
**Information technology — UPnP
Device Architecture —**

**Part 20-3:
Audio video device control protocol —
Level 4 — Media server device**

Technologies de l'information — Architecture de dispositif UPnP —

*Partie 20-3: Protocole de contrôle de dispositif audio-vidéo — Niveau
4 — Dispositif serveur de média*





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CONTENTS

1	Scope	1
2	Normative references	2
3	Terms, definitions, symbols and abbreviations	4
3.1	Provisioning terms	4
3.2	Symbols	5
4	Notations and Conventions	5
4.1	Notation	5
4.1.1	Data Types	5
4.1.2	Strings Embedded in Other Strings	6
4.1.3	Extended Backus-Naur Form	6
4.2	Derived Data Types	7
4.2.1	Summary	7
4.2.2	CSV Lists	7
4.3	Management of XML Namespaces in Standardized DCPs	8
4.3.1	Namespace Prefix Requirements	12
4.3.2	Namespace Names, Namespace Versioning and Schema Versioning	13
4.3.3	Namespace Usage Examples	15
4.4	Vendor-defined Extensions	15
4.4.1	Vendor-defined Action Names	15
4.4.2	Vendor-defined State Variable Names	15
4.4.3	Vendor-defined XML Elements and attributes	16
4.4.4	Vendor-defined Property Names	16
5	Device Definitions	16
5.1	Device Type	16
5.2	Device Model	16
5.2.1	Description of Device Requirements	17
5.2.2	Relationships Between Services	17
6	XML Device Description	17
7	Test	19
Annex A (informative)	Theory of Operation	20
A.1	Device Discovery	20
A.2	Locating Desired Content	20
A.3	Preparing to Transfer the Content	20
A.4	Controlling the Transfer of the Content	21
A.5	Recording Content	21
Annex B (informative)	Bibliography	22

List of Tables

Table 1 — EBNF Operators.....	7
Table 2 — CSV Examples	8
Table 3 — Namespace Definitions.....	9
Table 4 — Schema-related Information	11
Table 5 — Default Namespaces for the AV Specifications.....	13
Table 6 — Device Requirements	16

List of Figures

Figure 1 — MediaServer Functional Diagram.....	1
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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see <http://www.iso.org/directives>).

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For an explanation on the voluntary nature of Standard, the meaning of the ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword – Supplementary information](#)

ISO/IEC 29341-20-3 was prepared by UPnP Forum and adopted, under the PAS procedure, by joint technical committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

The list of all currently available parts of ISO/IEC 29341 series, under the general title *Information technology — UPnP Device Architecture*, can be found on the [ISO web site](#).

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Original UPnP Document

Reference may be made in this document to original UPnP documents. These references are retained in order to maintain consistency between the specifications as published by ISO/IEC and by UPnP Implementers Corporation and later by UPnP Forum. The following table indicates the original UPnP document titles and the corresponding part of ISO/IEC 29341:

UPnP Document Title	ISO/IEC 29341 Part
UPnP Device Architecture 1.0	ISO/IEC 29341-1:2008
UPnP Device Architecture Version 1.0	ISO/IEC 29341-1:2011
UPnP Device Architecture 1.1	ISO/IEC 29341-1-1:2011
UPnP Device Architecture 2.0	ISO/IEC 29341-1-2
UPnP Basic:1 Device	ISO/IEC 29341-2
UPnP AV Architecture:1	ISO/IEC 29341-3-1:2008
UPnP AV Architecture:1	ISO/IEC 29341-3-1:2011
UPnP AVTransport:1 Service	ISO/IEC 29341-3-10
UPnP ConnectionManager:1 Service	ISO/IEC 29341-3-11
UPnP ContentDirectory:1 Service	ISO/IEC 29341-3-12
UPnP RenderingControl:1 Service	ISO/IEC 29341-3-13
UPnP MediaRenderer:1 Device	ISO/IEC 29341-3-2
UPnP MediaRenderer:2 Device	ISO/IEC 29341-3-2:2011
UPnP MediaServer:1 Device	ISO/IEC 29341-3-3
UPnP AVTransport:2 Service	ISO/IEC 29341-4-10:2008
UPnP AVTransport:2 Service	ISO/IEC 29341-4-10:2011
UPnP ConnectionManager:2 Service	ISO/IEC 29341-4-11:2008
UPnP ConnectionManager:2 Service	ISO/IEC 29341-4-11:2011
UPnP ContentDirectory:2 Service	ISO/IEC 29341-4-12
UPnP RenderingControl:2 Service	ISO/IEC 29341-4-13:2008
UPnP RenderingControl:2 Service	ISO/IEC 29341-4-13:2011
UPnP ScheduledRecording:1	ISO/IEC 29341-4-14
UPnP ScheduledRecording:2	ISO/IEC 29341-4-14:2011
UPnP MediaRenderer:2 Device	ISO/IEC 29341-4-2
UPnP MediaServer:2 Device	ISO/IEC 29341-4-3
UPnP AV Datastructure Template:1	ISO/IEC 29341-4-4:2008
UPnP AV Datastructure Template:1	ISO/IEC 29341-4-4:2011
UPnP DigitalSecurityCamera:1 Device	ISO/IEC 29341-5-1
UPnP DigitalSecurityCameraMotionImage:1 Service	ISO/IEC 29341-5-10
UPnP DigitalSecurityCameraSettings:1 Service	ISO/IEC 29341-5-11
UPnP DigitalSecurityCameraStillImage:1 Service	ISO/IEC 29341-5-12
UPnP HVAC_System:1 Device	ISO/IEC 29341-6-1
UPnP ControlValve:1 Service	ISO/IEC 29341-6-10
UPnP HVAC_FanOperatingMode:1 Service	ISO/IEC 29341-6-11
UPnP FanSpeed:1 Service	ISO/IEC 29341-6-12
UPnP HouseStatus:1 Service	ISO/IEC 29341-6-13
UPnP HVAC_SetpointSchedule:1 Service	ISO/IEC 29341-6-14
UPnP TemperatureSensor:1 Service	ISO/IEC 29341-6-15
UPnP TemperatureSetpoint:1 Service	ISO/IEC 29341-6-16
UPnP HVAC_UserOperatingMode:1 Service	ISO/IEC 29341-6-17
UPnP HVAC_ZoneThermostat:1 Device	ISO/IEC 29341-6-2

UPnP BinaryLight:1 Device	ISO/IEC 29341-7-1
UPnP Dimming:1 Service	ISO/IEC 29341-7-10
UPnP SwitchPower:1 Service	ISO/IEC 29341-7-11
UPnP DimmableLight:1 Device	ISO/IEC 29341-7-2
UPnP InternetGatewayDevice:1 Device	ISO/IEC 29341-8-1
UPnP LANHostConfigManagement:1 Service	ISO/IEC 29341-8-10
UPnP Layer3Forwarding:1 Service	ISO/IEC 29341-8-11
UPnP LinkAuthentication:1 Service	ISO/IEC 29341-8-12
UPnP RadiusClient:1 Service	ISO/IEC 29341-8-13
UPnP WANCableLinkConfig:1 Service	ISO/IEC 29341-8-14
UPnP WANCommonInterfaceConfig:1 Service	ISO/IEC 29341-8-15
UPnP WANDSLLinkConfig:1 Service	ISO/IEC 29341-8-16
UPnP WANEthernetLinkConfig:1 Service	ISO/IEC 29341-8-17
UPnP WANIPConnection:1 Service	ISO/IEC 29341-8-18
UPnP WANPOTSLinkConfig:1 Service	ISO/IEC 29341-8-19
UPnP LANDevice:1 Device	ISO/IEC 29341-8-2
UPnP WANPPPConnection:1 Service	ISO/IEC 29341-8-20
UPnP WLANConfiguration:1 Service	ISO/IEC 29341-8-21
UPnP WANDevice:1 Device	ISO/IEC 29341-8-3
UPnP WANConnectionDevice:1 Device	ISO/IEC 29341-8-4
UPnP WLANAccessPointDevice:1 Device	ISO/IEC 29341-8-5
UPnP Printer:1 Device	ISO/IEC 29341-9-1
UPnP ExternalActivity:1 Service	ISO/IEC 29341-9-10
UPnP Feeder:1.0 Service	ISO/IEC 29341-9-11
UPnP PrintBasic:1 Service	ISO/IEC 29341-9-12
UPnP Scan:1 Service	ISO/IEC 29341-9-13
UPnP Scanner:1.0 Device	ISO/IEC 29341-9-2
UPnP QoS Architecture:1.0	ISO/IEC 29341-10-1
UPnP QosDevice:1 Service	ISO/IEC 29341-10-10
UPnP QosManager:1 Service	ISO/IEC 29341-10-11
UPnP QosPolicyHolder:1 Service	ISO/IEC 29341-10-12
UPnP QoS Architecture:2	ISO/IEC 29341-11-1
UPnP QosDevice:2 Service	ISO/IEC 29341-11-10
UPnP QosManager:2 Service	ISO/IEC 29341-11-11
UPnP QosPolicyHolder:2 Service	ISO/IEC 29341-11-12
UPnP QOS v2 Schema Files	ISO/IEC 29341-11-2
UPnP RemoteUIClientDevice:1 Device	ISO/IEC 29341-12-1
UPnP RemoteUIClient:1 Service	ISO/IEC 29341-12-10
UPnP RemoteUIServer:1 Service	ISO/IEC 29341-12-11
UPnP RemoteUIServerDevice:1 Device	ISO/IEC 29341-12-2
UPnP DeviceSecurity:1 Service	ISO/IEC 29341-13-10
UPnP SecurityConsole:1 Service	ISO/IEC 29341-13-11
UPnP ContentDirectory:3 Service	ISO/IEC 29341-14-12:2011
UPnP MediaServer:3 Device	ISO/IEC 29341-14-3:2011
UPnP ContentSync:1	ISO/IEC 29341-15-10:2011
UPnP Low Power Architecture:1	ISO/IEC 29341-16-1:2011
UPnP LowPowerProxy:1 Service	ISO/IEC 29341-16-10:2011

UPnP LowPowerDevice:1 Service	ISO/IEC 29341-16-11:2011
UPnP QoS Architecture:3	ISO/IEC 29341-17-1:2011
UPnP QoSDevice:3 Service	ISO/IEC 29341-17-10:2011
UPnP QoSManager:3 Service	ISO/IEC 29341-17-11:2011
UPnP QoSPolicyHolder:3 Service	ISO/IEC 29341-17-12:2011
UPnP QoSDevice:3 Addendum	ISO/IEC 29341-17-13:2011
UPnP RemoteAccessArchitecture:1	ISO/IEC 29341-18-1:2011
UPnP InboundConnectionConfig:1 Service	ISO/IEC 29341-18-10:2011
UPnP RADAConfig:1 Service	ISO/IEC 29341-18-11:2011
UPnP RADASync:1 Service	ISO/IEC 29341-18-12:2011
UPnP RATAConfig:1 Service	ISO/IEC 29341-18-13:2011
UPnP RAClient:1 Device	ISO/IEC 29341-18-2:2011
UPnP RAServer:1 Device	ISO/IEC 29341-18-3:2011
UPnP RADiscoveryAgent:1 Device	ISO/IEC 29341-18-4:2011
UPnP SolarProtectionBlind:1 Device	ISO/IEC 29341-19-1:2011
UPnP TwoWayMotionMotor:1 Service	ISO/IEC 29341-19-10:2011
UPnP AV Architecture:2	ISO/IEC 29341-20-1
UPnP AVTransport:3 Service	ISO/IEC 29341-20-10
UPnP ConnectionManager:3 Service	ISO/IEC 29341-20-11
UPnP ContentDirectory:4 Device	ISO/IEC 29341-20-12
UPnP RenderingControl:3 Service	ISO/IEC 29341-20-13
UPnP ScheduledRecording:2 Service	ISO/IEC 29341-20-14
UPnP MediaRenderer:3 Service	ISO/IEC 29341-20-2
UPnP MediaServer:4 Device	ISO/IEC 29341-20-3
UPnP AV Datastructure Template:1	ISO/IEC 29341-20-4
UPnP InternetGatewayDevice:2 Device	ISO/IEC 29341-24-1
UPnP WANIPConnection:2 Service	ISO/IEC 29341-24-10
UPnP WANIPv6FirewallControl:1 Service	ISO/IEC 29341-24-11
UPnP WANConnectionDevice:2 Service	ISO/IEC 29341-24-2
UPnP WANDevice:2 Device	ISO/IEC 29341-24-3
UPnP Telephony Architecture:2	ISO/IEC 29341-26-1
UPnP CallManagement:2 Service	ISO/IEC 29341-26-10
UPnP MediaManagement:2 Service	ISO/IEC 29341-26-11
UPnP Messaging:2 Service	ISO/IEC 29341-26-12
UPnP PhoneManagement:2 Service	ISO/IEC 29341-26-13
UPnP AddressBook:1 Service	ISO/IEC 29341-26-14
UPnP Calendar:1 Service	ISO/IEC 29341-26-15
UPnP Presense:1 Service	ISO/IEC 29341-26-16
UPnP TelephonyClient:2 Device	ISO/IEC 29341-26-2
UPnP TelephonyServer:2 Device	ISO/IEC 29341-26-3
UPnP Friendly Info Update:1 Service	ISO/IEC 29341-27-1
UPnP MultiScreen MultiScreen Architecture:1	ISO/IEC 29341-28-1
UPnP MultiScreen Application Management:1 Service	ISO/IEC 29341-28-10
UPnP MultiScreen Screen:1 Device	ISO/IEC 29341-28-2
UPnP MultiScreen Application Management:2 Service	ISO/IEC 29341-29-10
UPnP MultiScreen Screen:2 Device	ISO/IEC 29341-29-2
UPnP IoT Management and Control Architecture Overview:1	ISO/IEC 29341-30-1

UPnP DataStore:1 Service	ISO/IEC 29341-30-10
UPnP IoT Management and Control Data Model:1 Service	ISO/IEC 29341-30-11
UPnP IoT Management and Control Transport Generic:1 Service	ISO/IEC 29341-30-12
UPnP IoT Management and Control:1 Device	ISO/IEC 29341-30-2
UPnP Energy Management:1 Service	ISO/IEC 29341-31-1

1 Scope

This device specification is compliant with the UPnP Device Architecture version 1.0 [14]. It defines a device type referred to herein as MediaServer.

The MediaServer specification defines a general-purpose device that can be used to instantiate any Consumer Electronics (CE) device that provides AV content (for example, media) to other UPnP devices on the home network. It is based on the UPnP AV Architecture Framework (described in another document). It exposes its content via the ContentDirectory service (refer to the ContentDirectory service specification for details). The MediaServer may also provide functionality to record content using the ScheduledRecording service (refer to the ScheduledRecording service specification). As such, the MediaServer can handle any specific type of media, any data format, and transfer protocol.

Example instances of a MediaServer include traditional devices such as VCRs, CD Players, DVD Players, audio-tape players, still-image cameras, camcorders, radios, TV Tuners, and set-top boxes. Additional examples of a MediaServer also include new digital devices such as MP3 servers, PVRs, smartphones and Home MediaServers such as the PC. Although these devices contain diverse (AV) content in one form or another, the MediaServer (via the ContentDirectory service) is able to expose this content to the home network in a uniform and consistent manner. This ability allows the MediaServer to instantiate traditional single-function devices as well as more recent multi-function devices such as VCR-DVD players and the general purpose Home MediaServer, which contains a wide variety of content such as MPEG2 video, CD audio, MP3 and/or WMA audio, JPEG images, etc.

The MediaServer specification is very lightweight and can easily be implemented on low-resource devices such as still-image cameras or MP3 players that want to expose their local content to the home network. The MediaServer can also be used for high-end Home MediaServers that contain dozens of Gigabytes of heterogeneous content. Refer to the Theory Of Operation subclause for some specific examples of the MediaServer.

A full-featured MediaServer device provides clients with the following capabilities:

- Enumerate and query any of the content that the MediaServer can provide to the home network.
- Negotiate a common transfer protocol and data format between the MediaServer and target device.
- Control the flow of the content (for example, FF, REW, etc).
- Copy (import) content to the MediaServer from another device.
- Record content using the ScheduledRecording service [25].

This device specification does not provide:

- The ability to render AV content.

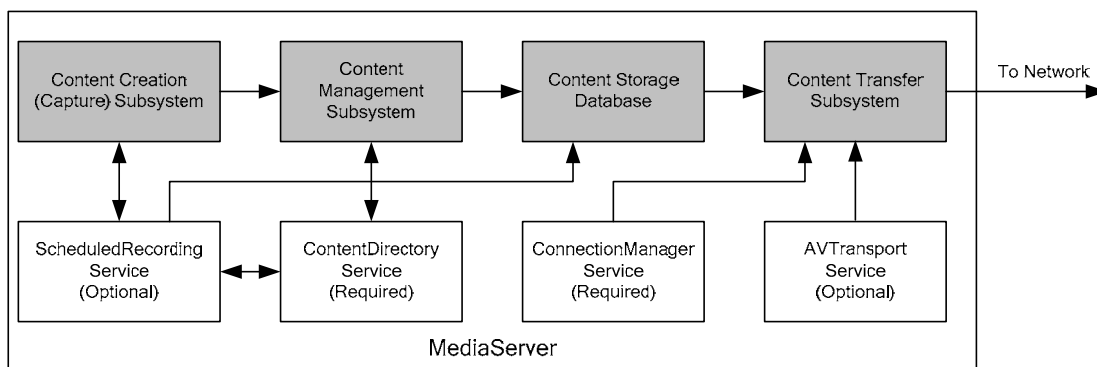


Figure 1 — MediaServer Functional Diagram

The un-shaded blocks represent the UPnP services that are contained by a MediaServer device. The shaded blocks represent various device-specific modules that the UPnP services

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might interact with. However, the internal architecture of a MediaServer device is vendor specific.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

[1] – *XML Schema for RenderingControl AllowedTransformSettings*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/schemas/av/AllowedTransformSettings-v1-20130331.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/AllowedTransformSettings.xsd>.

[2] – *AV Datastructure Template:1*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/specs/av/UPnP-av-AVDataStructureTemplate-v1-20130331.pdf>.

Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-AVDataStructureTemplate-v1.pdf>.

[3] – *XML Schema for UPnP AV Common XML Data Types*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/schemas/av/av-v3-20130331.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/av.xsd>.

[4] – *XML Schema for UPnP AV Common XML Structures*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/schemas/av/avs-v3-20130331.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/avs.xsd>.

[5] – *AVTransport:3*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/specs/av/UPnP-av-AVTransport-v3-Service-20130331.pdf>.

Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-AVTransport-v3-Service.pdf>.

[6] – *XML Schema for AVTransport LastChange Eventing*, UPnP Forum, September 30, 2008.

Available at: <http://www.upnp.org/schemas/av/avt-event-v2-20080930.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/avt-event.xsd>.

[7] – *ContentDirectory:4*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/specs/av/UPnP-av-ContentDirectory-v4-Service-20130331.pdf>.

Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-ContentDirectory-v4-Service.pdf>.

[8] – *XML Schema for ContentDirectory LastChange Eventing*, UPnP Forum, September 30, 2008.

Available at: <http://www.upnp.org/schemas/av/cds-event-v1-20080930.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/cds-event.xsd>.

[9] – *ConnectionManager:3*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/specs/av/UPnP-av-ConnectionManager-v3-Service-20130331.pdf>.

Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-ConnectionManager-v3-Service.pdf>.

[10] – *XML Schema for ConnectionManager DeviceClockInfoUpdates*, UPnP Forum, December 31, 2010.

Available at: <http://www.upnp.org/schemas/av/cm-deviceClockInfoUpdates-v1-20101231.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/cm-deviceClockInfoUpdates.xsd>.

[11] – *XML Schema for ConnectionManager Features*, UPnP Forum, December 31, 2010.

Available at: <http://www.upnp.org/schemas/av/cm-featureList-v1-20101231.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/cm-featureList.xsd>.

- [12] – *XML Schema for UPnP AV Dublin Core*.
Available at: <http://www.dublincore.org/schemas/xmls/simpledc20020312.xsd>.
- [13] – *DCMI term declarations represented in XML schema language*.
Available at: <http://www.dublincore.org/schemas/xmls>.
- [14] – *UPnP Device Architecture, version 1.0*, UPnP Forum, October 15, 2008.
Available at: <http://www.upnp.org/specs/arch/UPnP-arch-DeviceArchitecture-v1.0-20081015.pdf>.
Latest version available at: <http://www.upnp.org/specs/arch/UPnP-arch-DeviceArchitecture-v1.0.pdf>.
- [15] – *XML Schema for ContentDirectory Structure and Metadata (DIDL-Lite)*, UPnP Forum, March 31, 2013.
Available at: <http://www.upnp.org/schemas/av/didl-lite-v3-20130331.xsd>.
Latest version available at: <http://www.upnp.org/schemas/av/didl-lite.xsd>.
- [16] – *XML Schema for ContentDirectory DeviceMode*, UPnP Forum, December 31, 2010.
Available at: <http://www.upnp.org/schemas/av/dmo-v1-20101231.xsd>.
Latest version available at: <http://www.upnp.org/schemas/av/dmo.xsd>.
- [17] – *XML Schema for ContentDirectory DeviceModeRequest*, UPnP Forum, December 31, 2010.
Available at: <http://www.upnp.org/schemas/av/dmor-v1-20101231.xsd>.
Latest version available at: <http://www.upnp.org/schemas/av/dmor.xsd>.
- [18] – *XML Schema for ContentDirectory DeviceModeStatus*, UPnP Forum, December 31, 2010.
Available at: <http://www.upnp.org/schemas/av/dmos-v1-20101231.xsd>.
Latest version available at: <http://www.upnp.org/schemas/av/dmos.xsd>.
- [19] – ISO/IEC 14977, *Information technology - Syntactic metalanguage - Extended BNF*, December 1996.
- [20] – *XML Schema for ContentDirectory PermissionsInfo*, UPnP Forum, December 31, 2010.
Available at: <http://www.upnp.org/schemas/av/pi-v1-20101231.xsd>.
Latest version available at: <http://www.upnp.org/schemas/av/pi.xsd>.
- [21] – *RenderingControl:3*, UPnP Forum, March 31, 2013.
Available at: <http://www.upnp.org/specs/av/UPnP-av-RenderingControl-v3-Service-20130331.pdf>.
Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-RenderingControl-v3-Service.pdf>.
- [22] – *XML Schema for RenderingControl LastChange Eventing*, UPnP Forum, December 31, 2010.
Available at: <http://www.upnp.org/schemas/av/rcs-event-v3-20101231.xsd>.
Latest version available at: <http://www.upnp.org/schemas/av/rcs-event.xsd>.
- [23] – *XML Schema for ConnectionManager RendererInfo*, UPnP Forum, December 31, 2010.
Available at: <http://www.upnp.org/schemas/av/rri-v1-20101231.xsd>.
Latest version available at: <http://www.upnp.org/schemas/av/rri.xsd>.
- [24] – *XML Schema for AVTransport PlaylistInfo*, UPnP Forum, March 31, 2013.
Available at: <http://www.upnp.org/schemas/av/rpl-v1-20130331.xsd>.
Latest version available at: <http://www.upnp.org/schemas/av/rpl.xsd>.
- [25] – *ScheduledRecording:2*, UPnP Forum, March 31, 2013.
Available at: <http://www.upnp.org/specs/av/UPnP-av-ScheduledRecording-v2-Service-20130331.pdf>.
Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-ScheduledRecording-v2-Service.pdf>.

[26] – *XML Schema for ScheduledRecording Metadata and Structure*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/schemas/av/srs-v2-20130331.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/srs.xsd>.

[27] – *XML Schema for ScheduledRecording LastChange Eventing*, UPnP Forum, September 30, 2008.

Available at: <http://www.upnp.org/schemas/av/srs-event-v1-20080930.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/srs-event.xsd>.

[28] – *XML Schema for RenderingControl TransformSettings*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/schemas/av/TransformSettings-v1-20130331.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/TransformSettings.xsd>.

[29] – *XML Schema for ContentDirectory Metadata*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/schemas/av/upnp-v4-20130331.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/upnp.xsd>.

[30] – *The “xml:” Namespace*, November 3, 2004.

Available at: <http://www.w3.org/XML/1998/namespace>.

[31] – *XML Schema for the “xml:” Namespace*.

Available at: <http://www.w3.org/2001/xml.xsd>.

[32] – *Namespaces in XML*, Tim Bray, Dave Hollander, Andrew Layman, eds., W3C Recommendation, January 14, 1999.

Available at: <http://www.w3.org/TR/1999/REC-xml-names-19990114>.

[33] – *XML Schema Part 1: Structures, Second Edition*, Henry S. Thompson, David Beech, Murray Maloney, Noah Mendelsohn, W3C Recommendation, 28 October 2004.

Available at: <http://www.w3.org/TR/2004/REC-xmlschema-1-20041028>.

[34] – *XML Schema Part 2: Data Types, Second Edition*, Paul V. Biron, Ashok Malhotra, W3C Recommendation, 28 October 2004.

Available at: <http://www.w3.org/TR/2004/REC-xmlschema-2-20041028>.

[35] – *XML Schema for XML Schema*.

Available at: <http://www.w3.org/2001/XMLSchema.xsd>.

[36] – *DeviceProtection:1*, UPnP Forum, February 24, 2011.

Available at: <http://www.upnp.org/specs/gw/UPnP-gw-DeviceProtection-v1-Service-20110224.pdf>.

Latest version available at: <http://www.upnp.org/specs/gw/UPnP-gw-DeviceProtection-v1-Service.pdf>.