Index

Authentication, Authorization and Accounting (AAA), 176, 177
AAR. *See* Authenticate and Authorize Request (AAR)
Abort-Session-Answer (ASA), 312
Abort-Session-Request (ASR), 312
AC. *See* Attachment Circuit
ACC. *See* Automatic Congestion Control (ACC)
Access circuit, 101, 106, 116
Access Gateway (AGW), 10, 14, 22, 23, 28, 32, 34, 74, 92, 93, 116, 284–289, 292–294, 297, 298, 301, 314, 316, 324–327
Access network, 1, 2, 6, 18, 19, 27, 93–96, 98, 101, 149–151, 157–159, 173, 174, 180, 181, 198, 278
Access signalling, 101, 106
Access types
  ADSL (Asymmetric Digital Subscriber Line), 10, 232
  Cable, 2, 9, 18, 65, 77, 116, 178, 276
  DSL (Digital Subscriber Line), 2, 4, 10, 11, 14, 18–20, 22, 75, 77, 93, 150, 276, 277
  Fixed, 1, 4–6, 9, 13, 92, 114, 150, 151, 156, 159, 174, 175, 228, 268, 276, 285, 291, 300, 306, 309, 323
  GSM, 4, 11, 150–155, 174, 175, 178, 206, 208, 209
  Mobile, 1, 2, 4–6, 9, 11–14, 17, 19, 21, 24, 36, 55, 56, 92, 111, 114, 150–160, 163, 168, 170, 171, 173–179, 185, 193, 202, 206, 208, 209, 228, 276, 283, 300
  UMA (Unlicensed Mobile Access), 11, 12, 174, 175
  Universal Mobile Telecommunications System (UMTS), 4, 150–156, 158, 159, 170, 179, 184, 185
  WiFi, 4, 13, 94, 174
  WiMAX, 2, 4, 150, 151, 176
  wireless, 1, 2, 5, 6, 9, 11, 13, 150, 151, 159, 174–177, 182, 206
  WLAN (Wireless Local Area Network), 13
Access-Resource and Admission Control Function (A-RACF), 180
Adaptive Modulation and Coding (AMC), 158
Adaptive Multi-Rate (AMR), 156
Admission control, 269
AGI. *See* Attachment Group Identifier
AGW. *See* Access Gateway (AGW)
AH. *See* Authentication Header (AH)
AINI. *See* ATM Internet Network Interface
AIS. *See* Alarm indication Signal
Alarm Indication Signal (AIS), 262, 263
Alliance for Telecommunications Industry Solutions (ATIS), 22, 162, 165–167, 181, 182, 185
AMC. *See* Adaptive Modulation and Coding (AMC)
American National Standards community (ANSI-41), 151
AMR. *See* Adaptive Multi-Rate (AMR)
Analogue, 9–11, 16, 24, 27, 74, 92, 93, 99–106, 112, 114, 116–118, 129, 138, 140, 141, 151, 179, 314, 327
Application Function (AF), 180
Application Server (AS) 2, 8, 13, 23, 24, 36, 115, 163, 164, 167, 168, 171, 194–198,

© 2006 John Wiley & Sons, Ltd

COPYRIGHTED MATERIAL

Application Server (AS) (*continued*) 208–213, 215–225, 228, 267, 268, 289, 290, 299, 300, 306, 307, 321, 323, 329
A-RACF. *See* Access-Resource and Admission Control Function
Architecture, 1, 5–7, 9, 14–24, 36, 37, 91, 92, 99, 103, 108–111, 115, 142, 145, 146, 149, 150, 152, 156, 160, 163, 165, 166, 177, 180–186, 200, 205, 206, 210, 211, 213, 223, 228, 231–233, 243–247, 251, 253, 254, 263, 267, 271, 272, 276, 277, 280, 283–286, 288–296, 298–300, 303, 306, 310, 314, 318, 324, 329
ARPU. *See* Average Revenue Per User (ARPU)
ARQ. *See* Automatic Repeat Request (ARQ)
ASBR. *See* Autonomous System Border Routers (ASBRs)
Assured Forwarding (AF), 272
Asynchronous Transfer Mode (ATM), 4, 18, 106, 118–121, 135, 136, 141, 155–157, 184, 231, 232, 241, 244–252, 254–264, 278, 279
ATIS. *See* Alliance for Telecommunications Industry Solutions (ATIS)
ATM. *See* Asynchronous Transfer Mode (ATM)
ATM Forum, 246, 248, 257
ATM Inter-Network Interface (AINI), 257
ATM PW, 247, 254
ATM virtual trunks, 257
Attachment Circuit (AC), 244, 249, 250, 253–255, 260–263
Attachment group identifier, 250
Attachment identifier, 250
Attribute line, 67, 69
Audio/Video Transport Working Group (AVT), 183
Authenticate and Authorize Request (AAR), 307
Authentication Header (AH), 85
Automatic Congestion Control (ACC), 323
Automatic Repeat Request (ARQ), 155
Autonomous System (AS), 235
Autonomous System Border Routers (ASBRs), 235, 280
Availability, 5, 6, 13, 92, 144, 179, 181, 185, 203, 236, 238, 242, 244, 256, 259
Average Revenue Per User (ARPU), 4, 191
AVT. *See* Audio/Video Transport Working Group (AVT)

Bandwidth, 4, 5, 19
Bandwidth management, 9, 22, 23, 32, 267, 277, 280, 281, 283, 286, 289–297, 299, 300, 302, 303, 305–314, 316, 317, 329
Bandwidth manager, 23, 32, 288, 289
Base Station Controller (BSC), 1, 152
Base Station Subsystem (BSS), 152
Base Transceiver Station (BTS), 152
Basic Call State Model (BCSM), 15, 24–26, 28–31, 33, 39, 77
  O-BCSM (Originating BCSM), 24–26, 31–34
  T-BCSM (Terminating BCSM), 24, 33–35
BCSM. *See* Basic Call State Model (BCSM)
BE. *See* Best Effort (BE)
Bearer Independent Call Control protocol (BICC), 106, 111
Best Effort (BE), 271
BGCF. *See* Breakout Gateway Control Function (BGCF)
BGF. *See* Border Gateway Function (BGF)
BGP. *See* Border Gateway Protocol (BGP)
BICC. *See* Bearer Independent Call Control protocol (BICC), 1
Billing, 10, 19–21, 25, 33, 64, 65, 82, 92, 120, 154, 156, 157, 161, 167, 182, 210, 214, 227, 316
Bits, 27, 100, 101
Bluetooth, 13, 174
BNG. *See* Broadband Network Gateways (BNG)
Border Gateway Function (BGF), 181
Border Gateway Protocol (BGP), 235, 236, 244, 245, 253, 256
BRAS. *See* Broadband Remote Access Server (BRAS)
Breakout Gateway Control Function (BGCF), 165
British Telecom National User Part (BTNUP), 27
Broadband, 1, 2, 4, 9, 11, 13, 14, 18–21, 23, 77, 82, 150, 151, 174–176, 182, 231, 232, 263, 267, 276, 277
Broadband Network Gateways (BNG), 277
Broadband Remote Access Server (BRAS), 18, 277
Broadcast TV, 267, 277

BSS. *See* Base Station Subsystem (BSS)
BTNUP. *See* British Telecom National User Part (BTNUP)
BTS. *See* Base Transceiver Station (BTS)
Buffer, 71, 123

Cable Operator, 9
CAC. *See* Connection Admission Control (CAC)
Call Agent, 15, 19–25, 27–30, 32–39, 41–43, 45, 46, 54–58, 60–66, 68, 73, 77, 86–88, 90–95, 97, 108, 110, 122–124, 143, 156, 199, 210–214, 222–226, 282, 284–289, 291–294, 297–309, 311–318, 324–329
Call control, 7, 10, 14, 15, 19, 24, 25, 27–30, 33, 65, 67, 69, 71, 73, 75, 77, 81, 86, 90, 92, 93, 98, 106, 108, 111, 149, 156, 164, 186, 188, 192, 200, 202, 204, 215, 286, 288, 292, 293, 298–300, 306, 314, 324
Call counting, 284, 288
Call gapping, 21
Call Processing Language (CPL), 194, 195
Call routing, 15, 21, 24, 26–28, 32, 36–39, 41, 60–64, 76, 77, 94, 112, 119, 183, 211, 213, 281, 285, 300
Call session control, 6
Call Session Control Function (CSCF), 159
Call-gapping, 282, 326
Calling Line Identifier (CLI), 34, 191
Capabilities Exchange Request, 307
CAPEX. *See* Capital expenditure (CAPEX)
Capital expenditure (CAPEX), 3, 5
CBS. *See* Committed Burst Size (CBS)
CDMA2000, 158
CDMA2000 1x, 158
CDMA2000 1xEV-DO, 158
CDMA2000 1xEV-DV, 158
CE. *See* Customer Edge (CE)
Cell Loss Ratio (CLR), 155
CGI. *See* Common Gateway Interface (CGI)
Charging, 10, 64, 156, 177, 182, 186, 187, 200, 202, 210, 214
CIR. *See* Committed Information Rate (CIR)
Circuit domain, 11, 183, 184
Classification, 234, 249
CLI. *See* Calling Line Identifier (CLI)
CLR. *See* Cell Loss Ratio (CLR)
Codec, 16, 19, 36, 39, 44, 46, 48, 65–72, 77, 100, 101, 111, 112, 116–121, 125, 126, 132, 134–138, 156, 186, 187, 285, 305, 310
  G.711, 19, 44, 48, 65, 66, 68, 70, 100, 101, 119, 121, 136, 156, 310
  G.723.1, 44, 68, 112, 116, 136
  G.729, 19, 44, 65, 66, 68, 70, 112
Cold standby, 240
Colour, 234, 272
Committed Burst Size (CBS), 272
Committed Information Rate (CIR), 272
Common Gateway Interface (CGI), 195
Common Object Policy Service (COPS), 169
Common Object Request Broker Architecture (CORBA), 200
Common Open Policy Service (COPS), 89
Companding, 100, 123
  A-law, 68, 100, 123, 136
  μ-law, 44, 48, 68, 70, 100, 123
Connection Admission Control (CAC), 9, 23, 55, 274, 277, 279, 283, 285, 287–289, 293, 295, 296, 313
Connectivity Verification (CV), 237, 238
Contributing Sources (CSRC), 72
Control Plane Interworking, 256
Controlled Load Service, 271
Convergence, 1–3, 5, 6, 14, 24, 92, 150, 151, 159, 231, 232, 237, 239, 251, 263, 264, 269
Core network, 1–3, 5, 6, 9, 12, 15, 17–19, 23, 88, 92, 106, 149, 150, 152–156, 159, 160, 168, 169, 175, 181, 185, 186, 194, 200, 227, 228, 232, 239, 251, 254, 256–259, 264, 267, 275, 278, 279, 284
CPL. *See* Call Processing Language (CPL)
CSCF. *See* Call Session Control Function (CSCF)
CSRC. *See* Contributing Sources (CSRC)
Current status, 304
Customer Edge (CE), 244, 245, 247, 254
CV. *See* Connectivity Verification (CV)

Data Link Connection Identifier (DLCI), 241
Data path Session Border Gateway (D-SBG), 22, 23, 86, 89–92, 94, 97, 291, 292, 294, 297–299, 301, 306, 309, 310, 313–315, 325, 327, 328
Data services, 1, 4–6, 9, 10, 17–20, 23, 67, 71, 72, 75, 77, 81–86, 89, 99, 101, 110, 117, 143, 144, 149–159, 162, 168, 174, 175, 177–179, 182, 194, 202, 204, 208, 209, 227, 228, 269, 275, 276, 278, 300, 306

Default Forwarding (DF), 272
Denial of Service Attacks (DoS), 90
Desired Status (DS), 304
Detour
  LSP, 241, 242
DF. *See* Default Forwarding (DF)
DHCP. *See* Dynamic Host Configuration Protocol (DHCP)
Dial pulse signalling, 102
Dial tone, 20, 102, 103, 105, 124, 125, 138, 139, 322, 326
Diameter Protocol, 306
Differentiated Services Framework (DiffServ), 233, 234, 263
  behaviour aggregates, 234
  classification, 234, 249
  colour, 234
  DP (drop precedence), 234
  forwarding class, 234
  per-hop behaviours, 234
  PSC (Per-hop behaviour Scheduling Class), 234
DiffServ. *See* Differentiated Services Framework
DiffServ-aware traffic engineering, 275
Digest authentication, 55, 95
Digital Subscriber Line Access Multiplexer (DSLAM), 18, 20, 89, 276, 277
Digital Video Broadcasting Handheld (DVB-H), 177
DLCI. *See* Data Link Connection Identifier (DLCI)
DNS. *See* Domain Name System (DNS)
Domain Name System (DNS), 18–20, 28, 29, 39, 62, 76, 122, 124, 160, 163, 183, 187
DoS. *See* Denial of Service Attacks (DoS)
Downlink, 6, 152, 153, 157, 158, 178, 310
DP. *See* Drop Precedence (DP)
Drop Precedence (DP), 234
DS. *See* Desired Status (DS)
D-SBG. *See* Data path Session Border Gateway (D-SBG)
DSLAM. *See* Digital Subscriber Line Access Multiplexer (DSLAM)
DTMF. *See* Dual Tone Multiple Frequency (DTMF)
Dual Tone Multiple Frequency (DTMF), 44, 48, 69, 102, 110, 112, 115, 116, 121, 138, 140, 146, 192, 202, 217, 220
DVB-H. *See* Digital Video Broadcasting Handheld (DVB-H)
Dynamic Host Configuration Protocol (DHCP), 58, 60, 160

EBS. *See* Excess Burst Size (EBS)
EDGE. *See* Enhanced Data Rates for GSM Evolution (EDGE)
EF. *See* Expedited Forwarding (EF)
Egress remarking, 279
Emergency services, 4, 21, 23, 26, 27, 30, 33, 56, 57, 91, 92, 132, 161, 185, 186, 268, 283, 285, 286, 288, 291, 326
Encapsulating Security Payload (ESP), 85
End-to-end delay, 268
Enhanced Data Rates for GSM Evolution (EDGE), 154
ENUM (telephone number mapping), 16, 27–29, 76, 77, 124, 163, 183
ERO. *See* Explicit Route Object (ERO)
ESP. *See* Encapsulating Security Payload (ESP)
Ethernet, 2–4, 19, 20, 82, 83, 86, 89, 93, 184, 231, 232, 236, 239, 244, 246, 247, 251–257, 260, 261, 263, 276–279
ETSI. *See* European Telecommunications Standards Institute (ETSI)
European Telecommunications Standards Institute (ETSI), 14, 22, 23, 90, 103, 108, 126, 141, 151, 158, 160, 162, 165–167, 174, 178–181, 185, 192, 199, 201–205, 289, 291, 302, 303, 306, 307, 326, 328
Excess Burst Size (EBS), 272
EXP bits, 234, 275
Expedited Forwarding (EF), 271
Experimental (EXP), 234
Explicit Route Object (ERO), 274
Extended PNNI, 257, 259
Exterior gateway routing protocol, 235
  eBGP (exterior BGP), 235

Facility bypass, 241, 242
Facsimile, 100, 101, 104, 110, 121, 137, 138
Fast re-route, 14, 237, 239, 240, 242, 244, 296
FDD/TDMA. *See* Frequency Division Duplex/Time Division Multiple Access (FDD/TDMA)
Feature interaction, 24, 25, 28, 211, 221
Feature servers, 25, 28, 194
Features, 15, 20, 24, 28, 31, 33, 34, 37, 38, 93, 97, 102, 115, 120, 133, 150, 151, 154, 178, 286

call forwarding, 24, 25, 54, 119, 120, 204, 207
call hold, 33, 70, 102, 113, 129, 131, 219, 221, 226, 313, 314
call screening, 34, 204, 216–225
call waiting, 20, 34, 129, 211, 217–225
caller display, 20, 34, 56, 57, 93, 139, 191
CCBS (Call Completion to Busy Subscriber), 24, 25
conference calling, 24, 28, 33, 116, 121, 128, 163, 202, 205, 211, 313, 314
MCID (Malicious Call Identification), 34
Fibre to the Home (FTTH), 276
Fixed Network Operator, 13
Flowspec object, 271
Forwarding class, 234, 271
FQDN. *See* Fully qualified domain name (FQDN)
Frame Relay, 4, 184, 232, 241, 244–247, 249, 251, 252, 254–257, 262, 263, 278
Framework SCF, 200, 201
Frequency Division Duplex/Time Division Multiple Access (FDD/TDMA), 152
FTTH. *See* Fibre to the Home (FTTH)
Fully Qualified Domain Name (FQDN), 16, 32, 40

Gates and Pinholes, 90
Gateway GPRS Support Node (GGSN), 153
General Packet Radio Service (GPRS), 150, 153
Generalised ID FEC, 249
Generic Overload Control Application Protocol (GOCAP), 328
Generic Routed Encapsulation (GRE), 243, 246, 252
GERAN, 150, 160
GGSN. *See* Gateway GPRS Support Node (GGSN)
Global System for Mobile Communications (GSM), 150, 151
Gateway MGW (GMGW), 156
Gateway MSC (GMSC-S), 156
Go interface, 169
GOCAP. *See* Generic Overload Control Application Protocol (GOCAP)
GPRS. *See* General Packet Radio Service (GPRS)
GPRS Tunnel Protocol-Control Plane (GTP-C), 157
GPRS Tunnelling Protocol-User Plane (GTP-U), 157
Gq interface, 169, 306
Gq prime interface, 306
GR.303 access signalling, 27
Graceful restart, 239, 243
GRE. *See* Generic Routed Encapsulation
GTP-C. *See* GPRS Tunnel Protocol-Control Plane (GTP-C)
GTP-U. *See* GPRS Tunnelling Protocol-User Plane (GTP-U)
Guaranteed QoS, 231, 290, 300, 314
Guaranteed Service, 271
GUI, 194

H.248 (Gateway Control Protocol), 7, 10, 14, 23, 24, 29, 32, 34, 72, 73, 89, 90, 93, 97, 98, 111, 116, 117, 121, 122, 126–130, 132–142, 146, 156, 157, 165, 167, 183, 284, 289, 292, 306, 307, 314, 316, 324, 326–328
H.248 packages
Stimulus Analogue Line Package, 14, 23
H.320, 101, 104
H.323, 36, 108, 109, 116, 127, 194, 328
H.324, 104
Hashes, 84
Hierarchical Virtual Private LAN Service, 253
High Speed Circuit Switched Data (HSCSD), 152
High Speed Downlink Packet Access (HSDPA), 158
High Speed Uplink Packet Access (HSUPA), 158
HLR. *See* Home Location Register (HLR)
Home Location Register (HLR), 152
Home Subscriber Server (HSS), 162, 208
Homogeneous layer 2 VPN, 254
Hot Spot, 175
Hot-standby, 238, 240
HSCSD. *See* High Speed Circuit Switched Data (HSCSD)
HSDPA. *See* High Speed Downlink Packet Access (HSDPA)
HSS. *See* Home Subscriber Server (HSS)
HSUPA. *See* High Speed Uplink Packet Access (HSUPA)
HTML, 194
H-VPLS, 253

IANA. *See* Internet Assigned Numbers Authority (IANA)
iBGP. *See* Interior BGP (iBGP)
ICMP. *See* Internet Control Messaging Protocol (ICMP)
I-CSCF. *See* Interrogating CSCF (I-CSCF)
IETF. *See* Internet Engineering Task Force (IETF)
iFC. *See* Initial Filter Criteria (iFC)
IGP. *See* Interior gateway routing protocol (IGP)
IGW. *See* International gateway exchange (IGW)
IMS. *See* IP Multimedia Subsystem (IMS)
IMSI. *See* International Mobile Subscriber Identity (IMSI)
IM-SSF. *See* IP Multimedia Service Switching Function (IM-SSF)
IN. *See* Intelligent Network (IN)
INAP. *See* Intelligent Network Application Part (INAP)
Indication AVP, 314
Infrastructure, 2, 3, 5–7, 11, 14–16, 21–23, 30, 65, 93, 97, 179, 185, 191, 206, 227, 228, 231, 232, 243, 244, 246, 252, 253, 257, 263, 264, 276, 282, 286, 299, 300, 320, 321, 324
Initial Filter Criteria (iFC), 206
Integrated Services Digital Network (ISDN), 14, 23, 24, 26, 27, 29, 30, 76, 92, 101, 104, 105, 109, 115, 136, 142, 145, 146, 156, 182, 184, 192, 193, 325, 326
Integrated Services Framework (IntServ), 233
Intelligence, 6, 15, 16, 27, 37, 86, 92, 288, 293, 298, 329
Intelligent Network (IN), 24–27, 30, 31, 33, 34, 77, 182, 184, 191–193, 198, 199, 205, 208–210, 228
  SCP (Service Control Point), 18, 20, 22, 25, 33, 192, 193, 211
  SSP (Service Switching Point), 192, 198, 199
Intelligent Network Application Part (INAP), 26–28, 192, 193, 198, 199, 208, 209, 211
Intelligent Peripheral (IP), 192
Interconnect, 10, 11, 17–19, 22, 23, 299, 300
Interconnection with peer network, 10, 11, 17–19, 22, 23, 29, 30, 32, 76, 77, 86, 90, 92, 93, 95, 181, 284, 286, 292–294, 296, 299–301
Inter-exchange, 16, 32, 101, 106, 107, 110, 112, 116, 123, 138, 140, 141, 146
Interior BGP (iBGP), 235, 270
Interior gateway routing protocol (IGP), 235, 237, 239, 245
  iBGP (interior Border Gateway Protocol), 235, 244
  IS-IS (Intermediate System-Intermediate System), 235
  OSPF (Open Shortest Path First), 233, 235, 245
International gateway exchange (IGW), 17
International Mobile Subscriber Identity (IMSI), 153
International Telecommunication Union Telecommunication Standardisation Sector (ITU-T), 16, 22, 29–31, 35, 36, 65, 75, 76, 100, 102, 104, 106, 108, 111, 113, 114, 119, 121, 126, 127, 139, 142, 181, 183, 185, 238, 246
Internet, 232, 233, 235
Internet Assigned Numbers Authority (IANA), 141, 306
Internet Control Messaging Protocol (ICMP)
  Ping, 237
  traceroute, 237
Internet Engineering Task Force (IETF), 14–16, 29, 36, 65, 67, 68, 70, 71, 74, 76, 77, 89, 108–110, 112–114, 121, 126, 142, 144, 146, 159, 163, 169, 170, 181–185, 187, 194, 232, 236–238, 240, 243, 244, 246, 248, 250, 251, 271, 273, 293, 306
Internet Key Exchange (IKE), 85
Internet Protocol (IP), 159
Internet Protocol Security (IPSEC)
  VPNs, 245
Internet Service Provider (ISP), 11, 17, 20–22, 179
Interrogating CSCF (I-CSCF), 160, 162, 173
Interworking, 6, 7, 35, 92, 108, 112–114, 134, 142, 146, 154, 160, 170, 182, 183, 185, 186, 211
Interworking LSP, 246
IntServ. *See* Integrated Services Framework (IntServ)
INVITE, 302, 305, 314, 316, 317
IP address, 19, 28, 39, 40, 44, 48, 58, 62, 63, 66, 67, 70, 75, 87–90, 120, 157, 160, 161, 168, 169, 175, 269, 271, 272, 305, 307, 314

IP Multimedia Service Switching Function (IM-SSF), 198, 199, 208
IP Multimedia Subsystem (IMS), 1, 6, 7, 9, 14, 24, 64, 92, 106, 149, 150, 154, 158–168, 170, 173, 177, 179–182, 184–186, 206–209, 212, 214, 217–221, 223, 228, 267, 291, 306, 318–320, 329
IP Telephony (IPTEL), 183
IP Virtual Private Networks (IP VPNs), 4, 278
IP VPNs. *See* IP Virtual Private Networks (IP VPNs)
IPsec, 85
IPSEC. *See* Internet Protocol Security (IPSEC)
IPTEL. *See* IP Telephony (IPTEL)
IPv4, 66, 67, 87, 160, 176, 181, 295
IPv6, 66, 160, 168, 176, 181, 295
ISDN. *See* Integrated Services Digital Network (ISDN)
ISDN User Part (ISUP), 14, 24, 26, 27, 29, 30, 32, 34, 56, 106–115, 119, 142, 145, 146, 156, 157, 160, 165, 183, 184, 192, 193, 199, 322–324, 326–328
  IAM (Initial Address Message), 34, 56, 107, 113, 119
ISP. *See* Internet Service Provider (ISP)
ISUP. *See* ISDN User Part (ISUP)
ITU-T. *See* ITU-T (International Telecommunication Union Telecommunication Standardisation Sector)

JAIN. *See* Java for Advanced Intelligent Networks (JAIN)
Java for Advanced Intelligent Networks (JAIN), 194, 198
Jitter, 71, 73

Key Distribution, 85

L2TP. *See* Layer 2 Tunnelling Protocol
L2TP Access Concentrator (LAC), 18
L2TP Network Server (LNS), 18, 20
L2TPv3, 246
Label-inferred PSC LSP (L-LSP), 234, 275, 279
LAC. *See* L2TP Access Concentrator (LAC)
Lawful intercept, 19, 64, 93
Layer 2 mediation. *See* SPVC-PWE3 interworking
Layer 2 Tunnelling Protocol (L2TP), 243, 245, 251
Layer 2 Virtual Private Networks, 245
Layer 2 VPN. *See* Layer 2 Virtual Private Networks
Layer 3 Virtual Private Networks, 244
Link Management Interface (LMI), 262, 263
L-LSP. *See* Label-inferred PSC LSP (L-LSP)
LLU. *See* Local Loop Unbundling (LLU)
LMI. *See* Link management interface
LNS. *See* L2TP Network Server (LNS)
Load balancing, 240, 241
Local descriptor, 135, 137, 314
Local exchange, 10, 14, 16, 17, 19, 24, 27, 56, 101–104, 110, 115, 138, 276, 281, 282, 322
  Class Five Office, *16*
  DLE (Digital Local Exchange), 17, 18
Local Loop Unbundling (LLU), 10, 11
Local Management Interface (LMI), 262
Local protection, 241, 242
Location, 11, 13, 15, 21, 38, 39, 54, 58, 62, 76, 86, 153, 154, 157, 162, 168, 171, 175, 185, 187, 193, 202, 204, 217, 300
Loose routing, 274

MAC. *See* Medium Access Control (MAC)
MAC Ping, 260
MAC trace, 260
Management Information Base (MIB), 84, 293
Maximum Transmission Unit (MTU), 247, 249, 253, 254
MBMS. *See* Multimedia Broadcast/Multicast Service (MBMS)
MD5, 84
Media access control, 252
Media Component Description, 307, 309
Media Gateway (MG), 11, 19, 23, 32, 65, 90, 108–110, 112, 116–121, 124–126, 128–130, 132, 134–141, 146, 156, 182, 183, 324, 326
Media Gateway Control (MEGACO), 7, 183
Media Gateway Control Function (MGCF), 159
Media Gateway Control Protocol (MGCP), 24, 32, 72, 86–88, 90, 92, 93, 108, 116, 121–126, 128–130, 132, 133, 139, 140, 146, 287, 292, 328
Media Gateway Controller (MGC), 11, 108–110, 112, 113, 116–121, 125, 126, 128–130, 132, 134–141, 145, 146, 156
Media Resource Function (MRF), 159, 166
Media Server, 13, 36, 64, 90, 97, 217, 222, 227, 313, 314

Media sub-component, 309, 310
Medium Access Control (MAC), 83, 155, 252, 253, 260
MEGACO. *See* Media Gateway Control (MEGACO)
MG. *See* Media Gateway (MG)
MGC. *See* Media Gateway Controller (MGC)
MGCP. *See* Media Gateway Control Protocol (MGCP)
MIB. *See* Management Information Base (MIB)
MMUSIC. *See* Multiparty Multimedia Session Control (MMUSIC)
MNO. *See* Mobile Network Operator (MNO)
Mobile, 1, 2, 4, 13, 177
Mobile Country Code (MCC), 153
Mobile Network Operator (MNO), 9, 11, 13
Mobile Subscriber Identity Number (MSIN), 153
Mobile Switching Centre (MSC), 152
Mobile Virtual Network Operator (MVNO), 9, 13
Mode, 134
Modem, 18, 99, 104, 110, 133, 138, 276
Modified defect loop, 263
MP-BGP, 245
MPLS. *See* Multiprotocol Label Switching (MPLS)
MPLS traffic engineering, 14
MRFC. *See* Multimedia Resource Function Controller (MRFC)
MRFP. *See* Multimedia Resource Function Processor (MRFP)
MSAN. *See* Multi-Service Access Node (MSAN)
MSF. *See* MultiService Forum (MSF)
MTU. *See* Maximum Transmission Unit (MTU)
Multimedia, 1, 2, 4, 5, 7, 11, 12, 16, 22, 24, 36, 71–75, 77, 81, 86, 101, 106, 111, 121, 133, 149, 150, 152, 154, 158, 159, 163, 167, 168, 177–179, 183, 186, 187, 202–205, 208, 231, 273, 278, 289
Multimedia Broadcast/Multicast Service (MBMS), 179, 186, 187
Multimedia Resource Function Controller (MRFC), 166
Multimedia Resource Function Processor (MRFP), 166
Multiparty Multimedia Session Control (MMUSIC), 183
Multiprotocol Label Switching (MPLS), 14, 22, 23, 32, 82, 184, 231–233, 239–64, 267, 269, 273, 275–279, 282, 284, 287–289, 292–294, 296–298, 312, 320, 325, 329
  BFD (Bidirectional Forwarding Detection, 238, 261
  conservative label retention, 236
  CoS (class of service), 234
  CR-LDP (Constraint-based Routing Label Distribution Protocol), 236
  E-LSP (LSP with PSC inferred from experimental bits), 234
  experimental bits, 234
  FEC (Forwarding Equivalence Class), 232, 235–238, 249, 250
  label, 232–238, 243, 247–250, 253, 259, 263
  label binding, 235, 236, 238
  LDP (Label Distribution Protocol), 235, 236, 238, 249, 250, 253, 257, 259, 260, 263
  LER (Label Edge Router), 232–235, 237, 238, 240, 241, 263
  liberal label retention, 236
  L-LSP (LSP with PSC inferred from labels), 234
  LSP (Label Switched Path), 232–247, 256, 259, 263
  LSP Ping, 237, 238, 261
  LSP Trace Route, 238
  LSR (Label Switching Router), 232–244
  LSR self test, 238
Multi-segment Pseudo wire, 250
Multi-Service Access Node (MSAN), 14, 22, 23, 313, 325
MultiService Forum (MSF), 16, 22, 24, 28, 41, 65, 142, 210–217, 221–226, 228, 267, 289, 291–296, 299, 300, 303, 306, 307, 309, 310, 314, 319, 320, 329
Multi-service interworking, 254, 255, 262
MVNO. *See* Mobile Virtual Network Operator (MVNO)

NAT. *See* Network Address Translation (NAT)
Network Address Translation (NAT), 7, 19–21, 44, 46, 75, 78, 86–89, 92, 96, 97, 154, 180, 181, 306
Network engineering, 273, 277
Network management, 3, 13, 322
Network Termination Equipment (NTE), 276

Network Time Protocol (NTP), 73
Next Generation Network (NGN), 4, 81, 156, 267
NGN. *See* Next generation network (NGN)
Non-stop routing, 239
Notification Rate Package, 326
NTE. *See* Network termination equipment (NTE)
N-to-one mode, 248
NTP. *See* Network Time Protocol (NTP)
Number analysis, 24, 26

OAM. *See* Operations, Administration, and Maintenance (OAM)
OAS SCS. *See* Open Service Access Service Capability Server(OSA SCS)
Offline Charging, 177
Offline TE, 274
One-to-one mode, 248
Online Charging, 177
Online TE, 273
Open Service Access (OSA), 199
Open Service Access Service Capability Server(OSA SCS), 208
Operating Expenditure (OPEX), 3, 5, 160
Operational Support Systems (OSS), 20, 34, 92, 227, 293, 296
Operations, Administration, and Maintenance (OAM), 6, 237, 238, 248–250, 260–264
  alarm suppression, 237
  defect indication, 237, 238, 262, 263
  loopback, 237, 238
  path trace, 237
  performance monitoring, 237
OPEX. *See* Operating expenditure (OPEX)
ORBA. *See* Common Object Request Broker Architecture (CORBA)
OSA. *See* Open Service Access (OSA)
OSS. *See* Operational Support Systems (OSS)
Overload, 11, 21–23, 30, 91, 93, 116, 122, 123, 141, 268, 281–284, 291, 312, 313, 320–329
Over-provisioning, 9, 233, 268, 269, 273, 275, 283, 329

P routers, 242–244, 247, 249, 252
PABX. *See* Private Automatic Branch Exchange (PABX)
Packet Data Convergence Protocol (PDCP), 157
Packet Data Gateway (PDG), 176
Packet Data Protocol (PDP), 154
Packet domain, 11
Packetisation time, 69, 71
Packet-Switched Network (PSN), 243, 244, 246, 247, 251, 253, 255, 258–263
Packet-TMSI (P-TMSI), 154
PAN. *See* Personal Area Network (PAN)
Parlay, 24, 194, 199–204, 208–212, 227, 228
Parlay X, 24, 194, 201, 211
Path message, 274
Path protection, 240
Payload types, 44, 68
PBX. *See* Private Branch Exchange (PBX)
P-CSCF. *See* Proxy Call Session Control Function (P-CSCF)
PDCP. *See* Packet Data Convergence Protocol (PDCP)
PDF. *See* Policy Decision Function (PDF)
PDG. *See* Packet Data Gateway (PDG)
PDP. *See* Packet Data Protocol (PDP)
PDU mode, 248
Peak Information Rate (PIR), 273
Peer-to-peer, 6, 10, 15, 16, 19, 23, 24, 27, 36, 65, 67, 73, 77, 81, 86, 105, 200, 282–284, 286–288, 291, 299
PEP. *See* Policy Enforcement Point (PEP)
Per-hop behaviour Scheduling Classes (PSCs), 271
Personal Area Network (PAN), 174
PHY (Physical) Layer, 155
PINT. *See* PSTN/Internet Interfaces (PINT)
PIR. *See* Peak Information Rate (PIR)
PKI. *See* Public Key Infrastructure (PKI)
Plain Old Telephone Service (POTS), 4, 18–20, 22, 23, 159
PNNI. *See* Private Network-Node Interface
Point to Point Protocol (PPP), 18, 19, 157
Point-to-Point Protocol (PPP), 246
Policing, 86, 249, 278
Policy Decision Function (PDF), 169, 306
Policy Enforcement Point (PEP), 169
POTS. *See* Plain Old Telephone Service (POTS)
PPP. *See* Point to Point Protocol (PPP)
Private Automatic Branch Exchange (PABX), 13
Private Branch Exchange (PBX), 30, 76, 92, 103, 105, 109, 142, 146, 159, 325
Private key, 84, 85

Private Network–Network Interface (PNNI), 257
Private Network-Node Interface, 257–260
Private User Identity, 164, 165, 168
Protection, 5, 6, 46, 81, 83, 86, 236–241, 244, 252, 259, 263, 274, 276, 281, 321, 323, 324, 328
Protocol Type Indicator (PTI), 247
Provider Edge (PE), 239, 243–254, 259–263
Proxy Call Session Control Function (P-CSCF), 92, 160, 161, 218, 221, 324
PSC. *See* Per-hop behaviour Scheduling Classes (PSCs)
Pseudo wire (PW), 236, 246–256, 257–263, 264
PSN. *See* Packet-switched network (PSN)
PSTN. *See* Public Switched Telephone Network (PSTN)
PSTN emulation, 115, 139, 146
PSTN simulation, 115, 146, 180
PSTN/Internet Interfaces (PINT), 183
PTI. *See* Protocol Type Indicator
P-TMSI. *See* Packet-TMSI
Public key, 84, 85
Public Key Infrastructure (PKI), 84
Public Switched Telephone Network (PSTN), 1, 4, 5, 7, 9–11, 13–15, 17–30, 32–35, 37, 39, 56, 57, 65, 71, 74–77, 81, 90, 92, 93, 97, 99–101, 103, 105, 107–121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141–146, 151, 152, 155–157, 159, 163, 165, 166, 180, 182–184, 191, 198, 228, 267, 277, 281–285, 287, 289, 291, 292, 294–299, 301, 311, 320, 322–325, 327–329
  emulation, 7
  simulation, 7
Public User Identity, 164, 165, 168
PW. *See* Pseudo Wire
PW ID FEC, 249
PW segment, 251

Q.931 access signalling, 24, 26, 27, 29, 104–107, 109, 136, 142, 145, 146, 183, 326
QoS. *See* Quality of Service
Quad Play, 2, 5, 7, 9, 174
Quality of Service (QoS), 4, 5, 7, 9, 11, 14, 19, 21–23, 55, 89, 149, 150, 155–158, 162, 169–172, 175, 180, 184–186, 202, 231, 233, 234, 236, 244, 245, 249, 252, 258, 263, 267–271, 273, 275–284, 286–290, 300, 302–306, 311, 314, 316, 318, 320, 328, 329
  bandwidth, 4–6, 19, 23, 36, 38, 39, 65, 71, 72, 89, 91, 92, 99, 100, 108, 112, 136, 144, 150, 151, 161, 169, 174, 178, 185, 202, 231, 232, 234–236, 240, 242, 248, 251, 253, 267, 268, 270, 271, 273–283, 285–291, 293–300, 302, 303, 305–307, 309, 310, 312–314, 316–320, 329
  delay, 4, 9, 11, 19, 21, 71, 73, 74, 155, 156, 215, 236, 237, 241, 268–272, 274, 280, 290, 318
  jitter, 11, 19, 71–75, 112, 236, 241, 249, 270, 271, 274, 316
  loss, 4, 11, 21, 72, 73, 75, 138–140, 236, 237, 268–272, 274, 278, 280, 285, 312, 313
Queuing, 279

R2, 22, 291
R3, 291
RAB. *See* Radio Access Bearer (RAB)
RACS. *See* Resource and Admission Control Subsystem (RACS)
Radio Access Bearer (RAB), 155, 171
Radio Access Network (RAN), 150, 187
Radio Access Network Application Part (RANAP), 156, 157
Radio Network Controllers (RNCs), 154, 155
RADIUS. *See* Remote Authentication Dial-In User Service (RADIUS)
RAN. *See* Radio Access Network (RAN)
RANAP. *See* Radio Access Network Application Part (RANAP)
RCC. *See* Routing Control Channel
RCEF. *See* Resource Control Enforcement Function (RCEF)
RCU. *See* Remote Concentrator Unit (RCU)
Real-time, 6, 7, 9, 23, 29, 71, 86, 156, 183, 191, 228, 270, 278, 282, 290, 296, 329
Real-Time Control Protocol (RTCP), 71, 72
  extended reports, 74
  reports, 73
Real-Time Streaming Protocol (RTSP), 7
Real-time Transport Protocol (RTP), 7, 11, 16, 25, 44, 45, 48, 51, 66–75, 77, 87–91, 94, 106, 112, 125, 136, 181, 183, 188, 249, 309, 310, 314, 316, 327

AVP (Audio-Video Profile), 45, 48, 51, 66–72, 87, 136
Receiver Report (RR), 73
Record Object (RRO), 274
Redirection, 54
Redundancy, 238, 239, 243
Registration Procedures, 58
Regulation, 5, 14, 26, 27, 56, 93, 115, 291
Release 99, 11, 12, 151, 152
Remote Authentication Dial-In User Service (RADIUS), 18, 151, 174, 306
Remote Concentrator Unit (RCU), 17
Remote descriptor, 135, 137
Residential Gateway (RGW), 20, 21, 37, 75
Resiliency, 238, 252, 259
Resource and Admission Control Subsystem (RACS), 180
Resource Control Enforcement Function (RCEF), 181
Resource ReserVation Protocol (RSVP), 233, 235, 236, 263
Restoration, 6, 236, 239, 252, 256, 263
RESV, 274
RFC 2547, 244, 245, 253
RGW. *See* Residential Gateway (RGW)
Ringing, 46, 63, 102, 105, 117–119, 121, 138, 140, 172, 215, 222, 224, 292, 305, 316
Ringing tone, 33, 63, 102, 103, 105, 119–121, 125, 130, 316
RNC. *See* Radio Network Controllers (RNCs)
Route distinguisher, 245
Route pinning, 239
Routing, 6, 32, 84, 86, 92, 106, 107, 122, 144, 145, 153, 154, 157, 232–237, 239–241, 243, 245, 252, 256–261, 269, 270, 273–275, 280, 282, 293, 295–300, 312, 319
  loose, 274
Routing Control Channel (RCC), 257–259
RR. *See* Receiver Report (RR)
RRO. *See* Record Object (RRO)
RSA, 84
RSVP. *See* Resource ReserVation Protocol (RSVP)
RSVP with Traffic Engineering (RSVP-TE), 235, 236
RSVP-TE. *See* RSVP with Traffic Engineering
RTCP. *See* Real-time Control Protocol (RTCP)
RTP. *See* Real-time Transport Protocol (RTP)
RTSP. *See* Real-Time Streaming Protocol (RTSP)
S/MIME. *See* Secure MIME
SAI. *See* Source Attachment Identifier
Satellite Digital Multimedia Broadcast (S-DMB), 177, 178
SBC. *See* Session Border Controller (SBC)
SBG. *See* Session Border Gateway
Scalability, 6, 97, 236, 237, 252, 278, 283, 288, 300, 313
SCE. *See* Service Creation Environment (SCE)
SCFs. *See* Service Capability Features (SCFs)
S-CSCF. *See* Serving Call Session Control Function
SCTP. *See* Stream Control Transmission Protocol (SCTP)
SDH. *See* Synchronous Digital Hierarchy (SDH)
S-DMB. *See* Satellite Digital Multimedia Broadcast
SDP. *See* Session Description Protocol (SDP)
Secure MIME (S/MIME), 94, 96
Secure URI, 95
Security, 7, 22, 30, 38, 75, 77, 81–86, 90, 92–98, 114, 157, 161, 184, 186, 187, 291, 299
  authentication, 10, 18, 55, 56, 58, 78, 94–96, 98, 107, 153, 162, 200
  DoS (denial of service), 7, 81, 144, 268, 299, 321, 324, 327
  theft of service, 7, 81, 93
Sender Report (SR), 73
Sender template specific, 242
Sequence number, 247
Service Agility, 8
Service Assurance, 236
Service Broker, 22, 24, 28, 211–217, 221–226, 228
Service Capability Features (SCFs), 10, 200, 201
Service Control Function, 193, 208
Service Creation Environment (SCE), 193
Service Data Unit (SDU) mode, 248
Service Delivery Platforms, 226
Service Independent Building Blocks (SIBBs), 193, 205
Service Interworking, 254
Service Level Agreement (SLA), 5, 6, 236, 237, 239, 283
Service Logic Gateway, 211
Service Nodes, 193
Service Orchestration, 205, 206, 217

Service Point Trigger, 207
Service Policy Decision Function (SPDF), 180, 291
Service Provider, 2–4, 7–10, 13, 18, 19, 21, 87, 116, 149, 174, 194, 198, 205, 206, 231, 232, 234, 243–246, 251–254, 256, 257, 259, 264, 268, 276, 277, 279, 280
Service Switching Function, 193, 208
Service Velocity, 8
Service-based Policy Control (SBP), 180
Services in the PSTN/IN Requesting InTernet Services (SPIRITS), 184
Serving Call Session Control Function (S-CSCF), 160, 163, 164, 167, 208, 217
Serving GPRS Support Node (SGSN), 153
Session Border Controller (SBC), 19–21, 23, 30, 38, 44, 57, 64, 75, 81, 86–89, 92, 94, 96–98, 160, 283, 285–289, 291, 299
Session Border Gateway (SBG), 11, 23, 30, 44, 81, 83, 85–87, 89–97, 284, 291, 292, 298–301, 306, 307, 312, 313, 315–318, 320, 324, 327–329
Session Description Protocol (SDP), 7, 16, 36, 39, 42, 44, 46, 48, 49, 57, 65–70, 75, 77, 87, 88, 94, 96, 106, 109, 111, 112, 120–122, 125, 127, 134, 135, 137, 171–173, 180, 186, 187, 207, 219, 226–228, 285, 302–305, 307, 314, 316
  attribute (a=) line, 45, 48, 51, 66, 68–70, 136, 302, 304, 305
  conf (precondition negotiation) attribute, 302, 304, 305
  connection data (c=) line, 44, 48, 51, 66, 67, 69, 70, 87, 135, 136
  curr (precondition negotiation) attribute, 302, 304
  des (precondition negotiation) attribute, 302, 304
  fmtp attribute, 44, 45, 48, 51, 66, 69
  inactive attribute, 69, 70
  media type and transport (m=) line, 44, 45, 48, 51, 66–70, 87, 135–137
  ptime attribute, 45, 66, 68, 69
  recvonly attribute, 69, 70
  rtpmap attribute, 44, 45, 48, 51, 66, 68–70, 136
  sendonly attribute, 69, 70
  sendrecv attribute, 44, 45, 66, 69, 70, 302, 304
Session Initiation Protocol (SIP), 1, 7, 10, 11, 14–16, 24, 28, 29, 32, 34–70, 72, 75–77, 86–98, 105, 106, 108, 109, 112–121, 124–127, 134–137, 146, 159–165, 167, 168, 170, 171, 173, 180, 183, 184, 186–188, 194–199, 206–217, 219–222, 224, 225, 228, 267, 284, 285, 287, 289, 291, 292, 299, 300, 302–307, 312–320, 324, 325, 327–329
1xx (provisional) responses, 47
2xx response, 46
3xx response, 54
4xx response, 52, 53
100 Trying response, 38, 39, 45–47, 55, 62, 113, 302
180 Ringing response, 38, 46, 47, 49, 55, 61–63, 87, 88, 113, 120, 125, 302, 303, 315, 317, 318
200 OK response, 34, 38, 46, 50–53, 55, 58–60, 96, 113, 120, 124, 125, 164, 172, 173, 226, 302, 305, 315–318
ACK request, 38, 52, 54, 105, 107, 113, 120, 125, 144, 172, 315–318
Allow header field, 43, 47, 51, 150
B2BUA (Back-to-Back User Agent), 37, 38, 57, 64, 87, 89, 94, 198, 208, 212, 299, 316
branch parameter magic cookie, 40
BYE request, 38, 52–55, 116, 120, 125, 215, 220, 221, 224, 225
Call-ID header field, 41, 45, 47, 49–53, 57, 59, 60
CANCEL request, 52, 55
confirmed dialogue, 46
Contact header field, 42, 48, 49, 51, 52, 54, 57–60, 62
Content-Length header field, 42, 45, 48–54, 59, 60
Content-Type header field, 42, 51, 96
CSeq header field, 42, 45, 47, 49–54, 57, 59, 60, 95
Date header field, 45, 47, 50, 51, 53
dialogue, 39–43, 46–53, 55, 60, 62–65, 95, 198
early dialogue, 47, 52
forking, 11, 41, 54–56, 62, 167, 168, 313, 314
From header field, 40, 41, 45, 47, 49–53, 55–57, 59, 62, 96
History header field, 54
INVITE request, 32, 34, 37–42, 44–47, 49–52, 54–58, 60–63, 66, 87, 88, 93, 95, 96, 113, 116, 120, 125, 136,

167, 171, 172, 188, 194–197, 206, 208–210, 212–224, 226, 302, 305, 314–318, 328
Max-Forwards header field, 39, 53, 57
NOTIFY request, 43, 47, 51, 116, 206, 217, 219, 220, 326
offer-answer model, 36, 46, 48, 49, 65, 66, 68–70, 83, 107, 125, 128, 134, 136–138, 151, 172–174, 178, 187, 286, 300, 303, 305, 327
P-Asserted-Identity header field, 56, 57, 94, 114
P-Charging-Vector header field, 64, 65, 210, 214
PRACK (Provisional ACK) request, 38, 46, 49, 50, 63, 187, 302, 303, 315, 317, 318
precondition signalling for QoS, 267, 302
Privacy header field, 57
Proxy Server, 7, 32, 37, 39, 40, 52, 55, 60, 62, 64, 82, 92, 160, 164, 167, 176, 177, 194–196, 198, 309, 326
RAck header field, 50
Record-Route header field, 39, 60, 62–64, 173
redirect server, 38, 54
redirection, 11, 76, 195
REFER request, 43, 47, 51, 188
REGISTER request, 58–60, 93
registrar, 7, 38, 39, 58, 59, 62, 90, 91, 95, 96
registration, 10, 56, 58, 59, 76, 90, 95, 108, 141, 161, 163, 164, 173, 188, 208, 214, 219
re-INVITE, 46, 63, 64, 219–221, 226
Request-URI field, 39–41, 60, 62, 114, 187, 196, 212, 213, 216, 222, 223
Require header field, 42, 43, 47, 59
Route header field, 60, 61, 63, 64, 208, 210, 212–214, 219, 274
RSeq header field, 47, 50
Session-Expires header field, 42, 46
SIP: URI, 32, 39–42, 48, 57, 60, 62, 63, 76, 88, 95, 124, 163, 165, 167
SIP-I (SIP with encapsulated ISUP), 14, 29, 94, 113, 114
SIPS: URI, 95
Supported header field, 43, 59, 307
target URI, 61–63
tel: URI, 76, 79, 165, 183
To header field, 41, 45, 47, 49–53, 55–57, 59, 62, 96, 114
UA (User Agent), 7, 32, 37, 39, 40, 42, 43, 45–47, 49–60, 62–64, 66–70, 87, 88, 92, 93, 95, 96, 164, 194
UAC (User Agent Client), 37
UAS (User Agent Server), 32, 37
UPDATE request, 43, 46, 47, 51, 302, 303, 305, 315–318
Via header field, 39, 40, 45, 47, 49–53, 57–63
Session Initiation Protocol Project INvestiGation (SIPPING), 183
Session Termination Answer, 312
Session Termination Request (ST-Request), 311
SG. *See* Signalling Gateway (SG)
SHA1, 84
Shaping, 249, 269
Shared Secrets, 84
SIBBs. *See* Service Independent Building Blocks (SIBBs)
Signalling, 234–236, 247, 250–252, 256–262, 264
Signalling Gateway (SG), 11, 108–110, 118, 145, 146, 155, 160
Signalling Interworking, 257
Signalling network, 101, 144, 146
Signalling path Session Border Gateway (S-SBG), 22, 23, 86, 89, 91, 92, 94, 291–294, 297–301, 305–307, 312, 314, 316, 325, 327, 328
Signalling System No. 7 (SS7), 11, 21, 24, 26, 29, 30, 93, 106, 107, 142, 144–146, 183
Signalling Transport (SIGTRAN), 14, 29, 30, 109, 110, 142–144, 146, 183
DUA (DPNSS User Application Layer), 30
IUA (ISDN User Adaptation Layer), 14
M2PA (MTP2 User Peer to peer Adaptation Layer), 30, 145, 146
M2UA (MTP2 User Adaptation Layer), 29, 30, 145, 146
M3UA (MTP3 User Adaptation Layer), 29, 30, 145, 146
SIGTRAN. *See* Signalling Transport (SIGTRAN)
SIMPLE, 184
Simple Network Management Protocol, 84, 296
Simple Object Access Protocol (SOAP), 201
Single segment PWs (SS-PWs), 251, 252
SIP. *See* Session Initiation Protocol (SIP)

SIPPING. *See* Session Initiation Protocol Project INvestiGation (SIPPING)
SLA. *See* Service Level Agreement (SLA)
SLF. *See* Subscription Locator Function (SLF)
SOAP. *See* Simple Object Access Protocol (SOAP)
Soft Permanent Virtual Connections (SPVCs), 256, 257
Softswitch, 156, 199, 227
SONET. *See* Synchronous Optical Network (SONET)
Source Attachment Identifier (SAI), 250
Spanning Tree Protocol (STP), 252, 253
S-PE. *See* Switching PE (S-PE)
Special Resource Function, 192
Special service circuits, 99, 101
SPIRITS. *See* Services in the PSTN/IN Requesting InTernet Services (SPIRITS)
SPVC-PWE3 interworking, 259, 260
SPVCs. *See* Soft Permanent Virtual Connections
SR. *See* Sender Report (SR)
SS7. *See* Signalling System No. 7 (SS7)
S-SBG. *See* Signalling path Session Border Gateway
SS-PWs. *See* Single segment PWs
SSRC. *See* Synchronisation source (SSRC)
Standards, 6, 16, 22, 24, 25, 30, 33, 36, 103, 108, 109, 113, 121, 150, 176, 179–182, 184, 185, 193, 199, 206, 228, 326
Status signalling, 262
STP. *See* Spanning Tree Protocol
Stream Control Transmission Protocol (SCTP), 7, 29, 30, 141–145, 307
Strict routing, 274
Subscriber Identity Module, 151
Subscription Locator Function (SLF), 162, 165
Supervision, 25, 101–103, 106, 140, 146
  hook-flash, 102
  off-hook, 102, 103, 117, 119–121, 124, 125, 138–140, 316, 325
  on-hook, 102, 103, 120, 121, 124–126, 130, 138–140
SVC. *See* Switched Virtual Connections
Switched Virtual Connections (SVC), 256
Switching PE (S-PE), 251, 252
Symmetric RTP, 75, 77, 88
Synchronisation source (SSRC), 72
Synchronous Digital Hierarchy (SDH), 231, 232, 237, 239
Synchronous Optical Network (SONET), 231, 239

Tag
  in preconditions, 304
  in user part of SIP Route header field, 219, 223
  parameter of SIP From or To header field, 40, 41, 45, 47, 49–53, 55, 57, 59
  used in calls to SIP CGI server, 197
TAI. *See* Target Attachment Identifier
Target Attachment Identifier (TAI), 250
TCP. *See* Transmission Control Protocol (TCP)
TD-CDMA. *See* Time Division CDMA (TD-CDMA)
TDM. *See* Time Division Multiplex (TDM)
TE. *See* Traffic Engineering (TE)
Telecoms & Internet converged Services and Protocols for Advanced Networks (TISPAN), 22, 90, 180, 289
Telephone line, 2, 5, 9, 10, 24, 25, 32, 34, 56, 67, 74, 93, 101–104, 117–121, 123–126, 129, 138–140, 156, 228, 276, 283, 314, 322, 325
  local loop, 101
Telephone numbers, 16, 32, 75–77, 183
Temporary Mobile Subscriber Identity (TMSI), 154
Terminating PE (T-PE), 251, 252
TGW. *See* Trunking Gateway (TGW)
Third parties, 5, 25, 94, 194, 299
3GPP. *See* 3rd Generation Partnership Project (3GPP)
3rd Generation Partnership Project (3GPP), 6, 11, 12, 24, 36, 106, 111, 114, 126, 150–152, 154–156, 158, 160–162, 167–170, 173, 174, 176, 177, 179, 181, 184–188, 198, 199, 206–209, 291, 302, 306, 307
Threat model, 81, 83, 96, 97
Three-colour marker, 272, 273
Time Division CDMA (TD-CDMA), 158
Time Division Multiplex (TDM), 3, 4, 10, 14–17, 19, 21–24, 29, 30, 32, 34, 39, 77, 152, 153, 191, 199, 231, 246, 249, 256, 257, 281, 302, 327
Time Division Synchronous Code Division Multiple Access (TD-SCDMA), 158
TISPAN. *See* Telecoms & Internet converged Services and Protocols for Advanced Networks (TISPAN)

TLS. *See* Transport Layer Security (TLS)
TMSI. *See* Temporary Mobile Subscriber Identity (TMSI)
ToS. *See* Type of Service bits (ToS)
T-PE. *See* Terminating PE (T-PE)
Traffic contract, 234, 269, 272, 278
Traffic engineered, 14, 267, 296
Traffic Engineering (TE), 233–237, 239, 244, 252, 256, 263
Traffic Management, 234
Transit exchange, 16, 17, 19, 24, 27, 32, 297
  Class Four office, 17
  XIT, 17
Transmission Control Protocol (TCP), 7, 29, 57, 122, 141–144, 232, 233, 235, 270, 273, 274, 307
Transport Layer Security (TLS), 92, 94, 95
Trigger point, 25, 30, 33, 192, 206
Triple Play, 2, 5, 7, 9, 174, 276
Trunking Gateway (TGW), 19–23, 284, 287, 289, 292, 294, 297, 298, 301, 325
21st Century Network, 24
Type of Service bits (ToS), 234, 244

UA. *See* User agent (UA)
UDP. *See* User Datagram Protocol (UDP)
UE. *See* User equipment (UE)
ULTRA TDD, 158
UMA. *See* Unlicensed Mobile Access (UMA)
UMA Network Controller (UNC), 174
UMAN. *See* Unlicensed Mobile Access Network (UMAN)
UNC. *See* UMA Network Controller (UNC)
UNI. *See* User-Network Interface (UNI)
Universal Mobile Telecommunications System (UMTS), 4, 150–156, 158, 159, 170, 179, 184, 185
Universal Resource Identifier (URI), 32, 54, 57, 62, 64, 76, 95, 165, 183, 216
Universal Terrestrial Radio Access Network (UTRAN), 150
Unlicensed Mobile Access (UMA), 11
Unlicensed Mobile Access Network (UMAN), 175
Uplink, 6, 152, 153, 157, 158, 310
URI. *See* Universal Resource Identifier (URI)
User agent (UA), 7
User Datagram Protocol (UDP), 7, 29, 40, 42, 44, 45, 47, 49–53, 59, 67, 71, 121, 122, 141, 144, 157, 183, 233, 270, 274, 310
User equipment (UE), 104, 155, 159
User-Network Interface (UNI), 257
UTRAN. *See* Universal Terrestrial Radio Access Network (UTRAN)

V5 access signalling, 23, 24, 26, 27, 29, 103, 104, 139, 142, 146
Value-added services, 8, 24, 27, 30, 36, 37, 164, 191, 193, 195, 197, 199, 201, 203, 205–207, 209, 211, 213, 215, 217, 219, 221, 223, 225–228
VC. *See* Virtual Channel
VCC. *See* Virtual Channel Connection (VCC)
VCCV. *See* Virtual Circuit Connectivity Verification (VCCV)
VCI. *See* Virtual Channel Identifier (VCI)
Video on Demand (VoD), 10, 11, 18, 20, 277
Video services, 2, 5, 6, 10, 11, 16, 19, 36, 67, 71–74, 77, 101, 104, 121, 134–137, 156, 159, 174, 177–179, 182, 183, 205, 232, 267, 268, 276–278, 282, 283, 286, 289, 329
Virtual Channel (VC), 241, 247, 248
Virtual Channel Connection (VCC), 241, 248
Virtual Channel Identifier (VCI), 248, 250, 259
Virtual Circuit Connectivity Verification (VCCV), 260, 261
Virtual Leased Lines (VLLs), 277
Virtual Local Area Network (VLAN), 252, 256
Virtual Path Identifier (VPI), 248, 250, 257–259
Virtual Private LAN Services (VPLS), 4, 246, 252–254, 260, 264, 276, 278
Virtual Private Network (VPN), 175, 231, 243–247, 250, 253–256, 261–264
  IP VPN, 236, 245
  layer 2 VPN, 236
Virtual Private Wire Service (VPWS), 246, 253
Virtual routing and forwarding (VRF), 245
Virtual tunnel, 275, 285
Visitor Location Register (VLR), 154
VLAN. *See* Virtual Local Area network
VLL. *See* Virtual Leased Lines (VLLs)
VLR. *See* Visitor Location Register (VLR)
VoD. *See* Video on Demand
Voice mail, 10, 54, 62, 139, 221, 222, 224–226
Voice on net service, 20–23
Voice over IP (VoIP), 15, 20, 22, 23, 33, 36, 38, 43, 65, 74, 75, 77, 86, 87, 183, 270
Voice services, 2–7, 9–11, 14–17, 19–24, 27, 28, 36, 38, 65, 71–75, 77, 81, 82, 86,

Voice services (*continued*)
90, 99–101, 106, 108–112, 115, 116, 121, 137, 139, 149–152, 155, 156, 158, 159, 174, 175, 182, 191, 203, 205, 227, 228, 232, 257, 267, 268, 270, 276, 278, 281–287, 291, 310, 320, 329
VoIP. *See* Voice over IP
VPI. *See* Virtual Path Identifier (VPI)
VPLS. *See* Virtual Private LAN Services (VPLS)
VPN. *See* Virtual Private Network (VPN)
VPWS. *See* Virtual Private Wire Service
VRF. *See* Virtual routing and forwarding

WAG. *See* Wireless LAN Access Gateway (WAG)
Wallclock, 73
W-CDMA. *See* Wideband Code Division Multiple Access (W-CDMA)
Wideband Code Division Multiple Access (W-CDMA), 158
WiFi, 4, 13, 94, 174
WiMAX. *See* Worldwide Interoperability for Microwave Access (WiMAX)
Wireless LAN (WLAN), 149, 150
Wireless LAN Access Gateway (WAG), 176
WLAN. *See* Wireless LAN (WLAN)
Worldwide Interoperability for Microwave Access (WiMAX), 151

X.509, 84, 85
XML, 194, 195