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Information technology – Home electronic system (HES) gateway –
Part 2: Modularity and protocol

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INFORMATION TECHNOLOGY – HOME ELECTRONIC SYSTEM (HES) GATEWAY –

Part 2: Modularity and protocol

FOREWORD

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International Standard ISO/IEC 15045-2 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 15045 series, under the general title *Information technology – Home electronic system (HES) gateway*, can be found on the IEC 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.

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INTRODUCTION

As the market has developed for home systems, the number of communications protocols for home networks and for access to the home has increased. This has occurred even while ISO/IEC standards for these networks have been developed and published. Continuing technological progress also suggests that such proliferation will persist, and that no single technology or standard is likely to prevail.

Therefore, standards to enable interoperability among applications implemented on incompatible networks are being written. This standard addresses the gateway, which provides an interconnection between an access network (a wide area network) and one or more home networks (home area networks).

This standard is part of a series of standards and technical reports for the Home Electronic System (HES) that deal with the topic of control and communication networks in homes and small buildings. ISO/IEC 15045-1, published in 2004, defines a basic model of the residential gateway, including functional requirements.

This standard defines a common framework for implementing gateway platforms to achieve interconnection and interoperability of home system products and applications. The objective is to support products from any manufacturer or provider in a manner that is safe, reliable, predictable and consistent. Service providers such as cable TV companies, Internet service providers and telephone companies are each installing a gateway to deliver digital data and audio/video streams, therefore some houses contain multiple gateways. As a consequence, an optional feature of this standard specifies how to interconnect multiple gateways in one house so that these gateways can co-ordinate service offerings.

A communications gateway provides an interconnection between a wide area network (WAN) and local area network (LAN) where the protocols on each network differ. The gateway is responsible for protocol translation of signals, message formats and timing. The home systems industry has adapted LAN technology for Home Area Networks (HANs). Ideally, each home system would be based on one HAN and all attached devices and appliances would use one communications protocol. In reality, multiple incompatible HAN technologies are being marketed. Also, each service provider is installing a separate gateway (e.g., DSL, cable broadband and satellite). Therefore, it is possible that a user will purchase and install products employing two (or more) dissimilar HANs within the same premises. These HANs may be connected to WANs via separate incompatible gateways. However, the user expects these products and networks to behave as if they were the same logical network in order to deliver home services, such as:

- entertainment (audio/video);
- data/internet access;
- communication (telephony);
- energy management;
- health care and monitoring;
- environmental control (heating and cooling);
- security and safety monitoring;
- appliance telemetry;
- lighting control.

This standard accomplishes interoperability by specifying a modular architecture and set of protocols for interconnecting the modular elements with a common signalling bus. It relies on a common intermediate language to achieve interoperability among applications called the Common Interoperability Framework (HES-CIF), described in this standard. Parts of ISO/IEC 18012 define the network-specific interworking functions needed to provide conforming products.

This International Standard defines a universal gateway system by specifying interfaces between

- standalone local/Home Area Networks (HANs) and connected devices,
- multiple implementations of local/home area networks (HANs) and connected devices,
- Wide Area Networks (WANs) (also known as access networks) and applications connected to Home Area Networks (HANs) and connected devices.

This standard establishes a framework for implementation of a general-purpose interoperability platform or “translator” among home area networks or between wide area networks and home area networks. It represents one approach to implementation of the interoperability standard ISO/IEC 18012. This standard does not attempt to specify a central controller or control system; and does not attempt to improve or resolve disparities or shortcomings among transmission technologies, protocols, or application languages. However, this standard does provide the premises with a platform for supporting any number of specific services and supporting fundamental elements of consumer security (i.e., firewall services), safety and privacy.

This standard is not a design for a specific gateway, but rather it offers an architecture, and therefore it is necessarily abstract. However, this standard is relevant for many commercial gateway configurations. Examples of such implementations are included for information in Annex A.

Summing up, this standard shows how to build a gateway out of modular building blocks. This International Standard does not describe or specify gateway applications, service requirements, network topologies, or how gateways are to be applied within home networks and systems. These specifications are left to other home gateway-related standards.

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INFORMATION TECHNOLOGY – HOME ELECTRONIC SYSTEM (HES) GATEWAY –

Part 2: Modularity and protocol

1 Scope

This part of ISO/IEC 15045 specifies a gateway architecture that provides an interconnection between one or more Wide Area Networks (WANs) and one or more Home Area Networks (HANs). This standard is not needed for a “simple gateway” linking one WAN to one HAN where there is no intention of future expansion, as illustrated in Figure 1. The scope of this standard applies to a “distributed gateway,” as illustrated in Figure 1 and is also referred to in ISO/IEC 15045-1 as the Complex Modular Gateway. Also, this standard specifies how separate gateways in a single house can interoperate to provide co-ordinated functions.



Figure 1 – Options for home-gateway configurations

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 18012-2:—, *Information technology – Home electronic system (HES) – Guidelines for product interoperability – Part 2: Taxonomy and application interoperability model*¹

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

¹ To be published.

3.1.1

appliance

apparatus intended for household or similar use

[SOURCE: IEC 60050-151:2001, 151-11-23]

Note 1 to entry: For example a clothes washer, water heater, television, inverter, etc.

3.1.2

bridge

interface between dissimilar lower layer networks

Note 1 to entry: A bridge may provide services at layer 1 (physical layer) or layer 2 (data link layer).

3.1.3

bus

common or shared communication path or highway

Note 1 to entry: A bus is a means of interconnecting devices under a single administration, such as a LAN comprising devices sharing a common set of pathways.

Note 2 to entry: A distinction may be drawn between “logical” and “physical” buses when bus topologies are considered.

3.1.4

common interoperability framework CIF

abstract intermediate language expressions for translating HAN or WAN-specific messages

Note 1 to entry: A common interoperability framework includes

- a) an HES-AIL (Abstract Intermediate Language) and
- b) a set of network-specific Generic Interworking Function (GIWF) processes to express (i.e., translate) any message to or from any specific HAN or WAN message

3.1.5

compatibility

ability of two or more networks within a premises to be mutually tolerant and that do not interfere with one another

Note 1 to entry: The networks are co-existent, but they are not necessarily interoperable.

3.1.6

component

logical subunit of a larger, encompassing concept

Note 1 to entry: For example, the concept of interoperability is subdivided into constituent components such as safety, management and operation. These constituent components are further subdivided within their respective sections. In the context of the HES-gateway, the term component is also used to refer to logical subunits of system architecture concepts, such as the components of a networking implementation (e.g., addressing).

3.1.7

device

distinct physical unit on a network

Note 1 to entry: A device can either be an end node on the network, or an intermediate node (as in the case of a gateway, router, or bridge device connecting two distinct physical networks).

3.1.8

distributed gateway

HES-gateway implemented as separate but interconnected modular elements

3.1.9**gateway**

interface between dissimilar networks

Note 1 to entry: A gateway may provide services up to OSI layer seven and above.

Note 2 to entry: The HES-gateway provides protocol and language translation services above layer seven.

3.1.10**gateway link****GL**

full seven-layer protocol stack and the physical bus internal to and specific to the HES-gateway architecture to connect GL modules

Note 1 to entry: The GL is used to communicate the HES-AIL encoded messages (resulting from the GIWF translation process) between HES-link modules and is not intended to link to end user devices. It is a link in the sense that it transports messages within, or native to, the CIF (i.e., GL and HES-AIL). The GL may also be referred to as the "HES-link".

3.1.11**generic interworking function****GIWF**

translation function between a specific home network application language and the HES-AIL (Abstract Intermediate Language) used within the HES-gateway system

3.1.12**HES abstract intermediate language****AIL**

language to represent or express the messages of any HAN or WAN

Note 1 to entry: AIL is an intermediate HES-gateway-oriented application language that includes a syntactic structure and semantic definitions comprising a lexicon of terms including objects and methods (actions).

3.1.13**HES-gateway**

gateway conforming to ISO/IEC 15045-2

Note 1 to entry: The HES-gateway provides protocol and language translation services above layer seven in conformance with this standard.

3.1.14**HES-link module**

device that provides the required services for one of the networks of the HES-gateway system

Note 1 to entry: In the context of this standard, the HES-link module provides protocol and language translation services above layer seven and provides an interface to the GL for purposes of connecting by the GL to one or more other HES-link modules serving other networks. Two or more HES-link modules, connected together via a GL, comprise a gateway.

3.1.15**home area network****HAN**

network specifically serving nodes, devices, components and functions within a home or premises

3.1.16**home electronic system****HES**

collection of devices and components operating within the home and interconnected over one or more networks, and within which such devices and networks are compatible and interoperable according to various ISO/IEC standards

3.1.17**interface module**

HES-link module that provides an interface to a particular HAN or WAN network

3.1.18**interoperability**

ability of logical entities to function together for applications on a network or between multiple networks

3.1.19**management information base****MIB**

memory function in some portion of the gateway that stores information useful for various network management functions

Note 1 to entry: No relationship is implied here with Simple Network Management Protocol (SNMP) from which the term "MIB" is borrowed.

3.1.20**network**

distinct interconnection or set of nodes or devices that share a common communication protocol and are mutually compatible and interoperable

3.1.21**object**

program or unit of software functionality

Note 1 to entry: This definition is similar to that traditionally used in object-oriented programming.

[SOURCE: ISO/IEC 18012-2:–2, 3.1.27] [ISO/IEC 15045-2:2012](https://standards.iteh.ai/catalog/standards/sist/c20aa356-6279-4397-8db0-0951cd33b6df/iso-iec-15045-2-2012)

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3.1.22**product**

device or network of devices that may be purchased to make up a home electronic system

3.1.23**router**

interface between dissimilar middle layer networks

Note 1 to entry: A router may provide services at layer 2 (data link layer) or layer 3 (network layer).

3.1.24**service module**

HES-link module that provides a specific service or process for the home that requires access to one or more networks available to the HES gateway

3.2 Abbreviations

AAA	Authentication, Authorization and Accounting
ATM	Asynchronous Transfer Mode
CIF	Common Interoperability Framework (as specified in 3.1.4)
DBS	Direct Broadcast Satellite
DDS	Data Distribution Service
DG	Distributed Gateway
DGS	Distributed Gateway System
DSL	Digital Subscriber Line
GIWF	Generic InterWorking Function

² ISO/IEC 18012-2 is planned to be published together with ISO/IEC 15045-2.