Index

AB interleavers
advantages and disadvantages, 15
column permutations, 14
construction of, 14–16
error floor region, good performance in, 17
$I/2$ interleavers, 15, 16
randomization, 15
worst case patterns, avoiding, 14
Access resource areas (ARA), 248
Access resource metrics, combination of, 253
Access selection process
access priorities, 257
algorithms, 239–241
dynamic, 254–257
link-performance based, 255
policy-based, 254
resource based, 255–257
Acquisition mode, 195
Adaptive Coding and Modulations (ACM), 315
Adaptive Multi-Rate Wide Band (AMR-WB), 320
A/D conversion and IF-sampling, 196
implementation of I&Q-sampling on FPGA, 197
Additive white Gaussian noise (AWGN), 137
Alamouti scheme, 56
effective channel matrix, 56
vs. SM schemes, 55–58
Allocation
efficiency of, 107
and pricing scheme, 101
rule $A$, 106
Ambient Control Space, 240
AMR-WB-based cross-layer VoIP distributed rate control codec, 321
cross-layer VoIP rate control, 321, 322
higher voice quality and higher number of VoIPs, 326
load control, 326
outperforms RTCP-driven approach, 325, 326
RTCP-based vs. AMR-WB-based scenario, 321, 322
as system load control, 326
Angles of arrival (AoA), 183
Angular power spectrum (APS), 183
Antenna and user subsets, optimal selection of, 25
Antenna design, 190–192
anechoic chamber measurement of single PIFA element, 191
array design, 187–189
DBF algorithms, 186, 187, 193
DBF platform selection, 195
DBF techniques, 195
environmental conditions, analysis of, 182, 183
mechanical subsystem, 192
RF front end of single radiating element, 192
single radiating element on ground plane, 191
spherical section vs. double cone option, 190
Antenna selection, 40
hardware complexity, reducing, 25
with power saving modes, 25
ARTEMIS, 335
Attenuation process, stationarity investigations of, 164–167 structure function of LMS fading amplitude, 166 Attenuation threshold dependent fade duration model, 168–171 CCDF of fade duration, calculating, 168, 170 Markov modeled and measured CCDF of fade duration, 171 5-state Markov-chain, 169 state transition probabilities, determining, 170 transition matrix, 169 Attenuation time series, 163, 170, 173, 176, 177 long term, 163, 173 Authentication and encryption, 307, 308 NFC technology, 308 SIM as smart card, 307 smart card for security, 307 Automatic medical treatment/dosing (closed loop control process), 227, 228 automatic insulin injection for diabetes patients, 228 pacemaker, 228 Available bit rate (ABR), 208 Average sum rate performance, 44–48 versus $K$ with symmetric channels and block diagonalization, 45 and successive optimization, 46 versus number of active users $K$ for block diagonalization, 48 with scheduling and antenna selection algorithm block diagonalization, 47 successive optimization, 48 BAN applications and usage models for assisting persons with disabilities, 229, 230 fall down detection, 230 muscle tension sensors, 230 speech-impaired person, 230 with visual disability, 230 entertainment applications, 231 conceptual block diagram of BAN, 231 medical and healthcare applications, 227–229 automatic medical treatment/dosing (closed loop control process), 227, 228 with ID-TAG for reducing the risk of wrong treatment/medicine, 229 increased efficiency, 229 monitoring for inpatients, 228 transmission of vital and healthcare data, 227, 228 vital and health data, examples of, 229 BAN see Body area network (BAN) Base Station (BS), 115, 118 Beamforming matrices, 76, 82–85 iterative algorithm, 84 power-constrained optimization problems (PCO), 84 steps of proposed optimization approach, 83 Beamforming or transmit pre-processing, 23, 41 multiuser diversity, improves, 41 Bell Labs Layered Space-Time (BLAST), 55 BER performance, 64 Beyond 3G (B3G) systems, 261 Bit error rate (BER), 53 Block diagonalization (BD), 24, 25, 27, 28 Bluetooth, 357 using IEEE 802.15.1, 233 BM-SC see Broadcast/ Multicast Service Centre (BM-SC) Body area network and standardization at IEEE 802.15.BAN applications and usage models for assisting persons with disabilities, 229, 230
entertainment applications, 231
medical and healthcare
applications, 227–229
discussion and future work
frequency regulations for WMTs
and MICS, 236
wearable BAN and implant
BAN, 235
SG-BAN and BAN definition,
224–227
short-range technologies and
prototype BAN
BAN requirements and, 232
Body area network (BAN), 224
requirements, 232
low emission power, 232
wearable BAN vs. implant BAN,
235
Broadcast/ Multicast Service Centre
(BM-SC), 203
Business models for local mobile
services
basic types
Content provider (CP), 282
Network Operator (NO), 282
Service provider (SP), 282
charging and billing systems,
extending
design of online charging
interfaces, 292, 293
system design and benefits,
293, 294
definition of, 282
LOMS role model, 282–284
mobile services and different
charge types, categories of,
284–286
news publishing scenario
charging of service usage and
revenue sharing, 286–288
convergent online charging,
requirements for, 290
mobile user inside event
area, 289
mobile user outside event
area, 288
Carousel services, scheduling of
basic algorithm, 209, 210
basic principles, 209
deliberations, 209
consideration of congestion,
211, 212
mapping of congestion and
priority, 212
extension with priority scheme,
210, 211
initialization of R(i), 210
purposes, 210
interaction for service/content
scheduling, 209
Car scenario, 374
CCDF estimation, 152–154, 159, 160
CCDF see Complement cumulative
distribution function
(CCDF)
Cellular system, 72, 73
reuse factor, 73
Channel-aware scheduling, objective
of, 24
Channel estimation and quantization
errors, impact of, 53, 54, 68
errors at receiver, 59
error model, 59, 60
simulation results, 61, 62
multi-user downlink MIMO
transmission, 58
channel estimation errors at
receiver, impact of, 59
system model, 59
ZF precoding for multi-user
downlink transmission, 59
single link MIMO transmission, 54
system model, 54
transmission schemes, 55–58
at transmitter, 62, 63
random vector quantization, 63, 64
simulation results, 64–67
Channel estimation errors
at receiver, impact of
error model, 59, 60
iid complex Gaussian error
model, 68
simulation results
   Alamouti scheme and spatial multiplexing, impact on, 61
   hybrid transmission scheme, impact on, 61, 62
   source of, 53, 54, 68
Channel quantization errors
   at transmitter, impact of
   hybrid transmission scheme vs. SM schemes, 63
   random vector quantization, 63, 64
   simulation results
   dominant eigenmode transmission, impact on,
   64, 65
   multi-user downlink transmission using ZF precoding, impact on, 64–67
Channel state information (CSI), 27
   and Base Station (BS), 115
   imperfection of, 53
Charging and billing systems, extending
   Account & Balance Management Function (ABMF), 291
   Charging Gateway Function (CGF), 291
   customer care function, 291
   event-based charging, 291
   online charging interfaces, design of, 292, 293
   context-aware charging web service (CWS), 292
   functional view of the interfaces, 292
Online Charging System (OCS), 291
   rating function (RF), 291
   session based charging, 291
   system design and benefits, 293, 294
   charging zones, 294
Chunk, see Cluster
Cloud coverage and downlink time mean annual from (1983-2006), 339
   seasonal dependency of, 340
Cluster, 118
CN see Core Network (CN)
Coarse pointing assembly (CPA), 347
Codec Mode Request (CMR), 321
Codec selection algorithms, 317
Code rate, 4, 5
Complement cumulative distribution function (CCDF), 152
Computer/network aided clinical record management system, 223
management efficiency, improves, 223
Concatenated zigzag codes, interleaving strategies for multidimensional
   design of, 5
   hamming weight for, 5
   multiple interleavers
   congruential interleavers, 8
   cyclic shifted, 9
   problem, 6–8
   UMTS based interleaver, 9–11
   for zigzag codes, 11, 12
   simulation results, 16–18
   zigzag codes
   encoding of, 3–5
Conformal array simulations, 187–189
   array elements arranged on cone, 188
   comparison of gain patterns, 189
   comparison of LHCP gain patterns, 189
   isolated element pattern, 187
   method of moments, 187
Congestion control algorithms
   closed loop, 204
   open loop, 204
Congruential interleavers
   design of, 6, 7
   permutation rule, 8
   s-random, 8
   suboptimum performance, 8
Constant Bit Rate (CBR), 208
Index

Content-centric services, 285
closed community, 285
open user community, 285
Content consumer, 305
Content Provider (CP), 203, 303, 305
Context-aware charging Web Service (CWS) functions
Advice of Charge (AoC), 293
diameter credit control application, 293
online charging indication, 293
Continua Health Alliance, 224
Control entity, 304
Convergent online charging, requirements for, 290
Coordinated Access Band (CAB), 102
Core network (CN), 202
Correlation index, computation of, 140, 141
for different modulation schemes and roll-offs, 141
Correlation threshold, 42–44
average sum rate with block diagonalization versus threshold, 43
effect of threshold selection, 42, 43
objective, 43
Cost-optimised active receive array antenna
antenna design, 190–192
digital beamforming
implementation aspects, 195–199
simulation assessments
conformal array simulations, 187–189
directional land mobile satellite channel model, 183–186
environmental conditions, 182, 183
system scenario, 181, 182
“Cost-Optimised High Performance Active Receive Phase Array Antenna For Mobile Terminals (CORPA)”, 181
CP see Content Provider (CP)
Cyclic shifted multiple interleavers advantage, 9
asynchronism between users, 9
in interleave division multiple access (IDMA), 9
low Hamming weight, 9
$\Pi \kappa$ from mother interleaver $\Pi$, 9
require $D=3$ and self interleaving operations for good performance, 16
require low memory for storing of interleaving patterns, 9
DBF algorithms, 187
DBF see Digital Beamforming (DBF)
DBF weight vector update, 198, 199
radiation pattern, 199
Decentralized RAT selection algorithm enabled by IEEE P1900.4
case study: interference reduction through decentralized RAT selection, 265–268
multi-service scenario, results in, 272–275
appropriate setting of $PL_{th}$, 275
throughput improvement, 275
RAT selection enablers defined by IEEE P1900.4, 263–265
simulation model, 269, 270
RRM parameters, 269
single service scenario, results in, 270–272
downlink throughput for different values, 272
uplink load in UTRAN and GERAN, 272
Delay budget model and performance model, 322, 323
relationship between R-value and MOS, 323
relevant codec delays, 323
Dense Wavelength Division Multiplexing (DWDM) technology, 346
potential architecture, 347
Device domain, 304
Differentiated Services (DiffServ), 204
DiffServ see Differentiated Services (DiffServ)
Digital Beamforming (DBF), 193
advantages and disadvantages, 194
block diagram of DBF processing, 194
implementation aspects
acquisition phase in the DBF processing, 195
A/D conversion and IF-sampling, 196, 197
DBF weight vector update, 198, 199
pilot despreading and selection of illuminated elements, 197, 198
tracking phase in DBF processing, 196
Digital System E, 182
Digital Video Broadcasting for satellite applications (DVB-S2), 315
Digital Video Broadcasting – Handheld (DVB-H), 201
Directional land mobile satellite channel model
performance analysis, 183–186
Dirty paper coding (DPC), 23
Distributed cross-layer approaches for VoIP rate control
AMR-WB-based cross-layer VoIP distributed rate control codec, 321
cross-layer VoIP rate control, 321, 322
delay budget model and performance model, 322, 323
numerical results, 324–329
different rain attenuation models, 324
expedited forward aggregated throughput for channel attenuation, 326
expedited forward delay for channel attenuation, 325
probability of exceeding delay requirements, 327
probability of exceeding maximum delay, 328
R-factor for G. 729, 328
QoS model, 318
RTCP-driven cross-layer distributed VoIP rate control
bank of narrowband non-adaptive codecs, 320
RTCP reports, 319, 320
system model
centralized vs. distributed approaches, 317, 318
DVB-S2/RCS, 317
Dominant eigenmode transmission, 64
schemes, 65
Downlink, 331
increased, 339
optical, see Optical downlink
RF, see RF-downlink
RF-optical, 335
scenarios, comparison, 338
DRM broker, 304
provider, 303
DSA scheme, 101
DVB-S2/RCS systems, 315
Dynamic access selection
access priorities, 257
link-performance based, 255
resource based, 255–257
Dynamic MBMS resource scheduler
consideration of channel state information, 206
dynamic resource scheduling, 206–208
performance evaluation, 217
power scheduling, 208
Dynamic Resource Scheduling (DRS), 206
power control technique, 207
Dynamic spectrum allocation (DSA), 99

Earth observation (EO) sensors limitation, 331
Sat downlinks, 347
satellites, 331
Earth observation scenario, 333
Electronic Communications Committee (ECC)
ultra low power active medical implants, 355
Electronic patient record (EPR), 351, 353
End user, 303
Enterprise resource planning system (ERP)
and wireless technology, 362
Equivalent baseband model, 137, 138
second- and fourth order moments, 138
SNR estimation of oversampled narrowband signals, 138
Erbium Doped Fiber Amplifier (EDFA), 347
Errors at receiver, 59
error model, 59, 60
simulation results, 61
Alamouti Scheme and spatial multiplexing, impact on, 61
hybrid transmission scheme, impact on, 61, 62
European Cloud Climatology (ECC), 339
Event modeling with two-state Markov chain, 167, 168
fade/non-fade events, 167
state transition matrix S, 167
Exclusion-compensation principle, 107

FACH see Forward Access Channel (FACH)
Fade duration, 168

Fade duration Markov model, investigation of applicability of attenuation threshold dependent fade duration model, 168–171
event modeling with two-state Markov chain, 167, 168
from fade duration model to two-state fade/non-fade model, 171–173
measured data, description of, 164
modeling scintillation, 176
simulate single fading event, 173–175
stationarity investigations of attenuation process, 164–167
synthesized time series, evaluation of, 176–178
Fade duration model to two-state fade/non-fade model, 171–173
with desired duration, 173
fade duration CCDF, 172
simulated fading/non-fading event series, 173
Fair scheduling and antenna selection algorithms, 29, 30
Fine pointing assembly (FPA), 347
Float Point Multiplications (FPMs), 124
Forward Access Channel (FACH), 203, 205
Free-space optical (FSO) high speed links, 331
designated wavelength regions, 344
problem, 338
wavelengths, 344
10.6 μm, 345
800 nm, 345
1064 nm, 345
Frequency/time assignment algorithms, 117
Frequency/time-space resource allocation (FT-S RA) strategy, 116, 124
frequency/time assignment algorithm: user-to-resource assignment, 125
resource allocation strategy, 126
successive projections algorithm, 124, 125

Gateway GPRS Support Node (GGSN), 203
General Packet Radio Service (GPRS), 202

Generic abstraction of access performance and resources
access performance abstraction, 246, 247
access resource abstraction metrics, 248–251
structures and combined access resource metrics, 251–253
access selection process
dynamic, 254–257
policy-based, 254
multi-radio access architecture, 240–242
service requirements
delay requirements of applications, 244
rate requirements of applications, 243, 244
reliability requirements of applications, 243
service specification, 244, 245

Generic access performance abstraction, 246, 247
link performance abstraction, 246

Generic access resource abstraction metrics, 248–251
resource levels, computing, 249
resource measures, computing, 250, 251
structures and combined access resource metrics, 251–253

channelization resource, 252
physical resource, 252
Generic Link Layer (GLL), 240
Geometry-based stochastical model (GSCM), 183
GEO satellite as relay station, 335
vs. HAP relay, 336
GLL see Generic Link Layer (GLL)
Global positioning system (GPS), 359
3GPP see 3rd Generation Partnership Project (3GPP)
GPRS see General Packet Radio Service (GPRS)
Greedy regularized correlation-based algorithm (GRGCA), 116
vs. SPA, 125
Ground station diversity, 334

Hamming weight for concatenated zigzag codes, 5
Healthcare process management, 351
Hidden Markov model (HMM), 176
High Altitude Platforms (HAPs), 332
advantage of receiver concepts with wave-front correction systems, 346
attenuation effects, 344
designated wavelength for FSO, 344
relay, 336, 337
advantages, 336
downlink, 336
vs. GEO relay, 336
wavelength selection and terminal architecture, 344–348
1064 nm, 345, 346
800 nm technology, disadvantages, 345

Higher-order statistics
correlation index, 143
even-order moments, 142
sixth-order statistics, 142
High resolution optical/infrared cameras, 331

HMM see Hidden Markov model (HMM)
Home gateway, 305
Home network
  content adaptation, 301
  secure access, 300, 301
Homodyne binary phase-shift keying (BPSK) modulation, 345
Hospital, wireless see Wireless applications in healthcare and welfare, wireless hospital concept
Hybrid transmission scheme, 56–58
  dominant eigenmode transmission, 58
  effective MIMO channel matrix, 57
  by shuffling antenna, improves, 57, 58, 61, 62
IEEE 802
  802.15.1 Bluetooth, 224
  IEEE 802.15.BAN (SGBAN), 224
  802.11 WLAN, 224
IEEE P1900.4, 263
IEEE 802.11 radios, 357
I/2 interleavers, 15, 16
IMS trust models, 310
Inphase and quadrature (I&Q), 196
Input-output relationship for Alamouti scheme, 56
  hybrid transmission scheme, 57
  narrow band system, 54
Institute of Communications and Navigation of the German Aerospace Center (DLR), 332
Integrated Services (IntServ), 204
Intelligent mobile telecommunication (IMT), 223
Inter-cell interference, 71, 73, 80, 101
Interference reduction through decentralized RAT selection (case study), 265–268
decentralized RAT selection strategy, 267
information transmitted through P1900.4, 268
intercell interference in TDMA and CDMA systems, 266
Interleave division multiple access (IDMA), 9
Interleaver design approaches, 3
criteria, 7–12
memory for storing interleaver patterns, 3, 8, 19
memory requirements, minimizing, 3, 6, 8
of multidimensional parallel concatenated convolutional codes, 7
mutually independent, 13
permutation rule, 4, 8–11, 15
permutations from common mother interleaver, 7, 9, 16
turbo codes in UMTS, 8
Interleavers for zigzag codes, 11, 12
AB Interleavers, 14–16
code words with Hamming weight $w_H=2$, 12
$w_H=3$, 12
codewords with low weight, avoiding, 11
interleaver design criteria, 12
optimizing for performance in error floor region, 8, 9
restricted random interleaver, 12–14
restriction, 12
Intermediate UMTS interleavers, modified, 18
International commission on non-ionizing radiation protection (ICNIRP), 232
International Satellite Cloud Climatology Project (ISCCP), 338
cloud coverage data, 339
Internet key exchange protocol version 2 (IKEv2), 365
Internet Protocol (IP), 204
Internet services, 281, 284
Inter-symbol interference (ISI), 73
IP Multimedia Subsystem (IMS), 204, 285
IP see Internet Protocol (IP)
I&Q see Inphase and quadrature (I&Q)
“Islands geography,” 101
Japan Aerospace Exploration Agency (JAXA), 332
Joint Radio Resource Management (JRRM), 261
Joint user and antenna selection for block diagonalization (BD), 30–34
   first proportionally fair (PF) scheduling metric, 31, 32
   ith iteration of algorithm, 31
   low complexity algorithms, 31
   scheduling metrics, 31
   selection metric design, 33
   simplified proportionally fair (PF), 32
for successive optimization (SO), 34–38
   capacity based algorithm, 36
   objective, 34, 35
   scheduling metrics, 35, 36
   simplified Frobenius norm based algorithm, 36
   user scheduling, 35
JRRM see Joint Radio Resource Management (JRRM)
K-I interleavers, 6
KIODO (Project), 332
Land mobile satellite (LMS), 183
LEO (Low Earth Orbit) satellite, 331, 332
atmospheric transmission at selected elevation angles (Neustrelitz), 344
elevation dependency at selected wavelengths, 345
downlink availability, 343
increased downlink time, 335
see also GEO satellite
optical downlinks, 334
transmission, 331
Liberalization, 99
Line-of-sight (LOS), 183
LMS see Land mobile satellite (LMS)
Local Mobile Services (LOMS), 281
FindAFriend, 286
local search, 286
news service, 286
role model
   charges types, 283, 284
LOMS see Local Mobile Services (LOMS)
Low complexity algorithms, 31
Low level radio, 232
Low noise amplifier (LNA), 191
Market-driven dynamic spectrum allocation (DSA) framework, 111
of fade duration, 163, 168, 170–172
Fade duration CCDF, calculating with, 171, 172
method for time series generation, 164, 165
partitioned Fritchman’s, 173, 174
two state fade/non-fade, 174, 178
MBMS content distribution
   carousel service scheduling approach, 202
dynamic MBMS resource scheduler in RAN, 202
multicast streaming services, 202
MBMS see Multimedia Broadcast Multicast Service (MBMS)
Measured data, description of, 164
MIMO systems see Multiuser MIMO system
Minimum mean square error receiver (MMSE), 55
Minimum Variance Beamforming (MVB), 193

Mobile broadcast and multicast services, scheduling techniques for
concepts and algorithms
carousel services, 209–212
dynamic MBMS resource scheduler, 205, 206
streaming services, 212–215
and congestion control
in context of MBMS, 204, 205
fundamentals, 203, 204

performance evaluation
dynamic MBMS resource scheduler, 217
scheduling for carousel services, 215, 216
scheduling for streaming services, 216

problem analysis
introduction of MBMS, 202, 203

Mobile IPv6 protocol (MIPv6), 365
Mobile phone, 306

Mobile services and different charge types, categories of
content centric service, 284
internet access, 284
local mobile service (LOMS), 284
messaging, 284
Push to talk over Cellular (PoC), 285
voice calls, 284

Model parameterization, 154–156
Gaussian fade slope model, experimental parameters of, 154–156
state transition probabilities, determination of, 156

Modern modulation and coding (ModCod) schemes, 334, 335

Moment-based estimation of signal-to-noise ratio
computation of correlation index, 140, 141

equivalent baseband model, 137, 138
higher-order statistics, 142, 143
correlation index, 143
narrowband signals, 138, 139
simulation results, 144–146
SNR estimation, 138–140

MRRM see Multi-Radio Resource Management (MRRM)

Multi-bid profile, 106
allocation rule, 107
allocation’s efficiency, 107
exclusion-compensation principle, 107

see also Opponents’ profile, 106

Multicast mode vs. broadcast mode, 202

Multi-cell signal processing
exchange of data, backhaul
required for, 71, 74, 77, 78
notation, 72
optimization approach
beamforming matrices, 82–85
power allocation, 85, 86
user grouping, 80–82
virtual MIMO configuration, 82
simulation results, 89–93
subsystem partitioning, 86–89
system model
cellular system setup, 73
optimization framework, 74–78
optimization problem, 78, 79

Multimedia Broadcast Multicast Service (MBMS), 201
BM-SC as functional entity, 203
broadcast mode, 202
carousel services, 202
dynamic system, 205
efficient distribution of multicast and broadcast services, 201, 202
file download services, 202
multicast mode, 202
number of services/content and users, increases, 201
offers interactive multimedia services, 201
reference architecture, 203
requires single transmission, 202
scheduling and congestion control in, 203–205
scheduling techniques in, 201, 204, 205
streaming services, 202
Multiple interleavers
condition, 5
congruential interleavers, 8
cyclic shifted, 9
design criteria of
minimizing intersection, 7
minimizing multiuser interference impact, 6, 7
K–I, 6
in multidimensional parallel concatenated convolutional codes, 7
multiuser detection in CDMA and IDMA, design of, 6
problem, 6–8
design criteria, 6, 7
memory requirements, 6
of saving memory, 6
UMTS based interleaver, 9–11
for zigzag codes, 11, 12
Multi-radio access architecture, 240–242
abstraction model, 242
in ambient networks, 241
Multi-radio resource management (MRRM)
access connectivity abstraction model and architecture, 242
access selection, 241
Multi-user downlink MIMO transmission
channel estimation errors at receiver, impact of, 59
system model, 59
ZF precoding for multi-user downlink transmission, 59
Multi-user joint detection or transmission, 71, 73
see also Virtual MIMO or network MIMO
Multiuser MIMO system
block diagram of, 26
Muscle tension sensors, 230
MVB see Minimum Variance Beamforming (MVB)
Near field communication (NFC), 306, 308, 357
Network model, 369
Neustrelitz, 333
News publishing scenario
charging of service usage and revenue sharing, 286–288
charge types, 286
example for context-aware charging and revenue sharing, 287
convergent online charging, requirements for, 290
mobile user inside event area, 289
receiving a discount for traffic and service, 289
mobile user outside event area, 288
user outside film festival area fully charged, 288
Next generation network (NGN), 365
NFC technology, 310
NF see Noise figure (NF)
Noise figure (NF), 191
Non-linear vertical BLAST (V-BLAST), 55
Non-polynomial time hard (NP-H), 115
defined, 116
and optimum RA, 115
Non-uniform scatterer cross section (NSCS), 183
N-state Markov chain model, 149, 151–154
basic parameters, 152
schematic representation, 152
state separation, 153
Null space projected channels, 27, 41

OGS-networks
availability of, 340
cloud cover statistics and OGS-diversity, 338–340
within Europe, 342
four OGSs within Germany, 341
within Germany, 341
locations for European and world wide, 343
selection criteria, 340
world wide, 342, 343

One-shot multi-bid auction and pricing in DSA networks
average and maximum interference, 110
example, 108–111
geographic coupling parameters, 110
interference, 100
multibids, 110
optimal allocation and costs of providers, 111
pricing scheme in DSA model allocation and pricing rules, 106–108
inputs, 105, 106
radio technology coupling parameters, 109
related works, 101, 102
one-shot scheme, Delenda, 101
Progressive Second Price (PSP) Mechanism, 101
rights and obligations, 100
spectrum usage rights, 100
usage rights, parameters, 100
scenario, 109
spatio-temporal DSA model, based on feasible allocation, 104
interference and spectrum efficiency, 102, 103
interference tolerance, 105
trading and liberalization, 99, 100
efficient use of spectrum, 99
market for frequencies, 99
One-shot multibid auction method, 111
One-shot scheme (Delenda), 101
Open Systems Interconnection (OSI), 204
Opponents’ profile, 108
Optical C-Band technology, 346
Optical downlink, 332, 334
LEO, elevation dependency of atmospheric transmission, 345
limitations, 334
Optical Ground receiving Station (OGS), 331
adaptive optics technologies, 346
factors deciding location of, 339
Optical satellite downlinks to optical ground stations and HAPs, 331, 332, 348
availability of OGS-networks, 340
within Europe, 342
within Germany, 341
world wide, 342, 343
cloud cover statistics and OGS-diversity, 338–340
comparison of downlink scenarios, 338
solving challenge of cloud-blockage, 332, 333
system comparison
combined RF-optical downlink, 335
Earth observation scenario, 333
GEO relay, 335
HAP relay, 336, 337
optical downlink, 334
RF downlink, 334
state of art RF downlink, 333
wavelength selection and terminal architecture, 344–348
Optimal feasible allocation, 105, 110
Optimal threshold, 43
Optimistic capacity bounds, 71
Optimization (multi-cell signal processing) approach, 79
framework, 74–78
problem, 78, 79
Orthogonal Frequency Division Multiple Access (OFDMA), 115 and BS, 118
Orthogonal space division multiplexing (OSDM) techniques, 24
Orthogonal space-time block codes (OSTBCs), 53
OSDM techniques see Orthogonal space division multiplexing (OSDM) techniques

Pacemaker, 228
Partitioned Fritchman model, 149
Patient tracking in wireless hospital, hospital registration and, 358, 359
Pedestrian scenario, 374
Performance analysis of IPsec calculation method, 370–373 mobility process chain, 372 number of visits of jobs of classes, 373 scale factors, 373 input parameters, 373–378 calculation of service times, 375 meaning of input variables, 375 mobility scenarios, 373, 374 mobility state diagram of user, 374 parameters of network model, 375 processing requirement to encrypt, decrypt, or hash one block of data, 376 results, 378–384 dependency of utilization of HA on mobility rate, 381 full utilization of HA at different security configurations, 379

impact of processing speed of MN and access network, 381–383 mean response time of mobility process, 382 performance overheads, 379 relative effect of processing speed of MN and data rate, 383 utilization of HA, 378–381


Personal digital assistant (PDA), 354
Pilot despreading and selection of illuminated elements despreading of single antenna element signal, 198
Planar inverted-F antenna (PIFA), 190
Portable base station (PBS) wireless data transfer in hospitals, 355
Power allocation, 29, 76, 85, 86
Power delay profiles (PDP), 183
Power scheduling, 208
Pricing scheme $C$, 106
Pricing scheme in DSA model allocation and pricing rules, 106–108
inputs, 105, 106
Progressive second price (PSP) mechanism drawbacks, 101
Proportional fairness based scheduling, 25, 30
effect of antenna selection, evaluating, 30
Frobenius norm based, 31, 36, 41, 49
Prototype BAN system
  UWB transceiver for wearable
  BAN, 233

QoS see Quality of Service (QoS)
Quality of Service (QoS), 203, 261
model, 318
Quasi-linear utility functions, 101

Radio access networks (RANs), 202, 261
  see also Beyond 3G (B3G)
systems, 261
Radio access technologies (RATs), 239, 261
Radio frequency identification
(RFID), 357, 359
Radio network service providers
(NSPs), 111
Radio resource, 118
Radio resource management
(RRM), 262
Radio spectrum, 99
Rain attenuation distribution on
terrestrial microwave links,
estimation of
applying proposed model for
designated link, 157, 158
  principle of parameter
  transformation, 157
model parameterization, 154–156
N-state Markov model, 151–154
results, 158–160
  fade duration statistics
  prediction, 160
  parameters of proposed link, 158
  rain attenuation CCDF
  prediction, 159
stationary examination of rain
  attenuation process, 150, 151
Rain attenuation process, stationary
  examination of, 150, 151
  generated time series, 150, 153, 158
probability density of measured
data, 151
vs. fade duration CCDF values,
153, 159, 160
Rain attenuation/ rain rate
modeling, 149
first and second order statistics of
microwave link, estimating,
149–151, 155
Random interleaver, restricted,
12–14
construction of
  $k$-th interleaver $\Pi_k \kappa$, 13
  multiple, with restrictions, 13
  higher input index pairs, 14
  input indices sequence, 13
  output indices sequence, 13
Random vector quantization, 63, 64
RANs see Radio access networks
(RANs)
RAS-II see Receive Antenna
  Selection Algorithm 2
(RAS-II)
RAS-I see Receive Antenna Selection
  Algorithm 1 (RAS-I)
RAT selection algorithms, 263, 266, 269–271
for CDMA/TDMA scenarios,
265–268
RAT selection enablers defined by
IEEE P1900.4, 263–265
IEEE P1900.4 heterogeneous
system vision, 264
Network Reconfiguration
Manager (NRM)
 functionalities, 264
RAT selection policy, 268
RATs see Radio access technologies
(RATs)
3rd Generation Partnership Project
(3GPP), 202, 290
Receive Antenna Selection Algorithm
1 (RAS-I), 41
Receive Antenna Selection Algorithm
2 (RAS-II), 41, 42
Receive antenna selection (RAS), 36, 40
advantages, 40
impact of, 40–42
improves multiuser diversity, 41
RAS-I, 41
RAS-II, 41, 42
Reference scenario, 368
Resource allocation strategies for SDMA/OFDMA systems, 115–117, 132
analysis and simulation results, 126–131
frequency/time-space resource allocation, 124
frequency/time assignment algorithm: user-to-resource assignment, 125
resource allocation strategy, 126
SDMA algorithm: successive projections algorithm, 124, 125
performing optimum, complexity, 115, 116
simplify, 115, 117
space-frequency/time resource allocation, 119
frequency/time assignment algorithm: group-to-resource assignment, 121–123
resource allocation strategy, 123, 124
SDMA algorithm: greedy regularized correlation-based algorithm, 120, 121
suboptimal, 116
system model, 117–119
two suboptimal, 116
Resource blocks, 73
Resource matrix, 214
RF-downlink, 331
GEO-downlink, limiting factor, 335
limitations, 331
proposed, 334
RF-optical downlink, 335
Rights management, 301, 302
use of group authentication, 302
Rights management for user content authentication and encryption, 307, 308
background, 298–300
home network with access control and out-of-band key distribution, 299
interconnecting service, 299
devices in home network, 300, 301
future work, 310, 311
high capacity SIMs, 310
home right management system, 311
IMS trust models, 310
NFC readers, 310
NFC technology, 310
SmartMX chip, 310
service architecture, 308–310
constraints, 308
usage scenarios
commercial content, 303–305
user content, 305–307
RRM see Radio Resource Management (RRM)
RTCP-driven cross-layer distributed VoIP rate control and AMR-WB architectures, 319
bank of narrowband non-adaptive codecs, 320
codecs for RTCP-driven scenario, 320
reports, 319, 320
Sample Matrix Inversion (SMI), 194
SAR systems, 331
Satellite Digital Multimedia Broadcasting (SDMB), 181
Scheduling algorithms, 29, 30
Scheduling and congestion control in MBMS
in context of MBMS, 204, 205
fundamentals, 203, 204
Scheduling metrics, 25, 35, 36
average value, 38
Metric 1, 32
Metric 2, 34
Metric 3, 36
Metric 4, 36
performance, 46
Scintillation
defined, 176
filter parameters, 176
with HMM method, 176
modeling, 176
SDMA, FT-S RA strategy, 126
greedy regularized correlation-based algorithm, 120, 121
group-to-resource assignment, 121–123
see also Frequency/time-space resource allocation (FT-S RA) strategy
SDMA, S-FT RA strategy, 123, 124
successive projections algorithm, 124, 125
user-to-resource assignment, 125
see also Space-frequency/time resource allocation (S-FT RA) strategy
SDMA/OFDMA systems, 115
system model, 117–119
see also Resource allocation strategies for SDMA/OFDMA systems
Security configurations, 366, 367
MIPv6 signaling, 367
Selection metrics
design, 33
squared Frobenius norm, 34
Selective virtual MIMO, 71
Service requirements
delay requirements of applications insensitive, 244
sensitive, 244
rate requirements of applications discrete-rate, 244
elastic, 244
reliability requirements of applications error-sensitive, 243
error-tolerant, 243
Service specification, 244, 245
S-FT RA and FT-S RA strategies, performance, 126–131
comparison, for different allocation objectives, 130
simulation parameters, 127
SG-BAN and BAN, 224–227
BAN vs. other IEEE 802.15 standards, 226
current status of IEEE 802.15 working group, 225
definition and scope of BAN, 225
Short-range wireless technologies bluetooth using IEEE 802.15.1, 233
low rate UWB of IEEE 802.15.4a, 233
prototype BAN system, 233, 234
UWB transceiver for wearable BAN, 233
specific low level radio, 232
zigbee using IEEE 802.15.4, 232, 233
Signal Interference Ratios (SIRs), 207
Signal-to-interference-plus-noise ratio (SINR), 193
Signal-to-leakage ratios (SLR), 89
Signal-to-noise ratio (SNR), 137, 138
Simplified channel-aware greedy scheduling and antenna selection
fair scheduling and antenna selection algorithms, 29, 30
joint user and antenna selection for block diagonalization (BD), 30–34
joint user and antenna selection for successive optimization (SO), 34–38
subspace correlation based user grouping, 38, 39
receive antenna selection (RAS), impact of
RAS-I, 41
RAS-II, 41, 42
simulation results
average sum rate performance, 44–48
correlation threshold, 42–44
system model
block diagonalization (BD), 27, 28
successive optimization (SO), 28, 29
Simulation assessments
directional land mobile satellite channel model, 183–186
normalised squared absolute value, 185
PDF of power of sum receive signal, 186
PDP for near scatterers with NSCS, 186
time series azimuth angles of LOS and multipath signals, 185
time series of elevation angles of LOS and multipath signals, 184
environmental conditions, 182, 183
Simulation results
channel scheduling and antenna selection
average sum rate performance, 44–48
correlation threshold, 42–44
average sum rate with block diagonalization versus threshold, 43
mobile broadcast and multicast services
average difference in Eb/N0, 219
discard rate in dependence of standard deviation, 218
number of supplied users in dependence of standard deviation, 218
multi-cell cooperative signal processing
centralized / decentralized performance (UL), 91
comparison of different precoding schemes, 92
different backhaul scenarios in DL, impact of, 90
suitable number of quantization bits, 90
multidimensional concatenated zigzag codes, 16–18
signal-to-noise ratio, 144–146
evolution of $E[\cdot]$, 144
evolution of success rate, 146
medium SNR range, 145
normalized mean square error, 145, 146
Single fading event, simulate, 173–175
elementary fading event generation process, 174
generating single elementary fading event, 175
maximal attenuation, 174
synthesized fading event, 175
Single link MIMO transmission system model, 54
Single Sign On (SSO), 298
SIRs see Signal Interference Ratios (SIRs)
Smart card, 307
SmartMX chip, 310
SNR see Signal-to-noise ratio (SNR)
Software defined radio (SDR), 354
Space Division Multiple Access (SDMA), 115
algorithms, 116, 117
channel response, 118
S-FT RA and FT-S RA strategies, performance of, 126–131
simplifying tasks for, 118
spatial correlation between two vector channels, 119
Space-frequency/time resource allocation (S-FT RA) strategy, 116, 119
considering nonunique and unique SDMA groups, 128
frequency/time assignment algorithm: group-to-resource assignment, 121–123
and number of FPMs, 124
RCBA and GRCBA in unique SDMA groups, comparison between, 129
resource allocation strategy and SDMA, 123–124
SDMA algorithm: greedy regularized correlation-based algorithm, 120, 121
Spatial multiplexing, 55
minimum mean square error receiver (MMSE), 55
V-BLAST receiver, 55
zero-forcing receiver, 55
Spatio-temporal DSA model feasible allocation, 104
interference and spectrum efficiency, 102, 103
interference tolerance, 105
Spatio-temporal transmission schemes, 53
requirement of CSI, 53
Spectrum allocation, 107
distribution, 99
efficiency, 99, 102, 103
interference, 100
quality, 104
rights and obligations, 100
Spectrum broker entity (SB), 105
Sport training, wireless, 362
S-random congruential interleaver, 8
with $s=2J+1$, 16
StORe (Stratospheric Optical Relays), 332, 347
generational visibility constraints of, 337
improved access time (example), 337
 Streaming services, scheduling of concept overview, 213
basic phases, 213
performance evaluation scheduling for streaming services, 216
spatial user distribution and RAN resources, 214
resource matrix, 214
splitting of reception groups, 215
weighting, 213, 214
Strong codes, 3
Subscriber Identity Module (SIM), 300, 306
Subspace correlation based user grouping, 38, 39
Subsystem partitioning, 86–89
aim of, 88
gains of different cooperation sizes, 88
increased performance, 89
interference cancellation, 87
SINR, 86
Successive optimization (SO), 24, 25, 28, 29
transmit power minimization, 28
Successive projections algorithm (SPA), 116, 123–125
vs. GRCBA, 125
Synthesized time series, evaluation of, 176–178
CCDF of measured and generated, 177
fade duration of measured and generated, 178
realization of, 177
System model block diagonalization (BD), 27, 28
successive optimization (SO), 28, 29
System scenario antenna specifications, 182
Temporal Reference Beamforming (TRB), 193
Time division duplex (TDD), 27
Tracking mode, 196
Trading, 99
Transmission schemes, 55–58
   Alamouti scheme, 56
   Alamouti vs. SM schemes, 55–58
   dominant eigenmode
   transmission, 58
   hybrid transmission scheme vs. SM
   schemes, 55–58
   spatial multiplexing, 55
   minimum mean square error
   receiver (MMSE), 55
   V-BLAST receiver, 55
   zero-forcing receiver, 55
Transmit power minimization
   block diagonalization, 24
   successive optimization, 24
TRB see Temporal Reference
   Beamforming (TRB)

UE see User Equipment (UE)
Ultra-wideband (UWB), 223, 357
UMTS based interleaver, 9–11
   construction of, 10, 11
   high performance, 17
   improved interleavers, obtaining, 11
   methods of, 9
   performance results, 17
   randomization method, 10, 11
   transpose or modified read out
   order, 11
   turbo code, 9
   using intermediate steps by
   reading out permutation
   rules, 9, 10
   see also Intermediate UMTS
   interleavers, modified
Unspecified Bit Rate (UBR), 208
Usage rights of spectrum, 100
Usage scenarios
   commercial content, 303–305
   entities, 303, 304
   limitations, 303, 304
   user content, 305–307
   content sharing between
   users, 306
User equipment (UE), 202

User grouping, 80–82
   algorithm, 39
   origin of main interference in
   downlink, 81
   partitioning cellular network into
   subsystems, 80
   proposed resource block
   assignment, 81
   search complexity of users,
   reducing, 25, 39, 42, 49
   selective virtual MIMO schemes,
   effective, 80
   strategies, 33, 38
UWB of IEEE 802.15.4a, 233
UWB see Ultra-wideband (UWB)

Variable Bit Rate (VBR), 208
V-BLAST receiver, 55
Virtual MIMO or network MIMO,
   75, 82

Wibree, 357
WILHO Consortium, 352, 353
   and ERP, 362
   patient monitoring gadgets, 356
   and wireless pain meter, 361
WINNER C1
   channel model, 61
   multi-user downlink
   transmission, 66
   LOS scenario, 66
   WIPL-D simulation, 187, 188
Wireless Application Protocol
   (WAP), 298
Wireless applications in healthcare
   and welfare, 351, 352
   application areas
   enterprise resource planning
   system, 362
   sport training, 362
   wireless hospital, 358–361
   wireless sensors, 361, 362
   wireless hospital concept, 352, 353
   equipment, 356, 357
   network topologies, 354–358
   technology, 357, 358
Wireless body area network (WBAN), 355
Wireless broadband systems, advantage, 53
Wireless communication network technologies role in supporting medical and healthcare services, 223
Wireless data transfer (hospital), 357

see also Bluetooth; Ultra-wideband (UWB); Wibree; Zigbee

Wireless hospitals, 352, 353
advantages, 352, 353
after-care, 360, 361
data transfer modes, 355
equipment, 356, 357
example, 356
hospital registration and patient tracking, 358, 359
location and tracking (LT) applications, 359
using WLAN vs. GPS, 359
network topologies, 354–358
wireless body area network, 354–356
wireless hospital area network, 354
pain meter, 361
patient monitoring, 356
positioning, 359, 360
process flow optimization, 359
improved cost structure of, 359
real-time material tracking and monitoring, 360
real-time phase information, 359
technology, 357, 358
data communication and localization purposes, see IEEE 802.11 radios

see also Wireless data transfer (hospital)

use of NFC and RFID, 357
wireless playground, example of, 353
Wireless local area networks (WLAN), 223, 359
Wireless metropolitan area networks (WMAN), 223
Wireless personal area networks (WPAN), 223
Bluetooth, 223, 233
increase quality and efficiency, 223
Ultra-wideband (UWB), 223, 233
ZigBee, 223, 232, 233
Wireless sensors, 361
in animals, 361, 362
World Data Center for Remote Sensing of Atmosphere (WDC-RSAT), 338, 339
WPAN see Wireless personal area networks (WPAN)

Zero-forcing receiver, 55
Zigbee, 357
using IEEE 802.15.4, 232, 233
Zigzag codes, 3
code performance, 4
and concatenated zigzag codes, 4
concatenation, 3
with different interleavers, 17, 18
encoding of, 4
high code rate, 3
interleavers for, 11, 12
iterative decoding, 3, 5
low complexity for high performance, 3
minimum Hamming weight, 4
multiple interleavers, use of, 5
mutually independent for good performance, 5
performance results, 16, 17
principle, 4
single (weak performance), 3