

# Index

- 802.15.4, 12
  - modulation techniques
    - ASK (amplitude shift keying), 18
    - BPSK (binary phase shift keying), 17
    - O-QPSK (orthogonal quadrature phase shift keying), 17
  - PHY (physical) layer, 17
- Activity management
  - 1-limited policy, 123, 128, 189, 273
  - Bernoulli policy, 112, 121
  - centralized control, 124
  - distributed control, 126, 190
  - exhaustive policy, 123
  - lifetime gain, 128
  - multi-cluster networks, 187
- Adaptive management
  - Bernoulli policy, 128
- Battery
  - AA type, 189
  - AAA type, 111
  - energy budget, 112
- Beacon
  - frame, 20, 37
  - interval, 20
  - synchronization after sleep, 193
- Blocking
  - at the bridge, 192
  - of request packets during the random backoff countdown, 101
  - of uplink data packets during the random backoff countdown, 102
- Bridge
  - CSMA-CA access, 149, 150, 152
  - GTS access, 149, 152
  - master-slave, 148, 278
  - nodes, 147
  - slave-slave (SS), 203
  - switching, 147, 188
- Buffer
  - management
    - push-out policy, 113
- CAP (Contention Access Period), 21, 28
- CCA (Clear Channel Assessment), 5, 19, 24
- CFP (Contention-Free Period), 21
- Channel scanning, 31
  - active scanning, 31
  - ED (Energy Detection) scanning, 32
  - orphan scanning, 33
  - passive scanning, 32
- Cluster interconnection, 147
- Collision, 5
  - avoidance, 5
  - detection, 5
- Congestion
  - after the inactive period, 98, 104, 114, 194
  - of packets deferred to the next superframe, 24, 96, 103, 114
  - of uplink data requests, 99
- Coordinator, *see* PAN coordinator
- CSMA mechanism, 9

- CSMA-CA
  - slotted version, 22, 112, 260, 293
  - unslotted version, 29
- Device functionality
  - RFD (reduced-function device), 20
  - FFD (full-function device), 20
- Downlink communication, 20, 25
  - data extraction, 25
  - in the unslotted CSMA-CA mode, 30
- event sensing reliability, 64, 66
- Frame, *see* Packet
- GTS (Guaranteed Time Slots), 28
- IEEE 802 family of standards
  - 802.11 wireless LAN, 7, 10, 17, 24
  - 802.15.1 medium data rate WPAN (Bluetooth), 12, 17
  - 802.15.3 high data rate WPAN, 12, 17
  - 802.15.4 low data rate WPAN, 7, 12
- ISM (Industrial, Scientific and Medical) band, 17
- LQI (Link Quality Indicator), 19, 295
- LST (Laplace-Stieltjes transform), 302
- MAC (Medium Access Control) layer, 4, 6
- MAC packet header, 43, 257
- MANETs (mobile ad hoc networks), 3
- Markov chain
  - with sleep and synchronization states, 117
- Markov points, 114, 273
- Multiplexing
  - CDMA, 6
  - FDMA, 6
  - TDMA, 6
- Network lifetime, 111, 199
  - per-cluster equalization, 200
- Node utilization, 112, 122, 199
  - per-cluster equalization, 200
- Operating mode
  - beacon enabled, 20
  - non-beacon enabled, 29
- Orphan device
  - realignment, 33
- Orphaned device, 33
- Packet, 19
  - at the MAC layer, 35
  - at the PHY layer, 35
  - format, 35, 257
- PAN coordinator, 19
- pdf (probability density function), 59, 62, 301
- PDF (Probability Distribution Function), 301
- PDU (protocol data unit), *see* Packet
- Personal operating space, 19
- PGF (Probability Generating Function), 41, 59, 302
- RBC (Random Backoff Countdown), 24
- Scalability
  - of wireless ad hoc networks, 3
- Security, 255
  - attacks, 260
  - CCM\*, 258, 259, 295
  - confidentiality, 256
  - device table, 257
  - frame counter, 257
  - integrity, 256
  - intrusion detection, 255
  - key
    - group key, 257, 258
    - link key, 257
  - key table, 257
  - minimum security level table, 257
  - sequential freshness, 256, 257
  - SKKE, *see* SKKE
  - trust center, 296
- SKKE (Symmetric-Key Key Establishment), 297
  - challenge, 298

- Sleep, 111, 189
  - sleep time distribution, 113
- Superframe, 20, 111
  - active portion (period), 20, 111
  - inactive portion (period), 20, 111
- Throughput
  - in wireless ad hoc networks, 4
- Topology
  - multi-cluster tree, 33, 147, 278
  - peer-to-peer, 19
  - star, 19
- Transmission
  - acknowledged, 24, 28
    - fully reliable, 43, 268
    - partially reliable, 43
  - non-acknowledged, 43
- Uplink communication, 20
- Wireless ad hoc networks, 3
  - with mobile nodes, *see* MANETs (mobile ad hoc networks)
- Wireless personal area networks, 12
- Wireless sensor networks, 12, 111
  - sensor mote, 111, 189
- ZigBee, 291
  - APL (application) layer, 292
  - applications
    - commercial, 296
    - residential, 296
  - coordinator, 293
  - end device, 293
  - key establishment/update, 297
  - network formation, 293
  - NWK (network) layer, 291
  - protocol architecture, 291
  - router, 293
  - trust center, 296