF, 16–17
- Adjunct
  - in IN CS-X/AIN, 329
  - versus SCP, 314
- AERM (Alignment Error Rate Monitoring), 131
- AI (Address Indicator), 253–254
- AI (Address Information) field (CgPA/CdPA), 257
- AIN (Advanced Intelligent Network), 311, 323.
  - See also* AIN 0.2
  - Adjunct, 329
  - AIN 0, 332
  - AIN 0.1, 317, 333
  - AIN CS-1, 317
  - AIN CS-2, 317
  - call state models, 323
    - DP, 324–326
    - originating call half, 327
    - PIC, 323
    - terminating call half, 327
  - INCM, 330–331
  - IP, 329
  - SCE, 330
  - SCP, 329
  - SMS, 330
  - SSP, 329
  - standards, 318
- AIN 0.2, 311, 336
  - OBSCM, 338
    - PICs, 338
    - TDPs, 339
    - triggers, 339–342
  - SCP, call control messages, 345
  - TBSCM, 342
    - PICs, 342–343
    - triggers, 343–345
  - Time Of Day routing service, 346
- AIN CLASS provideValue message, 624
- air interface (GSM), 372
- Alerting PIC, 338
- alias Point Code routing, 148
- alignment, links, 607
- alternate access links, 67
- analog line signaling, PSTN, 89
- Analyze Information PIC, 338
- Analyzed Information TDP, 339
- ANM (Answer message), 188, 205
- ANSI (American National Standards Institute), 37–38, 602
  - cause values, 637–640
  - cluster routing, 147
  - ISUP timers, 563–570
  - national Point Codes, 137–139
  - operation codes, 297–299
  - package types (TCAP), 270
  - parameters, 299–305
  - protocols, comparing to ITU-T protocols, 595–597
  - routing labels, 143
  - SLS, 150
  - TCAP messages, 293
    - Conversation, 295
    - Protocol Abort, 296
    - Query, 294
    - Response, 295
    - Unidirectional, 293

User Abort, 296  
 transactions, 275  
 ANSI Dialogue, 282  
 ANSI MAP. *See* MAP  
 ANSI-41D, map operations, 553–555  
 Answer message (ISUP), 525  
 APDUs (Application Protocol Data Units), 280–281  
 Application Errors (TCAP), 289  
 Application Transport message (ISUP), 525  
 architecture  
   of NGNs, 405–406  
   of SCCP, 229  
     comparing SCOC and SCLC, 231  
     connectionless service protocol classes,  
       232–233  
     connection-oriented protocol classes, 233  
     messages, 236–244  
     NSDUs, 232  
     SCLC, 234  
     SCOC, 234–235  
     user data, 232  
 AS (Application Server), 414  
 ASP (Application Server Process), 415  
 ASPSM messages (M3UA), 425–427  
   MGMT messages, 426  
   RKM messages, 427  
 associated signaling, 22, 68, 72  
   ISUP, 185  
 AT (Access Tandem), 84  
 ATIS (Alliance for Telecommunications Industry  
   Solutions), 40  
 atomic values, 284  
 AuC (Authentication Center), 371  
 Authorization parameter (ANSI), 305  
 Authorize Call Setup PIC, 338  
 Authorize Origination Attempt PIC, 338  
 Authorize Termination Attempt PIC, 342  
 Automatic Callback, 272  
 Automatic Code Gap Indicators parameter  
   (ANSI), 300  
 availability, MTP3 management messages, 458  
 awaiting ACM timer, 207  
 awaiting address complete timer (ISUP), 190  
 awaiting answer timer (ISUP), 190  
 awaiting continuity timer (ISUP), 190

## B

“B” party, 6, 189  
   synchronization with A party, 14  
 backward signals, 14  
 basic call model (BCM), 628  
 basic error correction, 118–123  
 BCM (basic call model), 628  
 Bearer Capability Requested parameter (ANSI), 303  
 Bearer Capability Supported parameter (ANSI), 304  
 Begin messages (TCAP), 291  
 Bellcore specifications, 38  
 bit removal, 115  
 bit stuffing, 115  
 Blocking Acknowledgement message (ISUP), 525  
 blocking messages (ISUP), 223, 525  
 blue boxes, 20  
 BOF (Birds of a Feather) session of 1998, 407  
 BRI (Basic Rate Interface), 91  
 bridge links, 65  
 BSC (Base Station Controller), 370  
 BSI (British Standards Institute) standards, 40, 603  
 BSS (Base Station Subsystem), 363  
 BSSAP (Base Station Subsystem Application  
   Part), 375  
 BSSMAP (Base Station Subsystem Management  
   Application Part), 375  
 BTNR (British Telecom Network Requirements)  
   standards, 603  
 BTS (Base Transceiver Station), 370  
 Business Group Parameter parameter (ANSI), 304

## C

C5 (CCITT Signaling System No. 5), 57  
 C6 (CCITT Signaling System No. 6), 57  
 cadence, 14  
 Call Accepted TDP, 344  
 call control  
   messages, AIN 0.2 SCP, 345  
   role of TCAP in, 269  
 Call Forwarding, 218, 220  
 Call Forwarding Status parameter (ANSI), 301

- call handling (MAP), 393–394
  - provideRoamingNumber messages, 395
  - sendRoutingInfo messages, 394
- call phase (subscriber signaling), 7
- call processing, 100
  - ISUP, 206
    - call release, 208
    - call setup, 206–208
    - terminal portability, 208
  - PSTN, 99
- Call Progress message (ISUP), 525
- Call Reference parameter (ANSI), 305
- call release, ISUP, 188–189, 205–208
- call screening, 189
- call setup, 102
  - ISUP, 188, 200, 206–208
- call state models (AIN/IN CS)
  - AIN/IN CS, 323, 327
  - DP, 324–326
    - EDP, 325–326
    - TDP, 324–327
  - PIC, 323
- call waiting, Internet call waiting, 51
- called address sending tests (ISUP), 503
- Calling Party's Category, ISUP messages, 202
- cancelLocation operation (MAP), 386
- carrier switches, 84
- CAS (Channel Associated Signaling), 15
  - address signals, 16–17
  - limitations of, 20–21
  - supervisory signals, 18
    - digital, 20
    - SF, 18–20
- cause values, 637–640
- CC (Connection Confirm) messages, 240
  - parameters, 241
- CCAF (Call Control Agent Function), 332
- CCBS (Call Completion to a Busy Subscriber), 272, 393
- CCF (Call Control Function), 332
- CCITT (Consultative Committee for International Telegraph and Telephone)
  - Blue Book, 58
  - R1/R2, 56
  - yellow book recommendations, 57
- CCS (Common Channel Signaling), 10, 21, 183
  - associated mode, 22
  - circuit-related signaling, 22
  - non-associated mode, 24
  - non-circuit related signaling, 22
  - quasi-associated mode, 23
- CdPA (Called Party Address), 253–258
- CdPN (Called Party Number), 203, 207
- CEIR (Central Equipment Identity Register), 390
- cellular 911, 46
- cellular networks, SIM, 52
- cellular structure of GSM, 364
- Central Office (CO), 87
  - PSTN, 97–103
- CgPA/CdPA (Calling Party Address/Called Party Address), 253–258
  - AI, 253–254
  - AI field, 257
  - ES field, 256
  - NAI field, 257
  - NP field, 256
  - TT, 254
- Charge Information message (ISUP), 527
- Check RTB Full Test (MPT 2), 492
- CIC (circuit identification codes), 150
  - ISUP, 190–191
- circuit glare, resolving, 194–195
- Circuit Group Blocking Acknowledgement message (ISUP), 526
- Circuit Group Blocking message (ISUP), 525
- Circuit Group Query Response message (ISUP), 526
- Circuit Group Reset Acknowledgement message (ISUP), 526
- Circuit Group Reset message (ISUP), 526
- Circuit Group Unblocking Acknowledgement message (ISUP), 526
- Circuit Group Unblocking message (ISUP), 526
- Circuit Identification Code (CIC), 150
- Circuit Identification Code parameter (ANSI), 305
- Circuit Group Query, 526
- circuit related signaling, 22
- Circuit Reservation Acknowledgement message (ISUP), 526
- Circuit Reservation Message message (ISUP), 526
- circuit rest (ISUP), maintenance messages, 223–224
- circuit supervision, 7
- circuit suspend and resume (ISUP), 208
- Circuit Validation Response message (ISUP), 527
- Circuit Validation Test message (ISUP), 527

- circuits
  - testing, ISUP, 196–197
  - validation, 222
- Cisco SLTs, 445–448
- CLASS (custom local area signaling services), 47
- clear-down phase (subscriber signaling), 7
- CLECs (Competitive LECs), 85
- CLI (Calling Line Identification), 217
- click-to-dial applications, 51
- cluster routing, 147
- CNAME (calling name), 47
- CO (Central Office), 87
  - networks, 97–103
- Collect Information PIC, 338
- Collected Information TDP, 339
- combined linksets, 60
- comparing
  - ANSI and ITU-T protocols, 595–597
  - M2PA and M2UA, 441
- compatibility testing, 475
- Competitive LECs (CLECS), 85
- Component IDs, 278
- component sublayer (TCAP), 270
  - Protocol Error handling (TCAP), 289
- components, 276
  - Component IDs, 278
  - Invoke, 276–277
  - Invoke and Return Result, 277
  - Operation Codes, 278
  - parameters, 279–280
  - Return Result, 277–278
- concerned subsystems, 261
- Confusion message (ISUP), 527
- Congestion Abatement tests (MPT 2), 495
- Connect message (ISUP), 527
- Connection Establishment Phase (SCOC), 235
- Connection Release Phase (SCOC), 235
- Connectionless messages (SUA), 432
- connectionless service protocol classes (SCCP), 232–233
- Connection-oriented messages (SUA), 432–433
- connection-oriented protocol classes (SCCP), 233
- connections
  - call processing, 101
  - PSTN, 87–95
- constructors (TCAP messages), 284
- Continue messages (TCAP), 292
- Continuity Check Request message (ISUP), 527
- Continuity Indicators field (COT messages), 203
- Continuity message (ISUP), 527
- continuity testing, ISUP, 196–197
  - maintenance messages, 222
  - tandem node processing, 213
- Conversation messages (ANSI TCAP), 295
  - ITU versus ANSI, 271
- correlating Distributed Functional Plane and Physical Plane in INCM, 331
- corrupt LSSU validation testing (MPT 2), 485
- COs (central offices), 6
- COT (Continuity) message, 188, 203
- CPE (Customer Premises Equipment), 91
- CQM (Circuit Query Message), 221
- CQR (Circuit Query Response) message, 221
- CR (Connection Request) messages, 240
  - parameters, 240
- CREF (Connection Refused) messages
  - parameters, 241
- cross links, 65
- CS-1, 333–335
- CS-2, 336
  - OBCSM, 338
  - PICs, 338
  - TDPs, 339
  - triggers, 339–342
- TBCSM, 342
  - PICs, 342–343
  - triggers, 343–345
- CS-X, 323
  - Adjunct, 329
  - call state models, 323
    - DP, 324–326
    - originating call half, 327
    - PIC, 323
    - terminating call half, 327
  - INCM, 330–331
  - IP, 329
  - SCE, 330
  - SCP, 329
  - SMS, 330
  - SSP, 329
- Customer Premises Equipment (CPE), 91
- Customized Announcement parameter (ANSI), 300
- cut through, 102

**D**


---

DAC (Digital Access and Cross-Connect), 105  
 Data Transfer Phase (SCOC), 235  
 DDD (direct distance dialing), 10  
 deactivateTraceMode message (MAP), 392  
 deleteSubscriberData operation (MAP), 390  
 Destination Point Code (DPC), 135–136  
 development  
   of IN, 317–319  
     AIN 0.1, 317  
     AIN CS-1, 317  
     AIN CS-2, 317  
     IN/1, 317  
     standards, 318  
   of SS7/C7, 43  
 devices, NT1, 91  
 diagonal links, 66  
 dial pulse, 11  
 dialing, PSTN, 90  
 Dialogues  
   Dialogue Request, 281  
   Dialogue Response, 281  
   ANSI, 282  
   ITU, 280–281  
 digit collection, call processing, 100  
 Digital Access and Cross-Connect (DAC), 105  
 Digital International Switching Centers (DISC), 86  
 Digital Local Exchanges (DLE), 86  
 Digital Main Switching Units (DMSU), 86  
 Digital Signal 0 (DS0), 93  
 digital switches, PSTN CO, 97  
 Digits parameter (ANSI), 300  
 Directory Number to Line Service Type Mapping  
   parameter (ANSI), 302  
 DISC (Digital International Switching Centers), 86  
 disconnections, call processing, 102  
   ISUP, 208  
 discrimination messages, 145–146  
 Distributed Functional Plane (INCM), 331  
 distribution of service data, 314  
 DLE (Digital Local Exchange), 86  
 DMSU (Digital Main Switching Units), 86  
 do-not-call enforcement, 50  
 DP (Detection Points), 323  
   EDP, 325–326  
   TCP, 325

TDP, 324  
   escape codes, 327  
   trigger processing, 326  
 DPC (Destination Point Code), 135–136  
   parameter, 459  
   to CIC association, 191  
 dropback, 211  
 DS0 (Digital Signal 0), 93  
 DT1 (Data Form 1) messages, parameters, 243  
 DTAP (direct transfer application part), 375  
 DTMF (Dual Tone Multi-Frequency), 11–12, 90  
 dual-seizure, 194–195  
 Duration parameter (ANSI), 303  
 Dynamic Address Reconfiguration in SCTP, 413

**E**


---

E800 toll free service, 320  
   SSP/SCP message exchange, 321–322  
 E911 (Enhanced 911), 46  
 early telephone switches, 8  
 EDGE (Enhanced Data rates for GSM  
   Evolution), 36  
 EDP (Event Detection Point), 325–326  
 EIR (Equipment Identity Register), 371  
 EKTS (Electronic Key Telephone Set), 97  
 Element Identifier (TCAP messages), 284  
 elements (TCAP messages), 283  
   constructors, 284  
   Element Identifier, 284  
   Identifier tag, 285  
   layout, 286  
   Length Identifier, 286  
   primitives, 284  
 emergency alignment testing (MPT 2), 484  
 EMS (enhanced messaging service), 49  
 emulation, SS7 test equipment functionality, 477  
 enbloc signaling, 193  
 encoding procedures  
   for TCAP messages, 282–283  
   voice, 90  
 End messages (TCAP), 291  
 End Office (EO) node, 82  
 End Use Errors (TCAP), 289  
 end-to-end signaling, ISUP ISDN  
   internetworking, 215

EO (end office) node, 82  
EOs (end offices), 6  
EraseSS operation (MAP), 396  
error correction, 118  
    basic method, 118–123  
    preventative cyclic retransmission,  
    123126  
error detection, 117–118  
error handling, TCAP  
    of Application Errors, 289  
    of End Use Errors, 289  
    of Protocol Errors, 288–289  
ES (Encoding Scheme) field (CgPA/CdPA), 256  
escape codes, 327  
establishing transaction IDs, 273  
ETSI (European Telecommunication Standard  
Institute), 361  
    ISUP timers, 563–570  
    protocol specification documents, 600–601  
evolution  
    of IN, 317–319  
    of SS7, 57–58  
Exception PIC, 339  
exchanges, 6  
extended links, 67

## F

---

Facility Accepted message (ISUP), 527  
Facility message (ISUP), 527  
Facility Reject message (ISUP), 528  
Facility Request message (ISUP), 528  
Facility Selected and Available TDP, 344  
FACs (Final Assembly Codes), 366–367  
failure detection in SCTP, 411  
fast answer, 204  
fault recovery (MAP), 390–391  
FCI (Forward Call Indicators), 201–202  
FEA (Functional Entity Actions), 331  
fields  
    of ISUP messages, 198–199  
    of SUs, 114  
    routing labels, 143  
files, trace, 607  
FISU (fill-in signal unit), 112  
    MPT2 testing, 482

flow control, 131  
Forced Retransmission tests (MPT 2), 493  
format  
    of MTP3 messages, 140  
    of SIF messages, 142–144  
    of SIO messages, 140–142  
forward signals, 14  
Forward Transfer message (ISUP), 528  
forwardAccessSignaling messages, 388  
forwardCheckSsIndication operation (MAP), 391  
forwardSM message (MAP), 398  
fraud, susceptibility of CAS, 20  
freephone, 45  
fully associated links, 67

## G

---

Gateway Mobile Switching Center (MSC), 614  
Generic Name parameter (ANSI), 305  
generic PSTN hierarchies, 82  
generic service interface (TCAP), 268  
GGSN (Gateway GPRS Support Node), 372  
glare, 13  
    resolving, 194–195  
Global Functional Plane (INCM), 331  
Global Title Translations (GTT), 136  
ground start signaling, 13  
groups, trunks, 101  
GSM (Global System for Mobile  
communications), 361  
    cellular structure of, 364  
    interfaces and protocols, 372–374  
        BSSAP, 375  
        MAP, 376–377  
    map operations, 549–553  
        forwardSM, 616  
    mobility management, 378  
        location updating, 378  
        MTC, 379–380  
    network architecture, 363–365  
        AuC, 371  
        BSC, 370  
        BSS, 363  
        BTS, 370  
        EIR, 371  
        GGSN, 372

- HLR, 370–371
- MS, 366–369
- MSC, 370
- SGSN, 372
- SIM, 369
- VLR, 371
- Phase1 features, 362
- Phase2 features, 362
- Phase 2+ features, 362–363
- GT (global title) routing, 76, 249
  - CgPA/CdPA, 253–258
  - GTT, 249–252
- GTT (Global Title Translation), 76, 136, 245, 249–252

## H

- H.323, SIGTRAN interworking, 448
- handling messages, 145–153
- handover operations (MAP), 365, 387
  - forwardAccessSignaling, 388
  - prepareHandover, 387
  - prepareSubsequentHandover, 389
  - processAccessSignaling, 388
  - sendEndSignal, 387
- head-of-line blocking, 410
- hierarchies
  - pre-divestiture Bell system, 86
  - PSTN, 82–83
    - United Kingdom, 86
    - United States, 83–86
  - SDH, 93
- history
  - of international telephony standards, 28–29
    - ITU-T, 29–35
  - of signaling, 8
    - CCS, 10
    - DDD, 10
    - early telephone switches, 8
    - IDDD, 10
    - pulse dialing, 9
    - Strowger exchange, 9
  - of SS7, 57–58
- HLR (Home Location Register), 370–371, 383, 607
- Home Location Register (HLR), 607
- hybrid network services, 50
  - click-to-dial applications, 51
  - Internet call waiting, 51
  - location-based games, 52
  - WLAN hotspot billing, 52

## I-J-K

- IAM (Initial Address Message), 188, 200–203
  - signaling indicators, 215–216
- IAM messages, Continuity Check Indicator, 197
- IDDD (international direct distance dialing), 10
- Identification Request message (ISUP), 528
- Identification Response message (ISUP), 528
- Identifier tag (TCAP messages), 285
- IESG (Internet Engineering Steering Group), 41
- IETF (Internet Engineering Task Force), 41
  - documents, 603–604
- ILECS (Incumbent LECs), 85
- IMEI (International Mobile Equipment Identity), 366–367, 389
- implementing screening rules, 457
- IMSI (International Mobile Subscriber Identity), 367–368
- IN (Intelligent Network), 311, 628
  - AIN, standards, 318
  - AIN 0.2, 311
  - CS-1, 333
    - OBSCM, 333–335
  - CS-2, 336
    - OBSCM, 338–342
    - TBSCM, 342–345
  - CS-X, 323
    - Adjunct, 329
    - call state models, 323–327
    - INCM, 330–331
    - IP, 329
    - SCE, 330
    - SCP, 329
    - SMS, 330
    - SSP, 329
  - dependence on SS7 protocols, 317
  - evolution of, 317–319
    - AIN 0.1, 317
    - AIN CS-1, 317
    - AIN CS-2, 317



- IN/1, 317
    - standards, 318
  - IN/1, 319
    - E800 toll free service, 320–322
    - number services, 319
  - ITU recommendations, 318
  - open transactions, 325
  - SCE, 313
    - SIBs, 356–357
    - SLPs, 358
  - SCP versus Adjunct, 314
  - Service Data, 313–314
  - Service Logic, 313
  - services, 315
  - SSP, message exchange with SCP, 312
  - versions of, 312
- IN/1, 319
- E800 toll free service, 320–322
  - number services, 319
  - versus AIN, 321
- INAP (Intelligent Network Application Protocol), 316, 351–353
- requestReportBCSmEvent, 628
  - toll free service, 354
- in-band access signaling, 19
- in-band tone, 19
- INCM (Intelligent Network Conceptual Model), in IN CS-X/AIN, 330–331
- incompatibility of IN service messages, 316
- information elements of Dialogue APDUs, 281
- Information message (ISUP), 528
- Information Request message (ISUP), 528
- Initial Address message (ISUP), 528
- initial alignment procedures, 111
- initial release complete timer (ISUP), 190
- initialization testing (MPT 2), 481–482
- INN (Internal Network Number Indicator), 203
- insertSubscriberData operation (MAP), 390
- integrated STPs, 63
- integration of PSTN/SS7, 103–105
- Integrity parameter (ANSI), 305
- Intelligent Network Query messages, 101
- interfaces, 91
  - in GSM, 372–377
  - SS7 links, 104
- inter-MSC handover, 387
- international Point Codes, 136–137
- International network, 84
- International Signaling Point Code (ISPC), 136
- International Switching Center (ISC), 136, 145
- Internet call waiting, 51
- Internet standards, 41
- InterrogateSS operation (MAP), 396
- interoperability testing, 475
- inter-switch signaling, 6
- Interworking Class cause values, 640
- intraoffice calls, 43
- Invalid Message Class cause values, 639
- invention of Strowger exchange, 9
- Invoke and Return Result component, 277
- Invoke component, 276–277
- IP (Intelligent Peripheral)
  - distributed functional planes, 332
  - in IN CS-X/AIN, 329
- IP Server Process, 415
- IPSC (International Signaling Point Code), 136
- ISC (International Switching Center), 136, 145
- ISDN (Integrated Services Digital Network)
  - BRI, 91
  - internetworking specifications, 213–215
  - PRI, 94
- ISUP (ISDN User Part), 75, 215, 596
  - associated signaling, 185
  - bearers and signaling, 184
  - call processing, 206
    - call release, 208
    - call setup, 206–208
    - terminal portability, 208
  - call release, 188–189, 205–206
  - call setup, 188
  - CICs, 190–191
  - circuit glare, resolving, 194–195
  - circuit testing, 196–197
  - continuity testing, 196
  - disconnected call handling, 208
  - enbloc signaling, 193
  - ISDN internetworking
    - end-to-end signaling, 215
    - specifications, 213–214
- LNP, 209–210
  - ACQ, 210
  - dropback, 211
  - OR, 211
  - QOR, 211
- messages, 187, 525–530
  - ACM, 188, 204

- ANM, 188, 205
  - COT, 188, 203
  - format, 198
  - IAM, 188, 200–203, 215–216
  - maintenance, 220–224
  - optional fields, 198–199
  - REL, 188, 205
  - RLC, 189, 206
  - SAM, 203
  - SUS, 624
  - NOC, 200
  - overlap signaling, 193
  - Q.752 traffic monitoring measurements, 471–472
  - standards, 186
  - supported services
    - Call Forwarding, 218–220
    - CLI, 217
  - tandem node processing
    - continuity testing, 213
    - message processing, 212
  - testing, 500–502
    - called address sending, 503
    - continuity check procedure, 502
    - supplementary services, 504–507
    - timers, 503
  - timers, 189, 563–570
  - unsuccessful call attempts, 189
  - variants, 186
  - ITU (International Telecommunications Union)
    - dialogue, 280–281
    - IN recommendations, 318
    - Q.12xx recommendation, INAP, 353–354
    - TCAP
      - message flows, comparing with ANSI, 271
    - TCAP messages, 290
      - Abort, 292–293
      - Begin, 291
      - Continue, 292
      - End, 291
      - Unidirectional, 290
    - transactions, 275
  - ITU-T (International Telecommunications Union Telecommunication Standardization Sector), 29–35
    - cause values, 637–640
    - ISUP. *See also* ISUP
      - timers, 563–570
      - variants, 186
    - nationalization, 35
    - protocols, comparing to ANSI protocols, 595–597
    - recommendations, 599–600
    - routing labels, 143
    - signaling defined, 5
    - SLS, 150
    - SSNs, 247
    - test specifications, 475
    - testing specifications, 478–479
      - ISUP, 500–507
      - MTP 2, 480–495
      - MTP 3, 496–500
      - SCCP, 507–510
      - TCAP, 511–514
  - IUA (MTP ISDN User Adaptation), 444
  - IXCs (InterExchange Carriers), 83
- 
- ## L
- 
- labels, routing, 143
  - layout of TCAP messages, 286
  - LECs (Local Exchange Carriers), 83
  - Length Identifier (TCAP messages), 286
  - levels, 74
  - LI (length indicator), 116–117
  - LIDB (line information database), 48
  - limitations of CAS, 20–21
  - lines, PSTN, 87–95
  - Link Aligned Ready testing (MPT 2), 486–487
  - links
    - alignments, 607
    - SS7 interfaces, 104
    - Tektronix supporting traffic, 607–633
  - linksets, 60
  - LNP (Local Number Portability), 48, 209, 347–348
    - ACQ, 210
    - dropback, 211
    - OR, 211
    - QOR, 211
  - load sharing, 250
    - messages, 148
    - MTP3, 149
  - local calls, 45

- Local Exchange, 82
- Local Exchange Carriers (LECs), 83
- local loops, PSTN lines, 88
- Local Tandem (LT), 84
- location management operations (MAP)
  - cancelLocation, 386
  - purgeMS, 387
  - sendIdentification, 386
  - updateLocation message, 385
- Location Portability, 348
- location updating, 378
- location-based games, 52
- Look Ahead for Busy Response parameter (ANSI), 305
- Loop Back Acknowledgement message (ISUP), 528
- Loop Prevention message (ISUP), 528
- loop start signaling, 13
- loopback circuit testing, 196–197
- loss of alignment, 117
- LSSUs (link status signal units), 113
- LT (Local Tandem), 84

## M

---

- M2PA (MTP Level 2 Peer Adaptation), 440–441
  - messages, 442–443
  - versus M2UA, 441
- M2UA (MTP Level 2 User Adaptation), 434–435
  - messages, 435–439
- M3UA (MTP Level 3 User Adaptation Layer), 418–420
  - messages, 420–422
    - ASPSM, 425–427
    - SSNM, 423–425
    - transfer, 423
- Main Distribution Frame (MDF), 89
- maintenance messages (ISUP), 220–224
- management messages
  - MTP3, 458
    - DPC parameter, screening, 459
    - OPC parameter, screening, 459
  - SCCP
    - screening, 460
    - security parameters, 461
- Manterfield, Richard, 6
- manual telephone switches, 8
- MAP (Mobile Application Part), 376–377, 383, 607
  - call handling, 393–394
    - provideRoamingNumber messages, 395
    - sendRoutingInfo messages, 394
  - mobility management operations
    - fault recovery, 390–391
    - handover, 387–389
    - IMEIs management, 389
    - location management, 385–387
    - subscriber management, 390
  - operation and maintenance, 391–392
    - ANSI-41D, 553–555
    - GSM, 549–553
  - sendRoutingInfoForSM message, 398–399
  - SMS, 397
  - SMSLforwardSM message, 398
  - supplementary services, 395
    - USSs, 395
- MAP Operation cancelLocation, 610
- MAP Operation provideRoamingNumber, 612
- matrices, switching, 98
- MAUP (MTP2 User Adaptation) messages, 437–439
- MCCs (mobile country codes), 368, 573–588, 590–593
- MDF (Main Distribution Frame), 89
  - PSTN CO, 97
- ME (Mobile Equipment), 366
- members, trunks, 101–102
- Message Waiting Indicator Type parameter (ANSI), 305
- messages. *See also* transactions
  - call control messages from AIN 0.2 SCP, 345
  - discrimination, 145–146
  - IAM, Continuity Check Indicator, 197
  - IN, incompatibility between services, 316
  - ISUP, 187, 525–530
    - ACM, 188, 204
    - ANM, 188, 205
    - COT, 188, 203
    - format, 198
    - IAM, 188, 200–203, 215–216
    - maintenance, 220–224
    - optional fields, 198–199
    - REL, 188, 205
    - RLC, 189, 206
    - SAM, 203
  - tandem node processing, 212

- load sharing, 148
- M2PA, 442–443
- M2UA, 435–437
  - MAUP, 437–439
- M3UA, 420–422
  - ASPSM messages, 425–427
  - MGMT messages, 426–427
  - SSNM messages, 423, 425
  - transfer messages, 423
- MTP, 519–522
- MTP3, 140
  - handling, 145–153
  - management messages, 458–459
  - screening, 458–459
  - SIF, 142–144
  - SIO, 140–142
- Q.931, 543, 546
- SCCP, 236–237, 533–537
  - CC, 240–241
  - connection-oriented, 235–236
  - CR, 240
  - CREP, 241
  - DT1, 243
  - management, 460
  - MF part, 237
  - MV part, 238
  - O part, 239
  - Protocol Class parameter, 232
  - RLC, 242
  - RLSD, 242
  - security parameters, 461
  - UDT, 243
  - UDTS, 244
  - User, 460
- SCMG, 262–263
- SSP/SCP, open transactions, 325
- SUA, 430
  - Connectionless, 432
  - Connection-oriented, 432–433
- TCAP, 271, 290, 293, 539–541
  - Abort, 292–293
  - ANSI Dialogue, 282
  - Begin, 291
  - constructors, 284
  - Continue, 292
  - Conversation (ANSI), 295
  - Element Identifier, 284
    - elements, 283
    - encoding, 282–283
    - End, 291
    - Identifier tag, 285
    - ITU dialogue, 280–281
    - layout, 286
    - Length Identifier, 286
    - primitives, 284
    - Protocol Abort (ANSI), 296
    - Query (ANSI), 294
    - Response (ANSI), 295
    - transactions, 272–280
    - Unidirectional, 290
    - Unidirectional (ANSI), 293
    - User Abort (ANSI), 296
- MF (mandatory fixed) part, SCCP messages, 237
- MF (multi-frequency) signaling, 16–17
- MFC (Multi-Frequency Compelled) signaling, 16
- MG (Media Gateway), 405
- MGC (Media Gateway Controller), 405
- MGMT (Management) messages, 426
- MNCs (mobile network codes), 368, 573–588, 590–593
- Mobile Application Part (MAP), 607
- mobility management operations, 378
  - EMEs management, 389
  - fault recovery procedures (MAP), 390–391
  - handover, 387
    - forwardAccessSignaling message, 388
    - prepareHandover message, 387
    - prepareSubsequentHandover message, 389
    - processAccessSignaling message, 388
    - sendEndSignal message, 387
  - location management
    - cancelLocation message, 386
    - purgeMS message, 387
    - updateLocation message, 385
  - subscriber management, 390
- monitoring
  - SS7 test equipment functionality, 476
- traffic, 461–462
  - benefits of, 463
  - Q.752 measurements, 463–472
- MS (mobile stations), 366
  - IMEI, 366–367
  - IMSI, 367–368

- location updating, 378
- MSISDN, 369
- MSRN, 369
- TMSI, 368
- MSC (Mobile Switching Center), 365, 370, 614
- MSISDN (Mobile Station ISDN), 369
- MSRN (Mobile Station Roaming Number), 369
- MSU (message signal unit), 112
- MTC (mobile terminated call), 379–380
- MTP (Message Transfer Part), 74–75, 519–522
  - Q.752 traffic monitoring measurements, 463–467
  - timers, 557–561
- MTP2, 111
- SUs, 112
  - delimitation, 115
  - error correction, 118–126
  - error detection, 117–118
  - fields, 114
  - FISUs, 112
  - flow control, 131
  - LI, 116–117
  - loss of alignment, 117
  - LSSUs, 113
  - processor outage, 131
  - signaling link alignment procedure, 126–128
  - signaling link error monitoring, 130–131
- Tektronix supporting traffic, 607–633
- testing, 480
  - Check RTB Full tests, 492
  - Congestion Abatement, 495
  - corrupt LSSU validation tests, 485
  - emergency alignment tests, 484
  - FISU tests, 482
  - Forced Retransmission, 493
  - Link Aligned Ready tests, 486–487
  - power up tests, 481–482
  - Set and Clear LPO While Link in Service tests, 488
  - SIO validation tests, 485
- MTP3, 135, 595
  - load sharing, 149
  - management messages, 458–459
  - message formats, 140
    - SIF, 142–144
    - SIO, 140–142

- message handling, 145–153
- Point Codes. See also Point Codes, 139
- testing, 496–497
  - signal message handling, 498–500
  - signaling link management, 497
- multi-homing, SCTP, 412
- MV (mandatory variable) part, SCCP messages, 238

## N

- NAI (Nature of Address Indicator) field (CgPA/CdPA), 257
- national ANSI parameters, 299–305
- national Point Codes
  - ANSI, 137–139
  - ITU-T, 136–137
- National Spare network types, 145
- national standards, 37
  - ANSI, 37–38
  - ATIS, 40
  - BSI, 40
  - IETF, 41
  - NICC, 40–41
  - T1 Committee, 38
  - Telcordia, 38–39
  - TIA/EIA, 39
- nationalization, 35
- NDC (National Destination Code), 369
- network addressing
  - GT routing, 249
    - CgPA, 253–258
    - GTT, 249–252
  - SSN routing, 245–248
    - 3GPP SSNs, 248
    - ITU-T SSNs, 247
- network protection timer, 190, 207
- Network Resource Management message (ISUP), 528
- Network Termination 1 (NT1), 91
- networks
  - ANSI-41D map operations, 553–555
  - architecture
    - ISUP, 75
    - levels, 74
    - MTP, 74–75
    - PCs, 59

- SCCP, 75–76
- signaling modes, 68–70
- TCAP, 76–77
- TUP, 75
- FSM map operations, 549–553
- indicator values, 141
- international, 84
- National, 145
- PSTN
  - access/transmission facilities, 87–95
  - CO, 97–103
  - hierarchies, 83
  - integrating SS7, 103–105
  - next generation, 105
  - timing, 95–97
  - topology, 82
  - United Kingdom hierarchies, 86
  - United States hierarchies, 83–86
- signaling, 6, 15
- SPs, 59
  - linksets, 60
  - routes, 61
  - routesets, 61
  - SCPs, 63
  - signaling links, 60, 64–67
  - SSPs, 63
  - STPs, 62, 70–72
- NGNs (Next Generation Networks), 405–406
- NI (Network Indicator), 145
- NICC (Network Interoperability Consultative Committee), 40–41
- NOC (Nature of Connection Indicators), 200
- nodes
  - EO, 82
  - messages, discrimination, 145–146
  - Point Codes, 136
    - ANSI national, 137–139
    - ITU-T international and national, 136–137
  - Tandem, 82
  - Transit, 82
- non-associated signaling (CCS), 24
- non-circuit related signaling, 7, 22
- Normal Class cause value, 637, 640
- North American Bell System hierarchy, 86
- NP (Numbering Plan) field (CgPA/CdPA), 256

- NSDUs (Network Service Data Units),
  - segmentation, 232
- NSP (Network Service Part), 75, 227
- NSS (Network and Switching Subsystems), 363
- NT1 (Network Termination 1), 91
- number services (IN/1), 319
  - E800 toll free service, 320–322

## O

- O (optional) part, SCCP messages, 239
- O Abandon TDP, 342
- O Answer TDP, 341
- O Called Party Busy TDP, 340
- O Disconnect TDP, 341
- O Midcall TDP, 341
- O No Answer TDP, 341
- O Re-Answer TDP, 341
- O Suspend TDP, 341
- O Term Seized TDP, 340
- OBSCM (Originating Basic Call State Model), 337
  - in IN CS-1/AIN 0.1, 333
  - in IN CS-2/AIN 0.2, 338
    - PICs, 338
    - TDPs, 339
    - triggers, 339–342
- OC (Optical Carrier) units, 94
  - off-hook, 13
  - on-hook, 13
- OPC (Originating Point Code) parameter, 136, 459
- OPDUs (Operational Protocol Data Units), 276
- open transactions, 325
- operation and maintenance (MAP), 391–392
- operation codes (ANSI), 278, 297, 299
- Optical Carrier (OC) units, 94
- optional fields, ISUP messages, 198–199
- OR (Onward Routing), 211
- Orig Null PIC, 338
- originating call half, 327
  - IN CS-1, 333
- Originating Point Code (OPC), 136
- Originating Restrictions parameter (ANSI), 302
- Originating Transaction IDs, 273
- origination, call processing, 100
- Origination Attempt Authorized TDP, 339

Origination Attempt TDP, 339  
 OSS (Operations Support Subsystem), 363  
 overlap signaling, 193  
 Overload message (ISUP), 529

## P

package types (TCAP), 270  
 PAM (Pass Along Method), ISUP end-to-end signaling, 215  
 parameters  
   ANSI, 299–305  
   CC messages, 241  
   CR messages, 240  
   CREF messages, 241  
   DT1 messages, 243  
   of components, 279–280  
   RLC messages, 242  
   RLSD messages, 242  
   SCCP messages, 461  
   UDT messages, 243  
   UDTS messages, 244  
 Partial Reliability, SCTP, 413  
 Pass-Along message (ISUP), 529  
 PBX (Private Branch Exchange), 87  
 PCM (Pulse Coded Modulation), 90  
 PCs (point codes), 59  
 Physical Plane (INCM), 331  
 PIC (Points In Call), 323  
   in IN CS-2 OBCSM, 338  
   in IN CS-2 TBCSM, 342–343  
 Point Codes, 136  
   alias routing, 148  
   ANSI national, 137–139  
   ITU-T international and national, 136–137  
 POP (Point of Presence), 84  
 post-dial delay, 183  
 Precedence Identifier parameter (ANSI), 305  
 pre-divestiture Bell system hierarchy, 86  
 prepareHandover messages, 387  
 prepareSubsequentHandover messages, 389  
 Pre-Release Information message (ISUP), 529  
 Present Call PIC, 343  
 pre-SS7 systems, 56–57  
 preventative cyclic retransmission, 123–126  
 PRI (Primary Rate Interface), 91, 94

primitives, 277, 419  
   TCAP messages, 284  
 Private Branch eXchange (PBX), 87  
 processAccessSignaling messages, 388  
 processor outage condition, 131  
 progression of IN development, 317–319  
   AIN 0.1, 317  
   AIN CS-1, 317  
   AIN CS-2, 317  
   IN/1, 317  
   standards, 318  
 Protocol Abort messages (ANSI TCAP), 296  
 protocol classes (SCCP), 236–237  
   connectionless services, 232–233  
   connection-oriented, 233  
 Protocol Error Class cause values, 639  
 Protocol Errors (TCAP), 288  
   at component sublayer, 289  
   at transaction sublayer, 288  
 protocol stack (SS7), 73  
   ISUP, 75  
   levels, 74  
   MTP, 74–75  
     screening, 457  
   SCCP, 75–76, 227  
     screening, 457  
   TCAP, 76–77, 267  
     component sublayer, 270  
     generic service interface, 268  
     role in call control, 269  
     transaction sublayer, 270  
   TUP, 75  
 protocols  
   in GSM, 372, 374–377  
   ITU-T, comparing to ANSI, 595–597  
 provideRoamingNumber messages, 395  
 proving period, 127–128  
 PRS (Primary Reference Source), 96  
 PSTN (Public Switched Telephone Network), 81  
   access facilities, 87–95  
   CO, 97–103  
   hierarchies, 82–83  
     United Kingdom, 86  
     United States, 83–86  
   next generation, 105  
   SS7 integration, 103–105  
   timing, 95–97

- topology, 82
- transmission facilities, 87–95
- Pulse Coded Modulation (PCM), 90
- pulse dialing, DTMF, 11–12
- purgeMS operation (MAP), 387
- PVNs (Private Virtual Networks), 350–351

## Q

---

- Q.752 Recommendation, traffic monitoring measurements, 463
  - ISUP-related, 471–472
  - MTP-related, 463–467
  - SCCP-related, 468–471
  - TCAP-related, 472
- Q.931 messages, 543, 546
- QOR (Query On Release), 211
- QoS, 44
- quasi-associated signaling, 68
  - ISUP, 185
- quasi-associated signaling (CCS), 23
- Query messages (ANSI TCAP), 294

## R

---

- recommendations, 29
  - ITU Q.12xx, INAP, 351–354
  - Q.752, traffic monitoring measurements, 463
    - ISUP-related, 471–472
    - MTP-related, 463–467
    - SCCP-related, 468–471
    - TCAP-related, 472
- Reference ID parameter (ANSI), 304
- regional standards, 35
  - 3GPP, 36–37
  - 3GPP2, 37
  - ETSI, 36
- registerPassword operation (MAP), 397
- registers, 63
- registerSS operation (MAP), 396
- REL (Release message), 188, 205
- Release Complete message (ISUP), 529
- release complete timer (ISUP), 190
- Release message (ISUP), 529
- releasing transaction IDs, 274

- remotes, 89
- replicate subsystems, 261
- Reset Circuit message (ISUP), 529
- reset operation (MAP), 391
- resolving circuit glare, 194–195
- Resource Unavailable Class cause values, 638–640
- Responding Transaction IDs, 273
- Response messages (ANSI TCAP), 295
- restoreData operation (MAP), 391
- Resume message (ISUP), 529
- Return Result component, 277–278
- Returned Data parameter (ANSI), 303
- ring splash, 14
- ring trips, 90
- ringing, 14
  - PSTN, 90
- RKM (Routing Key Management) messages, 427
- RLC (Release Complete) messages, 189, 206
  - parameters, 242
- RLSD (Released) messages, 242
- roaming numbers, 614
- rotary dialing
  - address signals, 11
  - pulse dialing, 9
- Route Select Failure TDP, 340
- routesets, 61
- routing, 61
  - alias Point Code, 148
  - call processing, 101
  - cluster, 147
  - GT, 76
  - labels
    - ANSI, 143
    - fields, 143
    - ITU-T, 143
  - MTP3, 146
    - route selection, 101
- Routing Context, 416
- Routing Keys, 416–418
- RTP (Release To Pivot), 211

## S

---

- SAM (Subsequent Address Message), 203
- SANC (Signaling Area/Network Code), 137



- SCCP (Signaling Connection Control Part), 607, 75–76, 227, 596
  - architecture, 229
    - comparing SCOC and SCLC, 231
  - message screening
    - management messages, 460
    - security parameters, 461
  - messages, 236–237, 533–537
    - CC, 240–241
    - CR, 240
    - CREF, 241
    - DT1, 243
    - MF part, 237
    - MV part, 238
    - O part, 239
    - Protocol Class parameter, 232
    - RLC, 242
    - RLSD, 242
    - UDT, 243
    - UDTS, 244
  - network addressing
    - GT routing, 249–258
    - SSN routing, 245–248
  - NSDUs, segmentation, 232
  - protocol classes
    - connectionless service, 232–233
    - connection-oriented, 233
  - Q.752 traffic monitoring measurements, 468–471
  - SCLC, 234
  - SCMG, 260
    - concerned subsystems, 260–261
    - messages, 262–263
    - replicate subsystems, 261
  - SCOC, 234–235
    - messages, 235–236
  - SSNs (Sub-System Numbers), 377
  - subsystems, 230
  - testing, 507–510
  - user data, 232
  - User messages, screening, 460
- SCCP Method, ISUP end-to-end signaling, 215
- SCE (Service Creation Environment), 313
  - distributed functional plane, 332
  - IN CS-X/AIN, 330
  - SIBs, 355–357
  - SLPs, 358
- SCLC (SCCP connectionless control), 234
  - versus SCOC, 231
- SCMG (SCCP Management), 260
  - concerned subsystems, 260–261
  - messages, 262–263
  - replicate subsystems, 261
- SCOC (SCCP connection-oriented control), 234–235
  - versus SCLC, 231
- SCPs (Service Control Points), 63
  - AIN 0.2, call control messages, 345
  - distributed functional planes, 332
  - in IN CS-X/AIN, 329
  - messages
    - exchange with SSP, 312
    - open transactions, 325
    - versus Adjunct, 314
- SCRC (SCCP Routing Control), 244
  - network addressing
    - GT routing, 249–258
    - SSN routing, 245–248
- screening
  - MTP3 messages, 458–459
    - DPC parameter, 459
    - OPC parameter, 459
  - SCCP messages
    - management messages, 460
    - security parameters, 461
    - User messages, 460
- SCTP (Stream Control Transmission Protocol), 409
  - Dynamic Address Reconfiguration, 413
  - failure detection, 411
  - head-of-line blocking, 410
  - multi-homing, 412
  - Partial Reliability, 413
- SDH (Synchronous Digital Hierarchy), 93
- segmentation, NSDUs, 232
- Segmentation message (ISUP), 529
- Select Facility PIC, 343
- Select Route PIC, 338
- selection of routes, 101
- Send Call PIC, 338
- sendEndSignal messages, 387
- sendIdentification operation (MAP), 386
- sendRoutingInfo messages, 394
- sendRoutingInfoForSM message (MAP), 398–399
- SEP (Signaling End Point), 146

- Sequence Number parameter (ANSI), 305
- Service Data, 313–314
- Service Information Field (SIF), 142–144
- Service Information Octet (SIO), 140–142
- Service Logic (IN), 313
- Service or Option not Available cause values, 640
- Service or Option Not Implemented Class cause values, 639
- Service or Option Unavailable Class cause values, 638
- Service Plane (INCM), 331
- Service Portability, 348
- Service Provider Portability, 348
- Service Switching Point (SSP), 103
- services
  - AIN 0.2, Time of Day routing, 346
  - IN, 315
  - LNP, 347–348
  - toll free service (INAP), 354
- Session Initiation Protocol (SIP), 105
- Set and Clear LPO While Link in Service testing (MPT 2), 488
- set-up phase (subscriber signaling), 7
- SF (single frequency) signaling, 18–20
- SG (Signaling Gateway), 405, 415
- SGP (Signaling Gateway Process), 415
- SGSN (Serving GPRS Support Node), 372
- short message (SMS), 616
- SIBs (Service Independent Building Blocks), 355–357
- SIF (Signaling Information Field), 140–144
- signal message handling tests (MTP 3), 498–500
- signaling
  - as defined by ITU-T, 5
  - CAS, 15
    - address signals, 16–17
    - limitations of, 20–21
    - supervisory signals, 18–20
  - CCS, 21
    - associated mode, 22
    - circuit related signaling, 22
    - non-associated mode, 24
    - non-circuit related signaling, 22
    - quasi-associated mode, 23
  - circuit supervision, 7
  - example, 6
    - history of, 8
      - CCS, 10
      - DDD, 10
      - early telephone switches, 8
      - IDDD, 10
      - pulse dialing, 9
      - Strowger exchange, 9
    - indicators, IAM messages, 215–216
    - ISUP, 184
      - associated signaling, 185
      - call processing, 206
      - call release, 208
      - call setup, 206, 208
      - CIC, 190–191
      - enbloc signaling, 193
      - overlap signaling, 193
      - terminal portability, 208
    - message handling, 145–153
    - network signaling, 6, 15
    - non-circuit related signaling, 7
    - Point Codes, 136
      - ANSI national, 137–139
      - ITU-T international and national, 136–137
    - subscriber signaling, 6, 11
      - address signals, 11–12
      - call phase, 7
      - clear-down phase, 7
      - set-up phase, 7
    - supervisory signaling, 13
      - ringing, 14
      - tones, 13–14
  - signaling (D) channels, 91
  - Signaling Information Field (SIF), 140
  - signaling link activation, 497
  - signaling link alignment procedure, 126–128
  - Signaling Link Code (SLC), 150
  - signaling link error monitoring, 130
    - AERM, 131
    - SUERM, 130
  - signaling link management tests (MTP 3), 497
  - signaling links, 60, 64
    - access links, 64
    - bridge links, 65
    - cross links, 65
    - diagonal links, 66
    - extended links, 67
    - fully associated links, 67

- signaling modes, 68–70
- Signaling Networks Identifier parameter (ANSI), 304
- signaling point status management, 263
- SIGTRAN
  - Cisco SLTs, 445, 447–448
  - H.323/SIP interworking, 448
  - SCTP, 409
    - Dynamic Address Reconfiguration, 413
    - failure detection, 411
    - head-of-line blocking, 410
    - multi-homing, 412
    - Partial Reliability, 413
  - transport protocol
    - TCP, limitations of, 408
    - UDP, limitations of, 408
  - UA layers, 413–415
    - IUA, 444
    - M2PA, 440–443
    - M2UA, 434–435, 437–439
    - M3UA, 418–423, 425–427
    - Routing Keys, 416–418
    - SUA, 428, 430, 432–433
- SIGTRAN Working Group, 407
- SIM (subscriber identity module), 52, 369
- simulation, SS7 test equipment functionality, 477
- single directory number, 46
- SIO (Service Information Octet), 140–142
  - validation testing (MPT 2), 485
- SIP (Session Initiation Protocol), 105
  - SIGTRAN interworking, 448
- SIPO (status indication processor outage), 131
- SLC (Signaling Link Code), 150
- SLPs (Service Logic Programs), 313, 358
- SLS
  - ANSI, 150
  - ITU-T, 150
- SLTs (Signaling Link Terminals), 445–448
- SMH (Signaling Message Handling), 135, 140
- SMS (Service Management System)
  - distributed functional planes, 332
  - in IN CS-X/AIN, 330
- SMS (short message service), 49, 397, 616
  - forwardedSM message, 398
  - sendRoutingInfoForSM message, 398–399
- SNM (Signaling Network Management), 75, 135
- SONET (Synchronous Optical Network), 93
- specifications for SS7 tests, 478–479
  - ISUP, 500–507
  - MTP 2, 480–495
  - MTP 3, 496–500
  - SCCP, 507–510
  - TCAP, 511–514
- SPs (signaling points), 59
  - linksets, 60
  - routes, 61
  - routesets, 61
  - SCPs, 63
  - signaling links, 60, 64
    - access links, 64
    - bridge links, 65
    - cross links, 65
    - diagonal links, 66
    - extended links, 67
    - fully associated links, 67
  - signaling modes, 68–70
  - SSPs, 63
  - STPs, 62
    - standalone, 70–72
- SSF (Service Switching Function), 332
- SSF (Subservice Field), 140
- SSN (subsystem number) routing, 245–247
  - 3GGP specified SSNs, 248
  - ITU-T specified SSNs, 247
  - SSN values, 247–248
- SSNM messages (M3UA), 423–425
- SSPs (Service Switching Points), 63, 103
  - distributed functional planes, 332
  - donor switches, 349
  - in IN CS-X/AIN, 329
  - messages, open transactions, 325
  - recipient switches, 349
  - message exchange with SCP, 312
- standalone STPs, 62, 70–72
- Standard Announcement parameter (ANSI), 300
- Standard User Error Code parameter (ANSI), 301
- standards
  - Internet, 41
  - ISUP, 186
  - national, 37
    - ANSI, 37–38
    - ATIS, 40
    - BSI, 40
    - IETF, 41

- NICC, 40–41
- T1 Committee, 38
- Telcordia, 38–39
- TIA/EIA, 39
- nationalizing, 35
- regional, 35
  - 3GPP, 36–37
  - 3GPP2, 37
  - ETSI, 36
- telephony, history of, 28–29
  - ITU-T, 29–35
- STPs (Signal Transfer Points), 62
  - home pair, 70
  - message screening, 456
  - standalone, 70–72
  - traffic screening, 456
- Strowger exchange, 9
- structured dialogues, 280–281
- STS (Synchronous Transport Signal), 94
- SUA (SCCP User Adaptation), 428–430
  - messages, 430
    - Connectionless, 432
    - Connection-oriented, 432–433
- Subscriber Line Concentrators, 89
- Subscriber Line Multiplexes, 89
- subscriber management (MAP), 390
- subscriber signaling, 6, 11
  - address signals, 11–12
  - call phase, 7
  - clear-down phase, 7
  - set-up phase, 7
- subscriber tracing, 391
- Subsequent Address message (ISUP), 529
- Subsequent Directory Number message (ISUP), 530
- Subservice Field (SSF), 140
- subsystem status management, 263
- subsystems, 230
  - concerned, 260–261
  - replicate, 261
  - SCMG, 260
- SUERM (Signal Unit Error Rate Monitoring), 130
- supervision messages, 102
- supervisory signaling, 13, 18
  - digital, 20
  - ringing, 14
  - SF, 18–20
  - tones, 13–14
- supplementary services (MAP), 395
- supplementary services testing (ISUP), 504–507
- supplementary telecommunications services, 46
- SUs (signal units), 112
  - delimitation, 115
  - error correction, 118
    - basic method, 118–123
    - preventative cyclic retransmission, 123–126
  - error detection, 117–118
  - fields, 114
  - FISUs, 112
  - flow control, 131
  - LI, 116–117
  - loss of alignment, 117
  - LSSUs, 113
  - processor outage, 131
  - signaling link alignment procedure, 126–128
  - signaling link error monitoring
    - AERM, 131
    - SUERM, 130
- Suspend message (ISUP), 530
- suspend/resume (ISUP), 208
- Suspended PIC, 338
- switching
  - matrices, 98
  - nodes, 82

## T

- T Abandon TDP, 345
- T Answer TDP, 344
- T Busy TDP, 343
- T Disconnect TDP, 344
- T Midcall TDP, 344
- T No Answer TDP, 344
- T Re-Answer TDP, 345
- T Suspended TDP, 344
- T1 Committee, 38
- TAC (Type Approval Code), 366
- TALI (Transport Adaptation Layer Interface), 445
- tandem node processing (ISUP), 82
  - continuity testing, 213
  - message processing, 212
- TBSCM (Terminating Basic State Call Model)
  - in IN CS-1/AIN 0.1, 334–335

- in IN CS-2/AIN 0.2, 342
  - PICs, 342–343
  - triggers, 343–345
- TCAP (Transaction Capabilities Application Part), 76–77, 267, 596, 607
  - ANSI messages, 293
    - Conversation, 295
    - Protocol Abort, 296
    - Query, 294
    - Response, 295
    - Unidirectional, 293
    - User Abort, 296
  - ANSI operation codes, 297–299
  - ANSI parameters, 299–305
  - component sublayer, 270
  - error handling, 288
    - of Application Errors, 289
    - of End Use Errors, 289
    - of Protocol Errors, 288–289
  - generic service interface, 268
  - messages, 271, 290, 539–541
    - Abort, 292–293
    - ANSI Dialogue, 282
    - Begin, 291
    - constructors, 284
    - Continue, 292
    - Element Identifier, 284
    - elements, 283
    - encoding, 282–283
    - End, 291
    - Identifier tag, 285
    - ITU dialogue, 280–281
    - layout, 286
    - Length Identifier, 286
    - primitives, 284
    - Unidirectional, 290
  - package types, 270
  - Q.752 traffic monitoring measurements, 472
  - role in call control, 269
  - testing, 511–514
  - transaction sublayer, 270
  - transactions, 272
    - ANSI, 275
    - Component IDs, 278
    - component parameters, 279–280
    - components, 276
    - Invoke and Return Result component, 277
    - Invoke component, 276–277
    - ITU, 275
    - Operation Codes, 278
    - Return Result component, 277–278
    - transaction IDs, 273–274
- TCP (Transport Control Protocol), limitations of SIGTRAN transport layer implementation, 408
- TDM (Time Division Multiplexing), 92
- TDP (Trigger Detection Point), 324–325
  - escape codes, 327
  - in IN CS-2 OBCSM, 339–342
  - in IN CS-2 TBSCM, 343–345
  - trigger processing, 326
- Tektronix, supporting traffic, 607–633
- Telcordia, 38–39
  - protocol specification documents, 602
- telecommunications services
  - CLASS, 47
  - CNAME, 47
  - do-not-call enforcement, 50
  - EMS, 49
  - LIDB, 48
  - LNP, 48
  - single directory number, 46
  - SMS, 49
  - supplementary services, 46
  - telephone marketing numbers, 45
  - televoting, 46
  - webifying, 51
- Telephone User Part (TUP), 150
- telephony standards, history of, 28–29
  - ITU-T, 29–35
- televoting, 46
- Term Active PIC, 343
- Term Alerting PIC, 343
- Term Null PIC, 342
- Term Suspended PIC, 343
- terminal portability, ISUP, 208
- terminating call half, 327
  - IN CS-1, 334–335
- Terminating Restrictions parameter (ANSI), 302
- Termination Attempt Authorized TDP, 343
- Termination Attempt TDP, 343
- testing SS7
  - equipment used, 476–478
  - ISUP, 500–502
    - called address sending, 503

- continuity check procedure, 502
- supplementary services, 504–507
- timers, 503
- MTP2, 480
  - Check RTB Full, 492
  - Congestion Abatement, 495
  - corrupt LSSU validation tests, 485
  - emergency alignment tests, 484
  - FISU tests, 482
  - Forced Retransmission, 493
  - Link Aligned Ready tests, 486–487
  - power up tests, 481–482
  - Set and Clear LPO While Link in Service tests, 488
  - SIO validation tests, 485
- MTP3, 496–497
  - signal message handling, 498–500
  - signaling link management, 497
- SCCP, 507–510
  - specifications, 478–479
- TCAP, 511–514
- TIA/EIA, 39
- Time Of Day routing service, AIN 0.2, 346
- timers
  - ISUP, 189, 503, 563–570
  - MTP, 557, 559–561
- TimeStamp parameter (ANSI), 300
- timing networks, 95–97
- TLV (Tag, Length, Value) format, 283
  - atomic values, 284
- TMR (Transmission Medium Requirement), 202
- TMSI (Temporary Mobile Subscriber Identity), 368
- toll free service, 45
  - in INAP, 354
- tones, 13–14
- topologies, PSTN, 82
- trace files, 607
- traffic monitoring, 461–462
  - benefits of, 463
  - Q.752 measurements, 463
    - ISUP-related, 471–472
    - MTP-related, 463–467
    - SCCP-related, 468–471
    - TCAP-related, 472
- traffic screening, 455–457
- transaction IDs
  - establishing, 273
  - releasing, 274
- transaction sublayer, 270
  - Protocol Error handling (TCAP), 288
- transactions (TCAP), 272
  - ANSI, 275
  - components, 276
    - Component IDs, 278
    - Invoke, 276–277
    - Invoke and Return Result, 277
    - Operation Codes, 278
    - parameters, 279–280
    - Return Result, 277–278
  - ITU, 275
  - Transaction IDs, 273
    - establishing, 273
    - releasing, 274
- transceiver circuit testing, 196–197
- transfer messages (M3UA), 423
- Transit node, 82
- transmission facilities, PSTN, 87–95
- transport protocols, SCTP, 409
  - Dynamic Address Reconfiguration, 413
  - failure detection, 411
  - head-of-line blocking, 410
  - multi-homing, 412
  - Partial Reliability, 413
- triggers
  - IN CS-2 OBCSM, 339–342
  - IN CS-2 TBSCM, 343–345
- trunks
  - circuit states, 221
  - group, 101
  - members, 101–102
  - PSTN, 87–95
- TT (Translation Type) field (CgPA/CdPA), 254
- TUP (Telephone User Part), 75, 185
- two bearer (2B) channels, 91

## U

- UA (User Adaptation) layers, 413–415
  - IUA, 444
  - M2PA, 440–443
  - M2UA, 434–435
    - messages, 435–439
  - M3UA, 418–420
    - messages, 420–427

- Routing Keys, 416–418
- SUA, 428–430
  - messages, 430–433
- UCIC (Unequipped Circuit Code), 192
- UDP (User Datagram Protocol), limitations of
  - SIGTRAN transport layer implementation, 408
- UDT (Unitdata ) message parameters, 243–244
- unavailability, MTP3 management messages, 458
- Unblocking Acknowledgement message (ISUP), 530
- unblocking circuits (ISUP), maintenance messages, 223
- Unblocking message (ISUP), 530
- Unequipped CIC message (ISUP), 530
- Unidirectional Dialogue, 281
- Unidirectional messages (TCAP), 274, 290, 293
- United Kingdom, PSTN hierarchies, 86
- United States, PSTN hierarchies, 83–86
- unstructured dialogues, 280–281
- unsuccessful call attempts, ISUP, 189
- updateLocation messages, 385
- User Abort messages (ANSI TCAP), 296
- user data (SCCP), 232
- User messages (SCCP), screening, 460
- User Part Available message (ISUP), 530
- User Part Test message (ISUP), 530
- User-to-User Information message (ISUP), 530
- USI (User Service Information), 202
- USSD (unstructured supplementary service data), 396
- USSs (unstructured supplementary services), 395

## V

---

- validation testing, 475
- values
  - cause, 637–640
  - network indicator, 141
  - service indicator, 141
- variants of ISUP, 186
- versions of IN (Intelligent Network), 312
- Visitor Location Register (VLR), 607
- VLR (Visitor Location Register), 371, 383, 607
- voice encoding, 90
- VoIP (voice over IP), 91W-X-Y-Z

## W-X-Y-Z

---

- WAP (wireless application protocol), 396
- White Book, 58
- WLANs, hotspot billing, 52
- WCDMA (Wideband Code Division Multiple Access), 36
- webification of telecommunication services, 51
  
- yellow book recommendations, 57