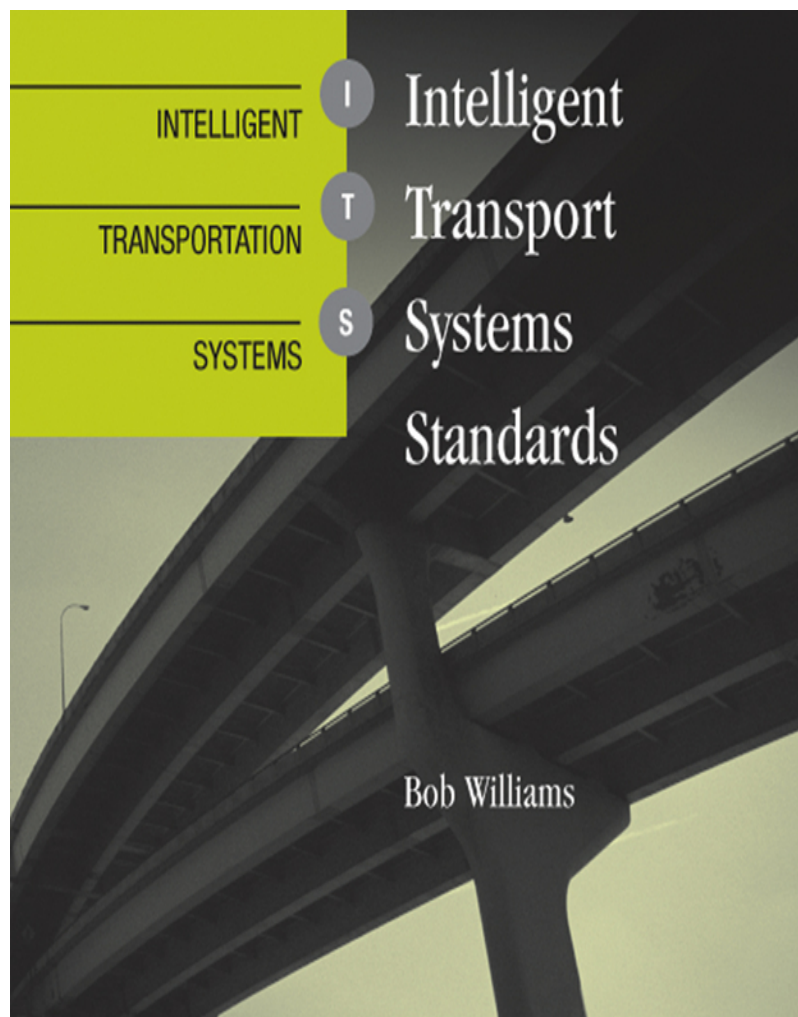


Intelligent Transport Systems Standards Bob Williams download

<https://ebookbell.com/product/intelligent-transport-systems-standards-bob-williams-1832790>

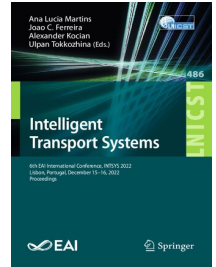


Explore and download more ebooks at ebookbell.com

Here are some recommended products that we believe you will be interested in. You can click the link to download.

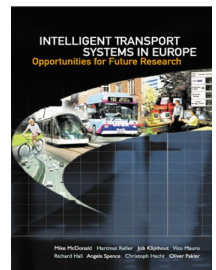
Intelligent Transport Systems 6th Eai International Conference Intsys 2022 Lisbon Portugal December 1516 2022 Proceedings Ana Lucia Martins

<https://ebookbell.com/product/intelligent-transport-systems-6th-eai-international-conference-intsys-2022-lisbon-portugal-december-1516-2022-proceedings-ana-lucia-martins-50005082>



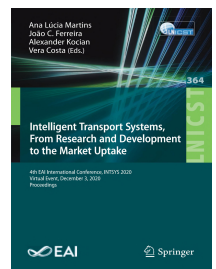
Intelligent Transport Systems In Europe Opportunities For Future Research Mike Mcdonald

<https://ebookbell.com/product/intelligent-transport-systems-in-europe-opportunities-for-future-research-mike-mcdonald-2192074>



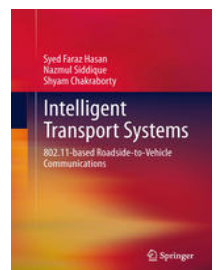
Intelligent Transport Systems From Research And Development To The Market Uptake 4th Eai International Conference Intsys 2020 Virtual Event December 3 2020 Proceedings 1st Ed 2021 Martins Ana Lucia Editor

<https://ebookbell.com/product/intelligent-transport-systems-from-research-and-development-to-the-market-uptake-4th-eai-international-conference-intsys-2020-virtual-event-december-3-2020-proceedings-1st-ed-2021-martins-ana-lucia-editor-34829960>



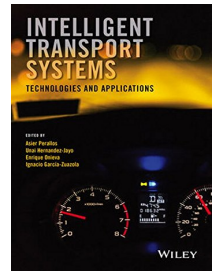
Intelligent Transport Systems 80211based Roadside-to-vehicle Communications 1st Edition Syed Faraz Hasan

<https://ebookbell.com/product/intelligent-transport-systems-80211based-roadside-to-vehicle-communications-1st-edition-syed-faraz-hasan-4392700>



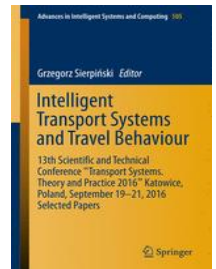
Intelligent Transport Systems Technologies And Applications 1st Edition Asier Perallos

<https://ebookbell.com/product/intelligent-transport-systems-technologies-and-applications-1st-edition-asier-perallos-5435186>



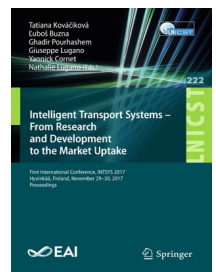
Intelligent Transport Systems And Travel Behaviour 13th Scientific And Technical Conference Transport Systems Theory And Practice 2016 Katowice Poland September 19-21 2016 Selected Papers 1st Edition Grzegorz Sierpiski Ed

<https://ebookbell.com/product/intelligent-transport-systems-and-travel-behaviour-13th-scientific-and-technical-conference-transport-systems-theory-and-practice-2016-katowice-poland-september-19-21-2016-selected-papers-1st-edition-grzegorz-sierpiski-ed-5675502>



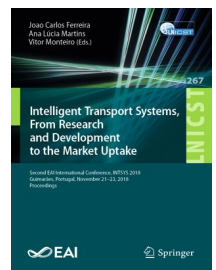
Intelligent Transport Systems From Research And Development To The Market Uptake 1st Ed Tatiana Kovikov

<https://ebookbell.com/product/intelligent-transport-systems-from-research-and-development-to-the-market-uptake-1st-ed-tatiana-kovikov-7151968>



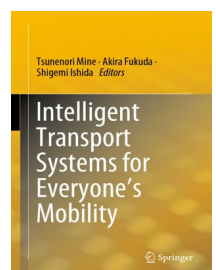
Intelligent Transport Systems From Research And Development To The Market Uptake Second Eai International Conference Intsys 2018 Guimares Portugal November 21-23 2018 Proceedings 1st Ed Joao Carlos Ferreira

<https://ebookbell.com/product/intelligent-transport-systems-from-research-and-development-to-the-market-uptake-second-eai-international-conference-intsys-2018-guimares-portugal-november-21-23-2018-proceedings-1st-ed-joao-carlos-ferreira-9960156>



Intelligent Transport Systems For Everyones Mobility 1st Ed Tsunenori Mine

<https://ebookbell.com/product/intelligent-transport-systems-for-everyones-mobility-1st-ed-tsunenori-mine-10494108>





INTELLIGENT

TRANSPORTATION

SYSTEMS

I

T

S

Intelligent Transport Systems Standards

Bob Williams

Intelligent Transport Systems Standards

For a listing of recent titles in the *Artech House
Intelligent Transportation Systems Series*, turn to the back of this book.

Intelligent Transport Systems Standards

Bob Williams



**ARTECH
HOUSE**

BOSTON | LONDON
artechhouse.com

Library of Congress Cataloging-in-Publication Data

A catalog record for this book is available from the U.S. Library of Congress.

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library.

ISBN-13: 978-1-59693-291-3

Cover design by

© 2008 ARTECH HOUSE, INC.

685 Canton Street

Norwood, MA 02062

All rights reserved. Printed and bound in the United States of America. No part of this book may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system, without permission in writing from the publisher.

All terms mentioned in this book that are known to be trademarks or service marks have been appropriately capitalized. Artech House cannot attest to the accuracy of this information. Use of a term in this book should not be regarded as affecting the validity of any trademark or service mark.

10 9 8 7 6 5 4 3 2 1

Contents

Preface	<i>xlix</i>
---------	-------------

PART I

Introduction to Intelligent Transport Systems	1
---	---

CHAPTER 1

Introduction	3
1.1 Objectives of the Book	3
1.2 How to Use This Book	5
1.2.1 Structure of the Book	5
1.2.2 Structure of Standards References	6
1.3 Obtaining Copies of Standards	8
1.4 Use of the Terms “Infrastructure” and “Roadside”	9
1.5 ITS Standards and Generic Standards Used for ITS	10
1.6 Introduction to Intelligent Transport Systems	11
1.7 Standardization for Intelligent Transport Systems	15
1.8 Benefits of ITS Standardization	16
1.9 Principles of Enterprise Architecture	17
1.10 The Business Case for ITS Standards	18

CHAPTER 2

Introduction to ITS Services and Supporting Technologies	19
2.1 What Are ITS Services?	19
2.2 ITS Users	21
2.3 Types of ITS Services	23
2.3.1 Introduction to ITS Service Types	23
2.3.2 Traveler Information	24
2.3.3 Traffic Management and Operations	24
2.3.4 Vehicle Services	24
2.3.5 Freight Transport and Logistics	25
2.3.6 Public Transport	25
2.3.7 Emergency	25
2.3.8 Transport-Related Electronic Payment	25
2.3.9 Road Transport-Related Personal Safety	26
2.3.10 Weather and Environmental Conditions Monitoring	26

2.3.11	Disaster Response Management and Coordination	26
2.3.12	National Security	26
2.3.13	ITS Data Management	27
2.4	Other “Views” of ITS	27
2.4.1	Services to Drivers	27
2.4.1.1	Driver/User Information Services	27
2.4.1.2	Driver Assistance Services	28
2.4.1.3	Collaborative Driver Assistance Services	28
2.4.1.4	Collaborative Driving Services	28
2.4.1.5	Subconscious Services to the Driver	29
2.5	Means of Achieving ITS Services	29
2.6	ITS Services for Vehicles and Their Occupants	30
2.6.1	In-Vehicle ITS Services	31
2.6.1.1	Adaptive Cruise Control	32
2.6.1.2	Antilock Brake System	33
2.6.1.3	Active Head Restraint	33
2.6.1.4	Adaptive Drivetrain Management	33
2.6.1.5	Airbag Control	33
2.6.1.6	Airbag Control—Intelligent	33
2.6.1.7	Automatic Light/Headlamp	34
2.6.1.8	Adaptive Headlight Aiming	34
2.6.1.9	Backwards Obstacle Warning	35
2.6.1.10	Blind Spot Information	35
2.6.1.11	Collision Warning	35
2.6.1.12	Driver Alert	35
2.6.1.13	Emergency Lane Assist	35
2.6.1.14	Electronic Stability Program (ESP)	35
2.6.1.15	Forward Collision Warning	36
2.6.1.16	Forward Obstacle Warning	36
2.6.1.17	Full Automatic Brake Power	36
2.6.1.18	Intelligent Driver Information System	36
2.6.1.19	Lane Departure Warning System	36
2.6.1.20	Lane Keeping Aid	37
2.6.1.21	Optimal Speed Advisory	37
2.6.1.22	Parking Assistance/Automatic Parking	37
2.6.1.23	Precrash Sensing	37
2.6.1.24	Rain-Sensing Wipers	38
2.6.1.25	Speed Control—Overspeed Warning	38
2.6.1.26	Speed Control—Speed Limiter	38
2.6.1.27	Tire Pressure Sensors	38
2.6.1.28	Vehicle Safety Inspection	38
2.6.1.29	Visibility Enhancer	38
2.6.2	Infrastructure Based Wireless ITS	39
2.6.2.1	Adaptive Traffic Signal Control	39
2.6.2.2	After Theft Vehicle Recovery	39
2.6.2.3	Commercial Vehicle Preclearance	40
2.6.2.4	Commercial Vehicle Administrative Processes	40

2.6.2.5	Control Center Information Sharing	40
2.6.2.6	Corridor Traffic Management—Surface Street (Local Road) and Freeway/Highway	40
2.6.2.7	Data Archiving	41
2.6.2.8	Data Warehouse	41
2.6.2.9	Detection and Confirmation of Incident Presence	41
2.6.2.10	Electronic Payment Systems—Infrastructure Only	41
2.6.2.11	Emergency Management Systems	42
2.6.2.12	Enforcement	42
2.6.2.13	Freight Transport Fleet Management	42
2.6.2.14	Freeway/Arterial/Highway Traffic Management	43
2.6.2.15	Hazardous Materials Monitoring and Management	44
2.6.2.16	High Occupancy Vehicle Facility Management	44
2.6.2.17	Highway Maintenance Management	44
2.6.2.18	Incident Management Systems	44
2.6.2.19	Intermodal Highway Junction Management	44
2.6.2.20	Parking Management	45
2.6.2.21	Reversible Lane Management/Counterflow/Tidal Flow	45
2.6.2.22	Response to On-Site Incident Information	46
2.6.2.23	Specific Vehicle Types Priority and Preemption	46
2.6.2.24	Surface Street Traffic Management	46
2.6.2.25	Traffic Information Dissemination	46
2.6.2.26	Traffic Monitoring	47
2.6.2.27	Transit Management Systems	47
2.6.2.28	Traveler Information—Infrastructure Based	47
2.6.2.29	Weather and Environmental Conditions Monitoring	47
2.6.2.30	Work Zone Traffic Management	47
2.6.3	Vehicle/Infrastructure ITS	48
2.6.3.1	Vehicle/Infrastructure	48
2.6.3.1.1	Infrastructure to On-Board Equipment	48
2.6.3.1.1.1	Accident Site Advisory	48
2.6.3.1.1.2	Animal Crossing Zone Information	49
2.6.3.1.1.3	Adaptive Drivetrain Management—Infrastructure Assisted	49
2.6.3.1.1.4	Adaptive Headlight Aiming	49
2.6.3.1.1.5	Blind Merge Warning	49
2.6.3.1.1.6	Curve Speed Warning—Infrastructure Based	49
2.6.3.1.1.7	Emergency Vehicle Signal Preemption	49
2.6.3.1.1.8	Emergency Vehicle Video Replay	50
2.6.3.1.1.9	Emergency Vehicle Warning—From Infrastructure	50
2.6.3.1.1.10	External Speed Limitation	50
2.6.3.1.1.11	Fog Warning	50
2.6.3.1.1.12	Freezing/Icy Bridge Warning	50
2.6.3.1.1.13	Freezing/Icy Road Surface Warning	50
2.6.3.1.1.14	GNSS Corrections	51
2.6.3.1.1.15	Hazardous Warnings Restricted Area	51
2.6.3.1.1.16	Highway/Rail Collision Warning	51
2.6.3.1.1.17	Homeland Security Identification and Management	51
2.6.3.1.1.18	Intelligent On-Ramp Metering	51
2.6.3.1.1.19	Intelligent Traffic Lights	51

2.6.3.1.1.20	Intersection Collision—Infrastructure Based Warning	52
2.6.3.1.1.21	Keep Clear Warning	52
2.6.3.1.1.22	Left Turn Assistant—Infrastructure Assisted	52
2.6.3.1.1.23	Low Bridge Warning	52
2.6.3.1.1.24	Low Parking Structure Warning	52
2.6.3.1.1.25	Merge Assistant	53
2.6.3.1.1.26	On-Board VMS Signage	53
2.6.3.1.1.27	Pedestrian Crossing Information	53
2.6.3.1.1.28	Pedestrian Crossing Control	53
2.6.3.1.1.29	Pedestrian/Children Warning	53
2.6.3.1.1.30	Post-Crash Warning	53
2.6.3.1.1.31	Rail Road Crossing Warning	53
2.6.3.1.1.32	Rest Area Ahead Advisory	53
2.6.3.1.1.33	Right Turn Assistant—Infrastructure Assisted	54
2.6.3.1.1.34	Road Condition Warning—Infrastructure Assisted	54
2.6.3.1.1.35	Rollover Warning	54
2.6.3.1.1.36	School Bus Warning	54
2.6.3.1.1.37	School Zone Warning	54
2.6.3.1.1.38	Sign Information (Warning Assistance)	54
2.6.3.1.1.39	SOS Services—Infrastructure Assisted	54
2.6.3.1.1.40	Speed Limit Advisory	54
2.6.3.1.1.41	Speed Limit Control	55
2.6.3.1.1.42	Stop Sign Movement Assistance—Infrastructure Assisted	55
2.6.3.1.1.43	Stop Sign Warning	55
2.6.3.1.1.44	Traffic Signal Warning	55
2.6.3.1.1.45	Traffic Signal Violation Warning	55
2.6.3.1.1.46	Transit Vehicle Data Transfer—Safety	56
2.6.3.1.1.47	Work Zone Warning	56
2.6.3.1.1.48	Wrong-Way Driver Warning—Infrastructure Assisted	57
2.6.3.1.2	On-Board Equipment to Infrastructure	57
2.6.3.1.2.1	Automatic Crash Notification	57
2.6.3.1.2.2	Blind Merge Warning	57
2.6.3.1.2.3	eCall	57
2.6.3.1.2.4	Incident Mapping and Warning	57
2.6.3.1.2.5	Intelligent Traffic Light Preemption for Priority Vehicles	57
2.6.3.1.2.6	Intersection Collision Avoidance	57
2.6.3.1.2.7	Intersection Collision—Vehicle-Based Warning	58
2.6.3.1.2.8	Probe Data	58
2.6.3.1.2.9	SOS Services	58
2.6.3.1.2.10	Vehicle-Based Warning	58
2.6.3.2	Infrastructure–Vehicle Commercial Services	58
2.6.3.2.1	Infrastructure to On-Board Equipment	58
2.6.3.2.1.1	Border Clearance	58
2.6.3.2.1.2	Commercial Service Payments	58
2.6.3.2.1.3	Drivers Daily Log	59
2.6.3.2.1.4	Driver Validation	59
2.6.3.2.1.5	Enhanced Route Guidance and Navigation	59
2.6.3.2.1.6	Freight and Fleet Operations	59
2.6.3.2.1.7	Infotainment	60
2.6.3.2.1.8	Internet In-Vehicle	60
2.6.3.2.1.9	Instant Messaging	60
2.6.3.2.1.10	Just-in-Time Repair Notification—Safety	60
2.6.3.2.1.11	Optimal Speed Advisory	60
2.6.3.2.1.12	Parking Space Identification/Navigation	61
2.6.3.2.1.13	Open Road (No Barrier) Tolling	61
2.6.3.2.1.14	Rental Car Processing	61
2.6.3.2.1.15	Route Guidance	61
2.6.3.2.1.16	Transit Vehicle Refueling Management	61
2.6.3.2.1.17	Transit Vehicle Data Transfer—Commercial	61
2.6.3.2.1.18	Vehicle Emissions Monitoring	61

2.6.3.2.1.19	Video Downloads	62
2.6.3.2.1.20	Yellow Page Services (Via In-Vehicle Internet)	62
2.6.3.2.2	On-Board Equipment to Infrastructure	62
2.6.3.2.2.1	Just-in-Time Repair Notification—Commercial	62
2.6.4	Vehicle-to-Vehicle ITS	62
2.6.4.1	Vehicle↔Vehicle Safety Services	63
2.6.4.1.1	Approaching Emergency Vehicle Warning—Vehicle-to-Vehicle	63
2.6.3.1.2	Blind Merge Warning	63
2.6.4.1.3	Blind Spot Warning	63
2.6.4.1.4	Cooperative Adaptive Cruise Control	63
2.6.4.1.5	Cooperative Collision Warning	64
2.6.4.1.6	Cooperative Glare Reduction	64
2.6.4.1.7	Cooperative Vehicle-Highway Automation System (Platooning)—Infrastructure Assisted	64
2.6.4.1.8	Curve Speed Warning—Vehicle Based	64
2.6.4.1.9	Highway Merge Assistant	65
2.6.4.1.10	Lane Change Assistant	65
2.6.4.1.11	Left Turn Assistant—Vehicle Assisted	65
2.6.4.1.12	Merge Assistant	65
2.6.4.1.13	Platooning—Vehicle Assisted	65
2.6.4.1.14	Precrash Sensing—Vehicle↔Vehicle Assisted	66
2.6.4.1.15	Post-Crash Warning	66
2.6.4.1.16	Right Turn Assistant—Vehicle Assisted	66
2.6.4.1.17	Road Condition Warning—Vehicle Assisted	66
2.6.4.1.18	Road Feature Notification	66
2.6.4.1.19	SOS Services—Vehicle Assisted	67
2.6.4.1.20	Stop Sign Movement Assistance—Vehicle Assisted	67
2.6.4.1.21	Vehicle Alert	67
2.6.4.1.22	Visibility Enhancer—Vehicle Assisted	67
2.6.4.1.23	Wrong-Way Driver Warning—Vehicle Assisted	67
2.6.4.2	Vehicle↔Vehicle Commercial Services	68
2.6.5	Off-Trip Services	68
2.6.5.1	Pretrip Dynamic In-Vehicle Route Guidance and Navigation Programming/Setup	68
2.6.5.2	Pretrip Integrated Multimodal Trip Guidance	68
2.6.5.3	Pretrip Pedestrian or Bicycle Route Guidance	68
2.6.5.4	Trip Planning: Current Utilization Levels from Public Transport Information Systems	68
2.7	Services to Public Transport Users and Pedestrians	69
2.7.1	Dynamic Ridesharing	69
2.7.2	Emergency Call/Mayday Alert for Public Transport	69
2.7.3	Intrusion Detection	69
2.7.4	Paratransit Fleet Dispatch	69
2.7.5	Public Transport Fares Management	70
2.7.6	Public Transport Service Dispatch	70
2.7.7	Public Transport Scheduling Services	70
2.7.8	Public Transport Service Planning	70
2.7.9	Public Transport Surveillance	71
2.7.10	Public Transport Vehicle Fleet Tracking	71

2.7.11	Public Transport Vehicle Internal Systems Monitoring	71
2.7.12	Safety Enhancements for Vulnerable Road Users	71
2.7.13	Silent Alarm	72
2.7.14	Travel Services Information—Dedicated Location	72
2.7.15	Travel Services Information—Personal Interactive	72
2.8	Technology in Evolution	72

PART II

Standards to Achieve ITS Services	73
-----------------------------------	----

CHAPTER 3

An Introduction to Communication Technologies Standards for ITS	75
3.1 On-Board ITS Standards	75
3.1.1 Introduction to In-Vehicle ITS Systems	75
3.2 Navigation Systems	76
3.2.1 SAT-NAV	76
3.2.1.1 GPS	78
3.2.1.2 GLONASS	81
3.2.1.3 GALILEO	82
3.2.2 SAT-NAV+	83
3.3 Radar Systems	84
3.4 Optical Systems	85
3.4.1 On-Board Systems	85
3.4.2 Enforcement Systems	85
3.4.3 Road Charging, Access Control, and Similar Systems	86
3.5 Ultrasound/Sonar Systems	86
3.6 Infrared Systems	86
3.7 Wireless Systems Within a Vehicle	86
3.8 Infrastructure/Infrastructure Standards for ITS	87
3.8.1 Introduction	87
3.8.2 Hard Wired Systems	88
3.8.3 Wireless Systems	90
3.8.4 Internet-Driven Systems	92
3.9 Sensors	92
3.10 Wi-Fi	93
3.11 Personal Area Networks	93
3.11.1 Bluetooth	94
3.11.2 ZigBee	94
3.11.3 Next Generation Networks	94
3.11.4 TISPA	96
3.11.4.1 IMS	96

CHAPTER 4

Wireless Communications Standards Used for ITS	99
4.1 Regulations	99
4.1.1 CEPT	99
4.1.1.1 ECC	102

4.1.1.2	ERO	101
4.1.1.3	Principal Regulatory Regimes That Affect ITS Service Provision in Europe	103
4.1.1.3.1	EN 300 422/EN 300 220 Aids for Hearing Impaired	103
4.1.1.3.2	EN 301 893 Wireless Access Systems Including RLAN	104
4.1.1.3.3	EN 302 288/EN 302 264 Automotive Radar	104
4.1.1.3.4	EN 300 330 Inductive SRDs	105
4.1.1.3.5	EN 300 220 Nonspecific SRDs	106
4.1.1.3.6	EN 303 035 TETRA	108
4.1.1.3.7	EN 301 357 Wireless Audio	108
4.1.1.3.8	EN 301 419 GSM	108
4.1.1.3.9	EN 301 444 / 301 426 / 301 427 Land Mobile Earth Satellite Stations	109
4.1.1.3.10	EN 301 441 / 301 442 Satellite-Personal	110
4.1.1.3.11	EN 301 406 DECT	110
4.1.1.3.12	EN 301 440 / EN 301 328 Nonspecific SRDs	110
4.1.1.3.13	EN 302 208 UHF RFID up to 2W ERP	111
4.1.1.3.14	EN 301 489 EMC Standard for Radio Equipment and Services	112
4.1.1.4	CEPT/ERC Recommendation 70-03	113
4.1.2	FCC	115
4.1.2.1	FCC Regulations Part 15 – RFID	117
4.1.3	Other Countries	120
4.2	Publicly Available Wireless Networks	121
4.2.1	3GPP	121
4.2.1.1	Overview	121
4.2.1.2	GSM	125
4.2.1.3	SIM	128
4.2.1.4	RUIM	128
4.2.1.5	IMS	128
4.2.1.6	GPRS	130
4.2.1.7	EDGE	130
4.2.1.8	WCDMA	130
4.2.1.9	UTRAN	130
4.2.1.10	UMTS	131
4.2.1.11	FOMA	131
4.2.1.12	USIM	131
4.2.1.13	ISIM	132
4.2.1.14	UICC	132
4.2.1.15	KASUMI	132
4.2.1.16	CAMEL	133
4.2.1.17	IMSI	133
4.2.1.18	TMSI	133
4.2.1.19	IMEI	134
4.2.1.20	MSISDN	134
4.2.1.21	GSM/3G Evolution	134
4.2.2	3GPP2	135
4.2.3	IEEE 802.11—WLAN, Wi-Fi, and Its Variants	135

4.2.4	Mobile Wireless Broadband	145
4.2.4.1	HC-SDMA Mobile Wireless Broadband	153
4.2.4.2	IEEE 802.16 WIMAX and Its Variants	154
4.2.4.3	IEEE 802.20 Mobile Broadband Wireless Access	160
4.2.5	Satellite	161
4.2.6	Personal Area Networks: Bluetooth	163
4.2.6.1	General Background	163
4.2.6.2	Bluetooth Core Specifications—Core Specification v2.0 + EDR	163
4.2.6.3	Bluetooth Core Specifications—Volume 4: HCI Transports	163
4.2.6.4	Bluetooth Core Specifications—Advanced Audio Distribution Profile	163
4.2.6.5	Bluetooth Core Specifications—Audio/Video Remote Control Profile	164
4.2.6.6	Bluetooth Core Specifications—Basic Imaging Profile (BIP)	164
4.2.6.7	Bluetooth Core Specifications—Basic Printing Profile 1.2 (BPP)	164
4.2.6.8	Bluetooth Core Specifications—Basic Printing Profile (BPP)	164
4.2.6.9	Bluetooth Core Specifications—Common ISDN Access Profile (CIP)	164
4.2.6.10	Bluetooth Core Specifications—Cordless Telephony Profile (CT)	165
4.2.6.11	Bluetooth Core Specifications—Device Identification Profile (DI)	165
4.2.6.12	Bluetooth Core Specifications—Dial-Up Networking Profile (DUN)	165
4.2.6.13	Bluetooth Core Specifications—Fax Profile (FAX)	165
4.2.6.14	Bluetooth Core Specifications—File Transfer Profile (FTP)	165
4.2.6.15	Bluetooth Core Specifications—Generic Audio/Video Distribution Profile	166
4.2.6.16	Bluetooth Core Specifications—Generic Object Exchange Profile (GOEP)	166
4.2.6.17	Bluetooth Core Specifications—Hands-Free Profile 1.5 (HFP 1.5)	166
4.2.6.18	Bluetooth Core Specifications—Hands-Free Profile (HFP)	166
4.2.6.19	Bluetooth Core Specifications—Hardcopy Cable Replacement Profile 1.2 (HCRP)	166
4.2.6.20	Bluetooth Core Specifications—Hardcopy Cable Replacement Profile	167
4.2.6.21	Bluetooth Core Specifications—Headset Profile (HSP)	167

4.2.6.22	Bluetooth Core Specifications—Human Interface Device Profile (HID)	167
4.2.6.23	Bluetooth Core Specifications—Intercom Profile (ICP)	167
4.2.6.24	Bluetooth Core Specifications—Object Push Profile (OPP)	168
4.2.6.25	Bluetooth Core Specifications—Personal Area Networking Profile (PAN)	168
4.2.6.26	Bluetooth Core Specifications—Serial Port Profile (SPP)	168
4.2.6.27	Bluetooth Core Specifications—Service Discovery Application Profile	168
4.2.6.28	Bluetooth Core Specifications—SIM Access Profile (SAP)	168
4.2.6.29	Bluetooth Core Specifications—Synchronization Profile (SYNCH)	168
4.2.6.30	Bluetooth Core Specifications—Video Distribution Profile (VDP)	169
4.2.6.31	Bluetooth Core Specifications—WAP Bearer (WAPB)	169
4.2.6.32	Bluetooth Core Specifications—Audio/Video Control Transport Protocol	169
4.2.6.33	Bluetooth Core Specifications—Audio/Video Distribution Transport	169
4.2.6.34	Bluetooth Core Specifications—Bluetooth Network Encapsulation Protocol	170
4.2.6.35	Bluetooth Core Specifications—Object Exchange (OBEX)	170
4.2.6.36	Bluetooth Core Specifications—Telephony Control Protocol (TCP)	170
4.2.6.37	Bluetooth Core Specifications—RFCOMM with TS 07.10	170
4.2.6.38	Bluetooth Core Specifications – HCI SD Transport	170
4.2.6.39	Bluetooth Core Specifications—HCI UART Transport	171
4.2.6.40	Bluetooth Core Specifications—HCI USB Transport	171
4.2.6.41	Bluetooth Core Specifications—Bluetooth Qualification and Testing	171
4.2.6.42	SAE Bluetooth Wireless Protocol for Automotive Applications	171
4.2.7	Personal Area Networks: ZigBee	172
4.3	CALM: Communications Access for Land Mobiles	173
4.3.1	The Evolving Online World	173
4.3.2	The Conundrum	175
4.3.3	The CALM Concept	175
4.3.4	CALM “Application” Service Types	176
4.3.5	CALM Benefits	176

4.3.6	The Role of CALM in the Provision of ITS Application Services	177
4.3.7	CALM Architecture	177
4.3.8	CALM and Standards	179
4.4	Dedicated and Public Wireless Networks	180
4.5	Standards Underpinning the Use of Public Wireless Networks for ITS	181
4.5.1	CALM: ITS Using Public Wireless Networks—General Requirements	181
4.5.2	Analog Cellular Systems	182
4.5.3	Second Generation Cellular Systems	182
4.5.3.1	ISO 21212 Intelligent Transport Systems: Communications Access for Land Mobiles (CALM)—2G Cellular Systems	182
4.5.4	ETSI DTS Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Intelligent Transport Systems (ITS): CALM 2G/2.5G Cellular	184
4.5.5	Third Generation Cellular Systems	184
4.5.5.1	ISO DIS 21213 Intelligent Transport Systems—Communications Access for Land Mobiles (CALM)—3G Cellular Systems	184
4.5.6	ETSI DTS Intelligent Transport Systems (ITS): CALM 3G Cellular	185
4.5.7	CALM Using Mobile Wireless Broadband Systems	186
4.5.7.1	ISO 25113 CALM Using HC-SDMA	186
4.5.7.2	ISO 25112 CALM Using IEEE 802.16e/IEEE 802.16g	187
4.5.7.3	ISO 29283 CALM Using IEEE 802.20	188
4.5.8	ISO 29282 CALM Using Satellite	189
4.5.9	ETSI WMB for ITS General Provisions	190
4.6	ITS Specific Wireless Communications Networks	190
4.6.1	Dedicated Short Range Communications (European)	190
4.6.1.1	ERM RTTT Part 1	191
4.6.1.2	EN 12253 RTTT DSRC PHY Using 5.8 GHz	192
4.6.1.3	EN 12795 RTTT DSRC Data Link Layer	193
4.6.1.4	EN 12834 RTTT DSRC Application Layer	194
4.6.1.5	EN 13372 RTTT DSRC Profiles for RTTT Applications	195
4.6.1.6	EN 300 674-1 ERM DSRC General Characteristics, Test Methods, and Essential Requirements for RSU and OBU	196
4.6.1.7	EN 102 486-1-1 ERM RTTT DSRC Data Link and MAC PICS	197
4.6.1.8	EN 102 486-1-2 ERM RTTT DSRC Data Link and MAC ATS & PIXIT	198
4.6.1.9	EN 102 486-1-3 ERM RTTT DSRC MAC & LLC ATS and Partial PIXIT	198

4.6.1.10	EN 102 486-2-1 ERM RTTT DSRC Application Layer PICS	199
4.6.1.11	EN 102 486-2-2 ERM RTTT DSRC Application Layer TSS & TP	199
4.6.1.12	EN 102 486-2-3 ERM RTTT DSRC Application Layer ATS & PIXIT Pro Forma	200
4.6.1.13	EN Interoperability Application Profile for DSRC	200
4.6.2	Standards for CALM	203
4.6.2.1	ISO 21210 CALM Networking	204
4.6.2.2	ETSI TS (CALM)/Network Service Access Point Definition	206
4.6.2.3	ISO 21212 CALM Using 2G Cellular Networks	207
4.6.2.4	ISO 21213 CALM Using 3G Cellular Networks	207
4.6.2.5	ISO 21214 CALM Using Infrared	207
4.6.2.6	ETSI TS TG37-011	207
4.6.2.7	ISO 21215 CALM Using 5 GHz	208
4.6.2.8	ETSI TS TG37-007	208
4.6.2.9	ISO 21216 CALM Using Millimeter Wave	208
4.6.2.10	ETSI TS TG37-018	208
4.6.2.11	ETSI TS TG37-008	209
4.6.2.12	ISO 3***** CALM Using WLAN	209
4.6.2.13	ISO 21217 CALM Architecture	210
4.6.2.14	ETSI TS TG37-006	211
4.6.2.15	ISO 21218 CALM Networking – Lower Layer SAPs	211
4.6.2.16	ETSI TS TG37-017	212
4.6.2.17	ISO 24100 Basic Principles for Personal Data Protection in Probe Vehicle Information Services	212
4.6.2.18	ISO 24101 CALM Application Management for ITS Communications	213
4.6.2.19	ISO 24102 CALM Interface Management	214
4.6.2.20	ISO 24103 CALM MAIL (Media Adapted Interface Layer)	215
4.6.2.21	ISO 25111 CALM Using Public Wireless Networks	215
4.6.2.22	ISO 25112 CALM Using IEEE 802.16e/IEEE 802.16g (WIMAX)	216
4.6.2.23	ISO 25113 CALM Using HC-SDMA	216
4.6.2.24	ISO 29281 CALM-FAST	217
4.6.2.25	ISO 29282 CALM Using Satellite Communications	217
4.6.2.26	ISO 29283 CALM Using IEEE 802.20	218
4.6.3	ISO 21214 Infrared Systems	218
4.6.4	ISO 21215 5-GHz Systems	219
4.6.5	ITU Dedicated Short Range Communications (DRSC) at 5.8 GHz	221
4.6.6	ISO 21216 Millimeter Wave Systems	221
4.7	Regional and National Standards for ITS Communications	222
4.7.1	Long and Medium Range Systems—United States	222

4.7.1.1	IEEE 802.11 P WLAN -WAVE	222
4.7.1.2	IEEE 1609-1 DSRC Resource Manager	223
4.7.1.3	IEEE 1609-3 Standard for Dedicated Short Range Communications (DSRC) Application Layer	225
4.7.1.4	IEEE 1609-3 Standard for IP Interface for Dedicated Short Range Communications	226
4.7.1.5	IEEE 1609-4 Standard for Dedicated Short Range Communications (DSRC) Medium Access Control (MAC) Layer	227
4.7.1.6	SAE J2735_200612 Dedicated Short Range Communications (DSRC) Message Set Dictionary	228
4.7.2	Long and Medium Range Systems—Japan	229
4.7.2.1	ARIB T55/T75 Long and Medium Range Systems (Japanese DSRC)	229
4.7.2.2	ISO 15628 Application Interface Standards to Enable Non-CALM Media to Interface with CALM	232
4.7.2.3	ARIB T88 Japanese DSRC Application Sublayer	233

CHAPTER 5

Technical Support Standards for ITS	237
5.1 General Architecture Development Standards and Specifications for ITS	237
5.1.1 ISO 14813-1 ITS Service Domains, Service Groups, and Services	237
5.1.2 ISO 14813-2 TICS System Architecture—Core TICS Reference Architecture	241
5.1.3 ISO 14813-3 TICS System Architecture—Example Elaboration	244
5.1.4 ISO 14813-4 TICS System Architecture—Reference Model Tutorial	245
5.1.5 ISO 14813-5 TICS System Architecture—Requirements for Architecture Description in TICS Standards	245
5.1.6 ITS Data Dictionaries	247
5.1.7 ISO 14817 ITS Data Registries	247
5.1.8 ISO TR 25102 TICS System Architecture—ITS Use Case Pro Forma Template	249
5.1.9 ISO 24098 Procedures for Developing ITS Deployment Plans Utilizing ITS System Architecture	250
5.1.10 ISO 25100 Intelligent Transport Systems—System Architecture—User Guide for Harmonization of Data Concepts	250
5.1.11 ISO 25106 Procedures and Formats for ITS Glossaries	251
5.1.12 ISO 20452 Requirements and a Logical Data Model for PSF and API Used in ITS Database Technologies and Logical Data Organization for a PSF	252

5.1.13	ISO 15662 Wide Area Communications—Protocol Management Information	253
5.1.14	ISO 21707 Data Quality	255
5.2	Technology Specific Standards and Guides	256
5.2.1	ISO 14813-6 TICS System Architecture—Use of ASN.1 in ITS Standards, Systems, and Services	255
5.2.2	Web Services in ITS Standards, Systems, and Services	257
5.2.2.1	ISO 24097 Using Web Services (Machine-Machine Delivery) for ITS Service Delivery	258
5.2.2.2	NIST Guide to Secure Web Services Special Publication 800-95	262
5.2.2.3	SAE Converting ATIS Message Standards from ASN.1 to XML	264
5.2.2.4	24824-3 Information Technology—Generic Applications of ASN.1: Fast Infoset Security	265
5.2.3	ISO 17452 Using UML (Unified Language) for Defining and Documenting ITS Interfaces	266
5.2.4	ISO TR 24529 Using UML in ITS Standards	266
5.2.5	ISO 24531 Using XML in ITS Standards, Data Registries, and Data Dictionaries	267
5.2.6	ISO 24532 Common Object Request Broker Architecture (CORBA)	268
5.2.7	ISO TR 26999 Rules and Guidance for the Use of Process (Functional) Orientated Methodology in ITS Standards, Data Registries, and Data Dictionaries	269
5.2.8	IEEE 1455 IEEE Standard for Message Sets for Vehicle/Roadside Communications	270
5.2.9	IEEE P1556 Standard for Security and Privacy of Vehicle/Roadside Communication Including Smart Card Communications	271
5.2.10	EN 12896 Transmodel	271
5.2.11	National Transportation Communications for ITS Protocol (NTCIP)	272
5.3	Transport Systems Security	274
5.3.1	ISO 15408 Evaluation Criteria for IT Security	275
5.3.2	ISO 15446 Guide for Production of Protection Profiles and Security Targets	276
5.3.3	IEEE P1556 Standard for Security and Privacy of Vehicle/Roadside Communication Including Smart Card Communications	277
5.3.4	ISO 9160 Data Encipherment—Physical Layer Interoperability Requirements	277
5.3.5	ISO 9591 Information Technology—Open Systems Interconnection, Part 2: The Directory Models; Part 10—The Directory: Use of Systems Management for Administration of the Directory	277
5.3.6	ISO 10736 Telecommunications and Information Exchange Between Systems—Transport Layer Security Protocol	277

5.3.7	ISO 11577 Open Systems Interconnection—Network Layer Security Protocol	277
5.3.8	ISO 13594 Information Technology—Lower Layers Security	277
5.3.9	ISO 26927 Corporate Telecommunication Networks—Mobility for Enterprise Communications	277
5.3.10	ISO 19773-12 Information Technology—Metadata Modules (MM) Data Structure for Entity-Person-Group (EPG) Security Credentials Data	278
5.3.11	Specification and Standardization of the Internet Protocol Version 6 (IPv6)—Encapsulating Security Payload Header	278
5.3.12	UDDI	278
5.3.13	7816-8 Personal Identification (Including IC Cards/Smart Cards)—Identification Cards—Integrated Circuit Cards—Part 8: Security Related Interindustry Commands	278
5.3.14	ISO 24534-2 Road Transport and Traffic Telematics—Automatic Vehicle and Equipment Identification—Electronic Registration Identification (ERI) for Vehicles—Part 2: Operational Requirements	278
5.3.15	ISO 24534-4 Road Transport and Traffic Telematics—Automatic Vehicle and Equipment Identification—Electronic Registration Identification (ERI) for Vehicles—Part 4: Secure Communications Using Asymmetric Techniques	278
5.3.16	ISO 24534-5 Road Transport and Traffic Telematics—Automatic Vehicle and Equipment Identification—Electronic Registration Identification (ERI) for Vehicles—Part 5: Secure Communications Using Symmetric Techniques	278
5.3.17	ISO FDIS 24535 Intelligent Transport Systems—Automatic Vehicle Identification—Basic Electronic Registration (Basic ERI)	278
5.3.18	ISO 24533 Intelligent Transport Systems—Data Dictionary and Message Set for Tracking of Freight and its Intermodal Transfer	278
5.3.19	ISO 18000-1 Radio Frequency Identification for Item Management—Part 1: Reference Architecture and Definition of Parameters to Be Standardized	279
5.3.20	ISO 18000-2 Radio Frequency Identification for Item Management—Part 2: Parameters for Air Interface Communications Below 135 kHz	279
5.3.21	ISO 18000-6 Radio Frequency Identification for Item Management—Part 6: Parameters for Air Interface Communications at 860 MHz to 960 MHz	279
5.3.22	ISO 18000-7 Radio Frequency Identification for Item Management—Part 7: Parameters for Active Air Interface Communications at 433 MHz	279
5.3.23	ISO 15961 Radio Frequency Identification (RFID) for Item Management—Data Protocol: Application Interface	279
5.3.24	J15674 Road Vehicles—Extended Data Link Security	279

5.3.25	J1760_200112 Data Security Services	279
5.3.26	J2186_200506 E/E Data Link Security	279
5.3.27	Transport Related Emergency Notification and Personal Security	279
5.3.28	ISO 17574 Electronic Fee Collection (EFC)—Guidelines for EFC Security Protection Profiles	279
5.3.29	Public Travel Security	280
5.3.30	National Security Service Groups	280
5.3.31	ARIB RCR STD-30 Security Radio Equipment for Low Power Radio Station	280
5.3.32	ISO 24100 Basic Principles for Personal Data Protection in Probe Vehicle Information Services	280
5.3.33	24824-3 Information Technology—Generic Applications of ASN.1: Fast Infosec Security	280
5.4	Transport Systems Safety	280
5.4.1	EN 302 288/EN 302 264 Automotive Radar	281
5.4.2	TR 24714-1 Cross-Jurisdictional and Societal Aspects of Implementation of Biometric Technologies—Part 1: Guide to the Accessibility, Privacy, and Health and Safety Issues in the Deployment of Biometric Systems for Commercial Application	281
5.4.3	J2189_200112 Guidelines for Evaluating Child Restraint System Interactions with Deploying Airbags	281
5.4.4	ISO/CD TS 22240 Road Vehicles—Vehicles Safety Information Model (VSIM)	281
5.4.5	ISO 24978 Emergency and Safety Message Data Registry	281
5.4.6	CEN TS/15722 (Was 24977) e-Call Minimum Set of Data	281
5.4.7	CEN WI 00278220 eCall Operating Requirements	281
5.4.8	SAE J2313_199909 On-Board Land Vehicle Mayday Reporting Interface	282
5.5	Geographic and Location Based Services for ITS	282
5.5.1	ISO 14825 Intelligent Transport Systems—Geographic Data Files (GDF)—Overall Data Specification	282
5.5.2	ISO 17572 Intelligent Transport Systems (ITS)—Location Referencing for Geographic Databases	283
5.5.3	ISO 22953 Intelligent Transport Systems (ITS) eXtended Geographic Data Files (XGDF)	284
5.5.4	SAE J1698 Location Referencing Message Specification (LRMS)	285
5.5.5	SAE J2374 Location Referencing Message Specification	286
5.6	Human-Machine Interface Standards	287
5.6.1	J1757 Standard Metrology for Vehicle Displays	287

CHAPTER 6

General Standards for Information Technology That May Be Used to Support ITS Service Provision	289
6.1 Geographic and Location Based Standards	289

6.1.1	eXtended Geographic Data File (XGDF)	289
6.1.2	ISO 6709:2006 Standard Representation of Latitude, Longitude, and Altitude for Geographic Point Locations	290
6.1.3	ISO 19100 Series of Standard—Geographic Information	290
6.1.4	ISO 19101 Geographical Information—Reference Model	291
6.1.5	ISO 19103:2004 Geographic Information—Conceptual Schema Language	292
6.1.6	ISO 19104 Geographical Information—Terminology Introduction	292
6.1.7	ISO 19105 Geographical Information—Conformance and Testing	293
6.1.8	ISO 19106:2003 Geographic Information—Profiles	294
6.1.9	ISO 19107 Geographic Information—Spatial Schema	295
6.1.10	ISO 19108:2004 Geographic Information—Temporal Schema	295
6.1.11	ISO 19109:2004 Geographic Information—Rules for Application Schema	295
6.1.12	ISO 19110:2004 Geographic Information—Methodology for Feature Cataloguing	296
6.1.13	ISO 19111 Geographic Information—Spatial Referencing by Coordinates	297
6.1.14	ISO 19112 Geographic Information—Spatial Referencing by Geographic Identifiers	298
6.1.15	ISO 19113 Geographic Information—Quality Principles	298
6.1.16	ISO 19114 Geographic Information—Quality Evaluation Procedures	299
6.1.17	ISO 19115 Geographic Information—Metadata	299
6.1.18	ISO 19115 Geographic Information—Metadata Extensions for Imagery and Gridded Data	300
6.1.19	ISO 19116:2004 Geographic Information—Positioning Services	301
6.1.20	ISO 19117:2004 Geographic Information—Portrayal	301
6.1.21	ISO 19118:2004 Geographic Information—Encoding	302
6.1.22	ISO 19119:2004 Geographic Information—Services	303
6.1.23	ISO/TR 19120 Geographic Information—Functional Standards	303
6.1.24	ISO/TR 19121 Geographic Information—Imagery and Gridded Data	303
6.1.25	ISO/TR 19122 Geographic Information—Qualifications and Certification of Personnel	304
6.1.26	ISO 19123 Geographic Information—Schema for Coverage Geometry and Functions	304
6.1.27	ISO 19124 Geographic Information—Imagery and Gridded Data Components	305
6.1.28	ISO 19125-1 Geographic Information—Simple Feature Access—Part 1: Common Architecture	306
6.1.29	ISO 19125-2 Geographic Information—Simple Feature Access—Part 2: SQL Option	306

6.1.30	ISO 19126 Geographic Information—Profile—FACC Data Dictionary	307
6.1.31	ISO 19127 Geographic Information—Geodetic Codes and Parameters	307
6.1.32	ISO 19128 Geographic Information—Web Map Server Interface	308
6.1.33	ISO 19129 Geographic Information—Imagery, Gridded, and Coverage Data Framework	308
6.1.34	ISO 19130 Geographic Information—Sensor and Data Models for Imagery and Gridded Data	309
6.1.35	ISO 19131 Geographic Information—Data Product Specifications	309
6.1.36	ISO 19132 Geographic Information—Location Based Services Possible Standards	309
6.1.37	ISO 19133 Geographic Information—Location Based Services Tracking and Navigation	310
6.1.38	ISO 19134 Geographic Information—Multimodal Location Based Services for Routing and Navigation	310
6.1.39	ISO 19135 Geographic Information—Procedures for Registration of Geographical Information Items	311
6.1.40	ISO 19136 Geographic Information—Geography Markup Language (GML)	311
6.1.41	ISO 19137 Geographic Information—Generally Used Profiles of the Spatial Schema and of Similar Important Other Schemas	313
6.1.42	ISO 19138 Geographic Information—Data Quality Measures	313
6.1.43	ISO 19139 Geographic Information—Metadata—Implementation Specification	314
6.1.44	ISO 19140 Geographic Information—Technical Amendment to the ISO 191** Geographic Information Series of Standards for Harmonization and Enhancements	314
6.1.45	ISO 19141 Geographic Information—Schema for Moving Features	314
6.1.46	ISO 19142 Geographic Information—Web Feature Service	315
6.1.47	ISO 19143 Geographic Information—Filter Encoding	315
6.1.48	ISO 19144-1 Geographic Information—Classification Systems—Part 1: Classification System Structure	315
6.1.49	ISO 19144-2 Geographic Information—Classification Systems—Part 2: Land Cover Classification System LCCS	315
6.1.50	ISO 19145 Geographic Information—Registry of Representations of Geographic Point Locations	315
6.1.51	ISO 19146 Geographic Information—Cross-Domain Vocabularies	316
6.1.52	ISO 19147 Geographic Information—Location Based Services—Linear Referencing System	316
6.1.53	ISO 19148 Geographic Information—Location Based Services—Linear Referencing System	316

6.1.54	ISO 19149 Geographic Information—Rights Expression Language for Geographic Information—GeoREL	316
6.1.55	ISO 19150 Geographic Information—Ontology	317
6.1.56	ISO 19151 Geographic Information—Dynamic Position Identification Scheme for Ubiquitous Space (u-position)	317
6.2	Data Specification, Management, and Transmission	317
6.2.1	General Data Specification, Management, and Transmission Standards	317
6.2.2	ISO/IEC JTC1 SC6 Information Technology—Telecommunications and Information Exchange Between Systems	317
6.2.2.1	ISO 1155 Use of Longitudinal Parity to Detect Errors in Information Messages	319
6.2.2.2	ISO 1177 Character Structure for Start/Stop and Synchronous Character Oriented Transmission	320
6.2.2.3	ISO 1745 Basic Mode Control Procedures for Data Communication Systems	320
6.2.2.4	ISO 2628 Basic Mode Control Procedures—Complements	320
6.2.2.5	ISO 2629 Basic Mode Control Procedures—Conversational Information Message Transfer	320
6.2.2.6	ISO 7478 Data Communication—Multilink	321
6.2.2.7	ISO 7480 Telecommunications and Information Exchange Between Systems—Start-Stop Transmission Signal Quality at DTE/DCE Interfaces	321
6.2.2.8	ISO 7498 Information Technology—Open Systems Interconnection	322
6.2.2.9	ISO 7776 Telecommunications and Information Exchange Between Systems—High-Level Data Link Control Procedures—Description of the X.25 LAPB-Compatible DTE Data Link Procedures	322
6.2.2.10	ISO 8072 Open Systems Interconnection (OSI)—Transport Service Definition	323
6.2.2.11	ISO 8073 Open Systems Interconnection (OSI)—Protocol for Providing the Connection-Mode Transport Service	323
6.2.2.12	ISO 8348 Open Systems Interconnection—Network Service Definition	324
6.2.2.13	ISO 8473 Protocol for Providing the Connectionless-Mode Network Service	324
6.2.2.14	ISO 8602 Protocol for Providing the OSI Connectionless-Mode Transport Service	325
6.2.2.15	ISO 8480 DTE/DCE Interface Back-Up Control Operation Using ITU-T Recommendation V.24 Interchange Circuits	326

6.2.2.16	ISO 8481 Telecommunications and Information Exchange Between Systems—DTE to DTE Direct Connections	326
6.2.2.17	ISO 8602 Protocol for Providing the OSI Connectionless-Mode Transport Service	327
6.2.2.18	ISO 8648 Open Systems Interconnection—Internal Organization of the Network Layer	328
6.2.2.19	ISO 8802 Telecommunications and Information Exchange Between Systems—Local and Metropolitan Area Networks	328
6.2.2.20	ISO 8824/5 Abstract Syntax Notation.1	331
6.2.2.20.1	Information Technology—Abstract Syntax Notation.1 (ASN.1)	331
6.2.2.20.2	Information Technology—ASN.1 Encoding Rules	333
6.2.2.20.3	Generic Applications of ASN.1: Fast Infoset	336
6.2.2.21	ISO 8878 Telecommunications and Information Exchange Between Systems—Use of X.25 to Provide the OSI Connection-Mode Network Service	337
6.2.2.22	ISO 8881 Data Communications—Use of the X.25 Packet Level Protocol in Local Area Networks	338
6.2.2.23	ISO 8886 Open Systems Interconnection—Data Link Service Definition	338
6.2.2.24	ISO 9160 Data Encipherment—Physical Layer Interoperability Requirements	339
6.2.2.25	ISO 9542 End System to Intermediate System Routing Exchange Protocol for Use in Conjunction with the Protocol for Providing the Connectionless-Mode Network Service (ISO 8473)	339
6.2.2.26	ISO 9543 Information Exchange Between Systems—Synchronous Transmission Signal Quality at DTE/DCE Interfaces	340
6.2.2.27	ISO 9574 Provision of the OSI Connection-Mode Network Service by Packet Mode Terminal Equipment to an Integrated Services Digital Network (ISDN)	340
6.2.2.28	ISO 9575 Telecommunications and Information Exchange Between Systems—OSI Routing Framework	341
6.2.2.29	ISO 9577 Protocol Identification in the Network Layer	341
6.2.2.30	ISO 9591 Information Technology—Open Systems Interconnection	341
6.2.2.31	ISO 9834 Open Systems Interconnection—Procedures for the Operation of OSI Registration Authorities	345
6.2.2.32	ISO 10000 Information Technology—Framework and Taxonomy of International Standardized Profiles	349

6.2.2.33	ISO 10021 Information Technology—Message Handling Systems (MHS)	350
6.2.2.34	ISO 10022 Open Systems Interconnection—Physical Service Definition	354
6.2.2.35	ISO 10028 Telecommunications and Information Exchange Between Systems—Definition of the Relaying Functions of a Network Layer Intermediate System	354
6.2.2.36	ISO 10030 End System Routing Information Exchange Protocol for Use in Conjunction with ISO/IEC 8878	355
6.2.2.37	ISO 10177 Provision of the Connection-Mode Network Internal Layer Service by Intermediate Systems Using ISO/IEC 8208, the X.25 Packet Layer Protocol	355
6.2.2.38	ISO 10589 Intermediate System to Intermediate System Intra-Domain Routing Information Exchange Protocol for Use in Conjunction with the Protocol for Providing the Connectionless-Mode Network Service (ISO 8473)	356
6.2.2.39	ISO 10611 International Standardized Profiles AMH1n—Message Handling Systems—Common Messaging	356
6.2.2.40	ISO 10733 Elements of Management Information Related to the OSI Network Layer	359
6.2.2.41	ISO 10736 Telecommunications and Information Exchange Between Systems—Transport Layer Security Protocol	360
6.2.2.42	ISO 10742 Elements of Management Information Related to OSI Data Link Layer Standards	360
6.2.2.43	ISO 10747 Protocol for Exchange of Inter-Domain Routing Information Among Intermediate Systems to Support Forwarding of ISO 8473 PDUs	361
6.2.2.44	ISO/IEC 11179 Metadata Registries	361
6.2.2.45	ISO 11570 Open Systems Interconnection—Transport Protocol Identification Mechanism	364
6.2.2.46	Telecommunications and Information Exchange Between Systems—Private Integrated Services Networks (PISN)	364
6.2.2.47	ISO 11575 Protocol Mappings for the OSI Data Link Service	379
6.2.2.48	ISO 11577 Open Systems Interconnection—Network Layer Security Protocol	380
6.2.2.49	ISO TRs 11802 Telecommunications and Information Exchange Between Systems—Local and Metropolitan Area Networks—Technical Reports and Guidelines	380

6.2.2.50	ISO 13236 Information Technology—Quality of Service: Framework	382
6.2.2.51	ISO 13239 Telecommunications and Information Exchange Between Systems—High-Level Data Link Control (HDLC) Procedures	382
6.2.2.52	Telecommunications and Information Exchange Between Systems—Broadband Private Integrated Services Network	382
6.2.2.53	ISO 13594 Information Technology—Lower Layers Security	383
6.2.2.54	ISO 13642 Elements of Management Information Related to the OSI Physical Layer	384
6.2.2.55	ISO 14476 Enhanced Communications Transport Protocol: Specification of Simplex Multicast Transport	384
6.2.2.56	ISO 14699 Open Systems Interconnection—Transport Fast Byte Protocol	385
6.2.2.57	ISO 14700 Open Systems Interconnection—Network Fast Byte Protocol	385
6.2.2.58	ISO 14765 Framework for Protocol Identification and Encapsulation	385
6.2.2.59	ISO 14766 Use of OSI Applications over the Internet Transmission Control Protocol (TCP)	386
6.2.2.60	ISO 15802 Local and Metropolitan Area Networks—Common Specifications	386
6.2.2.61	ISO 16512 Relayed Multicast Control Protocol (RMCP)	387
6.2.2.62	ISO 16513 Information Technology—Group Management Protocol	388
6.2.2.63	ISO 18016 Message Handling Systems (MHS): Interworking with Internet E-Mail	388
6.2.2.64	ISO 18051 Telecommunications and Information Exchange Between Systems—Services for Computer Supported Telecommunications Applications (CSTA) Phase III	389
6.2.2.65	ISO 18052 Telecommunications and Information Exchange Between Systems—Protocol for Computer Supported Telecommunications Applications (CSTA) Phase III	389
6.2.2.66	ISO 18053 Telecommunications and Information Exchange Between Systems—Glossary of Definitions and Terminology for Computer Supported Telecommunications Applications (CSTA) Phase III	389
6.2.2.67	ISO 18056 Telecommunications and Information Exchange Between Systems—XML Protocol for Computer Supported Telecommunications Applications (CSTA) Phase III	390

6.2.2.68	Telecommunications and Information Exchange Between Systems—Near Field Communication (NFC)	390
6.2.2.69	Telecommunications and Information Exchange Between Systems—Application Session Services	392
6.2.2.70	ISO 24771 MAC/PHY Standard for Ad Hoc Wireless Network to Guarantee QoS in an Industrial Work Environment	392
6.2.2.71	ISO 24824 Generic Applications of ASN.1: Fast Infoset	392
6.2.2.72	ISO 25437 WS-Session—Web Services for Application Session Services	394
6.2.2.73	ISO 26905 Enterprise Communication in Next Generation Corporate Networks (NGCN) Involving Public Next Generation Networks (NGN)	395
6.2.2.74	ISO 26907 High Rate Ultra Wideband PHY and MAC Standard	396
6.2.2.75	ISO 26908 MAC-PHY Interface for High Rate Ultra Wideband (ISO/IEC 26907)	396
6.2.2.76	ISO 26927 Corporate Telecommunication Networks—Mobility for Enterprise Communications	396
6.2.2.77	Further SC6 Standards	397
6.2.3	ISO 802-11 Information Technology—Telecommunications and Information Exchange Between Systems—Local and Metropolitan Area Networks—Specific Requirements—Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications	397
6.2.4	ISO/IEC JTC 1/SC7 Information Technology—Software Engineering	398
6.2.4.1	ISO 10476 Information Technology—Open Distributed Processing	398
6.2.5	ISO/IEC JTC 1/SC22 Information Technology—Programming Languages, Their Environments, and Systems Software Interfaces	399
6.2.5.1	ISO 10967 Language Independent Arithmetic	399
6.2.5.2	ISO 10176 Guidelines for the Preparation of Programming Language Standards	401
6.2.5.3	ISO 10182 Programming Languages, Their Environments, and System Software Interfaces—Guidelines for Language Bindings	401
6.2.5.4	ISO 11017 Framework for Internationalization	401
6.2.5.5	ISO 11404 Programming Languages, Their Environments and System Software Interfaces—Language-Independent Datatypes	402

6.2.5.6	ISO 13886 Language-Independent Procedure Calling (LIPC)	402
6.2.5.7	Further SC22 Standards	402
6.2.6	Audio, Video, and Graphics Standards	402
6.2.6.1	ISO 8602 Computer Graphics—Protocol for Providing the OSI Connectionless-Mode Transport Service	403
6.2.6.2	ISO 8632 Computer Graphics—Metafile for the Storage and Transfer of Picture Description Information	403
6.2.7	ISO/IEC JTC 1/SC 25 Information Technology—Interconnection of Information Technology Equipment	404
6.2.8	ISO/IEC JTC 1/SC 29 Information Technology—Coding of Audio, Picture, Multimedia, and Hypermedia Information	405
6.2.8.1	Coding of Moving Pictures and Associated Audio for Digital Storage Media at Up to About 1.5 Mbit/s	406
6.2.8.2	ISO 13818 Generic Coding of Moving Pictures and Associated Audio Information	406
6.2.8.3	ISO 14496 Coding of Audio-Visual Objects	407
6.2.8.4	ISO 15444 JPEG 2000 Image Coding System	415
6.2.8.5	ISO 15938 Multimedia Content Description	416
6.2.8.6	ISO 21000 Multimedia Framework (MPEG-21)	418
6.2.8.7	ISO 23000 Multimedia Application Format (MPEG-A)	419
6.2.8.8	ISO 23001 MPEG Systems Technologies	419
6.2.8.9	ISO 23002 MPEG Video Technologies	420
6.2.8.10	ISO 23003 MPEG Audio Technologies	420
6.2.8.11	ISO 23004 MPEG Multimedia Middleware	421
6.2.9	ISO/IEC JTC 1/SC 32 Information Technology Data Management and Interchange	421
6.2.9.1	Metadata Registries (MDR)	422
6.2.9.2	ISO 2382 Information Technology—Vocabulary Part 4: Organization of Data	422
6.2.9.3	ISO 2382 Information Technology—Vocabulary Part 5: Representation of Data	423
6.2.9.4	Information Technology—Vocabulary Part 6: Preparation and Handling of Data	424
6.2.9.5	ISO 10032 Information Technology—Reference Model of Data Management	424
6.2.9.6	ISO 14957 Notation of Format for Data Elements	424
6.2.9.7	ISO 14662 Information Technology—Open-EDI Reference Model	425
6.2.9.8	ISO 15944 Information Technology—Business Agreement Semantic Descriptive Techniques—Part 1: Operational Aspects of Open-EDI for Implementation	426

6.2.9.9	ISO 19502 Meta Object Facility (MOF) 1.4 Specification (OMG PAS)	426
6.2.9.10	ISO 19503 XML Metadata Interchange (XMI) 2.0 Specification (OMG PAS)	426
6.2.9.11	ISO 19763 Framework for Metamodel Interoperability	426
6.2.9.12	ISO 19773 Information Technology—Metadata Modules (MM)	427
6.2.9.13	ISO 20943 Achieving Metadata Registry Content Consistency	429
6.2.9.14	ISO 20944 Metadata Registry Interoperability and Bindings (MDRIB)	430
6.2.9.15	ISO 24706 Metadata for Technical Standards	430
6.2.9.16	ISO 24707 Metadata for Technical Standards—Common Logic	431
6.2.10	JTC 1/SC34 JTC 1/SC34 Markup Languages	432
6.2.10.1	ISO 8879 Standard Generalized Markup Language (SGML)	433
6.2.11	ISO/IEC JTC 1/SC 35 Generic IT User Interfaces	433
6.2.11.1	ISO 11580 Model for Describing User Interface Objects, Actions, and Attributes	434
6.2.11.2	ISO 19765 Survey of Existing Icons and Symbols for Elderly and Disabled Persons	434
6.2.11.3	ISO 19766 Guidelines for the Design of Icons and Symbols Accessible to All Users, Including the Elderly and Persons with Disabilities	435
6.2.11.4	ISO 24738 Icon Symbols and Functions for Multimedia Link Attributes	435
6.2.11.5	ISO 24752 User interfaces—Universal Remote Console	436
6.2.11.6	Screen Icons and Symbols for Personal Mobile Communication Device	437
6.2.11.7	Algorithmic Framework for Determining Accessibility for Individual Users of Interactive Systems	437
6.2.11.8	Taxonomy of Cultural and Linguistic Adaptability User Requirements	437
6.2.11.9	User Interfaces—Accessible User Interface for Accessibility Setting on Information Devices—Part 1: General and Methods to Start	438
6.2.12	Unified Modeling Language (UML)	438
6.2.12.1	ISO 19501 Information Technology—Open Distributed Processing—Unified Modeling Language (UML)	438
6.2.13	Terminology	438
6.2.13.1	ISO 860 Harmonization of Concepts and Terms	438
6.2.13.2	ISO 704 Principles and Methods of Terminology	439

6.2.13.3	Harmonization of Terminology	439
6.2.13.4	ISO 1087 Terminology—Vocabulary	440
6.2.13.5	Principles, Methods, and Vocabulary	440
6.2.13.6	Terminology in Sociolinguistic Application	441
6.2.14	Internet Protocol (IP)	441
6.2.14.1	Specification and Standardization of the Internet Protocol Version 4 (IPv4)	441
6.2.14.2	Specification and Standardization of the Internet Protocol Version 6 (IPv6)	442
6.2.14.3	Network Mobility (NEMO)	445
6.2.15	UTC—Coordinated Universal Time	446
6.2.16	WGS84—World Geodetic System	447
6.2.17	Simple Object Access Protocol (SOAP)	447
6.2.18	Web Services Description Languages (WSDL)	449
6.2.19	Universal Description, Discovery, and Integration (UDDI)	449
6.2.20	Extensible Markup Language (XML)	451

CHAPTER 7

Identification Technology Standards		453
7.1	Personal Identification (Including IC Cards/Smart Cards)	453
7.1.1	Background to Smart Cards	453
7.1.2	History of Smart Card/Personal Identification Standards	455
7.1.3	Radio Regulations Environment for Smart Cards	455
7.1.4	ISO 7812 Identification Cards—Identification of Issuers	456
7.1.5	ISO 7816 Identification Cards—Integrated Circuit Cards	456
7.1.6	ISO 10373 Identification Cards—Contact Cards	462
7.1.7	ISO 10536 Identification Cards—Contactless Integrated Circuit(s) Cards—Close-Coupled Cards	464
7.1.8	ISO 14443 Identification Cards—Contactless Integrated Circuit(s) Cards—Proximity [Contactless] Cards	465
7.1.9	ISO 15457 Identification Cards—Thin Flexible Cards	466
7.1.10	ISO 15693 Identification Cards—Contactless Integrated Circuit(s) Cards—Vicinity Cards	467
7.1.11	ISO 18013 Personal Identification—ISO-Compliant Driving License	469
7.1.12	ISO 24727 Identification Cards—Integrated Circuit Card Programming Interfaces	471
7.1.13	ISO 24749 Identification Cards—Secure and Interoperable IC Card Transaction Device	473
7.1.14	ISO 24787 On-Card Fingerprint Matching	473
7.2	Biometric Identification	473
7.2.1	Fingerprint Recognition	475
7.2.2	Eye Recognition	476
7.2.2.1	Retinal Pattern	476
7.2.2.2	Iris	477
7.2.3	Facial Recognition	477

7.2.4	Facial Thermogram	478
7.2.5	Hand Geometry	478
7.2.6	Hand Vein	479
7.2.7	Signature	479
7.2.8	Voice Recognition	480
7.2.9	DNA Techniques	480
7.2.10	Principal Biometrics Standards	480
7.2.10.1	ISO 24787 On-Card Fingerprint Matching	481
7.2.10.2	ISO 19784 Information Technology—Biometric Application Programming Interface	481
7.2.10.3	ISO 19785 Information Technology—Common Biometric Exchange Formats Framework	482
7.2.10.4	ISO 19794 Information Technology—Biometric Data Interchange Formats	483
7.2.10.5	ISO 24708 Information Technology—Biometrics—BioAPI Interworking Protocol	489
7.2.10.6	ISO 24709 Information Technology—Conformance Testing for the Biometric Application Programming Interface (BioAPI)	489
7.2.10.7	ISO 24714 Cross-Jurisdictional and Societal Aspects of Implementation of Biometric Technologies	491
7.2.10.8	ISO 24722 Information Technology—Multimodal Biometric Fusion	491
7.3	Vehicle Identification	492
7.3.1	Manual Identification Standards Embedded in AVI/ERI Identification Standards	493
7.3.1.1	ISO 3779 Road Vehicles—Vehicle Identification Number (VIN)—Content and Structure	493
7.3.1.2	ISO 3780 Road Vehicles—World Manufacturer Identifier (WMI) Code	494
7.3.1.3	ISO 4100 Road Vehicles—World Parts Manufacturer Identifier (WPMI) Code	495
7.3.1.4	ISO 8357 Road Vehicles—Instructions for the Implementation of WMI Codes for VIN Systems and for WPMI Codes	495
7.3.2	Automatic Vehicle Identification	496
7.3.2.1	ISO 14814 Road Transport and Traffic Telematics—Automatic Vehicle and Equipment Identification—Reference Architecture and Terminology	497
7.3.2.2	ISO 14815 Road Transport and Traffic Telematics—Automatic Vehicle and Equipment Identification—System Specifications	497
7.3.2.3	ISO 14816 Road Transport and Traffic Telematics—Automatic Vehicle and Equipment Identification—Numbering and Data Structure	498

7.3.2.4	ISO TS/DIS 17261 Road Transport and Traffic Telematics—Automatic Vehicle and Equipment Identification—Intermodal	499
7.3.2.5	ISO TS/DIS 17262 Road Transport and Traffic Telematics—Automatic Vehicle and Equipment Identification—Intermodal Goods Transport Numbering and Data Structures	500
7.3.2.6	ISO TS/DIS 17263 Road Transport and Traffic Telematics—Automatic Vehicle and Equipment Identification—Intermodal Goods Transport-System Parameters	502
7.3.2.7	ISO TS/DIS 17264 Road Transport and Traffic Telematics—Automatic Vehicle and Equipment Identification—[AVI/AEI] Interfaces	503
7.3.3	Electronic Registration Identification	504
7.3.3.1	ISO TS/DIS 24534-1 Road Transport and Traffic Telematics—Automatic Vehicle and Equipment Identification—Electronic Registration Identification (ERI) for Vehicles—Part 1: Architecture	505
7.3.3.2	ISO TS/DIS 24534-2 Road Transport and Traffic Telematics—Automatic Vehicle and Equipment Identification—Electronic Registration Identification (ERI) for Vehicles—Part 2: Operational Requirements	506
7.3.3.3	ISO TS/DIS 24534-3 Road Transport and Traffic Telematics—Automatic Vehicle and Equipment Identification—Electronic Registration Identification (ERI) for Vehicles—Part 3: Vehicle Data	506
7.3.3.4	ISO TS/DIS 24534-4 Road Transport and Traffic Telematics—Automatic Vehicle and Equipment Identification—Electronic Registration Identification (ERI) for Vehicles—Part 4: Secure Communications Using Asymmetric Techniques	508
7.3.3.5	ISO TS 24534-5 Road Transport and Traffic Telematics—Automatic Vehicle and Equipment Identification—Electronic Registration Identification (ERI) for Vehicles—Part 5: Secure Communications Using Symmetric Techniques	509
7.3.3.6	ISO FDIS 24535 Intelligent Transport Systems—Automatic Vehicle Identification—Basic Electronic Registration (Basic ERI)	509
7.3.4	Cargo Shipment/Goods Item Identification	510
7.3.4.1	ISO 24533 Intelligent Transport Systems—Data Dictionary and Message Set for Tracking of Freight and Its Intermodal Transfer	511

7.3.4.2	ISO 668 Freight Containers—Classification, Dimensions and Ratings	512
7.3.4.3	ISO 830 Freight Containers—Vocabulary	512
7.3.4.4	ISO 1496 Freight Containers—Specification and Testing	512
7.3.4.5	ISO 3874 Freight Containers—Handling and Securing	514
7.3.4.6	ISO 6346 Freight Containers—Coding, Identification, and Marking	514
7.3.4.7	ISO 9711 Freight Containers—Information Related to Containers on Board Vessels—Part 1: Bay Plan System	515
7.3.4.8	ISO 9897 Freight Containers—Container Equipment Data Exchange (CEDEX)—General Communication Codes	515
7.3.4.9	ISO 10368 Freight Thermal Containers—Remote Condition Monitoring	515
7.3.4.10	ISO 10374 Freight Containers—Automatic Identification	516
7.3.4.11	ISO 15069 Series 1 Freight Containers—Handling and Securing—Rationale for ISO 3874 Annex A	517
7.3.4.12	ISO 17712 Freight Containers—Mechanical Seals	517
7.3.4.13	Supply Chain Applications of RFID—Freight Containers	517
7.3.4.14	ISO 18185 Freight Containers—Electronic Seals—Part 3: Environmental Characteristics	518
7.3.4.15	ISO 23389 Freight Containers—Read Write Radio Frequency Identification	520
7.4	Radio Frequency Identification	521
7.4.1	ISO 17358 Supply Chain Application for RFID—Application Requirements	531
7.4.2	ISO 17363 Supply Chain Applications of RFID—Freight Containers	531
7.4.3	ISO 17364 Supply Chain Application for RFID—Transport Units	532
7.4.4	ISO 17365 Supply Chain Application for RFID—Returnable Transport Items	532
7.4.5	ISO 17366 Supply Chain Application for RFID—Product Packaging	532
7.4.6	ISO 17367 Supply Chain Application for RFID—Product Tagging	533
7.4.7	ISO 18000-1 Radio Frequency Identification for Item Management—Part 1: Reference Architecture and Definition of Parameters to Be Standardized	533
7.4.8	ISO 18000-2 Radio Frequency Identification for Item Management—Part 2: Parameters for Air Interface Communications Below 135 kHz	534

7.4.9	ISO 18000-3 Radio Frequency Identification for Item Management—Part 3: Parameters for Air Interface Communications at 13.56 MHz	535
7.4.10	ISO 18000-4 Radio Frequency Identification for Item Management—Part 4: Parameters for Air Interface Communications at 2.45 GHz	536
7.4.11	ISO 18000-6 Radio Frequency Identification for Item Management—Part 6: Parameters for Air Interface Communications at 860 MHz to 960 MHz	536
7.4.12	ISO 18000-7 Radio Frequency Identification for Item Management—Part 7: Parameters for Active Air Interface Communications at 433 MHz	537
7.4.13	ISO TR 18001 Information Technology—Radio Frequency Identification for Item Management—Application Requirements Profiles	538
7.4.14	ISO 15961 Radio Frequency Identification (RFID) for Item Management—Data Protocol: Application Interface	538
7.4.15	ISO 15962 Radio Frequency Identification (RFID) for Item Management—Data Protocol: Data Encoding Rules and Logical Memory Functions	542
7.4.16	ISO 15963 Radio Frequency Identification (RFID) for Item Management—Unique Identification for RF Tags	543
7.4.17	ISO 18046 RFID Tag and Interrogator Performance Test Methods	543
7.4.18	ISO 18047 Information Technology—Automatic Identification and Data Capture—RFID Device Conformance Test Methods	544
7.4.19	ARIB T92 Specified Low Power Radio Station 433 MHz-Band Data Transmission Equipment for International Logistics	548
7.5	Track and Trace	548
7.5.1	ISO 15459 Information Technology—Unique Identification of Transport Units	548
7.5.2	ISO 24710 Information Technology AIDC Techniques—RFID for Item Management—ISO/IEC 18000 Air Interface Communications—Elementary Tag License Plate Functionality for ISO/IEC 18000 Air Interface Definitions	552
7.5.3	ISO 24720 Automatic Identification and Data Capture Techniques—Guidelines for Direct Part Marking (DPM)	553
7.5.4	ISO 24729 Radio Frequency Identification for Item Management—Implementation Guidelines	554
7.5.5	ISO 24730 Real-Time Locating Systems (RTLS)	555
7.5.6	ISO 24753 Management—Application Protocol: Encoding and Processing Rules for Sensors and Batteries	558
7.5.7	ISO 24791 Radio-Frequency Identification (RFID) for Item Management—System Management Protocol	558

7.6	Other SC31 Automatic Identification Standards That May Be Useful for ITS Service Provision	559
7.6.1	ISO Information Technology—Security Techniques—Entity Authentication	559
7.6.2	ISO 19762 Automatic Identification and Data Capture (AIDC) Techniques—Harmonized Vocabulary	560

PART III

ITS Services to Stakeholders	563
------------------------------	-----

CHAPTER 8

ITS Service Groups and Domains	565
8.1 ITS Service Groups	567
8.2 Traveler Information Service Groups	568
8.2.1 General	568
8.2.1.1 ISO 17267 Navigation System API	568
8.2.1.2 ISO 20452 Requirements and Logical Data Model for a PSF and an API and Logical Data Organization for a PSF used in ITS Database Technology	569
8.2.1.3 SAE J1746 ISP-Vehicle Location Referencing Standard	569
8.2.1.4 SAE J2353 Data Dictionary for Advanced Traveler Information Systems (ATIS)	570
8.2.1.5 SAE J2354 Message Sets for Advanced Traveler Information System (ATIS)	570
8.2.1.6 SAE J2365 Calculation of the Time to Complete In-Vehicle Navigation and Route Guidance Tasks	570
8.2.1.7 SAE J2369 Standards for ATIS Message Sets Delivered over Reduced Bandwidth Media	571
8.2.1.8 SAE J2374 Location Referencing Message Specification	572
8.2.1.9 SAE J2540 Messages for Handling Strings and Look-Up Tables in ATIS Standards	572
8.2.1.10 SAE J2539 Comparison of GATS Messages to SAE ATIS Standards	573
8.2.1.11 SAE J2540 ITIS Phrase Lists (International Traveler Information Systems)	574
8.2.1.12 SAE J2630 Converting ATIS Message Standards from ASN.1 to XML	574
8.2.1.13 ITS0 Specification v2.1.2 Interoperable Contactless Smart Customer Media, Public Transport Ticketing	575
8.2.2 Pretrip Information	576
8.2.2.1 ISO 14822-1 Traffic and Travel Information—General Specifications For Medium-Range Preinformation Via Dedicated Short-Range Communication—Part 1: Downlink	576

8.2.2.2	CIS/EN/TS 14822-2 Traffic and Travel Information—Medium-Range Pre-Information Via DSRC—General Specification—Part 2: Uplink	577
8.2.2.3	Managing Demand Through Travel Information Services	577
8.2.3	On-Trip Information	578
8.2.3.1	Traffic and Travel Information (TTI)—TTI Messages Via Traffic Message Coding	578
8.2.3.2	ENV 12313 Traffic and Travel Information (TTI)—TTI Messages Via Traffic Message Coding	579
8.2.3.3	ENV 12315 Traffic and Travel Information (TTI)—TTI Messages Via Dedicated Short-Range Communication	580
8.2.3.4	ISO 14819 Traffic and Travel Information (TTI)—TTI Messages Via Traffic Message Coding	581
8.2.3.5	ISO 14821 Traffic and Travel Information (TTI)—TTI Messages Via Cellular Networks (GATS)	584
8.2.3.6	ISO 14822 Traffic and Travel Information (TTI)—Medium-Range Pre-Information Via DSRC	588
8.2.3.7	CEN/TS 14823 Messages Via Media-Independent Stationary Dissemination Systems—Graphic Data Dictionary for Pre-Trip and In-Trip Information Dissemination System	588
8.2.3.8	ISO 14825 Intelligent Transport Systems—Geographic Data Files (GDF)—Overall Data Specification	589
8.2.3.9	ISO 15075 Transport Information and Control Systems—In-Vehicle Navigation Systems—Communications Message Set Requirements	589
8.2.3.10	ISO TR 17384 Requirements for Interactive Centrally Determined Route Guidance	589
8.2.3.11	ISO PAS 17684 Transport Information and Control Systems—In-Vehicle Navigation Systems—ITS Message Set Translator to ASN.1 Format Definitions	590
8.2.3.12	ISO 18234 Traffic and Travel Information (TTI)—TTI Via Transport Protocol Expert Group (TPEG) Data-Streams	590
8.2.3.13	ISO 24530 Traffic and Travel Information (TTI)—TTI Via Transport Protocol Expert Group (TPEG) Extensible Markup Language (XML)	596
8.2.3.14	ISO ***** Traffic and Travel Information (TTI)—TTI Via Transport Protocol Expert Group (TPEG)—Navigation System Application Program Interface (API)	600
8.2.4	Route Guidance and Navigation Pretrip	600
8.2.4.1	ISO 14826 Physical Storage for Database Technology	600

8.2.4.2	ISO 17267 Navigation System API Standard (API)	600
8.2.4.3	ISO 24099 Data Structure for Map Data Provision and Update in ITS Applications	601
8.2.5	Route Guidance and Navigation On-Trip	601
8.2.5.1	SAE J2266 Navigation and Route Guidance Function Accessibility While Driving	601
8.2.5.2	J2678 Navigation and Route Guidance Function Accessibility While Driving Rationale	602
8.2.6	Trip Planning Support	602
8.2.6.1	U.S. Federal Transit Administration Trip Planning State of the Practice	602
8.2.7	Travel Services Information	603
8.2.7.1	ISO 14819 TTI Messages Via Traffic Message Coding—Conditional Access	603
8.2.7.2	ISO 14822 TTI Messages Via DSRC Beacons—Medium Range Pre-Information	603
8.2.7.3	ISO TTI Messages Via Stationary Dissemination Systems	604
8.2.8	Probe Data	604
8.2.8.1	ISO 24100 Basic Principles for Personal Data Protection in Probe Vehicle Information Services	606
8.2.8.2	ISO 25114 Probe Data Reporting Management	606
8.2.8.3	ISO 29284 Event Based Probe Vehicle Data	607
8.3	Traffic Management and Operations Service Groups	608
8.3.1	Traffic Management and Control	609
8.3.1.1	ISO 14827 TICS Data Interfaces Between Centres	609
8.3.1.2	EN 12352 Traffic Control Equipment—Warning and Safety Light Devices	610
8.3.1.3	EN 12368 Traffic Control Equipment—Signal Heads	610
8.3.1.4	EN 12899 Fixed, Vertical Road Traffic Signs	611
8.3.1.5	EN 12966 Road Vertical Signs—Variable Message Traffic Signs	613
8.3.1.6	ISO 14827 TICS Data Interfaces Between Centres	614
8.3.1.7	ISO 15784 Transport Information and Communication System—Data Exchange Involving Roadside Module Communication	614
8.3.1.8	ENV DATEX Traffic and Travel Data Dictionary	617
8.3.1.9	EN WI 00278074 Road Traffic Data—Elaboration, Storage, Distribution	617
8.3.1.10	ENV 13777 DATEX Specifications for Data Exchange Between Traffic and Travel Information Centers	617
8.3.1.11	ISO/EN Road Vehicles—Traffic Information and Control Systems—Ergonomic Aspects of In-Vehicle Visual Presentation of Information	618

8.3.1.12	CEN WI 00278213 Traffic Management Systems— Detection on Motorways for Traffic Information and Traffic Management Applications	618
8.3.1.13	CEN WI 00278213 Traffic Management Systems— Detection on Motorways for Traffic Information and Traffic Management Applications	619
8.3.1.14	SAE J2540 Messages for Handling Strings and Look-Up Tables in ATIS Standards	620
8.3.1.15	SAE J2540 RDS Phrase Lists	620
8.3.1.16	ITE Traffic Management Data Dictionary (TMDD) and Message Sets for External Traffic Management Center Communications (MS/ETMCC)	621
8.3.2	Transport-Related Incident Management	621
8.3.2.1	CEN 15722 [formerly 24977] eCall Minimum Set of Data	622
8.3.2.2	CEN WI 00278220 eCall Operating Requirements	622
8.3.2.3	ISO 24978 Emergency and Safety Message Data Registry	623
8.3.2.4	IEEE Std 1512 Common Incident Management Message Sets for Use by Emergency Management Centers	623
8.3.2.5	IEEE Std 1512-1 Common Traffic Incident Management Message Sets for Use by Emergency Management Centers	624
8.3.2.6	IEEE Std 1512-2 Public Safety Traffic Incident Management Message Sets for Use by Emergency Management Centers	625
8.3.2.7	IEEE Std 1512-3 Hazardous Material Incident Management Message Sets for Use by Emergency Management Centers	625
8.3.3	Demand Management	625
8.3.3.1	Access Control	626
8.3.3.2	Air Quality Access Control	626
8.3.3.3	Congestion Pricing	626
8.3.3.4	Parking Pricing	627
8.3.3.5	Public Transport Fares Management	627
8.3.4	Transport Infrastructure Maintenance Management	627
8.3.5	Policing/Enforcing Traffic Regulations	628
8.4	Vehicle Service Groups	628
8.4.1	Vehicle Data Systems	628
8.4.1.1	ISO 9141 Road Vehicles—Diagnostic Systems— Requirements for Interchange of Digital Information	629
8.4.1.2	ISO 11898 Road Vehicles—Controller Area Network (CAN)	629
8.4.1.3	ISO 11992 Road Vehicles—Interchange of Digital Information on Electrical Connections Between Towing and Towed Vehicles	631

8.4.1.4	ISO 15031 Road Vehicles—Communication Between Vehicle and External Equipment for Emissions-Related Diagnostics	633
8.4.1.5	ISO 15764 Road Vehicles—Extended Data Link Security	635
8.4.1.6	ISO 15765 Road Vehicles—Diagnostics on Controller Area Networks (CAN)	636
8.4.1.7	ISO 16845 Road Vehicles—Controller Area Network (CAN)—Conformance Test Plan	637
8.4.1.8	ISO/EN 15005 Road Vehicles—Ergonomic Aspects of In-Vehicle Presentation of Traffic Information and Control Systems—Dialogue Management Principles and Compliance Procedures	638
8.4.1.9	ISO 15006 Road Vehicles—Ergonomic Aspects of Transport Information and Control Systems—Specification and Compliance Procedures for In-Vehicle Auditory Presentations	638
8.4.1.10	ISO/EN 15007 Road Vehicles—Man Machine Interfaces—Visual Demand Measurement Method	639
8.4.1.11	ISO 15008 Road Vehicles—Traffic Information and Control Systems—Ergonomic Aspects of In-Vehicle Visual Presentation of Information	640
8.4.1.12	ISO/EN 16951 Road Vehicles—Ergonomic Aspects of Transport Information and Control Systems—Procedure for Determining Priority of On-Board Messages Presented to Drivers	640
8.4.1.13	ISO/EN 17287 Road Vehicles—Ergonomic Aspects of Transport Information and Control Systems—Procedure for Assessing Suitability for Use When Driving	641
8.4.1.14	SAE J2361 Bluetooth Wireless Protocol for Automotive Applications	641
8.4.1.15	SAE J2497 Power Line Carrier Communications for Commercial Vehicles	641
8.4.1.16	SAE J1939 Recommended Practice for a Serial Control and Communications Vehicle Network	642
8.4.1.17	SAE J1698 Vehicle Event Data Interface	642
8.4.1.18	SAE J2640 General Automotive Embedded Software Design Requirements	643
8.4.1.19	SAE J2748 VHDL-AMS Statistical Analysis Packages	643
8.4.1.20	SAE USCAR 30 Performance Specification for Automotive Universal Serial Bus (USB) Connection System	644
8.4.1.21	SAE J2735 Dedicated Short Range Communications (DSRC) Message Set Dictionary	644

8.4.2	Assistance to the Driver	644
8.4.2.1	ISO 22840 Extended Range Backing Aids Systems	645
8.4.2.2	ISO 17361 Lane Departure Warning	645
8.4.2.3	ISO 17387 Lane Change Decision Aids Systems	646
8.4.2.4	ISO 22178 Low Speed Following Systems	646
8.4.2.5	ISO 15662 Adaptive Cruise Control	647
8.4.2.6	ISO 15623 Forward Vehicle Collision Warning System	648
8.4.2.7	ISO 17386 Maneuvering Aid for Low Speed Operation	648
8.4.2.8	ISO 22179 Full Speed Range Adaptive Cruise Control Systems—Performance Requirements and Test Procedures	649
8.4.2.9	ISO 26684 Intersection Signal Information and Violation Warning Systems (ISIVWS)	650
8.4.2.10	ISO 11067 Curve Speed Warning Systems (CSWS)	651
8.4.2.11	ISO 11270 Lane Keeping Assist Schemes	651
8.4.2.12	SAE J2399 Adaptive Cruise Control (ACC) Operating Characteristics and User Interface	651
8.4.3	Cooperative Driving	652
8.4.3.1	ISO 22839 Rear-End Collision Mitigation Braking Systems	652
8.4.3.2	Automated Vehicle Operation	653
8.4.3.3	Collision Avoidance	653
8.4.3.4	Safety Readiness	654
8.4.3.5	Preocrash Restraint Deployment	654
8.4.4	In-Vehicle Advice and Control	657
8.4.4.1	ISO 2575 Road Vehicles—Symbols for Controls, Indicators and Tell-Tales	657
8.4.4.2	ISO 3833 Road Vehicles—Types—Terms and Definitions	658
8.4.4.3	ISO 4138 Passenger Cars—Steady-State Circular Driving Behavior—Open-Loop Test Procedure	658
8.4.4.4	ISO 4513 Road Vehicles—Visibility—Method for Establishment of Eyellipses for Driver's Eye Location	658
8.4.4.5	ISO 7401 Road Vehicles—Lateral Transient Response Test Methods—Open-Loop Test Methods	659
8.4.4.6	ISO 7639 Road Vehicles—Diagnostic Systems—Graphical Symbols	659
8.4.4.7	ISO 9141 Road Vehicles—Diagnostic Systems—Requirements for Interchange of Digital Information	660
8.4.4.8	ISO 10305 Road Vehicles—Calibration of Electromagnetic Field Strength Measuring Devices	661
8.4.4.9	ISO 11451 Road Vehicles—Vehicle Test Methods for Electrical Disturbances from Narrowband Radiated Electromagnetic Energy	662

8.4.4.10	ISO 11452 Road Vehicles—Component Test Methods for Electrical Disturbances from Narrowband Radiated Electromagnetic Energy	663
8.4.4.11	ISO 12155 Commercial Vehicles—Obstacle Detection Device During Reversing—Requirements and Tests	666
8.4.4.12	ISO 12364 Two-Wheeled Motorcycles—Antilock Braking Systems (ABS)—Tests and Measurement Methods	667
8.4.4.13	ISO 12366 Two-Wheeled Mopeds—Antilock Braking Systems (ABS)—Tests and Measurement Methods	667
8.4.4.14	ISO 14229 Road Vehicles—Diagnostic Systems—Diagnostic Services Specification	667
8.4.4.15	ISO 14230 Road Vehicles—Diagnostic Systems—Keyword Protocol 2000	668
8.4.4.16	ISO 20119 Road Vehicles—Test Method for the Quantification of On-Centre Handling—Determination of Dispersion Metrics for Straight-Line Driving	669
8.4.4.17	ISO 22239 Road Vehicles—Child Seat Presence and Orientation Detection System	669
8.4.4.18	ISO 22240 Road Vehicles—Vehicles Safety Information Model (VSIM)	670
8.4.4.19	ISO 27957 Road Vehicles—Temperature Measurement in Anthropomorphic Test Devices—Definition of the Temperature Sensor Locations	670
8.4.5	Vehicle Dynamics and Road Holding	670
8.4.5.1	ISO 12021 Road Vehicles—Sensitivity to Lateral Wind	670
8.4.5.2	ISO 8349 Road Vehicles—Measurement of Road Surface Friction	671
8.4.5.3	ISO Road Vehicles—Transient Open-Loop Response Test Method with One Period of Sinusoidal Input	671
8.4.5.4	ISO 8726 Road Vehicles—Transient Open-Loop Response Test Method with Pseudo-Random Steering Input	672
8.4.5.5	ISO 8855 Road Vehicles—Vehicle Dynamics and Road-Holding Ability—Vocabulary	672
8.4.5.6	ISO 9816 Passenger Cars—Power-Off Reactions of a Vehicle in a Turn—Open-Loop Test Method	672
8.4.5.7	ISO 12021 Road Vehicles—Sensitivity to Lateral Wind	673
8.4.5.8	ISO 13674 Road Vehicles—Test Method for the Quantification of On-Centre Handling	673

8.4.5.9	ISO 15037 Road Vehicles—Vehicle Dynamics Test Methods	674
8.4.5.10	ISO 16234 Heavy Commercial Vehicles and Buses—Straight-Ahead Braking on Surfaces with Split Coefficient of Friction—Open-Loop Test Method	675
8.4.5.11	ISO Heavy Commercial Vehicles and Buses—Steady-State Rollover Threshold—Tilt-Table Test Method	675
8.4.5.12	ISO 17288 Passenger Cars—Free-Steer Behaviour	676
8.4.5.13	ISO 20119 Road Vehicles—Test Method for the Quantification of On-Centre Handling—Determination of Dispersion Metrics for Straight-Line Driving	676
8.4.5.14	ISO 21994 Passenger Cars—Stopping Distance at Straight-Line Braking with ABS—Open-Loop Test Method	677
8.4.5.15	SAE J1113 Immunity to Radiated Electromagnetic Fields	677
8.4.5.16	SAE J1213 Glossaries Relating to Vehicles	678
8.4.5.17	SAE J1455 Joint SAE/TMC Recommended Environmental Practices For Electronic Equipment Design (Heavy-Duty Trucks)	679
8.4.5.18	SAE J1698 Joint SAE/TMC Electronic Data Interchange Between Microcomputer Systems in Heavy-Duty Vehicle Applications	679
8.4.5.19	SAE J1698 Vehicle Event Data Interface	680
8.4.5.20	SAE J1708 Serial Data Communications Between Microcomputer Systems in Heavy-Duty Vehicle Applications	681
8.4.5.21	SAE J1760 Data Security Services	682
8.4.5.22	SAE J1843 Accelerator Pedal Position Sensor for Use with Electronic Controls in Medium- and Heavy-Duty Vehicle Applications	682
8.4.5.23	SAE J1930 Electrical/Electronic Systems Diagnostic Terms, Definitions, Abbreviations, and Acronyms	682
8.4.5.24	SAE J1939 Recommended Practice for a Serial Control and Communications Vehicle Network	683
8.4.5.25	SAE J1979 E/E Diagnostic Test Modes	684
8.4.5.26	SAE J2403 Medium/Heavy-Duty E/E Systems Diagnosis Nomenclature	685
8.4.5.27	SAE J2496 Transport Area Network Cabling	685
8.4.5.28	SAE J2497 Power Line Carrier Communications for Commercial Vehicles	686
8.4.5.29	SAE J2178 Class B Data Communication Network Messages	686

8.4.5.30	SAE J2178 Class B Data Communication Network Messages	687
8.4.5.31	SAE J2178 Class B Data Communication Network Messages—Message Definitions for Three Byte Headers	687
8.4.5.32	SAE J2186 E/E Data Link Security	688
8.4.5.33	SAE J2366 ITS Data Bus	688
8.4.5.34	SAE J2395 ITS In-Vehicle Message Priority	690
8.4.5.35	SAE J2556 Radiated Emissions (RE) Narrowband Data Analysis—Power Spectral Density (PSD)	690
8.4.5.36	SAE J2590 Pmode for In-Vehicle Networks	691
8.4.5.37	SAE USCAR17 Performance Specification for Automotive RF Connector Systems	691
8.5	Freight Transport Service Groups	691
8.5.1	Architecture	692
8.5.2	Commercial Vehicle Preclearance	692
8.5.3	ISO 24533 Commercial Vehicle Administrative Processes	693
8.5.4	ISO 26683 Freight Conveyance Content Identification and Communication Architecture—Application Profile	693
8.5.5	Automated Roadside Safety Inspection	694
8.5.6	Commercial Vehicle On-Board Safety Monitoring	695
8.5.7	Freight Transport Fleet Management	695
8.5.7.1	ISO 9897 Freight Containers—Container Equipment Data Exchange (CEDEX)—General Communication Codes	696
8.5.7.2	ISO 9711 Freight Containers—Information Related to Containers On Board Vessels—Part 1: Bay Plan System	696
8.5.8	Intermodal Information Management	696
8.5.9	Management and Control of Intermodal Centers	697
8.5.10	Management of Dangerous Freight	697
8.5.10.1	ISO 17687 General Fleet Management and Commercial Freight Operations—Data Dictionary and Message Sets for Electronic Identification and Monitoring of Hazardous Materials/Dangerous Goods Transportation	697
8.6	Public Transport Service Groups	698
8.6.1	Public Transport Management	698
8.6.1.1	ISO 24014 Public Transport—Interoperable Fare Management System [IFMS] Architecture	699
8.6.1.2	ISO 22951 Data Dictionary and Message Sets for Pre-Emption and Prioritization Signal Systems for Emergency and Public Transport Vehicles (PRESTO)	700
8.6.1.3	ISO 28701 Public Transport—Identifications of Fixed Objects in Public Transport (IFOPT)	700
8.6.1.4	CEN 12896 Public Transport—Reference Data Model	700

8.6.2	Demand Response and Shared Transport	701
8.6.3	Public Transport Information	701
8.6.3.1	ISO 17685 Standards Numbering System for Public Transport Stops (SNSPTS)	701
8.6.3.2	CEN ***** Public Transport—Public Interactive Information Terminals—Traveler Interface	701
8.6.3.3	ENV 13998 Public Transport—Noninteractive Dynamic Passenger Information on Ground	702
8.6.4	Public Service Vehicle Environment	702
8.6.4.1	ISO/CEN 24014 Public Transport—Interoperable Fare Management System	702
8.6.4.2	CEN 12896 Public Transport—Reference Data Model	702
8.6.4.3	ENV 13149 Public Transport—Road Vehicle Scheduling and Control Systems	703
8.6.4.4	CEN ***** Public Transport—Road Vehicles—AVMS Onboard Equipment—Environmental and Electrical Conditions and Limits	705
8.6.4.5	ENV 12694 Public Transport—Road Vehicles—Dimensional Requirements for Variable Electronic External Signs	705
8.6.4.6	CEN 15504 Public Transport—Road Vehicles—Visible Variable Passenger Information Devices Inside the Vehicle	706
8.6.4.7	CEN 13093 Public Transport—Road Vehicles—Driver's Console Mechanical Interface Requirements—Minimum Display and Keypad Parameters	706
8.6.4.8	CEN 12796 Public Transport—Road Vehicles—Validators	707
8.6.4.9	CEN TS 15531 Public Transport—Service Interface for Real-Time Information Relating to Public Transport Operations	707
8.6.4.10	CEN WI 00278207 Public Transport—Identification of Fixed Objects in Public Transport (IFOPT)	709
8.7	Emergency Service Groups	709
8.7.1	Transport-Related Emergency Notification and Personal Security	709
8.7.1.1	ISO 24978 Emergency and Safety Message Data Registry	709
8.7.1.2	ISO 25109 Emergency Services Architecture	710
8.7.1.3	ISO 26682 Crash and Emergency Notification Reference Architecture	710
8.7.1.4	CEN 15722 [formerly 24977] eCall Minimum Set of Data	710
8.7.1.5	CEN WI 00278220 eCall Operating Requirements	710

8.7.1.6	SAE J2313_199909 On-Board Land Vehicle Mayday Reporting Interface	711
8.7.2	After-Theft Vehicle Recovery	711
8.7.2.1	CEN TS 15213	711
8.7.3	Emergency Vehicle Management	714
8.7.4	Hazardous Materials and Incident Notification	714
8.8	Transport-Related Electronic Payment Service Groups	715
8.8.1	Transport-Related Electronic Financial Transactions	715
8.8.1.1	ISO/CEN 14904 Electronic Fee Collection (EFC)— Interface Specification for Clearing Between Operators	716
8.8.1.2	ISO/CEN 14906 EFC—Application Interface Definition for DSRC	716
8.8.1.3	ISO/CEN 14907 EFC—Test Procedures User and Fixed Equipment	717
8.8.1.4	ISO/CEN 17573 EFC—System Architecture for Vehicle Related Transport Services	718
8.8.1.5	ISO/CEN 17574 EFC—Security Services Framework—Guidelines for EFC Security Protection Profiles	718
8.8.1.6	ISO/CEN 17575 EFC—Application Interface Definition for EFC Based on Global Navigation Satellite Systems and Cellular Network (GNSS/CN)	719
8.8.1.7	ISO/CEN WI 00278192 EFC—Information Flows Between Operators of EFC Systems	722
8.8.1.8	EN 15509 EFC—Interoperable Application Profile for Dedicated Short Range Communication	722
8.8.1.9	CEN WI 00278216 Electronic Fee Collection (EFC)—Conformity Evaluation of On-Board Unit And Roadside Equipment to EN 15509—Part 1: Test Suite Structure and Test Purposes	723
8.8.1.10	CEN WI 00278119 Dedicated Short Range Communication—Physical Integration with the Vehicle of On-Board Units (OBU) for Electronic Fee Collection (EFC)	723
8.8.1.11	CEN WI 00278215 Ensuring the Correct Function of ETC Equipment Installed Behind Metallized Windshield	723
8.8.1.12	CEN WI 00278217 Electronic Fee Collection (EFC)—Conformity Evaluation of On-Board Unit and Roadside Equipment to EN 15509—Part 2: Abstract Test Suite	724
8.8.2	Integration of Transport-Related Electronic Payment Services	724
8.8.2.1	ISO/CEN 14904 EFC—Interface Specification for Clearing Between Operators	724
8.8.2.2	ISO/CEN 25110 EFC—Interface Definition for On- Board Account Using ICC	725

8.9	Road Transport-Related Personal Safety	725
8.9.1	Public Travel Security	725
8.9.1.1	ISO ***** Lawful Interception in ITS and CALM	727
8.9.2	Safety Enhancements for Vulnerable Road Users	728
8.9.3	Safety Enhancements for Disabled Road Users	729
8.9.4	Safety Provisions for Pedestrians Using Intelligent Junctions Links	729
8.10	Weather and Environmental Conditions Monitoring Service Groups	729
8.10.1	Weather Monitoring	730
8.10.2	Environmental Conditions Monitoring	731
8.11	Disaster Response Management and Coordination Service Groups	731
8.11.1	Disaster Data Management	732
8.11.2	Disaster Response Management	732
8.11.2.1	Requirements for Communication of Citizens with Authorities/Organizations in Case of Distress (Emergency Call Handling)	733
8.11.2.2	Emergency Communications; Collection of European Regulatory Principles	733
8.11.2.3	ETSI TR 102 181 Requirements for Communications Between Authorities/ Organizations During Emergencies	733
8.11.2.4	ETSI TR 102 182 Requirements for Communications from Authorities/Organizations to Citizen During Emergencies	734
8.11.2.5	ETSI TR 102 410 Emergency Communications (EMTEL): Basis of Requirements for Communications Between Individuals and Between Individuals and Authorities While Emergencies Are in Progress	734
8.11.2.6	ETSI TR 102 444 Analysis of the Short Message Service (SMS) and Cell Broadcast Service (CBS) for Emergency Messaging Applications	735
8.11.2.7	ETSI TR 102 445 Emergency Communications (EMTEL); Overview of Emergency Communications Network Resilience and Preparedness	735
8.11.3	Coordination with Emergency Agencies	736
8.12	National Security Service Groups	736
8.12.1	Monitoring of Suspicious Vehicles	736
8.12.2	Utility and Pipeline Monitoring	737

PART IV

Standard National/Regional Architecture	739
---	-----

CHAPTER 9

National and Regional Architecture	741
9.1 The Role of National/Regional Architecture	742

9.2	Japan—National ITS Architecture	743
9.3	The United States—National ITS Architecture	744
9.4	European Union—ITS Architecture Framework	745
9.5	Other National ITS Architecture	746
9.5.1	Australian National ITS Architecture	746
9.5.2	French ACTIF National ITS Architecture	746
9.5.3	Korean National ITS Architecture	747
9.5.4	Italian National ITS Architecture	747
9.5.5	Czech Republic TEAM National ITS Architecture	748
9.5.6	Netherlands National ITS Architecture	748
9.5.7	Austrian National ITS Architecture	748
9.5.8	Norwegian ARKTRANS National ITS Architecture	749
9.5.9	Finnish National ITS Architecture	749
9.5.10	Canadian National ITS Architecture	750
9.5.11	Romanian National ITS Architecture	751
9.5.12	Hungarian National ITS Architecture	751
9.5.13	Slovenian CONNECT National ITS Architecture	751
9.5.14	Spanish National ITS Architecture	751
9.5.15	Swiss National ITS Architecture	751

PART V

Strategies to Use Standards in ITS	753
------------------------------------	-----

CHAPTER 10

Planning, Development, Deployment, and Operations	755
10.1 ITS System Requirements, Analysis, Design, and Delivery	755
10.2 Systems Engineering for ITS	756
10.3 Business Case and Benefit-Cost Analysis for ITS	756
10.4 Use Case Requirements Specification for ITS	757
10.5 Integrated Test, Evaluation, and Acceptance of ITS	758
10.6 ITS Software Development and Integration	759
10.6.1 Software Development Standards	759
10.6.1.1 ISO 9001 Quality Management Systems—Requirements	759
10.6.1.2 ISO 90003 Software Engineering—Guidelines for the Application of ISO 9001:2000 to Computer Software	760
10.6.1.3 ISO 12207 Information Technology—Software Life-Cycle Processes	760
10.6.1.4 ISO 14764 Software Engineering—Software Life Cycle Processes—Maintenance	761
10.6.1.5 ISO 15271 Information Technology—Guide for ISO/IEC 12207 (Software Life Cycle Processes)	761
10.6.1.6 ISO 15628 Systems Engineering—System Life Cycle Processes	762

10.6.1.7	ISO 15289 Systems and Software Engineering— Content of Systems and Software Life-Cycle Process Information Products (Documentation)	762
10.6.1.8	ISO 15504 Information Technology—Process Assessment	762
10.6.1.9	ISO 15940 Information Technology—Software Engineering Environment Services	765
10.6.1.10	ISO 16085 Systems and Software Engineering—Life Cycle Processes—Risk Management	765
10.6.1.11	ISO 16236 Software Engineering—Guide for the Application of ISO/IEC 12207 to Project Management	766
10.6.1.12	ISO 17799 Information Technology—Security Techniques—Code of Practice for Information Security Management	766
10.6.2	Software Integration Standards	766
10.6.2.1	ISO 20000-1 Information Technology—Service Management—Part 1: Specification	767
10.6.2.2	ISO 20000-2 Information Technology—Service Management—Part 2: Code of Practice	767
10.6.2.3	IEEE 11175 CASE Tool Interconnections	768
10.7	ITS Data Collection and Analysis	769
10.8	Simulation and Modeling for ITS	770
10.8.1	Simulation Standards	770
10.8.1.1	IEEE 1278 Standard for Distributed Interactive Simulation	770
10.8.2	Modeling for ITS	772

PART VI

The Process of Standards Development	773
--------------------------------------	-----

CHAPTER 11

International Standards Development Organizations for ITS	775
11.1 International Standards Organization	777
11.2 International Telecommunication Union	779
11.2.1 International Telecommunication Union— Telecommunications	782
11.2.2 International Telecommunication Union— Radiocommunications	782
11.3 International Electrotechnical Commission	783
11.4 Comité Européen de Normalisation	783
11.5 European Telecommunications Standards Institute	783
11.6 Internet Engineering Task Force	786
11.7 World Wide Web Consortium	790
11.8 Object Management Group	793

11.9 United Nations Centre for Trade Facilitation and Electronic Business	793
11.10 Institution of Electrical and Electronics Engineers	795

CHAPTER 12

National Standards Development Organizations for ITS	797
12.1 U.S. National Standards	797
12.1.1 American National Standards Institute	797
12.1.2 Society of Automotive Engineers	798
12.1.3 Automotive Industry Action Group	800
12.1.4 Institute of Transportation Engineers	801
12.1.5 Air Radio Incorporated	801
12.1.6 American Society for Testing and Materials	801
12.1.7 Telecommunications Industry Association	802
12.1.8 Alliance for Telecommunications Industry Solutions	803
12.2 Japan National Standards	806
12.2.1 Association of Radio Industries and Businesses (ARIB)	806
12.3 Other Organizations Relevant to ITS Standards	806
12.3.1 Asia-Pacific Economic Cooperation	806

PART VII

Conclusions	815
-------------	-----

CHAPTER 13

Summary	817
ANNEX A Numerical List of Relevant ISO/IEC ITS Standards	000
ANNEX B Numerical List of Relevant CEN Standards	000
ANNEX C Numerical List of Relevant SAE Standards	000
ANNEX D Numerical List of Relevant ETSI Standards	000
ANNEX E Numerical List of Relevant IEEE Standards	000
ANNEX F Numerical List of NTCIP Standards	000
ANNEX G Numerical List of Relevant OMG/W3C Standards	000
ANNEX H Numerical List of Other Relevant Standards	000
ANNEX J Glossary (Including Acronyms and Abbreviations)	000
ANNEX K Bibliography	000
About the Author	000
Index	000

Preface

The development of this book arose from a general frustration of one who, despite being involved in Intelligent Transport Systems (ITS) and the development of standards for the sector since 1991, finds information about these standards scattered across the libraries of many different standards organizations.

Where does one find out if a standard even exists? Do we spend man years developing a standard only to find out that another group has already done the work, or even worse, done something similar but slightly different and incompatible?

Additionally, and most importantly, ITS does not live in a world of isolation. ITS exists in a world of information technology. But those developing ITS standards are not necessarily IT/ICT experts, nor RFID experts, nor biometrics experts; they are more likely to be automotive engineers, traffic control managers, electronics design companies, information service providers, and representatives of governments and user groups.

Yet these technologies are an essential part of ITS. It does not make sense to start from scratch every time an ITS standard is needed when there are many IT/ICT standards already developed that can provide much of what we need; we can simply specify by reference, if only we could find them! In any case, as much of ITS is about transferring data from system to system in order achieve the provision of the desired service, ITS has to use and feed information through and to other IT/ICT systems. It has to be compatible with these standards.

What IT, ICT, RFID, and biometrics standards are available for us to use by reference? Which standards committees develop these standards? Where do we look to find out? Which standards are available for free download and which ones require payment? Does the title of the standard, which seemed so appropriate, really specify what we need? How can we find a summary of the standard and its contents without buying the document only to find out it was not what we needed? And if we find a relevant standard, from which Web site can it be obtained?

Of course, standards development organizations (SDOs) codify their standards in a systematic way, but in general they are not well organized to service the lay visitor. If you do not know which SDO or which committee developed a standard, or its reference number, or its exact title, it may take hours to wade through often slow and cumbersome Web sites.

If you wonder what those in standards committees do apart from develop the published papers, the answer in part is that we moan about how these issues make our life unnecessarily difficult. In one of these “feeling sorry for ourselves” sessions, Chris Skinner and I came to the conclusion that someone ought to put all these

Random documents with unrelated
content Scribd suggests to you:

my lady might catch cold in state, in the midst of yawning chimneys, creaking window-sashes, and smoking plaster.

Now look at the door of the coach-house, with its first coat of paint seen yet, and a variety of patches to keep the feeble barrier together. The loft was arched once, but a great corner has tumbled at one end, leaving a gash that unites the windows with the coach-house door. Several of the arch-stones are removed, and the whole edifice is about as rambling and disorderly as—as the arrangement of this book, say. Very tall tufts of mouldy moss are on the drawing-room windows, with long white heads of grass. As I am sketching this—*honk!*—a great lean sow comes trampling through the slush within the courtyard, breaks down the flimsy apparatus of rattling boards and stones which had passed for the gate, and walks with her seven squeaking little ones to disport on the grass on the hill.

The drawing-room of the tenement mentioned just now, with its pictures, and pulleyless windows and lockless doors, was tenanted by a friend who lodged there with a sick wife and a couple of little children; one of whom was an infant in arms. It is not, however, the lodger, who is an Englishman, but the kind landlady and her family who may well be described here—for their like are hardly to be found on the other side of the Channel. Mrs. Fagan is a young widow who has seen better days, and that portrait over the grand mantelpiece is the picture of her husband that is gone, a handsome young man, and well-to-do at one time as a merchant. But the widow (she is as pretty, as ladylike, as kind, and as neat as ever widow could be) has little left to live upon but the rent of her lodgings and her furniture; of which we have seen the best in the drawing-room.

She has three fine children of her own: there is Minny, and Katey, and Patsey, and they occupy indifferently the dining-room on the ground-floor or the kitchen opposite; where in the midst of a great smoke sits an old nurse, by a copper of potatoes which is always bubbling and full. Patsey swallows quantities of them, that's clear—his cheeks are as red and shining as apples, and when he roars, you are sure that his lungs are in the finest condition. Next door to the kitchen is the pantry, and there is a bucket full of the before-mentioned fruit, and a grand service of china for dinner and dessert. The kind young widow shows them with no little pride, and says with reason that there are few lodging-houses in Cork that can match such china as that. They are relics of the happy old times when Fagan kept his

gig and horse, doubtless, and had his friends to dine—the happy prosperous days which she has exchanged for poverty and the sad black gown.

Patsey, Minny, and Katey have made friends with the little English people upstairs; the elder of whom, in the course of a month, has as fine a Munster brogue as ever trolled over the lips of any born Corkagian. The old nurse carries out the whole united party to walk, with the exception of the English baby, that jumps about in the arms of a countrywoman of her own. That is, unless one of the four Miss Fagans take her; for four of them there are, four *other* Miss Fagans, from eighteen downwards to fourteen:—handsome, fresh, lively, dancing, bouncing girls. You may always see two or three of them smiling at the parlour-window, and they laugh and turn away their heads when any young fellow looks and admires them.

Now, it stands to reason that a young widow of five-and-twenty can't be the mother of four young ladies of eighteen downwards; and, if anybody wants to know how they come to be living with the poor widow their cousin, the answer is, they are on a visit. Peggy the maid says their papa is a gentleman of property, and can 'spend his eight hundred a year.'

Why don't they remain with the old gentleman, then, instead of quartering on the poor young widow, who has her own little mouths to feed? The reason is, the old gentleman has gone and *married his cook*; and the daughters have quitted him in a body, refusing to sit down to dinner with a person who ought by rights to be in the kitchen. The whole family (the Fagans are of good family) take the quarrel up, and here are the young people under shelter of the widow.

Four merrier, tender-hearted girls are not to be found in all Ireland; and the only subject of contention amongst them is, which shall have the English baby; they are nursing it, and singing to it, and dandling it by turns all day long. When they are not singing to the baby, they are singing to an old piano; such an old, wiry, jingling, wheezy piano! It has plenty of work, playing jigs and song accompaniments between meals, and acting as a sideboard at dinner. I am not sure that it is at rest at night either; but have a shrewd suspicion that it is turned into a four-post bed. And for the following reason:—

Every afternoon, at four o'clock, you see a tall old gentleman walking leisurely to the house. He is dressed in a long greatcoat with huge pockets, and in the huge pockets are sure to be some big apples for all the children—

the English child amongst the rest, and she generally has the biggest one. At seven o'clock, you are sure to hear a deep voice shouting 'PAGGY!' in an awful tone—it is the old gentleman calling for his 'materials'; which Peggy brings without any further ado; and a glass of punch is made, no doubt, for everybody. Then the party separates: the children and the old nurse have long since trampled upstairs; Peggy has the kitchen for her sleeping-apartment; and the four young ladies make it out somehow in the back drawing-room. As for the old gentleman, he reposes in the parlour; and it must be somewhere about the piano, for there is no furniture in the room except that, a table, a few old chairs, a workbox, and a couple of albums.

The English girl's father met her in the street one day, talking confidentially with a tall old gentleman in a greatcoat. 'Who's your friend?' says the Englishman afterwards to the little girl. 'Don't you know him, papa?' said the child in the purest brogue. 'Don't you know him?—THAT'S UNCLE JAMES!' And so it was: in this kind, poor, generous, barebacked house, the English child found a set of new relations; little rosy brothers and sisters to play with, kind women to take the place of the almost dying mother, a good old Uncle James to bring her home apples and care for her—one and all ready to share their little pittance with her, and to give her a place in their simple friendly hearts. God Almighty bless the widow and her mite, and all the kind souls under her roof!

How much goodness and generosity—how much purity, fine feeling—nay, happiness—may dwell amongst the poor whom we have been just looking at! Here, thank God, is an instance of this happy and cheerful poverty: and it is good to look, when one can, at the heart that beats under the threadbare coat, as well as the tattered old garment itself. Well, please Heaven, some of those people whom we have been looking at are as good, and not much less happy: but though they are accustomed to their want, the stranger does not reconcile himself to it quickly; and I hope no Irish reader will be offended at my speaking of this poverty, not with scorn or ill-feeling, but with hearty sympathy and good-will.

One word more regarding the Widow Fagan's house. When Peggy brought in coals for the drawing-room fire, she carried them—in what do you think? 'In a coal-scuttle, to be sure,' says the English reader, down on you as sharp as a needle.

No, you clever Englishman, it wasn't a coal-scuttle.

‘Well, then, it was in a fire-shovel,’ says that brightest of wits, guessing again.

No, it *wasn't* a fire-shovel, you heaven-born genius; and you might guess from this until Mrs. Snooks called you up to coffee, and you would never find out. It was in something which I have already described in Mrs. Fagan's pantry.

‘Oh, I have you now, it was the bucket where the potatoes were; the thlatternly wetch!’ says Snooks.

Wrong again! Peggy brought up the coals—in a CHINA PLATE!

Snooks turns quite white with surprise, and almost chokes himself with his port. ‘Well,’ says he, ‘of all the *wum* countwith that I ever wead of, hang me if Ireland ithn't the *wummetht*. Coalth in a plate! Mawyann, do you hear that? In Ireland they alwayth thend up their coalth in a plate!’

CHAPTER VIII

FROM CORK TO BANTRY; WITH AN ACCOUNT OF THE CITY OF SKIBBEREEN

THAT light four-inside, four-horse coach, the 'Skibbereen Perseverance,' brought me fifty-two miles to-day, for the sum of three-and-sixpence, through a country which is, as usual, somewhat difficult to describe. We issued out of Cork by the western road, in which, as the Guide-book says, there is something very imposing. 'The magnificence of the county court-house, the extent, solidity, and characteristic sternness of the county gaol,' were visible to us for a few minutes; when, turning away southward from the pleasant banks of the stream, the road took us towards Bandon, through a country that is bare and ragged-looking, but yet green and pretty; and it always seems to me, like the people, to look cheerful in spite of its wretchedness, or, more correctly, to look tearful and cheerful at the same time.

The coach, like almost every other public vehicle I have seen in Ireland, was full to the brim and over it. What can send these restless people travelling and hurrying about from place to place as they do? I have heard one or two gentlemen hint that they had 'business' at this place or that; and found afterwards that one was going a couple of score of miles to look at a mare, another to examine a setter-dog, and so on. I did not make it my business to ask on what errand the gentlemen on the coach were bound; though two of them, seeing an Englishman, very good-naturedly began chalking out a route for him to take, and showing a sort of interest in his affairs, which is not with us generally exhibited. The coach, too, seemed to have the elastic hospitality of some Irish houses; it accommodated an almost impossible number. For the greater part of the journey the little guard sat on the roof among the carpet-bags, holding in one hand a huge tambour-frame, in the other a bandbox marked 'Foggarty, Hatter.' (What is there more ridiculous in the name of Foggarty than in that of Smith? and yet, had Smith been the name, I never should have laughed at or remarked it.) Presently by his side clambered a green-coated policeman with his

carbine, and we had a talk about the vitriol-throwers at Cork, and the sentence just passed upon them. The populace has decidedly taken part with the vitriol-throwers; parties of dragoons were obliged to surround the avenues of the court; and the judge who sentenced them was abused as he entered his carriage, and called an old villain, and many other opprobrious names.

This case the reader very likely remembers. A saw-mill was established at Cork, by which some four hundred sawyers were thrown out of employ. In order to deter the proprietors of this and all other mills from using such instruments further, the sawyers determined to execute a terrible vengeance, and cast lots among themselves which of their body should fling vitriol into the faces of the mill-owners. The men who were chosen by the lot were to execute this horrible office on pain of death, and did so,—frightfully burning and blinding one of the gentlemen owning the mill. Great rewards were offered for the apprehension of the criminals, and at last one of their own body came forward as an approver, and the four principal actors in this dreadful outrage were sentenced to be transported for life. Crowds of the ragged admirers of these men were standing round ‘the magnificent county court-house’ as we passed the building. Ours is a strange life indeed. What a history of poverty and barbarity, and crime, and even kindness, was that by which we passed before the magnificent county court-house, at eight miles an hour? What a chapter might a philosopher write on them! Look yonder at those two hundred ragged fellow-subjects of yours; they are kind, good, pious, brutal, starving. If the priest tells them, there is scarce any penance they will not perform; there is scarcely any pitch of misery which they have not been known to endure, nor any degree of generosity of which they are not capable: but if a man comes among these people, and can afford to take land over their heads, or if he invents a machine which can work more economically than their labour, they will shoot the man down without mercy, murder him, or put him to horrible tortures, and glory almost in what they do. There stand the men; they are only separated from us by a few paces: they are as fond of their mothers and children as we are; their gratitude for small kindnesses shown to them is extraordinary; they are Christians as we are; but interfere with their interests, and they will murder you without pity.

It is not revenge so much which these poor fellows take, as a brutal justice of their own. Now, will it seem a paradox to say, in regard to them

and their murderous system, that the way to put an end to the latter is to *kill them no more*? Let the priest be able to go amongst them and say, the law holds a man's life so sacred that it will on *no account* take it away. No man, nor no body of men, has a right to meddle with human life; not the Commons of England any more than the Commons of Tipperary. This may cost two or three lives, probably, until such time as the system may come to be known and understood: but which will be the greatest economy of blood in the end?

By this time the vitriol-men were long passed away, and we began next to talk about the Cork and London steamboats; which are made to pay, on account of the number of paupers whom the boats bring over from London at the charge of that city. The passengers found here, as in everything else almost which I have seen as yet, another instance of the injury which England inflicts on them. 'As long as these men are strong and can work,' says one, 'you keep them: when they are in bad health, you fling them upon us.' Nor could I convince him that the agricultural gentlemen were perfectly free to stay at home if they liked: that we did for them what was done for English paupers—sent them, namely, as far as possible on the way to their parishes; nay, that some of them (as I have seen with my own eyes) actually saved a bit of money during the harvest, and took this cheap way of conveying it and themselves to their homes again. But nothing would convince the gentlemen that there was not some wicked scheming on the part of the English in the business; and, indeed, I find upon almost every other subject a peevish and puerile suspiciousness which is worthy of France itself.

By this time we came to a pretty village called Innishannon, upon the noble banks of the Bandon river; leading for three miles by a great number of pleasant gentlemen's seats to Bandon town. A good number of large mills were on the banks of the stream; and the chief part of them, as in Carlow, useless. One mill we saw was too small for the owner's great speculations; and so he built another and larger one: the big mill cost him £10,000, for which his brothers went security; and, a lawsuit being given against the millowner, the two mills stopped, the two brothers went off, and yon fine old house, in the style of Anne, with terraces and tall chimneys—one of the oldest country-houses I have seen in Ireland—is now inhabited by the natural son of the millowner, who has more such interesting progeny. Then we came to a tall, comfortable house, in a plantation; opposite to which was

a stone castle, in its shrubberies on the other side of the road. The tall house in the plantation shot the opposite side of the road in a duel, and nearly killed him; on which the opposite side of the road built this castle, *in order to plague* the tall house. They are good friends now; but the opposite side of the road ruined himself in building his house. I asked, 'Is the house finished?'—'*A good deal of it is,*' was the answer.—And then we came to a brewery, about which was a similar story of extravagance and ruin; but, whether before or after entering Bandon, does not matter.

We did not, it appears, pass through the best part of Bandon: I looked along one side of the houses in the long street through which we went, to see if there was a window without a broken pane of glass, and can declare on my conscience that every single window had three broken panes. There we changed horses, in a market-place, surrounded, as usual, by beggars; then we passed through a suburb still more wretched and ruinous than the first street, and which, in very large letters, is called DOYLE STREET: and the next stage was at a place called Dunmanway.

Here it was market-day, too, and, as usual, no lack of attendants: swarms of peasants in their blue cloaks, squatting by their stalls here and there. There is a little, miserable old market-house, where a few women were selling buttermilk; another, bullocks' hearts, liver, and such like scraps of meat; another had dried mackerel on a board; and plenty of people huckstering, of course. Round the coach came crowds of raggery, and blackguards fawning for money. I wonder who gives them any! I have never seen any one give yet; and were they not even so numerous that it would be impossible to gratify them all, there is something in their cant and supplications to the Lord so disgusting to me, that I could not give a halfpenny.

In regard of pretty faces, male or female, this road is very unfavourable. I have not seen one for fifty miles; though, as it was market-day all along the road, we have had the opportunity to examine vast numbers of countenances. The women are, for the most part, stunted, short, with flat Tartar faces; and the men no handsomer. Every woman has bare legs, of course; and as the weather is fine, they are sitting outside their cabins, with the pig, and the geese, and the children sporting around.

Before many doors we saw a little flock of these useful animals, and the family pig almost everywhere. You might see him browsing and poking

along the hedges, his fore and hind leg attached with a wisp of hay to check his propensity to roaming. Here and there were a small brood of turkeys; now and then a couple of sheep or a single one grazing upon a scanty field, of which the chief crop seemed to be thistles and stone; and, by the side of the cottage, the potato-field always.



The character of the landscape for the most part is bare and sad; except here and there in the neighbourhood of the towns, where people have taken a fancy to plant, and where nature has helped them, as it almost always will in this country. If we saw a field with a good hedge to it, we were sure to see a good crop inside. Many a field was there that had neither crop nor hedge. We passed by and over many pretty streams, running bright through brilliant emerald meadows: and I saw a thousand charming pictures, which want as yet an Irish Berghem. A bright road winding up a hill; on it a country cart, with its load, stretching a huge shadow; the before-mentioned emerald pastures and silver rivers in the foreground; a noble sweep of hills rising up from them, and contrasting their magnificent purple with the green; in the extreme distance the clear cold outline of some far-off mountains, and the white clouds tumbled about in the blue sky overhead. It has no doubt struck all persons who love to look at nature, how different the skies are in different countries. I fancy Irish or French clouds are as characteristic as Irish or French landscapes. It would be well to have a Daguerreotype and get a series of each. Some way beyond Dunmanna the road takes us through a noble savage country of rocks and heath. Nor must the painter forget long black tracts of bog here and there, and the water glistening brightly at the places where the turf has been cut away. Add to this, and chiefly by the banks of rivers, a ruined old castle or two; some

were built by the Danes, it is said. The O'Connors, the O'Mahonys, the O'Driscolls, were lords of many others, and their ruined towers may be seen here and along the sea.

Near Dunmanna that great coach, 'The Skibbereen Industry,' dashed by us at seven miles an hour; a wondrous vehicle: there were gaps between every one of the panels; you could see daylight through and through it. Like our machine, it was full, with three complementary sailors on the roof, as little harness as possible to the horses, and as long stages as horses can well endure; ours were each eighteen-mile stages. About eight miles from Skibbereen a one-horse car met us, and carried away an offshoot of passengers to Bantry. Five passengers and their luggage, and a very wild steep road; all this had one poor little pony to overcome! About the towns there were some show of gentlemen's cars, smart and well appointed, and on the road great numbers of country carts; an army of them met us coming from Skibbereen, and laden with grey sand for manure.

Before you enter the city of Skibbereen, the tall new Poorhouse presents itself to the eye of the traveller; of the common model, being a bastard-Gothic edifice, with a profusion of cottage-ornée (is cottage masculine or feminine in French?)—of cottage-orné roofs, and pinnacles, and insolent-looking stacks of chimneys. It is built for 900 people, but as yet not more than 400 have been induced to live in it; the beggars preferring the freedom of their precarious trade to the dismal certainty within its walls. Next we come to the chapel, a very large respectable-looking building of dark-grey stone; and presently, behold, by the crowd of blackguards in waiting, the 'Skibbereen Perseverance' has found its goal, and you are inducted to the 'Hotel' opposite.

Some gentlemen were at the coach, besides those of lower degree. Here was a fat fellow with large whiskers, a geranium, and a cigar; yonder a tall handsome old man that I would swear was a dragoon on half-pay. He had a little cap, a Taglioni coat, a pair of beautiful spaniels, and a pair of knee-breeches which showed a very handsome old leg; and his object seemed to be to invite everybody to dinner as they got off the coach. No doubt he has seen the 'Skibbereen Perseverance' come in ever since it was a 'Perseverance.' It is wonderful to think what will interest men in prisons or country towns!

There is a dirty coffee-room, with a strong smell of whisky; indeed three young 'materialists' are employed at the moment: and I hereby beg to offer an apology to three other gentlemen—the Captain, another, and the gentleman of the geranium, who had caught hold of a sketching-stool which is my property, and were stretching it, and sitting upon it, and wondering, and talking of it, when the owner came in, and they bounced off to their seats like so many schoolboys. Dirty as the place was, this was no reason why it should not produce an exuberant dinner of trout and Kerry mutton; after which Dan the waiter, holding up a dingy decanter, asks how much whisky I'd have.

That calculation need not be made here; and if a man sleeps well, has he any need to quarrel with the appointments of his bedroom, and spy out the deficiencies of the land? As it was Sunday, it was impossible for me to say what sort of shops 'the active and flourishing town' of Skibbereen contains. There were some of the architectural sort, viz. with gilt letters and cracked mouldings, and others into which I thought I saw the cows walking; but it was only into their little cribs and paddocks at the back of the shops. There is a trim Wesleyan chapel, without any broken windows; a neat church standing modestly on one side; the lower street crawls along the river to a considerable extent, having by-streets and boulevards of cabins here and there.

The people came flocking into the place by hundreds, and you saw their blue cloaks dotting the road and the bare open plains beyond. The men came with shoes and stockings to-day, the women all bare-legged, and many of them might be seen washing their feet in the stream before they went up to the chapel. The street seemed to be lined on either side with blue cloaks, squatting along the doorways as is their wont. Among these, numberless cows were walking to and fro, and pails of milk passing, and here and there a hound or two went stalking about. Dan, the waiter, says they are hunted by the handsome old Captain who was yesterday inviting everybody to dinner.

Anybody at eight o'clock of a Sunday morning in summer may behold the above scene from a bridge just outside the town. He may add to it the river, with one or two barges lying idle upon it; a flag flying at what looks like a custom-house; bare country all around; and the chapel before him, with a swarm of the dark figures round about it.

I went into it, not without awe (for, as I confessed before, I always feel a sort of tremor on going into a Catholic place of worship: the candles, and altars, and mysteries, the priest, and his robes, and nasal chanting, and wonderful genuflections, will frighten me as long as I live). The chapel-yard was filled with men and women; a couple of shabby old beadles were at the gate, with copper shovels to collect money; and inside the chapel four or five hundred people were on their knees, and scores more of the blue-mantles came in, dropping their curtsies as they entered, and then taking their places on the flags.

And now the pangs of hunger beginning to make themselves felt, it became necessary for your humble servant (after making several useless applications to a bell, which properly declined to work on Sundays) to make a personal descent to the inn-kitchen, where was not a bad study for a painter. It is a huge room, with a peat fire burning, and a staircase walking up one side of it, on which stair was a damsel in a partial though by no means picturesque dishabille. The cook had just come in with a great frothing pail of milk, and sat with her arms folded; the hostler's boy sat dangling his legs from the table; the hostler was dandling a noble little boy of a year old, at whom Mrs. Cook likewise grinned delighted. Here, too, sat Mr. Dan, the waiter; and no wonder breakfast was delayed, for all three of these worthy domestics seemed delighted with the infant.

He was handed over to the gentleman's arms for the space of thirty seconds; the gentleman being the father of a family, and of course an amateur.

'Say Dan for the gentleman,' says the delighted cook.

'Dada,' says the baby; at which the assembly grinned with joy: and Dan promised I should have my breakfast 'in a hurry.'

But of all the wonderful things to be seen in Skibbereen, Dan's pantry is the most wonderful: every article within is a makeshift, and has been ingeniously perverted from its original destination. Here lie bread, blacking, fresh butter, tallow-candles, dirty knives—all in the same cigar-box with snuff, milk, cold bacon, brown sugar, broken teacups, and bits of soap. No pen can describe that establishment, as no English imagination could have conceived it. But lo! the sky has cleared after a furious fall of rain—(in compliance with Dan's statement to that effect, 'that the weather would be fine')—and a car is waiting to carry us to Loughine.

Although the description of Loughine can make but a poor figure in a book, the ride thither is well worth the traveller's short labour. You pass by one of the cabin-streets out of the town, into a country which for a mile is rich with grain, though bare of trees; then through a boggy bleak district, from which you enter into a sort of sea of rocks, with patches of herbage here and there. Before the traveller, almost all the way, is a huge pile of purple mountain, on which, as one comes nearer, one perceives numberless waves and breaks, as you see small waves on a billow in the sea; then clambering up a hill, we look down upon a bright green flat of land, with the lake beyond it, girt round by grey melancholy hills. The water may be a mile in extent; a cabin tops the mountain here and there; gentlemen have erected one or two anchorite pleasure-houses on the banks, as cheerful as a summer-house would be on Salisbury Plain. I felt not sorry to have seen this lonely lake, and still happier to leave it. There it lies with crags all round it, in the midst of desolate plains; it escapes somewhere to the sea; its waters are salt; half a dozen boats lie here and there upon its banks, and we saw a small crew of boys plashing about and swimming in it, and laughing and yelling. It seemed a shame to disturb the silence so.

The crowd of swaggering 'gents' (I don't know the corresponding phrase in the Anglo-Irish vocabulary to express a shabby dandy) awaiting the Cork mail, which kindly goes twenty miles out of its way to accommodate the town of Skibbereen, was quite extraordinary. The little street was quite blocked up with shabby gentlemen, and shabby beggars, awaiting this daily phenomenon. The man who had driven us to Loughine did not fail to ask for his fee as driver; and then, having received it, came forward in his capacity of boots, and received another remuneration. The ride is desolate, bare, and yet beautiful. There are a set of hills that keep one company the whole way; they were partially hidden in a grey sky, which flung a general hue of melancholy too over the green country through which we passed. There was only one wretched village along the road, but no lack of population; ragged people who issued from their cabins as the coach passed, or were sitting by the wayside. Everybody seems sitting by the wayside here: one never sees this general repose in England—a sort of ragged lazy contentment. All the children seemed to be on the watch for the coach; waited very knowingly and carefully their opportunity, and then hung on by scores behind. What a pleasure, to run over flinty roads with bare feet, to be whipped off, and to walk back to the cabin again! These

were very different cottages to those neat ones I had seen in Kildare. The wretchedness of them is quite painful to look at; many of the potato-gardens were half dug up, and it is only the first week in August, near three months before the potato is ripe and at full growth; and the winter still six months away. There were chapels occasionally, and smart new-built churches—one of them has a congregation of ten souls, the coachman told me. Would it not be better that the clergyman should receive them in his room, and, that the church-building money should be bestowed otherwise?

At length, after winding up all sorts of dismal hills speckled with wretched hovels, a ruinous mill every now and then, black bog-lands, and small winding streams, breaking here and there into little falls, we come upon some grounds well tilled and planted, and descending (at no small risk from stumbling horses) a bleak long hill, we see the water before us, and turning to the right by the handsome little park of Lord Bearhaven, enter Bantry. The harbour is beautiful. Small mountains in pretty green undulations rising on the opposite side; great grey ones farther back; a pretty island in the midst of the water, which is wonderfully bright and calm. A handsome yacht, and two or three vessels with their Sunday colours out, were lying in the bay. It looked like a seaport scene at a theatre, gay, cheerful, neat, and picturesque. At a little distance the town, too, is very pretty. There are some smart houses on the quays, a handsome court-house as usual, a fine large hotel, and plenty of people flocking round the wonderful coach.

The town is most picturesquely situated, climbing up a wooded hill, with numbers of neat cottages here and there, an ugly church with an air of pretension, and a large grave Roman Catholic chapel, the highest point of the place. The main street was as usual thronged with the squatting blue cloaks, carrying on their eager trade of buttermilk and green apples, and such cheap wares. With the exception of this street and the quay, with their whitewashed and slated houses, it is a town of cabins. The wretchedness of some of them is quite curious; I tried to make a sketch of a row which lean against an old wall, and are built upon a rock that tumbles about in the oddest and most fantastic shapes, with a brawling waterfall dashing down a channel in the midst. These are, it appears, the beggars' houses; any one may build a lodge against that wall, rent-free; and such places were never seen! As for drawing them, it was in vain to try; one might as well make a sketch of a bundle of rags. An ordinary pigsty in England is really more

comfortable. Most of them were not six feet long or five feet high, built of stones huddled together, a hole being left for the people to creep in at, a ruined thatch to keep out some little portion of the rain. The occupiers of these places sat at their doors in tolerable contentment, or the children came down and washed their feet in the water. I declare I believe a Hottentot kraal has more comforts in it; even to write of the place makes one unhappy, and the words move slow. But in the midst of all this misery there is an air of actual cheerfulness; and go but a few score of yards off, and these wretched hovels lying together look really picturesque and pleasing.

CHAPTER IX

RAINY DAYS AT GLENGARIFF

A SMART two-horse car takes the traveller thrice a week from Bantry to Killarney, by way of Glengariff and Kenmare. Unluckily, the rain was pouring down furiously as we passed to the first-named places, and we had only opportunity to see a part of the astonishing beauties of the country. What sends picturesque tourists to the Rhine and Saxon Switzerland? within five miles round the pretty inn of Glengariff there is a country of the magnificence of which no pen can give an idea. I would like to be a great prince, and bring a train of painters over to make, if they could, and according to their several capabilities, a set of pictures of the place. Mr. Creswick would find such rivulets and waterfalls, surrounded by a luxuriance of foliage and verdure that only his pencil can imitate. As for Mr. Cattermole, a red-shanked Irishman should carry his sketching-books to all sorts of wild, noble heights, and vast, rocky valleys, where he might please himself by piling crag upon crag, and by introducing, if he had a mind, some of the wild figures which peopled this country in old days. There is the Eagles' Nest, for instance, regarding which the Guide-book gives a pretty legend. The Prince of Bantry being conquered by the English soldiers, fled away, leaving his Princess and children to the care of a certain faithful follower of his, who was to provide them with refuge and food. But the whole country was overrun by the conquerors; all the flocks driven away by them, all the houses ransacked, and the crops burnt off the ground, and the faithful servitor did not know where he should find a meal or a resting-place for the unhappy Princess O'Donovan.

He made, however, a sort of shed by the side of a mountain, composing it of sods and stones so artfully that no one could tell but that it was a part of the hill itself; and here, having speared or otherwise obtained a salmon, he fed their Highnesses for the first day; trusting to Heaven for a meal when the salmon should be ended.



The Princess O'Donovan and her princely family soon came to an end of the fish; and cried out for something more.

So the faithful servitor, taking with him a rope and his little son Shamus, mounted up to the peak where the eagles rested; and, from the spot to which he climbed, saw their nest, and the young eaglets in it, in a cleft below the precipice.

'Now,' said he, 'Shamus my son, you must take these thongs with you, and I will let you down by the rope' (it was a straw-rope, which he had made himself, and though it might be considered a dangerous thread to hang by in other countries, you'll see plenty of such contrivances in Ireland to the present day).

'I will let you down by the rope, and you must tie the thongs round the necks of the eaglets, not so as to choke them, but to prevent them from swallowing much.' So Shamus went down, and did as his father bade him, and came up again when the eaglets were doctored.

Presently the eagles came home: one bringing a rabbit and the other a grouse. These they dropped into the nest for the young ones; and soon after went away in quest of other adventures.

Then Shamus went down into the eagles' nest again, gutted the grouse and rabbit, and left the garbage to the eaglets (as was their right), and brought away the rest. And so the Princess and Princes had game that night for their supper. How long they lived in this way, the Guide-book does not say: but let us trust that the Prince, if he did not come to his own again, was at least restored to his family and decently mediatised: and, for my part, I have very little doubt but that Shamus, the gallant young eagle-robber, created a favourable impression upon one of the young princesses, and

(after many adventures in which he distinguished himself) was accepted by her Highness for a husband, and her princely parents for a gallant son-in-law.

And here, while we are travelling to Glengariff, and ordering painters about with such princely liberality (by the way, Mr. Stanfield should have a boat in the bay, and paint both rock and sea at his ease), let me mention a wonderful, awful incident of real life which occurred on the road. About four miles from Bantry, at a beautiful wooded place, hard by a mill and waterfall, up rides a gentleman to the car with his luggage, going to Killarney races. The luggage consisted of a small carpet-bag and a pistol-case. About two miles farther on, a fellow stops the car: 'Joe,' says he, 'my master is going to ride to Killarney, so you please to take his luggage.' The luggage consisted of a small carpet-bag, and—a pistol-case as before. Is this a gentleman's usual travelling baggage in Ireland?

As there is more rain in this country than in any other, and as, therefore, naturally, the inhabitants should be inured to the weather, and made to despise an inconvenience which they cannot avoid, the travelling conveyances are arranged so that you may get as much practice in being wet as possible. The travellers' baggage is stowed in a place between the two rows of seats, and which is not inaptly called the well, as in a rainy season you might possibly get a bucketful of water out of that orifice. And, I confess, I saw, with a horrid satisfaction, the pair of pistol-cases lying in this moist aperture, with water pouring above them and lying below them; nay, prayed that all such weapons might one day be consigned to the same fate. But as the waiter at Bantry, in his excessive zeal to serve me, had sent my portmanteau back to Cork by the coach, instead of allowing me to carry it with me to Killarney, and as the rain had long since begun to insinuate itself under the seat-cushion, and through the waterproof apron of the car, I dropped off at Glengariff, and dried the only suit of clothes I had by the kitchen fire. The inn is very pretty; some thorn-trees stand before it, where many bare-legged people were lolling, in spite of the weather. A beautiful bay stretches out before the house, the full tide washing the thorn-trees; mountains rise on either side of the little bay, and there is an island, with a castle in it in the midst, near which a yacht was moored. But the mountains were hardly visible for the mist, and the yacht, island, and castle looked as if they had been washed against the flat grey sky in India-ink.

The day did not clear up sufficiently to allow me to make any long excursion about the place, or indeed to see a very wide prospect round about it: at a few hundred yards, most of the objects were enveloped in mist; but even this, for a lover of the picturesque, had its beautiful effect, for you saw the hills in the foreground pretty clear, and covered with their wonderful green, while immediately behind them rose an immense blue mass of mist and mountain that served to *relieve* (to use the painter's phrase) the nearer objects. Annexed to the hotel is a flourishing garden, where the vegetation is so great that the landlord told me it was all he could do to check the trees from growing; round about the bay, in several places, they come clustering down to the water edge, nor does the salt water interfere with them.

Winding up a hill to the right, as you quit the inn, is the beautiful road to the cottage and park of Lord Bantry. One or two parties on pleasure bent went so far as the house, and were partially consoled for the dreadful rain which presently poured down upon them, by wine, whisky, and refreshments which the liberal owner of the house sent out to them. I myself had only got a few hundred yards when the rain overtook me, and sent me for refuge into a shed, where a blacksmith had arranged a rude furnace and bellows, and where he was at work, with a rough gilly to help him, and, of course, a lounge or two to look on.

The scene was exceedingly wild and picturesque, and I took out a sketch-book and began to draw. The blacksmith was at first very suspicious of the operation which I had commenced, nor did the poor fellow's sternness at all yield until I made him a present of a shilling to buy tobacco, when he, his friend, and his son became good-humoured, and said their little say. This was the first shilling he had earned these three years: he was a small farmer, but was starved out, and had set up a forge here, and was trying to get a few pence. What struck me was the great number of people about the place. We had at least twenty visits while the sketch was being made; cars, and single and double horsemen, were continually passing; between the intervals of the shower a couple of ragged old women would creep out from some hole and display baskets of green apples for sale: wet or not, men and women were lounging up and down the road. You would have thought it was a fair, and yet there was not even a village at this place, only the inn and post-house, by which the cars to Tralee pass thrice a week.

The weather, instead of mending, on the second day was worse than ever. All the view had disappeared now under a rushing rain, of which I never saw anything like the violence. We were visited by five maritime, nay buccaneering-looking gentlemen in mustachios, with fierce caps and jackets, just landed from a yacht: and then the car brought us three Englishmen wet to the skin and thirsting for whisky-and-water.

And with these three Englishmen a great scene occurred, such as we read of in Smollett's and Fielding's inns. One was a fat old gentleman from Cambridge, who, I was informed, was a fellow of a College in that University, but whom I shrewdly suspect^[23] to be a butler or steward of the same. The younger men, burly, manly, good-humoured fellows of seventeen stone, were the nephews of the elder, who, says one, 'could draw a cheque for his thousand pounds.'

Two-and-twenty years before, on landing at the Pigeon-House at Dublin, the old gentleman had been cheated by a carman, and his firm opinion seemed to be that all carmen, nay, all Irishmen, were cheats.

And a sad proof of this depravity speedily showed itself: for having hired a three-horse car at Killarney, which was to carry them to Bantry, the Englishmen saw, with immense indignation, after they had drunk a series of glasses of whisky, that the three-horse car had been removed, a one-horse vehicle standing in its stead.

Their wrath no pen can describe. 'I tell you they are all so!' shouted the elder. 'When I landed at the Pigeon-House——' 'Bring me a post-chaise!' roars the second. 'Waiter, get some more whisky!' exclaims the third. 'If they don't send us on with three horses, I'll stop here for a week.' Then issuing, with his two young friends, into the passage, to harangue the populace assembled there, the elder Englishman began a speech about dishonesty, 'd——d rogues and thieves, Pigeon-House; he was a gentleman, and wouldn't be done, d——n his eyes and everybody's eyes.' Upon the affrighted landlord, who came to interpose, they all fell with great ferocity: the elder man swearing, especially, that he 'would write to Lord Lansdowne regarding his conduct, likewise to Lord Bandon, also to Lord Bantry: he was a gentleman; he'd been cheated in the year 1815, on his first landing at the Pigeon-House: and d——n the Irish, they were all alike.' After roaring and cursing for half an hour, a gentleman at the door, seeing the meek bearing of the landlord—who stood quite lost and powerless in

the whirlwind of rage that had been excited about his luckless ears, said, 'If men cursed and swore in that way in his house, he would know how to put them out.'

'Put *me* out!' says one of the young men, placing himself before the fat old blasphemer, his relative. 'Put me out, my fine fellow!' But it was evident the Irishman did not like his customer. 'Put *me* out!' roars the old gentleman, from behind his young protector; '—n my eyes, who are *you*, sir? who *are* you, sir? I insist on knowing who you are?'

'And who are you?' asks the Irishman.

'Sir, I'm a gentleman, and *pay my way*!—and as soon as I get into Bantry, I swear I'll write a letter to Lord Bandon Bantry, and complain of the treatment I have received here.'

Now, as the unhappy landlord had not said one single word, and as, on the contrary, to the annoyance of the whole house, the stout old gentleman from Cambridge had been shouting, raging, and cursing for two hours, I could not help, like a great ass as I was, coming forward and (thinking the landlord might be a tenant of Lord Bantry's) saying, 'Well, sir, if you write and say the landlord has behaved ill, I will write to say that he has acted with extraordinary forbearance and civility.'

O fool! to interfere in disputes where one set of the disputants have drunk half a dozen glasses of whisky in the middle of the day! No sooner had I said this than the other young man came and fell upon me, and in the course of a few minutes found leisure to tell me 'that I was no gentleman; that I was ashamed to give my name, or say where I lived; that I was a liar, and didn't live in London, and couldn't mention the name of a single respectable person there; that he was a merchant and tradesman, and hid his quality from nobody;' and finally, 'that though bigger than himself, there was nothing he would like better than that I should come out on the green and stand to him like a man.'

This invitation, although repeated several times, I refused with as much dignity as I could assume; partly because I was sober and cool, while the other was furious and drunk; also because I felt a strong suspicion that in about ten minutes the man would manage to give me a tremendous beating, which I did not merit in the least; thirdly, because a victory over him would not have been productive of the least pleasure to me; and lastly, because there was something really honest and gallant in the fellow coming out to

defend his old relative. Both of the younger men would have fought like tigers for this disreputable old gentleman, and desired no better sport. The last I heard of the three was that they and the driver made their appearance before a magistrate in Bantry; and a pretty story will the old man have to tell to his club at the Hoop, or the Red Lion, of those swindling Irish, and the ill-treatment he met with in their country.

As for the landlord, the incident will be a blessed theme of conversation to him for a long time to come. I heard him discoursing of it in the passage during the rest of the day; and next morning when I opened my window and saw with much delight the bay clear and bright as silver—except where the green hills were reflected in it, the blue sky above, and the purple mountains round about with only a few clouds veiling their peaks—the first thing I heard was the voice of Mr. Eccles repeating the story to a new customer.

‘I thought thim couldn’t be gintlemin,’ was the appropriate remark of Mr. Tom the waiter, ‘from the way in which they took their whishky,—raw with cold wather, widout *mixing or inything*.’ Could an Irish waiter give a more excellent definition of the ungenteel?

At nine o’clock in the morning of the next day, the unlucky car which had carried the Englishmen to Bantry came back to Glengariff; and as the morning was very fine, I was glad to take advantage of it, and travel some five-and-thirty English miles to Killarney.

CHAPTER X

FROM GLENGARIFF TO KILLARNEY

THE Irish car seems accommodated for any number of persons: it appeared to be full when we left Glengariff, for a traveller from Bearhaven, and the five gentlemen from the yacht, took seats upon it with myself, and we fancied it was impossible more than seven should travel by such a conveyance; but the driver showed the capabilities of his vehicle presently. The journey from Glengariff to Kenmare is one of astonishing beauty; and I have seen Killarney since, and am sure that Glengariff loses nothing by comparison with this most famous of lakes. Rock, wood, and sea stretch around the traveller—a thousand delightful pictures: the landscape is at first wild without being fierce, immense woods and plantations enriching the valleys—beautiful streams to be seen everywhere.

Here again I was surprised at the great population along the road; for one saw but few cabins, and there is no village between Glengariff and Kenmare. But men and women were on banks and in fields; children, as usual, came trooping up to the car; and the jovial men of the yacht had great conversations with most of the persons whom we met on the road. A merrier set of fellows it were hard to meet. ‘Should you like anything to drink, sir?’ says one, commencing the acquaintance. ‘We have the best whisky in the world, and plenty of porter in the basket.’ Therewith the jolly seamen produced a long bottle of grog, which was passed round from one to another; and then began singing, shouting, laughing, roaring, for the whole journey. ‘British sailors have a knack, pull away ho, boys! Hurroo, my fine fellow, does your mother know you’re out? Hurroo, Tim Herlihy! you’re a *fluke*, Tim Herlihy.’ One man sang on the roof, one *hurrooed* to the echo, another apostrophised the aforesaid Herlihy as he passed grinning on a car; a third had a pocket-handkerchief flaunting from a pole, with which he performed exercises in the face of any horsemen whom we met; and great were their yells as the ponies shied off at the salutation and the riders swerved in their saddles. In the midst of this rattling chorus we went along: gradually the country grew wilder and more desolate, and we passed

through a grim mountain region, bleak and bare, the road winding round some of the innumerable hills, and once or twice, by means of a tunnel, rushing boldly through them. One of these tunnels, they say, is a couple of hundred yards long; and a pretty howling, I need not say, was made through that pipe of rock by the jolly yacht's crew. 'We saw you sketching in the blacksmith's shed at Glengariff,' says one, 'and we wished we had you on board. Such a jolly life we led of it!'—They roved about the coast, they said, in their vessel; they feasted off the best of fish, mutton, and whisky; they had Gamble's turtle-soup on board, and fun from morning till night, and *vice versâ*. Gradually it came out that there was not, owing to the tremendous rains, a dry corner in their ship; that they slung two in a huge hammock in the cabin, and that one of their crew had been ill, and shirked off. What a wonderful thing pleasure is! To be wet all day and night; to be scorched and blistered by the sun and rain; to beat in and out of little harbours, and to exceed diurnally upon whisky-punch—'faith, London, and an arm-chair at the club, are more to the tastes of some men.

After much mountain-work of ascending and descending (in which latter operation, and by the side of precipices that make passing cockneys rather squeamish, the carman drove like mad to the hooping and screeching of the red rovers), we at length came to Kenmare, of which all that I know is that it lies prettily in a bay or arm of the sea; that it is approached by a little hanging-bridge, which seems to be a wonder in these parts; that it is a miserable little place when you enter it; and that, finally, a splendid luncheon of all sorts of meat and excellent cold salmon may sometimes be had for a shilling at the hotel of the place. It is a great vacant house, like the rest of them, and would frighten people in England; but after a few days one grows used to the Castle Rackrent style. I am not sure that there is not a certain sort of comfort to be had in these rambling rooms, and among these bustling, blundering waiters, which one does not always meet with in an orderly English house of entertainment.

After discussing the luncheon, we found the car with fresh horses, beggars, idlers, policemen, etc., standing round, of course; and now the miraculous vehicle, which had held hitherto seven with some difficulty, was called upon to accommodate thirteen.

A pretty noise would our three Englishmen of yesterday, nay, any other Englishmen for the matter of that, have made, if coolly called upon to admit an extra party of four into a mail-coach! The yacht's crew did not make a

single objection; a couple clambered up on the roof, where they managed to locate themselves with wonderful ingenuity, perched upon hard wooden chests, or agreeably reposing upon the knotted ropes which held them together: one of the new passengers scrambled between the driver's legs, where he held on somehow, and the rest were pushed and squeezed astonishingly in the car.



A CAR TO KILLARNEY

Now the fact must be told, that five of the new passengers (I don't count a little boy besides) were women, and very pretty, gay, frolicsome, lively, kind-hearted, innocent women too; and for the rest of the journey there was no end of laughing, and shouting, and singing, and hugging, so that the caravan presented the appearance which is depicted in the opposite engraving.

Now it may be a wonder to some persons, that with such a cargo the carriage did not upset, or some of us did not fall off; to which the answer is that we *did* fall off. A very pretty woman fell off, and showed a pair of never-mind-what-coloured garters, and an interesting English traveller fell off too: but, Heaven bless you! these cars are made to fall off from; and considering the circumstances of the case, and in the same company, I would rather fall off than not. A great number of polite allusions and genteel inquiries were, as may be imagined, made by the jolly boat's crew. But though the lady affected to be a little angry at first, she was far too good-natured to be angry long, and at last fairly burst out laughing with the passengers. We did not fall off again, but held on very tight, and just as we

were reaching Killarney, saw somebody else fall off from another car. But in this instance the gentleman had no lady to tumble with.

For almost half the way from Kenmare, this wild, beautiful road commands views of the famous lake and vast blue mountains about Killarney. Turk, Tomies, and Mangerton were clothed in purple like kings in mourning; great, heavy clouds were gathered round their heads, parting away every now and then, and leaving their noble features bare. The lake lay for some time underneath us, dark and blue, with dark misty islands in the midst. On the right-hand side of the road would be a precipice covered with a thousand trees, or a green rocky flat, with a reedy mere in the midst, and other mountains rising as far as we could see. I think of that diabolical tune in *Der Freischütz*, while passing through this sort of country. Every now and then, in the midst of some fresh country or enclosed trees, or at a turn of the road, you lose the sight of the great, big, awful mountain; but, like the aforesaid tune in *Der Freischütz*, it is always there close at hand. You feel that it keeps you company. And so it was that we rode by dark old Mangerton, then presently past Mucruss, and then through two miles of avenues of lime-trees, by numerous lodges and gentlemen's seats, across an old bridge, where you see the mountains again and the lake, until, by Lord Kenmare's house, a hideous row of houses informed us that we were at Killarney.

Here my companion suddenly let go my hand, and, by a certain uneasy motion of the waist, gave me notice to withdraw the other too; and so we rattled up to the Kenmare Arms; and so ended, not without a sigh on my part, one of the merriest six-hour rides that five yachtsmen, one cockney, five women and a child, the carman, and a countryman with an alpeen, ever took in their lives.

As for my fellow-companion, she would hardly speak the next day; but all the five maritime men made me vow and promise that I would go and see them at Cork, where I should have horses to ride, the fastest yacht out of the harbour to sail in, and the best of whisky, claret, and welcome. Amen, and may every single person who buys a copy of this book meet with the same deserved fate!

The town of Killarney was in a violent state of excitement with a series of horse-races, hurdle-races, boat-races, and stag-hunts by land and water, which were taking place, and attracted a vast crowd from all parts of the

Welcome to our website – the perfect destination for book lovers and knowledge seekers. We believe that every book holds a new world, offering opportunities for learning, discovery, and personal growth. That's why we are dedicated to bringing you a diverse collection of books, ranging from classic literature and specialized publications to self-development guides and children's books.

More than just a book-buying platform, we strive to be a bridge connecting you with timeless cultural and intellectual values. With an elegant, user-friendly interface and a smart search system, you can quickly find the books that best suit your interests. Additionally, our special promotions and home delivery services help you save time and fully enjoy the joy of reading.

Join us on a journey of knowledge exploration, passion nurturing, and personal growth every day!

ebookbell.com