

# INTERNATIONAL HOME AUTOMATION STANDARDS

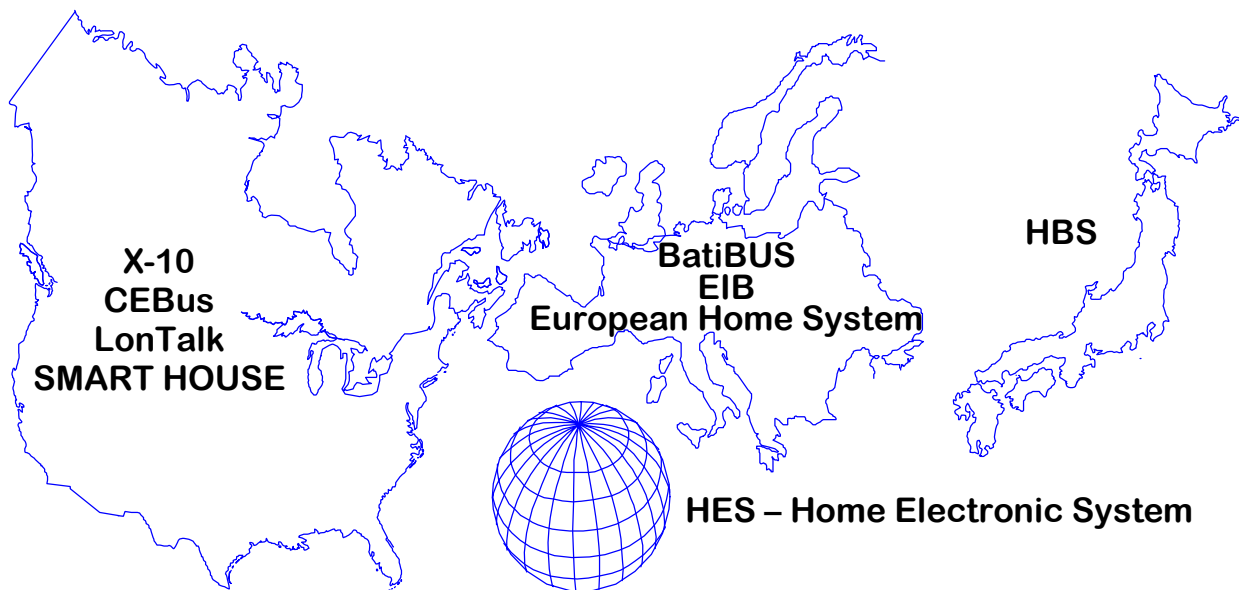
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## Introduction

[NOTE: This article originally appeared in the webzine *HTINews*, published by Hometoys (www.hometoys.com) in April 1998.]

This article is an excerpt from a report entitled, *Home Automation and Utility Customer Services*, written by Dr. Wacks and published by Cutter Information Corporation. Please see the Cutter web site (www.cutter.com/energy/reports/homeauto.htm) for an outline of the report and ordering information.

The full report is intended to guide energy utility companies in developing new customer services that use home automation networks. This excerpt focuses on the development of an international standard for home automation systems, known as the *Home Electronic System*.



**Figure 1.** Home Automation Networks

An article in the February issue of *HTINews* summarized home automation activities

outside North America. The December issue of HTINews reported on the SMART HOUSE<sup>®</sup> system, while the Echelon LonTalk<sup>®</sup> protocol was featured in October. The CEBus<sup>®</sup> protocol was described in the August issue of HTINews. The full report also includes information about X-10<sup>®</sup>, as shown in Figure 1.

## Overview of The Home Electronic System

The *Home Electronic System* (HES) is a standard under development by a formal Working Group sanctioned by the ISO (International Organization for Standardization) and the IEC (International Electrotechnical Commission) of Geneva, Switzerland. This Working



Group is chaired by the author of this article. The writing of standards is performed by experts from member countries. The HES Working Group is part of a subcommittee entitled, *Interconnection of Information Technology Equipment*. Membership in this standards body is composed of 20 Participating-Member countries and 13 Observer-Member Countries. The Participating-Member countries are obligated to vote on each Draft Standard, while the Observer-Member Countries may also cast votes. Where possible, comments submitted with negative votes are resolved to seek consensus among the voting countries.

Although ISO and IEC standards are voluntary, some countries may require conformance to selected standards as prerequisites to selling certain products. The European Union is considering such rules. Therefore, it behooves manufacturers to take note of international standards and participate in the creation of standards that may affect their business or exports

Technical experts from the following countries have been meeting twice a year to formulate the HES standard: Canada, France, Germany, Italy, Japan, the Netherlands, Norway, Sweden, the United Kingdom, and the United States. The development of the HES standard is continuing with semiannual meetings of the HES Working Group.

### Goals of HES

A primary goal of HES is to specify hardware and software so a manufacturer might offer one version of a product that could operate on a variety of home automation networks. To accomplish this, the Working Group is specifying the following components for HES:

- Universal Interface: An interface module to be incorporated into an appliance for communicating over a variety of home automation networks.

- Command Language: A language for appliance-to-appliance communications independent of which network carries the messages.
- HomeGate: A residential gateway to link home control networks with external service provider networks.

The HES Working Group is also chartered to investigate applications of networks for command, control, and communications in commercial and mixed-use buildings. Mixed-use buildings may be apartment houses with retail shops and offices, as is common in Europe.

### **HES Application Models**

The designers of appliances and subsystems make decisions about functions and variables that are accessible from other devices on a home automation network. In engineering terms, these are choices concerning *observability* and *controllability*. In order for devices to interoperate, these decisions must be consistent among the devices. An *application model* describes the engineering aspects of a device that can be read, written, or executed via a home automation network. A model is essential for conveying this information to manufacturers of products that will be linked by a home automation network.

No major protocol includes complete application models of subsystems in the specifications. By examining the objects that constitute an application, a model can be inferred. The choices of objects, methods, and variables are based on an understanding of the device by the designer of the communications interface. This information should be explicitly described in an application model. Otherwise, manufacturers may misinterpret details of device operation because they probably do not have network experts on staff who are familiar with communications models.

The Principal Member countries have approved for publication HES models of a lighting control system, energy management, and security. Last February the Working Group completed work on a heating and cooling system model. All these models were written by the author of this article and submitted to the Working Group as a United States position.

### **Functional Safety**

The HES Working Group has been asked by the IEC to examine issues of functional safety. The *Advisory Committee of Safety* (ACOS) of the IEC has requested that the HES Working Group develop guidelines for safety on home automation networks.

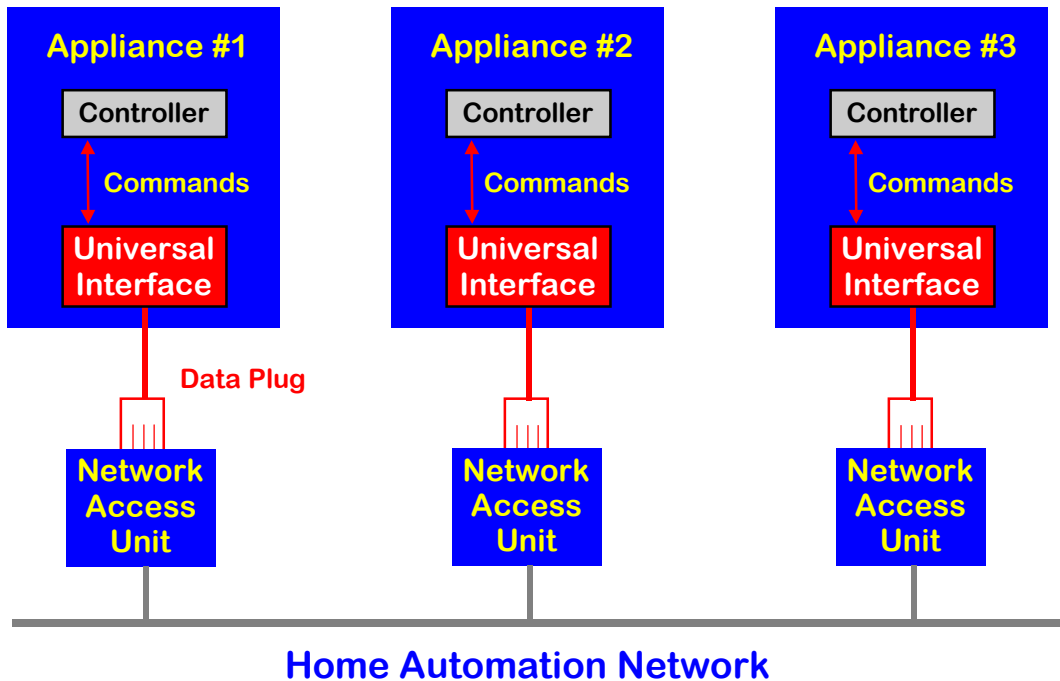
All safety-critical messages sent over the network must be confirmed. Operation of an appliance via the network must not compromise the safety aspects of the device. Thus, if the network fails, the device must maintain appropriate safety levels. There are IEC safety standards for many devices when operating individually. The concern of ACOS is that product interaction via a home control network requires a harmonization of safety requirements. The IEC defines functional safety as the ability of a home control system to carry out the actions necessary to achieve and maintain an appropriate level of safety both under normal conditions and in case of a fault or hazard.

## **The Home Electronic System Components**

### **The Universal Interface**

The primary goal of the *Home Electronic System* international standard is to allow an appliance to communicate on any home automation communications network. The appliance will incorporate a Universal Interface (UI) that includes a standard data plug. A standard application language is also being developed for all appliance commands and messages.

Each point of connection to the network will contain a Network Access Unit (NAU) to convert the data signals and appliance messages to a particular home automation communications protocol. HES specifies the communications protocol between the UI and the NAU. The connection of appliances to HES is illustrated in Figure 2.



**Figure 2.** Appliances connected to Home Electronic System

### HES Application Language

The Working Group is synthesizing a new application language. The UI should operate with all anticipated home automation networks. Features likely to be included in typical networks should be accessible via the UI. Therefore, the HES language must accommodate a superset of commands for the likely networks. Although interposing the UI-NAU link between the appliance and the network medium may not optimize operation on any one home automation system, it lowers costs when selling into a diverse market. Thus, the challenge for the Working Group is to specify a UI-NAU link that minimizes appliance interface costs without impeding network performance.

### HomeGate

The concept of a residential gateway is getting much attention in the utility industry. It is an essential vehicle for reaching customers with new services. However, the form of such a gateway is controversial. At the Residential Gateways Conference in May 1997 many gateway options were presented. There is no consensus yet on these important questions: how many gateways, where are they located, who owns them?

The function of a gateway is primarily to translate between a wide area network (WAN) protocol and a local area network (LAN) protocol. Also, the gateway can contain firewall features that limit what types of messages can flow into and out of the house. A *firewall* is a term popular in the Internet. Many corporate networks are connected to the public Internet via a processor that inspects data flows to prevent access into the local network from unauthorized or malevolent sources. In a similar way, a firewall feature in a gateway will allow the user to exercise control over external data entering the house. The user and utility would agree on specific access rights to deliver purchased services. The HES Working Group is writing firewall provisions into a residential gateway specification. The management of privacy is gaining international attention. For example, Canada and some European countries have laws mandating protection of customer privacy by controlling access to personal customer data.

### **Progress on International Standards**

Even though progress on international standards is relatively slow, participation is important for the exchange of ideas among home automation developers world-wide. The specification of application models may promote product interoperability. This may be more worthwhile than the current focus on protocols, which is encouraging protocol competition. Such competition is wasting resources, confusing potential market players, and delaying the home automation industry. The primary objective of companies and organizations in home automation should be to stimulate consumer interest, which will result in a flourishing industry.

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*Dr. Kenneth Wacks provides management and engineering consulting in home and building automation to utilities and manufacturers world-wide. He offers impartial and practical advice on business opportunities, network alternatives, and product development. The EIA (Electronic Industries Association) has appointed him chairman of the committee establishing international home and building automation standards. For further information, please contact Ken at 9 Pinewood Road, Stoneham, Massachusetts 02180, USA; Tel: (781) 662-6211, Fax: (781) 665-4311, E-mail: kenn@alum.mit.edu.*