

This is a preview - click here to buy the full publication



ISO/IEC 29341-4-2

Edition 2.0 2011-09

# INTERNATIONAL STANDARD



---

**Information technology –UPnP device architecture –  
Part 4-2: Audio Video Device Control Protocol – Level 2 – Media Renderer Device**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

PRICE CODE

**K**

---

ICS 35.200

ISBN 978-2-88912-678-1

## CONTENTS

1	Overview and Scope.....	2
1.1	Introduction .....	2
1.2	Notation .....	3
1.2.1	Data Types .....	3
1.2.2	Strings Embedded in Other Strings .....	3
1.2.3	Extended Backus-Naur Form .....	4
1.3	Derived Data Types.....	4
1.3.1	Comma Separated Value (CSV) Lists.....	5
1.4	Management of XML Namespaces in Standardized DCPs .....	6
1.4.1	Namespace Prefix Requirements .....	9
1.4.2	Namespace Names, Namespace Versioning and Schema Versioning .....	10
1.4.3	Namespace Usage Examples.....	12
1.5	Vendor-defined Extensions .....	13
1.5.1	Vendor-defined Action Names.....	13
1.5.2	Vendor-defined State Variable Names.....	13
1.5.3	Vendor-defined XML Elements and attributes .....	13
1.5.4	Vendor-defined Property Names .....	13
1.6	References.....	13
2	Device Definitions .....	17
2.1	Device Type .....	17
2.2	Device Model .....	17
2.2.1	Description of Device Requirements.....	17
2.2.2	Relationships Between Services .....	18
2.3	Theory of Operation.....	18
2.3.1	Device Discovery .....	19
2.3.2	Preparing to Transfer the Content .....	19
2.3.3	Controlling the Transfer of the Content.....	19
2.3.4	Controlling How the Content is Rendered .....	19
3	XML Device Description .....	20
4	Test .....	21
Figure 1 — MediaRenderer Functional Diagram .....		2
Table 1-1 — EBNF Operators .....		4
Table 1-2 — CSV Examples.....		6
Table 1-3 — Namespace Definitions .....		8
Table 1-4 — Schema-related Information .....		9
Table 1-5 — Default Namespaces for the AV Specifications .....		10
Table 2-6 — Device Requirements.....		17

## INFORMATION TECHNOLOGY – UPnP DEVICE ARCHITECTURE –

### Part 4-2: Audio Video Device Control Protocol – Level 2 – Media Renderer Device

#### FOREWORD

- 1) ISO (International Organization for Standardization) and IEC (International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards. Their preparation is entrusted to technical committees; any ISO and IEC member body interested in the subject dealt with may participate in this preparatory work. International governmental and non-governmental organizations liaising with ISO and IEC also participate in this preparation.
- 2) In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.
- 3) The formal decisions or agreements of IEC and ISO on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC and ISO member bodies.
- 4) IEC, ISO and ISO/IEC publications have the form of recommendations for international use and are accepted by IEC and ISO member bodies in that sense. While all reasonable efforts are made to ensure that the technical content of IEC, ISO and ISO/IEC publications is accurate, IEC or ISO cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 5) In order to promote international uniformity, IEC and ISO member bodies undertake to apply IEC, ISO and ISO/IEC publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any ISO/IEC publication and the corresponding national or regional publication should be clearly indicated in the latter.
- 6) ISO and IEC provide no marking procedure to indicate their approval and cannot be rendered responsible for any equipment declared to be in conformity with an ISO/IEC publication.
- 7) All users should ensure that they have the latest edition of this publication.
- 8) No liability shall attach to IEC or ISO or its directors, employees, servants or agents including individual experts and members of their technical committees and IEC or ISO member bodies for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication of, use of, or reliance upon, this ISO/IEC publication or any other IEC, ISO or ISO/IEC publications.
- 9) Attention is drawn to the normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 10) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 29341-4-2 was prepared by UPnP Forum Steering committee<sup>1</sup>, was adopted, under the fast track procedure, by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology.

This International Standard replaces ISO/IEC 29341-4-2, first edition, published in 2008, and constitutes a technical revision.

The list of all currently available parts of the ISO/IEC 29341 series, under the general title *Information technology – UPnP device architecture*, can be found on the IEC web site.

This International Standard has been approved by vote of the member bodies, and the voting results may be obtained from the address given on the second title page.

---

<sup>1</sup> UPnP Forum Steering committee, UPnP Forum, 3855 SW 153<sup>rd</sup> Drive, Beaverton, Oregon 97006 USA. See also "Introduction".

[This is a preview - click here to buy the full publication](#)

29341-4-2 © ISO/IEC:2011(E)

**IMPORTANT – The “colour inside” logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication using a colour printer.**

## 1 Overview and Scope

### 1.1 Introduction

This device specification is compliant with the Universal Plug and Play Device Architecture version 1.0. It defines a device type referred to herein as MediaRenderer.

The MediaRenderer specification defines a general-purpose device template that can be used to instantiate any Consumer Electronics (CE) device that is capable of rendering AV content from the home network. It exposes a set of rendering controls in which a control point can control how the specified AV content is rendered. This includes controlling various rendering features such as brightness, contrast, volume, etc.

Example instances of a MediaRenderer include traditional devices such as TVs and stereo systems. Some more contemporary examples include digital devices such as MP3 players and Electronic Picture Frames (EPFs). Although most of these examples typically render one specific type of content (for example, a TV typically renders video content), a MediaRenderer is able to support a number of different data formats and transfer protocols. For example, a sophisticated implementation of a TV MediaRenderer could also support MP3 data so that its speakers could be used to play MP3 audio content.

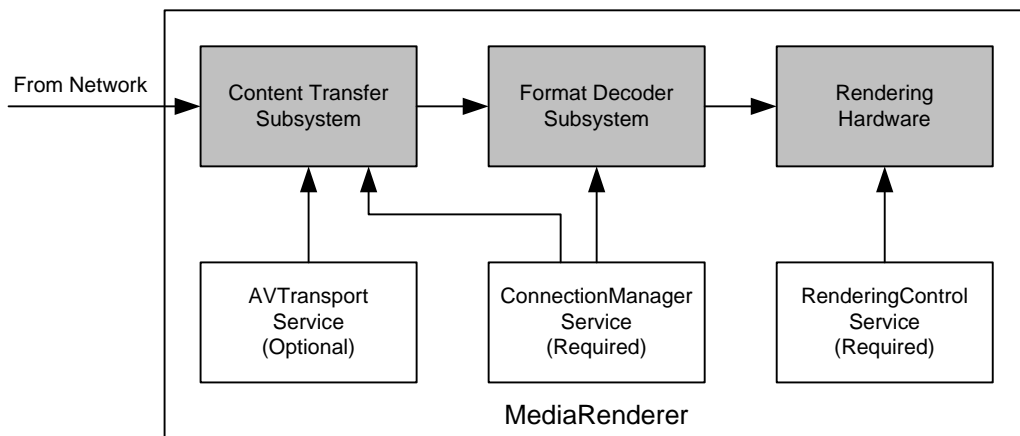
The MediaRenderer device specification is very lightweight and is easy to implement on low-resource devices such as an MP3 player. However, it can also be used to expose the high-end capabilities of devices such as a PC.

A full-featured MediaRenderer exposes the following capabilities:

- Control various rendering characteristics
- Expose the supported transfer protocols and data formats
- Control the flow of the content (for example, FF, REW, etc), if appropriate depending on the transfer protocol.
- 

The MediaRenderer DOES NOT enable control points to:

- Send AV content to another device
- Retrieve any type of meta-data associated with the content



**Figure 1 — MediaRenderer Functional Diagram**

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

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

## 1.6 References

This clause lists the normative references used in the UPnP AV specifications and includes the tag inside square brackets that is used for each such reference:

[AVARCH] – *AVArchitecture:1*, UPnP Forum, September 30, 2008. Available at: <http://www.upnp.org/specs/av/UPnP-av-AVArchitecture-v1-20080930.pdf>. Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-AVArchitecture-v1.pdf>.

[AVDT] – *AV DataStructure Template:1*, UPnP Forum, September 30, 2008. Available at: <http://www.upnp.org/specs/av/UPnP-av-AVDataStructure-v1-20080930.pdf>. Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-AVDataStructure-v1.pdf>.

[AVDT-XSD] – XML Schema for UPnP AV Datastructure Template:1, UPnP Forum, September 30, 2008. Available at: <http://www.upnp.org/schemas/av/avdt-v1-20080930.xsd>. Latest version available at: <http://www.upnp.org/schemas/av/avdt-v1.xsd>.

[AV-XSD] – *XML Schema for UPnP AV Common XML Data Types*, UPnP Forum, September 30, 2008. Available at: <http://www.upnp.org/schemas/av/av-v2-20080930.xsd>. Latest version available at: <http://www.upnp.org/schemas/av/av-v2.xsd>.

[AVS-XSD] – *XML Schema for UPnP AV Common XML Structures*, UPnP Forum, September 30, 2008. Available at: <http://www.upnp.org/schemas/av/avs-v2-20080930.xsd>. Latest version available at: <http://www.upnp.org/schemas/av/avs-v2.xsd>.

[AVT] – *AVTransport:2*, UPnP Forum, September 30, 2008. Available at: <http://www.upnp.org/specs/av/UPnP-av-AVTransport-v2-Service-20080930.pdf>. Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-AVTransport-v2-Service.pdf>.

[AVT-EVENT-XSD] – *XML Schema for AVTransport:2 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-v2.xsd>.

[CDS] – *ContentDirectory:3*, UPnP Forum, September 30, 2008. Available at: <http://www.upnp.org/specs/av/UPnP-av-ContentDirectory-v3-Service-20080930.pdf>. Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-ContentDirectory-v3-Service.pdf>.

[CDS-EVENT-XSD] – XML Schema for ContentDirectory:3 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-v1.xsd>.

[CM] – *ConnectionManager:2*, UPnP Forum, September 30, 2008. Available at: <http://www.upnp.org/specs/av/UPnP-av-ConnectionManager-v2-Service-20080930.pdf>. Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-ConnectionManager-v2-Service.pdf>.

[DC-XSD] – XML Schema for UPnP AV Dublin Core. Available at: <http://www.dublincore.org/schemas/xmls/simpledc20020312.xsd>.

[DC-TERMS] – DCMI term declarations represented in XML schema language. Available at: <http://www.dublincore.org/schemas/xmls>.

[DEVICE] – *UPnP Device Architecture, version 1.0*, UPnP Forum, July 20, 2006. Available at: <http://www.upnp.org/specs/architecture/UPnP-DeviceArchitecture-v1.0-20060720.htm>. Latest version available at: <http://www.upnp.org/specs/architecture/UPnP-DeviceArchitecture-v1.0.htm>.

[DIDL] – ISO/IEC CD 21000-2:2001, Information Technology - Multimedia Framework - Part 2: Digital Item Declaration, July 2001. [DIDL-LITE-XSD] – XML Schema for ContentDirectory:3 Structure and Metadata (DIDL-Lite), UPnP Forum, September 30, 2008. Available at: <http://www.upnp.org/schemas/av/didl-lite-v2-20080930.xsd>. Latest version available at: <http://www.upnp.org/schemas/av/didl-lite-v2.xsd>.



[EBNF] – ISO/IEC 14977, Information technology - Syntactic metalanguage - Extended BNF, December 1996.

[HTTP/1.1] – *HyperText Transport Protocol – HTTP/1.1*, R. Fielding, J. Gettys, J. Mogul, H. Frystyk, L. Masinter, P. Leach, T. Berners-Lee, June 1999. Available at: <http://www.ietf.org/rfc/rfc2616.txt>.

IEC 61883] – IEC 61883 Consumer Audio/Video Equipment – Digital Interface - Part 1 to 5. Available at: <http://www.iec.ch>.

[IEC-PAS 61883] – IEC-PAS 61883 Consumer Audio/Video Equipment – Digital Interface - Part 6. Available at: <http://www.iec.ch>.

[ISO 8601] – Data elements and interchange formats – Information interchange -- Representation of dates and times, International Standards Organization, December 21, 2000. Available at: [ISO 8601:2000](http://www.iso.org/iso/8601.html).

[MIME] – IETF RFC 1341, MIME (Multipurpose Internet Mail Extensions), N. Borenstein, N. Freed, June 1992. Available at: <http://www.ietf.org/rfc/rfc1341.txt>.

[MR] – *MediaRenderer:2*, UPnP Forum, September 30, 2008. Available at: <http://www.upnp.org/specs/av/UPnP-av-MediaRenderer-v2-Device-20080930.pdf>. Latest version available at: <http://www.upnp.org/specs/av/UPnP-AV-MediaRenderer-v2-Device.pdf>.

[MS] – *MediaServer:3*, UPnP Forum, September 30, 2008. Available at: <http://www.upnp.org/specs/av/UPnP-av-MediaServer-v3-Device-20080930.pdf>. Latest version available at: <http://www.upnp.org/specs/av/UPnP-AV-MediaServer-v3-Device.pdf>.

[RCS] – *RenderingControl:2*, UPnP Forum, September 30, 2008. Available at: <http://www.upnp.org/specs/av/UPnP-av-RenderingControl-v2-Service-20080930.pdf>. Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-RenderingControl-v2-Service.pdf>.

[RCS-EVENT-XSD] – XML Schema for RenderingControl:2 LastChange Eventing, UPnP Forum, September 30, 2008. Available at: <http://www.upnp.org/schemas/av/rcs-event-v1-20080930.xsd>. Latest version available at: <http://www.upnp.org/schemas/av/rcs-event.xsd>.

[RFC 1738] – *IETF RFC 1738, Uniform Resource Locators (URL)*, Tim Berners-Lee, et. Al., December 1994. Available at: <http://www.ietf.org/rfc/rfc1738.txt>.

[RFC 2045] – IETF RFC 2045, Multipurpose Internet Mail Extensions (MIME) Part 1:Format of Internet Message Bodies, N. Freed, N. Borenstein, November 1996. Available at: <http://www.ietf.org/rfc/rfc2045.txt>.

[RFC 2119] – IETF RFC 2119, Key words for use in RFCs to Indicate Requirement Levels, S. Bradner, 1997. Available at: <http://www.faqs.org/rfcs/rfc2119.html>.

[RFC 2396] – IETF RFC 2396, Uniform Resource Identifiers (URI): Generic Syntax, Tim Berners-Lee, et al, 1998. Available at: <http://www.ietf.org/rfc/rfc2396.txt>.

[RFC 3339] – *IETF RFC 3339, Date and Time on the Internet: Timestamps*, G. Klyne, Clearswift Corporation, C. Newman, Sun Microsystems, July 2002. Available at: <http://www.ietf.org/rfc/rfc3339.txt>.

[RTP] – *IETF RFC 1889, Realtime Transport Protocol (RTP)*, H. Schulzrinne, S. Casner, R. Frederick, V. Jacobson, January 1996. Available at: <http://www.ietf.org/rfc/rfc1889.txt>.

[RTSP] – *IETF RFC 2326, Real Time Streaming Protocol (RTSP)*, H. Schulzrinne, A. Rao, R. Lanphier, April 1998. Available at: <http://www.ietf.org/rfc/rfc2326.txt>.

[SRS] – *ScheduledRecording:2*, UPnP Forum, September 30, 2008. Available at: <http://www.upnp.org/specs/av/UPnP-av-ScheduledRecording-v2-Service-20080930.pdf>. Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-ScheduledRecording-v2-Service.pdf>.

[SRS-XSD] – XML Schema for ScheduledRecording:2 Metadata and Structure, UPnP Forum, September 30, 2008. Available at: <http://www.upnp.org/schemas/av/srs-v2-20080930.xsd>. Latest version available at: <http://www.upnp.org/schemas/av/srs-v2.xsd>.

[SRS-EVENT-XSD] – XML Schema for ScheduledRecording:2 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-v1.xsd>.

[UAX 15] – Unicode Standard Annex #15, Unicode Normalization Forms, version 4.1.0, revision 25, M. Davis, M. Dürst, March 25, 2005. Available at: <http://www.unicode.org/reports/tr15/tr15-25.html>.

[UNICODE COLLATION] – Unicode Technical Standard #10, Unicode Collation Algorithm version 4.1.0, M. Davis, K. Whistler, May 5, 2005. Available at: <http://www.unicode.org/reports/tr10/tr10-14.html>.

[UPNP-XSD] – *XML Schema for ContentDirectory:3 Metadata*, UPnP Forum, September 30, 2008. Available at: <http://www.upnp.org/schemas/av/upnp-v3-20080930.xsd>. Latest version available at: <http://www.upnp.org/schemas/av/upnp-v3.xsd>.

[UTS 10] – Unicode Technical Standard #10, Unicode Collation Algorithm, version 4.1.0, revision 14, M. Davis, K. Whistler, May 5, 2005. Available at: <http://www.unicode.org/reports/tr10/tr10-14.html>.

[UTS 35] – Unicode Technical Standard #35, Locale Data Markup Language, version 1.3R1, revision 5, M. Davis, June 2, 2005. Available at: <http://www.unicode.org/reports/tr35/tr35-5.html>.

[XML] – *Extensible Markup Language (XML) 1.0 (Third Edition)*, François Yergeau, Tim Bray, Jean Paoli, C. M. Sperberg-McQueen, Eve Maler, eds., W3C Recommendation, February 4, 2004. Available at: <http://www.w3.org/TR/2004/REC-xml-20040204>.

[XML-NS] – *The “xml:” Namespace*, November 3, 2004. Available at: <http://www.w3.org/XML/1998/namespace>.

[XML-XSD] – XML Schema for the “xml:” Namespace. Available at: <http://www.w3.org/2001/xml.xsd>.

[XML-NMSP] – *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>.

[XML SCHEMA-1] – *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>.

[XML SCHEMA-2] – *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>.

[XMLSCHEMA-XSD] – XML Schema for XML Schema. Available at: <http://www.w3.org/2001/XMLSchema.xsd>.

[XPath20] – *XML Path Language (XPath) 2.0*. Anders Berglund, Scott Boag, Don Chamberlin, Mary F. Fernandez, Michael Kay, Jonathan Robie, Jerome Simeon. W3C Recommendation, 21 November 2006. Available at: <http://www.w3.org/TR/xpath20>.

[XQUERY10] – *XQuery 1.0 An XML Query Language*. W3C Recommendation, 23 January 2007. Available at: <http://www.w3.org/TR/2007/REC-xquery-20070123>.