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Izmenjava podatkov pri merjenju električne energije - Niz DLMS/COSEM - 8-4. del: Ozkopasovni OFDM PLC-profil za omrežja PRIME

Electricity metering data exchange - The DLMS/COSEM suite - Part 8-4: The narrow-band OFDM PLC profiles for PRIME networks

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

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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 this document has to be announced at national level (doa) 2015-07-24

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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 .

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

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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.
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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

3 Abbreviations

AA	Application Association
AARE	Application Association Response
AARQ	Application Association Request
ACSE	Application Control Service Element
AL	Application Layer
AP	Application Process
APDU	Application Protocol Data Unit
ARQ	Automatic Repeat Request
CENELEC	European Committee for Electrotechnical Standardization
CL	Convergence Layer
.cnf	Confirm service primitive
COSEM	Companion Specification for Energy Metering
CPCS	Common Part Convergence Sublayer
CSMA/CA	Carrier Sense Multiple Access – Collision Avoidance
D8PSK	Differential Eight-Phase Shift Keying
DBPSK	Differential Binary Phase Shift Keying
DGW	Default Gateway
DHCP	Dynamic Host Configuration Protocol
DLMS	Device Language Message Specification
DQPSK	Differential Quaternary Phase Shift Keying
EUI-48	48-bit Extended Unique Identifier
FU	Firmware Upgrade
FW	Firmware
IANA	Internet Assigned Numbers Authority
IGMP	Internet Group Management Protocol
.ind	Indication service primitive
IP	Internet Protocol
IPv4	Internet Protocol, version 4
IPv6	Internet Protocol version 6
LCID	Local Connection Identifier
LD	Logical Device
LLC	Logical Link Control (sub-layer)
LNID	Local Node Identifier
MAC	Medium Access Control, MAC sublayer entity
MLME	MAC Layer Management Entity
MPDU	MAC Protocol Data Unit
NAT	Network Address Translation
NHC	Next Header Compression

NL	Noise Level
OBIS	OBject Identification System
OFDM	Orthogonal Frequency Division Multiplexing
OSI	Open System Interconnection
PHY	Physical Layer entity
PLC	Power Line Communication
PIB	PLC Information Base
PLME	Physical Layer Management Entity
PPDU	PHY Protocol Data Unit
.req	Request service primitive
RFC	Request For Comment
.rsp	Response service primitive
SDU	Service Data Unit
SID	Switch Identifier
SNA	Subnetwork Address
SNR	Signal-to-Noise Ratio
SSCS	Service Specific Convergence Sublayer
TCP	Transmission Control Protocol
TOS	Type Of Service
UDP	User Datagram Protocol
xDLMS_ASE	extended DLMS Application Service Element
ZCT	Zero Crossing Time

4 Targeted communication environments

The *DLMS/COSEM narrow-band OFDM PLC profiles for PRIME networks* are intended for remote data exchange on Neighbourhood Networks (NN) between *Neighbourhood Network Access Points* (NNAP) and *Local Network Access Points* (LNAPs) or *End Devices* using OFDM technology over the low voltage electricity distribution network as a communication medium. The functional reference architecture is shown in Figure 1.

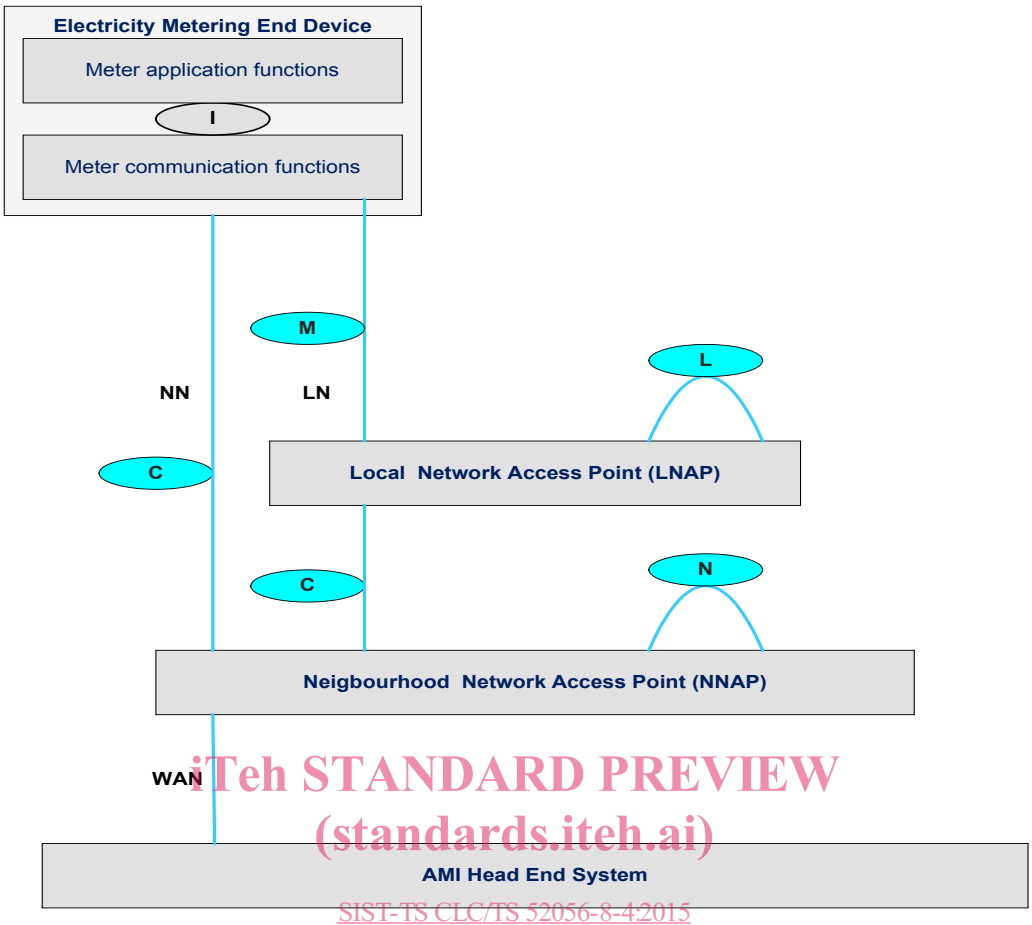

Figure 1 – Communication architecture

End devices – typically electricity meters – comprise application functions and communication functions. They may be connected directly to the NNAP via the C interface, or to an LNAP via an M interface, while the LNAP is connected to the NNAP via the C interface. The LNAP function may be co-located with the metering functions.

A NNAP comprises gateway functions and it may comprise concentrator functions. Upstream, it is connected to the Metering Head End System (HES) using suitable communication media and protocols.

End devices and LNAPs may communicate to different NNAPs, but to one NNAP only at a time. From the PLC communication point of view, the NNAP acts as the Base Node while end devices and LNAPs act as Service Nodes.

NNAPs and similarly LNAPs may communicate to each other, but this is out of the scope of this Technical Specification, which covers the C interface only.

When the NNAP has concentrator functions, it acts as a DLMS/COSEM client. When the NNAP has gateway functionality only, then the HES plays the role of a DLMS/COSEM client. The end devices or the LNAPs play the role of DLMS/COSEM servers.

A mixed architecture is also possible, i.e. both the HES and the NNAP can act as a client.