

UPnP and the SmartGrid

EPRI Presentation
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UPnP Smart Grid
Task Force

Questions about UPnP

- Is UPnP dead?
UPnP has nearly 900 members and over 400 Certified Products.
- Has UPnP has been replaced by DLNA?
DLNA references several UPnP Standards.
- Is UPnP is only about networking A/V components?
DCPs also cover HVAC, lightning control, blinds, etc.
- Are there any UPnP devices in the market?
There are over 400 Certified Products in 100s of millions of shipped devices.

UPnP Forum Today

- UPnP Forum represents 899 companies and organizations developing standards for interoperability between IP networked devices.
- Global membership from cross-industry sectors includes: consumer electronics, IT, automation, industrial applications, and service providers.
- Many active working committees (some examples):
 - Audio/Video
 - Gateway
 - Device Management

IP Home Networking and Smart Grid

- Over 200 million households worldwide had IP-based home networks at the end of 2008 (*InStat*). Over 45 million US households have IP-based home networks (*Parks Associates*).
- Smart Grid applications will benefit from leveraging IP networking - eliminating the need to duplicate millions of existing home networks and promoting market adoption.
- IP equipment is ubiquitous and cost-efficient. IP networks are the primary platform for technology innovation, easy to scale and support low power and secure applications (billions of dollars transacted over IP networks daily).
- Smart Grid data (pricing, alerts, meter readings, etc.) can be easily delivered to IP-based home networks or communicated with providers over the Internet or a private IP backbone.

Customers are more likely to use Smart Grid applications if they leverage existing technologies, devices, and services already installed and familiar.

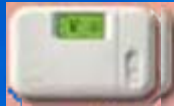
UPnP Technology

- UPnP Technology provides device & service discovery and device control protocols for IP-based home networks. It supports interoperability independent of underlying physical network technology.
- UPnP standards are international (ISO/IEC 29341) and adopted by many global standards organizations including DLNA, Broadband Forum, OpenIPTV Forum, CableLabs and CEA. It is recognized in emerging smart/intelligent home roadmaps (e.g.. CENELEC Smart House Roadmap).
- The UPnP Forum has directly certified 409 devices from 58 companies. Additionally, DLNA has certified more than 6,000 products.
- Hundreds of millions of UPnP devices are already deployed (internet gateways, TVs, PCs, game consoles, mobile phones, Blu-ray players, and others).
- ABI Research reports DLNA deployed devices: 250 million in 2009, and projects about 1 billion in 2012, about 2 billion in 2014.



UPnP technology is in your home

Thermostat controls HVAC and communicates with other UPnP devices



Gateway automatically configured via UPnP



Printer is discovered by computer and TV via UPnP



Windows OS since WinME can automatically catalog and manage devices via UPnP

UPnP protocols run over all IP networks including powerline, Ethernet, Wi-Fi, MoCA, etc



Game console connects to internet gaming via gateway via UPnP



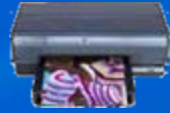
Over 1000 TV models include UPnP/IP connectivity to stream videos from the Internet or inside the home



Diversity of UPnP vendors & products



Game consoles



Wireless printers



Routers Gateways



DTVs



Networked Storage



DVD Players



Lighting Control



Cameras



Cell Phones



A/V Receivers



Digital Media Adapters



Blu-ray Players



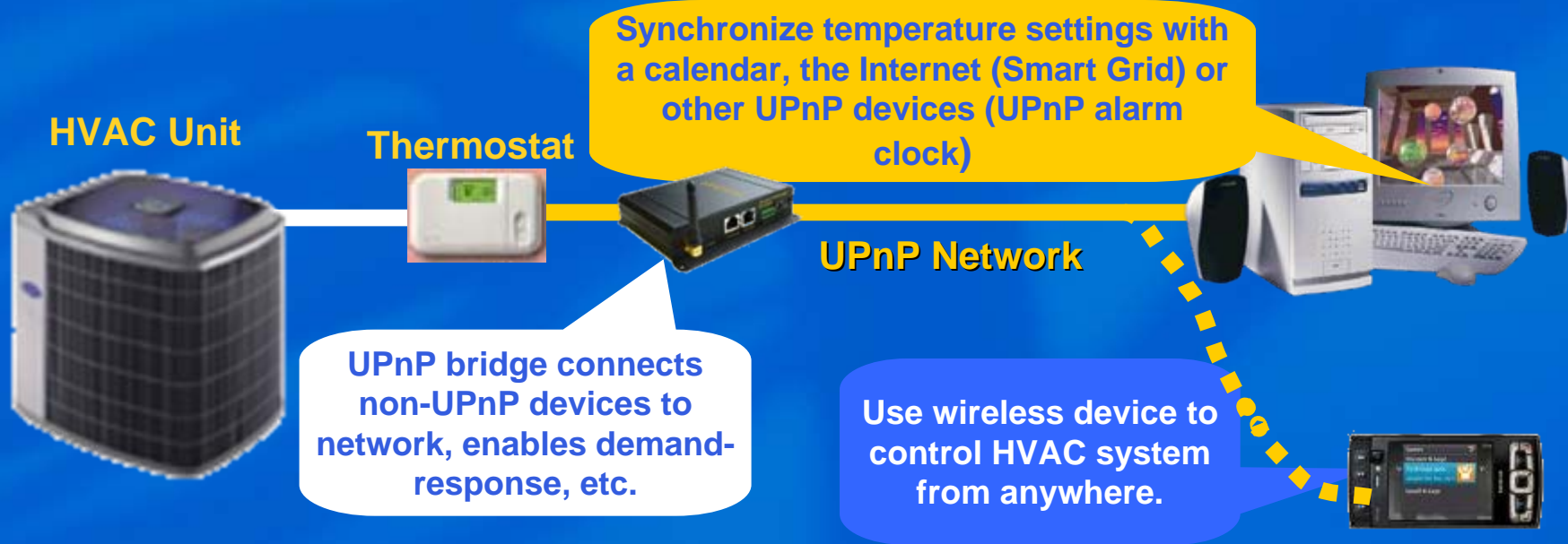
Thermostats



Multi-room Audio

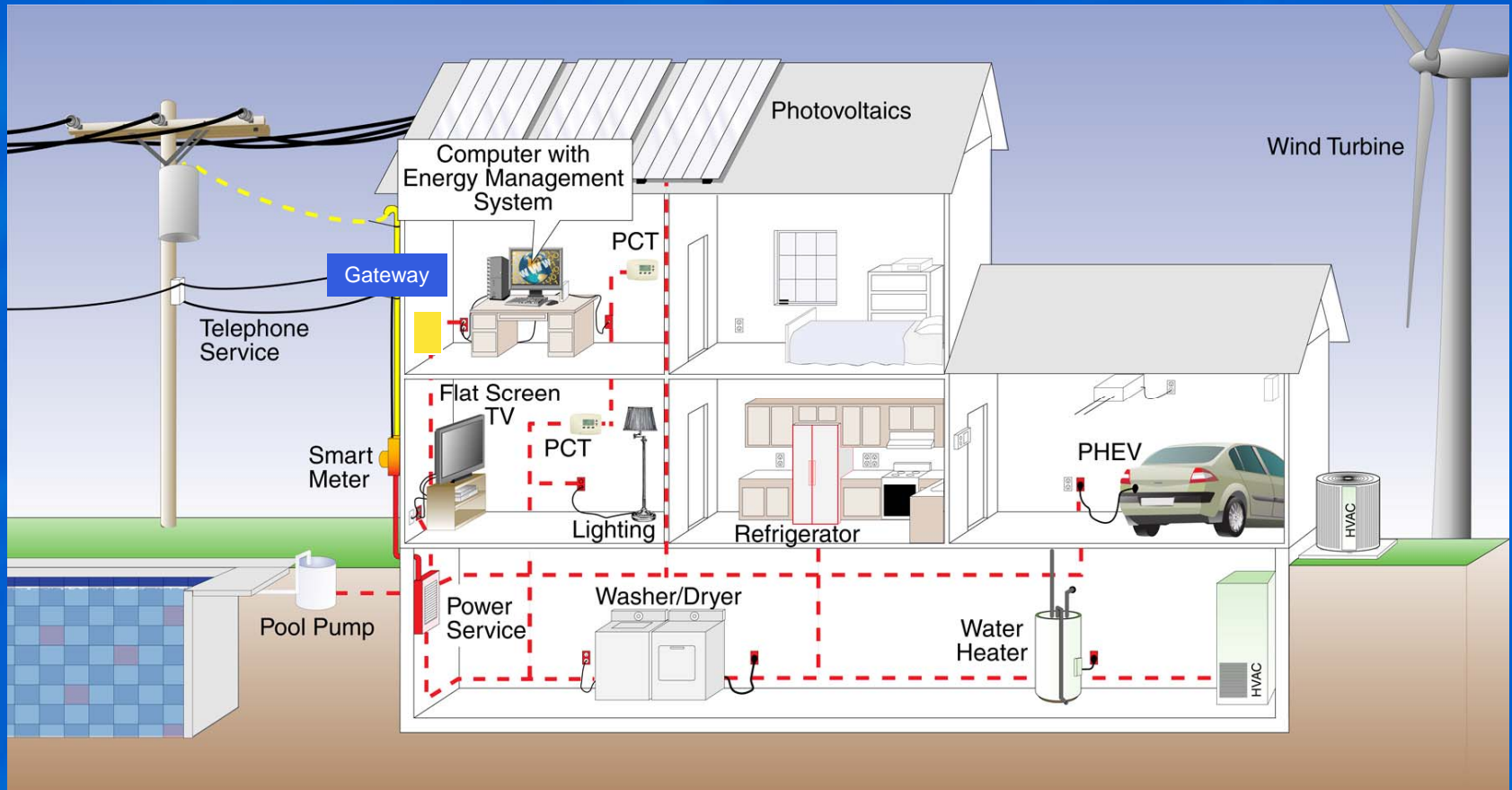
- Acer Aspire Laptop PC series
- Buffalo HS-DS Network Attached Storage (NAS) series
- Canon Digital Camera DS585784
- Cisco-Linksys Network Media Hub
- Corega 802.11N AP/Router
- Denon iPod/Networking Client dock ASD-3W
- Digeo MOXI HD DVR
- Epson All-In-One Printers
- HP Photosmart Plus All-in-One
- Hitachi LCD TV UT Series
- I-O Data AVeL LinkPlayer AV-LS300DW DVD Player/Recorder
- Iomega Home Media Network Hard Drive
- LG Electronics Media Station and BD Player
- NEC Valuestar/LaVie PC series
- ONKYO Receivers
- Panasonic Blu-ray Disc Recorder DMR-BW730
- Nokia N95/N85/N78 mobile phones
- Philips 42PFL9603D/10 Flat TV, NP1100 DMA, Wi-Fi Photo Frame 8FF3WMI
- Promise Technology Network Attached Storage - SmartStor NS2300N
- Pioneer Flat Screen TV series and AV Receiver VSX-94TXH
- Samsung HDTV LN40 Series and SGH-i900 Smart Phone
- Seagate NAS
- Sharp AQUOS LC-46RX5 LCD TV
- Sony Bravia KDL Series HDTV and Playstation 3
- Sony-Ericsson Mobile Communications C905/C705 mobile phones
- Thomson TG787g Residential Gateway NAS
- Toshiba Laptops and REGZA TVs
- Western Digital NAS
- Yamaha DSP-AX3900/RX-V3900 AV Player/Receiver
- Zyxel DMA-1000 Digital Media Adapter and NAS-220

UPnP Home Automation



- Power system solutions that enable Smart Grid applications in the home network were developed in 2001. Home automation specifications (HVAC, lighting, security camera, blinds/shutters) published since 2003.
- Bridges between UPnP and other technologies (LON, KNX, HomePlug, ZigBee, Z-Wave) are already on the market .
- UPnP technologies are supported in multiprotocol home control devices and integrated home energy management applications.

Future HAN Environment for Energy Management



Air Conditioner

Pool Pump

Water Heater

Refrigerator

Computer/Laptop

Flat Screen TV

Washer/Dryer

Plug-in Hybrid Electric Vehicle

Wind Turbine

Solar Panels

UPnP provides a comprehensive architecture which supports this model

Source EPRI

Slide 9

UPnP Architecture Principles

- Just send data over the network
 - No executables
 - Minimize version issues
 - Minimize security issues
- Allows implementation to be platform & vendor specific
 - Be agnostic re: programming language, OS
 - Update implementation without affecting interoperability
 - Improve performance
 - Reduce footprint
 - Improve capabilities
- Agree on meaning / format of data
 - Choose subset of proven protocols
 - Define device (service) specific protocols in a Forum
- Maintain backwards compatibility to core technology
 - Implementations of new specifications retain market interoperability
 - Grows ecosystem of devices and applications

UPnP Architecture Benefits

- Defines an ecosystem to encourage innovation and interoperability with millions of IP-networked devices.
- Open architecture – UPnP and IP technologies are mature, but open architecture allows them to be continually updated with new innovations to meet market needs.
- Real-time communications – Messages are sent and received instantly to enable real-time interactive applications (e.g. instant demand response).
- Messages using common data formats & protocols (XML, SOAP etc.) allow for reliable and interoperable communication.
- Market adoption – global deployments of UPnP, DLNA etc. based devices allows customers to choose from a variety of competitive solutions for their home networking applications.

Observations for Smart Grid applications

- An open architecture for the home network based on Internet Protocol (IP) and open standards will encourage interoperability, innovation and competition.
- Standards, equipment, and service providers for IP-based networks are already readily available and ubiquitous. Connecting Smart Grid devices in the home can be easy, robust and cost-effective by using existing installed IP-based networks.
- Leveraging existing networking technologies like IP and UPnP to support Smart Grid home applications will enable more compelling Smart Grid solutions at lower costs, encourage new categories of products and services and facilitate interoperability between different protocol devices in the home network.
- Consumer choice – allowing customers to choose competitive solutions on the open market will help to ensure the success of the Smart Grid.

Supporting Smart Grid applications for consumers

- UPnP uses IP networking for plug-n-play simplicity.
- UPnP leverages IP networking, the world's most powerful and ubiquitous innovation environment.
- UPnP enables interoperability between energy management devices and other consumer devices/appliances networked in the home.
- UPnP provides the infrastructure for globally deployed consumer home networks.
- UPnP already has technology to enable Smart Grid applications and is actively developing new services and technologies.

Now is a great time for you to get involved in the UPnP Forum and help define the tools for open and interoperable consumer interfaces to the Smart Grid.





For the interconnected lifestyle