

Index

- 10-Gigabit Ethernet (10GbE), 256
 - 64B/66B encoding, 261
 - 8B/10B encoding, 261
 - full duplex, 260
 - interframe spacing, 261
 - interoperability
 - Ethernet, 260
 - SONET/SDH, 260
 - port type
 - LAN PHY, 261
 - WAN PHY, 261
 - WWDW LAN PHY, 261
 - wide wavelength division multiplexing (WWDW), 261
- 100-Gigabit Ethernet (100GbE), 256
 - 3D path computation, 276
 - 64B/66B encoding, 261
 - 8B/10B encoding, 259, 261
- AAA, 275, 277
- Access control, 87
- Access network, 225
 - cost sensitivity, 225
 - P2P-friendly, 254
- Access strategy
 - a posteriori, 177–180
 - a priori, 177–179
- Accounting management, 17
- ACK, 106, 128
- Acknowledgment (ACK), 106, 128
- Acousto-optic tunable filter (AOTF), 11, 14, 36
- ACTS KEOPS (keys to optical packet switching), 136
- Adaptability, 76, 111
- ADM, 4
- Admission control, 234
- Advanced Technology Demonstration network (ATDnet), 279
- Alignment, 138, 139
- All-optical network (AON), 9, 26, 67, 84
- AllWave fiber, 37
- Amplified spontaneous emission (ASE), 40, 68, 83
- AON, 9, 26, 84
 - applications, 11
 - islands of transparency, 12
 - link connectivity verification, 67
 - modularity, 11
 - reconfigurability, 13
 - scalability, 11
 - service
 - point-to-multipoint, 11
 - point-to-point, 11
 - survivability, 15
- AOTF, 11, 14, 36
- API, 275, 277
- APON, 20, 221, 239
- Application programming interface (API), 275
- Applications
 - audio/video file sharing, 221, 254
 - backup of files, 22
 - broadcast television, 21
 - business continuity, 275
 - computer-aided design (CAD), 274
 - data, 11
 - disaster recovery, 275
 - distributed games, 225
 - e-science, 275, 278
 - file downloading, 22
 - Grid computing, 22, 28, 134, 275
 - HDTV, 22, 221
 - interactive games, 21
 - interactive video, 21
 - latency-critical, 21
 - medical imaging, 11
 - online gaming, 221, 251
 - client–server paradigm, 253
 - latency, 253
 - peer-to-peer (P2P) paradigm, 254
 - scalability, 253
 - traffic characteristics, 253
 - peer-to-peer (P2P), 22, 221, 251, 254
 - traffic characteristics, 254
 - program and file sharing, 22, 254
 - security video monitoring, 21
 - storage, 276

- Applications (*cont.*)
 supercomputer interconnection, 11, 134
 surveillance, 221
 telecommuting, 21, 221
 telemedicine, 21, 221
 throughput-critical, 22
 triple play, 221, 250
 uncompressed HDTV, 11, 134
 video, 11
 broadband, 274
 video and still-image email attachments, 22
 video conferencing, 21, 221
 video multicasting, 15
 video on demand (VoD), 22, 166, 221, 225
 video teleconferencing, 15
 video-over-IP (VoIP), 274
 visualization, 280
 voice, 11, 166
 web browsing, 166
- APS, 171
- Arrayed waveguide grating (AWG), 32, 140, 150
- ASE, 40, 68
- ASON, 27, 57, 277
 crankback, 70
 reference points, 57, 274
 E-NNI, 57
 external network–network interface (E-NNI), 274
 I-NNI, 57
 internal network–network interface (I-NNI), 274
 UNI, 57
 user-network interface (UNI), 274
 soft-permanent connection, 57, 274, 277
 switched connection, 57, 274, 277
 testbeds
 Layers Interworking in Optical Networks (LION), 274
- ASTN, 27
- Asynchronous transfer mode (ATM), 20, 22
- ATDnet, 279, 280
- Athermal, 246
- ATM, 20, 22, 132, 225
 ATM PON (APON), 20
 asynchronous transfer mode ring (ATMR), 190
 ATM PON (APON), 221
 cell, 139, 180
 cell tax, 222, 225
 framing overhead, 222
 switch, 136
 virtual channel identifier (VCI), 58, 60
 virtual circuit, 30, 58
 virtual path, 30, 58
 virtual path identifier (VPI), 58, 60
- Attenuation, 37, 72
- Augmented ring, 194
- Authentication, authorization, and accounting (AAA), 275
- Autocorrelation, 137
- Autodiscovery, 228
- Automatic protection switching (APS), 171
- Automatic switched optical network (ASON), 27, 57
- Automatic switched transport network (ASTN), 27
- Autonegotiation, 259
- Availability, 161
- AWG, 32, 140, 150, 195, 200, 205
 athermal, 246, 247
 free spectral range (FSR), 32, 206, 247, 255
 free-space, 201
 planar, 201
 polarization-independent, 33
 spatial reuse, 32
 temperature control, 246
 wavelength shift, 246
- Backlog, 229, 236
- Backoff, 180
- Backward-compatibility, 241
- Bandwidth, 3
- Bandwidth guaranteed polling (BGP), 231
- Bandwidth-distance product, 6, 34, 35
- Base station, 262
- BER, 39, 83
- Best effort, 76, 165
- BGP, 231
- Billing management, 17
- Bit error rate (BER), 39, 83
- Blocking probability, 12, 28, 30, 70
- BPON, 222
- Bridge, 89, 258
 RPR, 245
- Broadband PON (BPON), 222
- Broadcast
 directed, 253
- Broadcast-and-select networks, 8
- BSC, 239
 delta compression, 240
 preallocation, 240
- Buffer
 input, 142
 head-of-line (HOL) blocking, 142
 look-ahead capability, 142
 output, 140
 virtual output queueing (VOQ), 141
 recirculation, 142
 shared, 141
- Buffer insertion ring, 157
- Buffer management, 88
- Building backbone, 260
- Burst assembly algorithms, 109, 121, 132, 133
- Burst cluster transmission, 112

- Burst dropping policies, 121
- Burst segmentation techniques, 119
 - prioritized, 121
- Burst-mode transmitter, 239
- Byte interleaving, 9
- Byte size clock (BSC), 239

- C-TDMA, 181
- Cable
 - multifiber, 246
- Cable modem, 19, 225
- Call blocking probability, 264
- Cambridge ring, 157
- Campus backbone, 260
- CANARIE, 273
- Capacity planning, 111
- CAPEX, 20
- Carrier extension, 257
- Carrier sense multiple access with collision avoidance (CSMA/CA), 180
- Carrier sense multiple access with collision detection (CSMA/CD), 180
- Carrier sense multiple access with collision preemption (CSMA/CP), 180
- CBR, 191
- Cellular radio network, 262
 - base station, 262
 - microcells, 262
- Cellular radio networks
 - hand-off, 263
- Central office (CO), 225, 226, 245
- Channel collision, 174, 249
- Channel inspection, 177
- Channel-oriented TDMA (C-TDMA), 181
- CHEETAH, 278
- Chordal ring, 217
- Chromatic dispersion, 38
- Circuit-switched High-speed End-to-End Transport Architecture (CHEETAH), 278
- Circulator, 279
- Class of service (CoS), 69, 133
- CLDR, 122
- Cleave point, 163
- Client-server paradigm, 22, 253
 - hot-spot server, 254
 - on-line gaming, 253
- Clock recovery, 136
- CO, 245
- Coarse wavelength division multiplexing (CWDM), 238, 261
- Collision avoidance, 180
- Collision detection, 180
- Combiner, 31, 149, 206
- Commercial off-the-shelf (COTS) components, 266
- Compliance, 240, 241

- Condominium networks, 28
- Configurability, 205
- Configuration management, 17
 - provisioning, 17
 - signaling, 17
- Congestion, 168, 169
- Constant bit rate (CBR), 191
- Constraint-Based Routing Label Distribution Protocol (CR-LDP), 70
- Contention, 85, 89, 95, 108, 118
- Contention resolution, 118
- Contention-based limited deflection routing (CLDR), 122
- Control, 98
 - centralized, 16
 - control channel, 182
 - control channel management, 66
 - control network, 105
 - control plane, 26
 - distributed, 16
 - medium access control (MAC), 26
 - optical supervisory channel (OSC), 15
 - out-of-band, 105
- Control plane, 26, 57
 - IP centric, 26
 - MPLS, 57
- Conversion
 - electrical-optical (EO), 3
 - optical-electrical (OE), 3
 - optical-electrical-optical (OEO), 4
 - optical-to-RF, 262
 - RF-to-optical, 262
 - wavelength conversion, 12, 13
- Coordinated universal time (UTC), 53
- CoS, 69, 133
- Cost sensitivity, 225
- COTS components, 266
- CPU, 254
- CR-LDP, 70
- Crankback, 70
- Cross-bar switch, 14, 151
- Cross-gain modulation (XGM), 144
- Cross-phase modulation (XPM), 39, 144
- Crosscorrelation, 137
- Crosstalk, 11, 36, 40, 68, 72
 - interchannel, 40, 85
 - intrachannel, 40
- Cryptography, 17
- CSMA/CA, 180
- CSMA/CD, 180
- CSMA/CP, 180
- Customer-controlled and -managed optical networks, 28
 - Grid computing, 28
- Cut-through forwarding, 107, 162
- CWDM, 238, 261

- Dark fiber, 28, 195
- Data communications network (DCN), 132, 277
- Data plane, 26, 57
- DataTAG, 273
- DBA, 226, 252
 - WDM DBA algorithm, 239
- DBR laser, 35
- DCN, 132, 277
- DCS, 5
- DEB, 234
- DECT PRS, 266
- Deflection routing, 91, 95, 108, 121, 127, 133, 138, 140, 280
 - contention-based limited deflection routing (CLDR), 122
 - failure recovery, 126
 - optical packet switching (OPS), 145
- Delineation, 138, 139
- Delta compression, 240
- Destination conflict, 174, 208, 249
- Destination stripping, 157, 161, 187, 190, 197, 200
- Deterministic effective bandwidth (DEB), 234
- Devices
 - acousto-optic tunable filter (AOTF), 11, 14, 36
 - add-drop multiplexer (ADM), 4
 - arrayed waveguide grating (AWG), 32, 140, 150, 195
 - athermal, 246
 - burst-mode transmitter, 239
 - cable modem, 19
 - circulator, 279
 - combiner, 31, 149, 206, 226
 - coupler, 225
 - WDM, 248
 - cross-bar switch, 14, 151
 - digital cross-connect (DXC), 78
 - digital cross-connect system (DCS), 5
 - dynamic wavelength add-drop multiplexer (DWADM), 184
 - electroabsorption modulator (EAM), 134, 266
 - electro-optic tunable filter (EOTF), 36
 - Erbium doped fiber amplifier (EDFA), 10, 273
 - filter
 - tunable, 36
 - fixed wavelength converter (FWC), 149
 - fixed-tuned receiver, 207, 249
 - fixed-tuned transceiver, 201, 249
 - fixed-tuned transmitter, 207
 - frequency converter, 266
 - gate, 148, 149
 - laser, 35
 - diode, 266
 - light-emitting diode (LED), 34
 - limited-range wavelength converter (LRWC), 144
 - liquid-crystal (LC) Fabry-Perot filter, 36
 - Mach-Zehnder interferometer (MZI), 36
 - Mach-Zehnder modulator (MZM), 267
 - multicarrier generator, 238
 - multisection transmitter, 35
 - multiwavelength laser, 11, 14
 - multiwavelength receiver, 37, 250
 - multiwavelength receiver array, 11, 14
 - multiwavelength transmitter array, 14
 - optical add-drop multiplexer (OADM), 10, 14, 174, 268, 274
 - optical cross-connect (OXC), 10, 15, 274
 - passive star coupler (PSC), 31, 195, 247
 - phased array (PHASAR), 32
 - photodetector, 36
 - reconfigurable optical add-drop multiplexer (ROADM), 14, 266, 273
 - reconfigurable optical cross-connect (ROXC), 15
 - semiconductor optical amplifier (SOA), 144
 - splitter, 31, 148, 149, 206, 225, 226
 - star coupler, 3
 - superluminescent diode, 34
 - tunable laser, 246, 273
 - tunable receiver, 14, 208
 - tuning range, 208
 - tuning time, 208
 - tunable transceiver, 201
 - tunable transmitter, 14, 207, 250
 - tuning range, 208, 250
 - tuning time, 208
 - tunable wavelength converter (TWC), 13, 143, 148, 150
 - vertical-cavity surface emitting laser (VCSEL), 266
 - waveband departmenter, 31, 206
 - waveband partitioner, 31, 206
 - waveguide grating router (WGR), 32
 - wavelength add-drop multiplexer (WADM), 10
 - wavelength converter, 13
 - wavelength cross-connect (WXC), 273
 - wavelength demultiplexer, 10, 148, 149, 201
 - wavelength multiplexer, 10, 149, 201
 - wavelength-band-selective receiver, 239
 - wavelength-interchanging cross-connect (WIXC), 12, 13
 - wavelength-selection-free transmitter, 239
 - wavelength-selective cross-connect (WSXC), 10, 83
- DFB laser, 35
- Dielectric thin-film filter, 36
- Diffraction grating, 35, 36
- Digital cross-connect (DXC), 78
- Digital enhanced cordless telecommunication packet radio service (DECT PRS), 266
- Digital subscriber line (DSL), 19, 225
- Dispersion
 - chromatic, 38
- Direct current balance, 259

- Direct detection, 262
- Direct modulation, 262
- Discovery, 241, 250
- Dispersion, 6, 37, 72, 86
 - material, 38
 - modal dispersion, 37
 - polarization mode (PMD), 38
 - waveguide dispersion, 38
- Distributed Bragg reflector (DBR) laser, 35
- Distributed feedback (DFB) laser, 35
- Distributed queue bidirectional ring (DQBR), 190
- Distributed queue dual bus (DQDB), 190
- Distributed virtual-time scheduling in rings (DVSR), 202
- DIY, 221
- Do-it-yourself (DIY) installation, 221
- DOBS, 130
 - constant-scheduling-offset (CSO), 131
 - fairness, 131
- DPT, 205
- DQBR, 190
- DQDB, 190
- DRAGON, 275
- DSL, 19, 225
- Dual-header optical burst switching (DOBS), 130
 - constant-scheduling-offset (CSO), 131
- Dual-stack router, 276
- DVSR, 202
- DWA, 239
 - offline scheduling, 244
 - online scheduling, 244
- DWADM, 184
- DWDM, 77, 135
- DXC, 78
- Dynamic bandwidth allocation (DBA), 226
- Dynamic packet transport (DPT), 205
- Dynamic Resource Allocation in GMPLS Optical Networks (DRAGON), 275
- Dynamic wavelength add-drop multiplexer (DWADM), 184
- Dynamic wavelength allocation (DWA), 239

- E-NNI, 57, 274
 - interoperability, 275
- EAM, 134, 266
- EDFA, 10, 15, 273
 - amplified spontaneous emission (ASE), 40
 - gain competition, 29
- EFM, 222, 225
- Electroabsorption modulator (EAM), 134, 266
- Electro-optic tunable filter (EOTF), 36
- Electro-optical bottleneck, 5, 95, 136
- Encapsulation, 259
- EO conversion, 3
- EoS, 278
- EOTF, 36

- EPON, 20, 221, 222, 239
 - autodiscovery, 228
 - central office (CO), 245
 - control plane, 228
 - dynamic bandwidth allocation (DBA), 226
 - absolute QoS, 229
 - bandwidth guaranteed polling (BGP), 231
 - decentralized, 237
 - deterministic effective bandwidth (DEB), 234
 - interleaved polling with adaptive cycle time (IPACT), 229
 - multimedia, 234
 - relative QoS, 229
 - statistical multiplexing, 229
 - WDM DBA algorithm, 239
 - dynamic wavelength allocation (DWA)
 - offline scheduling, 244
 - online scheduling, 244
 - WDM IPACT with a single polling table (WDM IPACT-ST), 239
 - fragmentation, 228
 - interconnection, 245
 - interoperability, 226
 - logical link ID (LLID), 243
 - multipoint control protocol (MPCP), 226, 228
 - WDM extensions, 241
 - optical line terminal (OLT), 226
 - optical network unit (ONU), 226
 - burst-mode transmitter, 239
 - colorless, 239
 - polling, 227
 - cycle, 239
 - ranging, 228
 - registration, 228
 - scheduling
 - distributed, 237
 - inter-ONU, 228
 - intra-ONU, 228
 - offline, 244
 - online, 239, 244
 - service differentiation, 235
 - space division multiplexing (SDM), 246
 - synchronization, 228
- TDM, 227, 238
- tree topology, 226
- WDM, 21, 227, 238, 239, 245
 - backward compatibility, 241
 - compliance, 240, 241, 243
 - delta compression, 240
 - preallocation, 240
 - remote modulation, 239
- EPON forum, 225
- Erbium doped fiber amplifier (EDFA), 10, 273
- Error robustness, 259
- Escalation strategies, 74

- Ethernet, 20, 161, 256
 - 10-Gigabit Ethernet (10GbE), 21, 256, 260
 - 100-Gigabit Ethernet (100GbE), 256
 - 10GbE, 278
 - carrier-grade, 274
 - end-to-end, 21, 245
 - Ethernet PON (EPON), 20, 221, 225
 - Fast Ethernet, 256
 - full-duplex Ethernet, 258
 - flow control, 258
 - Gigabit Ethernet (GbE), 21, 256
 - Gigabit Ethernet LAN, 225
 - LAN, 222, 237
 - media independent interface (MII), 259
 - pause protocol, 258
 - switched Ethernet, 258
- Ethernet in the first mile (EFM), 222, 225
- Ethernet PON (EPON), 222
- Ethernet-over-SONET (EoS), 278
- Excess loss
 - AWG, 33
- Exponential averaging, 168
- External network-network interface (E-NNI), 57, 274
- Extinction ratio (ER), 138
- FλS, 53
- F-TCP, 255
- FA, 65
- Fabry-Perot
 - cavity, 35
 - liquid-crystal (LC) filter, 36
- Fairness, 130, 131, 151, 161, 167, 189, 190, 211
 - credit, 189
 - delay fairness, 190
 - distributed virtual-time scheduling in rings (DVSR), 202
 - equal, 168
 - quota, 189
 - SAT, 189
 - SAT-reservation field (SAT-RF), 191
 - throughput fairness, 190, 192, 230
 - weighted, 168
- Fallback, 278
- Fast Ethernet, 256
 - autonegotiation, 259
- Fast reroute (FRR), 58
- Fault management, 16, 67
 - escalation strategies, 74
 - fault detection, 67, 72, 170
 - fault localization, 67, 72
 - fault mitigation, 72
 - fault notification, 67, 72
 - traffic reversion, 73
- FBG, 36, 176, 266, 279
- FCAPS model, 16
- FCFS, 178
- FCFS-FF, 200
- FDDI, 4, 157, 256
- FDL, 25, 86, 90, 91, 108, 116, 127, 130, 142, 143, 145, 178
 - balking property, 119
 - broadcast-and-select switch, 149
 - optical packet switching (OPS), 142
 - space switch, 148
 - wavelength-routing switch, 150
- Fiber, 3
 - AllWave, 37
 - attenuation, 37
 - attenuation loss, 3, 42
 - bandwidth, 42
 - cladding, 38
 - core, 38
 - dark, 28, 195
 - dispersion, 6, 37
 - dispersion compensating, 87
 - electromagnetic interference, 42
 - fiber distributed data interface (FDDI), 4, 256
 - fiber to the building, 20
 - fiber to the curb, 20
 - fiber to the home, 20
 - hole-assisted, 221
 - impairments, 37
 - MetroCor, 38
 - multimode, 37
 - Gigabit Ethernet (GbE), 260
 - multimode (MMF), 266
 - noise, 40
 - nonlinear effects, 7, 68, 83
 - nonlinearities, 39
 - nonzero dispersion shifted fiber (NZ-DSF), 38
 - polarization mode dispersion (PMD), 68, 83
 - refractive index, 38
 - single-mode (SMF), 37, 266, 267
 - Gigabit Ethernet (GbE), 260
 - TeraLight Metro, 38
- Fiber Bragg grating (FBG), 36, 176, 266, 279
- Fiber delay line (FDL), 25, 86, 90, 91, 108, 116, 142, 143, 148, 178
- Fiber distributed data interface (FDDI), 157, 256
- Fiber optic microcellular radio, 262
 - call blocking probability, 264
 - dynamic channel assignment, 263
 - hand-off, 263
 - optical-to-RF converter, 262
 - remote modulation, 264
 - RF-to-optical converter, 262
- Fibre Channel, 259
- FIFO, 178, 181
 - look-ahead, 252

- Filter
 - broadcast-and-select networks, 8
 - dielectric thin-film, 36
 - diffraction grating, 36
 - fiber Bragg grating (FBG), 36
 - tunable
 - acousto-optically, 36
 - continuously, 36
 - discretely, 36
 - electro-optically, 36
 - liquid-crystal Fabry-Perot, 36
 - mechanically, 36
 - thermally, 36
- First mile, 225
- First mile bottleneck, 20
- First-come/first-served (FCFS), 178
- First-in/first-out (FIFO), 178
- Fixed wavelength converter (FWC), 149
- Flexibility, 10, 185, 205
- Flooding, 64
 - bidirectional, 163
 - unidirectional, 163
- Forward resource reservation, 111
- Forwarding
 - assured, 237
 - expedited, 237
- Forwarding adjacency (FA), 65
 - FA-LSP, 65
- Four-wave mixing (FWM), 39, 144, 268
- Fractional lambda switching (F λ S), 53
- Fragmentation, 180, 228
- Frame bursting, 258
- Free spectral range (FSR), 32, 206, 247
- Frequency converter, 266
- FRR, 58
- FSAN, 225
- FSR, 32, 206, 247, 255
- FTTX, 20, 225
 - fiber to the building (FTTB), 20, 226
 - fiber to the curb (FTTC), 20, 225, 226
 - fiber to the home (FTTH), 20, 53, 221, 225, 226
 - RoF network integration, 267
 - fiber to the premises (FTTP), 221
- Full duplex
 - 10-Gigabit Ethernet (10GbE), 260
 - Gigabit Ethernet (GbE), 258
- Full service access network (FSAN), 225
- Full-duplex Ethernet, 258
- FWC, 149
- FWM, 39, 144
 - RoF and PON network integration, 268
- Gate, 148, 149
- GbE, 21
- Generalized label, 59
- Generalized multiprotocol label switching (GMPLS), 27, 59
- Gigabit Ethernet (GbE), 21, 256
 - access
 - dedicated, 258
 - shared, 257
 - autonegotiation, 259
 - building backbone, 260
 - campus backbone, 260
 - CSMA/CD protocol, 257
 - carrier extension, 257
 - frame bursting, 258
 - direct current balance, 259
 - encapsulation, 259
 - error robustness, 259
 - full duplex, 258
 - flow control, 258
 - pause protocol, 258
 - gigabit media independent interface (GMII), 259
 - half duplex, 257
 - horizontal wiring, 260
 - physical coding sublayer (PCS), 259
 - 8B/10B encoding, 259
 - physical medium attachment (PMA), 259
 - non-return-to-zero (NRZ) line coding, 259
 - transition density, 259
- Gigabit media independent interface (GMII), 259
- Gigabit PON (GPON), 222
- Global Seamless Network (GSN), 274
- Global system for mobile communications (GSM), 265, 266
- GMII, 259
- GMPLS, 27, 59, 95, 122, 126, 127, 135
 - bidirectional LSP, 71
 - Ethernet-over-SONET (EoS), 278
 - FA-LSP, 65
 - generalized label, 59
 - interdomain routing, 275
 - interdomain signaling, 275
 - interface switching capability (ISC), 60
 - link bundling, 65
 - LMP, 66
 - LSP hierarchy, 62
 - LSP set-up, 63
 - LSP tunnel, 63
 - seamless IPv6 integration, 276
 - suggested label, 70
 - testbeds
 - ADRENALINE, 277
 - Circuit-switched High-speed End-to-End Transport Architecture (CHEETAH), 278
 - Dynamic Resource Allocation in GMPLS Optical Networks (DRAGON), 275
 - Global Seamless Network (GSN), 274
 - Layers Interworking in Optical Networks (LION), 274

- GMPLS (*cont.*)
 Multi-Partner European Testbeds for Research Networking (MUPBED), 275
 NetherLight, 277
 Optical Dynamic Intelligent Network services (ODIN), 277
 Optical Network Focused Interest Group (ONFIG), 276
 StarLight, 277
 UltraScience Net (USN), 278
 unnumbered links, 65
- GPON, 222
- Grid computing, 22, 28, 76
 consumer-oriented, 134
- Grid user-network interface (GUNI), 275
- Grooming, 29, 76, 82, 84, 95, 276
 blocking probability, 30
 degree of opacity, 30
- GSM, 265, 266
- GSN, 274
- Guard band, 230
- GUNI, 275
- Half duplex
 Gigabit Ethernet (GbE), 257
- Hand-off, 263
- Hand-over, 268, 269
- HDTV, 11, 22, 134
- Head-of-line (HOL) blocking, 142, 164, 179, 252
- Hello protocol
 HelloDeadInterval parameter, 66
 HelloInterval parameter, 66
- Heterogeneity, 76
- HFC, 225
- High-definition TV (HDTV), 11, 22, 134
- Higher Speed Study Group (HSSG), 256
- HOL blocking, 142, 164, 179
- Holdoff timer, 274
- Home channel, 174, 178, 247, 281
- Horizon, 114
- Horizontal wiring, 260
- HORNET, 179, 180, 281
 segmentation and reassembly on demand (SAR-OD), 182, 282
- Hot-potato routing, 122
- Hot-spot server, 254
- HSSG
 100-Gigabit Ethernet, 256
- Hybrid fiber coax (HFC), 225
- Hybrid optoelectronic ring network (HORNET), 179, 281
- HyperSCSI, 276
- I-NNI, 57, 274
- IETF, 27
- IGP, 64
- intermediate system to intermediate system (IS-IS), 64
- link state advertisement (LS), 67
- link state database, 68
- open shortest path first (OSPF), 64
- Impairments
 attenuation, 37
 dispersion, 37
 noise, 40
 nonlinearities, 39
- Individual wavelength switching (IWS), 92
- In-order delivery, 140, 173
- Intelligent optical network (ION), 60
- Interconnection models, 26
 augmented model, 27
 interdomain model, 27
 overlay model, 27, 275
 peer model, 27
- Interface switching capability (ISC), 60
- Interframe spacing, 261
- Interior gateway protocol (IGP), 64
- Interlayer networking, 26
- Interleaved polling with adaptive cycle time (IPACT), 229
- Internal network-network interface (I-NNI), 57, 274
- International Standards Organisation (ISO), 256
- Internet, 42, 76
 social impact, 252
- Internet protocol (IP), 23
- Interoperability, 27, 226
- Intersymbol interference (ISI), 6, 37
- ION, 60
- IP, 23, 30, 95
 asynchronous switch, 139
 IP-centric control plane, 26
 IP-over-optical networks, 26
 IP/MPLS client routers, 75
 IP/WDM network, 26
 native, 222
 router, 136
 telephony, 21
 video, 21
- IPACT, 229
 fairness, 230
 maximum transmission window (MTW), 230
 service
 credit, 230
 elastic, 230
 fixed, 230
 limited, 230
- IPv6 provider edge router (6PE), 276
- IS-IS, 122
- ISC, 60
 fiber switch capable (FSC), 61
 lambda switch capable (LSC), 61
 layer-2 switch capable (L2SC), 60

- packet switch capable (PSC), 60
- time-division multiplex capable (TDM), 60
- ISI, 37
- Island of transparency, 68, 245
- ISO, 16
 - Open Systems Interconnection (OSI), 256
- IST DAVID (data and voice integration over DWDM), 152
- ITU-T, 16, 27
- IWS, 92, 95

- JGN II, 281
- JumpStart, 133, 280
 - applications, 134
- Just-enough-time (JET) signaling, 113
- Just-enough-time (JET) signaling testbed
 - Optical Communication Center, 280
- Just-in-time (JIT) signaling, 113
 - implementation, 132
 - reverse deletion, 132
 - testbed
 - ATDnet, 280
 - JumpStart, 280
- Keep-alive message, 170

- Label edge router (LER), 58
- Label stacking, 59
- Label swapping, 58
- Label switched path (LSP), 58
- Label switched router (LSR), 58
- Labeled OBS (LOBS), 127
- LAN, 8
 - Ethernet, 222, 256
 - switched, 258
 - Gigabit Ethernet, 225
- Laser, 35
 - diode, 266
 - distributed Bragg reflector (DBR), 35
 - distributed feedback (DFB), 35
 - directly modulated, 38
 - multifrequency, 36
 - SG-DBR, 35
 - tunable
 - acousto-optically, 35
 - continuously, 35
 - discretely, 35
 - electro-optically, 35
 - injection-current, 35
 - mechanically, 35
 - vertical-cavity surface-emitting laser (VCSEL), 266
- Last mile, 225
- Last mile bottleneck, 20

- Latency
 - online games, 253
- Latest available unused channel with void filling (LAUC-VF), 114, 280
- LAUC-VF, 114, 280, 281
- Layers Interworking in Optical Networks (LION), 274
- Leaky bucket, 234
- LED, 34
- LER, 58
- Light emitting diode (LED), 34
- Light-trail, 53
 - testbed, 273
- Light-tree, 12
- Lightpath, 12, 26, 28, 30, 57, 84, 95, 128, 193
 - computation, 68
 - router initiated, 96
 - user initiated, 96
- Limited-range wavelength converter (LRWC), 144
- Linear programming (LP), 81
- Link bundling, 65, 67
- Link management protocol (LMP), 66
- Link state advertisement (LSA), 67
- Link state database, 68
- LION, 274
- Liquid-crystal (LC) Fabry-Perot filter, 36
- LLID, 243
- LMP, 66
 - control channel management, 66
 - fault localization, 72
 - keep alive, 66
 - link connectivity verification, 67
 - link property correlation, 67
 - parameter negotiation, 66
- LOBS, 127
 - burst assembly
 - label stacking, 127
 - LSP aggregation, 127
 - optical label swapping, 134
 - orthogonal modulation, 133
- Local area network (LAN), 8, 222, 256
- Logical link ID (LLID), 243
- LOL, 72
- Looping, 145
- LOS, 170
- Loss of light (LOL), 72
- Loss of signal (LOS), 170
- Louisiana Optical Network Initiative, 273
- LRWC, 144
- LSA, 67
 - link protection type, 74
- LSP, 58, 127
 - bidirectional, 71
 - FA-LSP, 65
 - hierarchy, 59, 62
 - protection, 71

- LSP (*cont.*)
 restoration, 71
 set-up, 63
 traffic-engineered, 275
 tunnel, 63
 unidirectional, 59
 LSR, 58, 127
- M-ATMR, 190
 MAC, 26, 98, 108, 175, 195
 carrier sense multiple access with collision avoidance (CSMA/CA), 180
 carrier sense multiple access with collision detection (CSMA/CD), 180, 257
 carrier sense multiple access with collision preemption (CSMA/CP), 180
 empty-slot protocol, 151, 152, 178, 181, 187, 281
 multipoint control protocol (MPCP), 227
 multitoken interarrival time (MTIT), 186
 protocol classification, 175
 reservation protocol, 200
 Mach-Zehnder interferometer (MZI), 36
 Mach-Zehnder modulator (MZM), 267
 MAN, 8, 157, 225
 metro core ring, 157
 metro edge ring, 157
 passivity, 246
 Management, 98, 246
 accounting management, 17
 adjacency table, 16
 billing management, 17
 configuration management, 17
 control channel management, 66
 fault management, 16, 67
 FCAPS model, 16
 link management protocol (LMP), 66
 network management system (NMS), 16
 performance management, 17
 ring management, 186
 security management, 17
 Telecommunications Management Network (TMN), 16
 Master node, 151
 Material dispersion, 38
 MAWSON, 176
 request/allocation protocol (RAP), 177
 Maximum transmission window (MTW), 230
 Mean hop distance, 201
 Media independent interface (MII), 259
 Medium access control (MAC), 26, 108, 175, 195
 MEMS, 44, 280
 Meshed ring, 187, 201, 217
 MetaRing, 157, 189
 MetroCor fiber, 38
 Metropolitan area network (MAN), 8, 157, 225, 226, 245
 Metropolitan area wavelength switched optical network (MAWSON), 176
 MG-OXC, 77
 multilayer MG-OXC, 79
 single-layer MG-OXC, 79
 Micro-electromechanical systems (MEMS), 44
 Microcells, 262
 MII, 259
 MMF, 266
 MMR, 189
 Mobility, 21, 42
 Modal dispersion, 37
 Modulation
 cross-gain modulation (XGM), 144
 cross-phase modulation (XPM), 144
 direct, 262
 orthogonal, 133
 remote, 239, 245, 264
 MONET, 132
 Moving cells, 268, 269
 MPLS, 75, 127, 135
 MP-BGP, 276
 MPCP, 226, 228
 discovery, 241
 protocol data unit (PDU), 243
 registration, 241
 STARGATE message, 252
 WDM extensions, 241, 250
 MPLS, 22, 57, 101
 fast reroute (FRR), 58
 label edge router (LER), 58
 label stacking, 59
 label swapping, 58
 label switched path (LSP), 58
 label switched router (LSR), 58
 LSP hierarchy, 59
 shim header, 58, 60
 traffic engineering (TE), 58
 MSPP, 278
 MTIT, 186
 circuit switching, 192
 target token interarrival time (TTIT), 186
 token interarrival time (TIAT), 186
 MTW, 230
 Multi-MetaRing (MMR), 189
 Multi-Partner European Testbeds for Research Networking (MUPBED), 275
 Multicarrier generator, 238
 Multicasting, 85, 124, 162, 176
 JumpStart, 280
 multicast group, 124
 tree-sharing, 124
 Multifiber cable, 246
 Multifrequency laser, 36
 Multigranularity optical cross-connect (MG-OXC), 77

- Multimedia, 234
- Multimode fiber (MMF), 266
 - 10-Gigabit Ethernet (10GbE), 261
 - Gigabit Ethernet (GbE), 260
- Multiplexing
 - coarse wavelength division multiplexing (CWDM), 238, 261
 - dense wavelength division multiplexing (DWDM), 77, 135
 - optical frequency division multiplexing (FDM), 5
 - optical time division multiplexing (OTDM), 6
 - space division multiplexing (SDM), 5
 - statistical multiplexing, 25, 26, 100, 135, 161, 191, 226
 - subcarrier multiplexing (SCM), 137, 179, 262
 - time division multiplexing (TDM), 5, 221, 227
 - wavelength division multiplexing (WDM), 5, 7, 221, 227
 - wide wavelength division multiplexing (WWDM), 261
- Multipoint control protocol (MPCP), 226, 228
- Multiprotocol border gateway protocol (MP-BGP), 276
- Multiprotocol label switching (MPLS), 22, 57
- Multiprotocol lambda switching (MPλS), 75
- Multiservice provisioning platform (MSPP), 278
- Multitoken ring, 186
 - multitoken interarrival time (MTIT), 186
- Multiwavelength optical networking (MONET), 132
- Multiwavelength receiver, 37
- MUPBED, 275
 - Grid user-network interface (GUNI), 275
- MZI, 36
- MZM, 267

- National LambdaRail, 273
- Neighbor discovery, 275
- NetherLight, 277
- Network controller, 28
- Network diameter, 201
- Network interface card (NIC), 225, 278
- Network lifetime, 216
- Network Management System (NMS), 16, 274
- Network Time Protocol, 99
- Networks
 - access, 225
 - P2P-friendly, 254
 - all-optical, 9
 - bimodal, 42
 - broadcast-and-select, 8
 - cellular radio, 262
 - condominium, 28
 - converged, 58
 - customer-controlled and -managed, 28
 - electronic packet switching, 95
 - end-to-end Ethernet, 21
 - fiber optic microcellular, 262
 - folded bus, 86
 - hierarchical, 217
 - hybrid fiber coax (HFC), 225
 - interconnected rings, 157, 205
 - IP/WDM, 26
 - local area, 8
 - mesh, 30
 - meshed ring, 201
 - metropolitan area, 8, 225
 - multihop, 8
 - multipoint-to-point, 227
 - multiservice, 58
 - multitoken ring, 186
 - opaque, 8, 201
 - optical, 3, 42
 - optical circuit switching, 9
 - OTDM, 6
 - passive optical network (PON), 225
 - point-to-multipoint, 227
 - point-to-point, 3
 - radio-over-fiber, 21
 - rail track, 268
 - reconfigurable, 13
 - ring, 4, 157
 - asynchronous, 202
 - augmented, 194
 - bidirectional, 217
 - chordal, 217
 - empty-slot, 202
 - meshed, 187, 217
 - slotted, 151, 152, 182
 - synchronous, 202
 - Token, 202
 - single-hop, 8, 247
 - star, 3
 - storage, 205
 - topologies, 3
 - translucent, 9
 - transparent, 7, 8
 - wavelength routing, 9
 - WDM, 7
 - WDM radio-over-fiber (RoF), 266
 - WDM ring, 174
 - wide area, 9, 53, 225
 - wireless, 21, 42
- Next Generation Internet Optical Network for Regional Access using Multi-wavelength Protocols (NGI ONRAMP), 279
- NGI ONRAMP, 279
- NIC, 225, 278
- NMS, 16, 274
- NNI, 27
 - E-NNI, 274
 - I-NNI, 274

- Node-to-node interface (NNI), 27
- Noise, 40
 - amplified spontaneous emission (ASE), 40
 - shot noise, 40
 - thermal noise, 41
- Non-return-to-zero (NRZ) line coding, 259
- Nonlinearities, 39
 - cross-phase modulation (XPM), 39
 - four-wave mixing (FWM), 39, 268
 - self-phase modulation (SPM), 39
 - stimulated Brillouin scattering (SBS), 40
 - stimulated Raman scattering (SRS), 39
- Nonzero dispersion shifted fiber (NZ-DSF), 38
- NRZ, 259
- NTP, 99
- NZ-DSF, 38
- O-UNI, 27
- OADM, 10, 14, 29, 174, 176, 268, 274
- OAM, 20, 157
- OBS, 25, 28, 100, 273
 - applications
 - Grid computing, 134
 - supercomputer interconnection, 134
 - uncompressed HDTV, 134
 - burst assembly, 104, 108, 133
 - label stacking, 127
 - LSP aggregation, 127
 - burst assembly algorithms, 109, 132, 133
 - burst cluster transmission, 112
 - burst dropping policies
 - head dropping, 121
 - tail dropping, 121
 - burst loss probability, 106, 108, 112, 116, 117, 119, 123
 - burst retransmission, 106
 - burst segmentation, 119, 126
 - prioritized, 121
 - composite burst assembly, 121
 - contention resolution, 108, 118, 123
 - cut-through forwarding, 107
 - deflection routing, 121, 122, 127
 - contention-based limited deflection routing (CLDR), 122
 - failure recovery, 126
 - delayed reservation, 113, 115, 130, 280
 - delayed scheduling, 130, 131
 - early dropping, 117
 - extra offset, 114, 117, 121, 123
 - fairness, 130, 131
 - burst loss probability, 130
 - void-filling algorithms, 130
 - forward resource reservation, 111
 - GMPLS, 127
 - hot-potato routing, 122
 - immediate reservation, 115
 - MAC layer, 108
 - multicasting, 124
 - tree-sharing, 124
 - multiclass, 116
 - offset, 106, 135
 - packet loss probability, 119
 - prediction, 111
 - preemption, 116
 - pretransmission, 111
 - protection
 - path switching, 125
 - segment switching, 126
 - QoS, 114, 121
 - absolute, 117
 - relative, 117
 - reservation
 - closed-ended, 113
 - open-ended, 113
 - reverse deletion, 132
 - routing
 - constraint-based, 127
 - explicit, 127
 - scheduling, 107
 - first-come-first-served (FCFS), 131
 - nonvoid-filling algorithms, 114
 - void-filling algorithms, 114
 - self-similar traffic, 111
 - service differentiation, 114, 117, 118, 121, 133
 - offset-time based, 281
 - signaling
 - JET, 113, 130
 - JIT, 113, 130, 132
 - testbed
 - ATDnet, 280
 - Japan Gigabit Network (JGN) II, 281
 - JumpStart, 280
 - Key Laboratory, 281
 - Optical Communication Center, 280
 - traffic engineering, 127
 - usage profile, 117
 - wavelength assignment, 123
 - priority-based wavelength assignment (PWA), 133
 - wavelength conversion, 123
 - wavelength utilization, 117
- OCBS, 119
- OCDMA, 273
- OCS, 9, 25, 102, 103, 135
- ODIN, 277
- OE conversion, 3
- OEO conversion, 4, 84, 101, 103, 136, 151, 157, 245, 246

- OFS, 95
 - testbed
 - Centre for Telecommunication Value Chain Research (CTVR), 280
 - Next Generation Internet Optical Network for Regional Access using Multi-wavelength Protocols (NGI ONRAMP), 279
- OIF, 27, 275
- OIS, 279
- OLS, 136, 153
- OLT, 226
- ONFIG, 276
- ONU, 221, 226
 - bandwidth guaranteed, 231
 - best-effort, 231
 - burst-mode transmitter, 239
 - colorless, 221, 239, 245
- OOO, 9
- Open Systems Interconnection (OSI), 256
- Operation administration maintenance (OAM), 20, 157
- OPEX, 20, 76
- OPS, 25, 93, 95, 102, 103, 135, 273
 - 3R regeneration, 138
 - alignment, 138, 139
 - buffer
 - fiber delay line (FDL), 142, 145
 - input, 142
 - look-ahead capability, 142
 - output, 140
 - recirculation, 142
 - shared, 141
 - switched delay line (SDL), 142
 - bufferless, 144, 151, 152
 - contention resolution, 145
 - buffering, 140, 144
 - deflection routing, 140, 145
 - wavelength conversion, 140, 143, 144
 - deflection routing, 138
 - delineation, 138, 139
 - fairness, 151
 - fiber delay line (FDL), 142, 143
 - fixed wavelength converter (FWC), 149
 - head-of-line (HOL) blocking, 142
 - in-order delivery, 140
 - looping, 145
 - optical correlator, 137
 - packet format, 137
 - packet loss, 146
 - packet re-ordering, 145
 - self-routing, 147
 - service differentiation, 145, 150
 - access restriction, 146
 - packet dropping, 146
 - preemption, 146, 150
 - slotted, 139
 - empty-slot access, 151, 152
 - ring, 151, 152
 - spatial reuse, 152
 - switch
 - asynchronous, 139
 - broadcast-and-select, 149
 - cross-bar, 151
 - feed-forward, 143
 - feedback, 143
 - multiple-stage, 143
 - single-stage, 143
 - space, 147
 - synchronous, 139, 147, 149
 - wavelength-routing, 150
 - synchronization, 138, 139
 - switched delay line (SDL), 139
 - testbed
 - Hybrid Optoelectronic Ring Network (HORNET), 281
 - RINGO, 281
 - traffic engineering, 147
 - tunable wavelength converter (TWC), 143, 145, 148, 150
 - unslotted, 139
 - virtual output queueing (VOQ), 141, 142
 - wavelength conversion, 138–140
 - wavelength matching, 144
- OPSnet, 140
- Optical add-drop multiplexer (OADM), 10, 14, 29, 174, 268, 274
- Optical burst switching (OBS), 25, 28, 100, 273
- Optical bypass, 9, 96, 201, 245, 246, 248, 253
- Optical circuit switching (OCS), 9, 25, 102, 103, 135
- Optical code division multiple access (OCDMA), 273
- Optical composite burst switching (OCBS), 119
- Optical correlator, 137
 - autocorrelation, 137
 - crosscorrelation, 137
- Optical cross-connect (OXC), 10, 15, 29, 75, 77, 274
- Optical Dynamic Intelligent Network services (ODIN), 277
- Optical FDM, 5
- Optical flow switching (OFS), 95
- Optical Internetworking Forum (OIF), 275
- Optical IP switching (OIS), 279
- Optical label switching (OLS), 136
- Optical line terminal (OLT), 226
- Optical Network Focused Interest Group (ONFIG), 276
- Optical network unit (ONU), 221, 226
- Optical packet switched network (OPSnet), 140
- Optical packet switching (OPS), 25, 93, 102, 103, 135, 273
- Optical signal-to-noise ratio (OSNR), 72, 126
- Optical supervisory channel (OSC), 15, 132

- Optical switching networks, 19
- Optical transport network (OTN), 11
- Optical user-network interface (O-UNI), 27
- Optimization, 81
- OSC, 15, 132
- OSI, 256
- OSNR, 72, 126
- OSPF, 122
- OTDM, 6, 25
 - synchronization, 7
 - transparency, 7
- OTE-WAVE, 273
- OTN, 11
- OXC, 10, 15, 29, 61, 75, 77, 274

- P2P, 22, 221, 254
- P2P-friendly, 254
- Packet loss, 146
- Packet reordering, 145
- Padding, 105
- Passive optical network (PON), 20, 221, 225
- Passivity, 246
- Pause protocol, 258
- PCS, 259
- PDU, 225, 243
- Peer-to-peer (P2P), 22, 221, 251
 - applications, 254
 - online gaming, 254
- Performance management, 17
- Personal handyphone system (PHS), 265
- PHASAR, 32
- Phased array (PHASAR), 32
- Photodetector
 - shot noise, 40
- Photodetector, 36
- Photonic slot, 84
 - photonic slot copying, 85
 - photonic slot merging, 85
 - photonic slot switching, 85
 - wavelength stacking, 279
- Photonic slot routing (PSR), 84, 152
- PHS, 265
- Physical coding sublayer (PCS), 259
- Physical medium attachment (PMA), 259
- Piggybacking, 229, 251
- Plain old telephone service (POTS), 21
- PMA, 259
- PMD, 38, 68, 83
- Point-to-multipoint (P2MP), 246
- Point-to-point (P2P), 246
- Polarization mode dispersion (PMD), 38, 68, 83
- Policy-based resource allocation, 276
- Polling, 227
 - cycle, 239
- PON, 20, 225
 - ATM PON (APON), 20, 221
 - broadband PON (BPON), 222
 - central office (CO), 245
 - Ethernet PON (EPON), 20, 221
 - gigabit PON (GPON), 222
 - interconnection, 239, 245
 - management, 20
 - operation administration maintenance (OAM), 20
 - TDM, 222
 - WDM, 222, 239
 - RoF network integration, 267
- POTS, 21
- Preallocation, 240
- Prebooking, 129
- Prediction, 111, 236
- Preemption, 74, 116, 146, 150, 180
- Pretransmission, 111
- Pretransmission coordination, 200
- Priority
 - queueing, 235
 - scheduling, 235
- Priority-based wavelength assignment (PWA), 133, 280
- Protection, 28, 72, 98, 157, 161, 276
 - automatic protection switching (APS), 171
 - dedicated, 74
 - line switching, 73
 - path switching, 73, 125
 - segment switching, 73, 126
 - deflection routing, 126
 - shared, 73
 - steering, 170, 204
 - wrapping, 170, 204
- Protectoration, 205
 - multifailure recovery, 213
 - single-failure recovery, 212
- Protocol data unit (PDU), 225, 243
- Proxy stripping, 197
- PSC, 31, 195, 200, 205, 247, 252
- PSR, 84, 95, 152
 - composite packet, 279
- PWA, 133

- QoS, 23, 26, 69, 97, 102, 114, 121, 161, 165, 191
 - absolute, 117, 229
 - bounded delay, 252
 - guaranteed, 191, 192
 - bandwidth, 252
 - relative, 117, 229
 - statistical, 191
- Quality of service (QoS), 23, 26, 69, 97, 102, 191
 - degrade, 29

- RACE ATMOS (ATM optical switching), 136
- Radio access unit (RAU), 266, 268

- Radio-over-fiber (RoF) networks, 21, 265
 - FTTH network integration, 267
 - moving cells, 268, 269
 - radio access unit (RAU), 266
 - radio-over-MMF, 266
 - radio-over-SMF, 266
 - rail track, 268
 - WDM PON integration, 267
 - WDM RoF, 266
- Rail track network, 268
- RAM, 25, 95, 136, 142
- Random access memory (RAM), 25, 95, 136, 142
- Random early detection (RED), 117
- Ranging, 228
- RAP, 177
- RAU, 266, 268
- Reachability, 21, 42
- Reassembly, 182
- Receiver
 - fixed-tuned, 249
 - multiwavelength, 37, 250
 - multiwavelength receiver array, 11, 14
 - tunable, 14
- Receiver collision, 174, 181, 186, 208, 249, 250
- Reconfigurability, 13
- Reconfigurable optical add-drop multiplexer (ROADM), 14, 98, 266, 273
- Reconfigurable optical cross-connect (ROXC), 15
- Reconfiguration
 - network failures, 15
 - network upgrades, 15
 - traffic load changes, 11, 15, 75
- Recovery time, 70, 73, 161
- RED, 117
- Refractive index, 35, 38
- Regeneration
 - reamplifying, reshaping, retiming (3R), 75, 138
- Registration, 228, 241, 250
- Reliability, 28, 161, 205, 221
- Request/allocation protocol (RAP), 177
- Reservation, 191
 - closed-ended, 113
 - delayed, 113
 - end-to-end reservation, 106
 - one-way reservation, 97, 100, 106
 - open-ended, 113
 - two-way reservation, 97, 100, 128
- Resilience, 204, 255
 - multilayer, 274
- Resilient packet ring (RPR), 152, 161
- Resource redundancy, 73
- Resource Reservation Protocol with Traffic Engineering (RSVP-TE), 70
- Restoration, 28, 72
 - fault management, 16
 - line switching, 73
 - link failures, 11
 - node failures, 11
 - path switching, 73
 - segment switching, 73
- Revenue growth, 44
- RIAMM, 170
- RIAS, 168, 202
- Ring ingress aggregated max-min (RIAMM), 170
- Ring ingress aggregated with spatial reuse (RIAS), 168
- Ring optical (RINGO) network, 178
- RINGO, 178, 281
- RINGOSTAR, 194
 - fairness
 - DVSR, 202
 - in-order delivery, 215
 - protection
 - multifailure recovery, 213
 - single-failure recovery, 212
 - proxy stripping, 197
 - service differentiation, 215
- ROADM, 14, 98, 266, 273, 275, 277, 279
- Robustness, 164
- RoF networks, 21
- Round-trip time (RTT), 226
- Router, 258
- Routing, 26, 40, 66
 - constrained shortest path first (CSPF), 69
 - constraint-based, 58, 64, 127, 280
 - contention-based limited deflection routing (CLDR), 122
 - deflection, 91, 108, 121, 122
 - explicit, 58, 106, 127
 - flow, 97
 - hop-by-hop, 106
 - hot-potato, 122
 - K shortest path, 97
 - self-routing, 147
 - shortest path first (SPF), 64, 69, 91, 187
 - store-and-forward, 122
- Routing algorithm
 - adaptive (dynamic), 68, 92
 - fixed, 68, 92
 - fixed-alternate, 68
- Routing and wavelength assignment (RWA), 28, 68, 80, 128
- Routing and wavelength/tunnel assignment (RWTA), 81
- Routing, wavelength assignment and waveband assignment (RWWBA), 81
- ROXC, 15
- RPR, 152, 161, 199, 206, 252
 - bridge, 245
 - cleave point, 163
 - cut-through forwarding, 162
 - destination stripping, 161

- RPR (*cont.*)
 dual-queue mode, 164
 fairness, 167
 aggressive mode (AM), 168, 169
 conservative mode (CM), 168, 169
 equal, 168
 oscillation, 170
 weighted, 168
 head-of-line (HOL) blocking, 164
 in-order delivery, 173
 multicasting, 162
 packet mode
 relaxed, 172
 strict, 172
 protection
 steering, 170, 204
 wrapping, 170, 204
 QoS, 165
 resilience, 204
 ring ingress aggregated max-min (RIAMM), 170
 ring ingress aggregated with spatial reuse (RIAS), 168
 service differentiation, 165
 shortest path routing, 162, 164
 single-queue mode, 164
 spatial reuse, 152, 161, 167, 170
 store-and-forward routing, 162
 time to live (TTL), 162
 token bucket, 164
 topology discovery protocol, 164, 166
 traffic classes, 166
 traffic measurement, 168
 virtual output queueing (VOQ), 164
 RSVP-TE, 70
 Notify message, 70
 RTT, 226
 RWA, 28, 68, 80, 128
 RWA+, 81
 RWTA, 81
 RWWBA, 81

 SAN, 274, 276
 SBS, 40
 crosstalk, 40
 Scalability, 76, 205, 222
 link bundling, 65
 online games, 253
 routing, 68
 scheduling, 200
 STARGATE, 255
 unnumbered links, 65
 WDM rings, 174
 Scalable multichannel adaptable ring terabit network (SMARTNet), 187
 Scheduling, 107
 EPON
 inter-ONU, 228
 intra-ONU, 228
 offline, 244
 online, 239, 244
 strict priority, 235
 first-come/first-served (FCFS), 131
 first-come/first-served and first-fit (FCFS-FF), 200
 non-void-filling algorithms, 114
 Horizon, 114
 randomized, 211
 round robin, 208
 strict priority, 235
 void-filling algorithms, 114
 latest available unused channel with void filling (LAUC-VF), 114
 SCM, 137, 179
 SDL, 90, 95, 118, 181
 balking property, 119
 optical packet switching (OPS), 142
 synchronization, 139
 SDM, 5, 246
 Security
 authentication, 29
 authorization, 29
 cryptography, 17
 eavesdropping, 29
 encryption, 29
 privacy, 29
 Security management, 17
 Segmentation, 182
 Self-healing ring (SHR), 171
 Self-phase modulation (SPM), 39
 Semiconductor optical amplifier (SOA), 144
 Service
 adaptive service shell, 44
 best-effort, 23, 165
 circuit-switched add-on, 278
 connection-oriented, 22, 58
 connectionless, 23
 credit, 230
 differentiation, 102, 114, 118, 150, 235
 discovery, 275
 disruption, 29
 elastic, 230
 fixed, 230
 IP, 98
 IP telephony, 21
 IP video, 21
 limited, 230
 optical, 98
 plain old telephone service (POTS), 21
 point-to-multipoint, 11
 point-to-point, 11
 QoS degrade, 29
 quality of service (QoS), 23

- service level agreement (SLA), 23
- STARGATING, 252
- triple play, 23
- virtual private network (VPN) services, 23
- voice, 161
- Service differentiation, 121, 145, 150, 165
 - EPON, 235
- Service layer, 277
- Service level agreement (SLA), 23, 231
- Service plane, 277
- Service provider, 225
- SG-DBR laser, 35
- Shared risk link group (SRLG), 64, 126
- Shot noise, 40
- SHR, 171
- Signal-to-noise ratio (SNR), 40, 138
- Signaling, 26, 66, 67, 70, 105
 - crankback, 70
 - in-band, 230
 - JET, 113
 - JIT, 113, 132
- Single ring recovery (SRR), 205
- Single-mode fiber (SMF), 37, 266, 267
 - 10-Gigabit Ethernet (10GbE), 261
 - Gigabit Ethernet (GbE), 260
- SLA, 23, 231, 236
- Slab waveguide, 33
- SMARTNet, 187
- SMF, 37, 266, 267
- SNMP, 277
- SNR, 11, 17, 40, 138
- SOA, 144
- Soliton propagation, 7
- SONET/SDH, 4, 17, 152, 161
 - ADM, 4, 60
 - automatic protection switching (APS), 171
 - DCS, 5, 60
 - failure detection, 66
 - loss of signal (LOS), 170
 - grooming, 29, 30
 - interoperability
 - 10-Gigabit Ethernet (10GbE), 260
 - self-healing ring (SHR), 171
- Source stripping, 157, 181, 186, 200
- Space division switch, 10
- Spatial reuse, 152, 157, 161, 167, 170, 183, 187, 193, 195, 201, 249
 - AWG, 32
 - fairness, 179
 - STARGATE, 247
- Spatial reuse protocol (SRP), 205
- Splitter, 31, 148, 149, 206
- SPM, 39
- SR³, 191
- SRLG, 64, 126
- SRP, 205
- SRR, 178, 205
- SRS, 39
- Standards
 - 10-Gigabit Ethernet, 256
 - ASON, 27
 - ASTN, 27
 - BPON, 225
 - DQDB, 190
 - EPON, 222
 - Ethernet, 256
 - Fast Ethernet, 256
 - FDDI, 4, 157, 256
 - Fibre Channel, 259
 - Full-duplex Ethernet, 258
 - Gigabit Ethernet, 256
 - Higher Speed Study Group (HSSG), 256
 - ISO, 16
 - Open Systems Interconnection (OSI), 256
 - ITU-T, 16, 132
 - MPLS, 57
 - RPR, 161
 - SONET/SDH, 4
 - TMN, 16
 - Token Ring, 157
 - UNI1.0, 275
- Star coupler, 3
- STARGATE, 245
 - all-optical integration
 - WDM EPON, 245
 - WDM RPR, 245
 - applications
 - online gaming, 253
 - peer-to-peer (P2P) file sharing, 254
 - destination conflict, 249
 - discovery, 250
 - dynamic bandwidth allocation (DBA), 252
 - gated service
 - STARGATING, 252
 - head-of-line (HOL) blocking, 252
 - MPCP
 - STARGATE message, 252
 - optical bypassing, 246, 248, 253
 - passivity, 246
 - piggybacking, 251
 - QoS
 - bounded delay, 252
 - guaranteed bandwidth, 252
 - receiver collision, 249
 - registration, 250
 - scalability, 255
 - space division multiplexing (SDM)
 - point-to-multipoint (P2MP), 246, 248
 - point-to-point (P2P), 246, 248

- STARGATE (*cont.*)
 spatial wavelength reuse, 247, 249
 switching granularity
 subwavelength granularity, 252
 topology
 regular, 247
 StarLight, 277
 Statistical multiplexing gain, 103, 135
 Stimulated Brillouin scattering (SBS), 40
 Stimulated Raman scattering (SRS), 39
 Stokes wave, 39, 40
 Storage area network (SAN), 274, 276
 Storage networks, 205
 Storage systems, 22
 Store-and-forward routing, 122, 162
 Subcarrier multiplexing (SCM), 137, 179, 262
 Superluminescent diodes, 34
 SURFnet, 273
 Survivability, 10, 205
 Switch, 258
 asynchronous, 139
 broadcast-and-select, 149
 cross-bar, 151
 feed-forward, 143
 feedback, 143
 MEMS-based, 280
 multiple-stage, 143
 single-stage, 143
 space, 147
 synchronous, 139, 147, 149
 wavelength-routing, 150
 Switched delay line (SDL), 90, 95, 118, 139, 142, 181
 Switched Ethernet, 258
 Switching, 40
 Switching granularity, 24
 cell switching, 25
 circuit switching, 191
 fast circuit switching, 127
 fiber switching, 24
 fractional lambda switching (FLS), 53
 optical burst switching (OBS), 25, 273
 optical circuit switching (OCS), 25, 135
 optical packet switching (OPS), 25, 135, 273
 subwavelength circuit, 252, 253
 subwavelength switching, 25
 TDM switching, 82
 waveband switching, 24, 61, 77
 wavelength switching, 25, 61
 Synchronization, 7, 86, 99, 138, 139, 185
 EPON, 228
 time-of-day, 247
 Synchronous digital hierarchy (SDH), 4
 Synchronous optical network (SONET), 4
 Synchronous round robin (SRR), 178
 Synchronous round robin with reservations (SR³), 191
 T1X1, 27
 TCP, 22, 75
 acknowledgment, 139
 light-weight, 255
 TDM, 5, 82, 89, 161, 185, 221, 238
 TDMA, 175, 179
 TE, 58, 111
 Telecommunications Management Network (TMN), 16
 Tell-and-go principle, 97, 113, 193
 Temperature control, 246
 TeraLight Metro fiber, 38
 Thermal noise, 41
 Time division multiple access (TDMA), 175
 Time to live (TTL), 162
 Time-domain wavelength interleaved networking (TWIN), 246
 TL1 commands, 278
 TMN, 16
 Token bucket, 164, 202
 Token ring, 157, 185, 202
 Topology
 regular, 247
 Topology discovery, 164, 166
 ToS, 95
 Traffic
 best-effort, 192
 bursty, 191, 226
 client-server, 190
 dynamic, 30
 extra, 74
 hot-spot, 30, 202, 217
 hubbed, 202
 multicast, 30
 online gaming, 253
 P2P, 254
 perturbations, 217
 predictable, 253
 self-similar, 105, 111
 traffic engineering (TE), 58
 triple-play, 250
 uniform, 190, 201, 202, 217
 uniform growth, 217
 unpredictable, 216
 web, 253, 254
 Traffic engineering (TE), 58, 111, 127, 147, 254
 TE attributes, 64, 67
 TE link, 64, 67
 Traffic forecasting, 216
 Traffic measurement, 168
 Traffic modeling, 216

- Transceiver
 - array, 240
 - fixed-tuned, 201, 249
 - tunable, 201, 240
- Transition density, 259
- Transmission control protocol (TCP), 22, 75
- Transmission impairments, 42, 83
 - crosstalk, 11
 - signal-to-noise ratio (SNR), 11
- Transmitter
 - burst-mode, 239
 - multisection, 35
 - multiwavelength laser, 11, 14
 - multiwavelength transmitter array, 14
 - tunable, 14, 88, 250
- Transparency, 7, 29, 84, 103, 152, 246
 - islands of transparency, 12, 245
 - link connectivity verification, 67
- TTL, 162
- Tunable transceiver
 - tuning time, 240
- Tunable transmitter
 - tunable laser, 246, 273
 - tuning range, 250
- Tunable wavelength converter (TWC), 13, 143, 148, 150
- Tunnel
 - VPN, 278
- TWC, 13, 143, 145, 148, 150
- TWIN, 246
- TWIN with wavelength reuse (TWIN-WR), 246
- TWIN-WR, 246
- Type of service (ToS), 95

- UKLight, 273
- UltraScience Net (USN), 278
- UMTS, 266
- UNI, 57, 274
 - interoperability, 275
- Universal mobile telecommunication system (UMTS), 266
- Unnumbered links, 65
- Unshielded twisted pair (UTP), 259, 260
- Usage profile, 117
- User-network interface (UNI), 57, 274
- USN, 278
- UTC, 53
- UTP, 259, 260

- Value creation, 44
- Variable bit rate (VBR), 191
- VBR, 191
- VCSEL, 266
- Vertical-cavity surface-emitting laser (VCSEL), 266
- Virtual circle, 184
- Virtual connection, 58

- Virtual network topology, 75
- Virtual output queuing (VOQ), 141, 142, 164, 177
- Virtual private network (VPN), 23
- Virtualization, 277
- Visualization systems, 22
- VOQ, 164, 177–179
 - optical packet switching (OPS), 141, 142
 - real-time, 192
- VPN, 23
 - L2VPN, 23
 - L3VPN, 23
 - tunnel, 278

- WADM, 10
- WAN, 9, 53, 225
- Waveband departitioner, 31, 206
- Waveband grouping, 80
- Waveband partitioner, 31, 206
- Waveband switching (WBS), 77
- Wavebanding, 279
- Waveguide dispersion, 38
- Waveguide grating router (WGR), 32
- Wavelength add-drop multiplexer (WADM), 10
- Wavelength assignment, 97, 123
 - adaptive, 123
 - first-fit, 97, 124
 - nonadaptive, 123
 - priority-based wavelength assignment (PWA), 133
 - random, 124
 - wavelength conversion, 144
- Wavelength continuity constraint, 12, 69, 97
- Wavelength conversion, 12, 13, 69, 70, 75, 82, 106, 108, 119, 123, 136, 138–140, 143, 273
 - cross-gain modulation (XGM), 144
 - cross-phase modulation (XPM), 144
 - fixed, 12
 - four-wave mixing (FWM), 144
 - full-range, 13, 82, 123, 144
 - intradband, 82
 - limited-range, 13, 82, 123, 144
 - sparse, 13, 123
 - wavelength matching, 144
- Wavelength converter, 13, 134
 - converter bank, 13, 144
 - full-range, 144
 - limited-range, 144
 - share-per-link, 13, 144
 - share-per-node, 13, 144
 - sharing, 13
 - tunable, 13, 143
- Wavelength cross-connect (WXC), 273
- Wavelength demultiplexer, 10, 148, 149, 201
- Wavelength matching, 144
- Wavelength multiplexer, 10, 149, 201
- Wavelength path, 69

- Wavelength plane, 151
- Wavelength registration, 17
- Wavelength router, 187
- Wavelength shift, 246
- Wavelength stacking, 93, 183, 279
- Wavelength-band-selective receiver, 239
- Wavelength-interchanging cross-connect (WIXC), 12, 13
- Wavelength-routed OBS (WR-OBS), 127
- Wavelength-routing networks, 9
- Wavelength-selection-free transmitter, 239
- Wavelength-selective cross-connect (WSXC), 10, 83, 92
- Waveplate, 33
- WBS, 77
 - intraband wavelength conversion, 82
 - testbed
 - Advanced Technology Demonstration network (ATDnet), 279
- WCDMA, 265
- WDM, 5, 7
 - EPON, 239, 245
 - PON, 239
 - RoF network integration, 267
 - WDM EPON, 21
 - WDM PON, 222
 - WDM IPACT with a single polling table (WDM IPACT-ST), 239
 - WDM IPACT-ST, 239
 - WDM RoF networks, 266
 - Weighted fair queueing (WFQ), 236
 - WFQ, 236
 - WGR, 32
 - Wide area network (WAN), 9, 53, 225, 226, 245
 - Wide wavelength division multiplexing (WWDM), 261
 - Wideband code division multiple access (WCDMA), 265
 - Wireless local area network (WLAN), 265, 266
 - WIXC, 12, 13
 - WLAN, 265, 266, 268
 - WR-OBS, 127
 - prebooking, 129
 - WSXC, 10, 83, 92
 - WWDM, 261
 - WXC, 273
 - xDSL, 225
 - XGM, 144
 - XML, 277
 - XPM, 39, 144