INTERNATIONAL STANDARD

ISO/IEC 15045-1

First edition
2004-01

Information technology – Home electronic system (HES) gateway –

Part 1: A residential gateway model for HES

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Reference number
ISO/IEC 15045-1:2004(E)

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PRICE CODE P

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INFORMATION TECHNOLOGY – HOME ELECTRONIC SYSTEM (HES) GATEWAY –

Part 1: A residential gateway model for HES

FOREWORD

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International Standard ISO/IEC 15045-1 was prepared by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology.

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

INTRODUCTION

The residential gateway (RG) is a device of the Home Electronic System (HES) that connects home network domains to network domains outside the house, as shown in Figure 1. It supports communications among devices within the premises and systems, service providers, operators and users outside the premises.

The RG enables service and content providers to deliver services such as entertainment, video and broadband digital streams, monitoring for health care, security and occupancy, home appliance control and preventive maintenance, remote metering, and energy management. The RG specified by this standard does not imply the use of any particular protocol such as IP and it is recognised that many forms of the RG will exist using many types of data such as analogue video and broadband digital streams.

The safe and effective delivery of these services places many demands on the facilities of the RG. These include the integrity and security of communications, the delivery of commands to devices in the home from external sources, the blocking of selected commands that may create unsafe conditions, the protection of the home from the risks inherent in a connection to the internet, and facilitating micro-payments. There may be many different configurations of RG. Regardless of the RG configuration, this standard ensures the interoperability of home devices with external services. Also, this standard specifies features to enhance the safety and security of network devices and consumer transactions via the network.

The RG connects the remote user and the internet with the people, equipment, appliances or services in the home. These devices or systems are usually objects or nodes on a particular Home Area Network (HAN).

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Residential gateway

Some of the potential interfaces and supported networks of a residential gateway are shown in Figure 1. In all cases the gateway provides the mechanism whereby Wide Area Networks (WANs) communicate with Home Area Networks. The gateway may be a standalone gateway; it may be embedded in another device; or more than one gateway unit may be used. A number of distributed gateway units may display the behaviour of a single gateway.

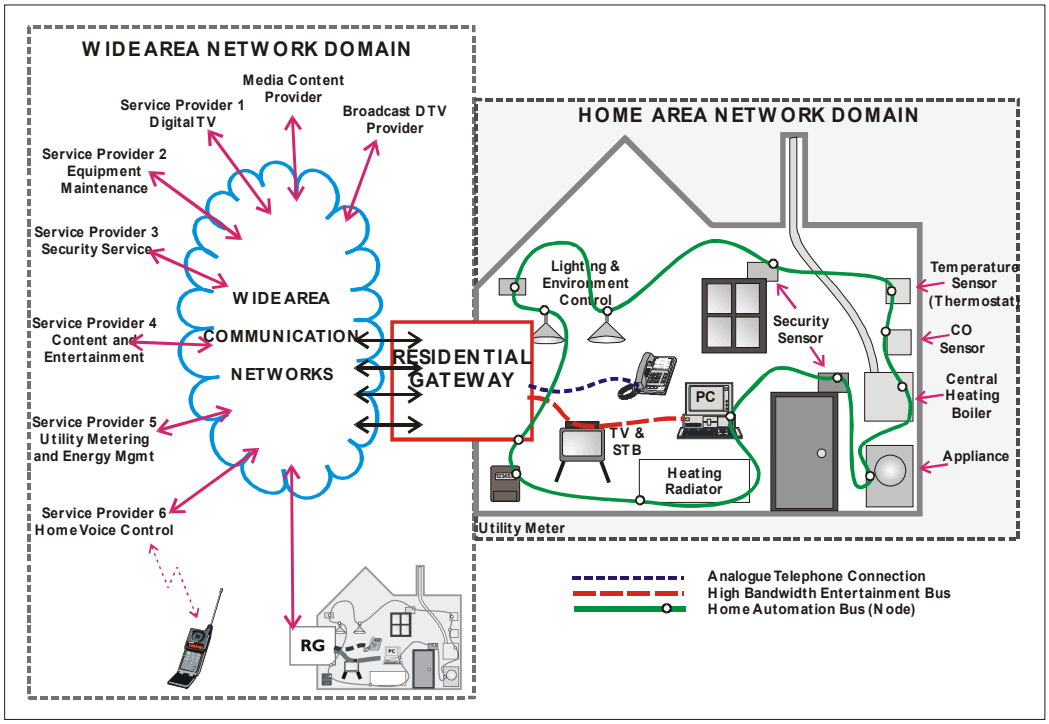

Figure 1 – Typical service provision for home network

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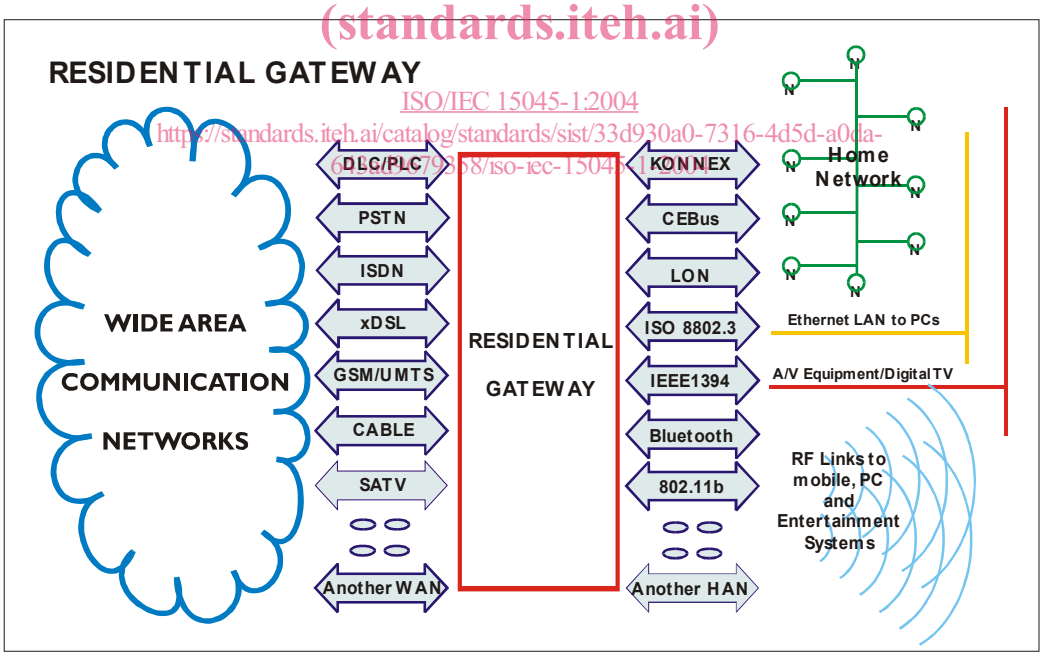

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Figure 2 – Diagram of possible RG connections and interfaces

Figure 2 illustrates that multiple WANs and HANs may be supported by the RG. This figure is not intended to imply that all or any of the interfaces or connections shown need to be connected to a residential gateway (or for instance that terrestrial DTV is excluded in favour of SATV).

The physical manifestation of a residential gateway is outside the scope of this standard. This standard accommodates a range of potential configurations. These configurations may range from an approach where a single box acts as interface between two or more WANs and HANs, to a modular dedicated residential gateway, to multiple residential gateways distributed among physically separate locations within the premises.

This standard is based on a black box approach, since it specifies the interfaces of the RG and the function provided but leaves considerable freedom on how these functions are implemented within the black box[1].

This standard is applicable to all communications and other technologies that may be incorporated in the residential gateway and includes both analogue and digital systems.

This document comprises the following:

- requirements of a residential gateway;
- functional safety requirements of a residential gateway, where these are not covered by existing functional safety standards;
- security requirements of a residential gateway;
- options for the Architecture of the residential gateway and the elements of a conforming residential gateway (see Annex A);
- safety requirements of home systems connected to Wide Area Networks and the role of the residential gateway (see Annex B);
- security requirements of home systems connected to Wide Area Networks and the role of the residential gateway (see Annex C).

This document offers a future-proof[2], forwards and backwards compatible standard for residential gateways and for networks and devices to which they are interfaced.

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1 In systems terminology a ‘black box’ refers to an object that has inputs, outputs and carries out functions but for which the means and methodology that convert the inputs into outputs are not specified. Only inputs, outputs and functions are specified.

2 A system that is called ‘future proof’ is expected to be adapted to technologies and meet requirements that were not specified when it was designed but may be needed in future.

INFORMATION TECHNOLOGY – HOME ELECTRONIC SYSTEM (HES) GATEWAY –

Part 1: Residential gateway model for HES

1 Scope

1.1 Overview

This part of ISO/IEC 15045 specifies the minimum functional requirements of a residential gateway (RG) and the documentation to be provided. The standard specifies what a gateway should do in order to deliver services in a suitably safe, secure and future-proof way without being prescriptive. It also gives functional requirements.

1.2 Functional safety

This standard specifies certain safety features where commands sent from remote places to devices on the premises could cause danger to persons or property.

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While this standard only specifies minimum requirements for the gateway architecture, gateway operation, and associated home systems in terms of safety, it provides an extensive checklist of functional situations that should be treated with the utmost caution and recommends appropriate measures.

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1.3 Privacy and security

This standard specifies security measures to ensure the integrity of information that may pass through the residential gateway.

A residential gateway operating between the internet and the home creates significant concerns for security to the user.

Particular attention is drawn to safety, security and privacy. The attention of the user (consumer, maintainer or application service provider (ASP)) of the gateway is drawn to dangers resulting from unexpected system interoperation, from unauthorised access and from compromise of private user information. RGs that are stated to conform to this standard will be evaluated by the RG manufacturers for potential functional safety and/or security hazards arising from systems integration.

2 Normative references

The following referenced documents are indispensable for the application 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 7498, *Information technology – Open Systems Interconnection – Basic Reference Model*

ISO/IEC 14762, *Information technology – Home Control Systems – Guidelines for functional safety*

ISO/IEC 18012-1, *Information technology – Home electronic system – Guidelines for product interoperability – Part 1: Introduction*[3]

3 Terms, definitions and abbreviations

3.1 Definitions

For the purposes of this part of ISO/IEC 15045, the following definitions apply.

3.1.1
co-existence
no interference between different pieces of equipment on the premises

Specifically, the operation of one RG does not interfere with the operation of another RG.

3.1.2
documentation
all instances of product literature, brochures, data sheets, manuals and catalogues in which the product is described, defined, detailed or pictured that may be produced in paper or any electronic format

NOTE In this definition, “product” refers to a product, a system, a network or a residential gateway.

3.1.3
file transfer protocol, FTP
IP based protocol (see IETF – Internet Engineering Task Force)

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3.1.4
home area network, HAN
any electronic network situated within the general environment of a residential dwelling and that connects enabled nodes within that dwelling

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3.1.5
HAN to gateway interface, HGI
translates the communications protocol of HAN nodes to that of the internal processor within the RG

NOTE The specification of the RG internal processor is outside the scope of this standard. The HGI may be implemented in software, firmware or hardware and may be modular or integrated in the RG.

3.1.6
IPSec
provides security services at the IP layer that allow the user to apply combinations of integrity, replay detection and encryption to IP packets

It also provides a mechanism for users to authenticate each other and generate and exchange session keys, secret keys that are used for a limited time (a session), and then discarded.

NOTE For further explanation, see IETF.

3.1.7
local area network, LAN
any electronic network that connects computing devices together to form a group of intercommunicating devices

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3 To be published.

3.1.8
management information base
Simple Network Management Protocol (SNMP)

NOTE See also IETF.

3.1.9
network address translation, NAT
feature defined for the internet whereby one IP address is assigned to an RG

Messages intended for specific nodes on a home network are sent to that address and mapped by the NAT to specific node addresses and vice versa.

NOTE See also IETF.

3.1.10
personal area network
any electronic network that connects to enabled devices within the immediate vicinity of a person, generally within a 10 m radius including devices carried by that person

3.1.11
processing and protocol conversion
for any WGI or HGI, processing and protocol conversion may take place to present data in the format and protocol of the RG

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3.1.12
residential gateway
electronic device that is situated between WANs and HANs (or LANs) in the premises

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3.1.13
residential gateway internal processes
any RG will have internal processes (which are not defined in terms of software requirements) to carry out the requirements of an RG

3.1.14
route
to route information is to direct the information, command or data stream to a particular address or node in the WAN, LAN or HAN

3.1.15
spyware
trojan horse software that may report to an external entity information about a computer, device or network and its parameters

3.1.16
secure/multi purpose internet mail extensions
secure encoding for e-mail attachments

NOTE See also IETF.

3.1.17
secure sockets layer/transport layer security (SSL)
the *Secure Sockets Layer* protocol implements security on HTTP-based communications[4]

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4 The IETF formed the TLS Working Group to develop a common standard. Version 1 of TLS, the Transport Layer Security protocol [N10], was issued in January 1999. See IETF.