

ICS 35.240.60; 91.140.50

English Version

**Electricity metering data exchange - The DLMS/COSEM suite -
Part 8-4: Narrow-band OFDM PRIME PLC communication
profile for neighbourhood networks**

This Technical Specification was approved by CENELEC on 2014-11-11.

CENELEC members are required to announce the existence of this TS in the same way as for an EN and to make the TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

CONTENTS

Foreword	7
Introduction.....	8
1 Scope.....	9
2 Normative references	9
3 Abbreviations	11
4 Targeted communication environments.....	12
5 Reference model	14
5.1 Overview	14
5.2 The EN 61334-4-32 profile	15
5.3 The TCP-UDP/IPv4 profile.....	16
5.4 The TCP-UDP/IPv6 profile.....	16
6 Physical Layer (PHY)	16
6.1 General.....	16
6.2 PRIME PHY data plane services	16
6.3 PRIME PHY control plane services.....	16
6.4 PRIME PHY management plane services	16
7 Data link layer	17
7.1 Overview – main features and functions	17
7.2 Services used by Base Node and Service Nodes.....	18
7.3 Services used by Base Node signalling	18
7.4 Management services.....	18
8 Convergence layers.....	18
8.1 Overview	18
8.2 The EN 61334-4-32 LLC convergence sublayer.....	19
8.2.1 General	19
8.2.2 Connection management services	20
8.2.2.1 CL_432_ESTABLISH.request.....	20
8.2.2.2 CL_432_ESTABLISH.confirm.....	20
8.2.2.3 CL_432_JOIN.indication	21
8.2.2.4 CL_432_RELEASE.request.....	21
8.2.2.5 CL_432_RELEASE.confirm	22
8.2.2.6 CL_432_LEAVE.indicate	22
8.2.3 Summary of the connection management services.....	23
8.2.4 CL_432_DATA services.....	23
8.2.4.1 Overview.....	23
8.2.4.2 CL_432_DATA services	24
8.2.4.3 DL_Broadcast services	24
8.2.4.4 DL_Reply and DL_Update_Reply services	24
8.2.5 Addressing	24
8.2.5.1 Overview.....	24
8.2.5.2 MAC address	25
8.2.5.3 EN 61334-4-32 SSCS addresses	25
8.2.5.4 LLC addresses.....	25
8.3 The TCP-UDP/IPv4 based convergence sublayer	26
8.3.1 Overview	26
8.3.1.1 General architecture	26

8.3.1.2	The TCP connection manager	27
8.3.1.3	TCP-UDP/IPv4	27
8.3.1.4	Subnetwork gateway	27
8.3.2	Opening and closing the IPv4 SSCS	28
8.3.2.1	Introduction	28
8.3.2.2	CL_IPv4_ESTABLISH.request	28
8.3.2.3	CL_IPv4_ESTABLISH.confirm	28
8.3.2.4	CL_IPv4_RELEASE.request	29
8.3.2.5	CL_IPv4_RELEASE.confirm	29
8.3.3	Unicast address management	30
8.3.3.1	Introduction	30
8.3.3.2	CL_IPv4_REGISTER.request	30
8.3.3.3	CL_IPv4_REGISTER.confirm	31
8.3.3.4	CL_IPv4_UNREGISTER.req	31
8.3.3.5	CL_IPv4_UNREGISTER.confirm	31
8.3.4	Multicast group management	32
8.3.4.1	General	32
8.3.4.2	CL_IPv4_IGMP_JOIN.req	32
8.3.4.3	CL_IPv4_IGMP_JOIN.confirm	32
8.3.4.4	CL_IPv4_IGMP_LEAVE.request	33
8.3.4.5	CL_IPv4_IGMP_LEAVE.confirm	33
8.3.5	Data transfer	33
8.3.5.1	General	33
8.3.5.2	CL_IPv4_DATA.request	33
8.3.5.3	CL_IPv4_DATA.confirm	34
8.3.5.4	CL_IPv4_DATA.indicate	34
8.3.6	IPv4 SSCS PDUs	34
8.3.6.1	General	34
8.3.6.2	Address resolution PDUs	34
8.3.6.2.1	Overview	34
8.3.6.2.2	AR_REGISTER_S	34
8.3.6.2.3	AR_REGISTER_B	35
8.3.6.2.4	AR_UNREGISTER_S	35
8.3.6.2.5	AR_UNREGISTER_B	35
8.3.6.2.6	AR_MCAST_REG_S	35
8.3.6.2.7	AR_MCAST_REG_B	36
8.3.6.2.8	AR_MCAST_UNREG_S	36
8.3.6.2.9	AR_MCAST_UNREG_B	36
8.3.6.3	Data connection establishment	36
8.3.6.3.1	Overview	36
8.3.6.3.2	AR_LOOKUP_S	36
8.3.6.3.3	AR_LOOKUP_B	37
8.3.7	IPv4 SSCS packet format	37
8.3.7.1	General	37
8.3.7.2	IPv4 packet format without header compression	37
8.3.7.3	IPv4 packet format with Van Jacobsen header compression	37
8.3.8	Connection data	38
8.3.8.1	General	38
8.3.8.2	Connection data from the initiator	38

8.3.8.3	Connection data from the responder	38
8.4	The TCP-UDP/IPv6 based convergence sublayer	39
8.4.1	Overview	39
8.4.1.1	General architecture	39
8.4.1.2	IPv6 unicast addressing assignment	39
8.4.1.3	Role of the Base Node	39
8.4.2	IPv6 SSCS	40
8.4.2.1	General	40
8.4.2.2	Routing in the subnetwork	40
8.4.2.3	CPCS: Segmentation and reassembly	40
8.4.3	IPv6 Address Configuration	40
8.4.3.1	Overview	40
8.4.3.2	Interface identifier	40
8.4.3.3	IPv6 Link local address configuration	40
8.4.3.4	Stateless address auto configuration	40
8.4.3.5	Stateful address configuration	40
8.4.3.6	Multicast address	40
8.4.3.7	Address resolution	41
8.4.3.7.1	Overview	41
8.4.3.7.2	Unicast address	41
8.4.3.7.3	Multicast address	41
8.4.3.7.4	Retransmission of address resolution packets	42
8.4.4	IPv6 packet transfer	42
8.4.5	Segmentation and reassembly	42
8.4.6	Compression	42
8.4.7	Quality of Service Mapping	43
8.4.8	Opening and closing the IPv6 SSCS	43
8.4.8.1	Introduction	43
8.4.8.2	CL_IPv6_ESTABLISH.request	43
8.4.8.3	CL_IPv6_ESTABLISH.confirm	44
8.4.8.4	CL_IPv6_RELEASE.request	44
8.4.8.5	CL_IPv6_RELEASE.confirm	44
8.4.9	Unicast address management	45
8.4.9.1	Introduction	45
8.4.9.2	CL_IPv6_REGISTER.request	45
8.4.9.3	CL_IPv6_REGISTER.confirm	45
8.4.9.4	CL_IPv6_UNREGISTER.request	46
8.4.9.5	CL_IPv6_UNREGISTER.confirm	46
8.4.10	Multicast group management	46
8.4.10.1	Introduction	46
8.4.10.2	CL_IPv6_MUL_JOIN.request	47
8.4.10.3	CL_IPv6_MUL_JOIN.confirm	47
8.4.10.4	CL_IPv6_MUL_LEAVE.request	47
8.4.10.5	CL_IPv6_MUL_LEAVE.confirm	48
8.4.11	Data transfer	48
8.4.11.1	General	48
8.4.11.2	CL_IPv6_DATA.request	48
8.4.11.3	CL_IPv6_DATA.confirm	48
8.4.11.4	CL_IPv6_DATA.indicate	49

8.4.12 IPv6 SSCS PDUs	49
8.4.12.1 General.....	49
8.4.12.2 Address resolution PDUs	49
8.4.12.2.1 Overview	49
8.4.12.2.2 AR_REGISTERv6_S	49
8.4.12.2.3 AR_REGISTERv6_B	49
8.4.12.2.4 AR_UNREGISTERv6_S	50
8.4.12.2.5 AR_UNREGISTERv6_B	50
8.4.12.2.6 AR_MCAST_REGv6_S	50
8.4.12.2.7 AR_MCAST_REGv6_B	50
8.4.12.2.8 AR_MCAST_UNREGv6_S	51
8.4.12.2.9 AR_MCAST_UNREGv6_B	51
8.4.12.3 Data connection establishment	51
8.4.12.3.1 Overview	51
8.4.12.3.2 AR_LOOKUPv6_S	51
8.4.12.3.3 AR_LOOKUPv6_B	52
8.4.13 IPv6 Packet format	52
8.4.13.1 General.....	52
8.4.13.2 No negotiated header compression	52
8.4.13.3 Header compression	52
8.4.14 Connection data	53
8.4.14.1 Overview.....	53
8.4.14.2 Connection data from the initiator	53
8.4.14.3 Connection data from the responder	53
Annex A (informative)	55
A.1 Data exchange between two IP communication peers	55
A.2 Joining a multicast group.....	57
Annex B (informative) EN 61334-4-32 profile: Error cases during connection establishment.....	58
Annex C (informative) PRIME encoding examples	59
C.1 ACSE APDUs and xDLMS APDUs carried by MAC frames using the EN 61334-4-32 SSCS	59
List of Figures	
Figure 1 – Communication architecture.....	13
Figure 2 – PLC PRIME protocol architecture.....	15
Figure 3 – EN 61334-4-32 SSCS services.....	19
Figure 4 – MSC for EN 61334-4-32 SSCS services	23
Figure 5 – MSC for Data services in the case of logical name referencing	24
Figure 6 – The TCP-UDP/IPv4 communication profile architecture	27
Figure A.1 – MSC of IPv4 SSCS services	56
Figure A.2 – MSC for joining an IPv4 multicast group	57
List of tables	
Table 1 – Result values for SSCS services	22
Table 2 – Client service access point values.....	25
Table 3 – Server service access point.....	25
Table 4 – AR_REGISTER_S message format	35

Table 5 – AR_REGISTER B message format	35
Table 6 – AR_UNREGISTER_S message format	35
Table 7 – AR_UNREGISTER_B message format	35
Table 8 – AR_MCAST_REG_S message format.....	36
Table 9 – AR_MCAST_REG_B message format.....	36
Table 10 – AR_MCAST_UNREG_S message format.....	36
Table 11 – AR_MCAST_UNREG_B message format.....	36
Table 12 – AR_LOOKUP_S message format.....	37
Table 13 – AR_LOOKUP_B message format.....	37
Table 14 – IPv4 packet format without header compression negotiated.....	37
Table 15 – IPv4 packet format with VJ header compression.....	38
Table 16 – Connection data sent by the initiator	38
Table 17 – Connection data sent by the responder	38
Table 18 – IPv6 SSCS table entry.....	42
Table 19 – Mapping IPv6 precedence to PRIME MAC priority	43
Table 20 – AR_REGISTERv6_S message format.....	49
Table 21 – AR_REGISTERv6_B message format.....	50
Table 22 – AR_UNREGISTERv6_S message format.....	50
Table 23 – AR_UNREGISTERv6_B message format.....	50
Table 24 – AR_MCAST_REGv6_S message format	50
Table 25 – AR_MCAST_REGv6_B message format	51
Table 26 – AR_MCAST_UNREGv6_S message format	51
Table 27 – AR_MCAST_UNREGv6_B message format	51
Table 28 – AR_LOOKUPv6_S message format	51
Table 29 – AR_LOOKUPv6_B message format	52
Table 30 – IPv6 Packet format without negotiated header compression	52
Table 31 – UDP/IPv6 Packet format with LOWPAN_IPHC header compression and LOWPAN_NHC	52
Table 32 – IPv6 Packet format with LOWPAN_IPHC negotiated header compression	53
Table 33 – IPv6 Connection signalling data sent by the initiator	53
Table 34 – IPv6 Connection signalling data sent by the responder	53
Figure A.1 – MSC of IPv4 SSCS services	56
Figure A.2 – MSC for joining an IPv4 multicast group	57

Foreword

This document (CLC/TS 52056-8-4:2015) has been prepared by CLC/TC 13 "Equipment for electrical energy measurement and load control".

The following date is fixed:

- latest date by which the existence of (doa) 2015-07-24
this document has to be announced
at national level

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

Introduction

This Technical Specification is based on the results of the European OPEN Meter project, Topic Energy 2008.7.1.1, Project no.: 226369, www.openmeter.com, and has been prepared by the PRIME Alliance Technical Working Group, www.prime-alliance.org.

This document is a preview generated by EVS

1 Scope

This Technical Specification is part of the EN 62056 / 52056 DLMS/COSEM suite and it specifies the DLMS/COSEM communication profiles for power line carrier neighbourhood networks using the modulation specified in ITU-T G.9904:2012.

There are three profiles specified:

- a profile using the EN 61334-4-32:1996 LLC layer;
- a profile using TCP-UDP/IPv4;
- a profile using TCP-UDP/IPv6.

2 Normative references

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

EN 50065-1, *Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148.5 kHz - Part 1: General requirements, frequency bands and electromagnetic disturbances*

EN 61334-4-1:1996, *Distribution automation using distribution line carrier systems – Part 4: Data communication protocols – Section 1: Reference model of the communication system (IEC 61334-4-1:1996)*

EN 61334-4-32:1996, *Distribution automation using distribution line carrier systems – Part 4: Data communication protocols – Section 32: Data link layer – Logical link control (LLC) (IEC 61334-4-32:1996)*

EN 61334-4-511:2000, *Distribution automation using distribution line carrier systems – Part 4-511: Data communication protocols – Systems management – CIASE protocol (IEC 61334-4-511:2000)*

FprEN 62056-4-7:2014, *Electricity metering data exchange - The DLMS/COSEM suite – Part 4-7: DLMS/COSEM transport layer for IP networks (IEC 62056-4-7:2015)*

EN 62056-5-3, *Electricity metering data exchange – The DLMS/COSEM suite – Part 5-3: DLMS/COSEM application layer (IEC 62056-5-3)*

EN 62056-6-1, *Electricity metering data exchange – The DLMS/COSEM suite – Part 6-1: Object identification system (OBIS) (IEC 62056-6-1)*

EN 62056-6-2, *Electricity metering data exchange – The DLMS/COSEM suite – Part 6-2: COSEM interface classes (IEC 62056-6-2)*

EN 62056-9-7:2013, *Electricity metering data exchange – the DLMS/COSEM suite – Part 9-7: Communication profile for TCP-UDP/IP networks (IEC 62056-9-7:2013)*

Recommendation ITU-T G.9904:2012, *SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS Access networks – In premises networks. Narrowband orthogonal frequency division multiplexing power line communication transceivers for PRIME networks*

RFC 2460 *Internet Protocol, Version 6 (IPv6) Specification*

Authors: S. Deering, Cisco, R. Hinden Nokia

Date: December 1998

Available from: <http://www.ietf.org/rfc/rfc2460.txt>

RFC 2464 *Transmission of IPv6 Packets over Ethernet Networks*

Authors M. Crawford Fermilab

Date: December 1998

Available from: <http://www.ietf.org/rfc/rfc2464.txt>

RFC 4291 IP Version 6 Addressing Architecture

Authors R. Hinden Nokia, S. Deering Cisco Systems

Date: February 2006.

Available from: <http://www.ietf.org/rfc/rfc4291.txt>

RFC 6282 Compression Format for IPv6 Datagrams over IEEE 802.15.4-Based Networks

Authors J. Hui, Ed. Arch Rock Corporation P. Thubert Cisco

Date: September 2011.

Available from: <http://www.ietf.org/rfc/rfc6282.txt>

RFC 4862 IPv6 Stateless Address Configuration

Authors S. Thomson, Cisco, T. Narten IBM, T. Jinmei, Toshiba

Date: September 2007.

Available from: www.ietf.org/rfc/rfc4862.txt

RFC 3315 Dynamic Host Configuration Protocol for IPv6 (DHCPv6)

Authors R. Droms, E J. Bound, B. Volz, T. Lemon, C. Perkins, M. Carney

Date: July 2003

Available from: www.ietf.org/rfc/rfc3315.txt

This document is a preview generated by EVS