

DIN EN 14908-1:2007-11 (E)

Open Data Communication in Building Automation, Controls and Building Management - Building Network Protocol - Part 1: Protocol Stack; English version EN 14908-1:2005

Contents

	page
Foreword	7
Introduction.....	8
1 Scope	9
2 Normative references.....	9
3 Terms and definitions	9
4 Symbols and abbreviations.....	11
4.1 Symbols and Graphical Representations	11
4.2 Abbreviations.....	13
5 Overview of Protocol Layering	13
6 MAC Sublayer	15
6.1 Service Provided	15
6.2 Interface to the Link Layer.....	15
6.3 Interface to the Physical Layer	16
6.4 MPDU Format.....	17
6.5 Predictive <i>p</i> -persistent CSMA — Overview Description	18
6.6 Idle Channel Detection.....	19
6.7 Randomising.....	19
6.8 Backlog Estimation	19
6.9 Optional Priority	20
6.10 Optional Collision Detection	21
6.11 Beta1, Beta2 and Preamble Timings	22
7 Link Layer.....	24
7.1 Assumptions.....	24
7.2 Service Provided	24
7.3 CRC	24
7.4 Transmit Algorithm	25
8 Network Layer.....	25
8.1 Assumptions.....	25
8.2 Service Provided	27
8.3 Service Interface.....	27
8.4 Internal Structuring of the Network Layer	28
8.5 NPDU Format	28
8.6 Address Recognition	29
8.7 Routers	29
8.8 Routing Algorithm	30
8.9 Learning Algorithm — Subnets	30
9 Transaction Control Sublayer	30
9.1 Assumptions.....	30
9.2 Service Provided	31
9.3 Service Interface.....	31
9.4 State Variables.....	31
9.5 Transaction Control Algorithm	32
10 Transport Layer	32
10.1 Assumptions.....	32
10.2 Service Provided	32
10.3 Service Interface.....	34
10.4 TPDU Types and Formats.....	34

10.5	Protocol Diagram.....	35
10.6	Transport Protocol State Variables	36
10.7	Send Algorithm.....	36
10.8	Receive Algorithm.....	37
10.9	Receive Transaction Record Pool Size and Configuration Engineering.....	37
10.9.1	General	37
10.9.2	Number of Retries	37
10.9.3	Transport Layer Timers	39
11	Session Layer	39
11.1	Assumptions.....	39
11.2	Service Provided	40
11.3	Service Interface.....	40
11.4	Internal Structure of the Session Layer	41
11.5	SPDU Types and Formats	41
11.6	Protocol Timing Diagrams.....	43
11.7	Request-Response State Variables	46
11.8	Request-Response Protocol — Client Part	46
11.9	Request-Response Protocol — Server Part	46
11.10	Request-Response Protocol Timers	47
11.11	Authentication Protocol.....	47
11.12	Encryption Algorithm.....	47
11.13	Retries and the Role of the Checksum Function	47
11.14	Random Number Generation	49
11.15	Using Authentication	49
12	Presentation/Application Layer	49
12.1	Assumptions.....	49
12.2	Service Provided	49
12.3	Service Interface.....	50
12.4	APDU Types and Formats	51
12.5	Protocol Diagrams.....	52
12.6	Application Protocol State Variables	54
12.7	Request - Response Messaging in Offline State.....	54
12.8	Network Variables	55
12.8.1	General	55
12.8.2	Network Variable Processing.....	55
12.9	Error Notification to the Application Program	56
12.9.1	General	56
12.9.2	Error Notification for Messages.....	56
12.9.3	Error Notification for Network Variables.....	56
13	Network Management & Diagnostics	56
13.1	Assumptions.....	56
13.2	Services Provided	57
13.3	Network Management and Diagnostics Application Structure	57
13.4	Node States.....	57
13.5	Using the Network Management Services	58
13.5.1	General	58
13.5.2	Addressing Considerations	58
13.5.3	Making Network Configuration Changes.....	58
13.5.4	Downloading an Application Program	59
13.5.5	Error Handling Conditions (Informative)	60
13.6	Using Router Network Management Commands	62
13.7	NMPDU Formats and Types	63
13.7.1	General	63
13.7.2	Query ID.....	63
13.7.3	Respond to Query	64
13.7.4	Update Domain	64
13.7.5	Leave Domain	64
13.7.6	Update Key.....	64

10.5	Protocol Diagram.....	35
10.6	Transport Protocol State Variables	36
10.7	Send Algorithm.....	36
10.8	Receive Algorithm.....	37
10.9	Receive Transaction Record Pool Size and Configuration Engineering.....	37
10.9.1	General	37
10.9.2	Number of Retries	37
10.9.3	Transport Layer Timers	39
11	Session Layer	39
11.1	Assumptions.....	39
11.2	Service Provided	40
11.3	Service Interface.....	40
11.4	Internal Structure of the Session Layer	41
11.5	SPDU Types and Formats	41
11.6	Protocol Timing Diagrams.....	43
11.7	Request-Response State Variables	46
11.8	Request-Response Protocol — Client Part	46
11.9	Request-Response Protocol — Server Part	46
11.10	Request-Response Protocol Timers	47
11.11	Authentication Protocol.....	47
11.12	Encryption Algorithm.....	47
11.13	Retries and the Role of the Checksum Function	47
11.14	Random Number Generation	49
11.15	Using Authentication	49
12	Presentation/Application Layer	49
12.1	Assumptions.....	49
12.2	Service Provided	49
12.3	Service Interface.....	50
12.4	APDU Types and Formats	51
12.5	Protocol Diagrams.....	52
12.6	Application Protocol State Variables	54
12.7	Request - Response Messaging in Offline State.....	54
12.8	Network Variables	55
12.8.1	General	55
12.8.2	Network Variable Processing.....	55
12.9	Error Notification to the Application Program	56
12.9.1	General	56
12.9.2	Error Notification for Messages.....	56
12.9.3	Error Notification for Network Variables.....	56
13	Network Management & Diagnostics	56
13.1	Assumptions.....	56
13.2	Services Provided	57
13.3	Network Management and Diagnostics Application Structure	57
13.4	Node States.....	57
13.5	Using the Network Management Services.....	58
13.5.1	General	58
13.5.2	Addressing Considerations	58
13.5.3	Making Network Configuration Changes.....	58
13.5.4	Downloading an Application Program	59
13.5.5	Error Handling Conditions (Informative)	60
13.6	Using Router Network Management Commands.....	62
13.7	NMPDU Formats and Types	63
13.7.1	General	63
13.7.2	Query ID.....	63
13.7.3	Respond to Query	64
13.7.4	Update Domain	64
13.7.5	Leave Domain	64
13.7.6	Update Key.....	64

13.7.7	Update Address	64
13.7.8	Query Address	64
13.7.9	Query Network Variable Configuration	65
13.7.10	Update Group Address	65
13.7.11	Query Domain	65
13.7.12	Update Network Variable Configuration	65
13.7.13	Set Node Mode	65
13.7.14	Read Memory	66
13.7.15	Write Memory	66
13.7.16	Checksum Recalculate	66
13.7.17	Install	66
13.7.18	Memory Refresh	82
13.7.19	Query SI	82
13.7.20	Network Variable Value Fetch	82
13.7.21	Manual Service Request Message	82
13.7.22	Network Management Escape Code	82
13.7.23	Router Mode	83
13.7.24	Router Clear Group or Subnet Table	83
13.7.25	Router Group or Subnet Table Download	83
13.7.26	Router Group Forward	83
13.7.27	Router Subnet Forward	84
13.7.28	Router Do Not Forward Group	84
13.7.29	Router Do Not Forward Subnet	84
13.7.30	Router Group or Subnet Table Report	84
13.7.31	Router Status	84
13.7.32	Router Half Escape Code	84
13.8	DPDU Types and Formats	84
13.8.1	General	84
13.8.2	Query Status	84
13.8.3	Proxy Status	88
13.8.4	Clear Status	88
13.8.5	Query Transceiver Status	88
Annex A	Reference Implementation (Normative)	89
A.1	General	89
A.2	Predictive CSMA Algorithm	89
A.3	LPDU Transmit Algorithm	148
A.4	LPDU Receive Algorithm	150
A.5	Routing Algorithm	153
A.6	Learning Algorithm	153
A.7	Transaction Control Algorithm	154
A.8	Network Layer Algorithm	161
A.9	TPDU and SPDU Send Algorithm with Authentication	177
A.10	Application Layer	232
A.11	Network Management Commands	287
A.12	Configuration Data Structures	324
A.13	Include Files for the Reference Implementation	343
A.14	Application Protocol State Variables and Address Recognition Structures	373
A.15	Query-id Data Structures	375
A.16	Respond to Query Data Structure	376
A.17	Update Domain Data Structures	376
A.18	Leave Domain Data Structures	376
A.19	Update Key Data Structures	376
A.20	Update Address Data Structures	377
A.21	Query Address Data Structures	378
A.22	Query NV Cnfg Data Structures	378
A.23	Update Group Address Data Structures	378
A.24	Query Domain Data Structures	378
A.25	Update Network Variable Configuration Data Structures	379
A.26	Set Node Mode Data Structures	379

A.27	Read Memory Data Structures	380
A.28	Write Memory Data Structures	380
A.29	Checksum Recalculate Data Structures	380
A.30	Install Command Data Structures.....	381
A.31	Memory Refresh Data Structures	389
A.32	Query SI Data Structures	389
A.33	NV Fetch Data Structures	390
A.34	Manual Service Request Message Data Structures.....	390
A.35	Product Query Data Structures.....	390
A.36	Router Mode Data Structures.....	390
A.37	Router Table Clear Group or Subnet Table Data Structures	391
A.38	Router Group or Subnet Download Data Structures	391
A.39	Router Group Forward Data Structures	391
A.40	Router Subnet Forward Data Structures	391
A.41	Router Group No-Forward Data Structures	392
A.42	Router Subnet No-Forward Data Structures	392
A.43	Group / Subnet Table Report Data Structures	392
A.44	Router Status Data Structures	392
A.45	Query Status Data Structures	393
A.46	Proxy Status Data Structures.....	393
A.47	Clear Status Data Structures.....	394
A.48	Query Transceiver Status Data Structures.....	394
Annex B	Additional Data Structures (Normative)	395
B.1	General	395
B.1.1	The System Image	395
B.1.2	The Application Image	395
B.1.3	The Network Image.....	396
B.2	Read-Only Structures	396
B.2.1	Fixed Read-Only Data Structures	396
B.2.2	Read-only Structure Field Descriptions.....	398
B.3	Domain Table	401
B.3.1	Domain Table Field Descriptions.....	402
B.4	Address Table.....	402
B.4.1	Declaration of Group Address Format	403
B.4.2	Group Address Field Descriptions	403
B.4.3	Declaration of Subnet/Node Address Format	404
B.4.4	Subnet/Node Address Field Descriptions	404
B.4.5	Declaration of Broadcast Address Format	404
B.4.6	Broadcast Address Field Descriptions	404
B.4.7	Declaration of Turnaround Address Format	405
B.4.8	Turnaround Address Field Descriptions.....	405
B.4.9	Declaration of Protocol Processor's Address Format	405
B.4.10	Protocol Processor Address Field Descriptions	405
B.4.11	Timer Field Descriptions	406
B.5	Network Variable Tables - Informative	407
B.5.1	Network Variable Configuration Table Field Descriptions - Informative	408
B.5.2	Network Variable Alias Table Field Descriptions - Informative	409
B.5.3	Network Variable Fixed Table Field Descriptions - Informative	409
B.6	Self-Identification Structures	409
B.6.1	SI Structure Field Descriptions.....	410
B.6.2	NV Descriptor Table Field Descriptions.....	411
B.6.3	SNVT Table Extension Records.....	411
B.6.4	SNVT Alias Field Descriptions	412
B.6.5	Version 2 SI Data	412
B.7	Configuration Structure.....	416
B.7.1	General	416
B.7.2	Configuration Structure Field Descriptions	417
B.8	Statistics Relative Structure.....	418
Annex C	Behavioral Characteristics (Informative)	420

C.1	Channel Capacity and Throughput	420
C.2	Network Metrics	421
C.3	Transaction Metrics	422
C.4	Boundary Conditions — Power-Up	423
C.5	Boundary Conditions — High Load	423
	Annex D PDU Summary (Normative)	424
	Annex E Naming and Addressing (Normative)	426
E.1	Address Types and Formats	426
E.2	Domains	426
E.3	Subnets and Nodes	427
E.4	Groups	427
E.5	Unique_Node_ID and Node Address Assignment	428
E.6	NPDU Addressing	429
	Annex F List of patents that pertain to this European Standard (Normative)	431
	Bibliography	434