SLOVENSKI STANDARD
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Odprta izmenjava podatkov v avtomatizaciji stavb, regulaciji in upravljanju stavb - Protokol regulacijske mreže - 9. del: Brezžična komunikacija v pasu ISM

Open Data Communication in Building Automation, Controls and Building Management - Control Network Protocol - Part 9: Wireless Communication in ISM bands

Firmenneutrale Datenkommunikation für die Gebäudeautomation und Gebäudemanagement - Steuerungs-Netzwerk-Protokoll - Teil 9: Drahtlose Kommunikation im ISM Band

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35.240.67	Uporabniške rešitve IT v gradbeništvu	IT applications in building and construction industry
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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 247.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Page

European foreword

This document (prEN 14908-9:2021) has been prepared by Technical Committee CEN/TC 247 “Building Automation, Controls and Building Management”, the secretariat of which is held by SNV.

This document is currently submitted to the CEN Enquiry.

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:

— *Part 1: Protocol Stack*

— *Part 2: Twisted Pair Communication*

— *Part 3: Power Line Channel Specification*

— *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*

— *Part 9: Wireless Communication in ISM bands* (this document)

Introduction

This document enables utilization of wireless communication in the general title *Control Network Protocol (CNP)* in the EN 14908 series. The wireless communication can provide fast and easy system deployment, robust, de-centralized and autonomous network operation for EN 14908 based applications.

Wireless communication is defined to operate in ISM bands, which are licensed exempt bands available either regionally or globally.

1 Scope

This document specifies an adaptation layer for the control network protocol (CNP), as described in EN 14908-1 to utilize wireless communication network. This document defines the services of the wireless communication provided to CNP layer for delivering data and commands towards and from sensors, actuators, etc. which are wirelessly connected as part of the EN 14908-1 network.

In addition, this document defines the requirements for the radio communication applicable for CNP layer operation.

For the radio communication different frequency bands can be utilized. Annex A defines requirement for operation in different frequency bands.

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*

3 Terms and definitions

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

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 http://www.electropedia.org/

3.1
ISM RF radio layer
layer used for radio communications in ISM RF 14908-9 system

Note 1 to entry: Higher layers of the EN 14908-1 can access ISM RF radio layer based on interface defined in Clause 7.

3.2
RF gateway
entity which has a backhaul connection for data delivery to the wireline CNP network

Note 1 to entry: The RF gateway operates as sink of ISM RF radio network, providing a root of routing, which in multi-hop network RF nodes are directing traffic.

3.3
RF node
physical node capable of wireless communication that represents the highest degree of address resolvability on a wireless network

4 Abbreviations

AES	Advanced Encryption Standard
APDU	Application layer Protocol Data Unit
ARQ	Automatic Repeat Request
CBC-MAC	Cipher Block Chaining MAC algorithm
CMAC	cipher-based Message Authentication Code
CNP	Control Network Protocol
CTR	Counter Mode
CRC	Cyclic Redundancy Check
ISM	Industrial Scientific and Medical
LPDU	Link Protocol Data Unit, or frame as defined according to EN 14908-1:2014, 6.5
NPDU	Network Protocol Data Unit, or packet as defined according to EN 14908-1:2014, 8.5
OMAC1	One-Key CBC-MAC
PDUID	Protocol Data Unit ID
QoS	Quality of Service
RF	Radio Frequency
RF-CSAP	RF Control Service Access Point
RF-DSAP	RF Data Service Access Point

5 Overview of ISM RF in EN 14908 based systems

5.1 General

The overall protocol architecture of the ISM RF in EN 14908 based system is depicted in Figure 1. The higher layer protocols of EN 14908-1 can access to the ISM RF radio protocols via open interfaces as specified in Clause 7. Annex A defines requirements for ISM RF radio protocol layers.

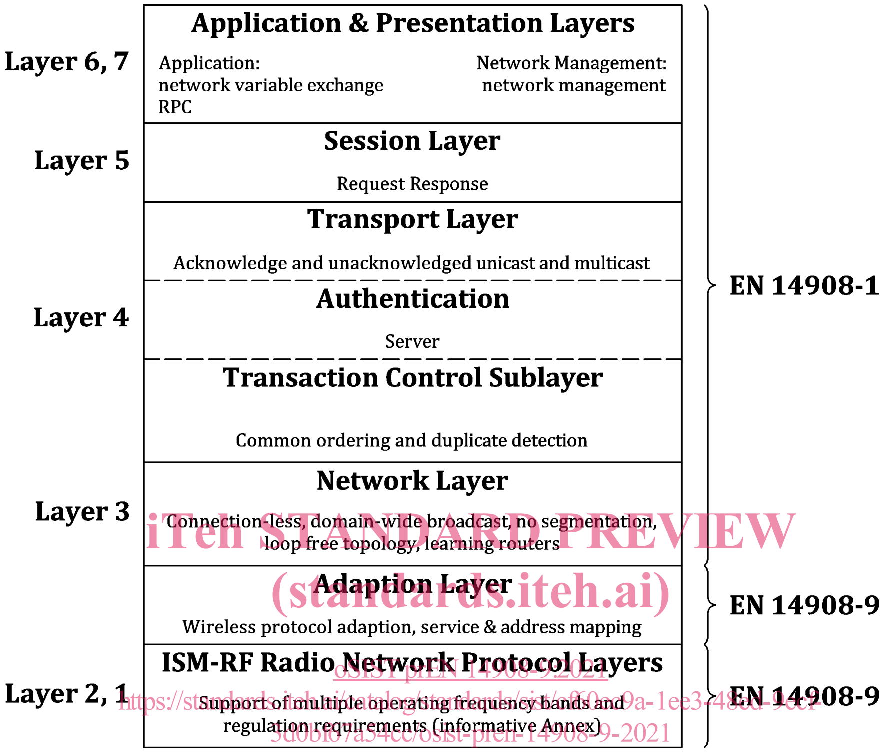
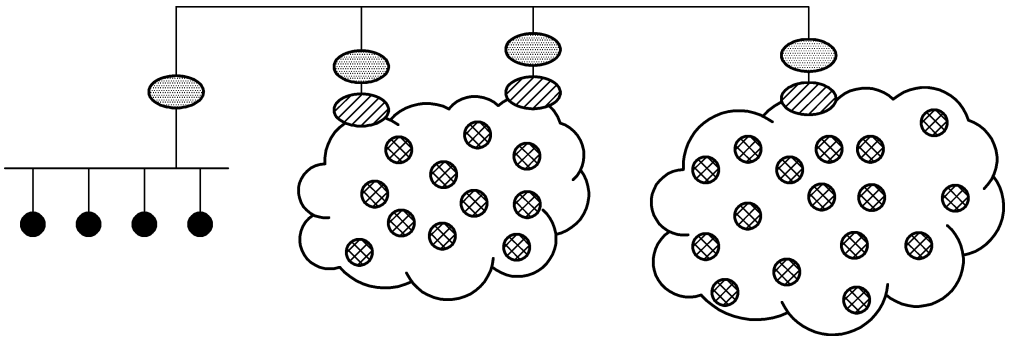


Figure 1 — Protocol layering

5.2 ISM RF radio communication introduction

5.2.1 Architecture

The radio communication solution for ISM RF radio communication is based on decentralized RF node to RF node communication network architecture as depicted in Figure 2. This enables ISM RF radio communication, to support deployments where some RF nodes are located outside of RF gateway radio coverage. The RF-node is capable of local decision making related to data routing, used transmission power, and used transmission time and frequency.



Key

Router, EN 14908-1

Node, EN 14908-1

RF Gateway

RF Node

ISM RF radio network

Figure 2 — ISM RF radio network and connection to other segments of CNP network

RF nodes are routing data towards the sink of the ISM RF radio network, which is in the RF gateway. The RF gateway delivers the data to the back-end network. There can exist one or multiple RF gateways operating as sink in single ISM RF network. However, transmitting data between two CNP routers via ISM RF network is not supported. To support different application requirements ISM RF radio communication supports different operating radio modes as defined in Annex A.

5.2.2 ISM RF radio network elements

5.2.2.1 RF gateway

The RF gateway is the data concentration point, i.e. sink, in the ISM RF radio network, which provides the backhaul connectivity to the rest of the CNP network via a CNP router. There is one to one mapping between single RF gateway and CNP router as depicted in Figure 3. The interface between CNP router and RF gateway is not defined.

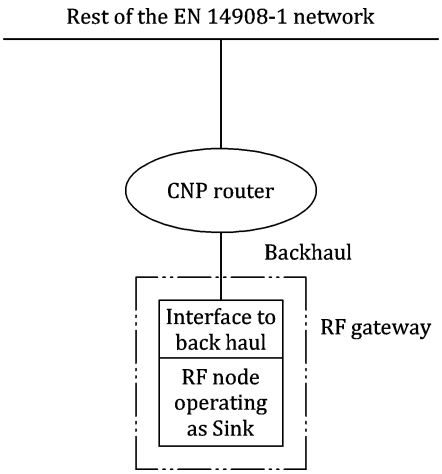


Figure 3 — Logical One-to-One relation between RF gateway and CNP router

The RF gateway shall have both backhaul and ISM RF radio connectivity. ISM RF gateway operates as a sink, by collecting the data from underlaying ISM RF radio network and routes received data to backhaul interface CNP router. RF gateway also transmits data received from CNP router towards the RF nodes inside the ISM RF radio network. ISM RF radio network can support multiple RF gateways in the same network.

5.2.2.2 RF node

All RF nodes in a single ISM radio network can be the same. An RF node is capable to decide to which neighbouring RF node it shall send its data that is to be routed to RF gateway.

Data can be generated by RF node itself or received from neighbouring RF node.

Additionally, RF node is capable to decide to which neighbouring RF nodes it shall transmit data transmitted from RF gateway to the RF node(s). Each RF node may dynamically change its routing to adapt changing environment and possible communication load variations. The decision of RF node routing may be done locally based on available information from environment and desired operational mode.

5.3 ISM RF functional overview

The ISM RF radio network may consist of RF nodes belonging into one or different CNP subnets, however the data routing in radio may not use subnets. Single CNP subnet shall not include nodes inside and outside single ISM RF radio network.

The ISM RF network supports following transmission modes:

— Broadcasting;

— Unicasting;

— Multicasting.