

# Index

## A

AAA framework 148  
 accelerometer 69  
 access services network (ASN) 8  
 ACC system 62  
 adaptive cruise control (ACC) 58, 61  
 Adaptive traffic control systems 331  
 ad hoc domain 372  
 Ad-hoc On-demand Distance Vector (AODV)  
     80  
 Advanced Public Transportation Systems  
     (APTS) 35  
 American Electronic Sign Co (AES) 54  
 analog-to-digital converter (ADC) 68  
 Android Market 294  
 Android/OSGi applications 305, 306, 307  
 Android platform 290, 291, 292, 294, 296,  
     299, 300, 301, 304, 307, 308  
 Android-powered infotainment operating sys-  
     tem 292  
 Android software 292  
 antilock braking system (ABS) 58, 60  
 application management 15, 21  
 application programming interface (APIs) 290  
 application server (AS) 164  
 Application Support Sublayer (APS) 77  
 APS data entity (APSDE) 77  
 APS management entity (APSME) 77  
 APTS system 36  
 architecture framework 144  
 ASN-anchored mobility 149, 150  
 Aspect-Oriented Programming (AOP) 298  
 asynchronous communication 258  
 Automatic Cargo Identification (ACI) 38  
 automatic number plate recognition (ANPR)  
     33

Automatic Vehicle Classification (AVC) 34  
 automatic vehicle identification (AVI) 34, 38  
 automatic vehicle locations (AVL) 34, 36, 38  
 Automatic Vehicle Monitoring (AVM) 36, 38

## B

backbone creation 203  
 backbone member 203  
 Backbone Member (BM) 202  
 Back-to-Back UA (B2BUA) 178  
 base station (BS) 8  
 beacon-enabled network 79  
 Bellman-Ford algorithm 135  
 biometric system 72  
 blind-spot warning 60  
 block diagram 64, 65, 66  
 Bluetooth 167, 181  
 broadcast protocols 208, 226

## C

C2F protocols 48, 49  
 C2X-applications 248  
 CAN (Controller Area Network) 1, 2  
 Car alarm system 124  
 CAR protocol 211, 212, 213, 214  
 Center-to-Center (C2C) 32  
 central processing unit (CPU) 232  
 changeable message signs (CMS) 33, 34, 35  
 CIM Object Manager (CIMOM) 315  
 CIM schema 314, 315  
 CIM specification 314  
 Cologne-based project 297  
 Common Gateway Interface (CGI) 24  
 common information model object manager  
     (CIMOM) 322

common information module (CIM) 320  
 communication protocols 160, 161, 162, 167, 171, 173, 174, 175  
 communications media 51  
 complex network protocols 230  
 components-oriented 295  
 computer vision system 128, 129, 130  
 computing environment 295  
 Confidentiality block (CB) 264  
 connectivity services network (CSN) 8  
 contention access period (CAP) 78  
 context-aware multicast routing (CAMR) 264  
 context-aware multicast routing (CAMR) scheme 264  
 Context-Aware Routing (CAR) protocol 258  
 context information 17, 18, 28  
 control channel (CCH) 91, 95  
 Controlled Vehicular Internet Access (CVIA) 185  
 controller area network (CAN) 2, 5, 20, 75  
 CVO technologies 38  
 cyclic redundancy checksum (CRC) 4

## D

data encryption mechanism 323  
 data packets 82, 83  
 data transmission 23  
 data transmissions 206, 261  
 Dedicated short range communications (DSRC) 231  
 Delay-bounded routing protocol 209  
 Delay/disruption tolerant networks (DTN) 252  
 delay model 211  
 Delay Tolerant Network (DTN) 252, 254  
 Denial-of-service (DoS) 377  
 Department of Defense (DoD) 109  
 diagnosis system 310, 319, 327  
 Diamond Digital router 339  
 digital data 61, 68  
 digital library 133, 135  
 digital map database 131, 133, 134, 137, 138  
 digital map library 133, 135  
 digital multimedia renderer (DMR) 179  
 digital multimedia server (DMS) 179  
 Digital Right Management (DRM) 170  
 Direct Sequence Spread Spectrum (DSSS) 77

Distance-Driven Probabilistic Diffusion (DDPD) 199  
 D-MinCost algorithm 217  
 Document Type Definition (DTD) 315  
 DSRC protocol layer 184  
 DTN routing algorithms 256  
 dynamic aspect 119  
 dynObjIndex 281, 282, 285

**E**

Earliest Delivery with All Queues (EDAQ) 258  
 Earliest Delivery with Local Queuing (EDLQ) 258  
 effective path length (EPL) 259  
 electronic control unit (ECU) 4, 6, 58, 61, 296  
 Electronic Emergency Barke Light (EEBL) 372  
 Electronic Fare Payment (EFP) 36  
 electronic stability program (ESP) 58, 66  
 Electronic Toll Collection (ETC) 34, 38  
 e-map 119  
 embezzlement 124  
 emergency-vehicle-approach 225  
 encounter-based multicast routing (EBMR) 264  
 end-to-end communicate 100  
 end-to-end paths 232  
 environmental information 65  
 Evaluate state 193  
 Extensible Authentication Protocol (EAP) 148

## F

Federal Communications Commission (FCC) 231  
 Felix framework 304  
 ferry relaying algorithm (FRA) 259  
 Fixed Mobile Convergence (FMC) 163  
 FlexRay protocol 2, 5  
 full function device (FFD) 76  
 Function-Driven Probabilistic Diffusion (FDPD) 200

## G

GBR (GroupBased Routing) 263  
 General Packet Radio Service (GPRS) 10

generated-map-based model 350  
Generation Telematics Protocol 28, 30  
geocast protocol 206, 217, 218, 219  
Geographic Information Systems (GIS)  
    34, 35, 39  
geographic routing protocol 365  
Global Positioning Systems (GPS) 15, 35, 247  
Global Satellite Positioning System (GPS)  
    108, 109  
global system for telematics (GST) 295  
Google Earth 356, 358, 359  
GPS receiver 109, 110, 111, 113, 115, 116  
gross domestic product (GDP) 369  
ground-based destinations 236  
Group-Based Routing (GBR) 263

**H**

hardware description language (HDL) 67  
Health management server (HMS) 23  
Heterogeneous Vehicular Network Diagnosis  
    System 310  
HIGA functional component 181  
Highway Advisory Radio (HAR) 35, 39  
Home Gateway Initiative (HGI) 160  
Home IMS Gateway (HIGA) 160, 177  
Home Subscriber Server (HSS) 164  
home/vehicular network  
    160, 161, 165, 170, 175, 181  
hop-by-hop manner 203  
HTTP (Hyper Text Transmission Protocol) 162  
HTTP-over-DTN 266  
HTTP-over-TCP 266  
HTTP standard protocol 170  
Hudson Valley Transportation Management  
    Center (HVTMC) 236, 249  
human-computer interaction 23  
human-machine interface  
    131, 133, 136, 137, 138, 291  
Human-to-human communications 47  
Hybrid Simulation Mode 365  
hybrid vehicular communication (HVC) 230  
hydraulic modulator 65

**I**

IC technology 59, 64  
IEEE 1609 90, 91, 92, 93, 94, 95, 97, 98,  
    100, 103, 104

IMS network 177, 178, 179, 180  
Information and Communication Technology  
    (ICT) 15  
information module 320, 321, 322, 323  
integrated circuit (IC) 67  
intelligent transportation system (ITS) 32, 33,  
    206, 246  
Inter-agent communication 18  
inter-contact time 255  
inter-departure time 359  
International Organization of Standards (ISO)  
    49  
Internet Protocol Based (IP-BASED) 318  
Internet service provider (ISP) 320  
inter-node connections 243  
inter-vehicle communication (IVC) 210, 214,  
    219, 230, 370  
inter-vehicle communications system 225  
intra-ASN mobility 149  
in-vehicle network  
    1, 2, 5, 6, 58, 59, 61, 62, 68  
in-vehicle network architecture 312  
in-vehicle networks 1, 12  
In-Vehicle Telematics Systems (IVIS) 18  
IP-based home network 317  
IP-based multimedia application 160  
IP-based multimedia services 160  
IP-based network technology 161  
IP Multimedia Service Control (ISC) 164  
IP Multimedia Subsystem (IMS)  
    160, 161, 181  
IP service model 144

**J**

Java Archive (JAR) 295  
JINI location 18  
JINI middleware 17, 18

**K**

knowledge-based mechanisms 256, 268  
K virtual machine (KVM) 296

**L**

LAN control module 321, 322, 323  
LAN management module  
    320, 321, 322, 323, 324, 325

LAN module 320, 321, 322, 323, 324, 325  
 LDAP (Lightweight Directory Access Protocol) 166  
 Licklider Transmission Protocol (LTP) 261  
 LIN (Local Interconnect Network) 1, 2, 312  
 Linux-based Ethernet router 339, 344  
 Linux kernel 291, 292, 294, 299  
 local interconnect network (LIN) 2, 5, 20  
 Location centric 243  
 LR-WPAN 74, 75, 76

## M

machine interaction 72  
 MAC protocols 183, 184, 185, 195, 204, 253  
 macro-scale levels 356  
 MAC sublayer management entity (MLME) 91, 92  
 management information base (MIB) 95, 271  
 management object format (MOF) 322, 327, 329  
 MANET simulation 349  
 map-based Activities 307  
 map-matching algorithm 119  
 map-matching function 134, 135, 137  
 map-matching module 133  
 map-matching process 131, 133, 134, 137  
 media oriented systems transport (MOST) 5  
 media streaming 161  
 medium access control (MAC) 230  
 mesh node 339, 341, 342, 345  
 metropolitan-area wireless mesh networks (MAWMN) 332  
 metropolitan-scale WMN 331  
 micro-controller unit (MCU) 11  
 microelectrical mechanical system (MEMS) 69  
 mobile ad hoc networks (MANETs) 206, 207, 229, 230, 369, 371  
 mobile agents 25, 26  
 mobile device 161, 170, 179, 180  
 mobile navigation assistant (MNA) 137  
 mobile network node 7  
 mobile networks 2  
 mobile router 24  
 mobile station (MS) 8  
 Mobile telematics computing environment 24

mobile vehicular network 62  
 mobility model 348, 349, 352, 353, 355, 356, 357, 360, 361, 363, 364, 365, 366, 367, 368  
 MOST (Media Oriented Systems Transport) 1, 2  
 MRT environment 158  
 multicast packets 207, 217, 226  
 multicast tree 263  
 multi-hop 370, 371, 372, 375, 377  
 multi-hop communication 185, 207  
 multi-hop forwarding 206, 209, 210, 211, 216, 217  
 multi-hop manner 183, 185  
 multi-hop transmission 209  
 multi-hop wireless transmission 207  
 multimedia contents 71  
 multimedia data 176, 177, 180, 181  
 multimedia data sharing 177, 181  
 multimedia file 169, 170, 180  
 multimedia storage 161  
 multiple routes (MURA) 259

## N

navigation routing algorithm 119  
 navigation system 119, 125, 126, 127, 128  
 Network Access Provider (NAP) 144  
 network architecture 1, 2, 3, 7, 8, 9  
 Network Attached Storage (NAS) 179  
 network devices 161, 171  
 network environment 160, 167, 174  
 network fragmentation 206, 207, 208, 214, 217, 218, 219, 221, 222, 225  
 network framework 163, 170, 171, 181  
 network-layer packet 377  
 Network Management Framework 271  
 Network-Management Systems (NMSs) 317  
 network monitoring 7  
 network on wheels (NoW) 371  
 Network protocol conversion 321, 322  
 network protocol conversion module 321, 322, 324  
 network reference model 144, 145, 146  
 Network Service Provider (NSP) 144  
 network simulator 349, 354  
 Network Surveillance 288

network topology 253, 258  
Next Generation Network (NGN) 162, 163  
Node centric 243  
Node-Initiated MF (NIMF) 259  
non-beacon-enabled network 79  
non-real-time applications 331, 335  
nonrecurring engineering (NRE) 67  
non-stationary solutions 242  
Normal Vehicle (NV) 202  
NTCIP-based system 49  
NTCIP-compatible traffic 41  
NTCIP protocols 42, 44, 49, 53, 54

## O

object-oriented schema 314  
on-board computers 1, 9  
on-board computers (OBC) 298  
onboard units (OBU) 38, 371  
one-hop delay 196  
one-hop transmission 195  
One Zero Flooding (OZF) 199  
Open Service Gateway Initiative (OSGi)  
    160, 181,  
Open Service Gateway Initiative Service Plat-  
    form (OSGi SP) 160  
operating system (OS) 6, 67  
operation environment 63  
Opportunistic forwarding 243  
Original Equipment Manufacture (OEM) plat-  
    forms 290  
orthogonal frequency division multiplex  
    (OFDM) 231  
OSEK Implementation Language (OIL) 21  
OSEK/VDX operating system 2  
OSGi framework 295, 299, 300, 301, 302,  
    303, 305, 307, 313, 314, 325  
OSGi platform 161, 165, 171, 174, 310,  
    311, 312, 325, 326  
out-vehicle network 1, 2, 3  
out-vehicle network architecture 1, 2, 3  
OZF 199

## P

peer-to-peer topology 79  
Personal Digital Assistant (PDA) 372  
Physical Layer (PHY) 184, 204

Point-to-Point Protocol (PPP) 41, 52  
position-based fashion 210  
Post Crash Notification (PCN) 372  
Practical Expected Delays (PEDs) 262  
prepaid server (PPS) 158  
probabilistic-based MAC protocol 185  
Probe Surveillance 288  
programmable logic device (PLD) 67  
Protocol data unit (PDU) 279  
protocol stack 45, 48, 52  
prototype model 6  
push-to-talk (PTT) 84  
PXE network 345

## Q

QoS-based accounting 157, 158

## R

radio-frequency ID (RFID) 72  
radio frequency (RF) 69  
RADIUS Server 158  
random waypoint (RWP) 232, 349  
real-time map 365  
real-time road information selections 243  
Received Channel Power Indicator (RCPI) 95  
reduced function device (RFD) 76  
regional computers (RC) 332  
Regional Traffic Control 288  
Remote Access Client (RAC) 178  
Remote Access Discovery Agent (RADA) 178  
Remote Access Server (RAS) 178  
Remote Access Transport Agent (RATA) 178  
remote alarm system 123  
remote transmission request (RTR) 4  
Road Feature Notification (RFN) 372  
Road Hazard Condition Notification (RHCN)  
    372  
Road-Look-Ahead (RLA) 17  
roadside-to-vehicle communication systems  
    (RVC) 230  
roadside to vehicle (R2V) 213  
Road Side Unit (RSU) 183, 371, 372  
ROMSGP protocol 213  
route discovery table (RDT) 82  
route guidance process  
    131, 133, 135, 136, 137

route planning process  
     131, 133, 134, 135, 136, 137  
 routing protocols 206, 207, 208, 209, 210,  
     218, 220, 222, 223, 226  
 routing table (RT) 82  
 RREP packets 82, 215  
 RTA wireless network 334

**S**

Sami Network Connectivity (SNC) 254  
 satellite technology 125  
 SDP parameters 179  
 service-based architecture 18  
 service channel (SCH) 95  
 service environments 23  
 service-integrated platform 160, 161  
 service-oriented architecture (SOA) 295  
 ServiceReference array 304  
 shortest expected path routing (SEPR) 259  
 Short-range radars (SRR) 69  
 Simple Network Management Protocol  
     (SNMP) 42, 317, 318  
 Simple Transportation Management Framework  
     (STMF) 271  
 Simple Transportation Management Protocol  
     (STMP) 42, 271  
 simulation model 352  
 SIP Proxy Server 171  
 SIP Service Bundle 171, 172, 173, 174, 175  
 sleep mode 74, 78, 79, 87  
 Slow Vehicle Alert (SVA) 372  
 Smart Probe Data 288  
 smart vehicle management system (SVMS) 20  
 SNMP manager 317  
 social networking 253  
 source-to-destination path 207, 208  
 sparse RVC (SRVC) 231  
 spatiotemporary coordination 220  
 SPER protocol 259  
 SRVC system 231, 234, 236  
 start-of-frame (SOF) 4  
 state-of-the-art 266  
 STMP 271, 272, 274, 275, 280, 281, 283,  
     284, 285, 286, 287, 289  
 Street RAndom Waypoint (STRAW) 365  
 sub-network 320, 321, 322, 323, 324, 325,  
     326, 328

Sub-network 321  
 sub-network agent 320, 321, 323, 325  
 sub-network information 320, 321  
 sub-network instruction 322  
 Sydney Coordinated Adaptive Traffic System  
     (SCATS) 333  
 system architecture 325  
 system-on-chip (SoC) 67  
 system platform 131, 137

**T**

TCP-based convergence layer (TCPCL) 262  
 TCPCL connection 262  
 TCP protocol 95  
 TDMA-based MAC protocols 183, 185, 204  
 TDMA system 185  
 Telecommunications Management Network  
     (TMN) 311  
 telematics protocol 15, 28  
 telematics service 2  
 telematics system 17  
 telemetric applications 15  
 TIGER maps 359, 364  
 topology 206, 207, 208, 210, 217, 219,  
     349, 357, 361, 363, 366  
 trace-based 349  
 traction control system (TCS) 58, 61, 65  
 traffic control system 365  
 traffic information center (TIC) 137  
 traffic management centre (TMC) 333  
 traffic quality 207  
 Transmission Control Protocol (TCP) 262  
 travel network 242  
 TSPs (Telematics Service Providers) 2

**U**

Ubiquiti wireless cards 339  
 Unwired network 341, 342, 345  
 URVC (Ubiquitous Roadside-to-Vehicle Com-  
     munication) 235  
 Usage Data Records (UDR) 158  
 USB-to-serial link 345  
 User Agent Client (UAC) 162  
 User Agent Server (UAS) 162

**V**

VADD protocol 211  
VANET 185, 190, 193, 196, 202, 204  
VANET embedded system 291  
VANET environment 364, 365, 366  
VANET protocol design 355  
VANET simulations 355, 356, 357, 366  
VANETs technologies 183  
Variable Message Sign (VMS) 54  
variable valve timing (VVT) 71  
Vehicle Ad Hoc Networks (VANETs) 229, 230  
vehicle dispatch server (VDS) 23  
vehicle management program (VMP) 20  
vehicle navigation system 131, 132, 133,  
    134, 135, 136, 137, 139, 141  
Vehicle Navigation System (VNS) 131  
vehicle to infrastructure (V2I) 91, 229, 230  
vehicle to infrastructure (V2I) communication  
    229, 230  
vehicle-to-roadside 90  
vehicle-to-vehicle 90  
vehicle to vehicle (V2V) 91, 229, 230  
vehicle to vehicle (V2V) communication  
    229, 230, 253  
vehicle tracking system 139  
Vehicular ad hoc network (VANET) 136, 183,  
    206, 252, 356, 370  
Vehicular Communication (VC) system 369  
vehicular environment 160  
vehicular network application 15  
vehicular network environment 311, 312  
vehicular network middleware 310  
vehicular networks 348, 365  
vehicular router 24  
very-large-scale integration (VLSI) 67  
VeSOMAC allocation 190  
video-broadcasting service 167  
Video on demand (VOD) 158  
Virtual TMC 288  
voice over IP (VoIP) 84  
voronoi-based mobility model 365, 368

**W**

WAN (Wide Area Network) 10, 12  
WAVE Basic Service Set (WBSS) 95, 96

WAVE management messages 90, 91, 97  
WAVE multi-channel operations 90, 91  
WAVE network services 91, 94, 95  
WAVE resource management 91  
WAVE short message protocol (WSMP)  
    92, 95, 96  
WAVE short message (WSM) 91, 94  
WAVE systems 185  
WBEM-based Remote Management 310  
WBEM-based Remote Vehicular Network  
    Management 311, 326, 327  
WBEM protocols 311  
web-based communication protocol 167  
web-based enterprise management (WBEM)  
    311, 322  
Weigh-in-Motion (WIM) 34  
wide area network (WAN) 319  
WiMAX 144, 145, 147, 148, 149, 150,  
    153, 154, 155, 156, 157, 158, 159  
WiMAX core network  
    144, 149, 150, 155, 158  
Windows Management Instrumentation (WMI)  
    316  
Wired Equivalent Privacy (WEP) 377  
wireless access in vehicular environment  
    (WAVE) 7, 90, 91  
wireless ad-hoc network 371  
Wireless channels 337  
wireless communication 20  
wireless mesh 331, 332, 333, 335, 340, 345  
Wireless mesh networks (WMN) 331, 332, 340  
wireless personal area network (WPAN) 75  
wireless sensor network (WSN) 74

**X**

x-by-wire 5  
XML document 168  
XML format 169, 175, 176

**Z**

ZigBee 74, 75, 76, 77, 78, 79, 80, 81, 82,  
    83, 84, 85, 86, 87, 88, 89  
ZigBee topology 81  
zone of relevance (ZOR) 219, 233