ISO/IEC 14543-4-301

Edition 1.0 2020-06

INTERNATIONAL STANDARD

colour inside

Information technology – Home Electronic System (HES) architecture – Part 4-301: Application protocols for home air conditioners and controllers

ISO/IEC 14543-4-301:2020-06(en)

Documents
Document Sharing Hub

Full document details: ISO IEC 14543-4-301-2020

THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2020 ISO/IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about ISO/IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

Documents
Document Sharing Hub

Full document details: ISO IEC 14543-4-301-2020

ISO/IEC 14543-4-301

Edition 1.0 2020-06

INTERNATIONAL STANDARD

colour inside

Information technology – Home Electronic System (HES) architecture – Part 4-301: Application protocols for home air conditioners and controllers

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 35.240.67

ISBN 978-2-8322-8494-0

Warning! Make sure that you obtained this publication from an authorized distributor.

Documents
Document Sharing Hub

Full document details: ISO IEC 14543-4-301-2020

CONTENTS

FOREWORD 4
INTRODUCTION 5
1 Scope 6
2 Normative references 6
3 Terms, definitions and abbreviated terms 6
3.1 Terms and definitions 6
3.2 Abbreviated terms 8
4 Conformance 9
5 Connection configuration 9
6 Application layer 10
6.1 General 10
6.2 NECD objects 10
6.3 NECD services 10
6.4 Object-specific NECD properties 11
6.5 Application operation 12
6.5.1 General 12
6.5.2 Continuous requests 12
6.5.3 Response wait timer value for controllers 12
6.5.4 Resending a frame 13
6.5.5 Processing object property counter 13
6.5.6 Property values of write requests 13
7 Normal operation 13
7.1 General 13
7.2 Start-up operation 14
7.2.1 General 14
7.2.2 Start-up processing of NECD nodes 14
7.2.3 Search processing 15
7.2.4 Obtaining NECD attribute information 15
7.2.5 Obtaining home air conditioner attribute information 16
7.3 Periodical operation 16
7.4 Occasional operation 16
7.4.1 General 16
7.4.2 Obtaining home air conditioner status 16
7.4.3 Controlling home air conditioners 17
7.5 Operation during fault status 18
8 Remote control 19
8.1 General 19
8.2 Processes to be carried out by controllers on remote control 19
9 Considerations on controllers 22
9.1 General 22
9.2 Restrictions by home air conditioner implementations 22
9.3 Processable number of object property counter 24
9.4 Status synchronization by controllers (periodical operation) 24
9.5 Reading fault status 26

Documents
Document Sharing Hub
Full document details: ISO IEC 14543-4-301-2020

Annex A (informative) Terms and NECD frame format on ISO/IEC 14543-4-3 and IEC 62394 27
A.1 Terms correspondence between ISO/IEC 14543-4-3 and IEC 62394 27
A.2 NECD frame format 27

Figure 1 – Relationship between IEC 62394, ISO/IEC 14543-4-3 and ISO/IEC 14543-4-301 ... 5
Figure 2 – Connection configurations 9
Figure 3 – Assumed network stack 10
Figure 4 – Example of normal operation sequences 14
Figure 5 – Example of sequence for obtaining NECD attribute information 15
Figure 6 – Sequence to obtain status of home air conditioners 17
Figure 7 – Sequence to control home air conditioners 18
Figure 8 – Remote control 19
Figure 9 – Remote control sequence (properties are written one by one) 21
Figure 10 – Remote control sequence (properties are written in a batch) 22
Figure 11 – Status synchronization flow by controllers 25
Figure 12 – Obtaining detailed fault status information 26
Figure A.1 – NECD frame format 28

Table 1 – NECD objects 10
Table 2 – NECD services 11
Table 3 – NECD properties of device object (super class) 11
Table 4 – NECD properties of device object 12
Table 5 – Response wait timer value for controllers 12
Table A.1 – Terms correspondence table between ISO/IEC 14543-4-3 and IEC 62394 27

Documents
Document Sharing Hub
Full document details: ISO IEC 14543-4-301-2020

© ISO/IEC 2020

INFORMATION TECHNOLOGY – HOME ELECTRONIC SYSTEM (HES) ARCHITECTURE –

Part 4-301: Application protocols for home air conditioners and controllers

FOREWORD

1) ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.
2) The formal decisions or agreements of IEC and ISO on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC and ISO National bodies.
3) IEC and ISO documents have the form of recommendations for international use and are accepted by IEC and ISO National bodies in that sense. While all reasonable efforts are made to ensure that the technical content of IEC and ISO documents is accurate, IEC and ISO cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC and ISO National bodies undertake to apply IEC and ISO documents transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC and ISO document and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC and ISO do not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC and ISO marks of conformity. IEC and ISO are not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this document.
7) No liability shall attach to IEC and ISO or their directors, employees, servants or agents including individual experts and members of its technical committees and IEC and ISO National bodies for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this ISO/IEC document or any other IEC and ISO documents.
8) Attention is drawn to the Normative references cited in this document. Use of the referenced publications is indispensable for the correct application of this document.
9) Attention is drawn to the possibility that some of the elements of this ISO/IEC document may be the subject of patent rights. IEC and ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 14543-4-301 has been prepared by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology.

The list of all currently available parts of the ISO/IEC 14543 series, under the general title *Information technology – Home Electronic System (HES) architecture*, can be found on the IEC and ISO websites.

The text of this document is based on the following documents:

CDV	Report on voting
JTC1-SC25/2929/CDV	JTC1-SC25/2952/RVC

Full information on the voting for the approval of this document can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

AVA Documents
Document Sharing Hub

Full document details: ISO IEC 14543-4-301-2020

INTRODUCTION

This document specifies the message structure, sequences and protocol of the application layer for networked enhanced control devices used in the Home Electronic System. Some services are targeted for communications between devices. Other services are exclusively reserved for management purposes. Some services can be used for both management and run-time communications. This document is applicable for energy management services, mobile access, remote appliance maintenance services, home healthcare services, home security services and comfort control.

This document specifies the detailed procedures and behaviours of both home air conditioners and controllers at the application level communication based on ISO/IEC 14543-4-3.

Figure 1 shows the relationship between IEC 62394, ISO/IEC 14543-4-3 and ISO/IEC 14543−4−301. The existing ISO/IEC 14543-4-3 specifies the message structure, sequences and protocol for a general-purpose communication for use in network enhanced control devices of the Home Electronic System (HES) Class 1. ISO/IEC 14543-4-3 provides the common interfaces for the use-level process and the services such as energy management, remote maintenance, and other services for easily building a system consisting of multi-vendor devices and equipment. The existing IEC 62394 specifies the detailed lists of control commands on NECD objects. Annex A shows terms and NECD frame format on ISO/IEC 14543-4-3 and IEC 62394.

Since ISO/IEC 14543-4-3 is a general-purpose communication specification that applies to a variety of devices, it does not focus on the detailed procedures and behaviours for each device such as a home air conditioner.

In order to enhance interoperability, it is necessary to specify how to implement ISO/IEC 14543−4-3 for each device or controller at the application level: command sequences, timeout requirements, required combinations of acceptable commands, etc.

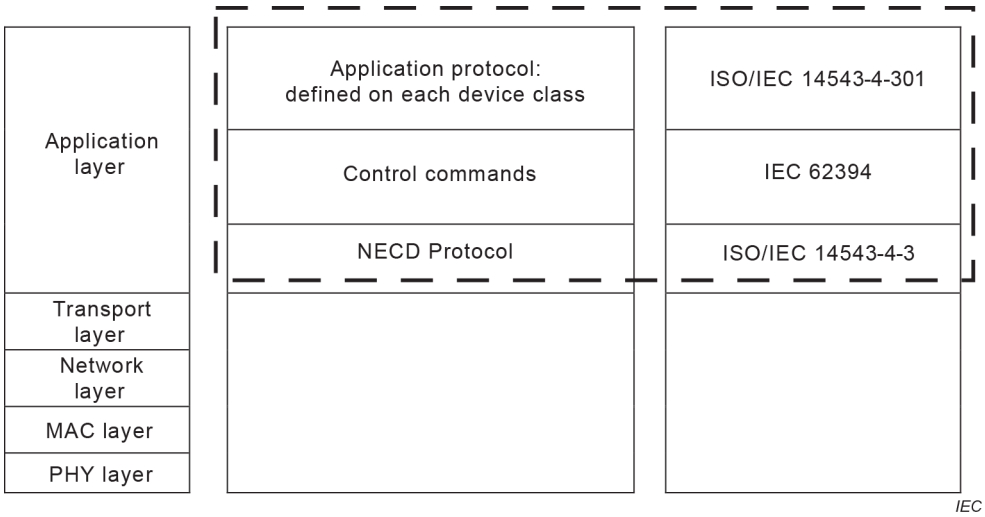

Figure 1 – Relationship between IEC 62394, ISO/IEC 14543-4-3 and ISO/IEC 14543-4-301

Documents
Document Sharing Hub
Full document details: ISO IEC 14543-4-301-2020

INFORMATION TECHNOLOGY – HOME ELECTRONIC SYSTEM (HES) ARCHITECTURE –

Part 4-301: Application protocols for home air conditioners and controllers

1 Scope

This part of ISO/IEC 14543 specifies an application-layer protocol necessary for ensuring interoperability among the products of various manufacturers regarding communications between home air conditioners and controllers, using a protocol called network enhanced communications device (NECD) as specified in ISO/IEC 14543-4-3. This protocol is based on user datagram protocol (UDP) using IPv4 or IPv6 (TCP is optional).

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.

ISO/IEC 14543-2-1, *Information technology – Home Electronic System (HES) architecture – Part 2-1: Introduction and device modularity*

ISO/IEC 14543-4-3, *Information technology – Home Electronic System (HES) architecture – Part 4-3: Application layer interface to lower communications layers for network enhanced control devices of HES Class 1*

IEC 62394, *Service diagnostic interface for consumer electronics products and networks – Implementation for ECHONET*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 14543-2-1 and the following apply.

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

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1.1
controller
function embedded on unspecified devices for controlling home air conditioners

3.1.2
device object
NECD object other than node profile object

Note 1 to entry: In this document, it refers to home air conditioner object only.

Documents
Document Sharing Hub

Full document details: ISO IEC 14543-4-301-2020

3.1.3
home air conditioner
air conditioning device for home use including a communications interface that supports the NECD protocol

Note 1 to entry: As used in this document, this term means the home air conditioner includes a communications interface that supports the NECD protocol.

3.1.4
NECD communication middleware
middleware between the lower communication layers and the application layer that performs communications processing according to the protocol specified in this document

3.1.5
NECD communication processing block
processing block for the communication middleware

Note 1 to entry: This block performs communications protocol processing to facilitate remote device control and monitoring processing for application software, stores information for the above and controls various data on the device as well as the status of other devices.

3.1.6
NECD data
NDATA
data region for a message exchanged by NECD communication middleware

3.1.7
NECD header
NHD
data containing the protocol type and message format for the NDATA section

3.1.8
NECD object
NOJ
model of information to be disclosed to the network from information owned by the NECD communication processing block, or an access procedure model

Note 1 to entry: The information or control target owned by each device is specified as a property and the operating method (setting, browsing) for this is specified as a service.

3.1.9
NECD property code
NPC
code value related to the NECD property

3.1.10
NECD protocol
communication protocol used in NECD communication specified in ISO/IEC 14543-4-3

3.1.11
NECD service
NSV
code value related to the NECD service

3.1.12
NECD frame
frame composed of NHD1, NHD2, TID and NDATA

Documents
Document Sharing Hub
Full document details: ISO IEC 14543-4-301-2020

3.1.13
node profile
description of objects implemented in each node

3.1.14
property data counter
PDC
indication of the size of the NDT region

3.1.15
property value data
data value related to the NECD property code (NPC)

EXAMPLE Status notification or specific setting.

Note 1 to entry: Property value data is controlled by the NECD service (NSV).

3.1.16
remote control
control from outside the home

3.1.17
response wait timer
timer that counts the time from a controller request until a response from a targeted home air conditioner

3.1.18
transaction ID
TID
parameter to link a sent request with a received response

3.1.19
super class
set of properties that are inherited to and implemented in all device object classes

3.2 Abbreviated terms

DNOJ	destination NECD object
IP	internet protocol
NDATA	NECD DATA
NDT	NECD Data
NECD	network enhanced control device
NHD	NECD header
NPC	NECD property code
NSV	NECD service
OPC	processing object property counter
PDC	property data counter
SNOJ	source NECD object
TID	transaction ID
UDP	user datagram protocol

Documents
Document Sharing Hub
Full document details: ISO IEC 14543-4-301-2020