Contents

Preface *xi*

Acknowledgments *xi*

Introduction 1

1.1 Introduction to wireless local area networks (LANs) 1

1.2 The need for standardization 2

1.3 Future trends 3

References 7

Selected Bibliography 8

The IrDA Standard 9

2.1 Introduction to the IrDA— General description 9

2.1.1 The standard protocol stack *11*

2.2 Physical layer (SIR) 13

2.2.1 General description of the physical layer specification *13*

2.2.2 Specifications for signals at bit rates from 2.4 Kbps to 115.2 Kbps *14*

2.2.3 Specifications for signals at bit rates of 0.576 Mbps and 1.152 Mbps *15*

2.2.4 Specifications for signals at bit rates of 4 Mbps *17*

2.2.5 Optical interface characteristics *21*

2.3 Serial infrared link access protocol (IrLAP) 22

2.3.1 Services provided by IrLAP: Connectionless services *24*

2.3.2 Services provided by IrLAP: Connection-oriented services *24*

2.3.3 Configurations and operating characteristics *25*

2.3.4 IrLAP frame structure *26*

2.3.5 IrLAP frame types *26*

2.4 IRDA link management protocol (IrLMP) 28
2.4.1 Link management multiplexor (LM-MUX) *28*
2.4.2 Information access service (IAS) *33*
2.5 IRDA transport protocol: TinyTP 35
2.5.1 TinyTP frames format *36*
2.5.2 Flow control *36*
2.6 LAN access extensions for link management protocol: IrLAN 38
2.6.1 IrLAN general description *38*
2.6.2 Access methods *39*
2.6.3 Frames size and format *41*
References 43

The IEEE 802.11 Standard **45**
3.1 Introduction to IEEE 802.11: General description 45
3.2 Medium access control (MAC) for the IEEE 802.11 wireless LANs (WLANs) 47
3.2.1 Expected features of a WLAN MAC protocol *48*
3.2.2 The structure of the IEEE standard MAC protocol *54*
3.2.3 Comparison with the MAC protocol of other WLANs: HIPERLAN *65*
3.2.4 Conclusions *69*
3.3 Physical layer for IEEE 802.11 wireless LANs: Radio systems 69
3.3.1 Introduction *69*
3.3.2 Spread spectrum techniques *71*
3.3.3 Frequency hopping techniques *72*
3.3.4 Direct sequence systems *75*
3.3.5 IEEE 802.11 frequency hopping physical layer *83*
3.3.6 IEEE 802.11 direct sequence physical layer *89*
3.3.7 Comparison of the FHSS and DSSS physical layers *93*
3.4 Physical layer for IEEE 802.11 wireless LANS: Infrared systems 96
3.4.1 Description *96*
3.4.2 The physical layer convergence procedure (IR-PLCP) *97*
3.4.3 The IR physical medium sublayer (IR-PMD) *99*
3.5 Conclusions and applications 104
References 105

The HIPERLAN Standard 109
4.1 Introduction: Terminology 109
4.2 Physical layer (PHY) 113
4.2.1 Introduction *113*
4.2.2 *Transmission characteristics* *114*
4.2.3 *Data bursts* *116*
4.2.4 Channel access bursts *118*
4.2.5 Receiver characteristics *118*
4.2.6 Compatibility between transmitter and receiver classes *119*
4.2.7 Establishing a defer threshold *119*
4.3 HIPERLAN channel access control (CAC) 121
4.3.1 Generalities *121*
4.3.2 HIPERLAN CAC protocol data units (HCPDUs) *122*
4.3.3 Channel access *124*
4.3.4 Channel access in the free channel condition *126*
4.3.5 Channel access in the synchronized channel condition *127*
4.3.6 Hidden node detection and operation *130*
4.4 HIPERLAN medium access control (MAC) 131
4.4.1 HIPERLAN MAC functions *131*
4.4.2 HIPERLAN differentiation and addressing *132*
4.4.3 Data encryption *133*
4.4.4 Power-saving function *133*
4.4.5 MAC information databases *135*
4.4.6 Priorities and traffic lifetime *137*
4.4.7 Types of HMPDUs *139*
4.4.8 Look-up function: LR-HMPDU and LC-HMPDU *139*
4.4.9 IP-HMPDU and GP-HMPDU *140*
4.4.10 DT-HMPDU *140*
4.4.11 TC-HMPDU and HO-HMPDU *141*
4.4.12 Routing functions and information maintenance *142*
4.5 Conclusions on HIPERLAN type 1 146
4.6 Future BRAN standards 147
References 148
Selected Bibliography 149

Application Scenarios 151
5.1 Introduction 151

5.2 The application scenarios 152
5.2.1 Public buildings 152
5.2.2 Business environment 158
5.2.3 Domestic buildings (the home) 159
5.2.4 Industrial sector 160
5.3 Wireless LAN technologies and products 161
5.3.1 The RF market 161
5.3.2 The IR market 168
5.4 Conclusions 176
References 177
Selected Bibliography 177
Appendix 5A: IrDA membership 178

Upcoming Standards and Future Trends 183
6.1 Introduction: Is the future wireless? 183
6.2 The evolution of HIPERLAN 186
6.3 The evolution of IEEE 802.11 188
6.4 Forthcoming IR standards 190
6.4.1 IrDA new techniques 190
6.4.2 Interconnection for wireless networks 195
6.4.3 New techniques for diffuse links: Spread spectrum 197
6.5 Other RF standards: DECT, Bluetooth, WATM, HomeRF, etc. 200
6.5.1 Introduction 200
6.5.2 Digital enhanced cordless telecommunications (DECT) 201
6.5.3 Bluetooth 203
6.5.4 Wireless ATM 206
6.5.5 HomeRF 207
6.6 Conclusions 209
References 209

Glossary 213

About the Author 223

Index 225