

Index

k-connectivity, 102

access point (AP), 259

acknowledgment (ACK), 6

additive white Gaussian noise (AWGN),
20

analog–digital (A-D), 256

antenna

effective area, 24

gain, 21, 46, 92, 116

omnidirectional, 5, 24, 92

selection, 256

applications

biomedical, 263

car-based, 263

environmental, 263

automatic repeat request (ARQ), 5, 7, 259

base station (BS), 1, 101, 269

bimodal behavior, 183

binary phase shift keying (BPSK), 23, 95,
117, 147, 171, 282

bit error rate (BER), 12, 16, 170, 250, 295

average route, 152

link, 23, 171, 204, 283

multipath and line-of-sight
(LOS), 24, 284

strong line-of-sight (LOS), 23,
283

strong multipath fading, 24, 283

maximum tolerable route, 88, 98

minimum route, 93

route, 18, 68, 88, 95, 103, 115, 157,
171, 202, 204, 282

bit loading, 256

bubbling, 5

capacity

aggregate effective transport, *see*
effective transport

effective transport, 111, 120, 196,
206, 214, 250

per unit cost, 4

Shannon–Hartley formula, 32

single-route effective transport, 117
transport, 3, 11, 111

carrier frequency, 21, 46, 92, 116

central limit theorem, 282

Cesaro–Wardrop equilibria, 4

clear to send (CTS), 259

clustering, 251

regular, 251

code

non-recursive non-systematic

convolutional (NRNSCC), 27

recursive systematic convolutional
(RSCC), 27

serially concatenated convolutional
(SCCC), 27

code division multiple access (CDMA),
99, 254

communication tube, 6, 45, 113, 141, 153

connectivity, 12, 34, 85, 108, 195, 199,
251, 254

bimodal behavior, 32, 37

full, 30, 37, 73, 79, 91, 92, 119

robustness, 213

control theory, 4

cooperation, 9

critical traffic load, 182, 183, 188

data-rate, 21

global optimal, 217

maximum acceptable, 31

- dedicated short-range communications (DSRC), 256
- delay, 5, 29, 145, 150, 177, 181, 183, 187, 295
 - access, 174
- digital audio broadcasting (DAB), 256
- digital video broadcasting (DVB-T), 256
- disaster relief, 263
- disjoint route, 174, 207
 - maximum number of, 176
 - number of, 188
- energy
 - battery, 5
 - bit, 89, 91, 147
 - node, 29
 - noise, 89
- fairness, 10, 12, 114, 141
- flooding, 3
- forward error correction (FEC), 6, 28
- fourth-generation (4G), 256
- free distance, 7
- free-space propagation, 91, 95, 250
 - Friis formula, 116, 146
- frequency division multiple access (FDMA), 254
- game theory, 4
- geographic random forwarding, 3
- goodput, 3, 179, 182, 183, 295
 - network, 179
 - route, 179
- graph theory, 102, 196, 199
 - geometric random, 102
- hop
 - average length, 201, 202
 - inter-cluster, 251
 - length, 198
- hot spot, 261
- integrated cellular and ad hoc relaying (iCAR), 257
- inter-cluster distance, 252
- interference, 193
 - energy, 97, 148
 - inter-node (INI), 48, 96, 108, 123, 147
 - power, 97, 116, 148, 171, 183, 284, 285, 289
- intermediate frequency (IF), 256
- internet protocol (IP), 257
- internet protocol(IP), 262
- intra-cluster radius, 252
- lifetime, 213
 - network, 40, 205
 - node, 40, 205
- link
 - average length, 151
 - evolution, 150
- local area network (LAN), 256
- loss factor, 21, 46, 92
- maximum tolerable speed, 172, 173
- medium access control, 192
- medium access control (MAC) protocol, 15, 43, 50, 97, 109, 148, 199
 - adaptive, 12
 - Aloha, 43, 134, 254
 - carrier sense multiple access (CSMA), 43, 254
 - CSMA with collision avoidance (CA), 259
 - CSMA with collision detection (CD), 259
 - limited receiver sensitivity (LRS)-RESLIGO, 254
 - multiple access collision avoidance (MACA), 254
 - reserve-and-go (RESGO), 11, 44, 74, 76, 80, 97, 123, 131, 140, 148, 199
 - maximum effective transport capacity, 287
 - reserve-listen-and-go (RESLIGO), 11, 44, 64, 75, 77, 82, 100, 128, 131, 148
 - slotted Aloha, 101
 - spread-RESGO (S-RESGO), 134
- metropolitan area network (MAN), 256
- WiMAX, 260
- mobility, 3, 12, 143, 150, 172, 191
 - direction-non-persistent (DNP), 144, 155, 161
 - direction changes, 155, 161, 162

- direction-persistent (DP), 144, 150, 157
- random waypoint model, 157
- modulation format, 254
- Monte Carlo simulation, 25, 156, 249
- multiple-input multiple-output (MIMO), 256
- Napster, 258
- neighbor
 - average number of transmission, 104
 - distance from nearest, 299
 - nearest, 17
 - spatial, 87, 94, 103
 - transmission, 91, 93, 105, 109
- neighbors
 - minimum number of, 101
 - optimal number of transmission, 101
- network
 - application architecture, 257
 - architecture
 - client-server, 257
 - hybrid client-server and P2P, 258
 - peer-to-peer (P2P), 257
 - area, 5
 - hybrid ad hoc, 257
 - linear, 95
 - mesh, 261
 - performance: n -dimensional vector space, 264
 - physical model, 111
 - protocol model, 111
 - random plane, 101
 - sensor, 25, 87, 250
 - smart dust-like, 25, 157, 251
 - wireless local area (WLAN), 25
- node, interfering, 50
- noise
 - figure, 21, 46, 116
 - power, 289
 - power spectral density, 21, 147
- number of hops
 - average, 18, 95, 146, 170, 196, 200, 289
 - average sustainable, 34, 78, 117
 - maximum, 90
 - maximum sustainable, 117
 - minimum average, 99
- number of neighbors
 - minimum, 37
- number of neighbors, minimum, 106
- number of routes
 - average, 179
 - maximum, 188
- one-hop progress, 101
- orthogonal frequency division multiplexing (OFDM), 256
- packet error rate (PER), 12, 171
- path loss, 211
 - exponent, 91, 211
- peer-to-peer (P2P), 10, 17, 113, 144
 - file-sharing, 253
- peers, 257
- percolation, 6, 12, 32, 92, 101
 - broadcast, 101, 104
 - generalized global, 107
 - generalized NLP, 105
 - non-local (NLP), 104
- phase transition, 102
- pipelining, 178, 193
- Poisson distribution, 45, 49
 - memoryless property, 105
- Poisson process, 173, 203
- power control, 12
- processing gain, 99
- programming, 9
- propagation loss, 211
- quality of service (QoS), 29, 41, 50, 88, 103, 114
- queuing model
 - $M/G/1$, 175, 177
 - $M/M/1$, 176
 - $M/M/C_s$, 179
 - $M/M/C_s/\infty/N$, 175–177
- random graph theory, 32, 99
- receiver sensitivity, 68, 253
- reference path, 198, 201
- regeneration, 6
- relay node, 8
- request to send (RTS), 259
- reservation-based (RB), 293

- retransmission, 172
 - maximum number of, 172, 178, 181, 187
- retransmission mechanism, 50, 90, 145
- route
 - average distance, 208
 - creation, 144, 149
 - discovery, 6, 17, 293
 - disjoint, 147
 - disjoint active, 120, 140
 - evolution, 152
 - maintenance, 8, 143
 - maximum sustainable distance, 207
- routing, 2, 197, 250
 - dynamic source (DSR), 3
 - multiuser diversity, 3
 - shortest path (SP), 17
 - zone-protocol (ZRP), 3
- security, 12
- semi-analytical approach, 144
- sensing, 64
- signal-to-noise ratio (SNR), 170, 202
 - link, 16, 20, 21, 88, 115, 147, 171
 - multipath and line-of-sight (LOS), 22
 - strong line-of-sight (LOS), 21
 - strong multipath fading, 22
 - minimum link, 74, 89, 90
- single-hop wireless network, 43
- spatial density
 - critical node, 26, 92, 183
 - minimum energy, 30, 73
 - minimum node, 93
 - node, 16, 95, 145, 213
 - supplementary energy, 74
- spectral efficiency, 254
- speed of light, 21, 46, 92, 116
- spreading
 - code, 134
 - factor, 134
- stability, 10, 114
- standards, 258
- subcarrier, 256
- subsidiary station (SS), 260
- switching, 167
 - circuit, 167
 - non-reservation-based (NRB), 10, 167, 175, 179, 293
 - opportunistic non-reservation-based (ONRBS), 144, 149, 150, 155, 157, 161
 - packet, 167
 - reservation-based (RBS), 10, 144, 150, 152, 156, 157, 161, 167, 173
- terrain monitoring, 87
- throughput, 5, 101, 179, 182, 187
- tiers, 48
- time division multiple access (TDMA), 254
- topology, 12, 169, 192
 - linear, 86, 101
 - one-dimensional, *see* linear
 - quasi-regular, 86, 97
 - random, 16, 99, 100, 102, 196
 - random versus uniform, 249
 - regular, 16, 196
 - regular lattice, 44, 113
 - square grid, 86, 95, 102, 145, 169, 197, 198
 - two-dimensional Poisson, 102, 197, 198
- torus, 169, 196
- traffic model, 49
- transmission
 - range, 90, 101, 102
- transmit power
 - critical, 102
 - global optimal, 217
 - minimum, 30, 31, 73, 74, 92, 93
 - optimal, 195, 204
- transport control protocol (TCP), 2, 257, 262
- universal mobile telecommunications system (UMTS), 28
- virtual overlay system, 175
- virtual request queue, 174
- virtual server, 175
- Voronoi
 - cell, 87
 - tessellation, 87
- vulnerable time interval, 50, 64
- wireless local area network (WLAN)
 - Wi-Fi, 259