

Why You Should Upgrade to UPnP+

February 2015



UPnP Forum
www.upnp.org

- What is UPnP+?
- Why is UPnP+ necessary?
- How does UPnP+ deliver these benefits?
- What's New in UPnP+ for UPnP Device Architecture?
- UPnP Cloud Architecture in UPnP+
- UPnP+ Security and DeviceProtection
- UPnP+ DCP Versions
- UPnP+ and the Internet of Things
- Upgrade to UPnP+

- UPnP+ is a new certification level for UPnP devices and services
- It is fully backwards-compatible with existing UPnP devices and services

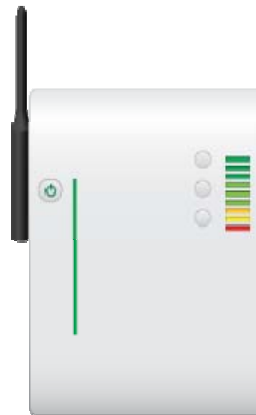
Why is UPnP+ necessary?

Audio/Video Devices



- Remote Cloud Access
- Richer content support: Playlist, Multitracks,...
- Updated to IPv6 & HTML5

Gateways



- Tighter security
- Updated to IPv6

Internet of Things



NEW DEVICES!!!

- Flexible architecture
- Flexible data model
- Strict security
- Virtual Cloud device

... and interoperability

How does UPnP+ deliver these benefits?

- Uses role-based access control with read-only action for untrusted devices
 - Adds cloud services extending the utility of UPnP devices over the Internet
 - Supports IPv6 as well as IPv4 (for legacy devices)
- ⇒ Uses a simple and complete certification program with new enriched test tools

UPnP+ Certification

Framework

UDA 2.0

- Dual IPv4/IPv6 Support
- Cloud-Capable

Floating Services

DeviceProtection

FriendlyInfoUpdate

EnergyManagement

BasicManagement

Latest Version of DCPs

AV:4

- MediaRenderer:3
- MediaServer:4

IGD:2

Optional or Conditionally Required Services

- ConfigurationManagement
- SoftwareManagement
- QOS

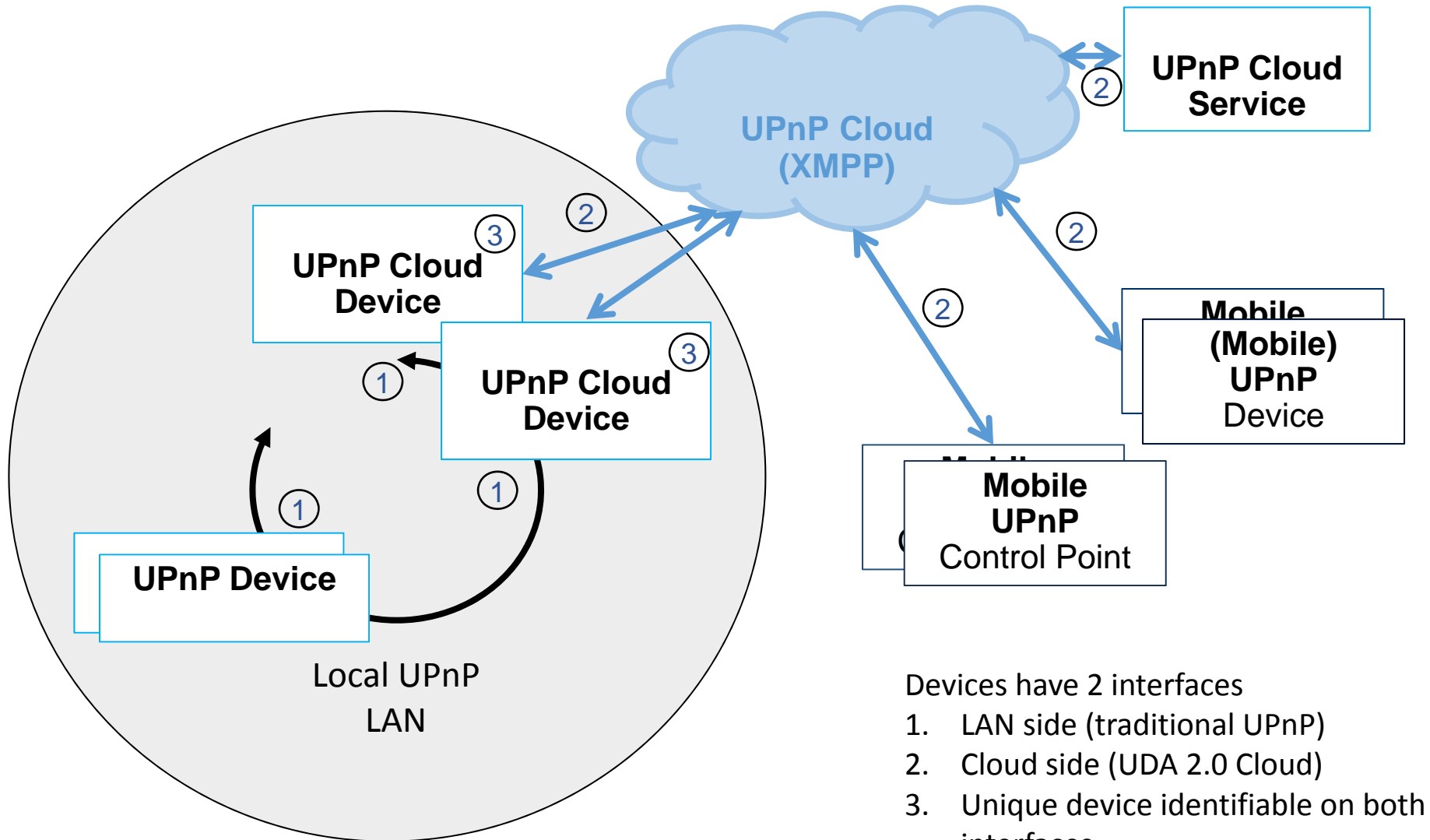
What's new in UPnP+ for UPnP Device Architecture?

Specification	UPnP Certification	UPnP+ Certification
UDA	<ul style="list-style-type: none"> • UPnP version 1.0 is a minimum requirement, • UPnP version 1.1 is optional 	<ul style="list-style-type: none"> • UPnP version 2.0 is a minimum requirement
IPv6 Annex	<ul style="list-style-type: none"> • UPnP certification requires IPv4 support • IPv6 support is optional and the currently published IPv6 annex is out of date 	<ul style="list-style-type: none"> • UPnP+ certification requires dual-stack (IPv4/IPv6) implementation as described in the new UPnP UDA annex
UDA Cloud Annex	<ul style="list-style-type: none"> • UDA V1.0 devices cannot be certified as cloud devices, however legacy UDA V1.0 devices can be bridged to the cloud using a UPnP+ certified CPDev Cloud Proxy device 	<ul style="list-style-type: none"> • UPnP cloud device support (UCCD) is mandatory for UPnP+ device certification • UPnP cloud control point support (UCC-CP) is mandatory for UPnP+ control point certification

UPnP+ Brings UDA 2.0

- Clarifications in the UDA specification
 - Support for Control Point identification
 - Subscription support for individual state variables
 - A clarification was made that UDA 2.0 control points shall be backwards compatible with UDA 1.x devices
 - Version mapping clarification
 - Initial bye-bye clarification
 - M-search responses clarification
 - Various language editorial changes for consistency
- An updated IPv6 Annex that brings the IPv6 requirements up to date with the latest IETF specifications
 - Requires support of IPv6 as well as backwards compatibility with IPv4 in a dual-stack implementation
 - Allows for unambiguous identification of devices that have both interfaces
 - Includes a selection strategy that ensures IPv4 devices will continue to operate
- A new UPnP Cloud Architecture Annex that defines a unique, secure, and extremely flexible way to use the XMPP protocol to share UPnP devices with people in virtual “chat rooms”

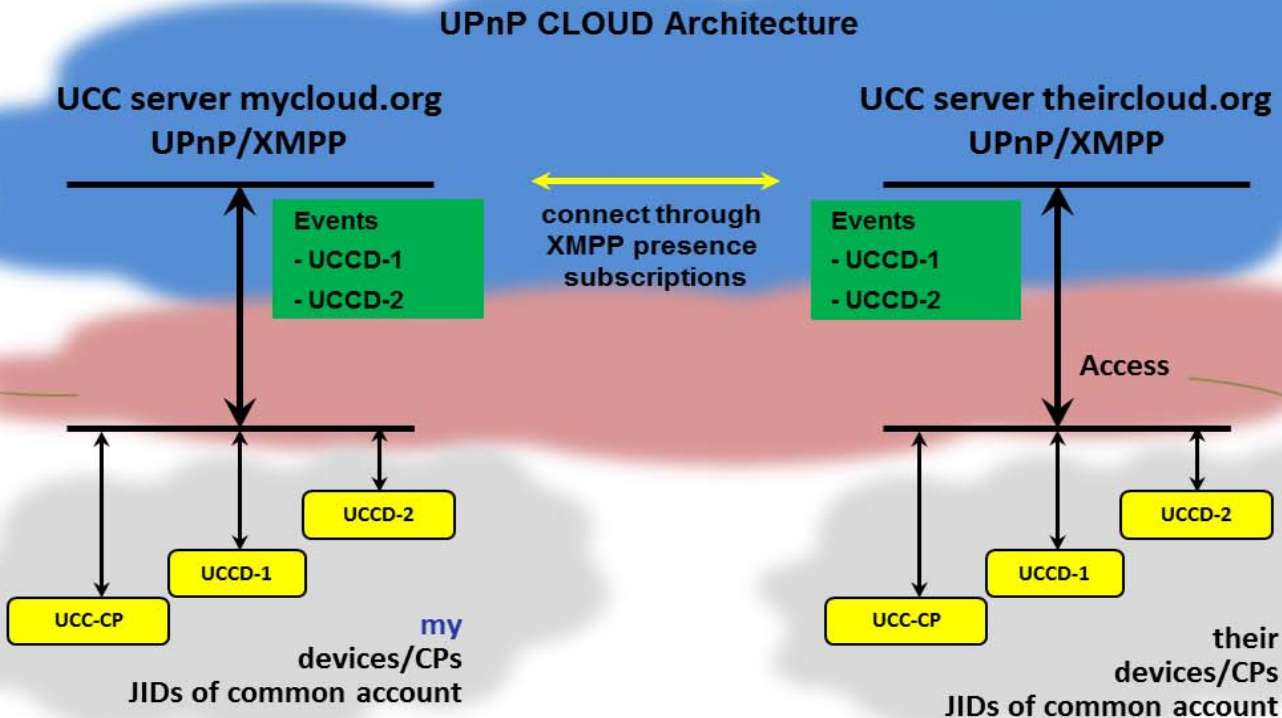
UPnP Cloud Overview



Devices have 2 interfaces

1. LAN side (traditional UPnP)
2. Cloud side (UDA 2.0 Cloud)
3. Unique device identifiable on both interfaces

- **UPnP Cloud Capable Devices (UCCD)** and **Control Points (UCC-CP)** as XMPP clients, for example *“user@upnpcloud.com/urn:upnp-...MediaServer:4...uuid”*



UPnP Cloud Architecture uses XMPP as a transport mechanism to connect LANs, mobile devices and web services securely over the Internet.

- XMPP requires SASL for authentication and TLS for link encryption and is considered very secure, even over local and public networks.
- Eventing is done over XMPP PubSub so is also secure.

This means all UCCDs and UCC-CPs need to log in to an XMPP account (JID).

- Device sharing is private until a user decides to share outside of their account such as in a secure room.
- UPnP specifications are silent about how you register the device/control point to your account at this time.

- Enables the following use cases:
- Share information by means of the cloud only, by turning off UDA (LAN) interface.
- Rooms
 - Create a virtual, secure room, where you can share your TV (or Moms TV).
 - Invite a visitor to that room to use your TV to display their pictures (or display your pictures to Moms TV).
 - The visitor can use a guest WiFi network or the 3/4G network on his mobile phone (do not have to share your WiFi password!)
 - The room can be destroyed once sharing is complete.
- Send your content to your home storage.

Service	UPnP Certification	UPnP+ Certification
DeviceProtection	<ul style="list-style-type: none"> DeviceProtection:1 is optional 	<ul style="list-style-type: none"> DeviceProtection:1 is required for UPnP+ certification http://upnp.org/specs/gw/deviceprotection1/ http://sourceforge.net/projects/upnpdm/ - an open source implementation from Orange (includes DeviceProtection, DeviceManagement: BMS & CMS & SMS)
FriendlyInfoUpdate	<ul style="list-style-type: none"> FriendlyInfoUpdate:1 support is optional 	<ul style="list-style-type: none"> FriendlyInfoUpdate:1 support is mandatory for UPnP+ certification
EnergyManagement	<ul style="list-style-type: none"> EnergyManagement:1 is optional 	<ul style="list-style-type: none"> EnergyManagement:1 support is mandatory in UPnP+ certification EnergyManagement proxy is mandatory for mains powered devices http://upnp.org/specs/lp/energymanagement1/
BasicManagementService	<ul style="list-style-type: none"> BasicManagementService:1 is optional 	<ul style="list-style-type: none"> BasicManagementService:2 is mandatory
ConfigurationManagementService	<ul style="list-style-type: none"> ConfigurationManagementService:1 is optional 	<ul style="list-style-type: none"> ConfigurationManagementService:2 is optional
SoftwareManagementService	<ul style="list-style-type: none"> SoftwareManagementService:1 is optional 	<ul style="list-style-type: none"> SoftwareManagementService:2 is optional

- DeviceProtection provides role-based access control
 - 3 default roles supported “Public”, “Basic”, “Admin”
 - Can also add user-defined roles
- When using device protection, unsecured control points still can use the device, i.e. default role of “Public”
 - However, the functionality is then restricted to “open” actions – depending on the authenticated role of the control point
- Most actions are profiled so data can be read, but not modified
 - Example 1: a “Public” control point can browse AV-CDS content, but cannot delete or add content
 - Example 2: a “Public” control point may observe the status of a software update but only “Admin” can trigger update.

- Uses TLS with self generated certificates
 - no trust authority involved
- Secured control points therefore use HTTPS for
 - device and service description downloads
 - invocation of actions allowed by their user role
- Certificate identification is translated to a “recognized” control point
 - e.g. regular user, guest,...
- Additional login required to identify specific users, such as “Admin”
- DCPs can further define roles and distinguish which actions each role has access to, vendors may define additional roles.
- Any control point, including unsecured ones, can still register for events
 - e.g. see what state the device is in

UPnP+ Device Control Protocol (DCP) Versions?

Specification	UPnP Certification	UPnP+ Certification
IGD	<ul style="list-style-type: none"> IGD:1 	<ul style="list-style-type: none"> IGD:2 http://upnp.org/specs/gw/igd2/ *
AV	<ul style="list-style-type: none"> AV:1 	<ul style="list-style-type: none"> AV:4 http://upnp.org/specs/av/av4/
MediaServer	<ul style="list-style-type: none"> MediaServer:1 	<ul style="list-style-type: none"> MediaServer:4 MULTI_STREAM feature CONTAINER_SHORTCUTS feature CDS Search() MULTI_STREAM properties are conditionally required Relaxed Tracking Changes Option TCO properties are conditionally required
MediaRenderer	<ul style="list-style-type: none"> MediaRenderer:1 	<ul style="list-style-type: none"> MediaRenderer:3 Trickmode Pause() is required SetStaticPlaylist(), SetStreamingPlaylist() and GetPlaylistInfo() are required GetRendererItemInfo() is required GetAllowedTransforms(), GetTransforms(), SetTransforms() and GetAllAvailableTransforms() are required

* note that IGD:1 is deprecated as of March 30, 2015

For MediaServer Device:

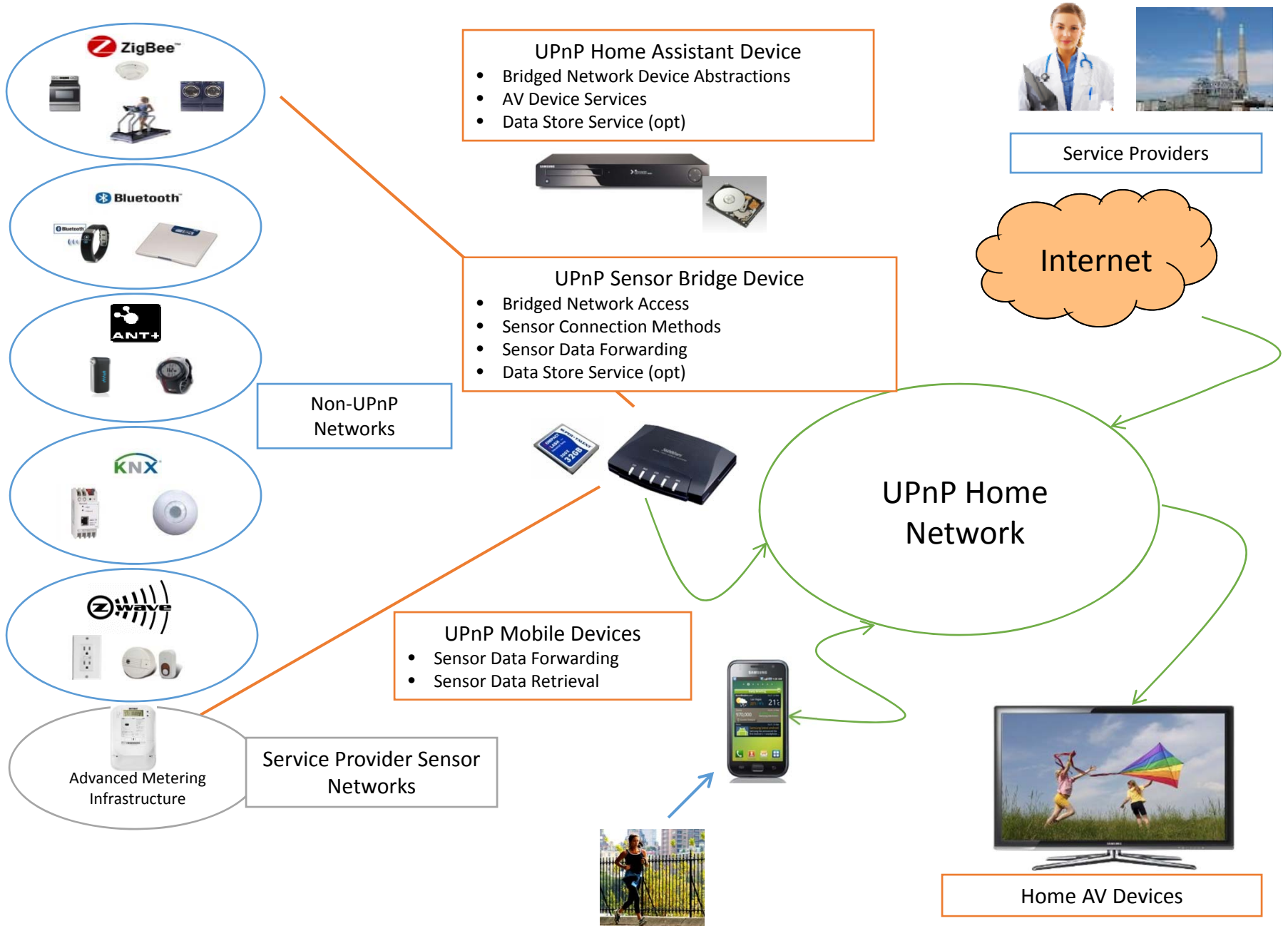
- Search and Change Tracking operations on servers: simplify for control devices aggregation of content for better and faster presentation (CDS Search)
 - Better aggregation improves customer experience, and avoid the current mix (finding photo object under video cause picture not being displayed)
- Facilitate mapping and hence aggregation of UPnP Trees (Container Shortcuts)
 - Fast index into well known access points such as MUSIC, IMAGES, VIDEOS, ...
- Enable support for multiplex elements in servers (MULTI_STREAM)
 - Describes multitrack audio, text subtitles, etc. contained in an multiplexed stream

For MediaRenderer Device:

- Playlist renderer-side operated (SetStaticPlaylist(), SetStreamingPlaylist() and GetPlaylistInfo())
 - Allow to continue operation on playlist from a third party controller (Playlist sharing between control points)
- Pre-checking for playback capability (including DRM) (GetRendererItemInfo)
 - UPnP controller to check if DRM protected content can be played back
- Allow operations on media content (GetAllowedTransforms(), GetTransforms(), SetTransforms() and GetAllAvailableTransforms())
 - Standardized mechanism to rotate image, enable and select subtitles, audio tracks, etc.
 - Multi_STREAM specific transform

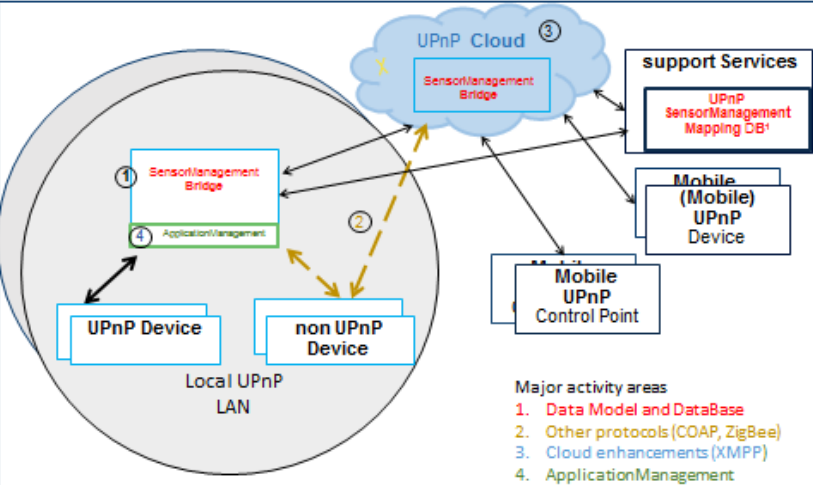
Ready today

UPnP Sensor Network Infrastructure



IOT strategy: embrace other technologies !

UPnP IoT Architecture Overview



UPnP embraces other technologies by Bridging.

- Different transports

- Different DataModels

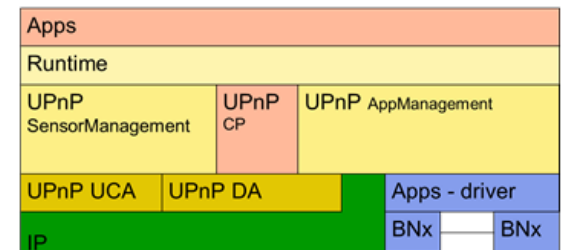
All mapped to same technology:

- All data can be accessed in and outside the home in the same way: unifying the different technologies in the system

Technology is ready:

- Specs are publicly available at www.upnp.org
 - Demo source code available: <https://github.com/upnpforum>
- Works in the home and over the Internet
- Sharing with others is 100% under user control
- Certification program is up and running
- Process in place to incorporate new data models

UPnP SensorManagement Bridge via Apps



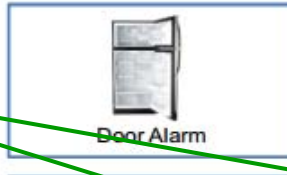
Applications
UPnP DCPs
UPnP infrastructure
Bridged network infrastructure

- UPnP SensorManagement provides bridging to other networks (Bluetooth, ZigBee, Z-Wave, CoAP, etc) by using a SensorManagement bridge with a north-facing UPnP interface
- Built as a UPnP DCP, so UPnP+ mechanisms apply:
 - Device Protection with ACL
 - Cloud extensions

- Existing DCP that exposes IOT (bridged) Devices.
 - Can be an single device
 - Can be an set of (bridged) devices
- Uses nodes in an tree to define an IOT device
 - Using Collection construct to define an device
- Each IOT Device its own sub tree and is represented by:
 - Device identifiers (Common Device Identifiers)
 - Supported Sensors/Actuators (Data Items)

- Manufacturer can define own:
 - Device Identifiers
 - Data Items
- Current ongoing work:
 - Extend list of Common Device Identifiers
 - Support more devices!
 - Extend list of Data Items
 - Support more types of actuators/sensors
 - Extend list of locations
- UPnP Forum has an open-source demonstration application that shows bridging to Bluetooth

DataModel Refrigerator Example



Sensor 1 - Status

AccumulatedPowerUsed	(kW-h, Cumulative)
FreezerTemp	(degC, Average)
GroceryTemp	(degC, Average)
VegetableTemp	(degC, Average)
DoorOpenAlarm	("Door Id", Timeout)
PowerFaultAlarm	(0 1)
StatusInterval	(s)

Sensor 2 - Control

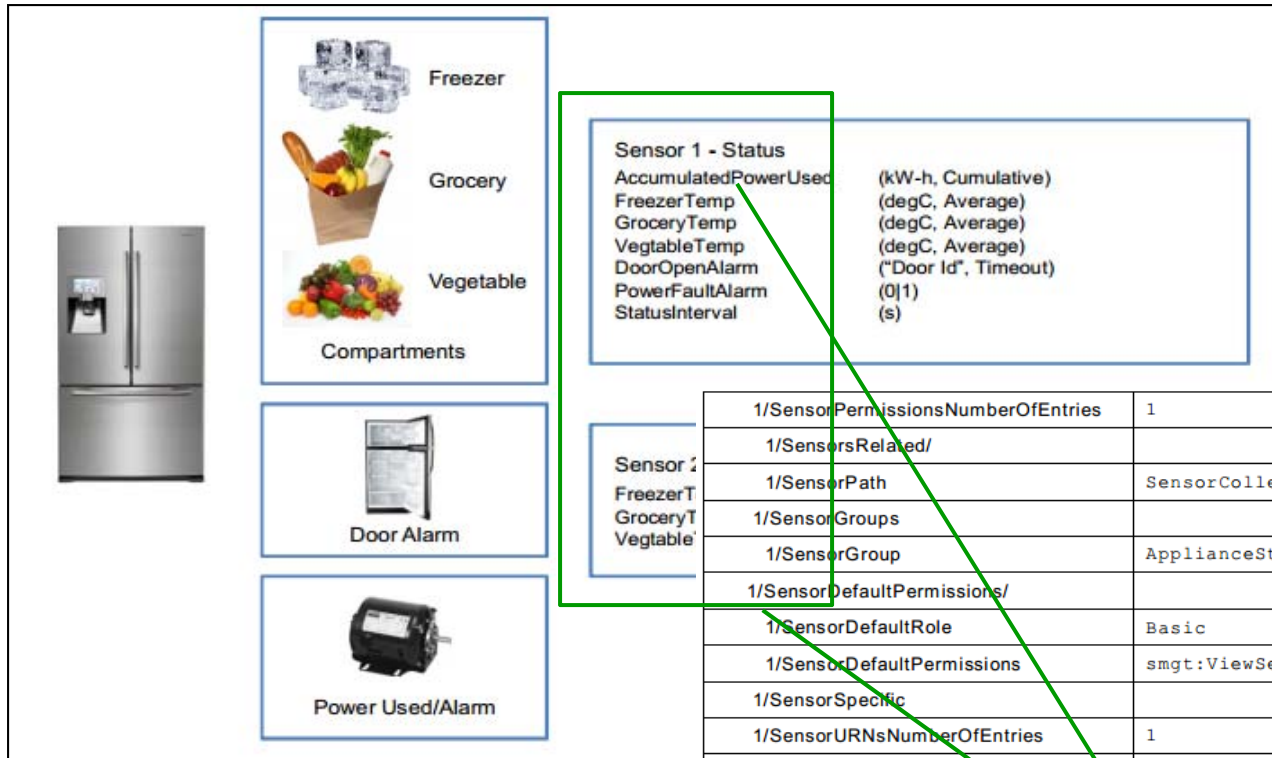
FreezerTempSetting	(degC - Current, LowLimit, HighLimit)
GroceryTempSetting	(degC - Current, LowLimit, HighLimit)
VegetableTempSetting	(degC - Current, LowLimit, HighLimit)

Features are named collection of sensors/actuators

Refrigerator is a modelled device – can be generic or specific

Parameters	Value
/UPnP/SensorMgt	
SensorCollectionsNumberOfEntries	1
SensorCollections/	
1/CollectionID	Collection0001
1/CollectionType	urn:upnp-org:smgt-sct:refrigerator:AcmeSensorsCorp-com:AcmeIntegratedController:FrigidaireCorp:rf217acrs
1/CollectionFriendlyName	"Your Refrigerator"
1/CollectionInformation	"Vendor Refrigerator Model RF217ACRS"
1/CollectionUniqueIdentifier	"123456789"
1/CollectionSpecific	
1/SensorsNumberOfEntries	2
1/Sensors/	
1/SensorID	Sensor0001
1/SensorType	urn:upnp-org:smgt-st:refrigerator:AcmeSensorsCorp-com:AcmeIntegratedController:FrigidaireCorp:rf217acrs:monitor
1/SensorUpdateRequest	0
1/SensorPollingInterval	0
1/SensorReportChangeOnly	0
1/SensorsRelatedNumberOfEntries	1
1/SensorGroupsNumberOfEntries	1

DataModel Refrigerator (Cont)



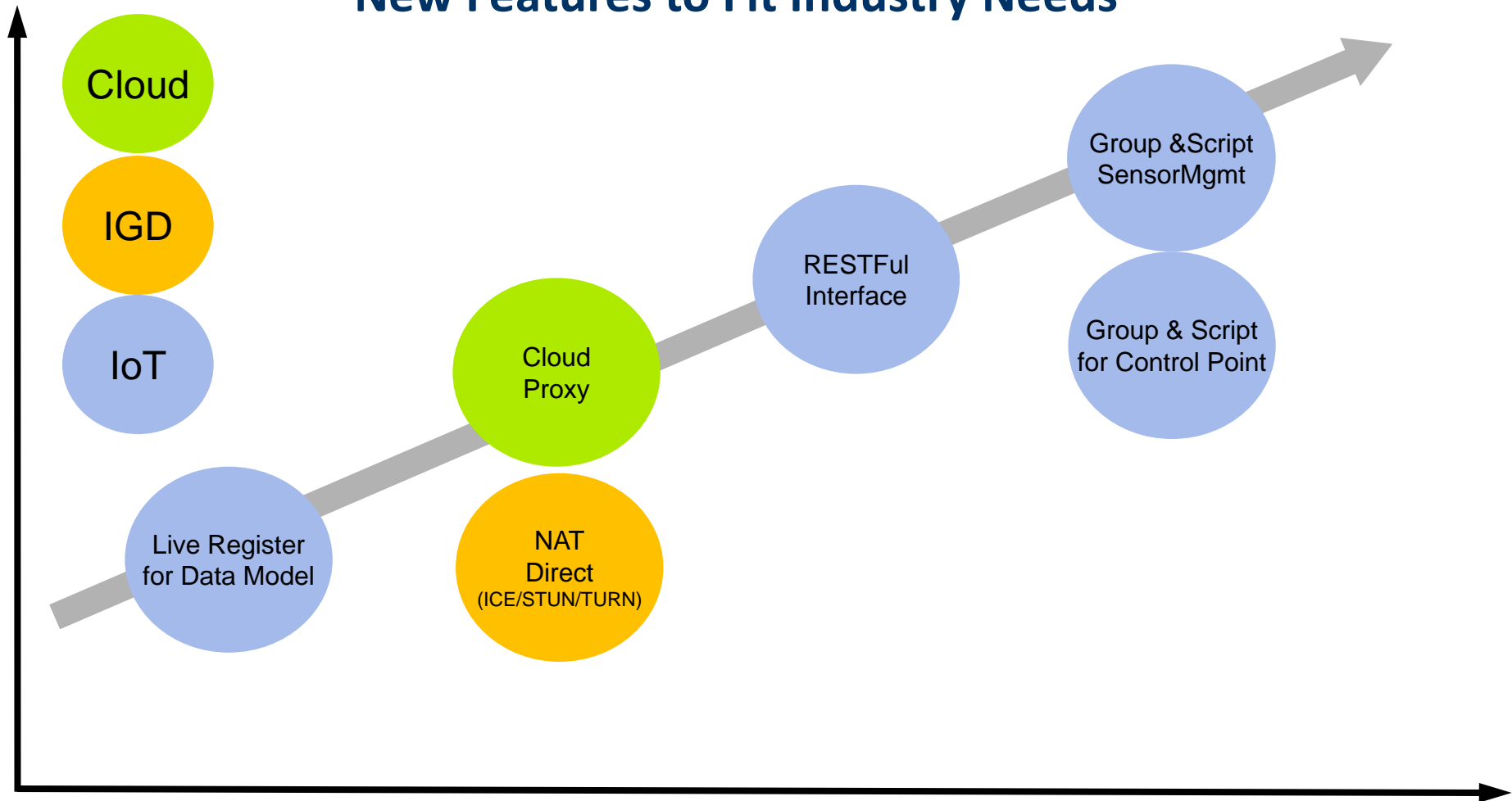
Model continued from previous slide



1/SensorPermissionsNumberOfEntries	1
1/SensorsRelated/	
1/SensorPath	SensorCollections/1/Sensor/2
1/SensorGroups	
1/SensorGroup	ApplianceStatus
1/SensorDefaultPermissions/	
1/SensorDefaultRole	Basic
1/SensorDefaultPermissions	smgt:ViewSensor, smgt:ReadSensor, smgt:ConnectSensor
1/SensorSpecific	
1/SensorURNsNumberOfEntries	1
1/SensorURNs	
1/SensorURN	urn:upnp-org:smgt-surn:refrigerator:AcmeSensorsCorp-com:AcmeIntegratedController:FrigidaireCorp:rf217acrs:Monitor
1/DataltemsNumberofEntries	9
1/Dataltems/	
1/Name	AccumulatedPowerUsed
1/Type	uda:ui4
1/Encoding	ascii
1/Description	See Annex A.1.1.1
2/Name	FreezerTemp
2/Type	uda:i4
2/Encoding	ascii

- UPnP+ provides the confidence of proven security, superior interoperability and the new features that make it the most complete and open solution for the Internet of Things
- The cloud solution of UPnP+ is the simplest and most complete way to securely share devices
- UPnP+ certification is inexpensive and open source solutions can validate their implementations for free
- UPnP+ certification is available today
- More to come...

New Features to Fit Industry Needs



Thank you

Questions?

- Scott Lofgren, Intel
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- <https://github.com/upnpforum>
- UPnP Cloud Device Applications
 - Sample desktop applications implementing UPnP Cloud Architecture (UCA). The repository contains the implementation of the following UPnP devices: DimmableLight, MediaServer, MediaRenderer and a light bulb modelled as a SensorManagement device.
- UPnP Cloud Controller Application for Android
 - Sample Android application capable of controlling several types of network devices connected using UPnP protocol for both local (UDA) and cloud devices (UCA).

- Website: www.upnp.org
- UPnP Forum Invites Orgs to use UPnP+ Certification
 - http://upnp.org/news/documents/UPnP_UPnPPlusCertificationLaunch_Nov2014.pdf
- Overview: UPnP+ Initiative
 - <http://upnp.org/latestupdates/upnpplus/>
- Presentation: UPnP Internet of Things Overview
 - http://upnp.org/resources/documents/UPnP_IoT_Overview_Dec2014.pdf
- Presentation: Bringing UPnP to the Cloud and IOT
 - http://upnp.org/resources/documents/Bringing_UPnP_to_the_Cloud_and_IoT_May2014.pdf
- Whitepaper: UPnP Enabling Standard IoT: Future-proofing device communications
 - http://upnp.org/resources/whitepapers/UPnPEnablingIoT_2014.pdf



For the interconnected lifestyle