



UPnP Forum Update  
2011-2012

- UPnP Forum Overview
  - About Us, Goals, Participation
  - Structure, Timeline
- UPnP Technology Overview
  - High-level View
  - Architectural Structure
  - Protocol Walk-through
  - DCP Summary
- Certification
- Existing Industry Momentum
- Future and Upcoming UPnP Standards
- Recap of 2011 YTD
- Focus on relevant DCPs

- More than a dozen years' experience developing standards for interoperability between IP-based networked devices; hundreds of millions of UPnP products ship annually, with more than a billion a year to ship by 2014 (In-Stat, September, 2010)
- Open participation, global organization: 950+ members from cross-industry sectors including consumer electronics, IT, automation, industrial applications, telecommunications and service providers
- Member organizations have been building and innovating home networks for years — e.g., home automation and device & service discovery guidelines first published in 2003
- UPnP core specifications and device control protocols first published as international standards (ISO/IEC 29341-x) in 2008

- In an open environment, develop standards for interoperable device services using common technologies: TCP/IP, SOAP and XML
- Balance protection of member investment in technology with confidence in ability to implement under royalty-free terms
- Encourage rapid and broad industry deployment of compliant devices

- 958 Basic Member companies
- 126 Implementer Members
- Demographics:

– **Asia (248)**

- China (25)
- Hong Kong (9)
- India (21)
- Japan (59)
- Korea (38)
- Singapore (4)
- Taiwan (92)

– **North America (487)**

- Canada (32)
- United States (455)

– **Australia (10)**

- Australia (8)
- New Zealand (2)

– **Latin America (4)**

- Brazil (2)
- Chile (1)
- Columbia (1)

– **Middle East (20)**

- Israel (19)
- Saudi Arabia (1)

– **Europe (189)**

- Austria (4)
- Belgium (6)
- Bulgaria (1)
- Denmark (5)
- Finland (5)
- France (37)
- Germany (42)
- Greece (2)
- Iceland (1)
- Ireland (4)
- Italy (11)
- Luxembourg (1)
- Netherlands (5)
- Norway (1)
- Poland (2)
- Portugal (1)
- Russia (1)
- Serbia (1)
- Slovenia (1)
- Spain (8)
- Sweden (11)
- Switzerland (5)
- Turkey (3)
- United Kingdom (31)

## Elected Steering Committee:

- Wouter van der Beek, Philips
- Paul Jeon, LG Electronics
- Scott Lofgren, Intel (*Treasurer & Vice President*)
- Panu Markkanen, Nokia (*Secretary*)
- Alan Messer, Samsung (*President & Chairman*)
- Bernard Peigne, France Telecom
- Clarke Stevens, CableLabs

Thank you Steering Committee Members!

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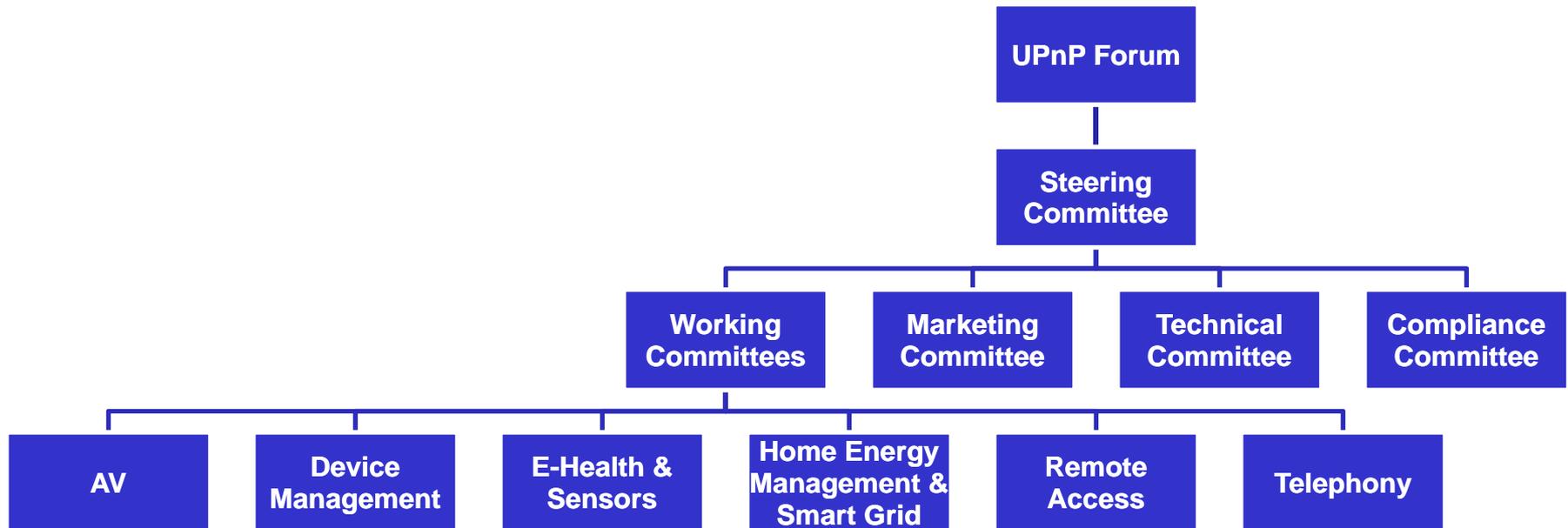
LG

NOKIA



PHILIPS





- Inactive Working Committees or those who have completed their work:
  - Appliances, Automation, Basic Device, Camera, Content Sync, Gateway, Low Power, Mobile, QoS, Printing & Imaging, Remote UI, Security, Storage

# 10+ Years of Progress

UPnP Forum formed **1999**

Windows ships with UPnP **2000** UPnP Device Architecture v1.0 published

UPnP toolkits announced  
UPnP Implementers Corp. (UIC) formed **2001** Gateway DCP published

1st Certified Gateway devices ship  
UPnP toolkits ship **2002** AV:1, Printer/Scanner and Basic Device standards published

1st Certified AV devices **2003** HVAC, Wireless AP, Security and Lighting DCPs published

**2004** DSL Forum TR-064 published  
DLNA HNV1 published  
Remote I/O DCP published

Applied for JTC1 PAS submitter status **2005** QoS:1, Security Camera and PrintEnhanced:1 DCPs published

DLNA expanded guidelines published  
Approved as JTC1 PAS submitter **2006** AV:2 and QoS:2 DCPs published

Approved as int'l standard by ISO/IEC **2007** Low Power DCP published

Published as int'l standard by ISO/IEC  
Record number of UPnP devices certified **2008** UPnP Device Architecture v1.1 and QoS:3 DCP published

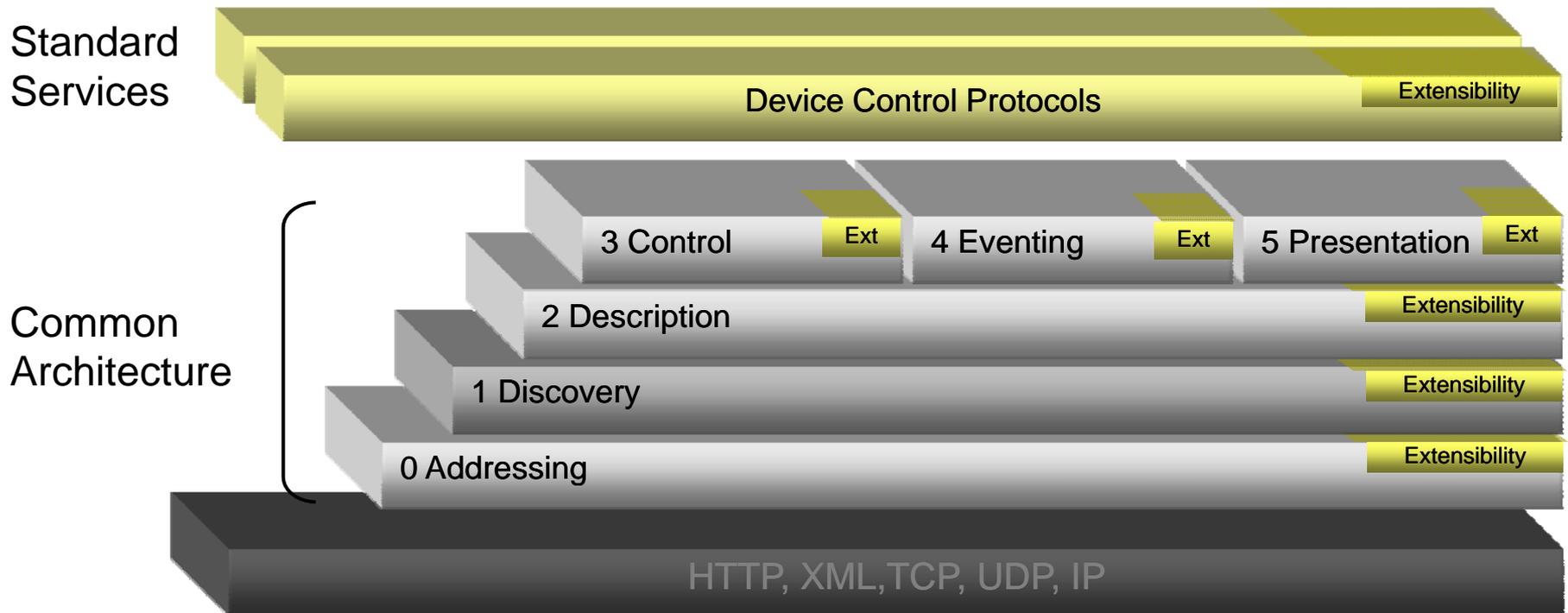
UPnP Forum Incorporates  
UPnP Forum and UIC consolidate efforts **2009** AV:3, SolarProtectionBlind:1 and ContentSync:1 DCPs published

New public & member websites launched  
Record number of Implementer Members  
New certification test tool (UCTT 2.0) published **2010** RemoteAccess:1, DeviceManagement:1, IGD:2 DCPs and AV DCP Annexes published

New UCTT 2.0 required for MediaServer:1  
Formation of New Working Committees:  
E-Health & Sensors, Home Energy Mgmt. & Smart Grid **2011** AV:4, DeviceProtection:1, Telephony:1, RemoteAccess:2, UDA 1.1 IPv6 Annex

- Innovate on established Internet standards
  - XML, UDP/TCP/IP, SOAP
- Create open, flexible architecture for service discovery and control
  - Simple Service Discovery Protocol (SSDP)
  - Generic Event Notification Architecture (GENA)
  - Service Control Protocol Description (SCPD/DDD)
- UPnP Device Architecture (UDA)
  - 0 Addressing: IP assignment on any network (AutoIP)
  - 1 Discovery: Of services/devices (SSDP)
  - 2 Description: Syntax for devices/services (SCPD/DDD)
  - 3 Control: Of device services (SOAP)
  - 4 Eventing: Updates of variables (GENA)
  - 5 Presentation: Access to device HTML page
- Device Control Protocols (DCPs)
  - APIs for various device functionality
  - Described using SCPD syntax and UDA protocols

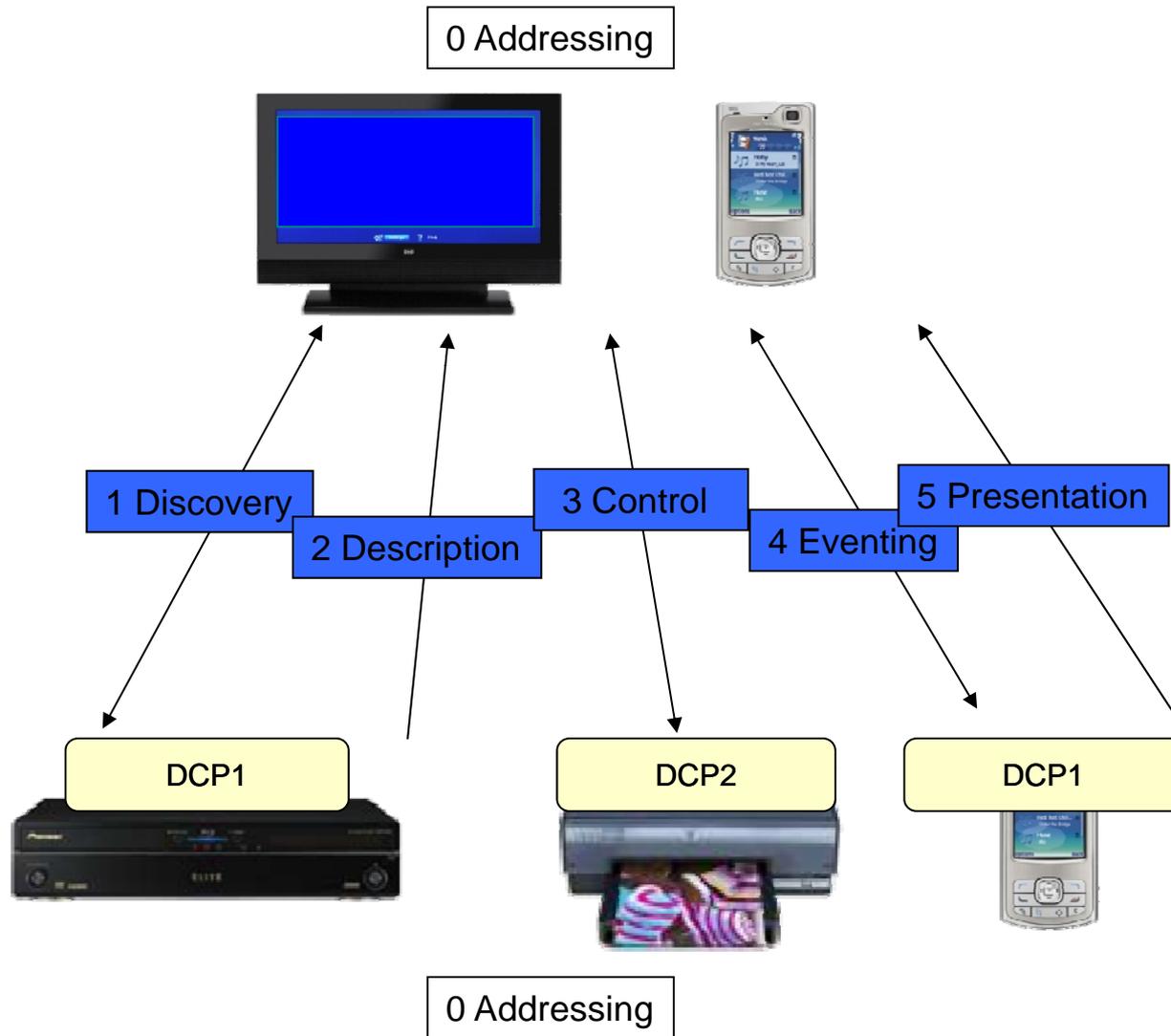
- Extensible, open architecture



# UPnP Technology Interactions

Control Points

Controlled Devices

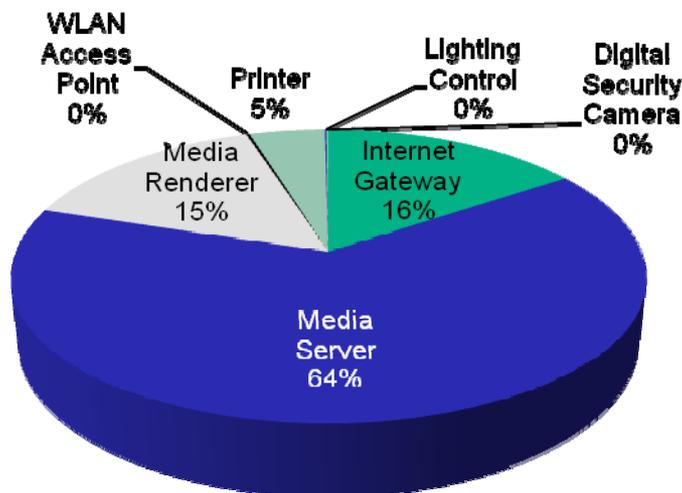


# Many Products in the Market



- Overall number of publicly displayed certified devices = 723
- Devices certified in 2011 and publicly displayed = 145
- Recent trends:
  - Since 2007, double-digit percentage increase in number of certifications year over year
  - Certified 3 times as many MediaRenderer devices in 2010 over 2009 and have already certified 74% more YTD in 2011 than all of 2010

- Device type breakdown:



- Wide range of software development kits (SDKs) and open source implementations from multiple vendors, multiple languages, multiple platforms

**Note:** The ability to submit an unlimited number of devices for certification and license the UPnP® Certification Mark is limited to Implementer Members (US\$5,000 annually). To become an Implementer Member, visit

[http://upnp.org/membership/join\\_implementer/.](http://upnp.org/membership/join_implementer/)

- Millions of UPnP compliant devices shipped
  - Routers, AV, printers, etc.
- Hundreds of millions of UPnP enabled personal computers already deployed
- Many UPnP compliant networked audio-video devices available on the market
- Bridges demonstrated between UPnP technology and other home automation networks (including Konnex, Echonet, Echelon LonWorks)
- Availability of commercial tools for more than a dozen vendors for many OS and embedded platforms
- Referenced by major standards
  - IEC 62481-1: DLNA Home networked device interoperability guidelines - Part 1: Architecture and Protocols
  - DLNA Expanded guidelines
  - CEA 2008 (DENi) and CEA 2014 (Remote UI)
  - INCITS URCC (Universal control)
  - CableLabs' CableHome specification (AV/QoS)
  - DSL Forum TR-064 (Gateways)
  - HGI (Home Gateway Initiative)
  - Open IPTV Forum
  - And more..

- Today, UPnP Forum remains very active
  - **UPnP AV**
    - Continued enhancements to AV scenarios & promotion of existing DCPs
  - **UPnP Device Management**
    - Enhancements to DeviceManagement:1
  - **UPnP E-Health & Sensors (New)**
    - Management of sensor networks, ecosystem specific data aggregation and messaging between devices
  - **UPnP Home Energy Management & Smart Grid (New)**
    - Revision and enhancements to existing and candidate DCPs to support a common Smart Grid solution
  - **UPnP Internet Gateway**
    - Recent publication of DeviceProtection:1 DCP
  - **UPnP Remote Access**
    - Development of whitepaper on RemoteAccess:2 for access and control of UPnP devices from outside the home (e.g. phone)
  - **UPnP Telephony**
    - Enhancements to Telephony:1 (call control, caller ID, address boxes and remote input)

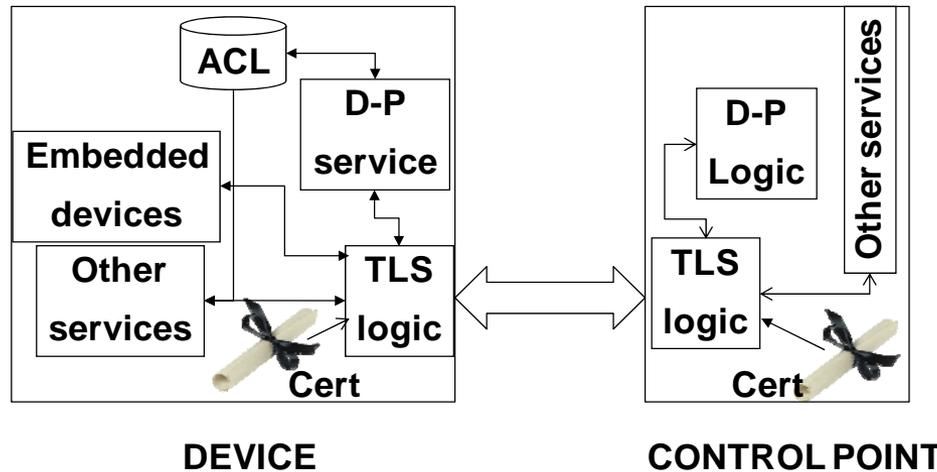
- Surpassed 125 Implementer Members
- Exceeded 900 UPnP® Certified implementations
- DCP and DCP Framework publications:
  - AV:4
  - DeviceProtection:1
  - RemoteAccess:2
  - Telephony:1
  - UDA 1.1 IPv6 Annex
- Published new test tool for official certification testing for certain device type versions
- Rolled out new Control Point certification testing program
- Continued collaboration with other organizations through liaisons
  - BBF, CABA, DLNA, EPRI, HGI, IGRS, Itophome, JTC1, MoCA, NIST, OMA, ZigBee, and more.
- Formation of new Working Committees:
  - E-Health & Sensors
  - Home Energy Management & Smart Grid



The Foundation of the  
Connected Home

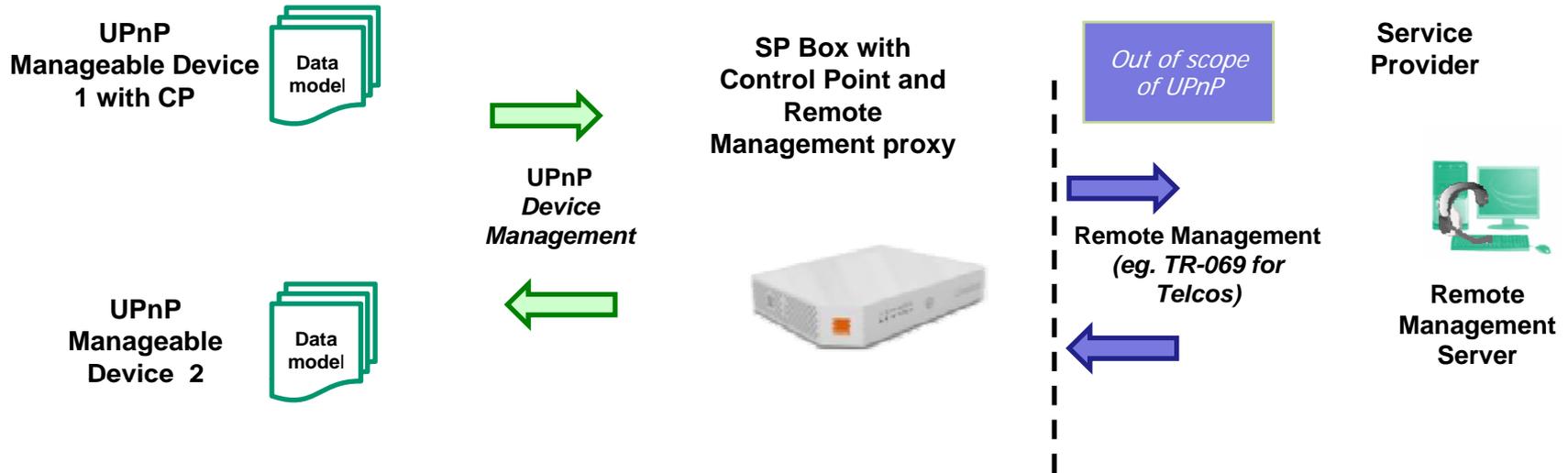
- Home applications are using UPnP IGD to dynamically update the NAT so they can get data from the Internet at any time
  - P2P clients, online gaming, Windows Live Messenger...
- UPnP IGD v2 adds more reliability and security:
  - Maintenance of v1 specification (WAN\*\*\*Connection:2):
    - Less ambiguity on NAT management
    - improved functionalities (AddAnyPortMapping, DeletePortMappingRange, ...)
    - Some default security based on IP filtering
  - optional security service based on DeviceProtection:1 with ACL (Action Control List), roles (public, basic, admin) and certificates
- UPnP IGD v2 preparing the future for IPV6 deployment with no NAT
  - Firewall Control service (WANIPv6FirewallControl:1)
  - Update: UPnP Device Architecture V1.1 Annex A – IP Version 6 support
    - <http://upnp.org/specs/arch/UPnP-arch-DeviceArchitecture-v1.1-AnnexA.pdf>

- Motivation:
  - UPnP services can expose valuable/sensitive resources
  - War drivers and malware in the home network
  - UPnP DeviceSecurity not used (bad user experience with security console, only devices were protected and not CP...)
- UPnP DeviceProtection allows authenticating users and devices and controlling access to privileged UPnP services and data
- Each Device Control Protocol/Device determines its own security policy.
  - e.g. UPnP InternetGatewayDevice:2 uses DeviceProtection to restrict changing IP configurations only for administrators
  - UPnP Device Protection is used by four UPnP DCPs:
    - IGD v2, AV v4, Telephony v1 and DM v2
- Open source implementations
  - Nokia: <http://gitorious.org/igd2-for-linux/deviceprotection>
  - Intel: <http://opentools.homeip.net/dev-tools-for-upnp>



- TLS protects the Description and Control phases of UPnP
- Authentication is based on self-signed X.509 certificates
- Trust in certificates is established locally by using Wifi Protected Setup (WPS) with PUSH button and PIN code methods
- Per-device ACLs (Action Control List)
  - DeviceProtection defines three Roles: Public, Basic and Admin
  - Default Role (e.g. Basic) is assigned to CP if WPS introduction succeeds
  - Public actions remain accessible to legacy CPs over normal HTTP connections

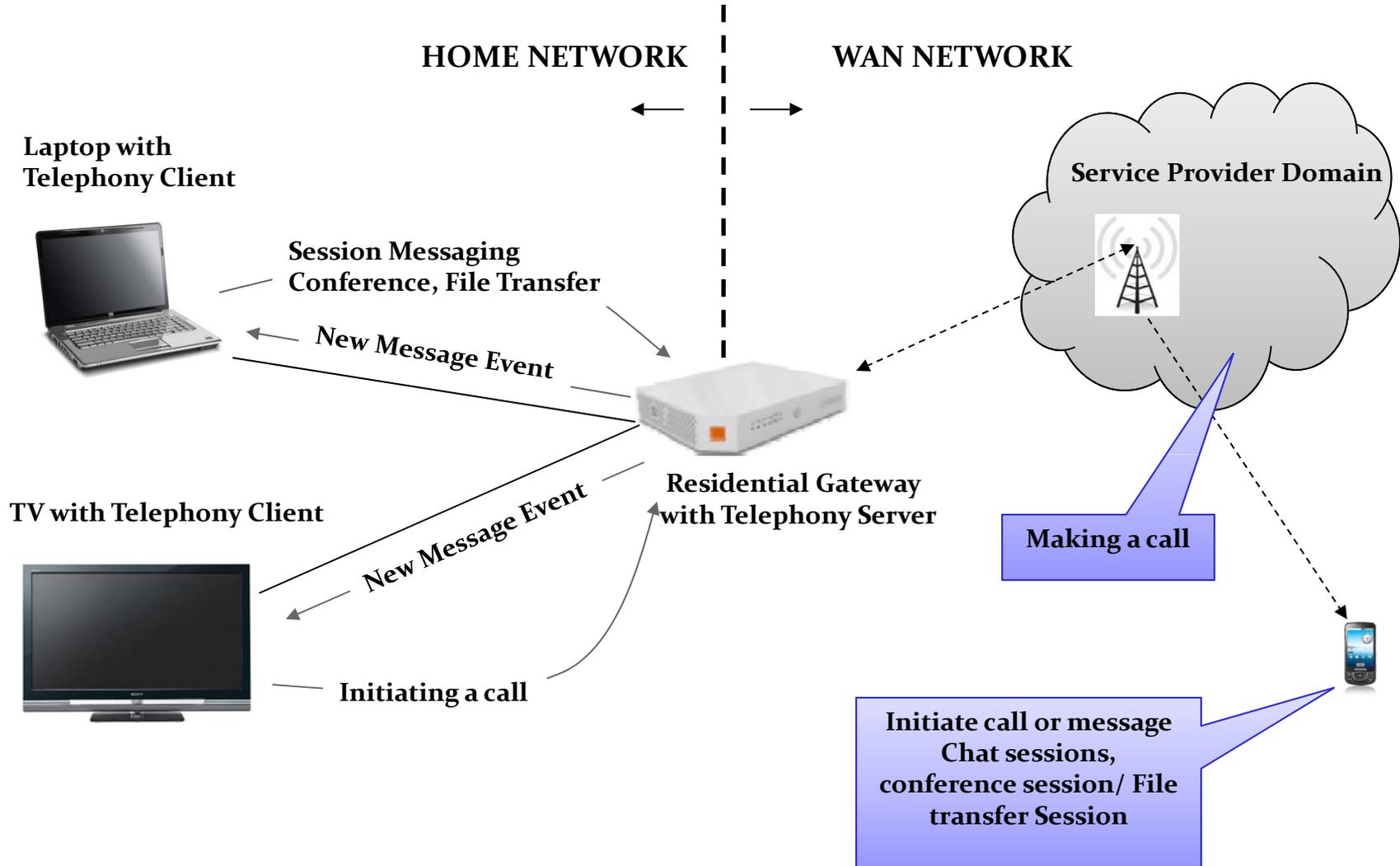
- UPnP DM provides a common solution for service providers and manufacturers to manage their devices and services
  - Defining management actions and data models
  - Implementable in devices running different execution environments
  - Remote Management through a local proxy gateway
- Management capability added to Device (Manageable Device)
  - Software update, service provisioning, configuration and diagnostics
  - UPnP DM is based on UPnP Device Architecture
- UPnP Device Management V1 (published)
  - BMS -- Basic management actions such as reboot, reset, diagnostics IP, retrieve device status and access to log information
  - CMS -- Configuration management actions for the status of the device, provisioning and configuring services
  - SMS -- Software management actions for the lifecycle of the device software components and firmware images
  - UPnP Device Management V2
    - Adds security support for sensitive parameters, alarm and bandwidth monitoring
    - Publication targeted in Q4 2011

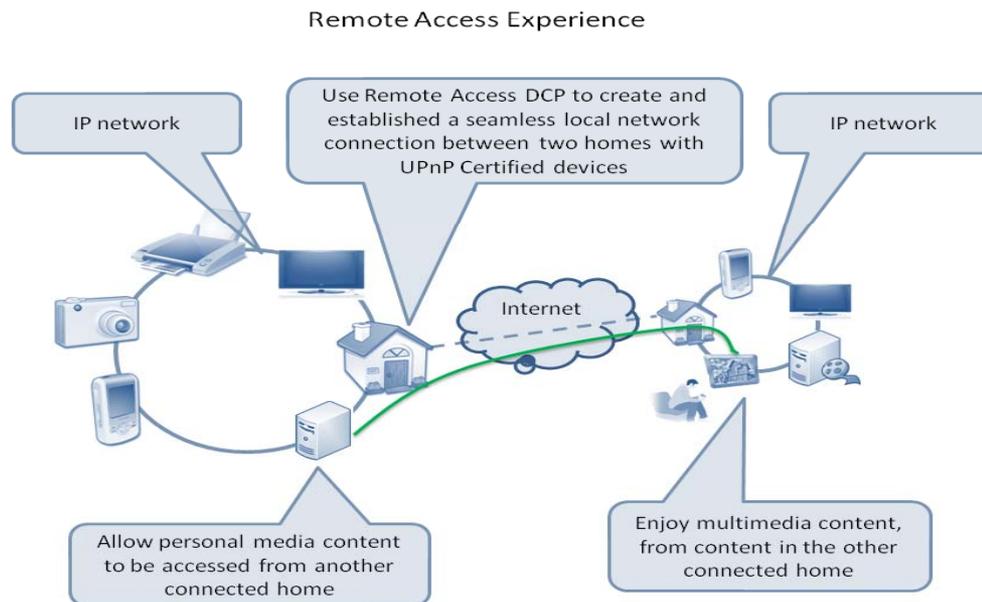


- SP-managed diagnostics
  - the SP box instructs the UPnP device to run diagnostics internally, with other UPnP devices or to the cloud, report back to SP box
- User-managed diagnostics
  - in case of troubleshooting, the user is able to initiate a complete diagnostics of the home network from UPnP Device 1, with CP information is presented to the user
- Resources
  - white paper: <http://upnp.org/sdcps-and-certification/resources/whitepapers/>
  - open source of UPnP DM v1 (BMS, CMS) has been published by Orange
    - <http://sourceforge.net/p/upnpdm>

- Enables managing of Telephony Services through non-phone devices (e.g., TV, PC)
  - Defines a set of UPnP interfaces for interaction between phone devices and non-phone devices
    - e.g., CE devices, PC etc.
- Provides a plethora of features including:
  - Initiating a telephony call through a TV or other CE or non-phone devices
  - Accepting or rejecting incoming calls through non-phone devices such as TV or PC etc.
  - Rendering of incoming messages (e.g., SMS) on a TV or non-phone device
  - Constructing a message on a TV or on a non-phone device through a user friendly input device (e.g., keyboard of a phone)
- UPnP Telephony v1 (published)
- UPnP Telephony v2 (in progress)
  - New features: presence, networked address book, calendar, content sharing...

# UPnP Telephony Architecture



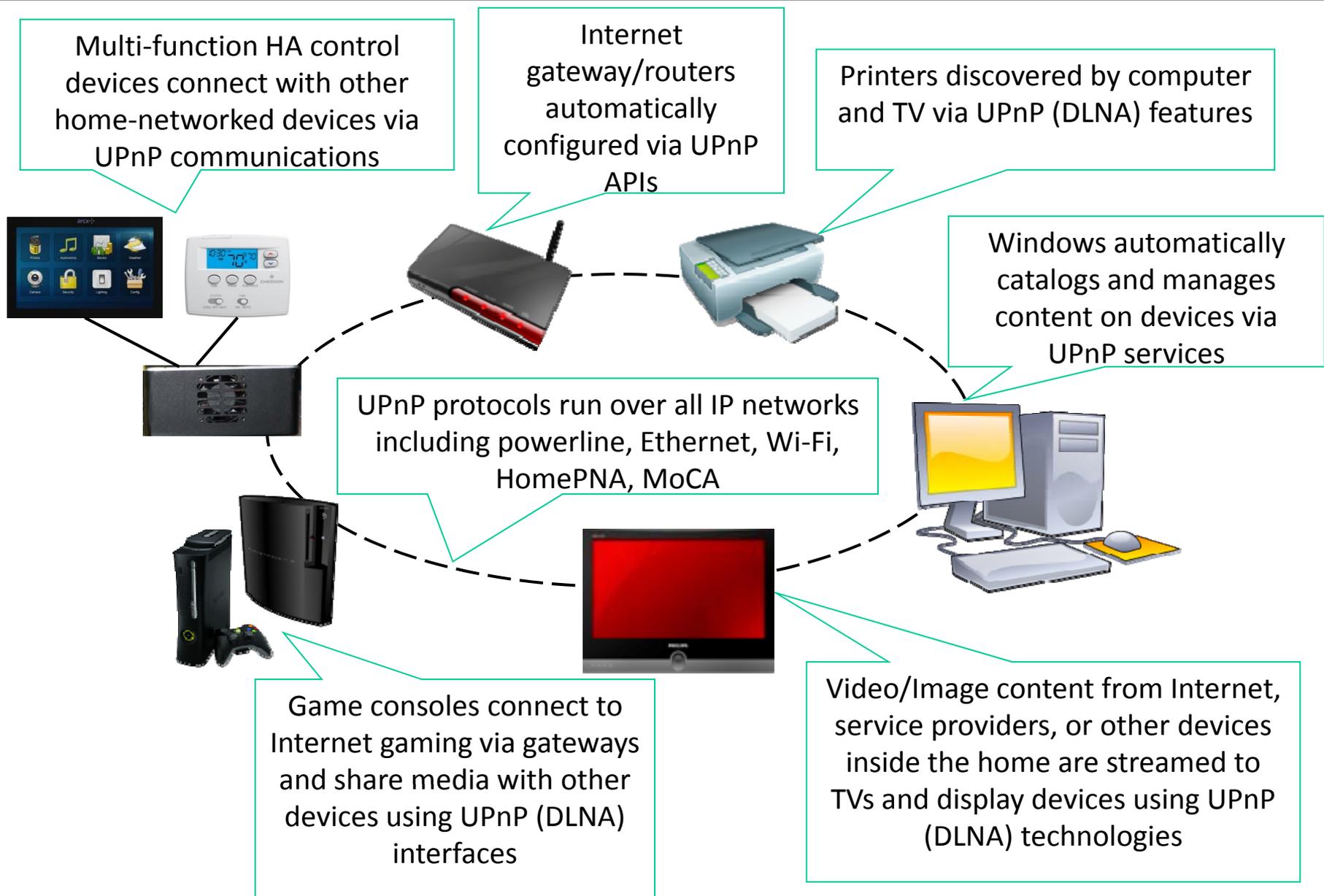


- UPnP Remote Access V1 (published)
  - Mobile or Web to Home scenario
- UPnP Remote Access V2 (published, white paper to come)
  - Home to Home (or small business) scenario
  - New features:
    - Address networking issues: address collision, Nat Traversal, model for connection capabilities negotiations
    - Enhanced filtering with Virtual Device

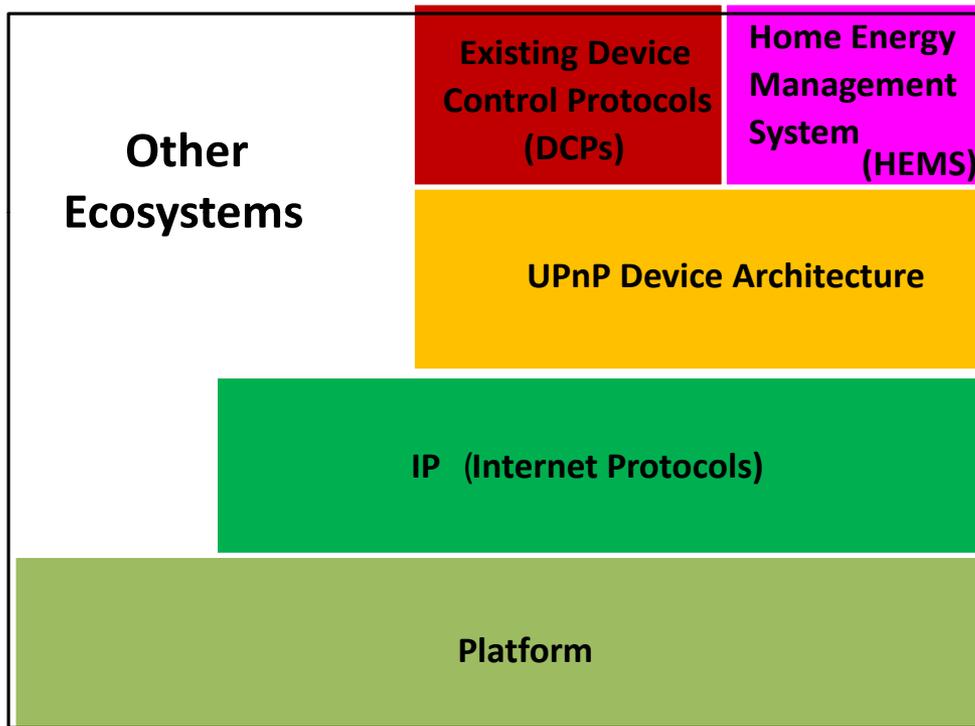
- The UPnP Low Power architecture allows devices implementing power saving modes to reduce energy consumption and still be discoverable by UPnP Control Point
- UPnP Low Power Aware Control Point
  - monitoring of the power states of nodes, may store/cache this information
  - can request a power state change (eg. wake-up or low power state)
- UPnP Low Power Device
  - informs the UPnP network about change in power state
  - 4 categories of devices: sleep-autonomous, sleep-controlled, wake-up autonomous and wake-up controlled devices
- UPnP Basic Power Management Proxy
  - acts as a proxy for sleeping devices, makes sure that devices are discoverable even if they are in low power mode
- Power states
  - active, transparent sleep, deep sleep online, deep sleep offline, disconnect

- International published standards for device & service discovery and secure device control on IP-based home networks, supporting interoperability independent of the underlying physical network technology
- UPnP technologies already provide an established ecosystem
  - UPnP is the foundational technology of more than 9,000 DLNA certified products; millions of CE devices in customer premises
  - well established compliance test & certification program
  - development tools and stacks available
- UPnP architecture and device schemas complement Smart Grid use case scenarios and control requirements
  - neutral platform for facilitating interoperability of energy management applications, energy data communication, and device discovery across different networks of home devices
  - Core technology that can be leveraged to support IP-based Smart Grid systems (time to market advantage)

# Already in Most Homes



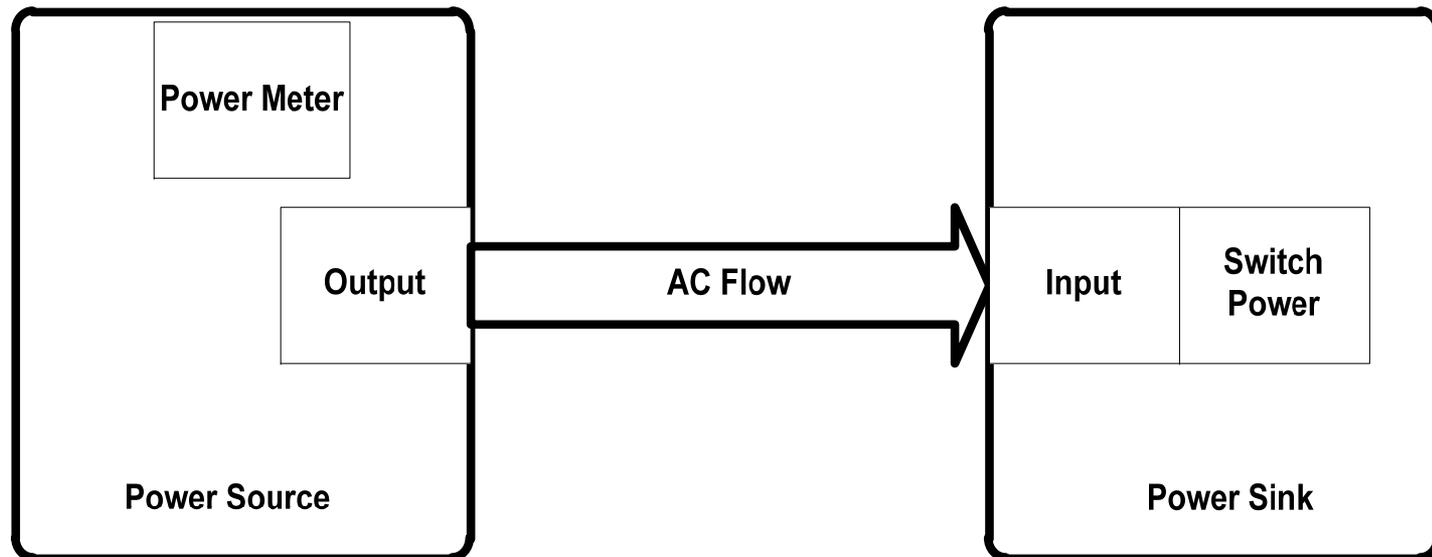
# Devices and services of a UPnP Power System



- Power Sink device
    - lights, motors, appliances...
  - Power Source device
    - utility, generator
  - Power Storage device
    - battery, charger...
  - Power Converter device
    - AC to DC...
  - Power Socket service
  - Power Flow service
  - Generic Power Converter device
  - Power Meter service
  - Charger service
  - Battery service
  - Generic Power Storage device
- 
- AutoIP
  - Discovery
  - Messaging
  - Eventing and Control

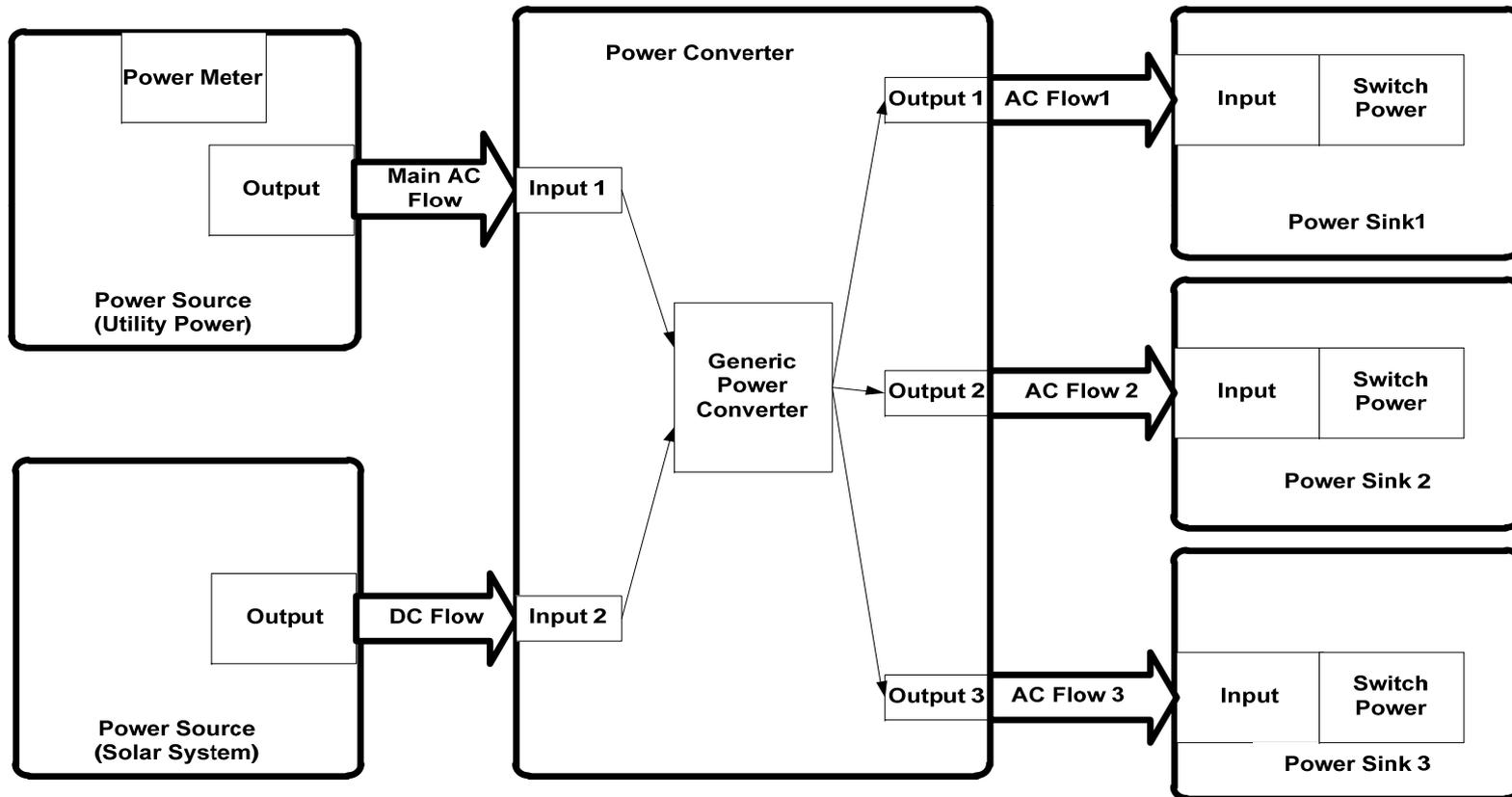
# A Simple Power System

- One **PowerSource** device consisting of one **AC Output PowerSocket** service and one **PowerMeter** service
- One **AC PowerFlow** service
- One **PowerSink** device consisting of one **AC Input PowerSocket** service and one **SwitchPower** service



# A More Complex Power System

- A dual source power generation and conversion



- Timeline
  - Power Systems Device Control Protocol almost completed
  - the next step required for official approval of the specifications is to test three working implementations
- The Power Systems DCPs along with other existing Home Automation DCPs form the foundation of UPnP tools that can be used in Smart Grid applications and can leverage the millions of UPnP/DLNA certified devices already on the market
- Companies are encouraged to join UPnP Forum and to participate in HEMS if they have an interest in UPnP as part of a Smart Grid solution



The Foundation of the  
Connected Home