UPnP™ Forum and Specifications Overview

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Steering Committee Chair

UPnP Forum

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  - Structure, Timeline

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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**

- **Free membership to ensure wide involvement, cross industries**

Members by Country/Region

Asia (201)

China (19)	Korea (27)
Hong Kong (6)	Singapore (5)
India (14)	Taiwan (78)
Japan (52)	

Australia (7)

Australia (5)

New Zealand (2)

Latin America (4)

Brazil (2)

Chile (1)

Columbia (1)

Middle East (19)

Israel (18)

Saudi Arabia (1)

Europe (142)

Austria (2)	Norway (1)
Belgium (5)	Poland (2)
Bulgaria (1)	Portugal (1)
Denmark (3)	Russia (1)
France (28)	Spain (6)
Finland (5)	Slovenia (1)
Germany (30)	Sweden (8)
Greece (2)	Switzerland (4)
Iceland (1)	Turkey (2)
Ireland (4)	UK (24)
Italy (7)	
Netherlands (4)	

North America (465)

Canada (28)

USA (437)

Total 838 Member Companies

As of September 5, 2007

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Widespread Member Interest

Working Committee Activity by Reflector Subscription

Committee	Number of Reflector Subscribers
Low Power	76
Remote Access	172
QoS	231
Automation	338
Gateway	399
AV	482

Number of Reflector Subscribers

© **Members of the UPnP Forum 2007**

As of September 5, 2007

UPnP™
FORUM

UPnP Structure

UPnP Implementers Corporation

UPnP Forum

Board of Directors

Steering Committee

Compliance Committee

Marketing Committee

Working Committees

Legal Committee

Technical Committee

AV

Gateway

Home Automation

Printing and Imaging

QoS

Remote UI

Basic Device

Security

Low Power

Content Sync

Remote Access

Storage

Balanced Leadership

Elected Steering Committee

CableLabs

Intel (TC chair)

LG Electronics

Microsoft (SC vice-chair)

Motorola

Nokia

Panasonic

Philips Electronics (TC vice-chair)

Pioneer

Samsung Electronics (SC chair)

Siemens AG (LC chair)

Sony

Thomson

Eight Years of Progress

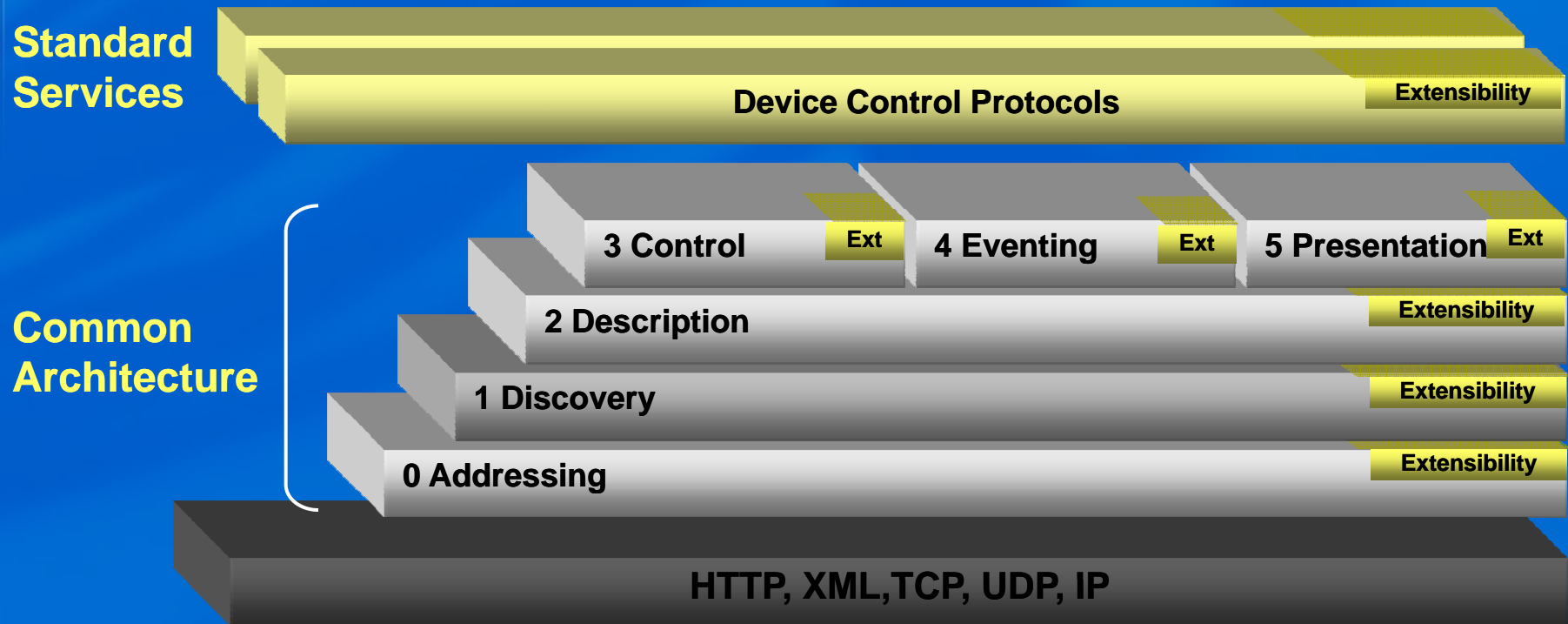|				
10/99	Forum officially formed		11/03	Security and Lighting DCPs published
06/00	UPnP™ DA v1.0 finalized		05/04	DSL Forum TR-064 published
06/00	Windows ships with UPnP™		06/04	DLNA HNv1 published
05/01	GW devices announced		09/04	Remote I/O DCP published
05/01	UPnP™ toolkits announced		03/05	QoS:1 standard published
11/01	UIC launched		04/05	Security Camera DCP published
11/01	Gateway DCP published		05/05	PrintEnhanced:1 published
Q1/02	UPnP™ toolkits ship		12/05	Applied for JTC1 PAS submitter status
Q1/02	1st Certified GW devices ship		03/06	DLNA Expanded guidelines published
06/02	AV:1 standards published		05/06	AV:2 standards published
07/02	Printer/scanner DCPs published		05/06	Approved as JTC1 PAS submitter
11/02	Basic Device DCP published		06/06	Editorial update UPnP™ DA v1.0
Q1/03	1st Certified AV devices		10/06	QoS:2 standard published
04/03	HVAC DCP published		11/06	UPnP DCPs/DA submitted to JTC1 PAS
10/03	Wireless Access Point standard published		08/07	JTC1 PAS submission ballot approved
			09/07	Low Power DCP published

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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**

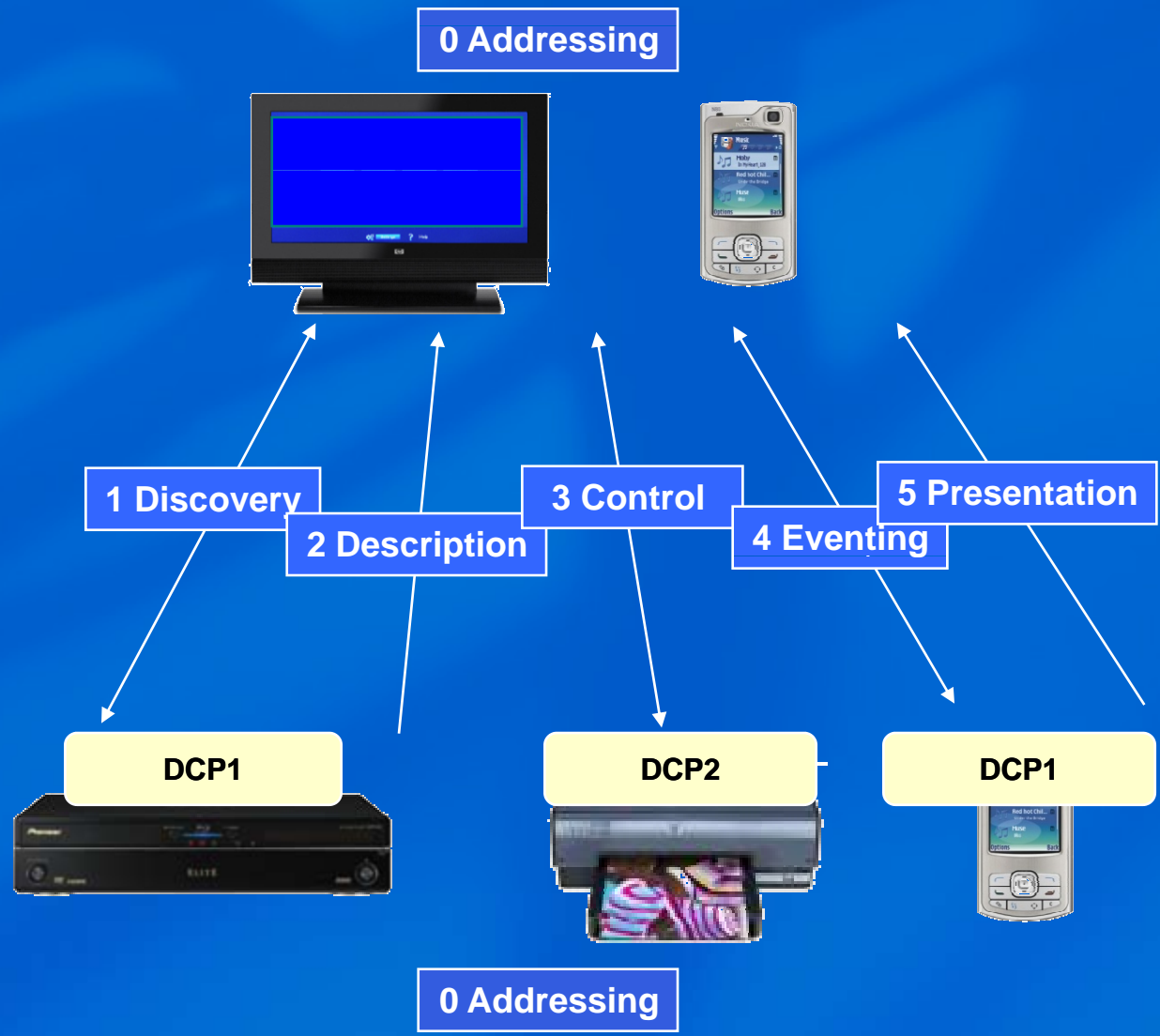# UPnP Architecture Diagram

- **Extensible, open architecture**

Standard Services

Device Control Protocols — Extensibility

Common Architecture

3 Control — Ext | 4 Eventing — Ext | 5 Presentation — Ext

2 Description — Extensibility

1 Discovery — Extensibility

0 Addressing — Extensibility

HTTP, XML,TCP, UDP, IP

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Built-in Support for Extension

- **FlexML processing rules**
  - Skip XML not understood by parser

- **Defined rules for creating extensions to UPnP**
  - **XXX.<org domain>:** for header extensions outside the namespace
  - **X_** and **A_** method extension for non-forum defined variables and methods
  - Use XML namespaces for additional elements

- **Used in several organizations to build value on UPnP**
  - DLNA
  - CEA
  - And more

UPnP Technology Interactions

0 Addressing

Control Points

1 Discovery

2 Description

3 Control

4 Eventing

5 Presentation

DCP1

DCP2

DCP1

Controlled Devices

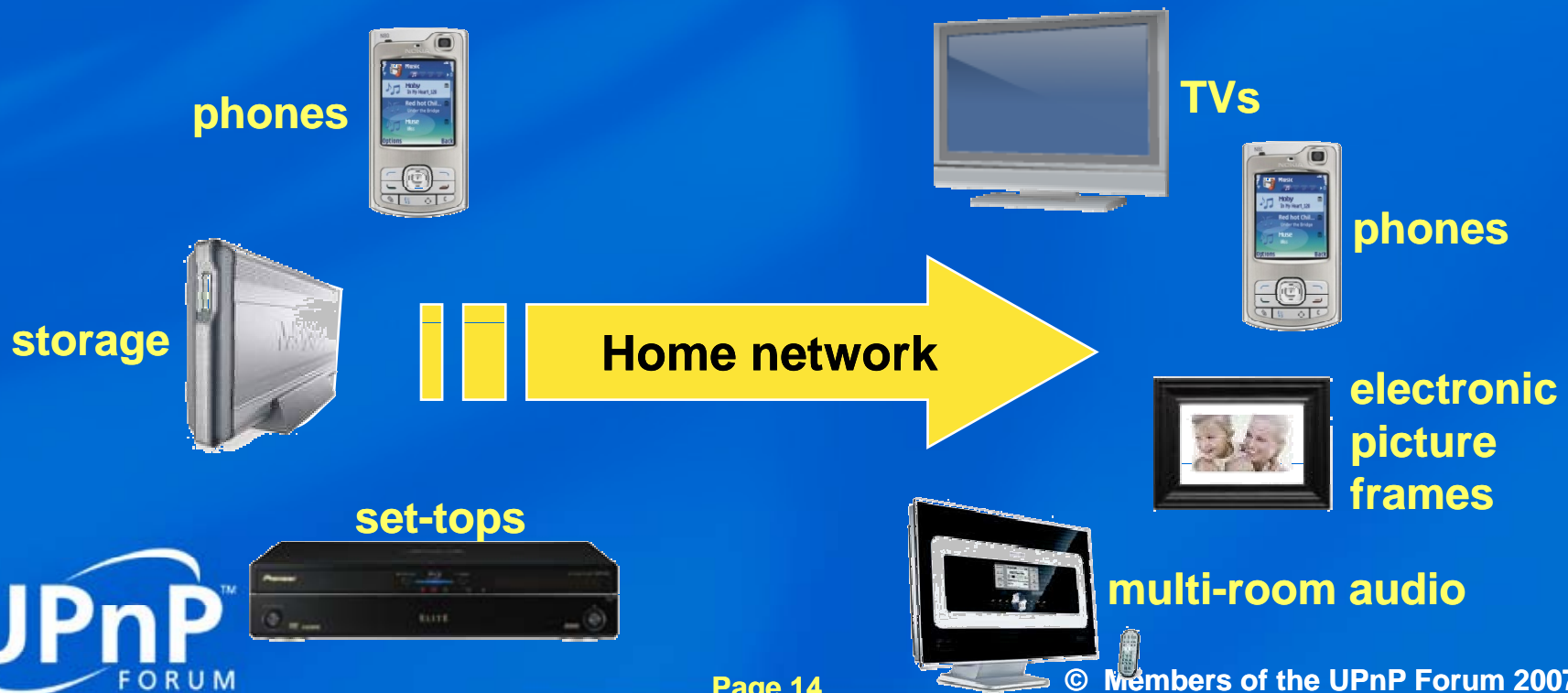**0 Addressing**

UPnP™ FORUM

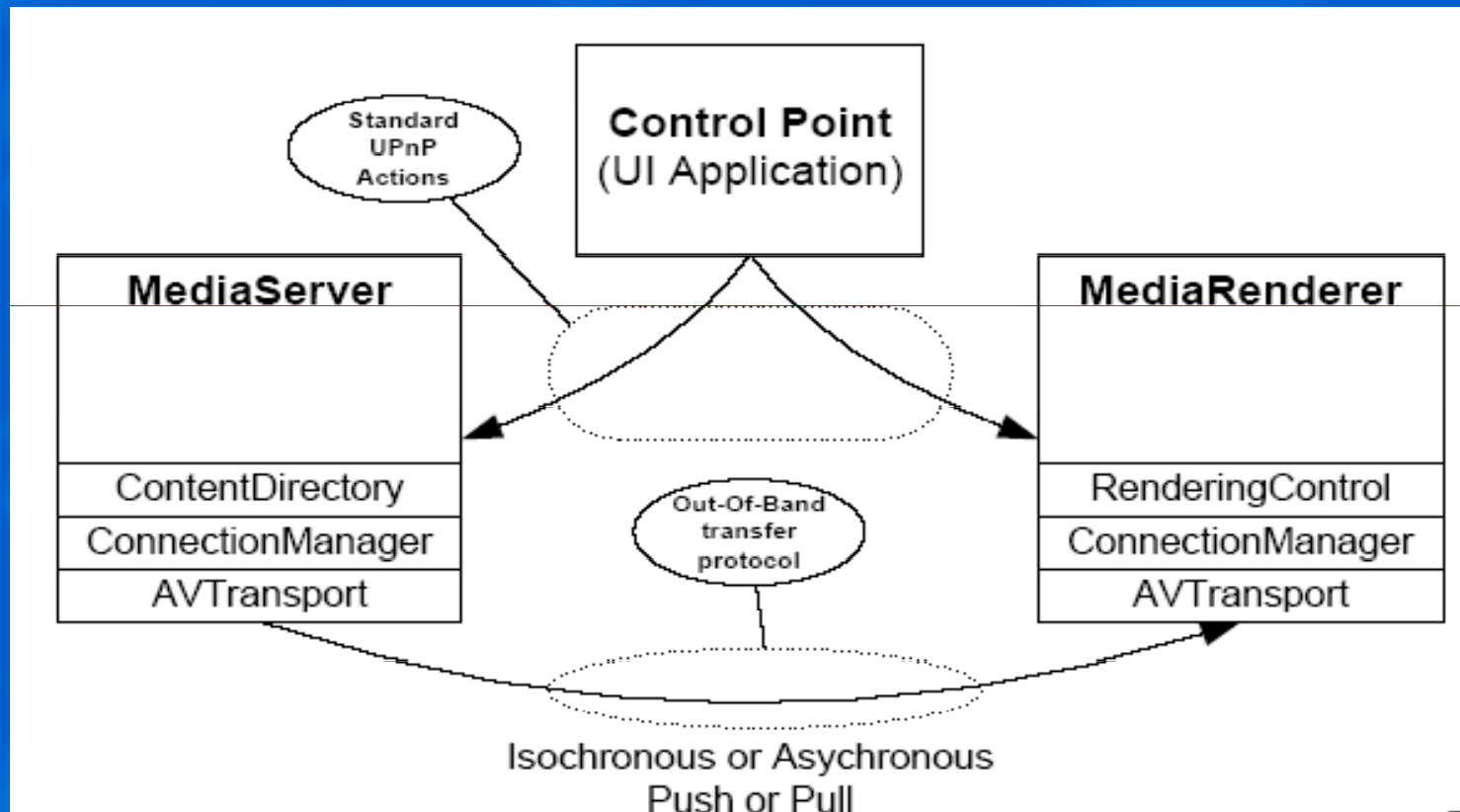# UPnP Standardized, Published DCPs

- **Internet Gateways and Wireless Access Points**
  - NAT translation control
- **Media Servers and Displays**
  - Powerful AV interaction in the home
  - Scheduled Recording, and other features
- **Quality of Service control**
  - Prioritized services
- **Printers and Scanners**
  - Document printing and photo printer support
- **Basic Devices**
- **Heating, Ventilation, and Air Conditioning**
- **Device Security / Security Console**
  - Orthogonal access control for any other DCP
- **Lighting controls**
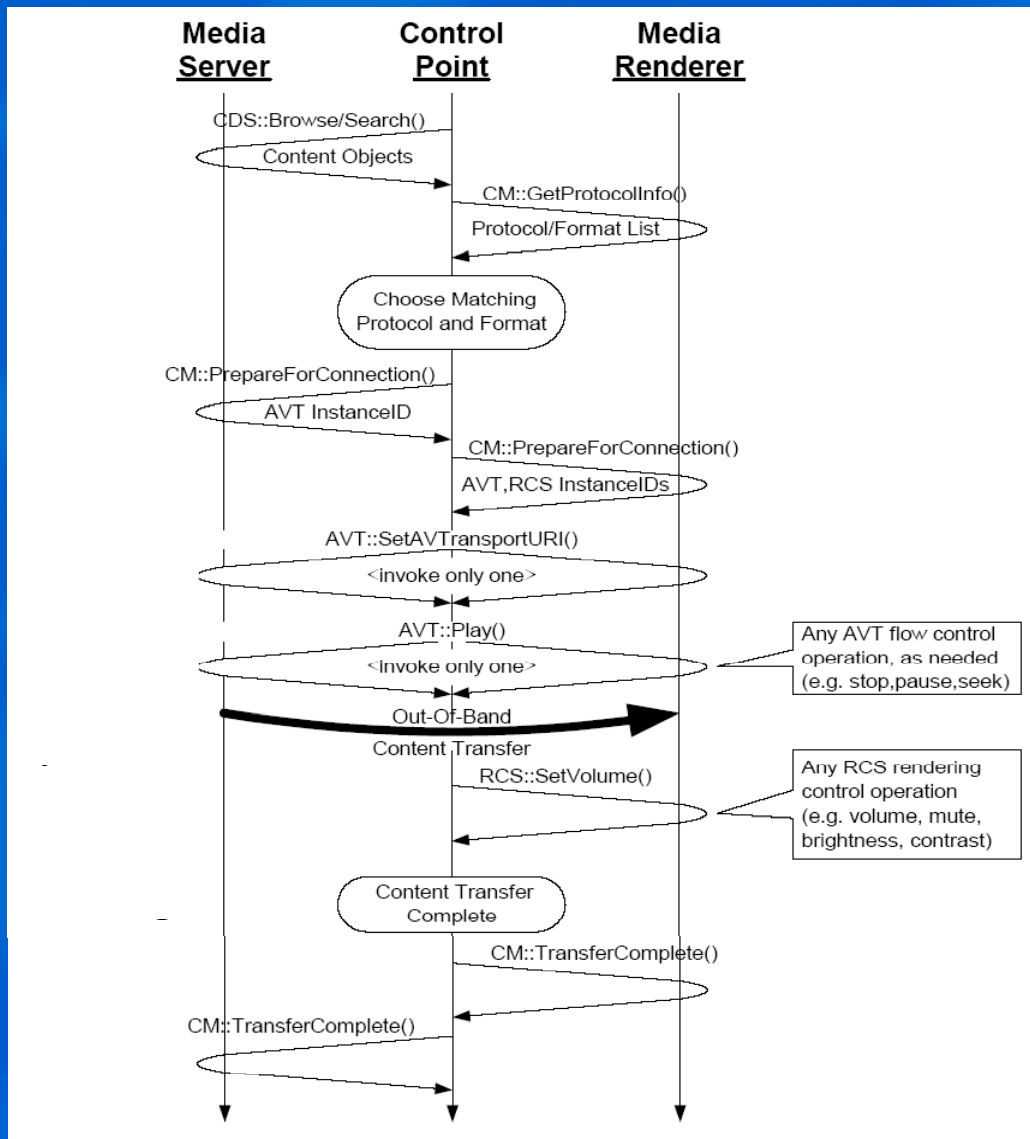- **Remote User Interfaces**
- **Digital Security Camera**
- **Low Power**

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AV: An Example DCP

- **UPNP has many DCPs, too many to describe here**

- **The AV DCPs allow many types of Audio and Visual home networking**

phones

TVs

phones

storage

Home network

electronic picture frames

set-tops

multi-room audio

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High-level AV Architecture

Example AV DCP Interaction

Established Certification Mark and Process

- **Certification is hosted by the UPnP Implementers Corporation (UIC)**
  - **Started in November 2001**
  - **Provides certification of <u>all</u> UPnP DCPs**
  - **Global access to certification and test suite**

- **US$5,000 annual dues**
  - **Unlimited number of certifications**
  - **Cooperative marketing**

- **Have already certified 275 implementations of UPnP in a wide variety of product types**
  - **Resulting in 1000s of product instances**
  - **1300+ in DLNA alone!**

- **Certification used as a mandatory item in several other standardization bodies**
  - **Building value on UPnP technologies**
  - **See DLNA presentation next!**

UPnP
IMPLEMENTERS CORPORATION

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**

Industry Momentum: Usage

- **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)**
  - **And more..**

Growing, Wide Ecosystem of Devices

Games consoles
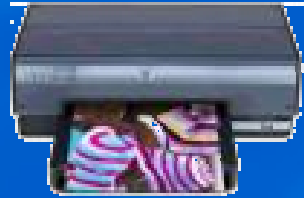
Wireless printers

Routers

DTVs

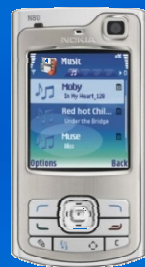HD-DVD Players

Networked Storage

DVD Players

Cameras

Digital Media Adapters

Blu-ray Players

Cell Phones

A/V Receivers

Multi-room Audio

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Upcoming UPnP Technologies

- **Specifications nearing completion**
  - **Enhancements for Media Servers and Renderers**
    - Editorial updates, External EPG metadata,
    - Enhanced content search, ContentSync
  - **Enhancements for QoS**
    - Parameterized QoS
  - **Remote Access**
    - Provisioning access into the UPnP network

- **In the sample implementer stage**
  - **Shutter and blind control specifications**

Device Architecture v1.1

- **V1.1 will provide several enhancements to v1.0**
  - Discovery enhancements to reduce traffic and improve wireless performance
  - Complex data types via XML Schema support
  - Multicast eventing support
  - Clarifies HTTP compliance issues
  - Requires SOAP 1.1 support, mustUnderstand, actor
  - Optional IPv6 support (IPv4 mandatory)

- **V1.1 requires full interoperability with v1.0 devices at the v1.0 level of functionality**

- **Technical work complete**
  - Approval expected soon

Bringing New Projects to UPnP

- **Increasing number of Working Committees and new DCP ideas**
  - Growing need for service standardization

- **To help the UPnP Forum has created the 'New Projects' committee**
  - Help nurture proposals for new areas
  - Provide a space for members to discuss ideas before approval
  - Help find other interested members

- **Any excellent way for members to engage the forum's leadership and others to drive new directions**

Looking Ahead

- **The UPnP Forum continues to be the basis for home networking interoperability everywhere**

- **Large, global membership with shared rights to RANDZ contributions ensures a open environment for interoperability and innovation**

- **Evolution of the technology provides innovation while maintain compatibility with existing products**

It is through your contributions that UPnP technology will deliver on its promises and potential.

Foundation of the Connected Home