SLOVENSKI STANDARD
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Odprta izmenjava podatkov v avtomatizaciji stavb, regulaciji in upravljanju stavb - Protokol regulacijske mreže - 8. del: Širokopasovna komunikacija z uporabo spletnih protokolov po daljnovodnih omrežjih

Open Data Communication in Building Automation, Controls and Building Management - Control Network Protocol - Part 8: Communication using Broadband over Power Line Networks - with internet protocols

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Firmenneutrale Datenkommunikation für die Gebäudeautomation und Gebäudemanagement - Steuerungs-Netzwerk-Protokoll - Teil 8: Breitband Kommunikation mit Internetprotokollen über Powerline-Netzwerke

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Réseau ouvert de communication de données pour l'automatisation, la régulation et la gestion technique du bâtiment - Protocole de contrôle du réseau - Partie 8 : Communication large bande sur les réseaux CPL via les protocoles Internet

Ta slovenski standard je istoveten z: **EN 14908-8:2021**

ICS:

35.240.67	Uporabniške rešitve IT v gradbeništvu	IT applications in building and construction industry
97.120	Avtomatske krmilne naprave za dom	Automatic controls for household use

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European foreword

This document (EN 14908-8:2021) has been prepared by Technical Committee CEN/TC 247 “Building Automation, Controls and Building Management”, the secretariat of which is held by SNV.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2022, and conflicting national standards shall be withdrawn at the latest by March 2022.

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

This document is part of a series of European Standards for open data transmission in building automation, control and in building management systems. The content of this document covers the data communications used for management, automation/control and field functions. This document is based on the American standards EIA/CEA-709.1-B Control Network Protocol Specification.

This document is part of a series of European Standards under the general title *Open Data Communication in Building Automation, Controls and Building Management — Control Network Protocol*, which comprises the following parts:

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— *Part 1: Protocol Stack*

— *Part 2: Twisted Pair Communication*

— *Part 3: Power Line Channel Specification*

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— *Part 4: IP-Communication*

— *Part 5: Implementation*

— *Part 6: Application elements*

— *Part 7: Communication via internet protocols*

— *Part 8: Communication using Broadband over Power Line Networks — with internet protocols* (this document)

— *Part 9: Wireless Communication in ISM bands*

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Introduction

This document has been prepared to provide mechanisms through which various vendors of building automation, control, and building management systems may exchange information in a standardized way. It defines communication capabilities.

This document is intended to be used by all involved in design, manufacture, engineering, installation and commissioning activities.

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1 Scope

This document specifies a communication protocol for networked control systems. The protocol provides peer-to-peer communication for networked control using web-services. This document describes services in layer 1 and layer 2.

The layer 1 (physical layer) specification describes the MAC sub-layer interface to the physical layer. The layer 2 (data link layer), as described in EN 14908-1, is integrated in UDP/IP communication using IPv4 and IPv6 protocols.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

EN 14908-1:2014, *Open Data Communication in Building Automation, Controls and Building Management - Control Network Protocol - Part 1: Protocol Stack*

IEEE 1901-2010, *IEEE Standard for Broadband over Power Line Networks: Medium Access Control and Physical Layer Specifications*

ITU-T G.9905, *Centralized metric-based source routing*

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 14908-1, IEEE 1901 apply.

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ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

NOTE Additionally, the following subclause introduces the basic terminology employed throughout this document. Most of it is commonly used and the terms have the same meaning in both the general and the standard context. However, for some terms, there are subtle differences. For example, in general, bridges do selective forwarding based on the layer 2 destination address. There are no layer 2 addresses in this standard protocol, so bridges forward all packets, as long as the domain address in the packet matches a domain of which the bridge is a member. Routers, in general, perform network address modification so that two protocols with the same transport layer but different network layers can be connected to form a single logical network. Routers of this document can perform network address modification, but typically they only examine the network address fields and selectively forward packets based on the network layer address fields.

3.1
channel
logical link between one or more communication nodes

Note 1 to entry: Usually used interchangeably with a link. However, multiple channels can be multiplexed on a given link. For example, PL-10 and PL-20 can be used to implement two different channels on the same power cable.

3.2
CNP/IP
control network protocol with control services defined by EN 14908-1 layers 4 through 7, and transport services based on the link protocol

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3.3
CNP/IP-LAN
CNP/IP communication on a native IP link that natively supports IP communication including Ethernet and Wi-Fi

Note 1 to entry: The CNP/IP-LAN protocol is based on layers 4 to 7 of the EN 14908-1 Control Network Protocol on top of a User Datagram Protocol (UDP) and Internet Protocol (IP) transport.

3.4
CNP/IP-CNP
CNP/IP communication on a native CNP link including a link hosting a TP/FT-10 channel defined by EN 14908-2, a PL-20 channel defined by EN 14908-3, and an IP-852 channel defined by EN 14908-4

3.5
CNP/HD-PLC
CNP communication on a HD-PLC link

3.6
configuration
non-volatile information used by the device to customize its operation

Note 1 to entry: There is configuration data for the correct operation of the protocol in each device, and optionally, for application operation. The network configuration data stored in each device has a checksum associated with the data. Examples of network configuration data are node addresses, communication media parameters such as priority settings, etc. Application configuration information is application specific.

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3.7
domain
virtual network that is the network unit of management and administration

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Note 1 to entry: Group and subnet (see below) addresses are assigned by the administrator responsible for the domain, and they have meaning only in the context of that domain.

3.8
link
physical layer 1 and 2 connection

3.9
node
abstraction for a physical communicating device that represents the highest degree of address resolvability on a network

Note 1 to entry: A node is identified (addressed) within a subnet by its (logical) node identifier. A physical node may belong to more than one subnet; when it does, it is assigned one (logical) node number for each subnet to which it belongs. A physical node may belong to at most two subnets; these subnets shall be in different domains. A node may also be identified (absolutely) within a network by its Unique Node ID.

3.10
router
device that forwards data packets to their respective destinations by selectively forwarding from subnet to subnet

Note 1 to entry: A router always connects two (sets of) subnets; routers may modify network layer address fields. Routers may be set to one of four modes: repeater mode, bridge mode, learning mode, and configured mode. In repeater mode, packets are forwarded if they are received with no errors. In bridge mode, packets are forwarded

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if they are received with no errors and match a domain that the router is a member of. Routers in learning mode learn the topology by examining packet traffic, while routers that are set to configured mode have the network topology stored in their memory and make their forwarding decisions solely upon the contents of their configured tables.

[SOURCE: EN 14908-1:2014, 3.11, modified – text from definition moved to Note 1 to entry.]

3.11
subnet
set of nodes accessible through the same link layer protocol; a routing abstraction for a channel

Note 1 to entry: In this document subnets are limited to a maximum of 127 nodes.

3.12
transaction
sequence of messages that are correlated together

Note 1 to entry: For example, a request and the responses to the request are all part of a single transaction. A transaction succeeds when all the expected messages from every node involved in the transaction are received at least once. A transaction fails if any of the expected messages within the transaction are not received. Retries of messages within a transaction are used to increase the probability of success of a transaction in the presence of transient errors.

3.13
LPDU
CNP Link Protocol Data Unit, or frame as defined in EN 14908-1

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3.14
CNP/HD-PLC frame
UDP datagram that contains one or more CNP frames in its data section

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3.15
HD-PLC-40
CNP/HD-PLC channel, which transports CNP frames using the Internet Protocol version 4 on a HD-PLC link without multihop

Note 1 to entry: HD-PLC-40M is used for HD-PLC-40 with multihop.

3.16
HD-PLC-60
CNP/HD-PLC channel, which transports CNP frames using the Internet Protocol version 6 on a HD-PLC link without multihop

Note 1 to entry: HD-PLC-60M is used for HD-PLC-60 with multihop.

3.17
Basic Service Set
set of stations that have successfully synchronized using PSNA

Note 1 to entry: Membership in a BSS does not imply that power line communication with all other members of the BSS is possible.

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3.18
station
any device that contains an HD-PLC-conformant medium access control (MAC) and physical layer (PHY) interface to the power line

3.19
BSS Manager
any entity that has station functionality and provides association/security, neighbor network coordination services and QoS management, via the power line, for associated stations in the basic service set (BSS)

Note 1 to entry: Every BSS is initialized and managed (including all associations, authorizations and QoS) by a BM.

4 Abbreviations

AES	Advanced Encryption Standard
ATOM	Aggregation Time Out Master (non-BM STA)
BM	BSS Manager (BM)
BSS	Basic Service Set
CSMA/CA	Carrier Sense Multiple Access/Collision Avoidance
HD-PLC	High Definition Power Line Communication
LPDU	Link Protocol Data Unit
MAC	Media-Access-Control
NOPM	Number of packets (BM STA)
NOPT	Number of packets (non-BM STA)
OFDM	Orthogonal Frequency-Division Multiplexing
PSNA	Pairwise-based Security Network Association
PSD	Power spectral density
TP/FT	Twist-Pair Free Topology
STA	Station
UDP	User Datagram Protocol

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5 Physical and Media Access Control Layer

A CNP/HD-PLC device shall use HD-PLC multihop as layer 1 and 2. HD-PLC multihop uses IEEE 1901 wavelet for layer 1 and 2 and ITU-T G.9905 for routing. IEEE 1901 operates over electric power lines carrying alternating current (AC) or direct current (DC) or non-energized metal lines is the communication medium. It has following functions:

— Uplinking/downlinking through 432 subcarriers between the frequency range of 2,0 MHz to 28 MHz utilizing Wavelet OFDM;

— Multilevel modulation for each sub carrier which suits the properties of the power line transmission channel and allows for the best transmission speed;

— Support for up to 1024 Nodes per BSS Manager;

— Centralized metric-based source routing as defined in ITU-T G9905;

— Support for up to 10 hops;

— CSMA/CA supported;

— Advanced encryption with 128 bit AES;

— QoS (priority CSMA/CA) by priority control;

— Maximum 240 Mbps PHY rate;

— PSD will be set by local standard.

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For further security requirement see Annex B.

A CNP/HD-PLC can support following network:

Items	Description
Media	TP/Powerline
Voltage	0–240V
Topology	Free

6 Media Access Control (MAC) Sublayer

6.1 Overview

A CNP/HD-PLC device shall use layer 3 network addresses as defined by EN 14908-1 to communicate with other CNP/HD-PLC and native CNP devices. These network addresses are assigned by network management tools in managed networks and are assigned by the devices themselves in self-installed networks.

On the MAC Sublayer, CNP/HD-PLC devices communicate using the “CNP/HD-PLC service”. The datagrams are transported using the User Datagram Protocol (UDP) on top of the Internet Protocol (IP).

The purpose of the CNP/HD-PLC service is the tunnelling of CNP LPDU frames over an existing HD-PLC network.