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CONTENTS

FOREWORD.....	20
INTRODUCTION.....	22
1 Scope.....	24
1.1 General.....	24
1.2 Specifications.....	24
1.3 Conformance.....	25
2 Normative references.....	25
3 Terms, definitions, abbreviations, symbols and conventions.....	27
3.1 Referenced terms and definitions.....	27
3.2 Additional terms and definitions for distributed automation.....	28
3.3 Additional terms and definitions for decentralized periphery.....	30
3.4 Additional abbreviations and symbols for distributed automation.....	37
3.5 Additional abbreviations and symbols for decentralized periphery.....	38
3.6 Additional abbreviations and symbols for media redundancy.....	39
3.7 Conventions.....	39
3.8 Conventions used in state machines.....	46
4 Application layer protocol specification for common protocols.....	49
4.1 FAL syntax description.....	49
4.2 Transfer syntax.....	52
4.3 Discovery and basic configuration.....	64
4.4 Precision time control.....	96
4.5 Media redundancy.....	162
4.6 Real-time cyclic.....	187
4.7 Real-time acyclic.....	206
4.8 Remote procedure call.....	219
4.9 Link layer discovery.....	236
4.10 MAC bridges.....	244
4.11 Virtual bridges.....	259
4.12 IP suite.....	269
4.13 Domain name system.....	273
4.14 Dynamic host configuration.....	273
4.15 Simple network management.....	273
4.16 Common DLL Mapping Protocol Machines.....	283
5 Application layer protocol specification for distributed automation.....	290
5.1 FAL syntax description.....	290
5.2 Transfer syntax.....	315
5.3 FAL protocol state machines.....	317
5.4 AP Context State Machine.....	318
5.5 FAL Service Protocol Machines.....	319
5.6 Application Relationship Protocol Machine (ARPM).....	418
5.7 DLL Mapping Protocol Machines.....	422
5.8 Protocol options.....	426
6 Application layer protocol specification for decentralized periphery.....	426
6.1 FAL syntax description.....	426
6.2 Transfer syntax.....	439
6.3 FAL protocol state machines.....	575

6.4	AP-Context state machine	577
6.5	FAL Service Protocol Machines	577
6.6	Application Relationship Protocol Machines	659
6.7	DLL Mapping Protocol Machines	739
Annex A (informative)	Filtering Data Base.....	740
Annex B (informative)	Establishing of a companion AR.....	743
Annex C (informative)	Establishing of a device access AR.....	744
Annex D (informative)	Establishing of an AR (simple procedure).....	745
Annex E (informative)	Establishing of an AR (accelerated procedure).....	746
Annex F (informative)	Establishing of an AR (fast startup procedure).....	749
Annex G (informative)	Example of the upload, storage, and retrieval procedure.....	750
Annex H (informative)	Establishing of an AR using RT_CLASS_3 CRs	753
Annex I (informative)	Overview of the AlarmCRs.....	754
Annex J (informative)	OSI reference model layers	756
Annex K (informative)	Overview of the IO device state machines.....	757
Annex L (informative)	Overview of the IO controller state machines.....	758
Annex M (informative)	Priority regeneration	759
Annex N (informative)	Overview of the synchronization master hierarchy.....	760
Annex O (informative)	Adapted baggy pants model of the IEEE 802.1D	762
Annex P (informative)	Optimization of bandwidth usage.....	765
Annex Q (informative)	Time constraints for bandwidth allocation.....	767
Annex R (informative)	Optimization for fast startup without autonegotiation	769
Annex S (informative)	TX-error handling	771
	Bibliography.....	772
Figure 1	– Common structure of specific fields.....	43
Figure 2	– Common structure of specific fields for octet 1 (high)	44
Figure 3	– Common structure of specific fields for octet 2 (low)	44
Figure 4	– Common structure of specific fields for octet 1 (high)	45
Figure 5	– Common structure of specific fields for octet 2.....	45
Figure 6	– Common structure of specific fields for octet 3.....	45
Figure 7	– Common structure of specific fields for octet 4 (low)	46
Figure 8	– Coding of the data type BinaryDate.....	54
Figure 9	– Encoding of Time Of Day value	54
Figure 10	– Encoding of Time Difference value	55
Figure 11	– Encoding of Network Time value	55
Figure 12	– Encoding of Network Time Difference value	56
Figure 13	– Timescale correspondence between PTCP_Time and CycleCounter	102
Figure 14	– Message timestamp point.....	107
Figure 15	– Four message timestamps	108
Figure 16	– Line delay protocol with follow up.....	109
Figure 17	– Line delay protocol without follow up.....	109
Figure 18	– Line delay measurement	111
Figure 19	– Model parameter for GSDML usage	112

Figure 20 – Bridge delay measurement.....	113
Figure 21 – Delay accumulation.....	113
Figure 22 – Worst case accumulated time deviation of synchronization	114
Figure 23 – Scheme for measurement of deviation	115
Figure 24 – Measurement of deviation	115
Figure 25 – Sending Sync-Frame without Follow Up-Frame	116
Figure 26 – Sending Sync- Frame with FollowUp-Frame	116
Figure 27 – Forwarding Sync- and FollowUp-Frame.....	117
Figure 28 – Transition between Synchronization Variants	118
Figure 29 – State transition diagram of delay request	119
Figure 30 – State transition diagram of delay response.....	125
Figure 31 – Overview of PTCP.....	130
Figure 32 – State transition diagram of BMA.....	131
Figure 33 – State transition diagram of MPSM	143
Figure 34 – State transition diagram of SPSM.....	149
Figure 35 – State transition diagram of SRPM	155
Figure 36 – State transition diagram of SCHEDULER.....	160
Figure 37 – MRM protocol machine for MRP	166
Figure 38 – MRC protocol machine	173
Figure 39 – State transition diagram of RRT_RELAY.....	184
Figure 40 – CycleCounter value range	189
Figure 41 – Structure of the CycleCounter.....	190
Figure 42 – Optimized CycleCounter setting	191
Figure 43 – State transition diagram for generating events	251
Figure 44 – State transition diagram of RED RELAY	255
Figure 45 – State transition diagram of MUX.....	261
Figure 46 – State transition diagram of DEMUX	266
Figure 47 – Structuring of the protocol machines within the DMPM (bridge).....	284
Figure 48 – Error message structure.....	290
Figure 49 – Coding scheme of ITEMQUALITYDEF.....	295
Figure 50 – Relationship among protocol machines	318
Figure 51 – State transition diagram of FSPM.....	333
Figure 52 – State transition diagram of ARPM	420
Figure 53 – State transition diagram of DMPM	425
Figure 54 – FrameSendOffset vs. duration of a cycle	477
Figure 55 – Classification of diagnosis, maintenance and qualified	511
Figure 56 – Definition of the reserved interval.....	531
Figure 57 – Definition of PLL window	534
Figure 58 – Detection of dropped frames — appear	542
Figure 59 – Detection of dropped frames — disappear.....	542
Figure 60 – Relationship among Protocol Machines	576
Figure B.1 – Establishing of a companion AR	743
Figure C.1 – Establishing of a device access AR	744

Figure D.1 – Accelerated establishing of an IOAR (simple procedure).....	745
Figure E.1 – Accelerated establishing of an IOAR without error	747
Figure E.2 – Accelerated establishing of an IOAR with “late” error	748
Figure F.1 – Establishing of an IOAR using fast startup	749
Figure G.1 – Example of upload with storage.....	751
Figure G.2 – Example of retrieval with storage.....	752
Figure H.1 – Establishing of an AR using RT_CLASS_3 CRs	753
Figure I.1 – Overview of an AlarmCR using high priority	754
Figure I.2 – Overview of an AlarmCR using low priority.....	755
Figure J.1 – Assignment of the OSI reference model layers	756
Figure K.1 – Overview of the IO device state machines	757
Figure L.1 – Overview of the IO controller state machines	758
Figure N.1 – Level model for synchronization master hierarchy.....	760
Figure N.2 – Two level variant of the synchronization master hierarchy.....	761
Figure O.1 – Adapted baggy pants model of the IEEE 802.1D.....	762
Figure O.2 – Adapted baggy pants model of the IEEE 802.1D for a frame transmitter	763
Figure O.3 – Adapted baggy pants model of the IEEE 802.1D for a frame receiver	764
Figure P.1 – Devices build up in a linear structure	765
Figure P.2 – Propagation of frames in linear transmit direction	765
Figure P.3 – Propagation of a frames in receive direction.....	766
Figure Q.1 – Overview of time constraints for bandwidth allocation.....	767
Figure Q.2 – Calculation of the length of a period.....	767
Figure R.1 – Scheme of a 2-port switch	769
Figure R.2 – Scheme of 2-ports	769
Table 1 – State machine description elements	46
Table 2 – Description of state machine elements	47
Table 3 – Conventions used in state machines	47
Table 4 – IEEE 802.3 DLPDU syntax	49
Table 5 – IEEE 802.11 DLPDU syntax	50
Table 6 – IEEE 802.15.1 DLPDU syntax	50
Table 7 – SourceAddress.....	57
Table 8 – DCP_MulticastMACAdd	57
Table 9 – PTCP_MulticastMACAdd range 1	57
Table 10 – PTCP_MulticastMACAdd range 2	58
Table 11 – PTCP_MulticastMACAdd range 3	58
Table 12 – PTCP_MulticastMACAdd range 4	58
Table 13 – PTCP_MulticastMACAdd range 5	58
Table 14 – PTCP_MulticastMACAdd range 6	59
Table 15 – PTCP_MulticastMACAdd range 7	59
Table 16 – PTCP_MulticastMACAdd range 8	59
Table 17 – MRP Organizationally Unique Identifier (OUI).....	59
Table 18 – MRPMulticastMACAdd	60

Table 19 – LT (Length/Type).....	60
Table 20 – TagControllInformation.Priority.....	61
Table 21 – FrameID range 1	61
Table 22 – FrameID range 2	61
Table 23 – FrameID range 3	62
Table 24 – FrameID range 4	62
Table 25 – FrameID range 5	62
Table 26 – FrameID range 6	62
Table 27 – FrameID range 7	62
Table 28 – FrameID range 8	63
Table 29 – FrameID range 9	63
Table 30 – FrameID range 10	63
Table 31 – FrameID range 11	63
Table 32 – FrameID range 12	64
Table 33 – FrameID range 13	64
Table 34 – DCP APDU syntax.....	64
Table 35 – DCP substitutions.....	66
Table 36 – ServiceID	68
Table 37 – ServiceType for request	68
Table 38 – ServiceType for response.....	68
Table 39 – ResponseDelayFactor	69
Table 40 – List of options.....	70
Table 41 – List of suboptions for option IPOption.....	70
Table 42 – List of suboptions for option DevicePropertiesOption.....	70
Table 43 – List of suboptions for option DHCPOption.....	70
Table 44 – List of suboptions for option ControlOption	71
Table 45 – List of suboptions for option DeviceInitiativeOption.....	71
Table 46 – List of suboptions for option AllSelectorOption	71
Table 47 – List of suboptions for option ManufacturerSpecificOption.....	71
Table 48 – SuboptionDHCP	73
Table 49 – Coding of DCPBlocklength in conjunction with SuboptionStart.....	74
Table 50 – Coding of DCPBlocklength in conjunction with SuboptionStop	74
Table 51 – Coding of DCPBlocklength in conjunction with SuboptionSignal	74
Table 52 – Coding of DCPBlocklength in conjunction with SuboptionFactoryReset	75
Table 53 – Coding of DCPBlocklength in conjunction with SuboptionDeviceInitiative	75
Table 54 – BlockQualifier with option IP.....	76
Table 55 – BlockQualifier with option DeviceProperties, DHCP, and ManufacturerSpecific	76
Table 56 – BlockError	77
Table 57 – BlockInfo for SuboptionIPParameter	77
Table 58 – Bit 1 and Bit 0 of BlockInfo for SuboptionIPParameter	77
Table 59 – Bit 7 of BlockInfo for SuboptionIPParameter	77
Table 60 – BlockInfo for all other suboptions	78

Table 61 – DeviceInitiativeValue	78
Table 62 – SignalValue	78
Table 63 – DeviceRoleDetails	80
Table 64 – IPAddress	80
Table 65 – Subnetmask	81
Table 66 – StandardGateway	82
Table 67 – DCPUCS state table	85
Table 68 – DCPUCR state table	89
Table 69 – DCPMCS state table	91
Table 70 – DCPMCR state table	93
Table 71 – DCPHMCS state table	95
Table 72 – DCPHMCR state table	96
Table 73 – PTCP APDU syntax	96
Table 74 – PTCP substitutions	97
Table 75 – PTCP_TLVHeader.Type	98
Table 76 – PTCP_Delay10ns	98
Table 77 – PTCP_Delay1ns_Byte.Value	98
Table 78 – PTCP_Delay1ns	99
Table 79 – PTCP_Delay1ns_FUP	99
Table 80 – PTCP_SequenceID	99
Table 81 – PTCP_SubType for OUI (=00-0E-CF)	100
Table 82 – PTCP_NanoSeconds	100
Table 83 – PTCP_Flags_LeapSecond	101
Table 84 – Timescale correspondence between MJD, UTC, and PTCP_EpochNumber	101
Table 85 – Timescale correspondence between PTCP_EpochNumber, PTCP_Second, PTCP_Nanosecond, CycleCounter, and SendClockFactor	101
Table 86 – PTCP_MasterPriority1.Priority for SyncID == 0 and SyncProperties.Role == 2	103
Table 87 – PTCP_MasterPriority1.Priority for SyncID == 0 and SyncProperties.Role == 1	103
Table 88 – PTCP_MasterPriority1.Priority for SyncID == 1 and SyncProperties.Role == 2	103
Table 89 – PTCP_MasterPriority1.Priority for SyncID == 1 and SyncProperties.Role == 1	103
Table 90 – PTCP_MasterPriority1.Level	103
Table 91 – PTCP_MasterPriority2	104
Table 92 – PTCP_ClockClass for SyncID == 0 (clock synchronization)	104
Table 93 – PTCP_ClockClass for SyncID == 1 (time synchronization)	105
Table 94 – PTCP_ClockAccuracy	106
Table 95 – PTCP_ClockVariance	106
Table 96 – PTCP_T2TimeStamp	107
Table 97 – DelayRequest state table	121
Table 98 – Macros used by DelayRequest	124
Table 99 – Functions used by DelayRequest	124
Table 100 – DelayResponse state table	127

Table 101 – Macros used by DelayResponse.....	128
Table 102 – Functions used by DelayResponse.....	129
Table 103 – BMA state table.....	133
Table 104 – BMA best remote sync master (RSM) state table.....	137
Table 105 – BMA get best sync master (GBSM) state table.....	139
Table 106 – Macros used by BMA.....	141
Table 107 – Functions used by BMA.....	142
Table 108 – MPSM state table.....	144
Table 109 – Macros used by MPSM.....	147
Table 110 – Functions used by MPSM.....	148
Table 111 – SPSM state table.....	150
Table 112 – Macros used by SPSM.....	153
Table 113 – Functions used by SPSM.....	154
Table 114 – SRPM state table.....	156
Table 115 – Macros used by SRPM.....	157
Table 116 – Functions used by the SRPM.....	158
Table 117 – Truth table for one SyncID.....	159
Table 118 – SCHEDULER state table.....	161
Table 119 – Functions used by the SCHEDULER.....	162
Table 120 – MRP APDU syntax.....	162
Table 121 – MRP substitutions.....	163
Table 122 – MRP_TLVHeader.Type.....	163
Table 123 – MRP_Prio.....	164
Table 124 – MRP_PortRole.....	164
Table 125 – MRP_RingState.....	164
Table 126 – MRP_Interval.....	165
Table 127 – MRP_Transition.....	165
Table 128 – MRP_TimeStamp.....	165
Table 129 – MRP_DomainUUID.....	165
Table 130 – Local variables of MRM protocol machine.....	167
Table 131 – MRM state machine.....	168
Table 132 – Local variables of MRC protocol machine.....	174
Table 133 – MRC state machine.....	175
Table 134 – Functions.....	180
Table 135 – FDB Clear Timer.....	182
Table 136 – Topology Change Timer.....	183
Table 137 – RRT_RELAY state table.....	185
Table 138 – Macros used by RRT_RELAY.....	187
Table 139 – RTC APDU syntax.....	187
Table 140 – RTC substitutions.....	188
Table 141 – CycleCounter Difference.....	189
Table 142 – DataStatus.State.....	191
Table 143 – DataStatus.Redundancy.....	192

Table 144 – DataStatus.DataValid	192
Table 145 – DataStatus.ProviderState	192
Table 146 – DataStatus.StationProblemIndicator	192
Table 147 – DataStatus.reserved_3	192
Table 148 – DataStatus.Ignore of a frame.....	193
Table 149 – TransferStatus for RT_CLASS_3.....	193
Table 150 – IOxS.Extension.....	194
Table 151 – IOCS.Instance.....	194
Table 152 – IOxS.DataState	194
Table 153 – PPM state table.....	197
Table 154 – Functions used by the PPM.....	200
Table 155 – CPM state table.....	202
Table 156 – Functions used by the CPM.....	206
Table 157 – RTA APDU syntax	206
Table 158 – RTA substitutions	207
Table 159 – PDUType.Type	208
Table 160 – PDUType.Version.....	208
Table 161 – VarPartLen	209
Table 162 – APMS state table.....	211
Table 163 – Functions used by the APMS and APMR.....	214
Table 164 – A_Timer_add.....	214
Table 165 – A_Timer_event.....	215
Table 166 – A_Timer_remove.....	215
Table 167 – APMR state table.....	217
Table 168 – RPC APDU syntax.....	219
Table 169 – RPC substitutions.....	220
Table 170 – RPCPacketType.....	221
Table 171 – RPCFlags.....	221
Table 172 – RPCFlags2.....	222
Table 173 – RPCDRep.Character- and IntegerEncoding.....	222
Table 174 – RPCDRep Octet 2 – Floating Point Representation	223
Table 175 – RPCObjectUUID.Data4.....	223
Table 176 – RPCObjectUUID for PNIO	224
Table 177 – RPCInterfaceUUID for PNIO.....	224
Table 178 – RPCInterfaceUUID for the RPC end point mapper	224
Table 179 – RPCOperationNmb (IO device, controller and supervisor)	226
Table 180 – RPCOperationNmb for endpoint mapper.....	226
Table 181 – RPCDataRepresentationUUID – defined values.....	228
Table 182 – RPCInquiryType	229
Table 183 – RPCEPMapStatus	231
Table 184 – Values of NCAFaultStatus	234
Table 185 – Values of NCARejectStatus	235
Table 186 – LLDP APDU syntax	236

Table 187 – LLDP substitutions	237
Table 188 – LLDP_PNIO_SubType	238
Table 189 – PTCP_PortRxDelayLocal	239
Table 190 – PTCP_PortRxDelayRemote	239
Table 191 – PTCP_PortTxDelayLocal	239
Table 192 – PTCP_PortTxDelayRemote	239
Table 193 – CableDelayLocal	240
Table 194 – RTClass2_PortStatus.State	240
Table 195 – RTClass3_PortStatus.State	240
Table 196 – MRRT_PortStatus.State	241
Table 197 – LLDP_RedOrangePeriodBegin.Offset	241
Table 198 – LLDP_RedOrangePeriodBegin.Valid	241
Table 199 – LLDP_OrangePeriodBegin.Offset	242
Table 200 – LLDP_OrangePeriodBegin.Valid	242
Table 201 – LLDP_GreenPeriodBegin.Offset	242
Table 202 – LLDP_GreenPeriodBegin.Valid	243
Table 203 – LLDP_LengthOfPeriod.Length	243
Table 204 – LLDP_LengthOfPeriod.Valid	243
Table 205 – Primitives issued by LLDP to RTC3PSM	245
Table 206 – Primitives issued by IEEE 802.3 to RTC3PSM	245
Table 207 – Primitives issued by PTCP to RTC3PSM	245
Table 208 – Primitives issued by IEEE 802.1D to RTC3PSM	245
Table 209 – Primitives issued by RTC3PSM to IEEE 802.1D	245
Table 210 – RTC3PSM state table	246
Table 211 – RTC3PSM function table	250
Table 212 – Event function table	251
Table 213 – Primitives issued by LLDP to RTC2PSM	252
Table 214 – Primitives issued by IEEE 802.3 to RTC2PSM	252
Table 215 – Primitives issued by PTCP to RTC2PSM	252
Table 216 – Primitives issued by IEEE 802.1D to RTC2PSM	252
Table 217 – Primitives issued by RTC2PSM to IEEE 802.1D	252
Table 218 – RTC2PSM state table	253
Table 219 – RTC2PSM function table	255
Table 220 – RED RELAY state table	257
Table 221 – RED RELAY function table	259
Table 222 – RED RELAY macro table	259
Table 223 – Primitives issued by MUX to MAC	260
Table 224 – Primitives issued by MAC to MUX	260
Table 225 – MUX state table	262
Table 226 – MUX function table	264
Table 227 – Primitives issued by MAC to DEMUX	265
Table 228 – DEMUX state table	267
Table 229 – DEMUX function table	268

Table 230 – DEMUX macro table	269
Table 231 – IP/UDP APDU syntax	269
Table 232 – IP/UDP substitutions	270
Table 233 – UDP_SrcPort.....	271
Table 234 – UDP_DstPort.....	271
Table 235 – IP_DstIPAddress	271
Table 236 – IP Multicast DstIPAddress according to RFC 2365	272
Table 237 – Enterprise number.....	273
Table 238 – LMPM state table	286
Table 239 – LMPM macros table.....	289
Table 240 – LMPM function table.....	289
Table 241 – Error messages	291
Table 242 – VARTYPE values.....	294
Table 243 – ITEMQUALITYDEF values	296
Table 244 – STATEDEF values.....	299
Table 245 – GROUPEXCEPTIONDEF values	299
Table 246 – ACCESSRIGHTSDEF values.....	299
Table 247 – PERSISTDEF values	299
Table 248 – UUID values	303
Table 249 – Data format for serialized connection data.....	316
Table 250 – Calculation of the RT reference data size	317
Table 251 – Primitives issued by FAL User to FSPM.....	320
Table 252 – Primitives issued by FSPM to FAL User.....	327
Table 253 – FSPM state descriptions.....	333
Table 254 – FSPM state table.....	334
Table 255 – Primitives issued by FSPM to ARPM	419
Table 256 – Primitives issued by ARPM to FSPM	419
Table 257 – Parameters used with primitives exchanged between FSPM and ARPM	420
Table 258 – ARPM state descriptions	420
Table 259 – ARPM state table	420
Table 260 – Primitives issued by ARPM to DMPM	422
Table 261 – Primitives issued by DMPM to ARPM	423
Table 262 – Parameters used with primitives exchanged between ARPM and DMPM	423
Table 263 – Primitives issued by DMPM to ORPC model	424
Table 264 – Primitives issued by ORPC model to DMPM	424
Table 265 – Parameters used with primitives exchanged between DMPM and ORPC model	425
Table 266 – DMPM state descriptions.....	425
Table 267 – DMPM state table.....	426
Table 268 – IO APDU substitutions.....	428
Table 269 – BlockType	440
Table 270 – BlockVersionHigh	444
Table 271 – BlockVersionLow.....	444

Table 272 – AlarmType	445
Table 273 – AlarmSpecifier.ChannelDiagnosis	446
Table 274 – AlarmSpecifier.ManufacturerSpecificDiagnosis	446
Table 275 – AlarmSpecifier.SubmoduleDiagnosisState	446
Table 276 – AlarmSpecifier.ARDiagnosticsState	447
Table 277 – API	447
Table 278 – SlotNumber	447
Table 279 – SubslotNumber	448
Table 280 – Grouping of DiagnosisData	450
Table 281 – Index (user specific)	451
Table 282 – Index (subslot specific)	452
Table 283 – Index (slot specific)	453
Table 284 – Index (AR specific)	454
Table 285 – Index (API specific)	455
Table 286 – Index (device specific)	456
Table 287 – ARType	457
Table 288 – IOCRMulticastMACAdd using RT_CLASS_UDP	458
Table 289 – IOCRMulticastMACAdd using RT_CLASS_2 or RT_CLASS_3	458
Table 290 – Type 10 OUI	458
Table 291 – ARProperties.State	459
Table 292 – ARProperties.SupervisorTakeoverAllowed	459
Table 293 – ARProperties.ParametrizationServer	459
Table 294 – ARProperties.DeviceAccess	459
Table 295 – ARProperties.CompanionAR	460
Table 296 – ARProperties.AcknowledgeCompanionAR	460
Table 297 – ARProperties.PullModuleAlarmAllowed	460
Table 298 – IOCRProperties.RTClass	461
Table 299 – IOCRProperties.MediaRedundancy	461
Table 300 – IOCRTagHeader.IOCRVLANID	462
Table 301 – IOCRTagHeader.IOUserPriority	462
Table 302 – IOCRType	462
Table 303 – CMInitiatorActivityTimeoutFactor with ARProperties.DeviceAccess:=0	462
Table 304 – CMInitiatorActivityTimeoutFactor with ARProperties.DeviceAccess:=1	463
Table 305 – LengthIOCS	463
Table 306 – LengthIOPS	464
Table 307 – AlarmCRProperties.Priority	464
Table 308 – AlarmCRProperties.Transport	464
Table 309 – AlarmCRTagHeaderHigh.AlarmCRVLANID	465
Table 310 – AlarmCRTagHeaderHigh.AlarmUserPriority	465
Table 311 – AlarmCRTagHeaderLow.AlarmCRVLANID	465
Table 312 – AlarmCRTagHeaderLow.AlarmUserPriority	465
Table 313 – AlarmSequenceNumber	466
Table 314 – AlarmCRType	466

Table 315 – RTATimeoutFactor	466
Table 316 – RTARetries.....	466
Table 317 – AddressResolutionProperties.Protocol.....	467
Table 318 – AddressResolutionProperties.Factor.....	467
Table 319 – MCITimeoutFactor.....	468
Table 320 – ModuleIdentNumber	468
Table 321 – SubmoduleIdentNumber	469
Table 322 – ControlBlockProperties in conjunction with ControlCommand.ApplicationReady	470
Table 323 – ControlBlockProperties in conjunction with the other values of the field ControlCommand.....	470
Table 324 – ControlCommand.PrmEnd	471
Table 325 – ControlCommand.ApplicationReady.....	471
Table 326 – ControlCommand.Release	471
Table 327 – ControlCommand.Done	471
Table 328 – ControlCommand.ReadyForCompanion.....	471
Table 329 – ControlCommand.ReadyForRT_CLASS_3	472
Table 330 – DataDescription.Type	472
Table 331 – Values of SendClockFactor	473
Table 332 – Values of ReductionRatio	474
Table 333 – Values of Phase	475
Table 334 – Values of Sequence	475
Table 335 – DataHoldFactor of a frame	476
Table 336 – WatchdogFactor of a frame.....	476
Table 337 – Values of FrameSendOffset.....	476
Table 338 – Values of ErrorCode for negative responses.....	478
Table 339 – Values of ErrorDecode	478
Table 340 – Coding of ErrorCode1 with ErrorDecode PNIORW.....	479
Table 341 – Values of ErrorCode1 and ErrorCode2 for ErrorDecode with the value PNIO	480
Table 342 – Values of ErrorCode2 for ErrorCode1 = RPC.....	486
Table 343 – ModuleState	486
Table 344 – SubmoduleState.AddInfo	487
Table 345 – SubmoduleState.QualifiedInfo	487
Table 346 – SubmoduleState.MaintenanceRequired	487
Table 347 – SubmoduleState.MaintenanceDemanded	487
Table 348 – SubmoduleState.DiagInfo	488
Table 349 – SubmoduleState.ARInfo	488
Table 350 – SubmoduleState.IdentInfo	488
Table 351 – SubmoduleState.FormatIndicator.....	488
Table 352 – SubmoduleState.Detail	489
Table 353 – SubmoduleProperties.Type.....	489
Table 354 – SubmoduleProperties.SharedInput	490
Table 355 – SubmoduleProperties.ReduceInputSubmoduleDataLength	490

Table 356 – SubmoduleProperties.ReduceOutputSubmoduleDataLength.....	490
Table 357 – SubmoduleProperties.DiscardIOXS	490
Table 358 – SubstitutionMode.....	491
Table 359 – SubstituteActiveFlag.....	491
Table 360 – InitiatorUDPRTPort.....	492
Table 361 – ResponderUDPRTPort.....	492
Table 362 – InitiatorRPCServerPort	492
Table 363 – ResponderRPCServerPort.....	493
Table 364 – IM_Hardware_Revision.....	493
Table 365 – IM_SWRevision_Functional_Enhancement.....	494
Table 366 – IM_SWRevision_Bug_Fix	494
Table 367 – IM_SWRevision_Internal_Change	494
Table 368 – IM_Revision_Counter	494
Table 369 – IM_Profile_ID	494
Table 370 – IM_Profile_Specific_Type	495
Table 371 – IM_Version_Major	495
Table 372 – IM_Version_Minor	495
Table 373 – IM_Date	496
Table 374 – UserStructureIdentifier	498
Table 375 – ChannelErrorType	500
Table 376 – ChannelNumber	501
Table 377 – ChannelProperties_Type	502
Table 378 – Valid combinations within ChannelProperties.....	503
Table 379 – Valid combinations for Alarmnotification and RecordDataRead(DiagnosisData)	504
Table 380 – ChannelProperties.Specifier.....	505
Table 381 – ChannelProperties.Direction.....	505
Table 382 – ExtChannelErrorType	505
Table 383 – ExtChannelErrorType for ChannelErrorType 0 – 0x7FFF	505
Table 384 – ExtChannelErrorType for ChannelErrorType “Data transmission impossible”	506
Table 385 – ExtChannelErrorType for ChannelErrorType “Remote mismatch”.....	506
Table 386 – ExtChannelErrorType for ChannelErrorType “Media redundancy mismatch”	507
Table 387 – ExtChannelErrorType for ChannelErrorType “Sync mismatch” and for ChannelErrorType “Time mismatch”	507
Table 388 – ExtChannelErrorType for ChannelErrorType “Isochronous mode mismatch”	507
Table 389 – ExtChannelErrorType for ChannelErrorType “Multicast CR mismatch”	508
Table 390 – ExtChannelErrorType for ChannelErrorType “Fiber optic mismatch”	508
Table 391 – ExtChannelErrorType for ChannelErrorType “Network component function mismatch”	508
Table 392 – Values for Accumulative Info	509
Table 393 – Values for “Fiber optic mismatch” – “Power Budget”	509
Table 394 – Values for “Network component function mismatch” – “Frame dropped”	509

Table 395 – Values for “Remote mismatch” – “Peer CableDelay mismatch”	510
Table 396 – Values for QualifiedChannelQualifier	510
Table 397 – Values for MaintenanceStatus	511
Table 398 – URRecordIndex	512
Table 399 – URRecordLength	512
Table 400 – LineDelay.Value with LineDelay.FormatIndicator == 0	513
Table 401 – LineDelay.Value with LineDelay.FormatIndicator == 1	513
Table 402 – LineDelay.FormatIndicator	513
Table 403 – RxPort	514
Table 404 – NumberOfTxPortGroups	514
Table 405 – TxPortEntry	515
Table 406 – FrameDetails.SyncFrame	516
Table 407 – FrameDetails.MeaningFrameSendOffset	516
Table 408 – MAUType	517
Table 409 – Valid combinations between MAUType and LinkState	518
Table 410 – CheckSyncMode.CableDelay	518
Table 411 – CheckSyncMode.SyncMaster	519
Table 412 – MAUTypeMode.Check	519
Table 413 – DomainBoundaryIngress	520
Table 414 – DomainBoundaryEgress	521
Table 415 – MulticastBoundary	521
Table 416 – PeerToPeerBoundary	522
Table 417 – DCPBoundary	522
Table 418 – LinkState.Link	523
Table 419 – LinkState.Port	523
Table 420 – MediaType	523
Table 421 – MaxBridgeDelay	524
Table 422 – NumberOfPorts	524
Table 423 – MaxPortTxDelay	524
Table 424 – MaxPortRxDelay	524
Table 425 – MaxLineRxDelay	525
Table 426 – YellowTime	525
Table 427 – StartOfRedFrameID	525
Table 428 – EndOfRedFrameID	526
Table 429 – Dependencies of StartOfRedFrameID and EndOfRedFrameID	526
Table 430 – NumberOfAssignments	526
Table 431 – NumberOfPhases	527
Table 432 – AssignedValueForReservedBegin	527
Table 433 – AssignedValueForOrangeBegin	527
Table 434 – AssignedValueForReservedEnd	528
Table 435 – Values of RedOrangePeriodBegin	528
Table 436 – Dependencies of RedOrangePeriodBegin, OrangePeriodBegin, and GreenPeriodBegin	528

Table 437 – Values of OrangePeriodBegin.....	529
Table 438 – Values of GreenPeriodBegin	529
Table 439 – EtherType	529
Table 440 – SyncProperties.Role	530
Table 441 – SyncProperties.SyncID.....	530
Table 442 – Dependencies of ReservedIntervalBegin and ReservedIntervalEnd	531
Table 443 – SyncSendFactor	531
Table 444 – PTCPTimeoutFactor	532
Table 445 – PTCPTakeoverTimeoutFactor.....	532
Table 446 – PTCPMasterStartupTime	533
Table 447 – PLLWindow	533
Table 448 – TimeDataCycle	534
Table 449 – TimeIOInput	534
Table 450 – TimeIOOutput.....	535
Table 451 – TimeIOInputValid.....	535
Table 452 – TimeIOOutputValid	535
Table 453 – ControllerApplicationCycleFactor.....	535
Table 454 – MRP_Role	536
Table 455 – MRP_RTMode.RTClass1_2.....	536
Table 456 – MRP_TOPchgT	536
Table 457 – MRP_TOPNRmax.....	537
Table 458 – MRP_TSTshortT.....	537
Table 459 – MRP_TSTdefaultT.....	537
Table 460 – MRP_TSTNRmax	538
Table 461 – MRP_LNKdownT.....	538
Table 462 – MRP_LNKupT	538
Table 463 – MRP_LNKNRmax	539
Table 464 – MRP_RTState	539
Table 465 – MRP_Check.MediaRedundancyManager	539
Table 466 – MRP_Check.MRP_DomainUUID.....	539
Table 467 – VendorBlockType	540
Table 468 – FiberOpticType.....	540
Table 469 – FiberOpticCableType.....	540
Table 470 – FiberOpticPowerBudgetType.Value	541
Table 471 – FiberOpticPowerBudgetType.CheckEnable.....	541
Table 472 – NCDropBudgetType.Value.....	541
Table 473 – NCDropBudgetType.CheckEnable	542
Table 474 – FSHelloMode.Mode	543
Table 475 – FSHelloInterval.....	543
Table 476 – FSHelloRetry	544
Table 477 – FSHelloDelay	544
Table 478 – FSPParameterMode.Mode	544
Table 479 – FSPParameterUUID.....	545

Table 480 – ArgsLength check.....	545
Table 481 – ARBlockReq – request check	547
Table 482 – IOCRBlockReq – request check.....	548
Table 483 – AlarmCRBlockReq – request check	552
Table 484 – ExpectedSubmoduleBlockReq – request check	553
Table 485 – PrmServerBlock – request check	554
Table 486 – MCRBlockReq – request check	555
Table 487 – ARRPCBlockReq – request check	555
Table 488 – ArgsLength check.....	555
Table 489 – ARBlockRes – response check.....	556
Table 490 – IOCRBlockRes – response check	557
Table 491 – AlarmCRBlockRes – response check.....	558
Table 492 – ModuleDiffBlock – response check	559
Table 493 – ArgsLength check.....	560
Table 494 – ControlBlockConnect – request check	560
Table 495 – ControlBlockPlug – request check	561
Table 496 – ArgsLength check.....	561
Table 497 – ControlBlockConnect – response check.....	562
Table 498 – ControlBlockPlug – response check.....	563
Table 499 – ArgsLength check.....	563
Table 500 – ControlBlockConnect – request check	564
Table 501 – ControlBlockPlug – request check	564
Table 502 – ArgsLength check.....	564
Table 503 – ControlBlockConnect – response check.....	565
Table 504 – ControlBlockPlug – response check.....	566
Table 505 – ArgsLength check.....	566
Table 506 – ReleaseBlock – request check.....	567
Table 507 – ArgsLength check.....	567
Table 508 – ReleaseBlock – response check	568
Table 509 – ArgsLength check.....	568
Table 510 – IODWriteReqHeader – request check	569
Table 511 – ArgsLength check.....	569
Table 512 – IODWriteResHeader – response check.....	570
Table 513 – ArgsLength check.....	570
Table 514 – ArgsLength check.....	571
Table 515 – ArgsLength check.....	572
Table 516 – IODReadReqHeader – request check	573
Table 517 – RecordDataReadQuery – request check	573
Table 518 – ArgsLength check.....	574
Table 519 – IODReadResHeader – response check.....	575
Table 520 – Primitives issued by AP-Context (FAL user) to FSPMDEV	579
Table 521 – Primitives issued by FSPMDEV to AP-Context (FAL user)	589
Table 522 – FSPMDEV protocol machine for multicast communication	600

Table 523 – Functions used by AP-Context (FAL user) to FSPMDEV.....	609
Table 524 – Function used by FSPMDEV to AP-Context (FAL user)	613
Table 525 – Primitives issued by AP-Context (FAL user) to FSPMCTL.....	622
Table 526 – Primitives issued by FSPMCTL to AP-Context (FAL user).....	628
Table 527 – Function used by AP-Context (FAL user) to FSPMCTL	638
Table 528 – Functions used by FSPMCTL to AP-Context (FAL user)	650
Table 529 – Primitives issued by FSPMDEV or FSPMCTL to ALPMI	659
Table 530 – Primitives issued by ALPMI to FSPMDEV or FSPMCTL	660
Table 531 – Primitives issued by CMDEV or CMCTL to ALPMI	660
Table 532 – Primitives issued by ALPMI to CMCTL or CMDEV	660
Table 533 – Primitives issued by APMR to ALPMI.....	661
Table 534 – Primitives issued by ALPMI to APMR.....	661
Table 535 – Primitives issued by APMS to ALPMI.....	662
Table 536 – Primitives issued by ALPMI to APMS	662
Table 537 – ALPMI state table	663
Table 538 – Primitives issued by FSPMDEV or FSPMCTL to ALPMR	666
Table 539 – Primitives issued by ALPMR to FSPMDEV or FSPMCTL	667
Table 540 – Primitives issued by CMDEV or CMCTL to ALPMR	667
Table 541 – Primitives issued by ALPMR to CMCTL or CMDEV	667
Table 542 – Primitives issued by APMR to ALPMR	668
Table 543 – Primitives issued by ALPMR to APMR	668
Table 544 – Primitives issued by APMS to ALPMR	669
Table 545 – Primitives issued by ALPMR to APMS	669
Table 546 – ALPMR state table.....	670
Table 547 – Primitives issued by CMCTL to NRPM	675
Table 548 – Primitives issued by NRPM to CMCTL	676
Table 549 – Primitives issued by other machines to NRPM	678
Table 550 – Primitives issued by NRPM to other machines	679
Table 551 – NRPM state table	680
Table 552 – Functions used by the NRPM and RMPM	685
Table 553 – Primitives issued by CMDEV to RMPM	686
Table 554 – Primitives issued by RMPM to CMDEV	687
Table 555 – Primitives issued by RPC to RMPM	687
Table 556 – Primitives issued by RMPM to RPC	688
Table 557 – Primitives issued by other machines to RMPM.....	689
Table 558 – Primitives issued by RMPM to other machines.....	690
Table 559 – RMPM state table	691
Table 560 – Macros used by RMPM.....	699
Table 561 – Primitives issued by FSPMDEV to CMDEV	700
Table 562 – Primitives issued by CMDEV to FSPMDEV	701
Table 563 – CMDEV state table	702
Table 564 – Macros used by CMDEV	714
Table 565 – Variables used by CMDEV.....	714

Table 566 – CMDEV(DA) state table	715
Table 567 – Functions used by CMDEV(DA).....	717
Table 568 – Macros used by CMDEV(DA).....	717
Table 569 – Primitives issued by CMDEV to NRMC	717
Table 570 – Primitives issued by NRMC to CMDEV	718
Table 571 – Primitives issued by CPM to NRMC	718
Table 572 – Primitives issued by NRMC to CPM	718
Table 573 – Primitives issued by other machines to NRMC.....	719
Table 574 – Primitives issued by NRMC to other machines.....	719
Table 575 – NRMC state table	721
Table 576 – Primitives issued by FSPMCTL to CMCTL	726
Table 577 – Primitives issued by CMCTL to FSPMCTL	727
Table 578 – CMCTL state table.....	729
Table A.1 – Unicast FDB entries	740
Table A.2 – Multicast FDB entries	741
Table A.3 – Broadcast FDB entry	742
Table M.1 – Priority regeneration and queue usage.....	759
Table Q.1 – Parameter for the equation	768
Table R.1 – Truth table	770
Table S.1 – TX-error	771

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 6-10: Application layer protocol specification – Type 10 elements

FOREWORD

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International Standard IEC 61158–6–10 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

This second edition cancels and replaces the first edition published in 2007. This edition constitutes a technical revision.

The main changes with respect to the previous edition are listed below:

- corrections;
- improvements;
- optimization of the synchronization;
- optimization of the startup time from power down.

The text of this standard is based on the following documents:

FDIS	Report on voting
65C/607/FDIS	65C/621/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with ISO/IEC Directives, Part 2.

A list of all the parts of the IEC 61158 series, published under the general title *Industrial communication networks – Fieldbus specifications*, can be found on the IEC web site.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

reconfirmed;
withdrawn;
replaced by a revised edition, or
amended.

NOTE The revision of this standard will be synchronized with the other parts of the IEC 61158 series.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

This part of IEC 61158 is one of a series produced to facilitate the interconnection of automation system components. It is related to other standards in the set as defined by the “three-layer” fieldbus reference model described in IEC/TR 61158–1.

The application protocol provides the application service by making use of the services available from the data-link or other immediately lower layer. The primary aim of this standard is to provide a set of rules for communication expressed in terms of the procedures to be carried out by peer application entities (AEs) at the time of communication. These rules for communication are intended to provide a sound basis for development in order to serve a variety of purposes:

- as a guide for implementors and designers;
- for use in the testing and procurement of equipment;
- as part of an agreement for the admittance of systems into the open systems environment;
- as a refinement to the understanding of time-critical communications within OSI.

This standard is concerned, in particular, with the communication and interworking of sensors, effectors and other automation devices. By using this standard together with other standards positioned within the OSI or fieldbus reference models, otherwise incompatible systems may work together in any combination.

NOTE Use of some of the associated protocol types is restricted by their intellectual-property-right holders. In all cases, the commitment to limited release of intellectual-property-rights made by the holders of those rights permits a particular data-link layer protocol type to be used with physical layer and application layer protocols in type combinations as specified explicitly in the IEC 61784 series. Use of the various protocol types in other combinations may require permission of their respective intellectual-property-right holders.

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of patents concerning Type 10 elements and possibly other types given in the normative elements of this standard.

The following patent rights for Type 10 have been announced by [HI]:

WO publication	Title (WO)
WO 99/046908	Local network, especially ethernet network, with redundancy properties and redundancy manager

The following patent rights for Type 10 have been announced by [SI]:

WO publication	Title (WO)
WO 99/046908	Local network, especially ethernet network, with redundancy properties and redundancy manager
WO 00/026731	Automation system and method for accessing the functionality of hardware components
WO 02/043336	System and method for the parallel transmission of real-time critical and non real-time critical data via switched data networks especially ethernet
WO 02/076033	Synchronous, clocked communication system with local input/output components and method for integrating local input/output components into such a system
WO 03/028258	Method for synchronising nodes of a communication system
WO 03/028259	Communications system and method for synchronising a communications cycle
WO 04/030284	Method for permanent redundant transmission of data telegrams in communication systems

IEC takes no position concerning the evidence, validity and scope of these patent rights.

The holder of these patent rights has assured the IEC that he/she is willing to negotiate licences either free of charge or under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of these patent rights is registered with IEC. Information may be obtained from:

[HI]: Hirschmann Automation and Control GmbH
Stuttgarter Straße 45-51
D-72654 Neckartenzlingen
Germany

[SI]: Siemens AG
CT IP L&T
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ISO (www.iso.org/patents) and IEC (http://www.iec.ch/tctools/patent_decl.htm) maintain on-line data bases of patents relevant to their standards. Users are encouraged to consult the data bases for the most up to date information concerning patents.

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INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 6-10: Application layer protocol specification – Type 10 elements

1 Scope

1.1 General

The Fieldbus Application Layer (FAL) provides user programs with a means to access the fieldbus communication environment. In this respect, the FAL can be viewed as a “window between corresponding application programs.”

This standard provides common elements for basic time-critical and non-time-critical messaging communications between application programs in an automation environment and material specific to Type 10 fieldbus. The term “time-critical” is used to represent the presence of a time-window, within which one or more specified actions are required to be completed with some defined level of certainty. Failure to complete specified actions within the time window risks failure of the applications requesting the actions, with attendant risk to equipment, plant and possibly human life.

This standard defines in an abstract way the externally visible behavior provided by the Type 10 fieldbus application layer in terms of

- a) the abstract syntax defining the application layer protocol data units conveyed between communicating application entities,
- b) the transfer syntax defining the application layer protocol data units conveyed between communicating application entities,
- c) the application context state machine defining the application service behavior visible between communicating application entities; and
- d) the application relationship state machines defining the communication behavior visible between communicating application entities; and.

The purpose of this standard is to define the protocol provided to

- a) define the wire-representation of the service primitives defined in IEC 61158-5-10, and
- b) define the externally visible behavior associated with their transfer.

This standard specifies the protocol of the Type 10 fieldbus application layer, in conformance with the OSI Basic Reference Model (ISO/IEC 7498) and the OSI Application Layer Structure (ISO/IEC 9545).

1.2 Specifications

The principal objective of this standard is to specify the syntax and behavior of the application layer protocol that conveys the application layer services defined in IEC 61158-5-10.

A secondary objective is to provide migration paths from previously-existing industrial communications protocols. It is this latter objective which gives rise to the diversity of protocols standardized in IEC 61158–6.

1.3 Conformance

This standard does not specify individual implementations or products, nor does it constrain the implementations of application layer entities within industrial automation systems. Conformance is achieved through implementation of this application layer protocol specification.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60559, *Binary floating-point arithmetic for microprocessor systems*

IEC 61158-5-10:2010¹, *Industrial communication networks – Fieldbus specifications – Application layer service definition – Type 10 elements*

IEC 61784-3-3, *Industrial communication networks – Profiles – Part 3-3: Functional safety fieldbuses – Additional specifications for CPF 3*

ISO/IEC 646:1991, *Information technology – ISO 7-bit coded character set for information interchange*

ISO/IEC 7498-1, *Information technology – Open Systems Interconnection – Basic Reference Model: The Basic Model*

ISO/IEC 8822, *Information technology – Open Systems Interconnection – Presentation service definition*

ISO/IEC 8824-1, *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation*

ISO/IEC 9545, *Information technology – Open Systems Interconnection – Application Layer structure*

ISO/IEC 10731, *Information technology – Open Systems Interconnection – Basic Reference Model – Conventions for the definition of OSI services*

ISO 8601, *Data elements and interchange formats – Information interchange – Representation of dates and times*

IEEE 802-2001, *IEEE Standard for Local and metropolitan area networks: Overview and Architecture*, available at <<http://www.ieee.org>>

IEEE 802.1AB-2005, *IEEE Standard for Local and metropolitan area networks: Station and Media Access Control Connectivity Discovery*, available at <<http://www.ieee.org>>

IEEE 802.1D-2004, *IEEE Standard for Local and metropolitan area networks – Media access control (MAC) Bridges*, available at <<http://www.ieee.org>>

IEEE 802.1Q-2005, *IEEE Standard for Local and metropolitan area networks – Virtual Bridged Local Area Networks*, available at <<http://www.ieee.org>>

¹ To be published.

IEEE 802.3-2005, *IEEE Standard for Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and Physical Layer specifications*, available at <<http://www.ieee.org>>

IEEE 802.11-1999, *IEEE Standard for 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*, available at <<http://www.ieee.org>>

IEEE 802.15.1-2005, *IEEE Standard for Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 15.1: Wireless medium access control (MAC) and physical layer (PHY) specifications for wireless personal area networks (WPANs)*, available at <<http://www.ieee.org>>

IETF RFC 768, *User Datagram Protocol*; available at <<http://www.ietf.org>>

IETF RFC 791, *Internet Protocol*; available at <<http://www.ietf.org>>

IETF RFC 792, *Internet Control Message Protocol*; available at <<http://www.ietf.org>>

IETF RFC 826, *An Ethernet Address Resolution Protocol or Converting Network Protocol Addresses to 48.bit Ethernet Address for Transmission on Ethernet Hardware*; available at <<http://www.ietf.org>>

IETF RFC 1034, *Domain names – concepts and facilities*; available at <<http://www.ietf.org>>

IETF RFC 1112, *Host Extensions for IP Multicasting*; available at <<http://www.ietf.org>>

IETF RFC 1518, *An Architecture for IP Address Allocation with CIDR*, available at <<http://www.ietf.org>>

IETF RFC 1519, *Classless Inter-Domain Routing (CIDR): an Address Assignment and Aggregation Strategy*, available at <<http://www.ietf.org>>

IETF RFC 2131, *Dynamic Host Configuration Protocol*; available at <<http://www.ietf.org>>

IETF RFC 2132, *DHCP Options and BOOTP Vendor Extensions*; available at <<http://www.ietf.org>>

IETF RFC 2365, *Administratively Scoped IP Multicast*; available at <<http://www.ietf.org>>

IETF RFC 2474, *Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers*; available at <<http://www.ietf.org>>

IETF RFC 2674, *Definitions of Managed Objects for Bridges with Traffic Classes, Multicast Filtering and Virtual LAN Extensions*, available at <<http://www.ietf.org>>

IETF RFC 2737, *Entity MIB (Version 2)*, available at <<http://www.ietf.org>>

IETF RFC 2863, *The Interfaces Group MIB*, available at <<http://www.ietf.org>>

IETF RFC 3330, *Special-Use IPv4 Addresses*, available at <<http://www.ietf.org>>

IETF RFC 3418, *Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)*, available at <<http://www.ietf.org>>

IETF RFC 3490, *Internationalizing Domain Names in Applications (IDNA)*; available at <<http://www.ietf.org>>

IETF RFC 3621, *Power Ethernet MIB*, available at <<http://www.ietf.org>>

IETF RFC 4836, *Definitions of Managed Objects for IEEE 802.3 Medium Attachment Units (MAUs)*, available at <<http://www.ietf.org>>

The Open Group — Publication C706, *Technical standard DCE1.1: Remote Procedure Call*, available at <<http://www.opengroup.org/onlinepubs/9629399/toc.htm>>

Withdrawn