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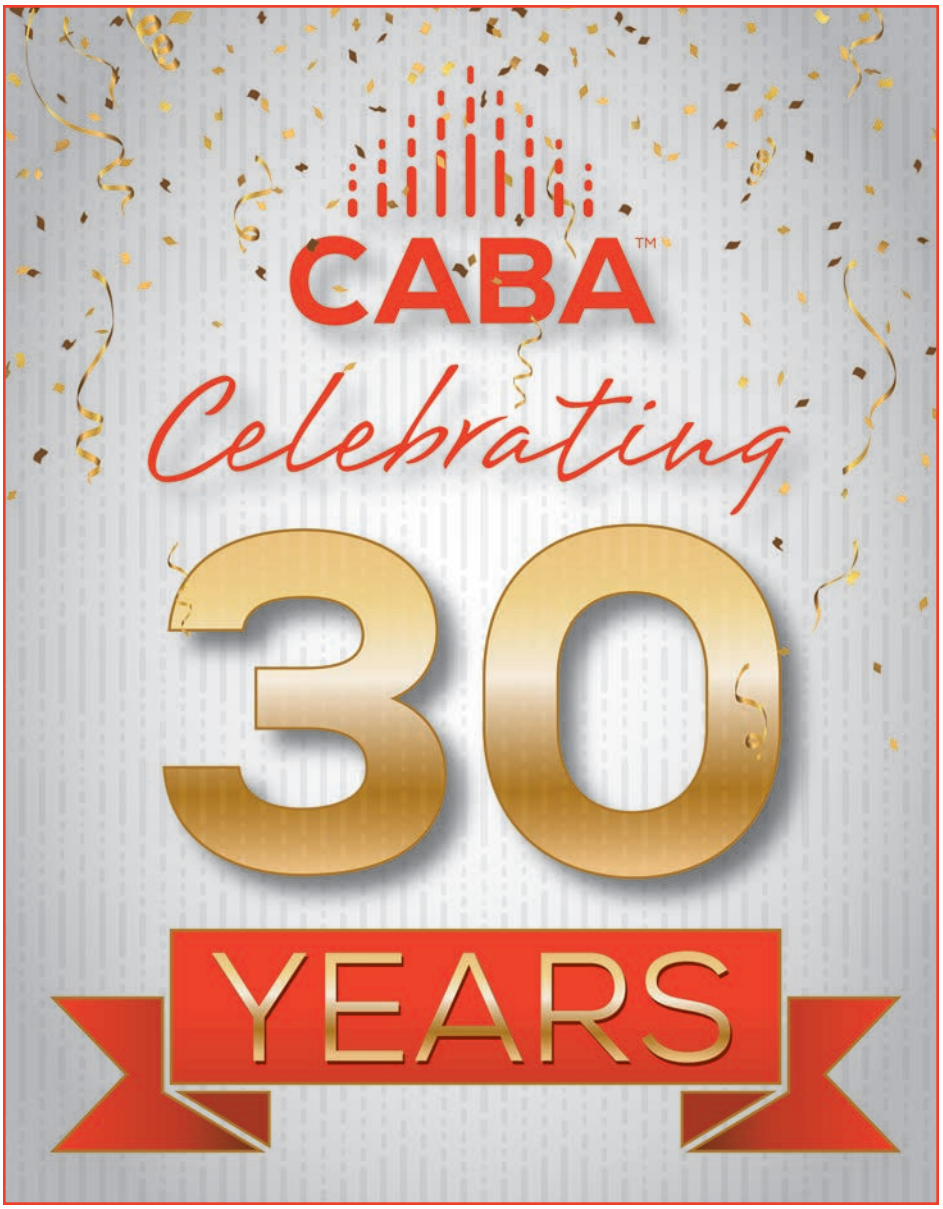
iHOMES and BUILDINGS

THE MAGAZINE OF THE CONTINENTAL AUTOMATED BUILDINGS ASSOCIATION



CABA: An Early History

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Human Skin Cells: A Potential Source of Building Contaminants

The Yin and Yang of IoT Standards

Distributed Wi-Fi: How a Pod in Every Room Enables Connected Smart Homes

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Ken Wacks' Perspectives

The Yin and Yang of IoT Standards

By Ken Wacks

Introduction

There is often a significant difference between public statements embracing standards and private actions opposing them. On first blush most companies express support for developing and complying with standards. However, when actually planning a strategy for creating a new product line, managers often ignore standards or view them as threats. Sometimes the marketing department claims adherence to standards, but is vague about the specifics.

Years ago, I had the opportunity to read a confidential report advising a manufacturer of building automation systems to attend standards meetings, to express support for building automation standards, but to slow the process so standards were delayed as long as possible in order to protect the current product line. (I was never told the name of the manufacturer.) As chair of an international standard committee, I have witnessed such activities on many occasions. One company product manager confided that standards promoting interoperability were a threat to his business because he tried to convince customers to buy all building automation products exclusively from his company.

In this article I explore this love/hate relationship with standards, explain the source of conflicts, and focus on the importance of standards for successful IoT (Internet of Things) home and building automation industries. This is the sixth in my series of articles on IoT in *iHomes and Buildings* that I started in the spring of 2016.

Why standards are needed

Early telegraph communications required technical translations at national borders. Eventually, countries realized that incompatible telegraph networks were impeding business transactions so they developed agreements to foster seamless communications. This resulted in the creation of the International Telegraph Union (ITU) in 1865. The ITU still exists as the International Telecommunications Union, now part of the United Nations, responsible for telephony, radio, satellite, and data-communication standards.

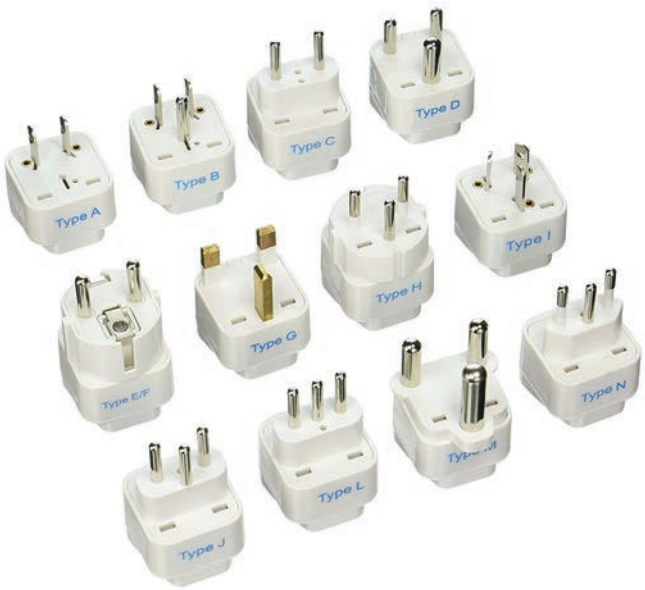
As electric power became a public utility, interfaces were needed between lamps, appliances, and the utility power source. Initially, companies patented and controlled the market for these interfaces. Eventually, national standards for plugs and sockets were developed to address technical and safety requirements. However, there were also business and political motivations for protecting local and national manufacturers of these interfaces, called electrical wiring devices. For this reason we still need plug adapters when traveling to most countries outside of North America, as illustrated in Figure 1.

Many of the early connectors for wired data networks were based on telephone connections, which also varied by country. Fortunately, the RJ-45 plug and jack, developed by Bell Laboratories in the US, has been widely adopted for Ethernet connectors and is now recognized internationally. Thus, some but not all interfaces become world standards. Impediments to uniformity usually result from lobbying or government mandates to protect businesses within a country.

How standards benefit appliance makers

If a manufacturer of kitchen appliances wants to add home automation features, the company needs to connect the appliances to a home network. For example, a networked washer and dryer might exchange configuration data so the user does not have to set the dials on each appliance separately. The appliance maker probably has a staff of engineers who design the mechanics, plumbing, electronics, user control panel, and packaging. But can they develop the communications interface to the

Figure 1 – Power Plugs Worldwide



Plug Type	Sampling of Countries (some countries use multiple plug types)
A	USA, Canada, and Japan
B	American Samoa, Antigua & Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Japan, Liberia, Mexico, USA
C	Angola, Gabon, Guinea Bissau, Mauritania, Paraguay, Somalia, Togo
D	India, Pakistan
E/F	France, Germany, South Korea
G	England, Ghana, Gibraltar, Grenada, Hong Kong, Ireland, Kenya
H	Israel
I	Argentina, Australia, New Zealand, Samoa, Tonga, Tuvalu
J	Liechtenstein, Rwanda, Switzerland
K	Denmark, Greenland, Guinea, Senegal
L	Italy, Uruguay
M	Lesotho, South Africa, Swaziland
N	Brazil, South Africa

home network? Of course these engineers could study communications technology, or the company might hire a communications specialist. But it is probably simpler and cheaper to choose a communications standard such as Ethernet or LonWorks or Wi-Fi and buy interface modules from a manufacturer specializing in communications. Hence a standard interface makes economic sense.

In this example I mentioned competing home network technologies. This is a reality in our industry. Many of us did try to promote a single infrastructure standard such as CEBus (ANSI/EIA-600 series of US standards; a "series" is a group of related standards) and the Home Electronic System (HES: ISO/IEC 14543 series of international standards). However, market forces, led by chip companies, pushed for multiple network options. At least there are just a few really popular home network protocols, rather than custom networks developed by each appliance maker.

Standards promote business among companies so they can focus their expertise in their product area. This is the same principle in macroeconomics that motivates international trade, as explained in Ricardo's *Theory of Comparative Advantage*:

> *Comparative advantage* is the economic reality describing the work gains from trade for individuals, firms, or nations, which arise from differences in their factor endowments or technological progress.[1]

In simpler terms, it makes sense for specialists to trade with other specialists. One company that attempts to do everything will likely end up doing one thing well and the others mediocre. For components that are needed occasionally, such as a communications interface for an appliance, it is more economical to buy these components from OEMs (Original Equipment Manufacturers) who maintain a full-time development staff than to hire experts for a limited engagement to produce a custom design. A competitive market for OEM components will keep prices for these components in check. Compliance with interface standards ensures that any of these OEM components will work with the appliance.

1 Andrea Maneschi, *Comparative Advantage in International Trade: A Historical Perspective*, Cheltenham: Elgar, 1999, p. 1.

Is it really a standard?

Engineering specifications for products and interfaces can be categorized as:

1. Proprietary
2. Open
3. Standard

Proprietary specifications are owned by a company and may be treated as a trade secret, patented, or shared with business allies. An *open* specification may be developed by a company or a consortium of companies (such as the Z-Wave Alliance, Zigbee Alliance, or OCF) and publicly disclosed. However, some companies and consortia may require contracts limiting ownership rights, usage, or support before making their specifications available. Also, some alliances that promoted home automation have already dissolved. (Do you remember the 1394 Trade Association, DLNA, HomePlug Alliance or Smart House?) An official standard is created by a Standards Developing Organization (SDO). Most SDOs have existed for decades or even more than a century.

Essential standards for IoT

International IoT standards for home and building systems have been published, with additional standards under development. I plan to write an article for *iHomes and Buildings* describing the 50 standards and technical reports issued by the international committee I chair. As a preview to this article, the sidebar below describes our recent international activities focusing on cybersecurity and energy management. For further details about our cybersecurity project please see my article in the Autumn 2018 edition of *iHomes and Buildings*. We are expecting proposals related to voice recognition, applications of blockchains, and a common user interface for home applications.

Conclusion

In a competitive world companies seek product differentiation. Product differentiation makes product interoperation in a connected world difficult. Just like we have agreed on the shape of a power plug on a national level, we need common communication protocols including physical and application interfaces for networked devices. Widely agreed interface specifications will foster a market for connected devices by enabling interoperability. ●

Dr. Kenneth Wacks has been a pioneer in establishing the home systems industry. He delivers clear and practical advice to manufacturers and utilities worldwide on business opportunities, network alternatives, and product developments in home and building systems. The United States Department of Energy appointed him to the GridWise® Architecture Council to guide the electric industry toward smart grids. For further information, please contact Ken at +1 781 662-6211; kenn@alum.mit.edu; www.kenwacks.com.

ISO/IEC JTC 1/SC 25/WG 1
Home Electronic System (HES)[1] Standards
Dr. Kenneth Wacks, chair

2018 Progress

The ISO/IEC committee developing the HES family of IoT standards for home and building systems is pleased to report excellent progress in 2018. Our semi-annual meetings this year were in Toronto, Ontario (hosted by the Standards Council of Canada), March 19-23, and in Falls Church, Virginia (hosted by the Telecommunications Industry Association (TIA), September 24-27. We were joined at these meetings by about 20 experts from eight countries in Asia, Australia, Europe, and North America.

Participation continues at a strong level with some countries increasing the number of experts participating at our meetings. This reflects the continued growth of the home systems industry. These experts represent some of the leading established and entrepreneurial consumer electronics and industrial suppliers in the world.

During the past two years the home system industry has been positioned as an important segment in the world of the Internet of Things (IoT). IoT is essentially machine-to-machine (M2M) communications where the devices are typically sensors, actuators, controllers, and user interfaces. The standards we develop for home and building automation are in-fact IoT standards. Thus, SC 25/WG 1 has been involved with IoT since our committee was created in 1987, long before the term IoT was coined.

Cybersecurity is an essential adjunct to IoT and has become an active project in WG 1. WG 1 has developed a working draft standard for adding cybersecurity, privacy, and safety specifications to the HES suite of standards.

Some of the HES standards developed by WG 1 have already been deployed in consumer electronics, home and building automation network components, and trials of "smart grids" for enhanced reliability and resiliency of electricity grids.

This year WG 1 expanded the library of more than 50 HES standards and technical reports with four new publications. Among the new standards is the *Modular Communications Interface for Energy Management*. This standard was developed by the Consumer Technology Association as ANSI/CTA-2045 and offered to ISO and IEC (now designated internationally as ISO/IEC 10192-3). Three additional standards are in the voting process by the member nations, including energy management for apartment buildings. Nine new standards have been proposed, covering a diversity of topics:

- Expanding the home gateway to protect customer privacy, cybersecurity, and safety
- Smart locks and voice recognition
- Applications of blockchains for remote access
- A common user interface for home applications
- Interconnected equipment for comfort control

On September 13, 2018 our committee chair, Ken Wacks, received the IEC *1906 Award* with a formal presentation by the General Secretary and CEO of the IEC (International Electrotechnical Commission) at ceremonies hosted by the TIA. This award commemorates the year the IEC was founded and honors experts whose work is fundamental to the IEC.

The award includes the distinctive pin (shown to the right) and the following commendation:

The International Electrotechnical Commission
expresses its sincere appreciation of the valuable and sustainable contribution by

Dr. Kenneth Wacks

Expert of the ISO/IEC JTC 1,
ISO/IEC Joint Technical Committee on Information Technology

Nominated by the Chair and Secretary of ISO/IEC JTC 1

In recognition of his role as chair of ISO/IEC JTC 1/SC 25/WG 1, responsible for the Home Electronic System (HES) for 20 years. He has been a pioneer in establishing the home systems industry and has written standards in home automation and networked appliances.

On behalf of the
International Electrotechnical CommissionInternational Electrotechnical Commission

1 The Home Electronic System is a family of standards developed by the committee officially designated:
ISO/IEC JTC 1/SC 25/WG 1
ISO = International Organization for Standardization
IEC = International Electrotechnical Commission
JTC 1 = Joint Technical Committee 1, entitled Information Technology
SC 25 = Subcommittee 25, entitled Interconnection of Information Technology Equipment
WG 1 = Working Group 1, entitled Home Electronic System (HES)