ISO/IEC JTC 1/SC 25/WG 1 **N 879A**
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ISO/IEC JTC 1 SC 25 WG 1
Interconnection of Information Technology Equipment
Home Electronic System

Title: Linking HES Devices to IP-based (Internet Protocol) Networks, revision 2

Source: ISO/IEC JTC 1/SC 25/WG 1

Project: Addendum to Project: 25.01.04.01-01: HES Architecture, Part 2: Device Modularity

Status: Preliminary Draft Technical Report Type 2

Requested Action: Approval as an Addendum to Technical Report Type 2, HES Architecture Part 2: Device modularity

Reason: Respond to industry requests for linking home products to IP-based home control networks and to the public Internet for remote access and control

Distribution: SC 25

Notes:

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FOREWORD

ISO (the International Organization for Standardization) and the IEC (the International Electrotechnical Commission) form the specialized system for world-wide 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.

This proposal was prepared by the U.S. Technical Advisory Group to ISO/IEC JTC 1/SC 25/WG 1, *Interconnection of Information Technology Equipment / Home Electronic System*. It has been revised as directed by WG 1 and approved by WG 1 as an addendum to the HES architecture documents.

INTRODUCTION

The development of most home automation infrastructures is based on applications of local area network technology to the home. The anticipated applications have involved interconnecting appliances, sensors, switches, and control panels within the home. Growing interest by electric, gas, telephone, cable, and satellite companies prompted WG 1 to focus on HomeGate. HomeGate provides a link between an external wide area network and the Home Electronic System, the standard being written by WG 1.

Current applications of the Internet involve primarily E-mail and transmission of World Wide Web pages for viewing. Various trade groups are starting to examine the transmission of commands and control over the Internet between user and device, and from device to device. Also, networks within the home may be based on versions of the Internet protocols. These protocols are called TCP/IP (Transmission Control Protocol / Internet Protocol).

This paper discusses how the HES architecture could be modified to accommodate remote control via the Internet. The proposed architecture also could accommodate home control networks internal to the house that are based on TCP/IP, commonly called Intranets.

1. Scope

The ideas presented here are intended to facilitate extensions of the HES architecture to accommodate home networks based on TCP/IP, so-called “IP-based Networks.” Access to the public Internet will be provided by the HES gateway called HomeGate. It is expected that remote control via the Internet would be useful both for home and building automation applications.

The rapid growth of the Internet has resulted in much engineering resources devoted to Internet research. Therefore, investigation of this topic by WG 1 may draw attention to the potential importance of HES in extending the Internet via an Intranet to home appliances and building system components. Liaisons with Internet standards groups and trade associations may be worthwhile for WG 1.

2. The Internet

2.1 Background

The Internet originated in the United States as a defense project to create a nation-wide data communications network that could continue to function if portions were destroyed. The key elements of the communications protocol are connectionless packets that are routed dynamically from sender to receiver via intermediate points. The route from city to city taken by each packet in a message may differ. IP (Internet Protocol), Layer 3 of the protocol, manages the dynamic routing, while TCP (Transmission Control Protocol), Layer 4 of the protocol, assembles the packets into a message. UDP (User Datagram Protocol) is a subset of TCP that may be appropriate for simple devices.

Originally, applications of the Internet were electronic mail, file transfers, and remote access to computers. The Internet remained in government and academia until the introduction of the World Wide Web in 1989 based on a hypertext protocol, invented by Tim Berners-Lee at the European Lab for Particle Physics (CERN) and the Massachusetts Institute of Technology (MIT). The World Wide Web transformed the Internet into a vehicle for the dissemination of information and for commerce.

2.2 Potential home control applications

Recent developments in Internet applications have been directed toward using the network for sending command, control, and status reports between humans and devices and between devices. In a home automation application, a user might call the house via the Internet and HomeGate, and be presented with a web page illustrating the status of the home lighting, heating, or security system. The user could then click on designated “hot spots” on the screen to cause actions in the house. For example, the heat could be turned up in the house before leaving work, or a service person could be allowed in for appliance repairs. Application domain controllers or a designated server in the house could be a repository of web pages for the various home automation applications. Commands resulting from clicks by the user on the web page could be directed to an appliance via the appropriate application domain controller. The application domain controller would transmit the command or status request to the appliance over the local home control network. Thus, the appliance does not need the additional cost of Internet access.

3. Interface to an IP-based Network

3.1 Network Access Unit for an IP-based Network

The HES Universal Interface (UI) allows home and building components to connect to a variety of communications infrastructures. The design principle for the UI is that adaptation to a specific network is done outside the device via a Network Access Unit (NAU), as shown in Figure 1.

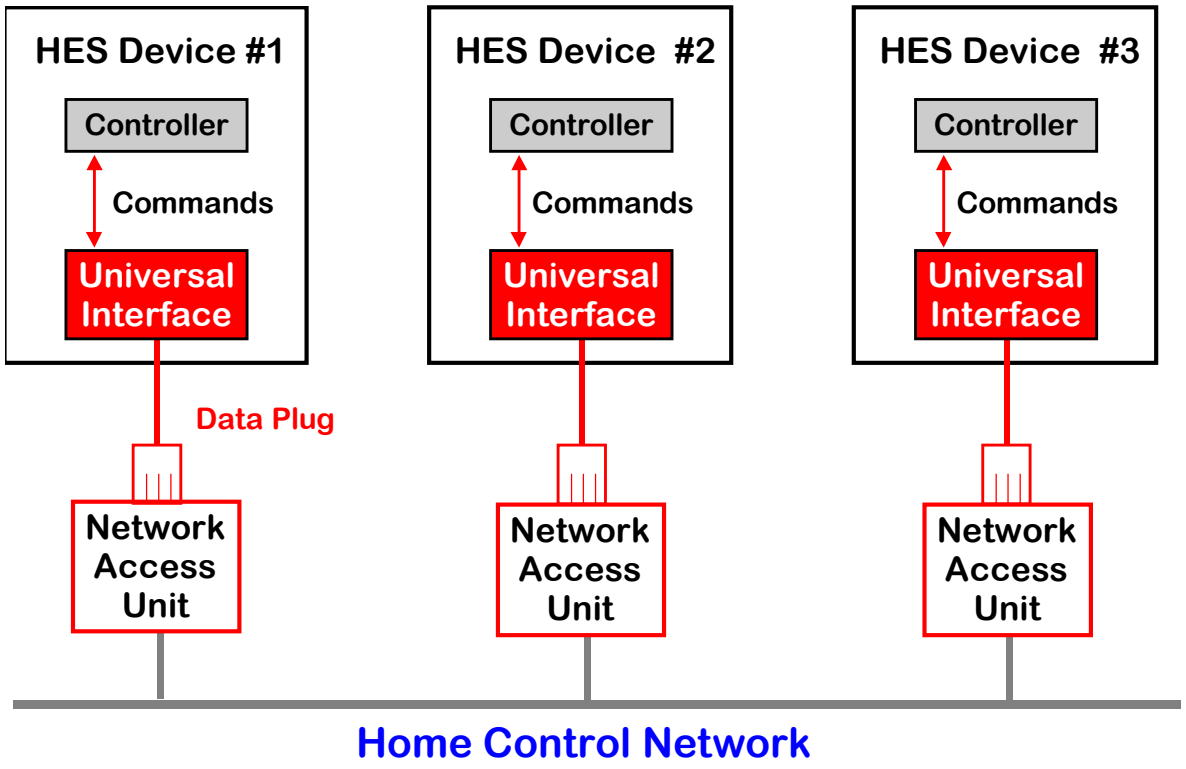

Figure 1 – The Role of the HES Universal Interface and Network Access Unit

The specifications for the UI have already been decided by WG 1 using a serial data stream. The communications protocol was derived from IEC 870 and EIA-232. It does not use any IP-based protocol.

For consistency with HES, it is proposed that the UI remain unchanged, Instead, the NAU would be designed for the IP-based network. This means that a special IP-based NAU would be specified that includes the UI interface on the device side and the TCP/IP protocol on the network side. Alternatively, UDP/IP may be used on the network side. This is illustrated in Figure 2.

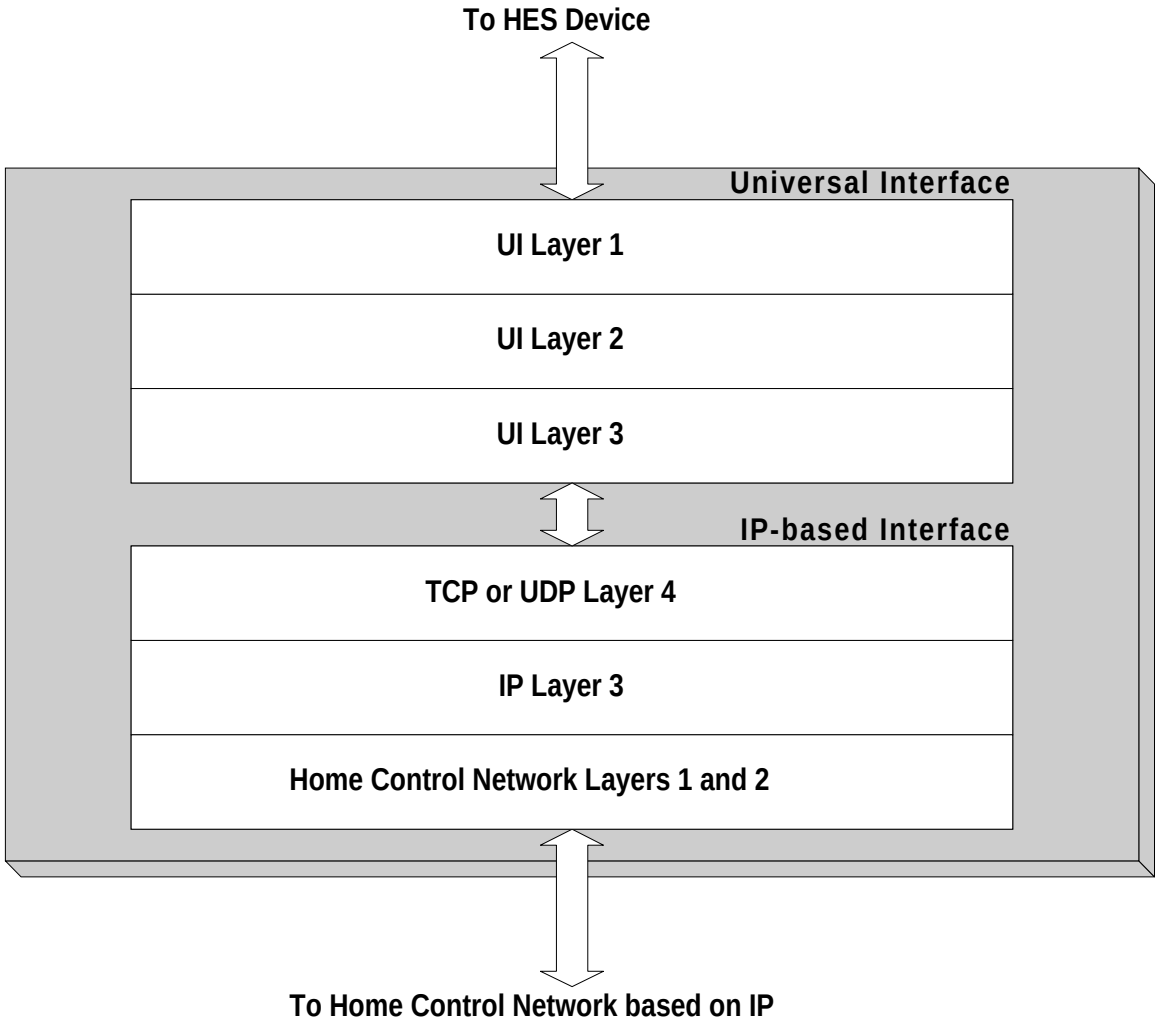

Figure 2 – Network Access Unit for an IP-based Network

3.2 Integrated NAU

The concept of a UI-equipped HES device and an external NAU constitutes HES Type A Conformance. This is illustrated in Figure 3 HES also accommodates devices specifically designed for the underlying network with HES Type B Conformance, as shown in Figure 4.

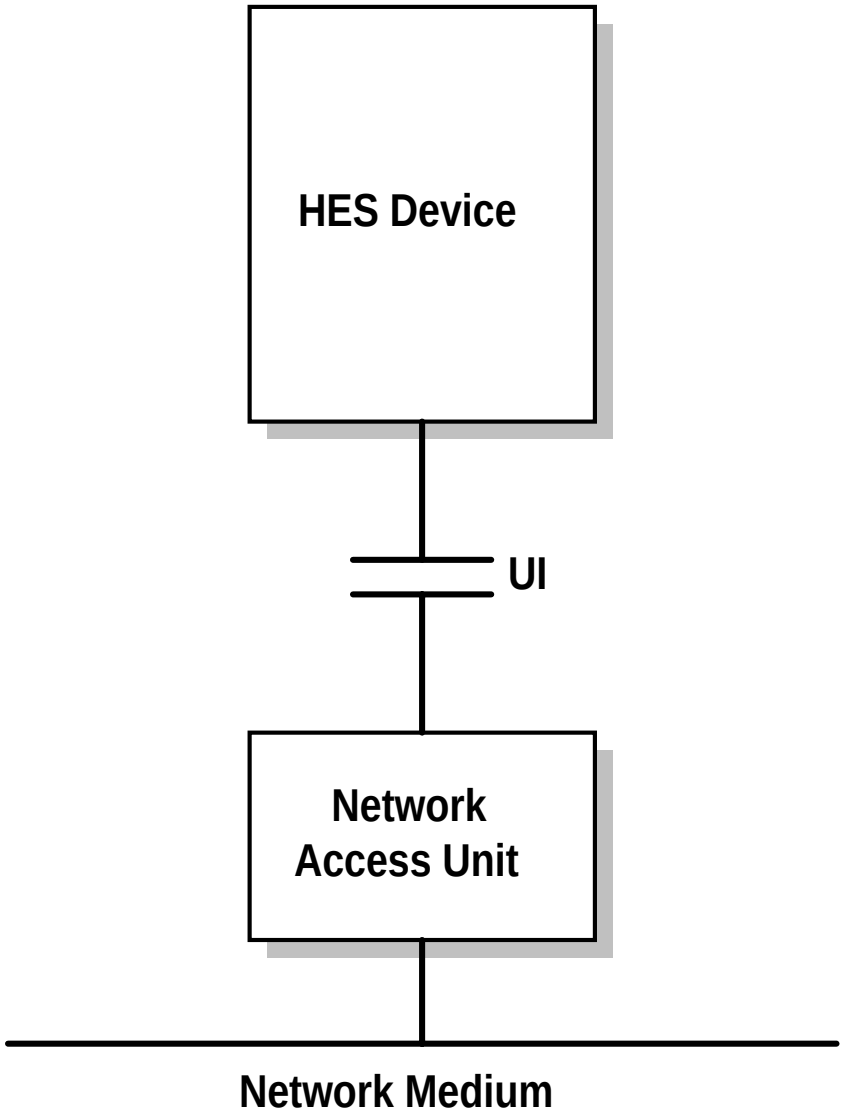

Figure 3 – HES Type A Conformance

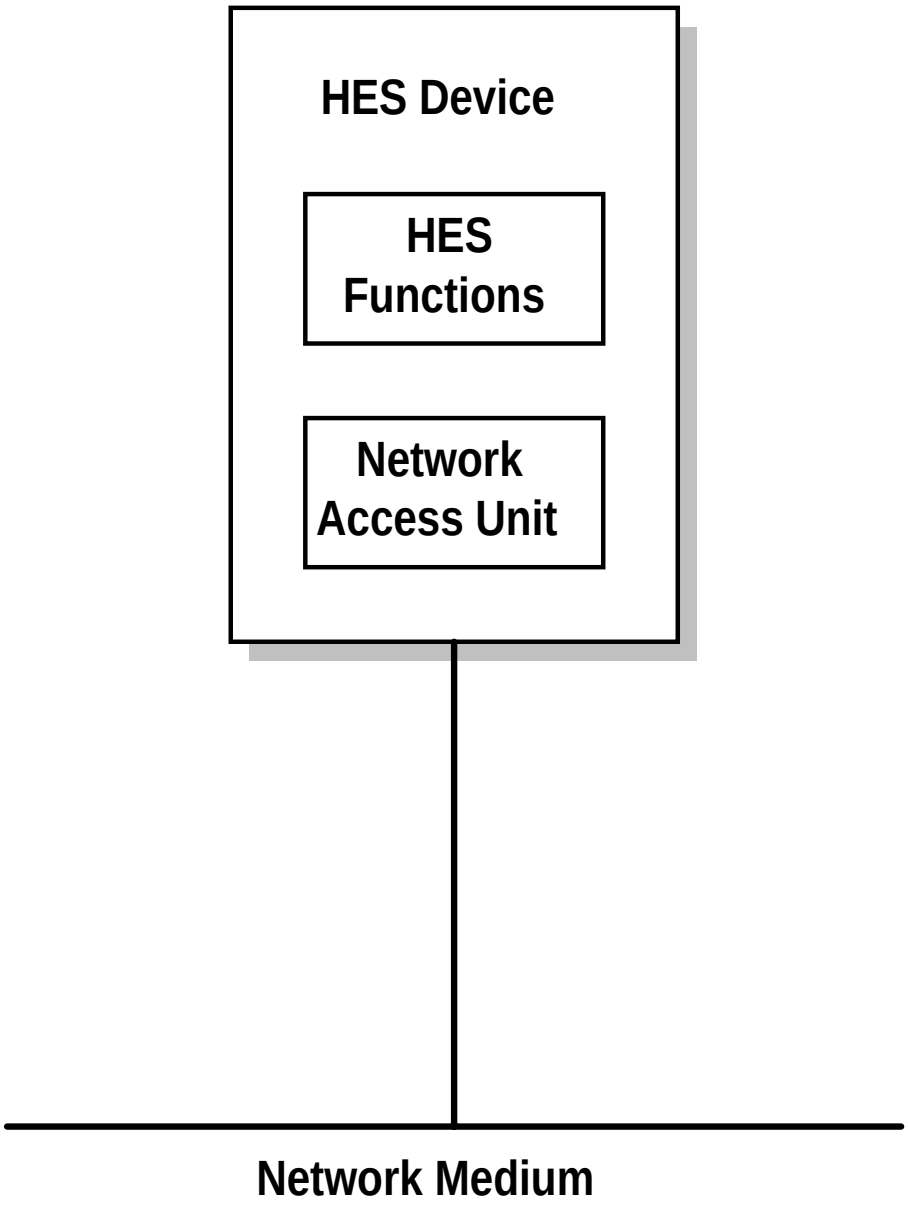

Figure 4 – HES Type B Conformance

HES Type B Conformance could be applied to devices intended for connection to an IP-based network. Such devices no longer meet the HES principle that they can operate on a wide variety of home or building control networks. However, if the home and building control industries eventually adopt one network, then all devices could be HES Type B Conformant.

4. Separate Control and IP-based Networks

The previous section explained how HES devices might be equipped for connection to an IP-based network. In practice, the addition of the interface protocols, TCP/IP or UDP/IP, and Internet applications may be too costly for simple devices. It may be practical to retain a home or building network specialized for command and control distinct from the Internet.

Thus, only selected devices in a premises network might be equipped for access to an IP-based network. Figure 5 shows a connection to an IP-based network either directly or via a proxy. A proxy may provide an IP interface for one device or for a non-IP network.

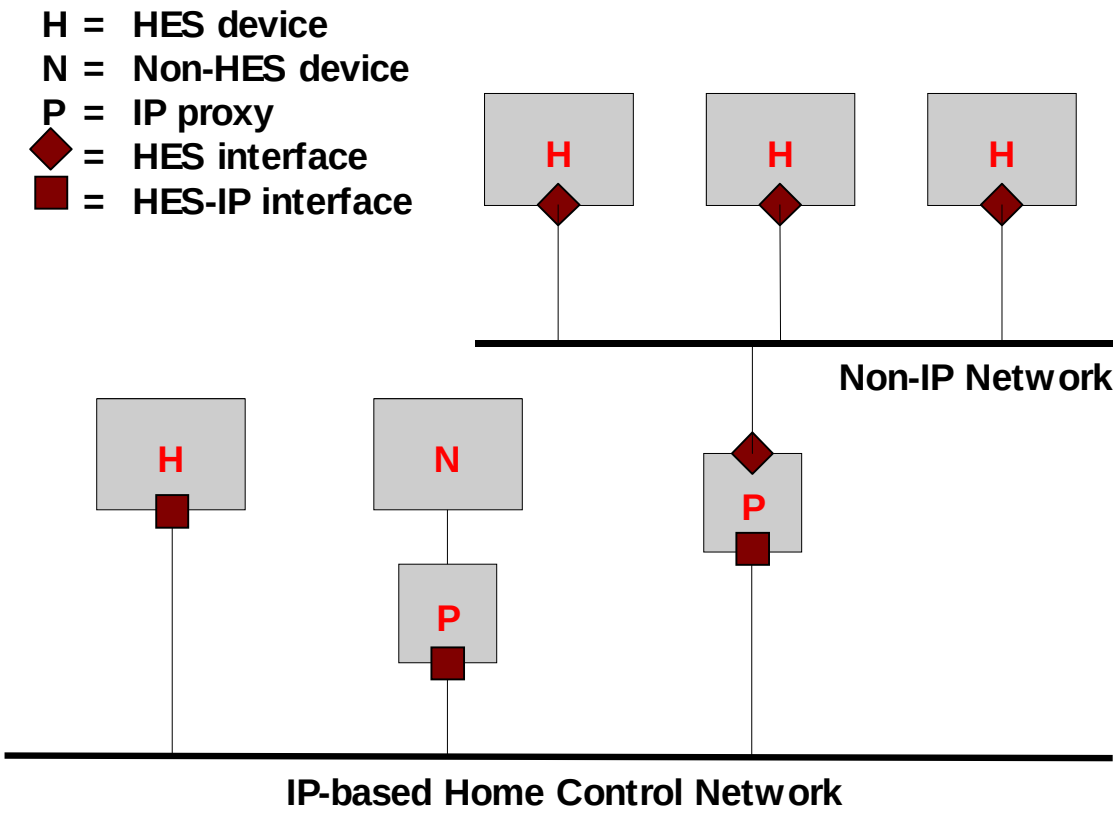

Figure 5 – Linking Home Automation to an IP-based Network

5. Transmitting HES via an IP-based Network

Web pages on the Internet are transmitted using the application layer protocol called HTTP, Hypertext Transfer Protocol. HTTP accesses and delivers data from a file identified by a Uniform Resource Identifier, URI. A URI may provide the name or location of the data to be sent via HTTP. The most common method of identifying the data is with the Uniform Resource Locator (URL). This is the familiar web location string such as the WG 1 web site, http://www.metrolink.com/sc25wg1. Web pages are usually maintained in web servers, which send the data to clients, such as customers' personal computers.

In HTTP the user requests a web page by entering a URL. The HTTP protocol issues a GET command. If the web page requests data from the user, these data are passed up to the web server in an HTTP POST command. The format of the data describing a web page is defined by HTML, Hypertext Markup Language. HTML contains text and graphics to be displayed, plus tags that describe the data by size, position, color, etc. A web browser, such as Netscape or Internet Explorer, is responsible for interpreting the HTML tags to create the display.

The Internet Engineering Task Force (IETF) and the World Wide Web Consortium (W3C), the organizations that maintain the Internet protocols, are specifying XML (Extensible Markup Language) to expand the HTML language for applications beyond web pages. XML is a meta-language for creating applications. Like HTML, XML is based on embedded tags that describe the data.

HES or other home automation commands could be carried via XML. Here is a simple example of a possible version of XML for HES:

<HES>

[HES command]

</HES>

The XLM tags are contained within angle brackets.`