Middleware Developers Event

Agenda

9:00am - 9:45am: Introduction & Status Updates

- UPnP Forum overview and cert/DCP updates – *Alan Messer (Samsung), President & Chairman*
- UCTT 2.0 roll out details – *Wouter van der Beek (Philips), Compliance Committee Chair*
- Discussion

9:45am - 11:15am: Detailed Update on Upcoming DCPs

- UPNP AV 2+ Feature Description – *Keith Miller (Nokia), AV WC Co-Chair*
- UPnP IGD2 and Device Protection – *Fabrice Fontaine (France Telecom), Gateway WC Member*
- UPnP Device Management – *Xavier Roubaud (France Telecom), DM WC Co-Chair*
- UPnP Telephony – *Yu Zhu (Huawei Technologies), Telephony WC Vice-Chair*
- Discussion

11:15am - 11:30am: Break

11:30am - 12:30pm: Future Looking

- UPnP Home Automation, HEMS & SmartGrid – *Clarke Stevens (CableLabs), HEMS WC Chair*
- E-Health & Sensors – *Russell Berkoff (Samsung), EH&S WC Chair*
- UPNP Plus (UPnP+) – *Alan Messer (Samsung) and Clarke Stevens (CableLabs)*
- Discussion

12:30pm - 1:00pm: Wrap-up

UPnP™ FORUM

UPnP Forum Update

Alan Messer
UPnP Forum President & Chairman

UPnP™ FORUM

UPnP Forum Goals

- 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

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UPnP Forum Membership

- 973 Basic Member companies
- 129 Implementer Members
- 7 Steering Members:

CableLabs · intel · LG Electronics · NOKIA · orange · PHILIPS · SAMSUNG

- Demographics:
  - Asia (254)
    - China (27)
    - Hong Kong (9)
    - India (21)
    - Japan (59)
    - Korea (38)
    - Singapore (4)
    - Taiwan (96)
  - North America (491)
    - Canada (32)
    - United States (459)
  - Australia (10)
    - Australia (8)
    - New Zealand (2)
  - Latin America (5)
    - Brazil (3)
    - Chile (1)
    - Columbia (1)
  - Middle East (20)
    - Israel (19)
    - Saudi Arabia (1)
  - Middle East (20)
    - Israel (19)
    - Saudi Arabia (1)
  - Europe (193)
    - Austria (4)
    - Belgium (6)
    - Bulgaria (1)
    - Denmark (5)
    - Finland (5)
    - France (39)
    - Germany (42)
    - Greece (2)
    - Iceland (1)
    - Ireland (4)
    - Italy (11)
    - Luxembourg (1)
    - Netherlands (5)
    - Norway (1)
    - Poland (2)
    - Portugal (1)
    - Romania (1)
    - Russia (1)
    - Serbia (1)
    - Slovenia (1)
    - Spain (9)
    - Sweden (11)
    - Switzerland (5)
    - Turkey (3)
    - United Kingdom (31)

UPnP™ FORUM

As of March 19, 2012

UPnP Technologies

- 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

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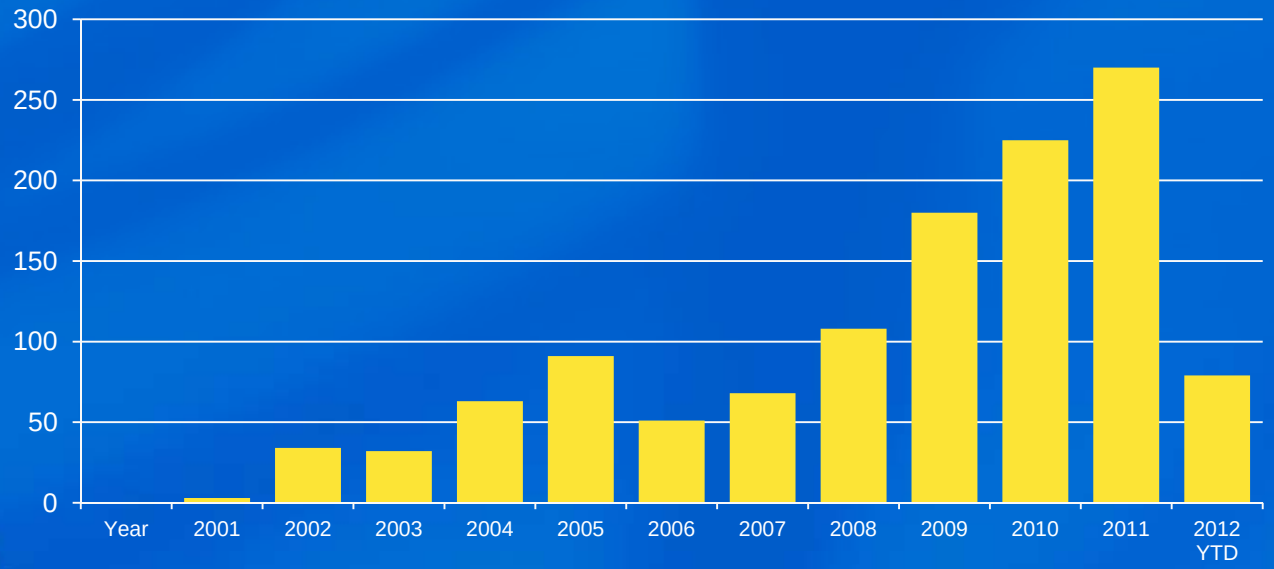
Many Products in the Market

Certifications

- 1000+ UPnP® Certified implementations
- Certified first UPnP AV Control Points in early 2012
- Latest test tool release version and instructions for submitting suspected bugs using the new Bugzilla system available on the members-only website
- Wide range of software development kits (SDKs) and open source implementations from multiple vendors, languages, and platforms available on the public website
- Certifications over time:



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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/.

As of March 19, 2012

Industry Momentum/Deployment

- **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..

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Achievements

- **Record high number of Implementer Members (129 companies)**
- **Certification program achievements and enhancements**
  - 1000+ UPnP® Certified implementations
  - Certified first AV Control Point devices in early 2012
  - Continued roll-out of UCTTT 2.0 for new device types
  - Launched new bug submission and tracking system (i.e. Bugzilla)
- **Recent DCP and DCP Framework publications**
  - AV:4, DeviceManagement:2, DeviceProtection:1, RemoteAccess:2, Telephony:1, UDA 1.1 IPv6 Annex
- **UPnP documents newly adopted and published by ISO/IEC**
  - 21 new UPnP DCPs, UDA V1.1 and 8 updates
- **Formation of new Committees and Taskforces**
  - UPnP+ Taskforce, IPv6 Taskforce, E-Health & Sensors WC, HEMS WC
- **Expanded marketing**
  - New member newsletter, more press releases, UPnP YouTube channel and Member company case studies *(coming soon!)*
- **Continued collaboration with other organizations through liaisons**
  - BBF, CABA, DLNA, EPRI, HGI, IGRS, Itophome, JTC1, MoCA, NIST, OMA, ZigBee, and more.
- **First open-forum Middleware Developers Event to share feedback among vendors on UPnP efforts (going on now in Paris)**

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Working Committee Activity

- **Today, UPnP Forum remains very active**
  - **UPnP AV**
    - Continued enhancements to AV scenarios & promotion of existing DCPs
  - **UPnP Device Management**
    - Recent publication of DeviceManagement:2 DCPs
  - **UPnP E-Health & Sensors**
    - Management of sensor networks, ecosystem specific data aggregation and messaging between devices
  - **UPnP Home Energy Management & Smart Grid**
    - 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)

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Certification Program and Test Tool Update

Wouter van der Beek (Philips)
Compliance Committee Chair

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UCTT 2.0 Update

- Phasing out UCTT 1.5 for MediaServer:2 and MediaRenderer:1 devices on May 17, 2012.
- Control Point certification for MediaServer:1 and MediaRenderer:1 began on November 17, 2011.
- Finalizing test for SRS and AV:3
- Introduction of new online bug tracking system. Members encouraged to submit suspected bugs and refer to the Known Issues List.
  - https://bugzilla.upnp.org/
- Planned enhancements:
  - Higher AV versions
  - Automated testing
  - Support for other devices such as IGD and Printer

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UPnP Pre-Certification Program

- Pre-Certification program launched in 2011
  - Independent certification vendors (ICVs)* now allowed to perform pre-certification testing with UPnP tooling
  - Allows understanding UPnP compliance without associated learning curve
- ICVs* encouraged to send contact information to UPnP Forum Admin for addition to public listing:
  - http://upnp.org/sdcps-and-certification/resources/precertification/

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* *Implementer level membership required*

UCTT 2.0 Deployment Schedule (Device)

Device Categories	Device Versions	UCTT 2.0 test logs required to be submitted for "Pre-certification" validation	Passing UCTT 2.0 logs accepted for official certification	UCTT 1.5 test logs no longer accepted
Audio Video	**MediaServer:1**	Began fall 2010	Began March 22, 2011	Began November 17, 2011
	MediaServer:2	Began fall 2010	Began November 17, 2011	Beginning May 17, 2012
	MediaServer:3	Began fall 2010	TBD	TBD
	MediaServer:4	TBD	TBD	TBD
	MediaRenderer:1	Began fall 2010	TBD	Beginning May 17, 2012
	MediaRenderer:2	Began fall 2010	TBD	TBD
	MediaRenderer:3	TBD	TBD	TBD
Basic	**Basic Device:1**	N/A	N/A	N/A
Printer	**Printer Enhanced:1**	TBD	TBD	TBD
	Printer Basic:1	TBD	TBD	TBD
Remote Access	**RAClient:1**	TBD	TBD	TBD
	RAServer:1	TBD	TBD	TBD
	RADiscoveryAgent:1	TBD	TBD	TBD
RemoteUI	**RemoteUIClient:1**	TBD	TBD	TBD
	RemoteUIServer:1	TBD	TBD	TBD
Other	**Other**	TBD	TBD	TBD

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Refer to the Testing Matrix on the Implementers Area landing page for updates (https://members.upnp.org/default.asp)

UCTT 2.0 Deployment Schedule
(Control Point)

Control Point Categories	Control Point Versions	UCTT 2.0 test logs required
Audio Video	MediaServer:1	Began November 17, 2011
	MediaServer:2	TBD
	MediaServer:3	TBD
	MediaServer:4	TBD
	MediaRenderer:1	Began November 17, 2011
	MediaRenderer:2	TBD
	MediaRenderer:3	TBD
Basic	Basic Device:1	N/A
Printer	Printer Enhanced:1	TBD
	Printer Basic:1	TBD
Remote Access	RAClient:1	TBD
	RAServer:1	TBD
	RADiscoveryAgent:1	TBD
RemoteUI	RemoteUIClient:1	TBD
	RemoteUIServer:1	TBD
Other	Other	TBD

Refer to the Testing Matrix on the Implementers Area landing page for updates (https://members.upnp.org/default.asp)

UPnP Remote Testing Framework

- To aid testing and adoption of newer version of the specifications
- Access system to host certified devices that can be used by member companies to test against
- Remote Testing Framework
  - Hosted OpenVPN server to allow UPNP devices to communicate as if on the same LAN
- Two Forum usages
  1. Remote hosting of working committee plugfests
     - Allows more frequent testing/revision
  2. Remote hosting of golden devices for vendor testing
     - Far easier access to new standard references

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Summary And Call to Action

- Continue testing and submitting feedback on the new UCTT 2.0 tool
- Implementer Member case studies
  - Contact UPnP Forum Admin to be considered for a future co-marketing efforts
- Devices for Remote Testing Framework (RTF)
  - Consider submitting devices to UPnP Forum or host your own device on a system that will allow Members to test their against a set of validated “golden” devices for plugfesting, debugging and pre-certification testing
- Submit implementations for SmartGrid demonstration systems
- Participate in the Working Committees *(all members eligible)*
- *R*equest to participate in the Technical Committee *(limited to SC level members and invited guests)*
- Future face-to-face meetings *(visit http://upnp.org/events/)*

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Questions & Discussion

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UPnP AV:2, AV:3 New Features

- Scheduled Recording Service
- EPG Metadata
- Tracking Changes Option
- Support for Foreign Metadata
- Clarification of Behaviors
- Control Point Requirements (Appendix)

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UPnP AV:4 New Features

- “DVD like” Navigation of Content
- Richer Content Description (Multi-stream)
- Playback Synchronization (Multi-device)
- Device Resource Control
- Content Privacy
- Enhanced Playlist Support
- Instant Replay/Time Shift Support
- Renderer Content Matching (with DRM)
- Complex Metadata Filtering

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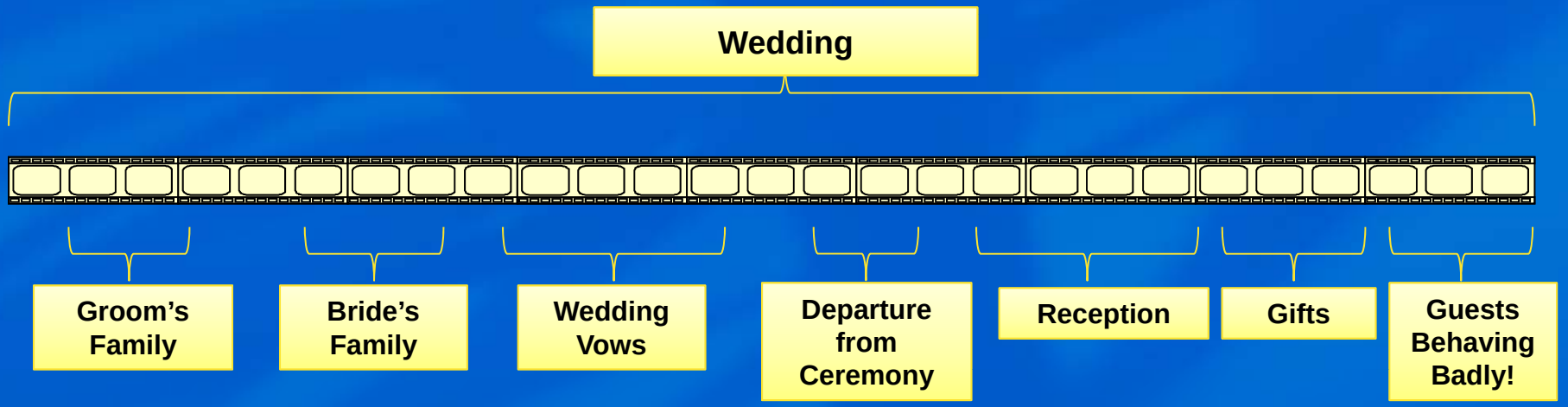
Navigation - Content Segmentation



Control Point Display

Wedding Videos → Wedding

Wedding Highlights → Bride's Family, Groom's Family, Vows, Departure from Ceremony, Reception, Gifts

Wedding Outtakes → Guests Behaving Badly!

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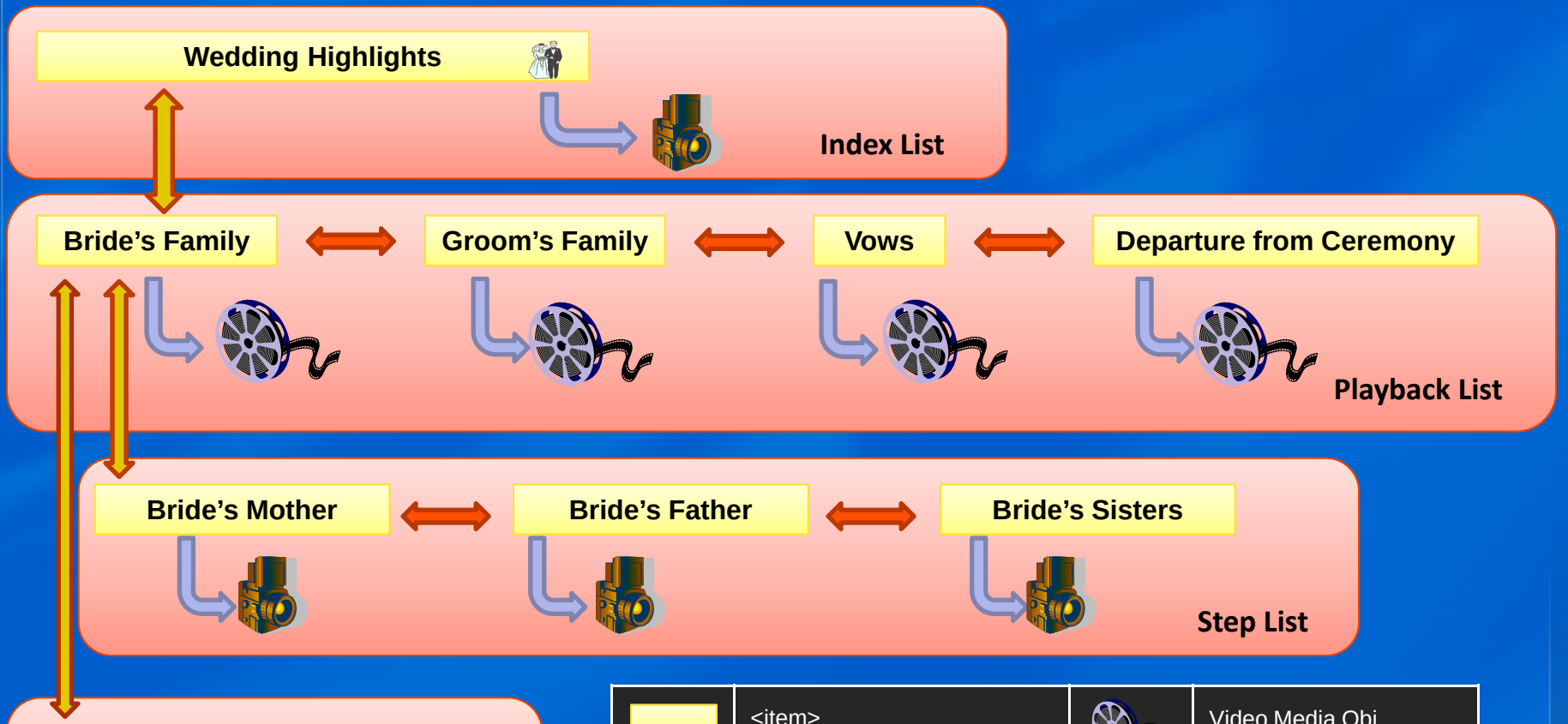
Navigation - Object Linking



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	<res>		Image Media Obj
	<upnp:objectLink>		Audio Media Obj
	<upnp:objectLinkRef>		

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Richer Content Description

DTV
Media Renderer

Playback item

Including subtitling,
alternate audio tracks

Home Media Server

Select Item for playback

Play()

Control Point lists choices exposed by renderer for multi-stream content

Subtitle Language:	**English**
Audio Language:	**Dutch**
Camera Angle:	**Main**
Zoom:	**0%**
Playspeed:	**Normal**

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Precision Time-Synchronization

DTV
(Renderer)

Network
Speaker
(#1)

Network
Speaker
(#2)

Use Case: CP initiates precision time-synchronous rendering of the same content on another renderer

IEEE AVB Clock Reference

Existing
Streams

New
Stream

Home Media Server

SyncPlay
(Presentation Time,
Reference Position,
...)

(Control Point)

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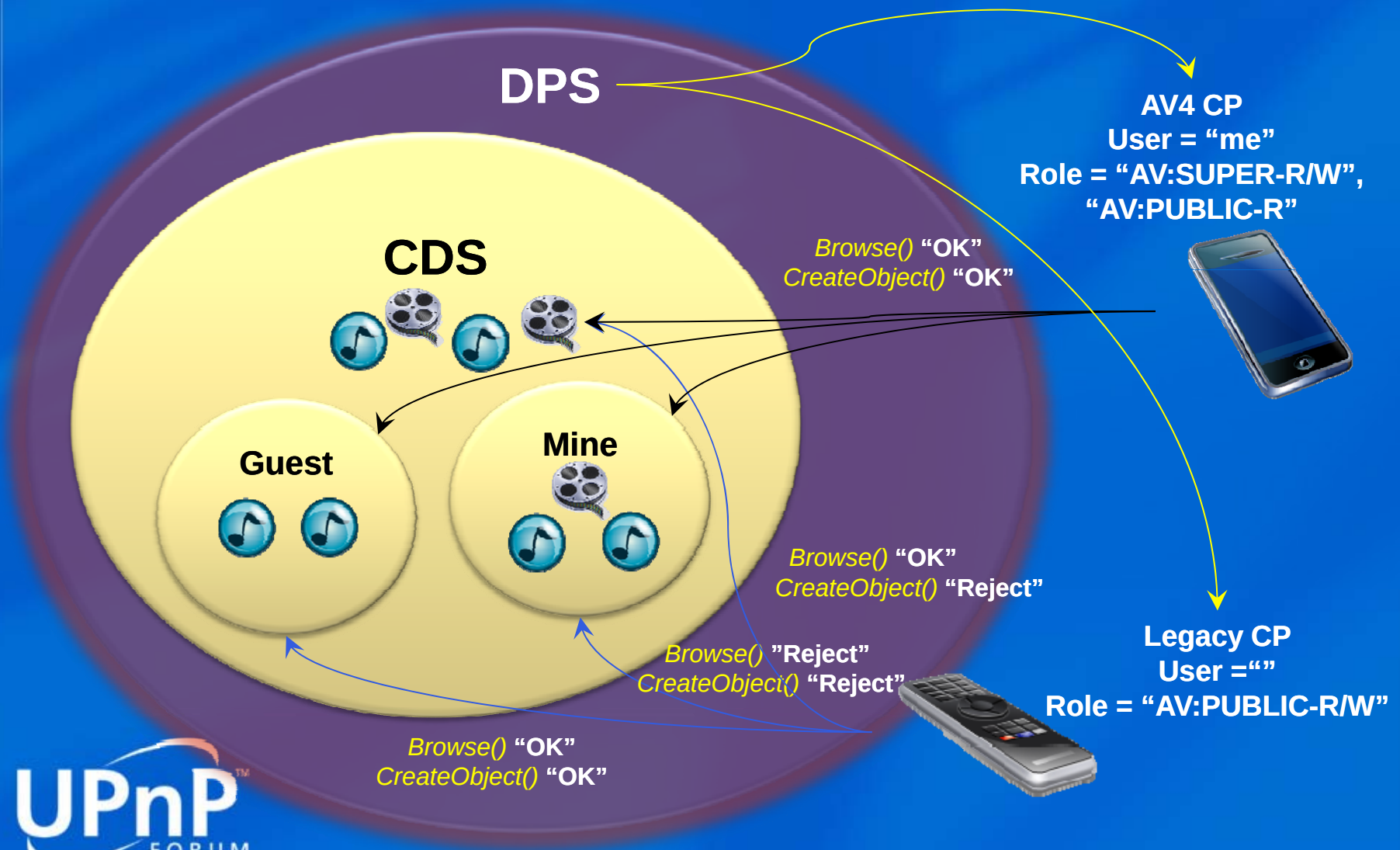
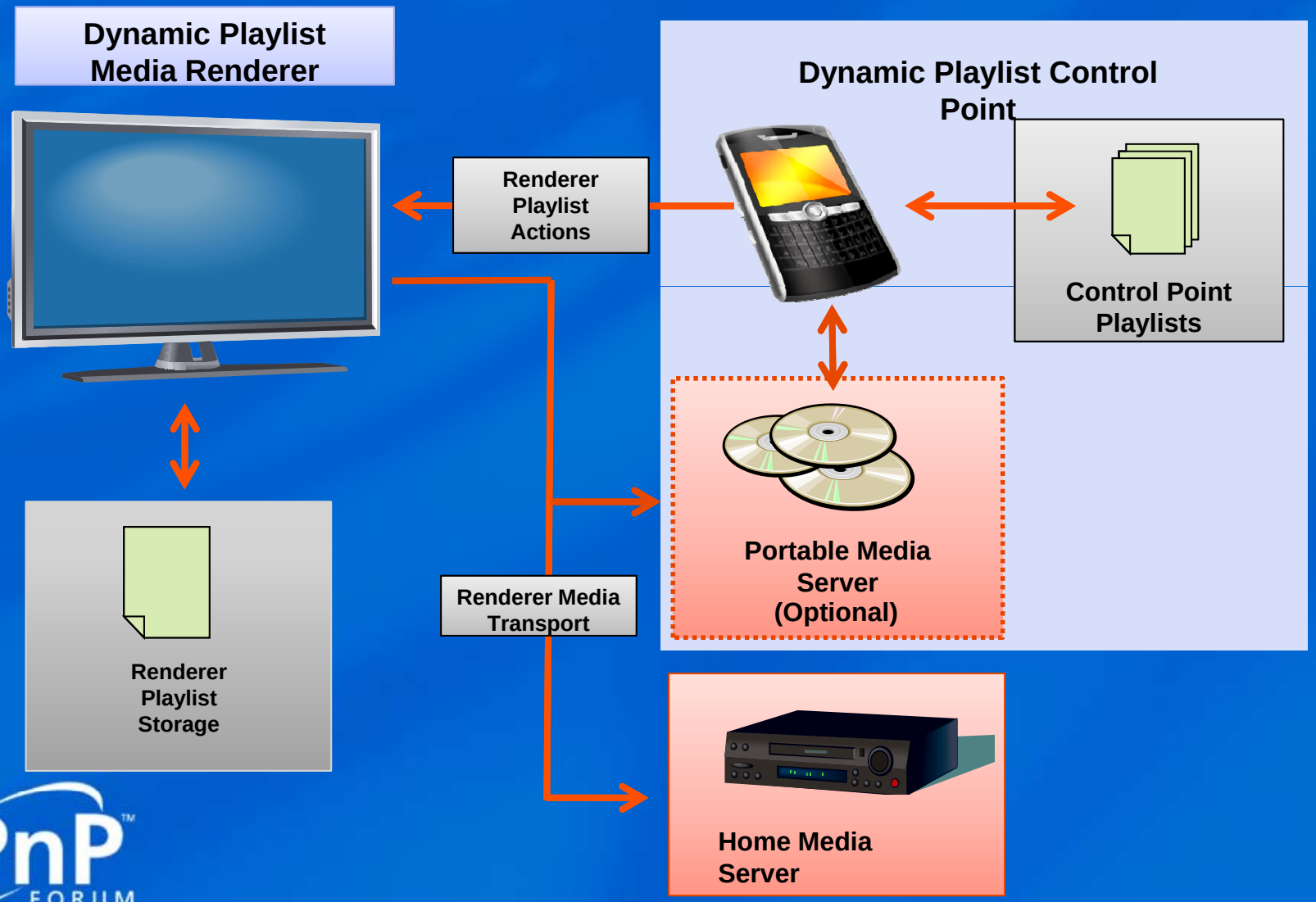
Content Privacy



Enhanced Playlist Support



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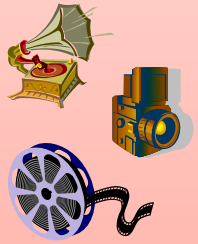
Instant Time-Shift/Playback Support

MediaRenderer
+
Control Point

Watch Tuner from Media server

Record program



Time Shift Buffer for Tuner

- Contains start = Y/N
- In progress = Y/N
- Complete = Y/N

Home MediaServer

- CDS/EPG
- SRS
- Time Shift Buffer
- TSB Support

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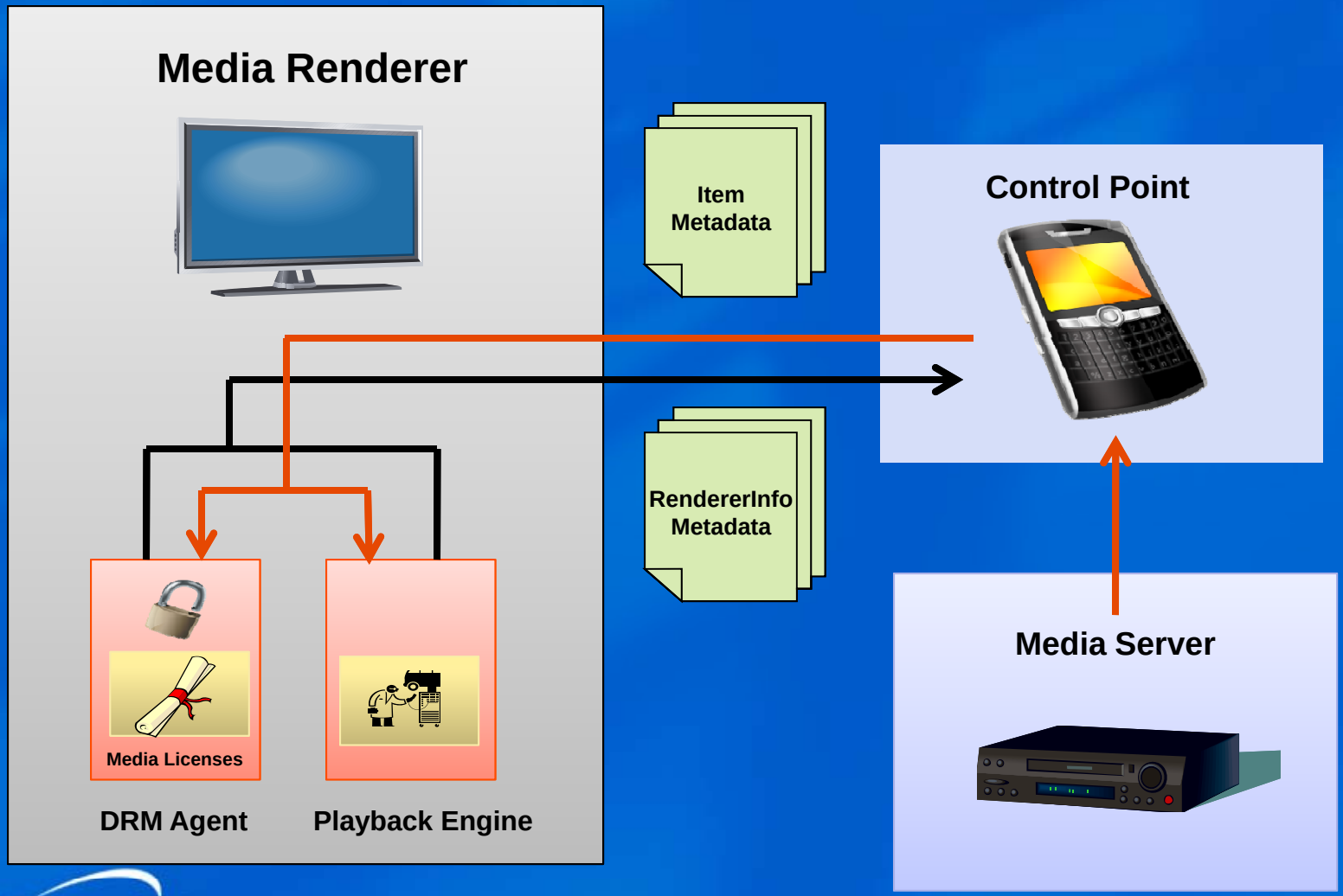
Renderer Content Matching (with DRM)



AV5 (in progress)

- Nearing v0.80 status
- Includes:
  - TextToSpeech Service
  - Metadata enhancements for resExt
  - Support for server-Side transforms including component selection and transcoding.

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Internet Gateway Device v2 Overview

Mika Saaranen – Nokia
Mark Baugher – Cisco
Fabrice Fontaine – Orange

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The Risks of Home Networking

Home networks are vulnerable to malware and war drivers

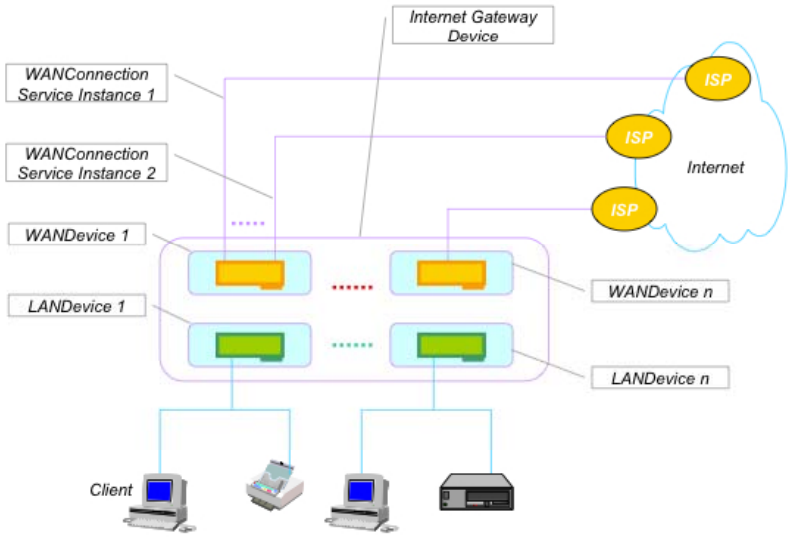

Figure 1: *InternetGatewayDevice* with LAN and WAN Interfaces

The UPnP Forum has developed a device protection service for UPnP IGD and other Device Control Protocols

- **Home networks face risks**
  - **Well-known admin passwords**
  - **Little authentication of services**
  - **Viruses are common on home computers**
- **Malware is biggest threat (viruses, Flash-based attacks)**
- **War Driving is another**

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Gateway V1 Overview

- IGD V1 Features
  - Manage and configure physical connections e.g. connect or disconnect
  - Automatic and seamless configuration of Internet access among networked devices
  - Status and events on connections like External IP address
  - Control NAT traversal
- IGD and other UPnP DCPs have had the option of using UPnP Device Security for the past 6 years
  - This is a high-grade security service
  - No significant flaws were found in UPnP Device Security
  - Still, vendors have not chosen to ship Device Security

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Gateway v2 Overview

- Enhanced security by new DeviceProtection service
  - Applied to all IGD variables and actions
  - Allows vendors as well as users to limit access
- Enhanced portmapping by new action giving any free portmapping if requested mapping is not free
  - Policy changes e.g. no infinite portmappings
- Expanded IPv6 support
  - New service for controlling IPv6 firewalls
  - Clarifications for UPnP IPv6 support

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Gateway v2 Security Service

- **UPnP Device Protection**
  - **Does not require a third-device as a security console**
  - **Uses X.509 certificates and SSL/TLS services**
  - **Uses WiFi Protected Setup means of enrollment**
- **IGD & other DCPs can use UPnP Device Protection**
  - **Device Protection is a UPnP service for all DCPs**
  - **DP provides an extensible authorization framework**
- **IGD has applied Device Protection to its needs**
  - **Three-levels of authorization and authentication**
    - Admin, Basic and Public

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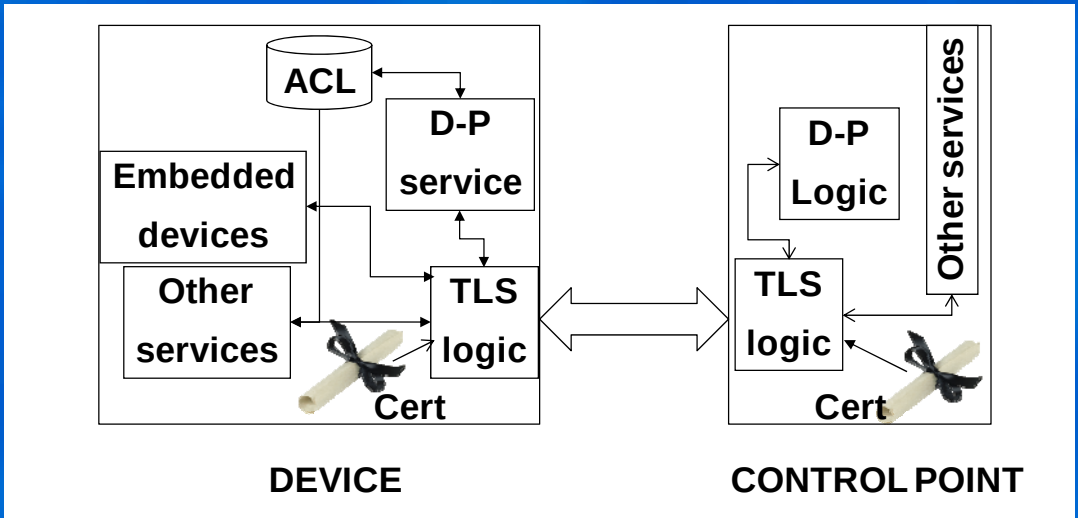
UPnP Device Protection



- TLS protects the Description and Control phases of UPnP
- Authentication is based on self-signed X.509 certificates
- Trust in certicates 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

Access Controls in IGD:2

Table 3: *WANIPConnection:2* Actions

Name	Access level	Description
SetConnectionType()	*Admin*	Impacts connectivity for all applications
GetConnectionTypeInfo()	*Public*	Allows retrieving information
RequestConnection()	*Basic*	Starting a connection is normal operation and should not require strict security, but *Basic* authentication is RECOMMENDED
RequestTermination()	*Admin*	Ending connection impacts connectivity for all applications
ForceTermination()	*Admin*	See previous
SetAutoDisconnectTime()	*Admin*	IGD configuration – not part of normal usage
SetIdleDisconnectTime()	*Admin*	IGD configuration – not part of normal usage
SetWarnDisconnectDelay()	*Admin*	IGD configuration – not part of normal usage
GetStatusInfo()	*Public*	Allows retrieving information – does not change operation
GetAutoDisconnectTime()	*Public*	Allows retrieving information – does not change operation
GetWarnDisconnectDelay()	*Public*	Allows retrieving information – does not change operation
GetNATRSIPStatus()	*Public*	Allows retrieving information – does not change operation
GetGenericPortMappingEntry()	*Public* for CP's IP address and ports greater than or equal to 1024 *Basic* for CP's IP address and ports lower than or equal to 1023	Allows retrieving information on device's own port mappings when ports *are not* well-known ports Allows retrieving information on device's own port mappings when ports *are* well-known ports

Access control is defined

- For all IGD Actions

Three levels of access

- Admin
- Basic
- Public

Better overall security

- Least privilege
- Privilege separation

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UDA Annex A IPv6 Changes

- IPv6 support in UDA 1.0 and 1.1 evolved with the evolving standard
  - Deprecation of site-local addressing
  - Development of unique local addressing
  - Publication of RFC 3484 address selection policies
- Allow routed home networks using ULAs
  - 802.14.5 uses a 64-bit address means that it cannot be bridged to Wi-Fi, Ethernet, MoCA, or other LANs.
  - Accommodate routed private networks with site-routing without resorting to globally-routable addresses.

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Summary

- IGD:2 introduces two new services:
  - DeviceProtection :1 to enable authentication and access control
  - WANIPv6firewallControl:1 for controlling IPv6 firewalls
- There is new and enhanced port mapping experience with WANIPConnection:2 service
- A number of policy changes that improves security and resource usage

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Introduction to UPnP Device Management

WC co-chair
Kiran Vedula (Samsung)
Xavier Roubaud (Orange)

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Terms Definitions

- **UPnP *ManageableDevice*** (MD): UPnP device defined by the UPnP Device Management Working Committee. It represent the device that will be managed.
- **Control Point** (CP): a software capable of calling Manageable Device actions. In other words, the software that is going to manage the *ManageableDevice.*
- **Deployment Unit** (DU): software package which can be installed, uninstalled or updated. Such binary unit that can be individually deployed on the execution environment. A deployment unit consists of resources such as library files, functional execution units, configuration files (packages, jar files, bundles, assemblies, etc)
- **Execution Unit** (EU): software entity which can be started or stopped. Once started, this functional entity initiates processes to perform tasks or provide services, until that it is stopped. Execution units are deployed by deployment units (services, scripts, software components, MIDlets, etc)

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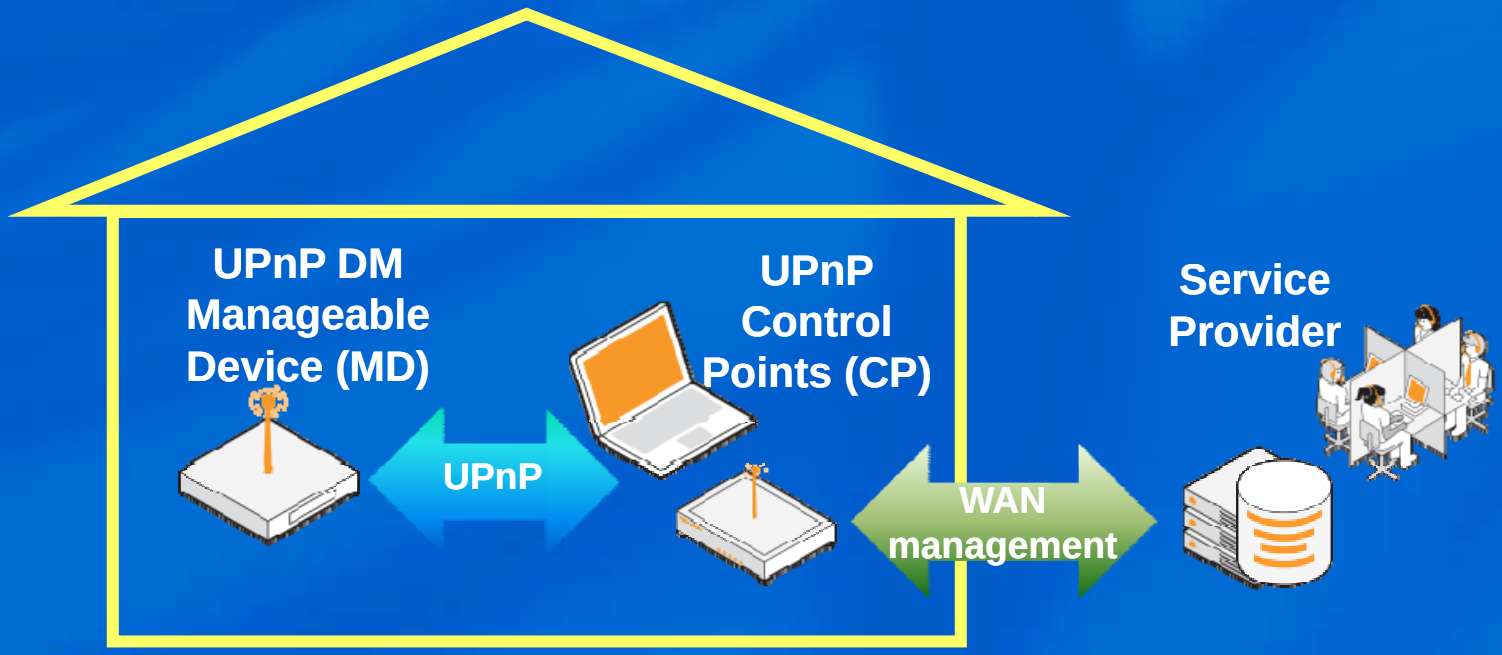
Purpose of UPnP Device Management

- UPnP DM is a Device Control Protocol based on UPnP standard
- Objective is to standardize management operation of LAN IP devices such as troubleshoot, configuration or software updating



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UPnP DM Services

- **Three types of management services are defined in UPnP Device Management:**

  ***Basic Management Service* (BMS)**
  - reboot and baseline reset a device
  - run self-test in order to diagnose problems
  - manage logs (enable, disable, retrieve)

  ***Configuration Management Service* (CMS)**
  - discover data model and current instances
  - data model manipulation (read, write, create, delete)
  - set alarm on value change
  - get or retrieve values
  - get and set parameter's attributes
  - event on parameter value change
  - create or delete multi-instance objects instances (like BBF table rows)

  ***Software Management Service* (SMS)**
  - manage embedded software or firmware
  - install, uninstall and update software modules (Deployment Units)
  - start and stop software entities (Execution Units)
  - software data model describing DUs and EUs

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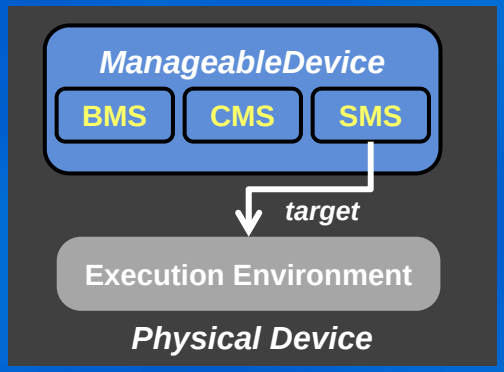
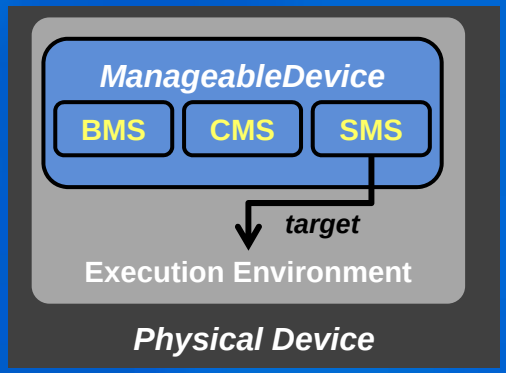
ManageableDevice Deployment

- A ***ManageableDevice*** (***MD***) corresponds to a physical or a virtual device with an associated data model and with potentially software entities to be managed
- An Execution Environment could be an Operating System, a Java VM, a virtual machine, etc.
- ***BMS*** and ***CMS*** are associated to a Device and ***SMS*** is associated to an Execution Environment

MD outside the Execution Environment



MD inside the Execution Environment



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Deployment of UPnP DM Services

- ***ManageableDevice:2*** device is a container for device management service with at least:
  - ***BasicManagement:2*** service**.**
  - ***ConfigurationManagement:2*** service that contains the Common Objects which is a data model defining a minimal set of parameter to engage device management operations.
  - ***SoftwareManagement:2*** service is **optional**.
  - ***DeviceProtection:1*** service (security and Access Control Lists) is **optional**. Security has been added to prevent any Control Point to run any actions on any UPnP DM device.
- **However each service may be used independently**
  - Any UPnP device can embed one or several UPnP DM services.
    - ex: an Internet Gateway would only need to embed BMS in order to run bandwidth tests.
  - If it embeds the Common Objects, or a data model, it must embed the ***ConfigurationManagement:2*** service.

UPnP™ FORUM

Usage Examples

- Each action is available locally to the user or remotely to the service provider via a proxy (i.e. : TR-069 to UPnP DM proxy)
- Examples of Device **maintenance** / **Troubleshooting** / **Diagnostics**
  - *reboot or reset a device*
  - *Initiate a self-test diagnostic in order to troubleshoot*
  - *runs a bandwidth test to figure out why the video streaming is not smooth*
- Examples of **Provisioning/Configuration**
  - *modify wireless security*
  - *change the password of a service*
  - *monitor alarms and parameters*
- Examples of **Software** management
  - *update a firmware*
  - *install a new codec*
  - *start a service*

UPnP™ FORUM

Working Committee Status

- **UPnP DM v1**
  - UPnP Device Management version 1 published in July 2010 on www.upnp.org
  - Orange Labs made an UPnP DM:1 reference implementation using pupnp opensource stack and published it in open source (Apache licence) on SourceForge.

- **UPnP DM v2**
  - UPnP Device Management version 2 published in February 2012 on www.upnp.org.
  - Orange Labs made a UPnP DM:2 reference implementation (including security) and should publish it in open source on SourceForge
  - Security has been added to Device Management v2 since, in UPnP DM v1, any Control Point could potentially run any actions on any UPnP DM device.
    - Security implementation is based on UPnP Device Protection.
  - UPnP DM:V2 also includes non security related features
    - Bandwidth tests,
    - Alarm management on parameter value change.

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Questions?

UPnP™ FORUM

UPnP Telephony

Chair, Mahfuz Rahman (Samsung)

Vice-Chair, Yu Zhu (Huawei)

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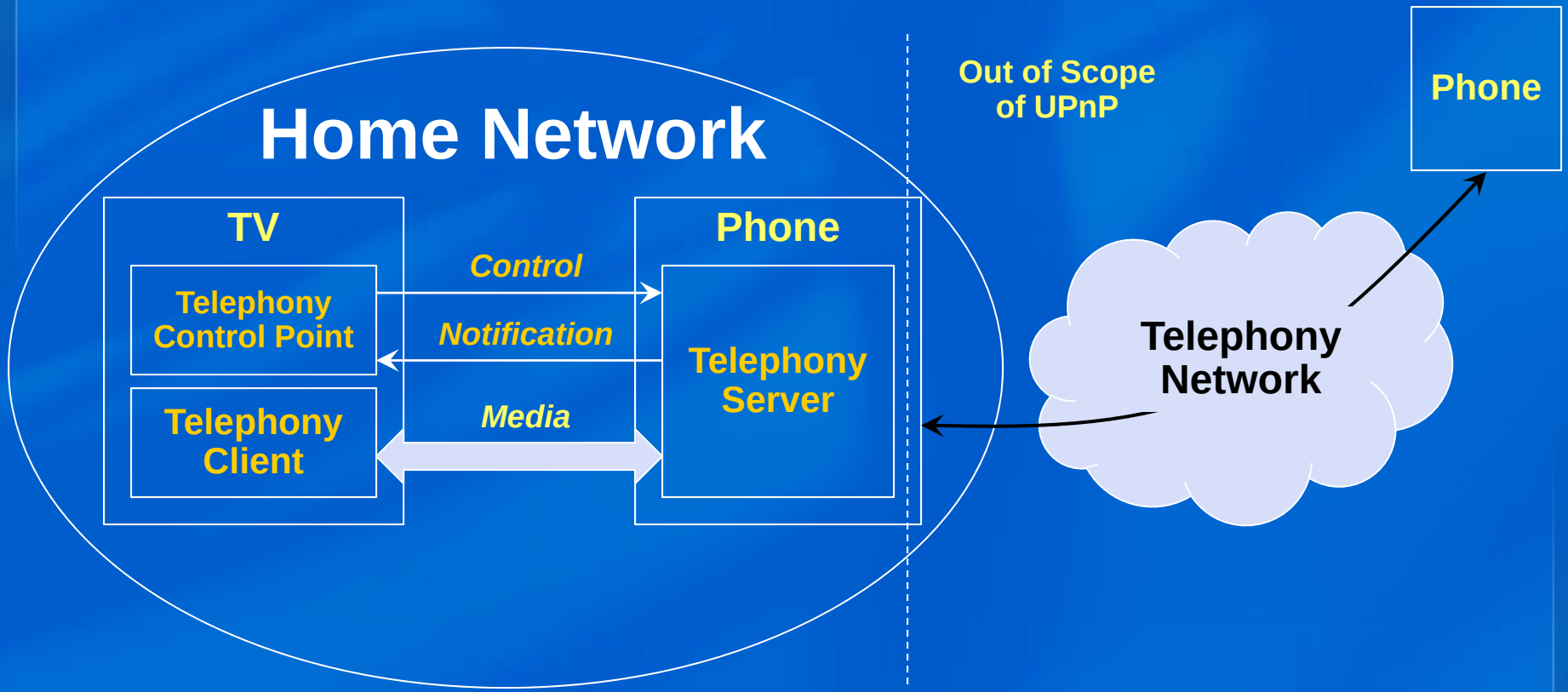
UPnP Telephony

- UPnP Telephony
  - Provides a means for interactions between telephony devices and non-telephony devices (i.e., TV, Tablet etc.) using the UPnP feature of the phone device
  - Allows control of telephony features (i.e., calls, messaging, presence etc.) and rendering of telephony media from a non-phone devices

Telephony Architecture



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Telephony Components

- **Telephony framework contains:**
  - **2 Device type:**
    - TelephonyServer (TS), a logical device which provides telephony features (call management, messaging etc), e.g. cellphone or VoIP gateway.
    - TelephonyClient (TC), a logical device which provides basic input/output functionalities for the voice and video media etc, e.g. TV.
  - **1 CP type:**
    - Telephony Control Point (TelCP), software feature that controls TS and TC functionalities, and help setting up media session between TS and TC.

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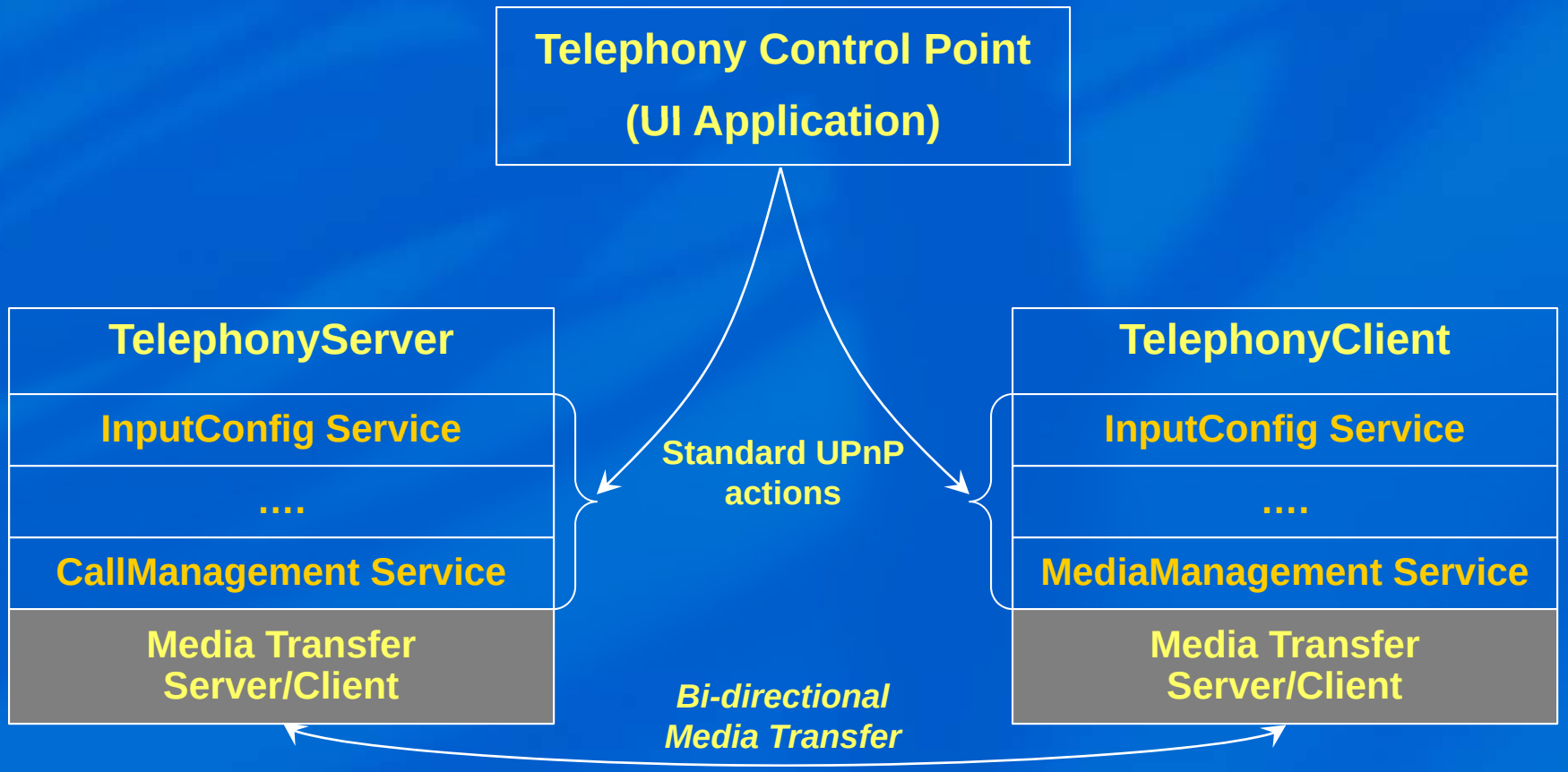
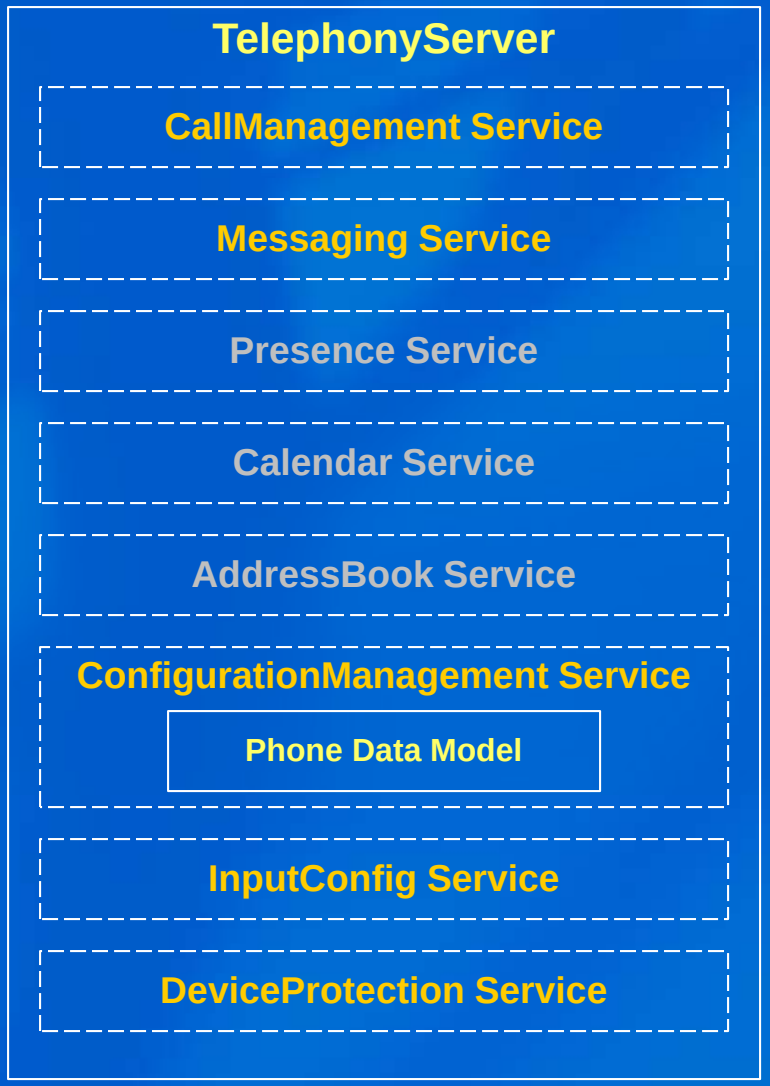
Basic Interaction Model



Telephony Server Architecture

- All services are optional, but device implementation must choose at lease either CallManagement Service or Messaging Service to be a TS.
- ConfigurationManagement and DeviceProtection are borrowed from UPnP DM and Gateway working committees.
- *Gray colored are v2 service under development.*



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Telephony Client Architecture

- Only MediaManagement Service is mandatory in TC, others are optional.
- DeviceProtection is borrowed from UPnP Gateway working committee.

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Call Management Service (CaMS)

- CaMS enables the capability to initiate/accept/manage a telephony call.

- CaMS supports following features
  - Initiating a call : Initiating call with media relaying in the home network
  - Starting a new call : Initiating the call and relaying media of the call to the UPnP device in the home
  - Modify an ongoing call
  - Call logs
  - Call back
  - Voice mail
  - Push information : Notification from the service provider or TS to the UPnP devices in the home
  - Parallel call : secondary call for multimedia call
  - Call Monopolization : Exclusive control of the call (different feature of normal UPnP concept)

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Call Management Service : Basic user scenario

- Initially TelCP, start the media session set up for negotiating the media capabilities between TC and TS devices. (1, 2 sequence in the figure)
- TelCP decides the media capabilities for the call and initiate the call (sequence 3)
- TS initiate the call to the WAN user and then once call is setup, event back the status of the call
- TelCP starts the media transfer between the TC and TS

Call Logs Feature

- **Call Logs information is corresponds to all the terminated, or missed call information**
- **A TelCP can manage the call log information in the TS**

- ***GetCallLogs()*** **:**
  - **A TelCP can retrieve the call logs from the TS.**
  - **Output argument**
    - *A_ARG_TYPE_CallLogs* : xml structure represents the call log information

- ***ClearCallLogs()*** **:**
  - **A TelCP can delete all the call log information from the TS by invoking this action**

UPnP™ FORUM

Media Management Service (MMS)

- MMS enables the capability to relay/exchange media of a Telephony call from the TS to UPnP devices (TC) in the home network

- MMS service supports following features
  - Setup a Media Session
  - Modify the ongoing Media Session
  - Terminate Media Session

UPnP™ FORUM

Telephony Other Features

- **Messaging**
  - **Allows a Telephony Control Point to manage the messaging (SMS. MMS, email and IM) services of a TS or TC.**
    - Retrieve, read and send page mode messages (email, SMS, MMS etc).
    - Establish, modify and close session mode messaging (IM, SMS etc) and file transfer.
- **Presence (*in progress of v2*)**
  - **Provides the features for a Telephony Control point to manage the presence information**
    - Retrieve and update the presence status representing the presence information of a user
    - Retrieve the presence information of the remote contacts managed by the Presence service
    - Get notifications of presence updates of remote contacts
- **Calendar and Address Book (*in progress of v2*)**
  - **Stores networked address book**
  - **Calendar events**

UPnP™ FORUM

Questions?

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Agenda

9:00am - 9:45am: Introduction & Status Updates

- UPnP Forum overview and cert/DCP updates – *Alan Messer (Samsung), President & Chairman*
- UCTT 2.0 roll out details – *Wouter van der Beek (Philips), Compliance Committee Chair*
- Discussion

9:45am - 11:15am: Detailed Update on Upcoming DCPs

- UPNP AV 2+ Feature Description – *Keith Miller (Nokia), AV WC Co-Chair*
- UPnP IGD2 and Device Protection – *Fabrice Fontaine (France Telecom), Gateway WC Member*
- UPnP Device Management – *Xavier Roubaud (France Telecom), DM WC Co-Chair*
- UPnP Telephony – *Yu Zhu (Huawei Technologies), Telephony WC Vice-Chair*
- Discussion

11:15am - 11:30am: Break

11:30am - 12:30pm: Future Looking

- UPnP Home Automation, HEMS & SmartGrid – *Clarke Stevens (CableLabs), HEMS WC Chair*
- E-Health & Sensors – *Russell Berkoff (Samsung), EH&S WC Chair*
- UPNP Plus (UPnP+) – *Alan Messer (Samsung) and Clarke Stevens (CableLabs)*
- Discussion

12:30pm - 1:00pm: Wrap-up

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UPnP Home Energy Management and SmartGrid WC

Clarke Stevens (CableLabs)

UPnP FORUM

Why the UPnP Platform for SmartGrid ?

- 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)

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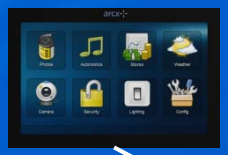
Already in Most Homes

Multi-function HA control devices connect with other home-networked devices via UPnP communications

Internet gateway/routers automatically configured via UPnP APIs

Printers discovered by computer and TV via UPnP (DLNA) features

Windows automatically catalogs and manages content on devices via UPnP services



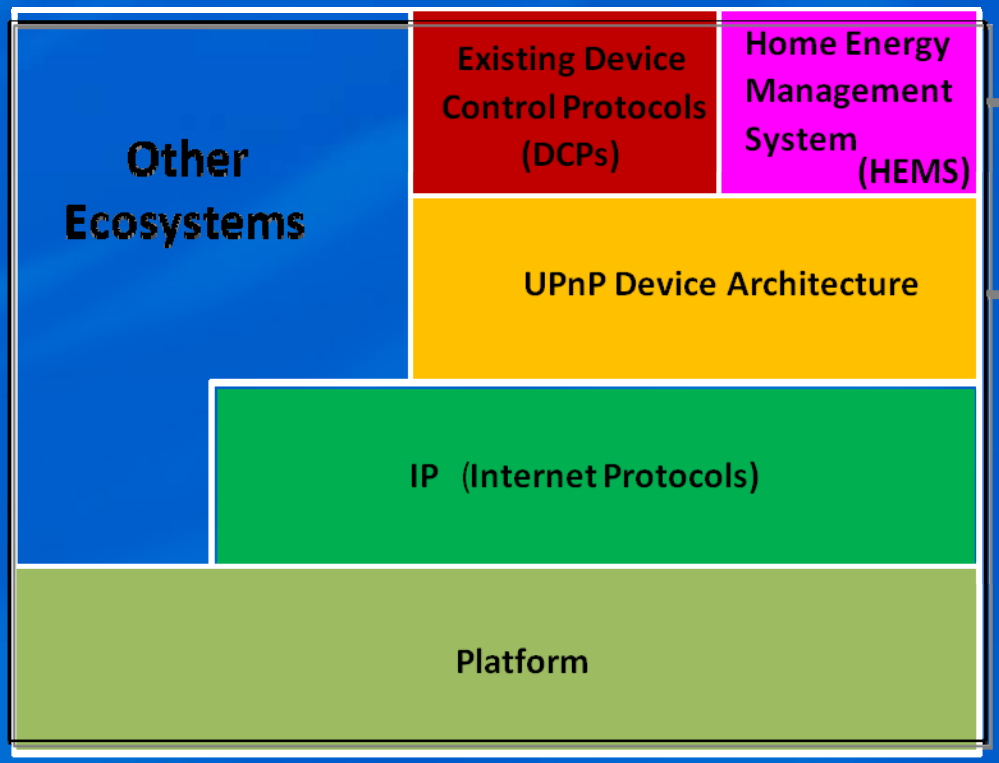
UPnP protocols run over all IP networks including powerline, Ethernet, Wi-Fi, HomePNA, MoCA

Game consoles connect to Internet gaming via gateways and share media with other devices using UPnP (DLNA) interfaces

Video/Image content from Internet, service providers, or other devices inside the home are streamed to TVs and display devices using UPnP (DLNA) technologies

UPnP™ FORUM

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

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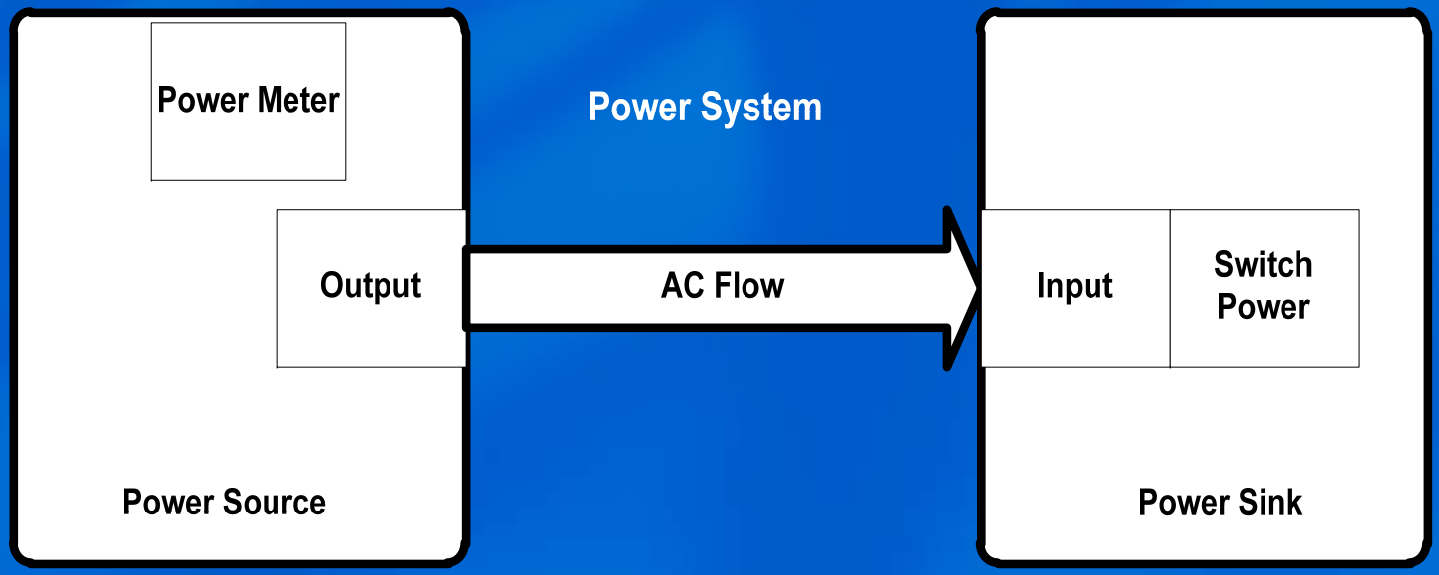
A Simple Power System

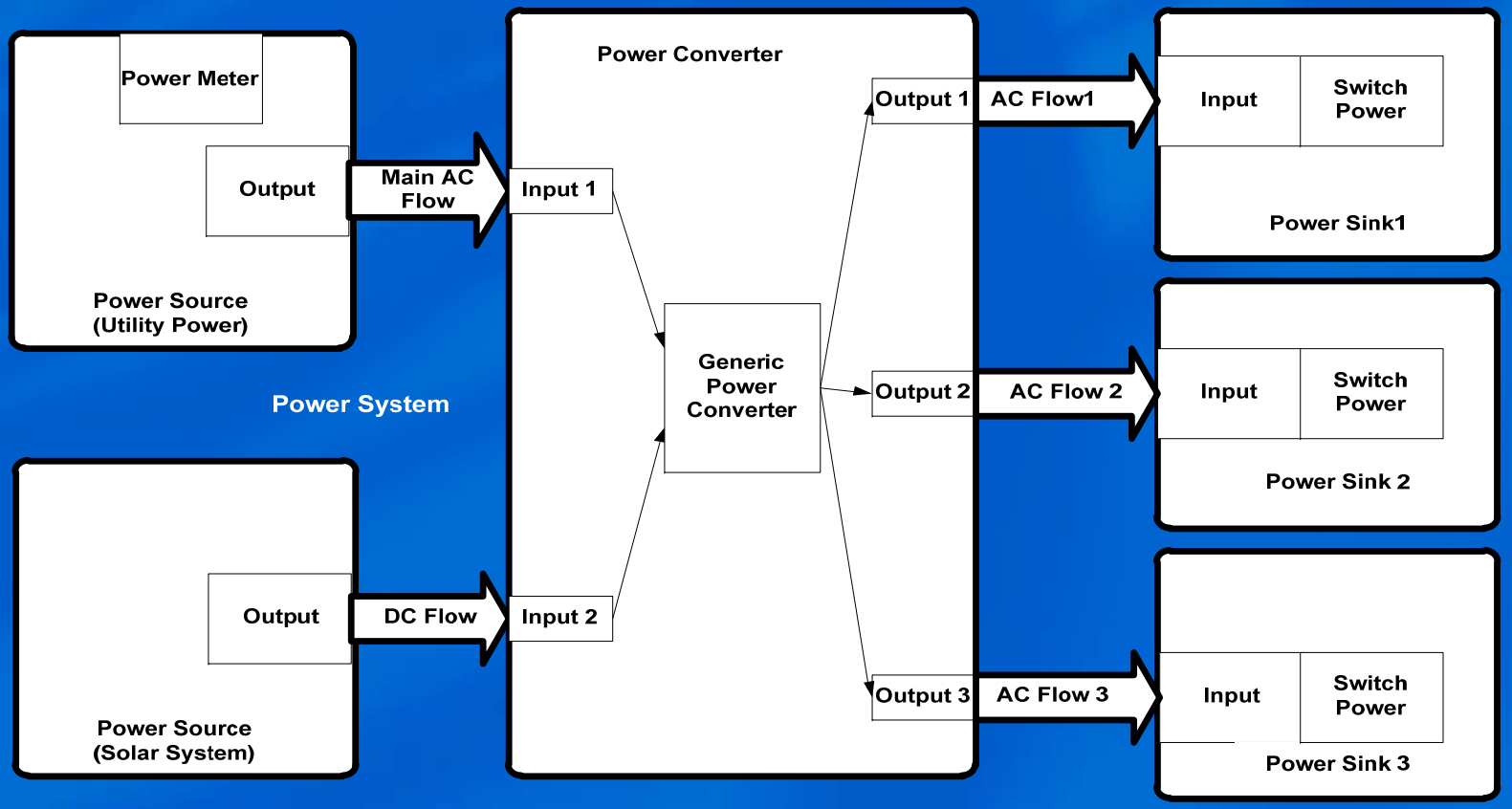
- One **PowerSource** device consisting of one **AC Output PowerSocket** service and one **PowerMeter** service
- One **AC PowerFlow** service
- One **PowerSink** device consisting of one **AC Input PowerSocket** service and one **SwitchPower** service



UPnP™ FORUM

A More Complex Power System

- A dual source power generation and conversion



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UPnP Home Energy Management & SmartGrid

- 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

UPnP™ FORUM

Home Automation

- **Lighting**
  - Light
  - Binary switch
  - Dimming switch
- **Security Camera**
  - MotionImageService
  - StillImageService
  - SettingsService
- **Solar Blinds**
  - SolarProtectionBlind device
    - TwoWayMotionMotor
- **HVAC**
  - HVAC System
  - Thermostat
    - TemperatureSensor
    - TemperatureSetPoint
    - SetPointSchedule
  - Fan controls
  - Other services
- **Security Camera**
  - MotionImageService
  - StillImageService
  - SettingsService

Power Systems (almost complete)

PowerSystem, PowerFlow, PowerSink, PowerSocket, PowerMeter, PowerStorage, PowerConverter, ChargerService, BatteryService

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UPnP E-Health and Sensors WC

Russell Berkoff (Samsung)

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Overview of E-Health and Sensors WC

- **Objective:**
  - **The E-Health and Sensors (EH&S) Working Committee shall address the management of sensor networks, ecosystem specific data aggregation and messaging between devices. This work is anticipated to include the following areas:**
    - Discovery
    - Command/Data Protocol Encapsulation
    - Eventing/Alarms
    - Session Connection/Reconnection
    - Transport
    - Data aggregation and reduction
    - Device to device messaging
    - Security

- **Working Committee policies**
  - **The EH&S Working Committee shall utilize/leverage pre-existing sensor standard(s) where possible. The EH&S WC shall initially consider the following sensor networks for standardization:**
    - E-Health devices (as defined IEEE-11073)

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Why UPnP

- **Both E-Health and Smart Grid share common requirements of sensor networks.**
  - **Discovery**
  - **Command/Data Protocol Encapsulation**
  - **Eventing/Alarms**
  - **Session Connection/Reconnection**
  - **Data Transport**
- **A UPnP framework inherently supports all the above behaviors and can be used to manage the underlying sensor network as well as to enable ecosystem specific abstraction layers.**

UPnP™ FORUM

Home Assistant (in Home Gateway Device)

Control/Output via Remote UI

Control via HomeAssistant App Service

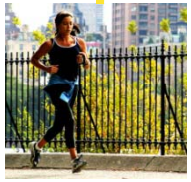
Home Assistant in Home Gateway

Output via UPnP AV Control via Local Remote

UPnP Sensor Bridge

BT/Zigbee/USB

BT/NFC



UPnP Control/Transfer

Non-UPnP Control/Transfer

Personal Health Home Network Model

Home Assistant Device

DataDirectory Service

Device Management Services

E-Health Application(s) and Services

Sensor Proxy Device

DataDirectory Service

HealthDeviceAccess Service

IEEE-11073 State Machine

- Device Listing
- Data Streaming
- Data Forwarding

SensorAccessZigBee Service

- Discovery
- Command Clusters
  - Basic
  - Identity
  - Generic Tunnel
  - 11073 Protocol Tunnel
  - Partitions
  - *Power*
  - *Alarms*
  - *Time*
  - *ASKE/ASAC*
  - *Commissioning*

UPnP AV / Client Application / Web Browser

UPnP FORUM

Scope of Work

- **E-Health**
  - **UPnP based health measurement device: health measurement data are made available to the UPnP network**
  - **UPnP based assisted living sensing device: assisted living support data made available to the UPnP network**
  - **UPnP based health/assisted living information aggregation device: aggregate health measurement data from multiple devices**
  - **UPnP based coordination between multiple e-health devices.**
- **Generic Sensor Framework**
  - **Sensor Network Framework providing:**
    - Discovery
    - Commanding
    - Events/Alarms
    - Session Connection/Reconnection
    - Data Transport

UPnP™ FORUM

UPnP+ Architecture and Technology Discussion

UPnP Technical Committee

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UPnP+

- An internal UPnP project name for a set of features and technologies that comprise the next phase of UPnP
  - We have an opportunity to deprecate (or alternative minimum level)
  - Analysis of changes to current UPnP technologies that help us get to our goals (change, remove, fix, API abstractions?, etc.)
  - Opportunity to get people to participate (members and NEW members)
  - New feature DCPs and new auxiliary DCPs

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Potential Services

- Full integration of IPv6 with seamless backwards compatibility to IPv4
- New architectural features such as grouping, device pairing, etc.
- Discovery of cloud services, content and other devices
- Web APIs for access to UPnP devices and services
- Mandatory support of low-power to support mobile devices
- Bridging to non-UPnP networks (e.g. ZigBee, Z-Wave, Bluetooth, ANT+) for applications like health & fitness, energy management, home automation, etc.

UPnP™ FORUM

Full Integration of IPv6

- Many groups are leading the charge to IPv6
  - CEA, Comcast, Google, etc.
- UPnP must be ready for transition to IPv6
  - Today IPv6 is optional, IPv4 mandatory
- Future UPnP+ solution must support IPv6 as mandatory
  - Must still be backwards compatible with IPv4
- Active UPnP TC work item
  - Should be completed soon

UPnP™ FORUM

New Architectural Features Such as Grouping

- Group devices for common or related actions
  - Lights can be grouped to respond to the same switch
- Different devices can be associated to create an overall objective
  - A “scene” can be created. For example lights can be dimmed, blinds lowered, the television turned on and the surround sound system powered up to create the “watch a movie” scene.
- A security grouping could engage all perimeter sensors on the alarm system

UPnP™ FORUM

Discovery of Cloud Services

- Access Content or Services in the cloud
  - Discovery of UPNP compatible cloud services
  - Access to cloud based content types
  - Cloud based event sources
- Discover other devices accessible through the Internet
  - Wider support then existing Remote Access
  - Directory services and search
  - Discovery Scalability
  - Firewall traversal
  - Personalization and search scope
  - Control what content is exposed
- Grouping of devices, content and services

UPnP™ FORUM

Web APIs for Access to UPnP

- Web browsers must enable access to UPnP devices and services
- Access to devices and services on local networks must have protections against snooping and other threats from web-based services
- Discovery, eventing, cross-origin restrictions
- Implementing UPnP DCPs in JavaScript

UPnP™ FORUM

Bridging to non-UPnP Networks

- UPnP's work in Home Automation has long enabled bridging to non-UPnP and non-IP networks of devices and services
- UPnP should expand this flexibility to enable rich bridging to many ecosystems
  - Application layer bridging
  - Security support
  - Persistent Device pairing
- Define the semantics of the bridging
  - Previously UPnP focused only on the IP side syntax

UPnP™ FORUM

Mandatory Support for Low-Power

- UPnP must provide improved support for low-power and mobile devices. Some possibilities are:
  - Leverage and expand with existing UPnP low-power DCP
  - Require low-power proxy on gateways and other classes of powered devices
  - Support low-power efforts (e.g. 6LowPAN, etc.)

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Other Opportunities within UPnP+ Ecosystem

- Analyze UPnP specs for potential technologies which better support current ecosysystem needs
  - REST
  - Zeroconf discovery
- Analyze UPnP specs for potential deprecations
- Task force to look at other potential opportunities

UPnP™ FORUM

Task Force Objectives

- Work out details of things that need to be changed with respect to the key identified items above
- Consider new opportunities
- Provide a cohesive architectural package and updated version message/solution
- Provide an analysis and recommendations to the TC
  - Revisions to UDA
  - Revisions to DCPs
  - Additional DCPs
  - New marketing messaging, etc.

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Questions?

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Wrap-up / Discussion

Thank you for your time!

Please remember to turn in your survey!

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For the interconnected lifestyle

Back-up

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Technical Details of UPNP V1.x

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UPnP Architecture Diagram

- **Extensible, open architecture**

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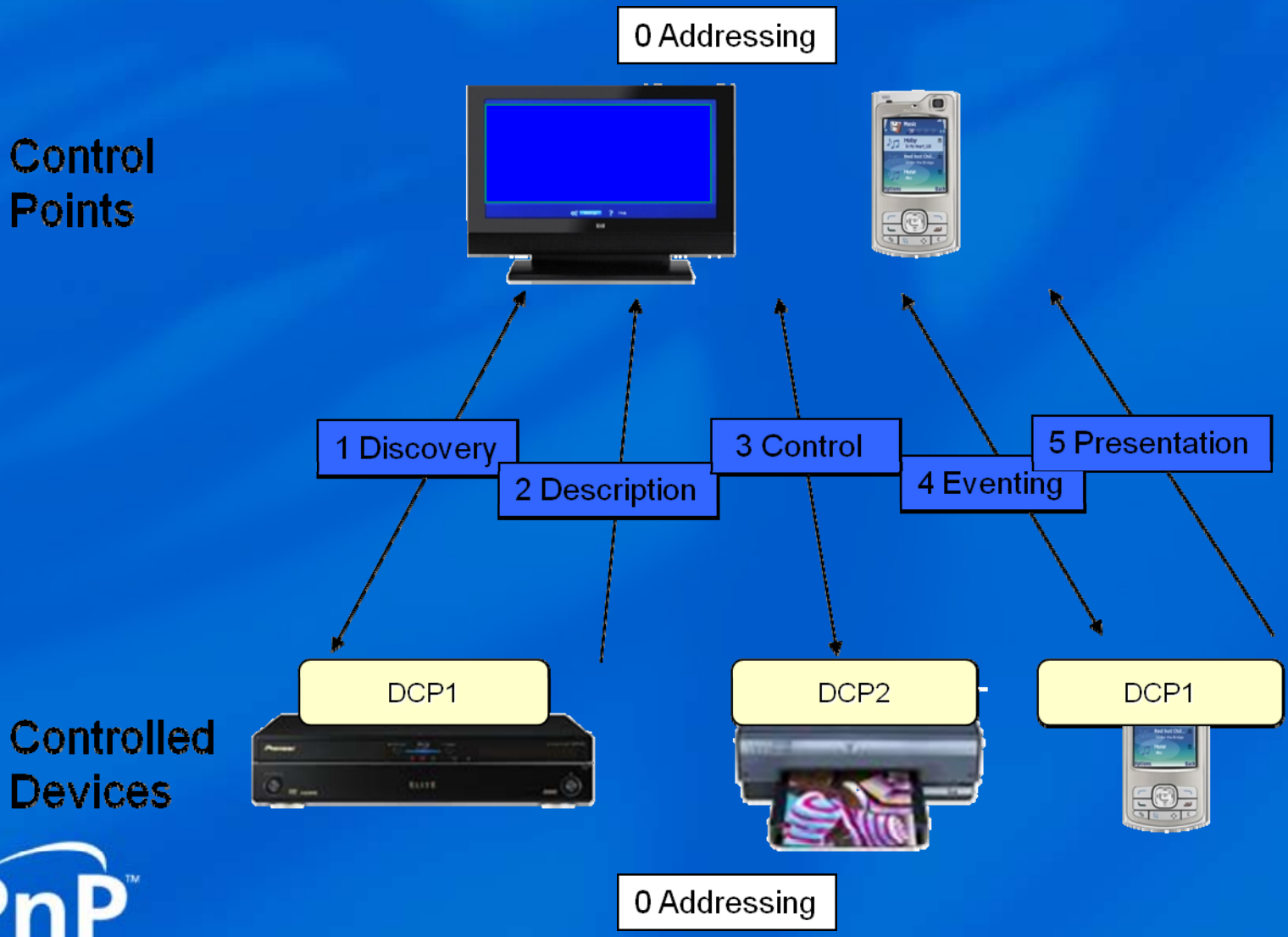
UPnP Technology Interactions



UPnP FORUM

10+ Years of Progress

		Specification Publication
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 AV devices Formation of New Working Committees: E-Health & Sensors, Home Energy Mgmt. & Smart Grid New documents published by ISO/IEC	2011	AV:4, DeviceProtection:1, Telephony:1 and RemoteAccess:2 DCPs published; UDA 1.1 IPv6 Annex published
Control Point Certification Program Launch	2012	DeviceManagement:1 DCPs published

Technical Details of IGD V2

UPnP™ FORUM

UPnP IGD v2 Update

- **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

UPnP™ FORUM

UPnP Device Protection

- **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**

UPnP™ FORUM

UPnP Device Management

- 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 (published)
  - Adds security support for sensitive parameters, alarm and bandwidth monitoring
  - Published in Q1 2012

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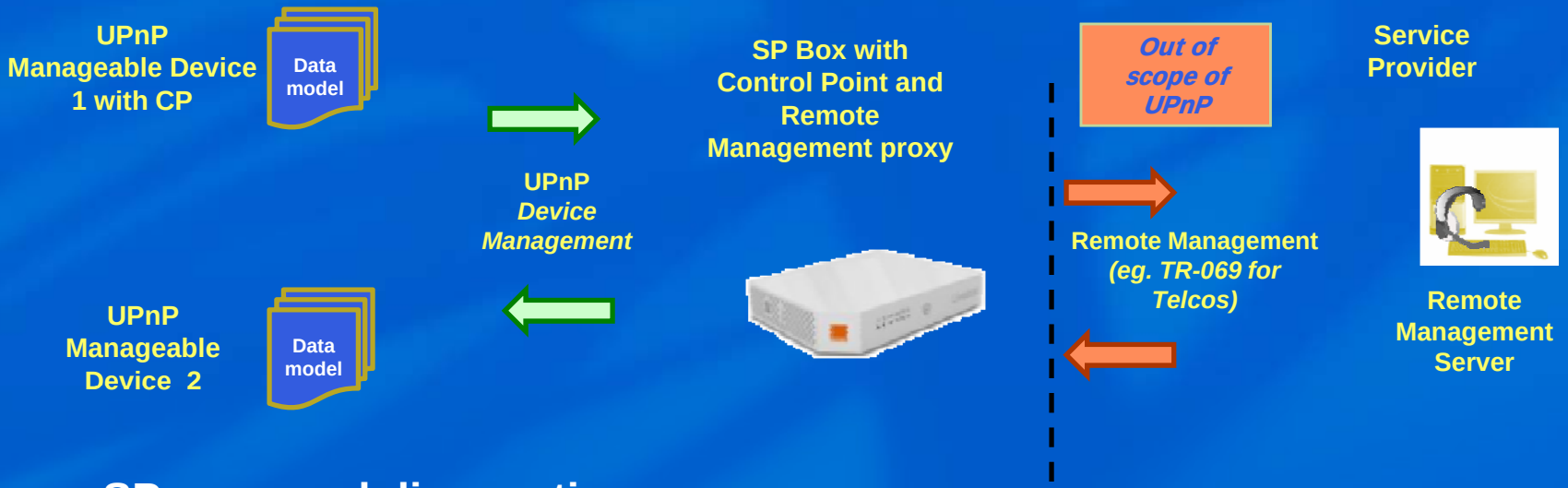
UPnP Device Management



- **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

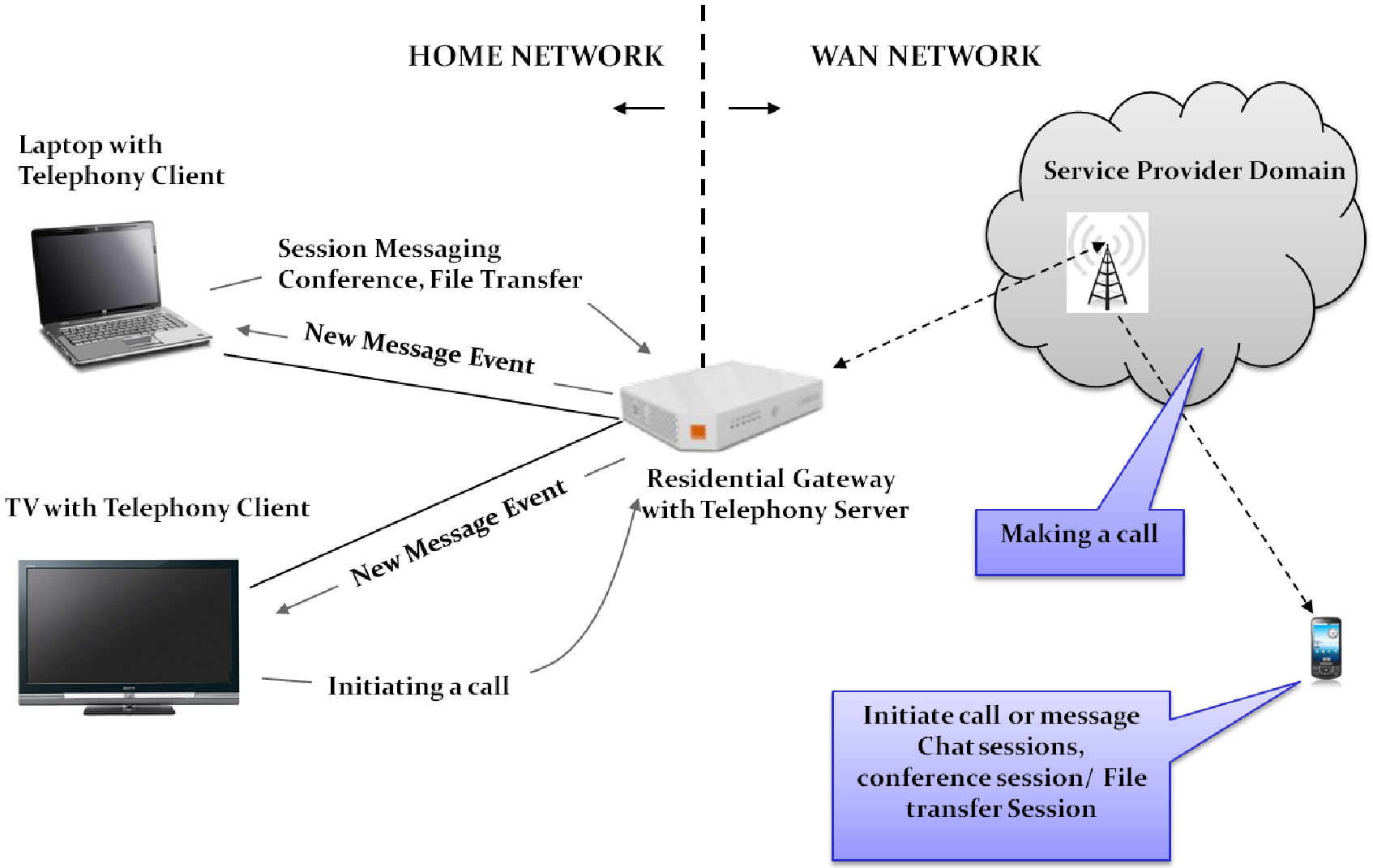
UPnP™ FORUM

UPnP Telephony

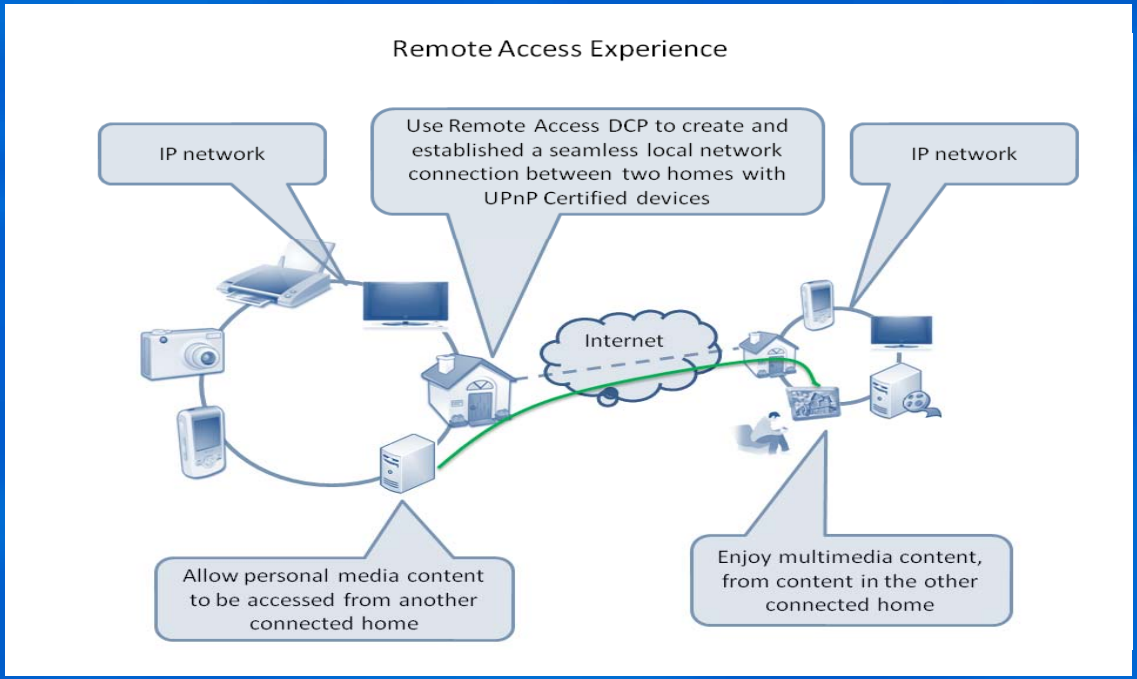
- **Enables managing of Telephony Services through non-phone devices (e.g., TV, PC)**
  - **Defines a set of UPnP interfaces for interaction between phone devices and non-phone devices**
    - e.g., CE devices, PC etc.
- **Provides a plethora of features including:**
  - **Initiating a telephony call 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™ FORUM

UPnP Telephony Architecture



UPnP Remote Access



- **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

UPnP™ FORUM

UPnP Low Power

- 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 automonous 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

UPnP™ FORUM

WANIPCONNECTION:2

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Key Use Cases

- Use case #1 Add portmapping
  - User has an application that needs to be contacted from the internet
  - Usually, no user interaction is needed: Application uses IGD control point to make required portmappings (or a UI can be used)
  - It is possible to get any free portmapping or request a specific one
- Use case #2 – delete portmappings
  - Applications may remove portmappings automatically or user may use UI to delete specific mappings
  - It is possible to remove single items or ranges
- Use case #3 – find out existing portmappings
  - Control point UI allows user to retrieve list of portmappings for diagnostic or other purposes

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List of Key changes Features - actions

- DeletePortMappingRange() allows removing a range of portmappings
- GetListOfPortmappings() allows retrieving a list of existing portmappings.
- AddAnyPortMapping() allows requesting specific external port and if the port is not free the gateway assign a free port. Policy how to determine the assigned port is left to vendors

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List of Key changes Features New – state variables

- SystemUpdateID is used to track changes in NAT portmappings
- A_ARG_TYPE_MANAGE is a parameter used in new actions
- A_ARG_TYPE_PortListing is a data structure used to return a list of portmappings

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List of Key changes Features – policy changes

- PortmappingLeaseTime can have values between 1 to 604800 seconds
- If control point uses value 0 to indicate infinite lease time mapping, it is required that gateway uses maximum value instead
- In IGD there is access control feature introduced.
- If a Control point has not been authenticated and authorized as defined in the DeviceProtection service, control points may request portmappings only for their own IP address
- If a Control point has not been authenticated and authorized, the External port value must be >1023
- It is not possible to require that ExternalPort must be equal to InternalPort

UPnP™ FORUM

DeviceProtection:1

Vic Lortz (Intel)

Mika Saaranen (Nokia)

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Background

- Ease of use is generally at odds with secure use
  - People find that passwords and other authentication methods are a challenge to manage on home networks
  - Easily defining authorizations is also a big challenge
  - There needs to be user involvement in both
- UPnP DeviceProtection work was initiated to create a security solution that
  - Is easy to use and can be attached to other mechanisms namely Wifi Protected setup
  - Has industry support
  - Provides adequate level of security
  - Supports legacy services

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Basic Security Requirements

- Simple to understand and use
- Mutual authentication
- Access control
- Privacy
- Align with widely-supported security mechanisms
- Decentralized trust model
- Both Device Identities and User Identities

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Device Protection Properties

- **Trust based on physical proximity and access**
  - Such as reading a PIN
  - Pushing a button,
  - NFC touch, etc.
- **Bootstraps strong cryptographic secrets**
  - X.509 Server and Client certificates (2048 RSA)
  - Password-based User login uses PKCS#5, protected by HTTPS
- **Role-based per-device access control lists**

Note: data plane protection is out of scope

Trust Boostrapping by Introduction

- Pair-wise introduction
  - PIN-based, run once
  - Establishes trust in self-signed certs of both Device and CP
  - Successful introduction establishes default Role for CP
- "Gossip" introduction
  - With AddIdentityList(), authorized CPs propagate other CP Identities to devices on network
  - "Gossip" model only propagates Identity information, not authorization

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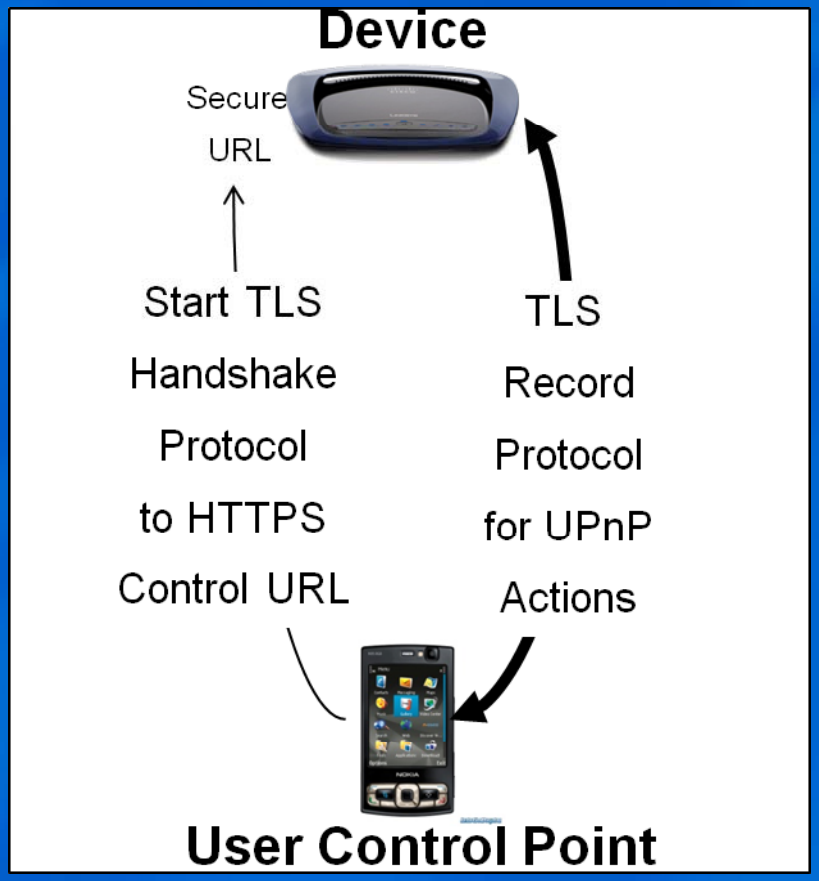
Securing the Control Plane



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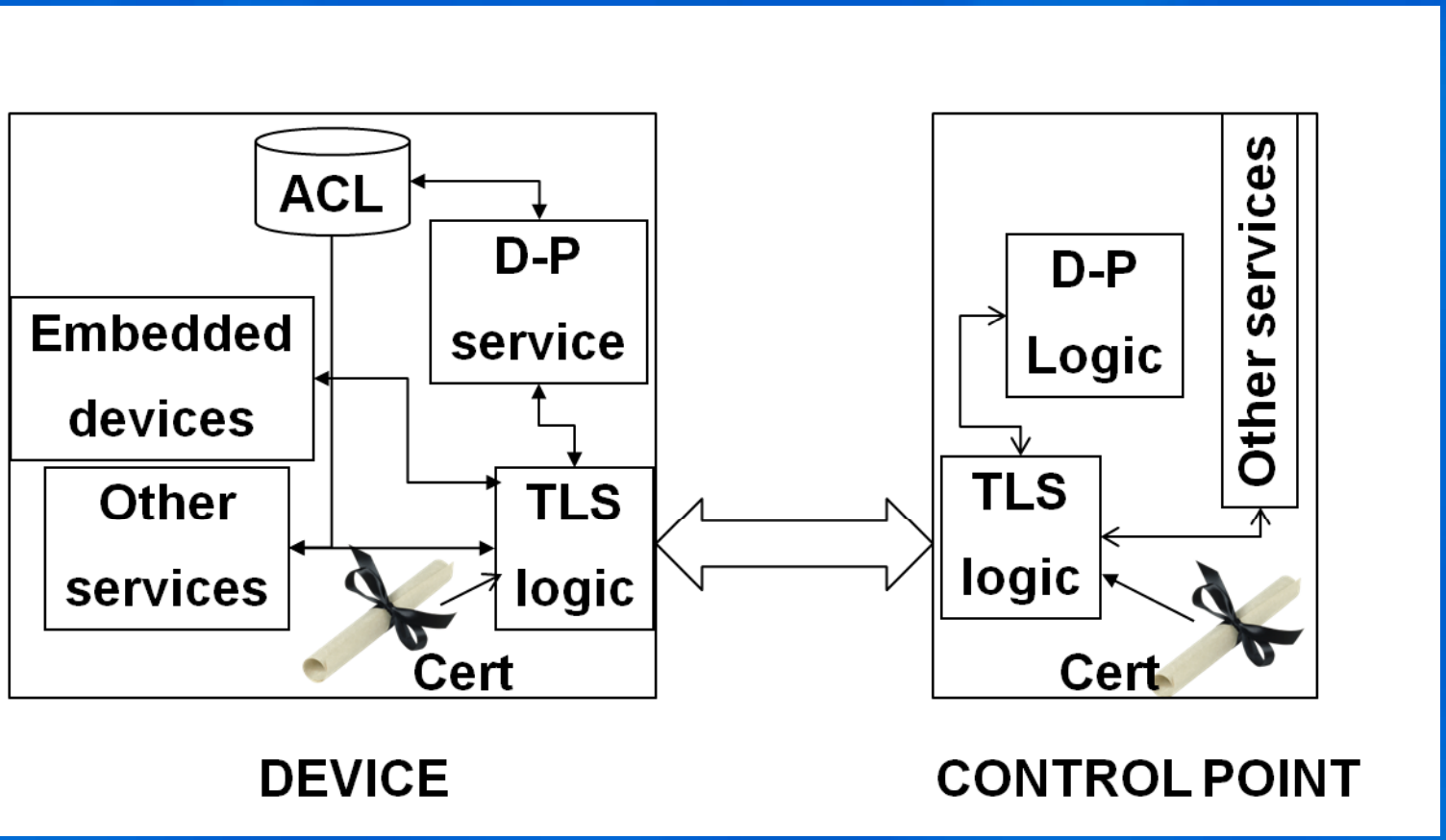
D-P Functional Block Diagram



IGD User Experience Scenario

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IGD Scenario

Control Point

IGD

- CP on laptop and IGD are already connected to an IP network (may be wired or wireless)
- User introduces CP to IGD (IGD and CP exchange certs)
- IGD automatically assigns new CP a default role of “Basic”
- Basic is recommended, but Device MAY have different policy
- Gaining Admin rights to a device or asserting a User identity requires login with username/ password

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Example Setup UI Flow

CP's GUI

GatewayXYZ

Setup…

Please enter GatewayXYZ's SETUP PIN number.

12345678

Okay | Cancel

Success!

Okay

Or…

Failure. please do this: …

Okay

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Administrator Login (rarely needed)

IGD

Settings
...

TLS connection

Configuration UI

Advanced Settings...

Done

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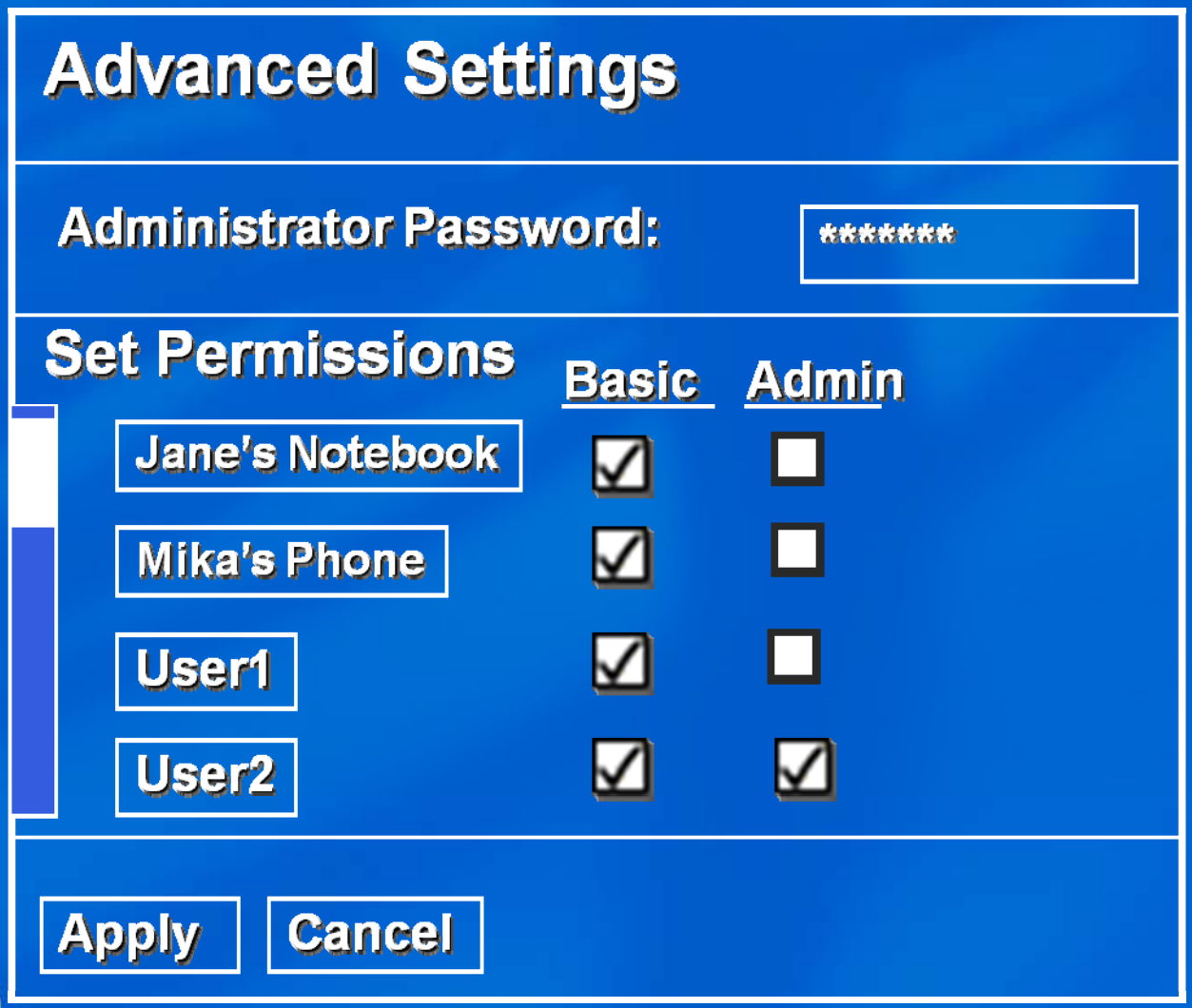
Concept UI of Administrative CP



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SOAP Actions & Roles for the D-P Service

- *SendSetupMessage() [Public]*
- *GetSupportedProtocols() [Public]*
- *GetAssignedRoles() [Public]*
- *GetRolesForAction() [Basic or Admin]*
- *GetUserLoginChallenge() [Basic or Admin]*
- *UserLogin() [Basic or Admin]*
- *UserLogout() [Basic or Admin]*
- *GetACLData() [Basic or Admin]*
- *AddIdentityList() [Basic or Admin]*
- *RemoveIdentity() [Admin-only]*
- *SetUserLoginPassword() [Basic or Admin]*
- *AddRolesForIdentity() [Admin-only]*
- *RemoveRolesForIdentity() [Admin-only]*

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Summary

- CPs and Devices authenticate each other using certificates, users of shared CPs can also authenticate with Username/password over TLS
  - Device uses ACL to identify trusted CPs
  - CP *may* maintain list of trusted Devices
- Unauthenticated CP (or attacker) has only Public role unless its cert is added to ACL through introduction process
- Remaining threats
  - TLS renegotiation attack (fixed in initial release by prohibiting renegotiation)
  - Malware (virus) on trusted CP
  - Weak introduction methods (label-based PIN, push-button)
  - Denial-of-service on initial UPnP Discovery layer
  - Eventing layer
  - Flaws in access control policies (of vendor or UPnP committee)
  - Others? Please help us find them.

UPnP™ FORUM

WANIPv6FirewallControl:1

Mika Saaranen, Nokia

Fabrice Fontaine, Orange

Mark Baugher, Cisco

UPnP™ FORUM

Introduction

- It is expected that massive roll-outs of IPv6 will start in next couple of years
- In IPv6, we likely won't have NATs, but it seems that business considerations require IPv6 firewalls
- There is a need to open transport addresses (pinholes) for unsolicited packets from the exterior for a duration as requested by the control point
- WANIPv6Firewall control is a service that allows hosts to:
  - Create pinholes into firewall
  - Delete pinholes
  - Check if a pinhole works (optional)

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Key use cases

- Use case #1 Add pinhole
  - User has an application that needs to be contacted from the internet
  - Usually, no user interaction is needed, but application uses IGD control point to make required pinhole, but UI can be used to verify validity of request
- Use case #2 – Delete pinholes
  - Applications may remove its pinholes automatically or user may use UI to delete pinholes
- Use case #3 – find out if specified pinhole works
  - Optional feature

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State variables

- FirewallEnabled : is firewall enabled
- InboundPinholeAllowed : Can pinholes be created
- OutboundPinholeTimeout : How long a pinhole created by sending traffic out remains
- And argument types for actions

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Actions

- GetFirewallStatus() : returns information if the firewall is active and new pinholes can be created
- GetOutboundPinholeTimeout() : returns timeout value for automatic pinholes
- AddPinhole(): Creates a pinhole with specified arguments e.g. remote host, local host, expiration
- UpdatePinhole(): Allows extending life of a pinhole

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Summary

- Following specifications have been published:
  - IGD v2: v2: http://upnp.org/specs/gw/igd2
  - Device Protection: http://upnp.org/specs/gw/UPnP-gw-DeviceProtection-v1-Service.pdf
  - IPv6 Annex update: http://upnp.org/specs/arch/UPnP-arch-DeviceArchitecture-v1.1-AnnexA.pdf
- Three open sources implementations are available:
  - http://gitorious.org/igd2-for-linux/deviceprotection
  - http://opentools.homeip.net/dev-tools-for-upnp
  - http://miniupnp.tuxfamily.org
- An IPv6 Task Force has been created in February 2012 to make new updates on the IPv6 annex, HGI is welcome to join this work.

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Technical Details of Device Management

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BasicManagement Service

- **Actions**
  - ***Reboot(), BaselineReset(), GetDeviceStatus()***
  - ***SetSequenceMode(), GetSequenceMode()***: when a CP is running or planning to run several actions
  - ***InterfaceReset(), GetInterfaceResetResult()***
  - ***GetLogURIs(), SetLogInfo(), GetLogInfo()***: to manage log files
  - ***GetACLData()***: to retrieve security information
  - **Test actions**
    - ***Ping(), GetPingResult()***
    - ***NSLookup(), GetNSLookupResult()***
    - ***Traceroute(), GetTracerouteResult()***
    - ***GetBandwidthTestInfo(), BandwidthTest(), GetBandwidthTestResult(),***
    - ***SelfTest(), GetSelfTestResult()***
    - ***GetTestIDs(), GetActiveTestIDs(), GetTestInfo(), CancelTest()***

- **State Variables (lists)**
  - ***DeviceStatus*:** parent device status, date/time of last change and additionnal information
  - ***SequenceMode*:** indicates whether a Control Point is executing a sequence of actions
  - ***TestIDs* and *ActiveTestIDs*:** list tests executed and test that are not yet completed.
  - **...**

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ConfigurationManagement Service

- **Actions**
  - ***GetSupportedDataModels(), GetSupportedParameters()*** : to retrieve device datamodel and parameters
  - ***GetInstances(), CreateInstance(), DeleteInstance()***: to manage multiple instances of nodes
  - ***GetValues, GetSelectedValues(), SetValues()***
  - ***GetAttributes(), SetAttributes(), GetAttributeValuesUpdate()***
  - ***GetInconsistentStatus()***
  - ***GetCurrentConfigurationVersion()***
  - ***GetConfigurationUpdate(), GetSupportedDataModelsUpdate(), GetSupportedParametersUpdate()***
  - ***GetAlarmsEnabled(), SetAlarmsEnabled()***: to manage alarm on parameters
  - ***GetACLData()***: to retrieve security information

- **State Variables (lists)**
  - ***CurrentConfigurationVersion***: retrieve changes between updates
  - ***SupportedDataModelUpdate, SupportedParameterUpdate, AttributeValueUpdate*****:** data model update indicators.
  - **…**

- **Framework to integrate Data model definitions**

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SoftwareManagement Service

- **Actions**
  - ***GetDUInfo()***: information on existing deployment units
  - ***GetEUInfo()***: information on existing execution units (firmware is identified by EUID=0)
  - ***GetDUIDs(), Install(), Update(), Uninstall()***: to manage deployment units
  - ***GetEUIDs(), GetActiveEUIDs(), GetRunningEUIDs(), Start(), Stop()***: to control execution units
  - ***GetOperationInfo()***
  - ***GetOperationIDs***
  - ***GetErrorEUIDs()***
  - ***GetACLData()***: to retrieve security information

- **State Variables (lists)**
  - ***OperationIDs*:** on going software management operations
  - ***DUIDs*:** IDs of all unresolved or installed DUs. A DU may contain multiple EUs.
  - ***EUIDs*:** IDs of all installed EUs. Each EU belongs to one only DU
  - ***ActiveEUIDs*:** IDs of all started EUs.
  - ***RunningEUIDs*:** IDs of all EUs observed as running.
  - ***ErrorEUIDs*:** IDs of all EUs in error.
  - **…**

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Technical Details of Telephony

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CaMS : Action Summary

Actions	Features
RegisterTelCPName(),	Registering the TelCP to TS. Used for the call monopolization
UnregisterTelCPName(),	Un-register the TelCP to TS, Used for the call monopolization feature
ChangeTelCPName()	Change the registered TelCP name. Used for the Call Monopolization feature
ChangeMonopolizer()	Change the owner of the call, Use for the call monopolization feature
GetTelCPNameList()	Getting the registered TelCP names
GetMediaCapabilities()	Used for getting the media capabilities of the device (TS, and TC). Used for general media negotiation purpose
StartCall()	Initiate the call with WAN user
StopCall()	Terminating the ongoing call
AcceptCall()	Accepting the incoming call
RejectCall()	Rejecting the incoming call
ModifyCall()	Modify the ongoing call
AcceptModifyCall()	Accept the modification request initiated by WAN user
StartMediaTransfer()	Start the media transfer
InitiateCall()	Initiate the call, This is just to initiate a out going, not means to control the call from home
GetCallInfo()	Getting ongoing call information
GetCallLogs()	Getting call log information.
ClearCallLogs()	Clear the call logs
RegisterCallBack()	Register for the call back feature
ClearCallBack()	Clear the call back feature
GetCallBackInfo()	Call back information

CaMS : Action Summary

Actions	Features
ChangeCallMode()	Changing the mode of a call
GetPushInfo()	Getting push information
IgnoreCall()	Allowing a TelCP to ignore an incoming call
GetVoiceMail()	Gettting voice mails
DeleteVoiceMail()	Deleting voice mails
EnhancedInitiateCall()	Initiate the multimedia call, This is just to initiate a out going, not means to control the call from home
WaitingForCall()	Waiting for an incoming call
InitiateParallelCall()	Initiate the parallel call
AcceptParallelCall()	Accepting the incoming parallel call

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MMS service actions and State variables

Actions	Features
GetMediaCapabilities()	Getting the supported media capabilities by the TC
StartMediaSession()	Stopping ongoing Media transfer within a Media Session
StopMediaSession()	Searching for the messages from the TS
ModifyMediaSession()	Modifying the ongoing media session, modifying the media capabilities
GetMediaSessionInfo()	Retrieving the media session information

State Variable	Features
MediaSessionInfo	XML. Eventable state variable. Media Session information like Media Session ID, Session Status etc.
A_ARG_TYPE_MediaSessionID	String. Unique identifier for the Media Session.
A_ARG_TYPE_MediaCapabilityInfo	XML. Media Capabilities
A_ARG_TYPE_MediaSessionInfoList	XML. List of Media Session information

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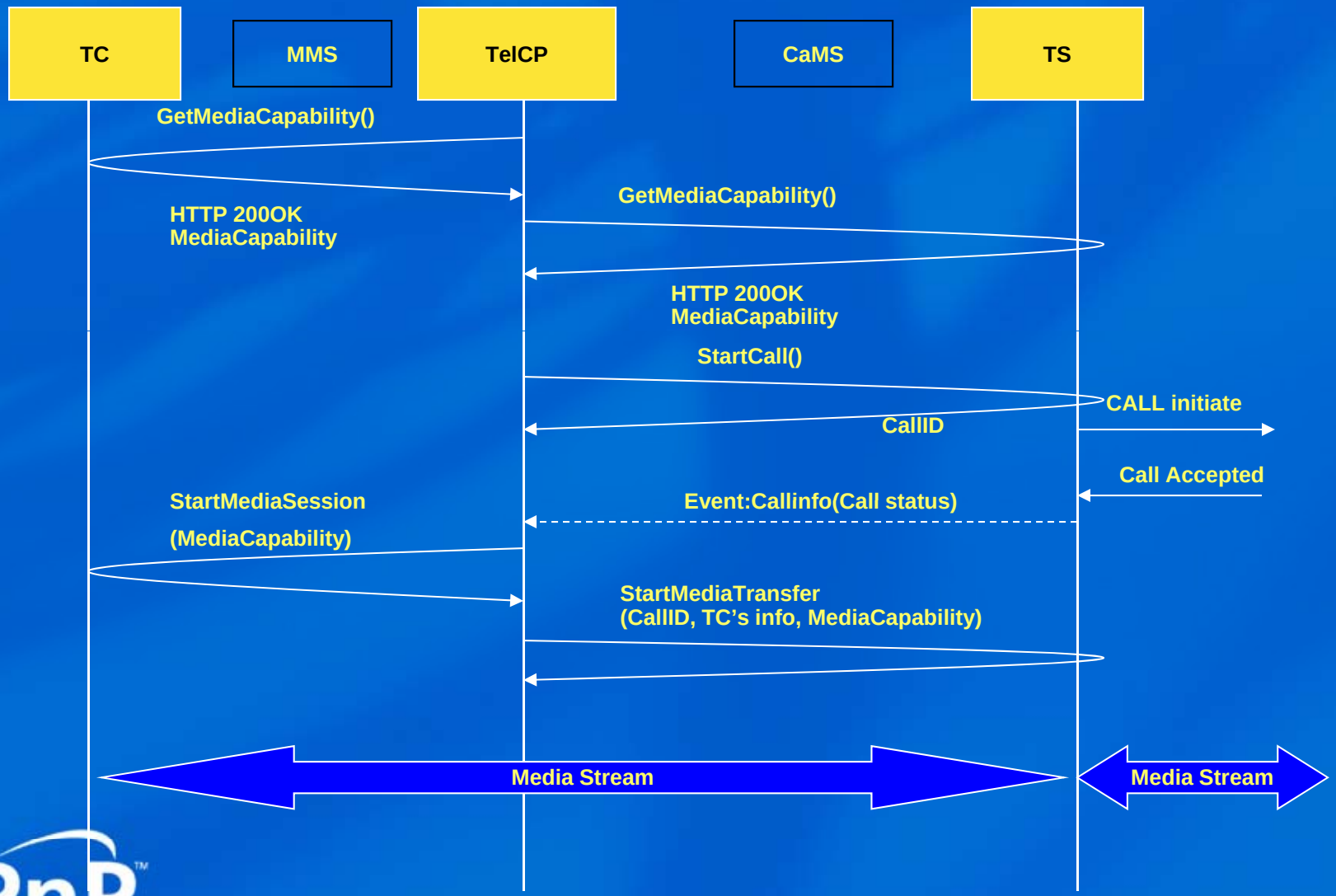
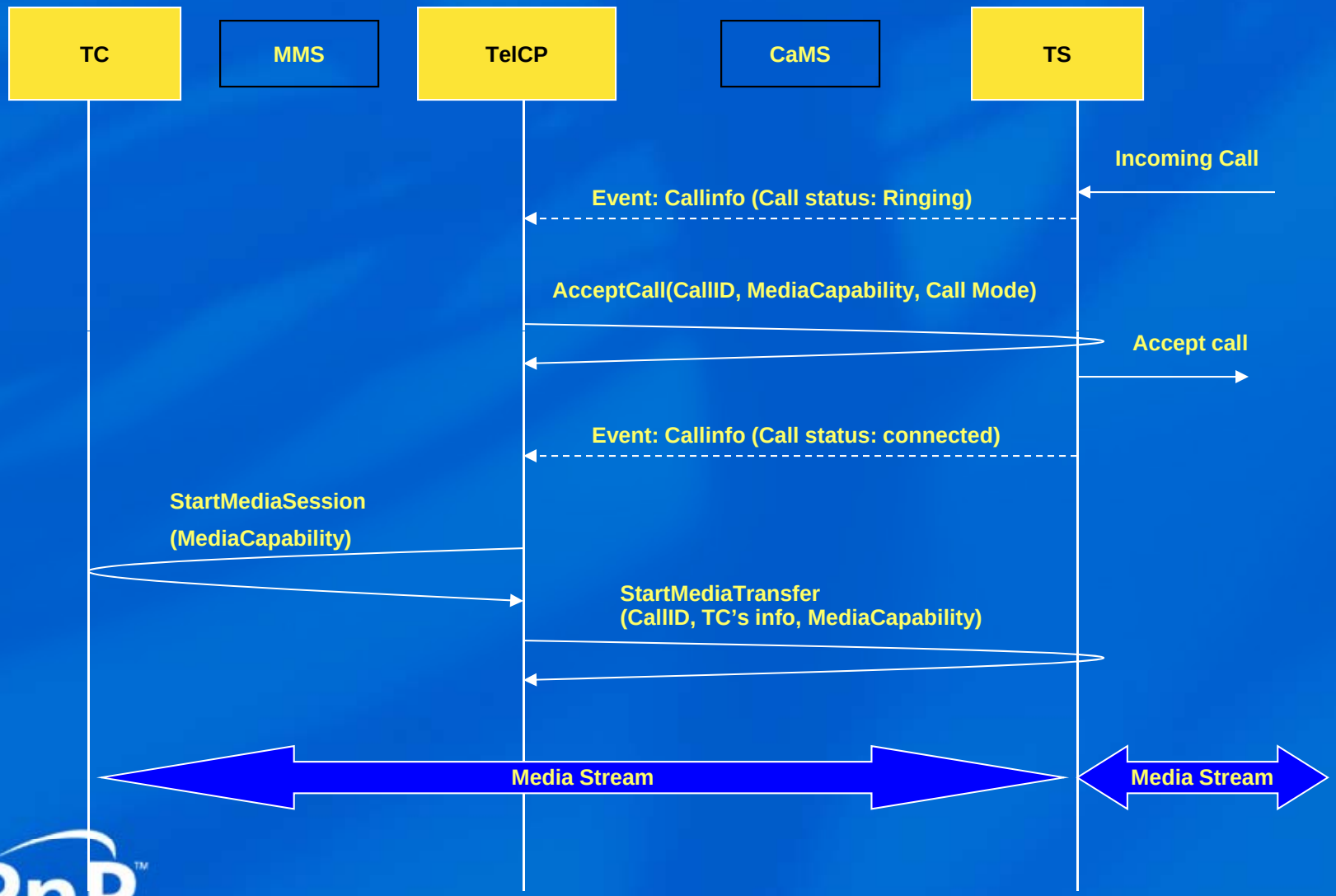
Basic Sequence diagram for Starting a call



Basic Sequence diagram for Accepting a Call



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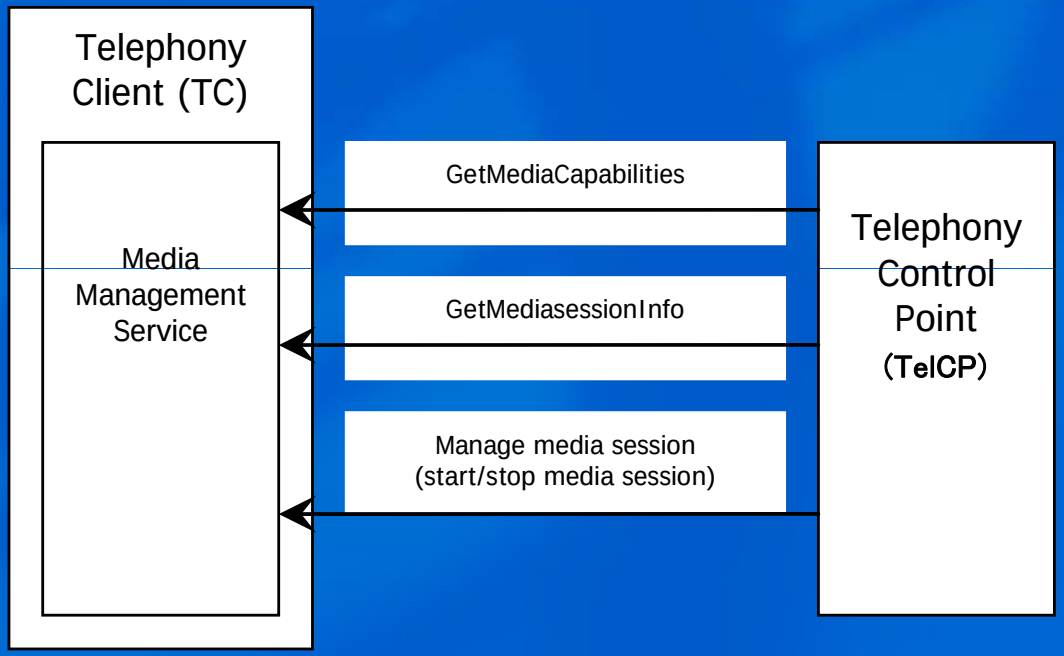
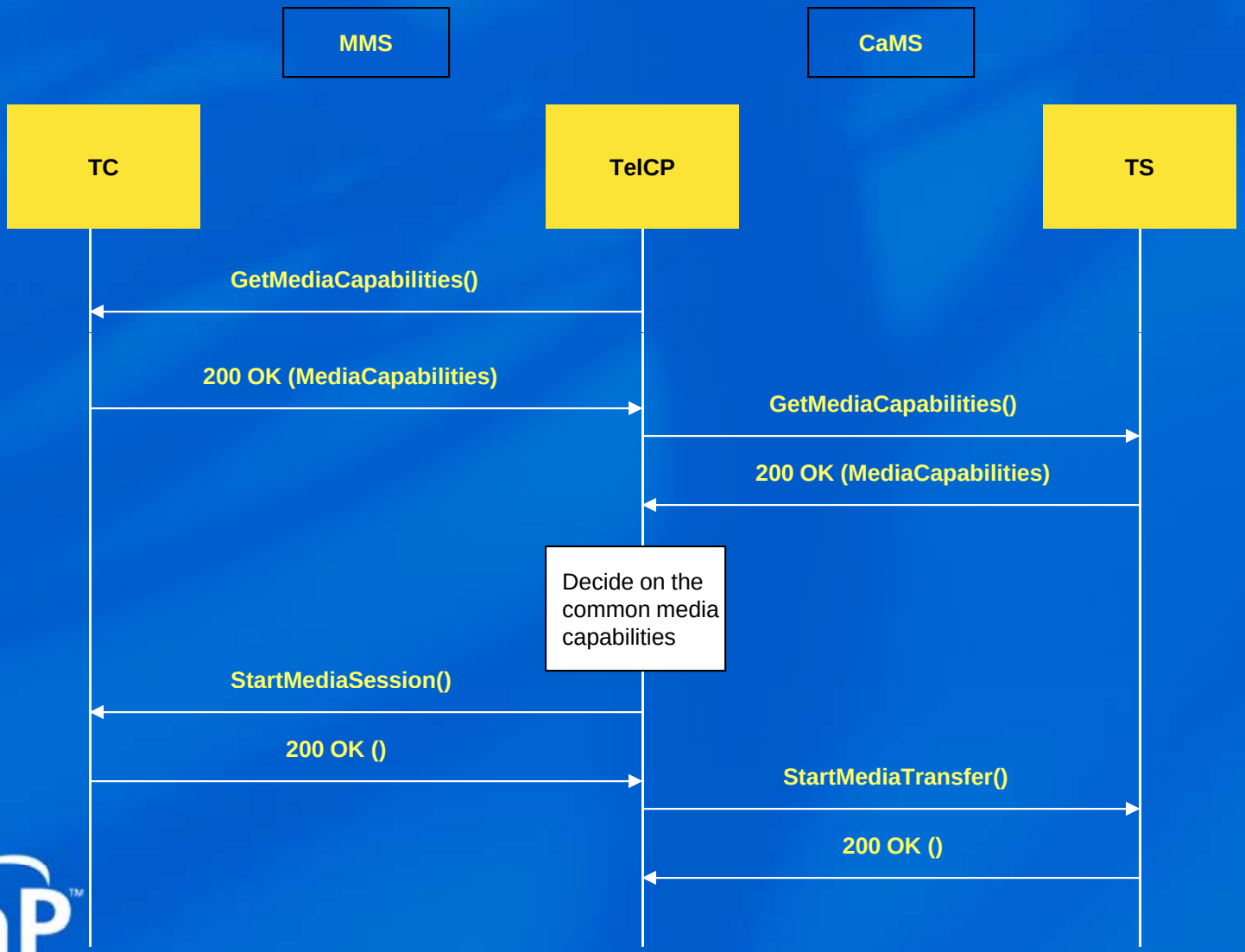
Media Management Service (MMS) : Architecture



Media Session setup : Flow diagram



Technical Details of AV:4/5

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Instant Time-Shift/Playback Support

- Currently a recording device can have a time shift buffer which is not described for UPnP.
- This new feature can record programs, wholly or partially stored in the time shift buffer.
- By leveraging existing CDS/EPG and SRS mechanisms with additional time shift buffer information.

UPnP™ FORUM

Metadata Filter Enhancement

Metadata Filter Enhancement defines:

- New Metadata Filter operator (#) to include all supported dependent properties associated with a property.
- Clarifies usage of "::" notation in Metadata Filter strings.

Metadata Filter Enhancement allows:

- Less complex Metadata Filter arguments.
- Ability for control point to request all dependent properties without fully specifying each property name in the Metadata Filter argument.

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Media IOP improvement

```
<item id="100" parentID="200" restricted="0">
  <dc:title>KBS News</dc:title>
  <upnp:class>object.item.videoItem</upnp:class>
  <res id="100-res-1" protocolInfo="http-get:*:video/vnd.dlna.mpeg-tts:*"
     http://10.0.0.1/content/content?id=100-res
  </res>

  <upnp:resExt id="100-res-1">
    <upnp:isSyncAnchor>1</upnp:isSyncAnchor>
      <upnp:componentInfo>
        <upnp:componentGroup groupID="0" required="1">

          <upnp:component componentID="comp_v1">
            <upnp:componentClass>Video</upnp:componentClass>
            <upnp:contentType MIMEType="video/avc1.4D4040"
                extendedType="*" bitrate="15000000" resolution="1280x720"
                framerate="30p"/>
          </upnp:component>

          <upnp:component componentID="comp_a1">
            <upnp:componentClass>Audio</upnp:componentClass>
            <upnp:language>en-US</upnp:language>
            <upnp:contentType MIMEType="audio/ac3" extendedType="*"
               bitrate="2000000" nrChannels="6"/>
          </upnp:component>
    </upnp:componentInfo>
  </upnp:resExt>
</item>

This highlighted text indicates proposed metadata to be updated via DLNA/UPnP fast-track,
empty component item indicates same resource.
```

UPnP™ FORUM

Text-to-Speech (TTS) examples

- Text appearing, e.g. service information or menus, on the screen will be spoken out loud

Intended Devices that use
The TTS interface

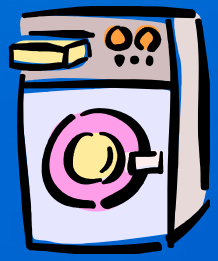
AV commands to render text audible

Device that renders
text into speech

Spoken out text

Alternate Devices that can use
the same TTS interface

AV commands to render text audible



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Server-Side Transforms

- Control Point discovers formats supported by various MediaRenders
- Control Point discovers transforms supported by Server
- Control Point chooses list of items to be transformed and transforms to apply
- Control Point initiates batch transforms on items
- Control Point can query status of transforms
- New resources are exposed as transforms complete