



ISO/IEC 29341-3-12

Edition 1.0 2008-11

INTERNATIONAL STANDARD

**Information technology – UPnP Device Architecture –
Part 3-12: Audio Video Device Control Protocol – Content Directory Service**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE

X

ICS 35.200

ISBN 2-8318-1005-6

CONTENTS

FOREWORD	5
ORIGINAL UPNP DOCUMENTS (informative)	7
1. Overview and Scope	9
1.1. Introduction	9
2. Service Modeling Definitions	10
2.1. Service Type	10
2.2. References	10
2.3. Terms	11
2.3.1. Notation: Strings Embedded in Other Strings	12
2.3.2. Notation: Extended Backus-Naur Form	13
2.4. Class Hierarchy	13
2.4.1. Class name syntax	13
2.4.2. Base Properties	14
2.4.3. Class 'object' (Base Class)	15
2.4.4. Class 'item' : 'object'	15
2.4.5. Class 'container' : 'object'	15
2.5. State Variables	16
2.5.1. Derived data types	16
2.5.2. TransferIDs	18
2.5.3. A_ARG_TYPE_ObjectID	19
2.5.4. A_ARG_TYPE_Result	19
2.5.5. A_ARG_TYPE_SearchCriteria	19
2.5.6. A_ARG_TYPE_BrowseFlag	21
2.5.7. A_ARG_TYPE_Filter	21
2.5.8. A_ARG_TYPE_SortCriteria	21
2.5.9. A_ARG_TYPE_Index	21
2.5.10. A_ARG_TYPE_Count	21
2.5.11. A_ARG_TYPE_UpdateID	22
2.5.12. A_ARG_TYPE_TransferID	22
2.5.13. A_ARG_TYPE_TransferStatus	22
2.5.14. A_ARG_TYPE_TransferLength	22
2.5.15. A_ARG_TYPE_TransferTotal	22
2.5.16. A_ARG_TYPE_TagValueList	22
2.5.17. A_ARG_TYPE_URI	22
2.5.18. SearchCapabilities	22
2.5.19. SortCapabilities	22
2.5.20. SystemUpdateID	23
2.5.21. ContainerUpdateIDs	23
2.6. Eventing and Moderation	25
2.7. Actions	26
2.7.1. GetSearchCapabilities	26
2.7.2. GetSortCapabilities	27
2.7.3. GetSystemUpdateID	27
2.7.4. Browse	28
2.7.5. Search	30
2.7.6. CreateObject	32
2.7.7. DestroyObject	34
2.7.8. UpdateObject	35
2.7.9. ImportResource	38
2.7.10. ExportResource	39
2.7.11. StopTransferResource	40
2.7.12. GetTransferProgress	41
2.7.13. DeleteResource	42
2.7.14. CreateReference	43
2.7.15. Non-Standard Actions Implemented by an UPnP Vendor	43
2.7.16. Common Error Codes	43

2.8.	Theory of Operation (Informative).....	45
2.8.1.	Introduction	45
2.8.2.	Content setup for Browsing and Searching	45
2.8.3.	Browsing	46
2.8.4.	Searching.....	50
2.8.5.	Browsing, Searching, and References.....	53
2.8.6.	Browsing, Searching, and Filtering	54
2.8.7.	Object Creation	55
2.8.8.	File Transfer of a resource in Objects.....	56
2.8.9.	Playlist Manipulation	58
2.8.10.	Internet Content Representation.....	60
2.8.11.	Vendor Metadata Extensions.....	60
3.	XML Service Description	61
4.	Test.....	68
Annex A	(normative) DIDL-Lite	69
Annex B	(normative) AV Working Committee Extended Properties.....	74
Annex C	(normative) AV Working Committee Class Definitions.....	84
C.1	audiolItem : item.....	85
C.1.1	musicTrack : audiolItem.....	86
C.1.2	audioBroadcast : audiolItem	86
C.1.3	audioBook : audiolItem	86
C.2	videolItem : item.....	87
C.2.1	movie : videolItem.....	87
C.2.2	videoBroadcast: videolItem.....	87
C.2.3	musicVideoClip: videolItem.....	88
C.3	imagelItem : item.....	88
C.3.1	photo: imagelItem	88
C.4	playlistItem : item.....	89
C.5	textlItem : item.....	90
C.6	album : container.....	90
C.6.1	musicAlbum : album	91
C.6.2	photoAlbum : album	91
C.7	genre : container	91
C.7.1	musicGenre : genre	91
C.7.2	movieGenre : genre	91
C.8	playlistContainer : container	92
C.9	person : container	92
C.9.1	musicArtist : person	92
C.10	storageSystem : container	93
C.11	storageVolume : container	93
C.12	storageFolder : container	94

LIST OF TABLES

Table 1: Terms	11
Table 2: Base properties.....	14
Table 3: Object properties	15
Table 4: Item properties.....	15
Table 5: Container properties	15
Table 6: CSV Examples	17
Table 7: State variables	18
Table 8: ContainerUpdateIDs Example	24
Table 9: Event moderation.....	25
Table 10: Actions.....	26
Table 11: Update examples.....	36
Table 12: Common error codes.....	44

INFORMATION TECHNOLOGY – UPNP DEVICE ARCHITECTURE –

Part 3-12: Audio Video Device Control Protocol – Content Directory Service

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.

IEC and ISO draw attention to the fact that it is claimed that compliance with this document may involve the use of patents as indicated below.

ISO and IEC take no position concerning the evidence, validity and scope of the putative patent rights. The holders of the putative patent rights have assured IEC and ISO that they are willing to negotiate free licences or licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statements of the holders of the putative patent rights are registered with IEC and ISO.

Intel Corporation has informed IEC and ISO that it has patent applications or granted patents.

Information may be obtained from:

Intel Corporation
Standards Licensing Department
5200 NE Elam Young Parkway
MS: JFS-98
USA – Hillsboro, Oregon 97124

Microsoft Corporation has informed IEC and ISO that it has patent applications or granted patents as listed below:

6101499 / US; 6687755 / US; 6910068 / US; 7130895 / US; 6725281 / US; 7089307 / US; 7069312 / US;
10/783 524 / US

Information may be obtained from:

Microsoft Corporation
One Microsoft Way
USA – Redmond WA 98052

Philips International B.V. has informed IEC and ISO that it has patent applications or granted patents.

Information may be obtained from:

Philips International B.V. – IP&S
High Tech campus, building 44 3A21
NL – 5656 Eindhoven

NXP B.V. (NL) has informed IEC and ISO that it has patent applications or granted patents.

Information may be obtained from:

NXP B.V. (NL)
High Tech campus 60
NL – 5656 AG Eindhoven

Matsushita Electric Industrial Co. Ltd. has informed IEC and ISO that it has patent applications or granted patents.

Information may be obtained from:

Matsushita Electric Industrial Co. Ltd.
1-3-7 Shiromi, Chuoh-ku
JP – Osaka 540-6139

Hewlett Packard Company has informed IEC and ISO that it has patent applications or granted patents as listed below:

5 956 487 / US; 6 170 007 / US; 6 139 177 / US; 6 529 936 / US; 6 470 339 / US; 6 571 388 / US; 6 205
466 / US

Information may be obtained from:

Hewlett Packard Company
1501 Page Mill Road
USA – Palo Alto, CA 94304

Samsung Electronics Co. Ltd. has informed IEC and ISO that it has patent applications or granted patents.

Information may be obtained from:

Digital Media Business, Samsung Electronics Co. Ltd.
416 Maetan-3 Dong, Yeongtang-Gu,
KR – Suwon City 443-742

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those identified above. IEC and ISO shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 29341-3-12 was prepared by UPnP Implementers Corporation 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 the ISO/IEC 29341 series, under the general title *Universal plug and play (UPnP) 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.

ORIGINAL UPNP DOCUMENTS (informative)

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. 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
UPnP Basic:1 Device	ISO/IEC 29341-2
UPnP AV Architecture:1	ISO/IEC 29341-3-1
UPnP MediaRenderer:1 Device	ISO/IEC 29341-3-2
UPnP MediaServer:1 Device	ISO/IEC 29341-3-3
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: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
UPnP AVTransport:2 Service	ISO/IEC 29341-4-10
UPnP ConnectionManager:2 Service	ISO/IEC 29341-4-11
UPnP ContentDirectory:2 Service	ISO/IEC 29341-4-12
UPnP RenderingControl:2 Service	ISO/IEC 29341-4-13
UPnP ScheduledRecording:1	ISO/IEC 29341-4-14
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 HVAC_ZoneThermostat:1 Device	ISO/IEC 29341-6-2
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 BinaryLight:1 Device	ISO/IEC 29341-7-1
UPnP DimmableLight:1 Device	ISO/IEC 29341-7-2
UPnP Dimming:1 Service	ISO/IEC 29341-7-10
UPnP SwitchPower:1 Service	ISO/IEC 29341-7-11
UPnP InternetGatewayDevice:1 Device	ISO/IEC 29341-8-1
UPnP LANDevice:1 Device	ISO/IEC 29341-8-2
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 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 WANPPPConnection:1 Service	ISO/IEC 29341-8-20
UPnP WLANConfiguration:1 Service	ISO/IEC 29341-8-21
UPnP Printer:1 Device	ISO/IEC 29341-9-1
UPnP Scanner:1.0 Device	ISO/IEC 29341-9-2
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 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 QOS v2 Schema Files	ISO/IEC 29341-11-2

UPnP Document Title	ISO/IEC 29341 Part
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 RemoteUIClientDevice:1 Device	ISO/IEC 29341-12-1
UPnP RemoteUIServerDevice:1 Device	ISO/IEC 29341-12-2
UPnP RemoteUIClient:1 Service	ISO/IEC 29341-12-10
UPnP RemoteUIServer:1 Service	ISO/IEC 29341-12-11
UPnP DeviceSecurity:1 Service	ISO/IEC 29341-13-10
UPnP SecurityConsole:1 Service	ISO/IEC 29341-13-11

1. Overview and Scope

This service template is compliant with the UPnP Device Architecture version 1.0. It defines a service type referred to herein as Content Directory Service (CDS).

1.1. Introduction

Many devices within the home network contain various types of content that other devices would like to access (e.g. music, videos, still images, etc). As an example, a “Media Server” device might contain a significant portion of the homeowner’s audio, video, and still-image library. In order for the homeowner to enjoy this content, the homeowner must be able to browse the objects stored on the Media Server, select a specific one, and cause it to be “played” on an appropriate rendering device (e.g. an audio player for music objects, a TV for video content, an Electronic Picture Frame for still-images, etc).

For maximum convenience, it is highly desirable to allow the homeowner to initiate these operations from a variety of UI devices. In most cases, these UI devices will either be a UI built into the rendering device, or it will be a stand-alone UI device such as a wireless PDA or tablet. In any case, it is unlikely that the homeowner will interact directly with the device containing the content (i.e. the homeowner won’t have to walk over to the server device). In order to enable this capability, the service device needs to provide a uniform mechanism for UI devices to browse the content on the server and to obtain detailed information about individual content objects. This is the purpose of the Content Directory Service

The Content Directory Service additionally provides a lookup/storage service that allows clients (e.g. UI devices) to locate (and possibly store) individual objects (e.g. songs, movies, pictures, etc) that the (server) device is capable of providing. For example, this service can be used to enumerate a list of songs stored on an MP3 player, a list of still-images comprising various slide-shows, a list of movies stored in a DVD-Jukebox, a list of TV shows currently being broadcast (a.k.a an EPG), a list of songs stored in a CD-Jukebox, a list of programs stored on a PVR (Personal Video Recorder) device, etc. Nearly any type of content can be enumerated via this Content Directory service. For those devices that contain multiple types of content (e.g. MP3, MPEG2, JPEG, etc), a single instance of the Content Directory Service can be used to enumerate all objects, regardless of their type.

2. Service Modeling Definitions

2.1. Service Type

The following service type identifies a service that is compliant with this template:

urn:[schemas-upnp-org:service](#):ContentDirectory:1

Content Directory Service (CDS) is used herein to refer to this service type.

2.2. References

This section lists the normative references used in this document and includes the tag inside square brackets that is used for each such reference:

[DEVICE] - UPnP Device Architecture, version 1.0.

[XML] - “Extensible Markup Language (XML) 1.0 (Second Edition)”, T. Bray, J. Paoli, C. M. Sperberg-McQueen, E. Maler, eds. W3C Recommendation, 6 October 2000. Available at: <http://www.w3.org/TR/2000/REC-xml-20001006>.

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

[DIDL] ISO/IEC CD 21000-2:2001, *Information Technology - Multimedia Framework - Part 2: Digital Item Declaration*, July 2001.

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