

INTERNATIONAL STANDARD



**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**

get full document from standards.iteh.ai



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2015 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 Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
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 corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

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 It also gives information on projects, replaced and withdrawn publications.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 also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

More than 60 000 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.

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: csc@iec.ch.



ISO/IEC 14543-4-3

Edition 1.0 2015-09

INTERNATIONAL STANDARD



**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**

get full document from standards.iteh.ai

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 35.200

ISBN 978-2-8322-2868-5

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

CONTENTS

FOREWORD	5
INTRODUCTION	6
1 Scope	7
2 Normative references	7
3 Terms, definitions and abbreviations	7
3.1 Terms and definitions	7
3.2 Abbreviations	9
4 Conformance	9
5 Services of the application layer	9
5.1 Positioning in communications layers	9
5.1.1 General	9
5.1.2 When using UDP in layer 4 and IP in layer 3	10
5.2 Service primitives of the application layer	10
5.2.1 General	10
5.2.2 NECD objects from the viewpoint of application software	11
5.2.3 Case 1: Obtaining the status of another node	11
5.2.4 Case 2: Controlling the functions of other nodes	12
5.2.5 Case 3: Notifying own node status to other nodes	13
6 Application layer protocol data unit (APDU)	15
6.1 Overview	15
6.2 NECD header (NHD)	16
6.2.1 Overview	16
6.2.2 NECD header 1 (NHD1)	16
6.2.3 NECD header 2 (NHD2)	17
6.3 Transaction ID (TID)	17
6.4 NECD data (NDATA)	17
6.5 NECD object (NOJ)	17
6.6 NECD Service (NSV)	18
6.6.1 Overview	18
6.6.2 Property value write service (no response required) [0x60, 0x50]	22
6.6.3 Property value write service (response required) [0x61, 0x71, 0x51]	22
6.6.4 Property value read service [0x62, 0x72, 0x52]	23
6.6.5 Property value write and read service [0x6E, 0x7E, 0x5E]	24
6.6.6 Property value notification service [0x63, 0x73, 0x53]	25
6.6.7 Property value notification (response required) [0x74, 0x7A]	26
6.7 Processing object property counters (OPC, OPCSet and OPCGet)	27
6.8 NECD property (NPC)	27
6.9 Property data counter (PDC)	28
6.10 NECD property value data (NDT)	28
7 Basic sequences	29
7.1 General	29
7.2 Basic sequences for object control	29
7.2.1 Overview	29
7.2.2 Basic sequences for object control in general	29
7.2.3 Basic sequences for service content	30

7.3	Basic sequences for node start-up	32
7.3.1	Overview	32
7.3.2	Basic sequence for NECD node start-up	32
8	NECD objects – Detailed specifications	33
8.1	General.....	33
8.2	Types of objects.....	33
8.2.1	Device objects	33
8.2.2	Node profile object	33
8.3	NECD property value data types	33
8.3.1	Overview	33
8.3.2	NECD property value range	34
8.3.3	Class-specific mandatory properties	34
8.3.4	Profiles obliged to have a status change announcement function.....	35
	Bibliography.....	36
	Figure 1 – Communications middleware.....	9
	Figure 2 – Acquisition of status of another node (synchronous type).....	11
	Figure 3 – Acquisition of status of another node (asynchronous type).....	12
	Figure 4 – Objects seen from application software	12
	Figure 5 – Method of controlling other nodes	13
	Figure 6 – Objects seen from application software	13
	Figure 7 – Method of notification to other nodes (synchronous type).....	14
	Figure 8 – Method of notification to other nodes (asynchronous type).....	14
	Figure 9 – Objects seen from application software	14
	Figure 10 – Example of object configuration	15
	Figure 11 – NECD frame format.....	16
	Figure 12 – Bit specifications of NHD 1	17
	Figure 13 – Detailed specifications of NHD 2	17
	Figure 14 – Bit specifications of the NOJ code	18
	Figure 15 – Bit specifications of the NSV code.....	18
	Figure 16 – Sequence diagram for NSV transmission and reception	21
	Figure 17 – NDATA configuration for property value write service (no response required).....	22
	Figure 18 – NDATA configuration for property value write service (response required)	23
	Figure 19 – NDATA configuration for property value read service	24
	Figure 20 – NDATA configuration for property value write and read service	25
	Figure 21 – NDATA configuration for property value notification service	26
	Figure 22 – NDATA configuration for property value notification (response required) service.....	27
	Figure 23 – Processing target property counter for three requests	27
	Figure 24 – NPC detailed specifications.....	28
	Figure 25 – NPC code allocation.....	28
	Figure 26 – Basic sequence when controlled object does not exist	29
	Figure 27 – Basic sequence when controlled objects exist	30
	Figure 28 – Basic request receiving sequence for NSV = 0x60.....	30

Figure 29 – Basic request receiving sequence for NSV = 0x6*	31
Figure 30 – Basic request receiving sequence for NSV = 0x63	31
Figure 31 – Basic property value notification sequence	32
Figure 32 – Basic sequence for NECD node start-up	32
Table 1 – List of NSV Codes for Requests	20
Table 2 – List of NSV codes for response/notification	20
Table 3 – List of NSV codes for “Response not possible”	21
Table 4 – Data types, data sizes and overflow / underflow codes	34

Sample Document

get full document from standards.iteh.ai

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

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. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.
- 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 National Committees and ISO member bodies.
- 3) IEC, ISO and ISO/IEC publications have the form of recommendations for international use and are accepted by IEC National Committees and ISO member bodies in that sense. While all reasonable efforts are made to ensure that the technical content of IEC, ISO and ISO/IEC publications is accurate, IEC or 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 National Committees and ISO member bodies undertake to apply IEC, ISO and ISO/IEC publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any ISO, IEC or ISO/IEC publication and the corresponding national or regional publication should be clearly indicated in the latter.
- 5) ISO and IEC do not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. ISO or IEC 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 publication.
- 7) No liability shall attach to IEC or ISO or its directors, employees, servants or agents including individual experts and members of their technical committees and IEC National Committees or ISO member 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 of, use of, or reliance upon, this ISO/IEC publication or any other IEC, ISO or ISO/IEC publications.
- 8) Attention is drawn to the normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this ISO/IEC publication may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 14543-4-3 was 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 web site and ISO web site.

This International Standard has been approved by vote of the member bodies, and the voting results may be obtained from the address given on the second title page.

This publication 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.

INTRODUCTION

This part of ISO/IEC 14543 specifies the message structure, sequences and protocol of the application layer for use 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 standard is applicable for energy management services, mobile access, remote appliance maintenance services, home healthcare services, home security services and comfort control. This standard focuses on the application layers (5th layer to 7th layer of the OSI reference model). This standard specifies a message structure that differs from the 12 message structures specified in ISO/IEC 14543-4-1. This standard allows the use of IP addressing or MAC addressing, while ISO/IEC 14543-4-1 specifies a different non-IP address structure. This part depends on routing functions provided by an external IP layer. ISO/IEC 14543-4-1 uses the routing functions specified in ISO/IEC 14543-4-2. Therefore Part 4-3 is an alternative to Part 3-1 plus Part 3-2.

ISO/IEC 14543, *Information technology – Home Electronic System (HES) architecture*, provides

an introduction to specifications for Home Electronic System (HES):

Part 2-1: Introduction and device modularity

and specifications for three types of HES devices:

Parts 3-x Specifications for network based control of HES Class 1

Parts 4-x Specifications for network enhanced control of HES Class 1

Parts 5-x Specifications for intelligent grouping and resource sharing for HES Class 2 and Class 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

1 Scope

This part of ISO/IEC 14543 specifies the message structure, sequences and protocol of the application layer for use in network enhanced control devices of the Home Electronic System (HES) Class 1. It provides the services and the interface for the user-level process. This application layer protocol is independent of lower communications layers, which support MAC addressing or IP addressing. The communications sequence is based on the application services.

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.

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

ISO/IEC 14543-4-1, *Information technology – Home electronic system (HES) architecture – Part 4-1: Communication layers – Application layer for the network enhanced control devices of HES Class 1*

ISO/IEC 14543-4-2, *Information technology – Home electronic system (HES) architecture – Part 4-2: Communication layers – Transport, network and general parts of data link layer for network enhanced control devices of HES Class 1*

3 Terms, definitions and abbreviations

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.

3.1.1

NECD communications middleware

middleware between the lower communications layers to the application layer that performs communications processing according to the protocol specified in this standard

3.1.2

NECD communications processing block

processing block for the communications middleware

Note 1 to entry: This block performs communications protocol processing to facilitate remote device control / 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.

3.1.3

NECD data

NDA

data region for message exchanged by NECD communications middleware

3.1.4

NECD header

NHD

data containing the protocol type and message format for the NDATA section

3.1.5

NECD object

NOJ

model of information to be disclosed to the network from information owned by the NECD communications 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.

3.1.6

NECD property code

NPC

code value related to the NECD property

3.1.7

NECD service

NSV

code value related to the NECD service

3.1.8

NECD frames

frame composed of NHD1, NHD2, TID and NDATA

3.1.9

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).

3.1.10

transaction ID

TID

parameter to link a sent request with a received response

3.1.11

property data counter

PDC

indication of the size of the NDT region

3.2 Abbreviations

DNOJ	Destination NECD ObJect
IP	Internet Protocol
NDATA	NECD DATA
NDT	NECD DaTa
NECD	Network Enhanced Control Device
NHD	NECD HeaDer
NPC	NECD Property Counters
NSV	NECD SerVice
OPC	Processing Object Property Counter
PDC	Property Data Counter
SNOJ	Source NECD ObJect
TID	Transaction ID
UDP	User Datagram Protocol

4 Conformance

Enhanced control devices of HES Class 1 that claim conformance to this International Standard shall:

- send, receive and process application layer protocol data units as specified in Clause 6;
- provide application services specified in 6.6 that may be needed by devices for which the application is intended.

5 Services of the application layer

5.1 Positioning in communications layers

5.1.1 General

The NECD communications processing block is positioned between application and lower communications layers. This standard provides the specifications of “NECD communications processing block”. In Figure 1, the shaded area shows the communications middleware block to be specified.

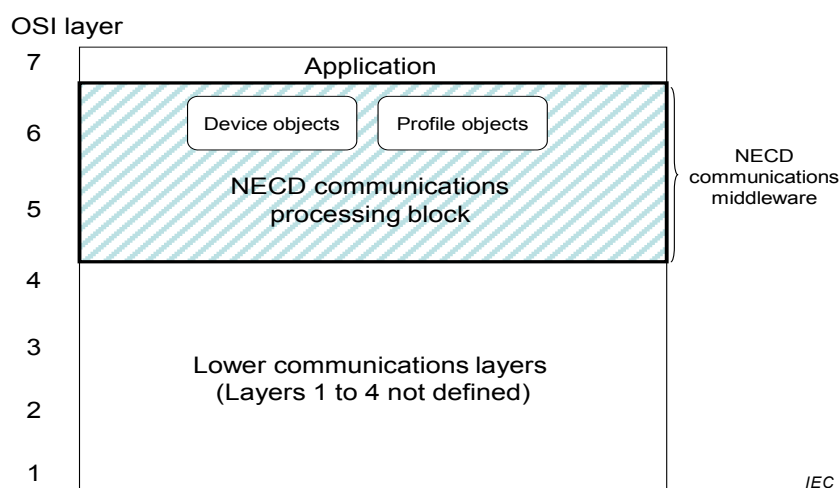


Figure 1 – Communications middleware

As Figure 1 shows, the NECD communications middleware block specified in this standard corresponds to the NECD communications processing block, which is specified as a function that is independent of layers 1 to 4. The NECD communications processing block sends and receives a NECD frame specified in Clause 6. There are two kinds of messages: unicast and broadcast.

Unicast transmission specifies a destination address that is in layer 4 or lower, and transmits the NECD frame to a specific NECD node. Broadcast transmission specifies a destination address that is in layer 4 or lower, and transmits the NECD frame to all the NECD nodes in a subnet. In case of UDP/IP, refer to 5.1.2.

When the transmission system of layer 4 or lower layer corresponds to neither multicasting nor broadcasting, it shall transmit to all the NECD nodes in a subnet using multiple unicast transmissions to achieve the equivalence of a broadcast transmission. The destination address and the method for setting it are not specified, but shall be defined for every lower communications layer.

Security is not specified in the NECD communications processing block. Security standard technologies in layer 4 or lower can be applied as necessary.

5.1.2 When using UDP in layer 4 and IP in layer 3

When using UDP/IP, the following addresses and ports shall be supported.

Each NECD node has an IP address. The IP address range and acquisition method are not specified. If NECD frames are transferred by UDP packets, the destination port number of UDP packets shall be 3 610. The source port number is not specified. For general broadcast (simultaneous transmission), NECD frames are mapped on IP multicast packets and transferred. For IPv4, the destination multicast address value shall be 224.0.23.0. For IPv6, ff02::1 (all-node multicast address) shall be used.

5.2 Service primitives of the application layer

5.2.1 General

The NECD objects are introduced with two objectives:

- compartmentalisation of the functions of devices connected to the NECD network;
- modularisation of communications between devices to enable application software developers to utilise NECD communications without having to consider detailed specifications.

The NECD objects are processed in the NECD communications processing block. Control content exchanged in communications can be classified into those relating to functions unique to each device and those relating to data profiling other than the functions unique to each device. In NECD, all of these are specified as NECD objects, and control and data exchange are achieved to enable their manipulation.

Each NECD object has some properties. The various unique functions possessed by an NECD node are represented as NECD properties. Devices are operated by reading or writing the NECD properties of the NECD object in the relevant NECD node.

NECD objects are defined by the following specifications: object type (codes are specified in 6.5 as NOJ); the properties possessed by each object (codes are specified in 6.8 as NPC); and the services for those properties (codes are specified in 6.6 as NSV).

NOTE It is assumed that each NECD node would have more than one NECD object of the same type (e.g., two human detection sensor objects in the same node), and that identification could be performed by stipulating a specific code.