SLOVENSKI STANDARD
SIST-TS CLC/TS 52056-8-5:2015

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Izmenjava podatkov pri merjenju električne energije - Niz DLMS/COSEM - 8-5. del: Ozkopasovni OFDM PLC-profil za omrežja G3-PLC

Electricity metering data exchange - The DLMS/COSEM suite - Part 8-5: The narrow-band OFDM PLC profile for G3-PLC networks

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Foreword

This document (CLC/TS 52056-8-5:2015) has been prepared by CLC/TC 13, "Electrical energy measurement and 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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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 prepared by G3 Alliance, www.g3-plc.com.

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1 Scope

This Technical Specification specifies the EN 62056 DLMS/COSEM communication profile for metering purposes based on the Recommendations ITU-T G.9901: *Narrowband Orthogonal Frequency Division Multiplexing Power Line Communication Transceivers – Power Spectral Density Specification* and ITU-T G.9903 *Narrow-band orthogonal frequency division multiplexing power line communication transceivers for G3-PLC networks*, an Orthogonal Frequency Division Multiplexing (OFDM) Power Line Communications (PLC) protocol.

The physical layer provides a modulation technique that efficiently utilizes the allowed bandwidth within the CENELEC A band (3 kHz – 95 kHz) (although ITU-T G.9903 defines the protocol for CENELEC B, ARIB and FCC bands as well), thereby allowing the use of advanced channel coding techniques. This combination enables a very robust communication in the presence of narrowband interference, impulsive noise, and frequency selective attenuation.

The medium access control (MAC) layer allows the transmission of MAC frames through the use of the power line physical channel. It provides data services, frame validation control, node association and secure services.

The 6LoWPAN adaptation sublayer enables an efficient interaction between the MAC and the IPv6 network layers. The IPv6 network protocol; the latest generation of IP (Internet Protocol), widely opens the range of potential applications and services for metering purposes (but not limited to metering purposes).

The transport layer, the application layer and the data model are as specified in the EN 62056 DLMS/COSEM suite.

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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.

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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.9901 (2014) *Narrowband Orthogonal Frequency Division Multiplexing Power Line Communication Transceivers – Power Spectral Density Specification* – available at http://www.itu.int/rec/T-REC-G.9901/en

Recommendation ITU-T G.9903 (2014) *Narrowband Orthogonal Frequency Division Multiplexing Power Line Communication Transceivers for G3-PLC Networks available at http://www.itu.int/rec/T-REC-G.9903/en*

IETF RFC 768: *User Datagram Protocol. Edited by J. Postel. August 1980. Available from http://www.ietf.org/rfc/rfc768.txt*

IETF RFC 2460: *Internet Protocol, Version 6 (IPv6) Specification. Edited by S. Deering, R. Hinden. December 1998. Available from http://www.ietf.org/rfc/rfc2460.txt*

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IETF RFC 4193: *Unique Local IPv6 Unicast Addresses. Edited by R. Hinden, B. Haberman. October 2005. Available from http://www.ietf.org/rfc/rfc4193.txt*

IETF RFC 4291: *IP Version 6 Addressing Architecture. Edited by R. Hinden, S. Deering. February 2006. Available from http://www.ietf.org/rfc/rfc4291.txt*

IETF RFC 4944: *Transmission of IPv6 Packets over IEEE 802.15.4 Networks. Available from http://www.ietf.org/rfc/rfc2460.txt*

IETF RFC 6282: *Compression Format for IPv6 Datagrams over IEEE 802.15.4-Based Networks. Available from http://www.ietf.org/rfc/rfc2460.txt*

3 Abbreviations

6LoWPAN	IPv6 over Low power Wireless Personal Area Networks
CENELEC	European Committee for Electrotechnical Standardization
DLMS	Device Language Message Specification
EAP	Extensible Authentication Protocol
IEC	International Electrotechnical Commission
IP	Internet Protocol
ITU-T	International Telecommunication Union-Telecommunication
LBA	LoWPAN Bootstrapping Agent
LBP	LoWPAN Bootstrapping Protocol
MAC	Media Access Control
NNAP	Neighbourhood Network Access Point
OFDM	Orthogonal Frequency Division Multiplexing
OSI	Open System Interconnection
PAN	Personal Area Network
PLC	Power Line Communication
PSK	Pre-Shared Key
TCP	Transmission Control Protocol
UDP	User Datagram Protocol

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Furthermore, the abbreviations given in Clause 4 of ITU-T G.9903 apply also.

4 Conventions

Through the document, the applicability of each provision from the reference documents is given using the following convention:

- I = "Informative". The statements of the reference document are provided for information only;
- N = “Normative”: The statements of the reference document apply without modifications or remarks;

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- S = “Selection”: The statements of the reference document apply with the selections specified;
- E = “Extension”: The statements of the reference document apply with the extensions specified;
- N/R = “Not Relevant”: The statements of the reference document do not apply. An explanation may be given under the part title.

5 Overview

The present technical specification constitutes the specification for ITU-T G.9903 communication profile for metering purposes based on OFDM and DLMS/COSEM.

This technical specification has been developed to meet the following aims:

- Robustness: the communication profile shall be suited to severe powerline environments;
- Performance: it embeds adaptive modulation to use the proper modulation according to the quality of the link;
- Simplicity: it shall be simple to implement, install (Plug and Play), operate and maintain;
- Flexibility: it shall be compatible with diverse applications and network topologies;
- Security: it shall offer a secure environment for the promotion of Value Added services;
- Openness: it shall be based on open standards in order to support multi-supplier solutions;
- Scalability: it shall support a very large range of devices (from 2 up to 2000 nodes in the same PAN);
- Future proof: it shall be able to support future applications.

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6 Targeted communication environments

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The *DLMS/COSEM narrow-band OFDM PLC profile for G3 networks* is 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.

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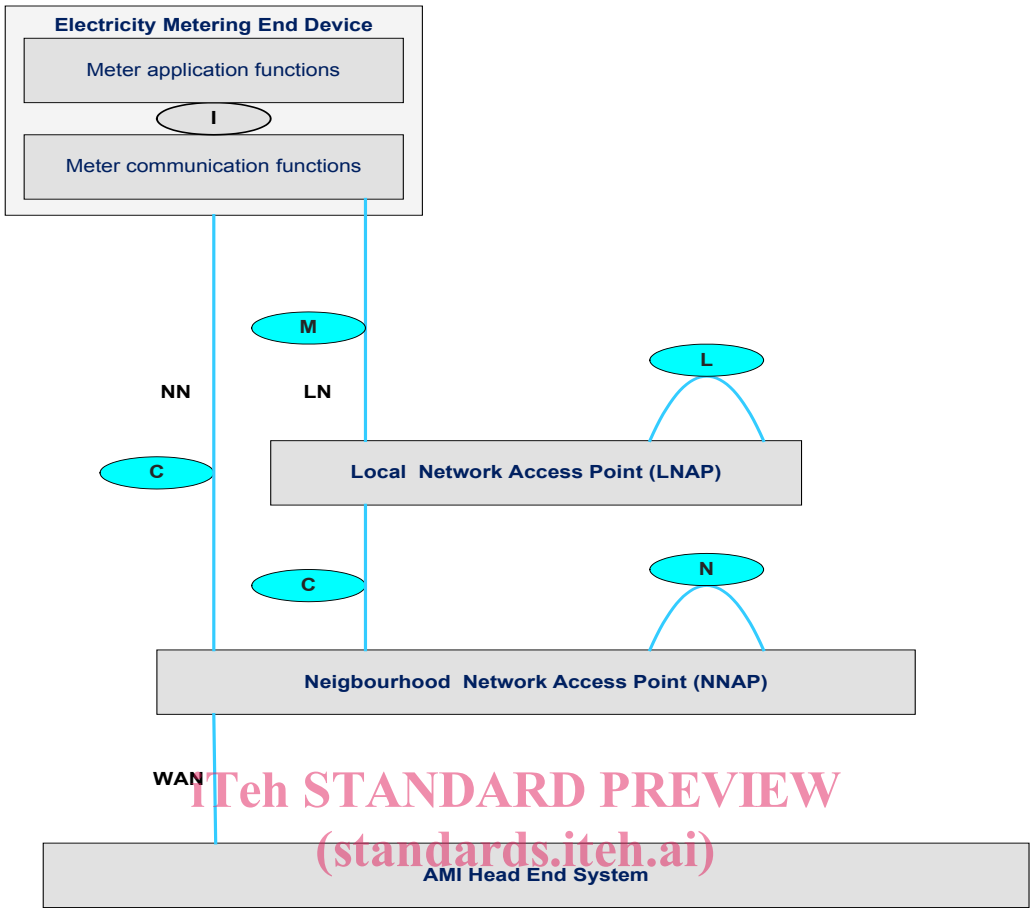

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Figure 1 – Communication architecture

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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 PAN coordinator while end devices and LNAPs act as PAN devices.

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.

7 Reference model

The proposed protocol stack uses the following OSI layers as shown in Figure 2: