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Part 4-12: Audio Video Device Control Protocol –
Level 2 – Content Directory Service**

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CONTENTS

FOREWORD	14
ORIGINAL UPNP DOCUMENTS (informative)	16
1 Overview and Scope	18
1.1 Introduction	18
1.2 Notation	18
1.2.1 Data Types	19
1.2.2 Strings Embedded in Other Strings	19
1.2.3 Extended Backus-Naur Form	19
1.2.3.1 Typographic conventions for EBNF	19
1.3 Derived Data Types	20
1.3.1 Comma Separated Value (CSV) Lists	20
1.4 Management of XML Namespaces in Standardized DCPs	21
1.4.1 Namespace Prefix Requirements	23
1.4.2 Namespace Names, Namespace Versioning and Schema Versioning	24
1.4.3 Namespace Usage Examples	25
1.5 Vendor-defined Extensions	25
1.6 References	26
2 Service Modeling Definitions	29
2.1 Service Type	29
2.2 Terms	29
2.2.1 object	29
2.2.2 property	29
2.2.2.1 Multi-valued property	30
2.2.2.2 Single-valued property	30
2.2.3 class	30
2.2.4 <i>item</i>	30
2.2.5 <i>container</i>	30
2.2.6 container modification	30
2.2.7 XML Document	31
2.2.8 XML Fragment	31
2.2.9 <i>ContainerUpdateID</i>	31
2.2.10 <i>reference, reference item, referenced item</i>	31
2.2.11 <i>CDS feature</i>	32
2.3 State Variables	32
2.3.1 State Variable Overview	33
2.3.2 <i>SearchCapabilities</i>	34
2.3.3 <i>SortCapabilities</i>	34
2.3.4 <i>SortExtensionCapabilities</i>	34
2.3.5 <i>SystemUpdateID</i>	35
2.3.6 <i>ContainerUpdateIDs</i>	35
2.3.7 <i>TransferIDs</i>	36
2.3.8 <i>FeatureList</i>	36
2.3.9 <i>A ARG TYPE ObjectID</i>	37
2.3.10 <i>A ARG TYPE Result</i>	37
2.3.11 <i>A ARG TYPE SearchCriteria</i>	37
2.3.11.1 <i>SearchCriteria</i> String Syntax	37

2.3.11.2	<u>SearchCriteria</u> String Semantics and Examples	38
2.3.12	<u>A ARG TYPE BrowseFlag</u>	39
2.3.13	<u>A ARG TYPE Filter</u>	39
2.3.14	<u>A ARG TYPE SortCriteria</u>	40
2.3.15	<u>A ARG TYPE Index</u>	41
2.3.16	<u>A ARG TYPE Count</u>	41
2.3.17	<u>A ARG TYPE UpdateID</u>	41
2.3.18	<u>A ARG TYPE TransferID</u>	42
2.3.19	<u>A ARG TYPE TransferStatus</u>	42
2.3.20	<u>A ARG TYPE TransferLength</u>	42
2.3.21	<u>A ARG TYPE TransferTotal</u>	42
2.3.22	<u>A ARG TYPE TagValueList</u>	42
2.3.23	<u>A ARG TYPE URI</u>	42
2.4	Eventing and Moderation	43
2.5	Actions	44
2.5.1	<u>GetSearchCapabilities()</u>	45
2.5.1.1	Arguments	45
2.5.1.2	Dependency on State	45
2.5.1.3	Effect on State	45
2.5.1.4	Errors	45
2.5.2	<u>GetSortCapabilities()</u>	45
2.5.2.1	Arguments	45
2.5.2.2	Dependency on State	45
2.5.2.3	Effect on State	45
2.5.2.4	Errors	46
2.5.3	<u>GetSortExtensionCapabilities()</u>	46
2.5.3.1	Arguments	46
2.5.3.2	Dependency on State	46
2.5.3.3	Effect on State	46
2.5.3.4	Errors	46
2.5.4	<u>GetFeatureList()</u>	46
2.5.4.1	Arguments	46
2.5.4.2	Dependency on State	46
2.5.4.3	Effect on State	46
2.5.4.4	Errors	47
2.5.5	<u>GetSystemUpdateID()</u>	47
2.5.5.1	Arguments	47
2.5.5.2	Dependency on State	47
2.5.5.3	Effect on State	47
2.5.5.4	Errors	47
2.5.6	<u>Browse()</u>	47
2.5.6.1	Arguments	47
2.5.6.2	Dependency on State	48
2.5.6.3	Effect on State	48
2.5.6.4	Errors	49
2.5.7	<u>Search()</u>	49
2.5.7.1	Arguments	49
2.5.7.2	Dependency on State	50
2.5.7.3	Effect on State	50

2.5.7.4	Errors	50
2.5.8	<u>CreateObject()</u>	51
2.5.8.1	<u>res</u> Property Creation	51
2.5.8.2	Arguments	54
2.5.8.3	Dependency on State	54
2.5.8.4	Effect on State	54
2.5.8.5	Errors	55
2.5.9	<u>DestroyObject()</u>	55
2.5.9.1	Arguments	56
2.5.9.2	Dependency on State	56
2.5.9.3	Effect on State	56
2.5.9.4	Errors	56
2.5.10	<u>UpdateObject()</u>	56
2.5.10.1	Arguments	58
2.5.10.2	Dependency on State	58
2.5.10.3	Effect on State	58
2.5.10.4	Errors	59
2.5.11	<u>MoveObject()</u>	59
2.5.11.1	Arguments	60
2.5.11.2	Dependency on State	60
2.5.11.3	Effect on State	60
2.5.11.4	Errors	61
2.5.12	<u>ImportResource()</u>	61
2.5.12.1	Arguments	61
2.5.12.2	Dependency on State	62
2.5.12.3	Effect on State	62
2.5.12.4	Errors	62
2.5.13	<u>ExportResource()</u>	62
2.5.13.1	Arguments	62
2.5.13.2	Dependency on State	62
2.5.13.3	Effect on State	63
2.5.13.4	Errors	63
2.5.14	<u>DeleteResource()</u>	63
2.5.14.1	Arguments	63
2.5.14.2	Dependency on State	64
2.5.14.3	Effect on State	64
2.5.14.4	Errors	64
2.5.15	<u>StopTransferResource()</u>	64
2.5.15.1	Arguments	64
2.5.15.2	Dependency on State	64
2.5.15.3	Effect on State	64
2.5.15.4	Errors	64
2.5.16	<u>GetTransferProgress()</u>	65
2.5.16.1	Arguments	65
2.5.16.2	Dependency on State	65
2.5.16.3	Effect on State	65
2.5.16.4	Errors	65

2.5.17	<i>CreateReference()</i>	65
2.5.17.1	Arguments	66
2.5.17.2	Dependency on State	66
2.5.17.3	Effect on State	66
2.5.17.4	Errors	66
2.5.18	Non-Standard Actions Implemented by a UPnP Vendor	66
2.5.19	Common Error Codes	67
2.6	Theory of Operation (Informative)	69
2.6.1	Introduction	69
2.6.2	Content Setup for Browsing and Searching	69
2.6.3	Browsing	69
2.6.3.1	Retrieving Sort Capabilities	70
2.6.3.2	Browsing the Root Level Metadata	70
2.6.3.3	Browsing the Children of the Root Level	71
2.6.3.4	Browsing the Children of the My Music Folder	72
2.6.3.5	Browsing the Children of the Singles Soundtrack Music Album	72
2.6.3.6	Browsing the Children of the Album Art Folder	74
2.6.4	Searching	74
2.6.4.1	Retrieving Search Capabilities	75
2.6.4.2	Search for All Content Created by the performer Sting	75
2.6.4.3	Search for all Photos Taken During the Month of October	76
2.6.4.4	Search for All Objects in the My Photos Folder Containing the Word "Christmas"	77
2.6.4.5	Search for all <i>album</i> objects in the ContentDirectory service	77
2.6.5	Browsing, Searching, and References	79
2.6.5.1	Creating a reference to a photo in the Mexico Trip album inside the Christmas album	79
2.6.5.2	Search for All Photos Taken During the Month of October	79
2.6.5.3	Deletion of the Reference to the Photo in the Mexico Trip Album	80
2.6.6	Object Creation	80
2.6.6.1	Creating a New Object	80
2.6.6.2	Example: Creating a New MusicTrack in the Album1 (<i>@id</i> = 10)	80
2.6.7	Object Resource Binding (Importing a Resource)	81
2.6.7.1	Transfer Using the <i>ImportResource()</i> Action	81
2.6.7.2	Transfer Using Direct HTTP POST	82
2.6.8	Exporting ContentDirectory Resources	82
2.6.8.1	Transfer Using the <i>ExportResource()</i> Action	83
2.6.8.2	Transfer using HTTP GET	84
2.6.9	Playlist Manipulation	84
2.6.9.1	Playlist File Representation in the ContentDirectory Service	84
2.6.9.2	Playlist File Generation	84
2.6.10	Internet Content Representation	85
2.6.11	Bookmark Manipulation	86
2.6.11.1	<i>bookmarkItem</i> Example	86
2.6.11.2	Creating and Destroying Bookmarks	88
2.6.11.3	Browsing Bookmarks	92
2.6.12	Vendor Metadata Extensions	98
3	XML Service Description	99
4	Test	108

Annex A (normative) Schemas	109
A.1 DIDL-Lite	109
A.2 UPnP Elements	109
A.3 Dublin Core Subset Elements	109
A.4 <u>FeatureList</u> State Variable Schema.....	109
Annex B (normative) AV Working Committee Properties.....	110
B.1 Base Properties	110
B.1.1 <u>@id</u>	111
B.1.2 <u>@parentID</u>	111
B.1.3 <u>@refID</u>	111
B.1.4 <u>@restricted</u>	111
B.1.5 <u>@searchable</u>	111
B.1.6 <u>@childCount</u>	111
B.1.7 <u>dc:title</u>	112
B.1.8 <u>dc:creator</u>	112
B.1.9 <u>res</u>	112
B.1.10 <u>upnp:class</u>	112
B.1.10.1 allowedValueList for the <u>upnp:class</u> Property	113
B.1.10.2 <u>upnp:class@name</u>	114
B.1.11 <u>upnp:searchClass</u>	114
B.1.11.1 <u>upnp:searchClass@name</u>	114
B.1.11.2 <u>upnp:searchClass@includeDerived</u>	114
B.1.12 <u>upnp:createClass</u>	114
B.1.12.1 <u>upnp:createClass@name</u>	115
B.1.12.2 <u>upnp:createClass@includeDerived</u>	115
B.1.13 <u>upnp:writeStatus</u>	115
B.1.13.1 allowedValueList for the <u>upnp:writeStatus</u> Property.....	115
B.2 Resource Encoding Characteristics Properties.....	116
B.2.1 <u>res</u>	116
B.2.1.1 <u>res@protocolInfo</u>	116
B.2.1.2 <u>res@importUri</u>	117
B.2.1.3 <u>res@size</u>	117
B.2.1.4 <u>res@duration</u>	117
B.2.1.5 <u>res@protection</u>	117
B.2.1.6 <u>res@bitrate</u>	118
B.2.1.7 <u>res@bitsPerSample</u>	118
B.2.1.8 <u>res@sampleFrequency</u>	118
B.2.1.9 <u>res@nrAudioChannels</u>	118
B.2.1.10 <u>res@resolution</u>	118
B.2.1.11 <u>res@colorDepth</u>	118
B.2.1.12 <u>res@tspec</u>	119
B.2.1.13 <u>res@allowedUse</u>	119
B.2.1.14 <u>res@validityStart</u>	119
B.2.1.15 <u>res@validityEnd</u>	119
B.2.1.16 <u>res@remainingTime</u>	120
B.2.1.17 <u>res@usageInfo</u>	120
B.2.1.18 <u>res@rightsInfoURI</u>	120
B.2.1.19 <u>res@contentInfoURI</u>	120
B.2.1.20 <u>res@recordQuality</u>	120

B.3	Contributor-related Properties	121
B.3.1	<u>upnp:artist</u>	121
B.3.1.1	<u>upnp:artist@role</u>	121
B.3.2	<u>upnp:actor</u>	121
B.3.2.1	<u>upnp:actor@role</u>	121
B.3.3	<u>upnp:author</u>	121
B.3.3.1	<u>upnp:author@role</u>	122
B.3.4	<u>upnp:producer</u>	122
B.3.5	<u>upnp:director</u>	122
B.3.6	<u>dc:publisher</u>	122
B.3.7	<u>dc:contributor</u>	122
B.4	Affiliation-related Properties	122
B.4.1	<u>upnp:genre</u>	123
B.4.1.1	<u>upnp:genre@id</u>	123
B.4.1.2	<u>upnp:genre@extended</u>	123
B.4.2	<u>upnp:album</u>	123
B.4.3	<u>upnp:playlist</u>	123
B.5	Associated Resources Properties	123
B.5.1	<u>upnp:albumArtURI</u>	124
B.5.2	<u>upnp:artistDiscographyURI</u>	124
B.5.3	<u>upnp:lyricsURI</u>	124
B.5.4	<u>dc:relation</u>	124
B.6	Storage-Related Properties	124
B.6.1	<u>upnp:storageTotal</u>	124
B.6.2	<u>upnp:storageUsed</u>	124
B.6.3	<u>upnp:storageFree</u>	125
B.6.4	<u>upnp:storageMaxPartition</u>	125
B.6.5	<u>upnp:storageMedium</u>	125
B.6.5.1	allowedValueList for the <u>upnp:storageMedium</u> Property	125
B.7	General Description (mainly for UI purposes) Properties	125
B.7.1	<u>dc:description</u>	126
B.7.2	<u>upnp:longDescription</u>	126
B.7.3	<u>upnp:icon</u>	126
B.7.4	<u>upnp:region</u>	126
B.7.5	<u>upnp:rights</u>	126
B.7.6	<u>dc:date</u>	126
B.7.7	<u>dc:language</u>	127
B.7.8	<u>upnp:playbackCount</u>	127
B.7.9	<u>upnp:lastPlaybackTime</u>	127
B.7.10	<u>upnp:lastPlaybackPosition</u>	127
B.7.11	<u>upnp:recordedStartDateTime</u>	127
B.7.12	<u>upnp:recordedDuration</u>	127
B.7.13	<u>upnp:recordedDayOfWeek</u>	128
B.7.13.1	allowedValueList for the <u>upnp:recordedDayOfWeek</u> Property	128
B.7.14	<u>upnp:srsRecordScheduleID</u>	128
B.7.15	<u>upnp:srsRecordTaskID</u>	128
B.7.16	<u>upnp:recordable</u>	128

B.8	Recorded Object-related Properties.....	129
B.8.1	<u>upnp:programTitle</u>	129
B.8.2	<u>upnp:seriesTitle</u>	129
B.8.3	<u>upnp:programID</u>	130
B.8.3.1	<u>upnp:programID@type</u>	130
B.8.4	<u>upnp:seriesID</u>	130
B.8.4.1	<u>upnp:seriesID@type</u>	130
B.8.5	<u>upnp:channelID</u>	131
B.8.5.1	<u>upnp:channelID@type</u>	131
B.8.6	<u>upnp:episodeCount</u>	131
B.8.7	<u>upnp:episodeNumber</u>	131
B.8.8	<u>upnp:programCode</u>	132
B.8.8.1	<u>upnp:programCode@type</u>	132
B.8.9	<u>upnp:rating</u>	132
B.8.9.1	<u>upnp:rating@type</u>	132
B.8.10	<u>upnp:episodeType</u>	132
B.9	User Channel and EPG Related Properties.....	133
B.9.1	<u>upnp:channelGroupName</u>	133
B.9.1.1	<u>upnp:channelGroupName@id</u>	133
B.9.2	<u>upnp:callSign</u>	133
B.9.3	<u>upnp:networkAffiliation</u>	134
B.9.4	<u>upnp:serviceProvider</u>	134
B.9.5	<u>upnp:price</u>	134
B.9.5.1	<u>upnp:price@currency</u>	134
B.9.6	<u>upnp:payPerView</u>	134
B.9.7	<u>upnp:epgProviderName</u>	134
B.9.8	<u>upnp:dateTimeRange</u>	134
B.10	Radio Broadcast Properties.....	135
B.10.1	<u>upnp:radioCallSign</u>	135
B.10.2	<u>upnp:radioStationID</u>	135
B.10.3	<u>upnp:radioBand</u>	135
B.10.3.1	allowedValueList for the <u>upnp:radioBand</u> Property.....	135
B.11	Video Broadcast Properties.....	135
B.11.1	<u>upnp:channelNr</u>	136
B.11.2	<u>upnp:channelName</u>	136
B.11.3	<u>upnp:scheduledStartTime</u>	136
B.11.4	<u>upnp:scheduledEndTime</u>	136
B.12	Physical Tuner Status-related Properties.....	136
B.12.1	<u>upnp:signalStrength</u>	137
B.12.2	<u>upnp:signalLocked</u>	137
B.12.3	<u>upnp:tuned</u>	137
B.13	Bookmark-related Properties.....	137
B.13.1	<u>@neverPlayable</u>	138
B.13.2	<u>upnp:bookmarkID</u>	138
B.13.3	<u>upnp:bookmarkedObjectID</u>	138
B.13.4	<u>upnp:deviceUDN</u>	138
B.13.4.1	<u>upnp:deviceUDN@serviceType</u>	138
B.13.4.2	<u>upnp:deviceUDN@serviceId</u>	138
B.13.5	<u>upnp:stateVariableCollection</u>	139

B.13.5.1	<i>upnp:stateVariableCollection@serviceName</i>	139
B.13.5.2	<i>upnp:stateVariableCollection@rcsInstanceType</i>	139
B.14	Miscellaneous Properties	140
B.14.1	<i>upnp:DVDRegionCode</i>	140
B.14.2	<i>upnp:originalTrackNumber</i>	140
B.14.3	<i>upnp:toc</i>	140
B.14.4	<i>upnp:userAnnotation</i>	140
Annex C	(normative) AV Working Committee Class Definitions	141
C.1	Class Hierarchy	141
C.1.1	Class name syntax	142
C.1.2	Class Properties Overview	143
C.2	<i>object</i> (Base Class)	147
C.2.1	<i>item:object</i>	147
C.2.1.1	<i>imageItem:item</i>	147
C.2.1.2	<i>audioItem:item</i>	148
C.2.1.3	<i>videoItem:item</i>	149
C.2.1.4	<i>playlistItem:item</i>	151
C.2.1.5	<i>textItem:item</i>	152
C.2.1.6	<i>bookmarkItem:item</i>	153
C.2.1.7	<i>epgItem:item</i>	153
C.2.2	<i>container:object</i>	155
C.2.2.1	<i>person:container</i>	155
C.2.2.2	<i>playlistContainer:container</i>	156
C.2.2.3	<i>album:container</i>	157
C.2.2.4	<i>genre:container</i>	158
C.2.2.5	<i>channelGroup:container</i>	158
C.2.2.6	<i>epgContainer:container</i>	159
C.2.2.7	<i>storageSystem:container</i>	160
C.2.2.8	<i>storageVolume:container</i>	161
C.2.2.9	<i>storageFolder:container</i>	162
C.2.2.10	<i>bookmarkFolder:container</i>	162
Annex D	(normative) EBNF Syntax Definitions	163
D.1	Date&time Syntax	163
Annex E	(normative) CDS features	164
E.1	Requirements for the <i>EPG feature</i> , Version 1	165
E.2	Requirements for the <i>TUNER feature</i> , Version 1	166
E.3	Requirements for the <i>BOOKMARK feature</i> , Version 1	167

LIST OF TABLES

Table 1-1:	EBNF Operators	20
Table 1-2:	CSV Examples	21
Table 1-3:	Namespace Definitions	22
Table 1-4:	Schema-related Information	23
Table 1-5:	Default Namespaces for the AV Specifications.....	24
Table 2-1:	Properties in XML	29
Table 2-2:	State variables	33
Table 2-3:	Sort Modifiers	34
Table 2-4:	ContainerUpdateIDs Example	36
Table 2-5:	Event moderation	43
Table 2-6:	Actions	44
Table 2-7:	Arguments for <u>GetSearchCapabilities()</u>	45
Table 2-8:	Error Codes for <u>GetSearchCapabilities()</u>	45
Table 2-9:	Arguments for <u>GetSortCapabilities()</u>	45
Table 2-10:	Error Codes for <u>GetSortCapabilities()</u>	46
Table 2-11:	Arguments for <u>GetSortExtensionCapabilities()</u>	46
Table 2-12:	Error Codes for <u>GetSortExtensionCapabilities()</u>	46
Table 2-13:	Arguments for <u>GetFeatureList()</u>	46
Table 2-14:	Error Codes for <u>GetFeatureList()</u>	47
Table 2-15:	Arguments for <u>GetSystemUpdateID()</u>	47
Table 2-16:	Error Codes for <u>GetSystemUpdateID()</u>	47
Table 2-17:	Arguments for <u>Browse()</u>	48
Table 2-18:	Error Codes for <u>Browse()</u>	49
Table 2-19:	Arguments for <u>Search()</u>	50
Table 2-20:	Error Codes for <u>Search()</u>	50
Table 2-21:	Arguments for <u>CreateObject()</u>	54
Table 2-22:	Error codes for <u>CreateObject()</u>	55
Table 2-23:	Arguments for <u>DestroyObject()</u>	56
Table 2-24:	Error Codes for <u>DestroyObject()</u>	56
Table 2-25:	Update examples.....	58
Table 2-26:	Arguments for <u>UpdateObject()</u>	58
Table 2-27:	Error Codes for <u>UpdateObject()</u>	59
Table 2-28:	Arguments for <u>MoveObject()</u>	60
Table 2-29:	Error Codes for <u>MoveObject()</u>	61
Table 2-30:	Arguments for <u>ImportResource()</u>	61
Table 2-31:	Error Codes for <u>ImportResource()</u>	62
Table 2-32:	Arguments for <u>ExportResource()</u>	62

Table 2-33:	Error Codes for <i>ExportResource()</i>	63
Table 2-34:	Arguments for <i>DeleteResource()</i>	63
Table 2-35:	Error Codes for <i>DeleteResource()</i>	64
Table 2-36:	Arguments for <i>StopTransferResource()</i>	64
Table 2-37:	Error Codes for <i>StopTransferResource()</i>	64
Table 2-38:	Arguments for <i>GetTransferProgress()</i>	65
Table 2-39:	Error Codes for <i>GetTransferProgress()</i>	65
Table 2-40:	Arguments for <i>CreateReference()</i>	66
Table 2-41:	Error Codes for <i>CreateReference()</i>	66
Table 2-42:	Common error codes.....	67
Table B-1:	Base Properties Overview.....	110
Table B-2:	allowedValueList for the <i>upnp:class</i> Property.....	113
Table B-3:	allowedValueList for the <i>upnp:writeStatus</i> Property.....	115
Table B-4:	Resource Encoding Characteristics Properties Overview.....	116
Table B-5:	Contributor-related Properties Overview.....	121
Table B-6:	Affiliation-related Properties Overview.....	122
Table B-7:	Associated Resources Properties Overview.....	123
Table B-8:	Storage-Related Properties Overview.....	124
Table B-9:	General Description (mainly for UI purposes) Properties Overview.....	125
Table B-10:	allowedValueList for the <i>upnp:recordedDayOfWeek</i> Property.....	128
Table B-11:	Recorded Object-related Properties Overview.....	129
Table B-12:	User Channel and EPG Related Properties Overview.....	133
Table B-13:	Radio Broadcast Properties Overview.....	135
Table B-14:	allowedValueList for the <i>upnp:radioBand</i> Property.....	135
Table B-15:	Video Broadcast Properties Overview.....	135
Table B-16:	Physical Tuner Status-related Properties Overview.....	136
Table B-17:	Bookmark-related Properties Overview.....	137
Table B-18:	allowedValueList for the <i>upnp:stateVariableCollection@rcsInstanceType</i> Property.....	139
Table B-19:	Miscellaneous Properties Overview.....	140
Table C-1:	Class Properties Overview.....	143
Table C-2:	<i>object</i> Properties.....	147
Table C-3:	<i>item</i> Properties.....	147
Table C-4:	<i>imageItem:item</i> Properties.....	147
Table C-5:	<i>photo:imageItem</i> Properties.....	148
Table C-6:	<i>audioItem:item</i> Properties.....	148
Table C-7:	<i>musicTrack:audioItem</i> Properties.....	148
Table C-8:	<i>audioBroadcast:audioItem</i> Properties.....	149
Table C-9:	<i>audioBook:audioItem</i> Properties.....	149

Table C-10:	<u>videoItem:item</u> Properties	150
Table C-11:	<u>movie:videoItem</u> Properties	150
Table C-12:	<u>videoBroadcast:videoItem</u> Properties	151
Table C-13:	<u>musicVideoClip:videoItem</u> Properties	151
Table C-14:	<u>playlistItem:item</u> Properties	152
Table C-15:	<u>textItem:item</u> Properties	152
Table C-16:	<u>bookmarkItem:item</u> Properties	153
Table C-17:	<u>epgItem:item</u> Properties	153
Table C-18:	<u>audioProgram:epgItem</u> Properties	155
Table C-19:	<u>videoProgram:epgItem</u> Properties	155
Table C-20:	<u>container</u> Properties	155
Table C-21:	<u>person:container</u> Properties	155
Table C-22:	<u>musicArtist:person</u> Properties	156
Table C-23:	<u>playlistContainer:container</u> Properties	156
Table C-24:	<u>album:container</u> Properties	157
Table C-25:	<u>musicAlbum:album</u> Properties	157
Table C-26:	<u>photoAlbum:album</u> Properties	157
Table C-27:	<u>genre:container</u> Properties	158
Table C-28:	<u>channelGroup:container</u> Properties	159
Table C-29:	<u>epgContainer:container</u> Properties	160
Table C-30:	<u>storageSystem:container</u> Properties	161
Table C-31:	<u>storageVolume:container</u> Properties	161
Table C-32:	<u>storageFolder:container</u> Properties	162
Table C-33:	genre:container Properties	162
Table E-1:	<i>CDS features</i>	164
Table E-2:	REQUIRED characteristics of the <i>EPG Feature</i> element	165
Table E-3:	REQUIRED characteristics of the <i>TUNER Feature</i> element	166
Table E-4:	REQUIRED characteristics of the <i>BOOKMARK feature</i> element	167

LIST OF FIGURES

Figure 1: Class hierarchy for the item base class.	141
Figure 2: Class hierarchy for the container base class.	142

INFORMATION TECHNOLOGY – UPNP DEVICE ARCHITECTURE –

Part 4-11: Audio Video Device Control Protocol – Level 2 – Content Directory Service

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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 QosDevice:2 Service	ISO/IEC 29341-11-10

UPnP Document Title	ISO/IEC 29341 Part
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 ContentDirectory service.

1.1 Introduction

Many devices within the home network contain various types of content that other devices would like to access (for example, music, videos, still images, etc). As an example, a MediaServer 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 MediaServer, select a specific one, and cause it to be played on an appropriate rendering device (for example, 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 (that is: the homeowner won't have to walk over to the server device). In order to enable this capability, the server 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 ContentDirectory service.

The ContentDirectory service additionally provides a lookup/storage service that allows clients (for example, UI devices) to locate (and possibly store) individual objects (for example, 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 ContentDirectory service. For devices that contain multiple types of content (for example, MP3, MPEG2, JPEG, etc.), a single instance of the ContentDirectory service can be used to enumerate all objects, regardless of their type.

1.2 Notation

- In this document, features are described as Required, Recommended, or Optional as follows:

The key words "MUST," "MUST NOT," "REQUIRED," "SHALL," "SHALL NOT," "SHOULD," "SHOULD NOT," "RECOMMENDED," "MAY," and "OPTIONAL" in this specification are to be interpreted as described in [RFC 2119].

In addition, the following keywords are used in this specification:

PROHIBITED – The definition or behavior is an absolute prohibition of this specification. Opposite of **REQUIRED**.

CONDITIONALLY REQUIRED – The definition or behavior depends on a condition. If the specified condition is met, then the definition or behavior is **REQUIRED**, otherwise it is **PROHIBITED**.

CONDITIONALLY OPTIONAL – The definition or behavior depends on a condition. If the specified condition is met, then the definition or behavior is **OPTIONAL**, otherwise it is **PROHIBITED**.

These keywords are thus capitalized when used to unambiguously specify requirements over protocol and application features and behavior that affect the interoperability and security of implementations. When these words are not capitalized, they are meant in their natural-language sense.

- Strings that are to be taken literally are enclosed in "double quotes".
- Words that are emphasized are printed in *italic*.
- Keywords that are defined by the UPnP AV Working Committee are printed using the *forum* character style.
- Keywords that are defined by the UPnP Device Architecture are printed using the *arch* character style.
- A double colon delimiter, "::", signifies a hierarchical parent-child (parent::child) relationship between the two objects separated by the double colon. This delimiter is used in multiple contexts, for example: Service::Action(), Action()::Argument, parentProperty::childProperty.

1.2.1 Data Types

This specification uses data type definitions from two different sources. The UPnP Device Architecture defined data types are used to define state variable and action argument data types [DEVICE]. The XML Schema namespace is used to define property data types [XML SCHEMA-2].

For UPnP Device Architecture defined Boolean data types, it is strongly RECOMMENDED to use the value “0” for false, and the value “1” for true. However, when used as input arguments, the values “false”, “no”, “true”, “yes” may also be encountered and MUST be accepted. Nevertheless, it is strongly RECOMMENDED that all state variables and output arguments be represented as “0” and “1”.

For XML Schema defined Boolean data types, it is strongly RECOMMENDED to use the value “0” for false, and the value “1” for true. However, when used as input properties, the values “false”, “true” may also be encountered and MUST be accepted. Nevertheless, it is strongly RECOMMENDED that all properties be represented as “0” and “1”.

1.2.2 Strings Embedded in Other Strings

Some string variables and arguments described in this document contain substrings that MUST be independently identifiable and extractable for other processing. This requires the definition of appropriate substring delimiters and an escaping mechanism so that these delimiters can also appear as ordinary characters in the string and/or its independent substrings. This document uses embedded strings in two contexts – Comma Separated Value (CSV) lists (see Section 1.3.1, “Comma Separated Value (CSV) Lists”) and property values in search criteria strings. Escaping conventions use the backslash character, “\” (character code U+005C), as follows:

- a. Backslash (“\”) is represented as “\\” in both contexts.
- b. Comma (“,”) is
 1. represented as “\,” in individual substring entries in CSV lists
 2. not escaped in search strings
- c. Double quote (“””) is
 1. not escaped in CSV lists
 2. not escaped in search strings when it appears as the start or end delimiter of a property value
 3. represented as “\\” in search strings when it appears as a character that is part of the property value

1.2.3 Extended Backus-Naur Form

Extended Backus-Naur Form is used in this document for a formal syntax description of certain constructs. The usage here is according to the reference [EBNF].

1.2.3.1 Typographic conventions for EBNF

Non-terminal symbols are unquoted sequences of characters from the set of English upper and lower case letters, the digits “0” through “9”, and the hyphen (“-”). Character sequences between ‘single quotes’ are terminal strings and MUST appear literally in valid strings. Character sequences between (*comment delimiters*) are English language definitions or supplementary explanations of their associated symbols. White space in the EBNF is used to separate elements of the EBNF, not to represent white space in valid strings. White space usage in valid strings is described explicitly in the EBNF. Finally, the EBNF uses the following operators:

Table 1-1: EBNF Operators

Operator	Semantics
<code>:</code>	definition – the non-terminal symbol on the left is defined by one or more alternative sequences of terminals and/or non-terminals to its right.
<code> </code>	alternative separator – separates sequences on the right that are independently allowed definitions for the non-terminal on the left.
<code>*</code>	null repetition – means the expression to its left MAY occur zero or more times.
<code>+</code>	non-null repetition – means the expression to its left MUST occur at least once and MAY occur more times.
<code>[]</code>	optional – the expression between the brackets is optional.
<code>()</code>	grouping – groups the expressions between the parentheses.
<code>-</code>	character range – represents all characters between the left and right character operands inclusively.

1.3 Derived Data Types

This section defines a derived data type that is represented as a string data type with special syntax. This specification uses string data type definitions that originate from two different sources. The UPnP Device Architecture defined [string](#) data type is used to define state variable and action argument [string](#) data types. The XML Schema namespace is used to define property xsd:string data types. The following definition applies to both string data types.

1.3.1 Comma Separated Value (CSV) Lists

The UPnP AV services use state variables, action arguments and properties that represent lists – or one-dimensional arrays – of values. The UPnP Device Architecture, Version 1.0 [DEVICE], does not provide for either an array type or a list type, so a list type is defined here. Lists MAY either be homogeneous (all values are the same type) or heterogeneous (values of different types are allowed). Lists MAY also consist of repeated occurrences of homogeneous or heterogeneous subsequences, all of which have the same syntax and semantics (same number of values, same value types and in the same order). The data type of a homogeneous list is [string](#) or xsd:string and denoted by CSV (*x*), where *x* is the type of the individual values. The data type of a heterogeneous list is also [string](#) or xsd:string and denoted by CSV (*x, y, z*), where *x, y* and *z* are the types of the individual values. If the number of values in the heterogeneous list is too large to show each type individually, that variable type is represented as CSV (*heterogeneous*), and the variable description includes additional information as to the expected sequence of values appearing in the list and their corresponding types. The data type of a repeated subsequence list is [string](#) or xsd:string and denoted by CSV ({*x, y, z*}), where *x, y* and *z* are the types of the individual values in the subsequence and the subsequence MAY be repeated zero or more times.

- A list is represented as a [string](#) type (for state variables and action arguments) or xsd:string type (for properties).
- Commas separate values within a list.
- Integer values are represented in CSVs with the same syntax as the integer data type specified in [DEVICE] (that is: optional leading sign, optional leading zeroes, numeric ASCII)
- Boolean values are represented in state variable and action argument CSVs as either “[0](#)” for false or “[1](#)” for true. These values are a subset of the defined Boolean data type values specified in [DEVICE]: [0](#), [false](#), [no](#), [1](#), [true](#), [yes](#).
- Boolean values are represented in property CSVs as either “[0](#)” for false or “[1](#)” for true. These values are a subset of the defined Boolean data type values specified in [XML SCHEMA-2]: 0, false, 1, true.
- Escaping conventions for the comma and backslash characters are defined in Section 1.2.2, “Strings Embedded in Other Strings”.
- White space before, after, or interior to any numeric data type is not allowed.
- White space before, after, or interior to any other data type is part of the value.

Table 1-2: CSV Examples

Type refinement of string	Value	Comments
CSV (string) or CSV (xsd:string)	"-artist,-date"	List of 2 property sort criteria.
CSV (int) or CSV (xsd:integer)	"1,-5,006,0,+7"	List of 5 integers.
CSV (boolean) or CSV (xsd:Boolean)	"0,1,1,0"	List of 4 booleans
CSV (string) or CSV (xsd:string)	"Smith\, Fred,Jones\, Davey"	List of 2 names, "Smith, Fred" and "Jones, Davey"
CSV (i4 , string , ui2) or CSV (xsd:int, xsd:string, xsd:unsignedShort)	"-29837, string with leading blanks,0"	Note that the second value is " string with leading blanks"
CSV (i4) or CSV (xsd:int)	"3, 4"	Illegal CSV. White space is not allowed as part of an integer value.
CSV (string) or CSV (xsd:string)	" , "	List of 3 empty string values
CSV (heterogeneous)	"Alice,Marketing,5,Sue,R&D,21,Dave,Finance,7"	List of unspecified number of people and associated attributes. Each person is described by 3 elements: a name string , a department string and years-of-service ui2 or a name xsd:string, a department xsd:string and years-of-service xsd:unsignedShort.

1.4 Management of XML Namespaces in Standardized DCPs

UPnP specifications make extensive use of XML namespaces. This allows separate DCPs, and even separate components of an individual DCP, to be designed independently and still avoid name collisions when they share XML documents. Every name in an XML document belongs to exactly one namespace. In documents, XML names appear in one of two forms: qualified or unqualified. An unqualified name (or no-colon-name) contains no colon (":") characters. An unqualified name belongs to the document's default namespace. A qualified name is two no-colon-names separated by one colon character. The no-colon-name before the colon is the qualified name's namespace prefix, the no-colon-name after the colon is the qualified name's "local" name (meaning local to the namespace identified by the namespace prefix). Similarly, the unqualified name is a local name in the default namespace.

The formal name of a namespace is a URI. The namespace prefix used in an XML document is *not* the name of the namespace. The namespace name is, or should be, globally unique. It has a single definition that is accessible to anyone who uses the namespace. It has the same meaning anywhere that it is used, both inside and outside XML documents. The namespace prefix, however, in formal XML usage, is defined only in an XML document. It must be locally unique to the document. Any valid XML no-colon-name may be used. And, in formal XML usage, no two XML documents are ever required to use the same namespace prefix to refer to the same namespace. The creation and use of the namespace prefix was standardized by the W3C XML Committee in [XML-NMSP] strictly as a convenient local shorthand replacement for the full URI name of a namespace in individual documents.

All AV object properties are represented in XML by element and attribute names, therefore, all property names belong to an XML namespace.

For the same reason that namespace prefixes are convenient in XML documents, it is convenient in specification text to refer to namespaces using a namespace prefix. Therefore, this specification declares a “standard” prefix for all XML namespaces used herein. In addition, this specification expands the scope where these prefixes have meaning, beyond a single XML document, to all of its text, XML examples, and certain string-valued properties. This expansion of scope *does not* supersede XML rules for usage in documents, it only augments and complements them in important contexts that are out-of-scope for the XML specifications.

All of the namespaces used in this specification are listed in the Tables “Namespace Definitions” and “Schema-related Information”. For each such namespace, Table 1-3, “Namespace Definitions” gives a brief description of it, its name (a URI) and its defined “standard” prefix name. Some namespaces included in these tables are not directly used or referenced in this document. They are included for completeness to accommodate those situations where this specification is used in conjunction with other UPnP specifications to construct a complete system of devices and services. The individual specifications in such collections all use the same standard prefix. The standard prefixes are also used in Table 1-4, “Schema-related Information”, to cross-reference additional namespace information. This second table includes each namespace’s valid XML document root elements (if any), its schema file name, versioning information (to be discussed in more detail below), and links to the entries in the Reference section for its associated schema.

The normative definitions for these namespaces are the documents referenced in Table 1-3. The schemas are designed to support these definitions for both human understanding and as test tools. However, limitations of the XML Schema language itself make it difficult for the UPnP-defined schemas to accurately represent all details of the namespace definitions. As a result, the schemas will validate many XML documents that are not valid according to the specifications.

The Working Committee expects to continue refining these schemas after specification release to reduce the number of documents that are validated by the schemas while violating the specifications, but the schemas will still be informative, supporting documents. Some schemas might become normative in future versions of the specifications.

Table 1-3: Namespace Definitions

Standard Name-space Prefix	Namespace Name	Namespace Description	Normative Definition Document Reference
<i>AV Working Committee defined namespaces</i>			
av:	urn:schemas-upnp-org:av:av	Common data types for use in AV schemas	[AV-XSD]
avs:	urn:schemas-upnp-org:av:avs	Common structures for use in AV schemas	[AVS-XSD]
avdt:	urn:schemas-upnp-org:av:avdt	Datastructure Template	[AVDT]
avt-event:	urn:schemas-upnp-org:metadata-1-0/AVT/	Evented <i>LastChange</i> state variable for AVTransport	[AVT]
didl-lite:	urn:schemas-upnp-org:metadata-1-0/DIDL-Lite/	Structure and metadata for ContentDirectory	[CDS]
rcs-event:	urn:schemas-upnp-org:metadata-1-0/RCS/	Evented <i>LastChange</i> state variable for RenderingControl	[RCS]
srs:	urn:schemas-upnp-org:av:srs	Metadata and structure for ScheduledRecording	[SRS]
srs-event:	urn:schemas-upnp-org:av:srs-event	Evented <i>LastChange</i> state variable for ScheduledRecording	[SRS]
upnp:	urn:schemas-upnp-org:metadata-1-0/upnp/	Metadata for ContentDirectory	[CDS]
<i>Externally defined namespaces</i>			
dc:	http://purl.org/dc/elements/1.1/	Dublin Core	[DC-TERMS]
xsd:	http://www.w3.org/2001/XMLSchema	XML Schema Language 1.0	[XML SCHEMA-1] [XML SCHEMA-2]
xsi:	http://www.w3.org/2001/XMLSchema-instance	XML Schema Instance Document schema	Sections 2.6 & 3.2.7 of [XML SCHEMA-1]
xml:	http://www.w3.org/XML/1998/namespace	The “xml:” Namespace	[XML-NS]

Table 1-4: Schema-related Information

Standard Name-space Prefix	Relative URI and File Name		Schema Reference
	• Form 1	• Form 2	
Valid Root Element(s)			
AV Working Committee Defined Namespaces			
av:	- av-vn-yyyyymmdd.xsd - av-vn.xsd	n/a	[AV-XSD]
avs:	- avs-vn-yyyyymmdd.xsd - avs-vn.xsd	<Features> <stateVariableValuePairs>	[AVS-XSD]
avdt:	- avdt-vn-yyyyymmdd.xsd - avdt-vn.xsd	<AVDT>	[AVDT]
avt-event:	- avt-event-vn-yyyyymmdd.xsd - avt-event-vn.xsd	<Event>	[AVT-EVENT-XSD]
didl-lite:	- didl-lite-vn-yyyyymmdd.xsd - didl-lite-vn.xsd	<DIDL-Lite>	[DIDL-LITE-XSD]
rds-event:	- rds-event-vn-yyyyymmdd.xsd - rds-event-vn.xsd	<Event>	[RDS-EVENT-XSD]
srs:	- srs-vn-yyyyymmdd.xsd - srs-vn.xsd	<srs>	[SRS-XSD]
srs-event:	- srs-event-vn-yyyyymmdd.xsd - srs-event-vn.xsd	<StateEvent>	[SRS-EVENT-XSD]
upnp:	- upnp-vn-yyyyymmdd.xsd - upnp-vn.xsd	n/a	[UPNP-XSD]
Externally Defined Namespaces			
dc:	Absolute URL: http://dublincore.org/schemas/xmls/simpledc20021212.xsd		[DC-XSD]
xsd:	n/a	<schema>	[XMLSCHEMA-XSD]
xsi:	n/a		n/a
xml:	n/a		[XML-XSD]

1.4.1 Namespace Prefix Requirements

There are many occurrences in this specification of string data types that contain XML names (property names). These XML names in strings will not be processed under namespace-aware conditions. Therefore, all occurrences in instance documents of XML names in strings MUST use the standard namespace prefixes as declared in Table 1-3. In order to properly process the XML documents described herein, control points and devices MUST use namespace-aware XML processors [XML-NMSP] for both reading and writing. As allowed by [XML-NMSP], the namespace prefixes used in an instance document are at the sole discretion of the document creator. Therefore, the declared prefix for a namespace in a document MAY be different from the standard prefix. All devices MUST be able to correctly process any valid XML instance document, even when it uses a non-standard prefix for ordinary XML names. It is strongly RECOMMENDED that all devices use these standard prefixes for all instance documents to avoid confusion on the part of both human and machine readers. These standard prefixes are used in all descriptive text and all XML examples in this and related UPnP specifications. Also, each individual specification may assume a default namespace for its descriptive text. In that case, names from that namespace may appear with no prefix.

The assumed default namespace, if any, for each UPnP AV specification is given in Table 1-5, “Default Namespaces for the AV Specifications”.

Note: all UPnP AV schemas declare attributes to be “unqualified”, so namespace prefixes are never used with AV Working Committee defined attribute names.

Table 1-5: Default Namespaces for the AV Specifications

AV Specification Name	Default Namespace Prefix
AVTransport:2	avt-event:
ConnectionManager:2	<i>n/a</i>
ContentDirectory:2	didl-lite:
MediaRenderer:2	<i>n/a</i>
MediaServer:2	<i>n/a</i>
RenderingControl:2	rct-event:
ScheduledRecording:1	srs:

1.4.2 Namespace Names, Namespace Versioning and Schema Versioning

Each namespace that is defined by the AV Working Committee is named by a URN.

In order to enable both forward and backward compatibility, the UPnP TC has established the general policy that namespace names will not change with new versions of specifications, even when the specification changes the definition of a namespace. But, namespaces still have version numbers that reflect definitional changes. Each time the definition of a namespace is changed, the namespace's version number is incremented by one.

Therefore, namespace version information must be provided with each XML instance document so that the document's receiver can properly understand its meaning. This is achieved by the following rules:

- Every release of a schema is identified by a version number and date of the form “*n-yyyymmdd*”, where *n* corresponds to the namespace definition version number and *yyyymmdd* is the year, month and day in the Gregorian calendar that the schema is released.

For example, the new version numbers of the pre-existing “DIDL-Lite” and “upnp” schemas are “2”. Versions for new schemas, such as “srs” are “1”.

For each schema, the version-date will appear in two places:

1. In the schema file name, according to the naming structure shown in Table 1-4, “Schema-related Information”.
2. As the value of the `version` attribute of each schema's `schema` root element.

Namespaces are referenced in both schema and XML instance documents by namespace name. The namespace name appears as the value of an `xmlns` attribute. The `xmlns` attribute also declares a namespace prefix that will be used to qualify names from each namespace. Schemas are referenced in both schema and XML instance documents by URI in the `schemaLocation` attribute. See section 1.4.3, “Namespace Usage Examples”. Two different forms of URI are available, each with a different meaning. All UPnP AV-defined schema URIs share a common base path of “<http://www.upnp.org/schemas/av/>”. Each schema URI has two unique relative forms (see Table 1-4, “Schema-related Information”), according to which version of a namespace and its representative schema is of interest. The allowed relative URI forms are:

1. *schema-root-name* “-v” *version-date*
where *version-date* is a full version-date of the form *n-yyyymmdd*. This form references the schema whose “root” name (typically the standardized prefix name used for the namespace that the schema represents) and version-date match *schema-root-name* and *version-date*, respectively.
2. *schema-root-name* “-v” *version*
where *version* is an integer representing the namespace's version number. This form references the most recent version of the schema whose root name and namespace version number match *schema-root-name* and the *version*, respectively.

Usage rules for schema location URIs are as follows:

- All instance documents, whether generated by a service or a control point, MUST use Form 1.
- All UPnP AV published schemas that reference other UPnP AV schemas will also use Form 1.
- Validation of XML instance documents in UPnP AV systems potentially serves two purposes. The first is based on standard XML and XML Schema semantics: the document's creator asserts that the document is syntactically correct with respect to the referenced schema. The receiving processor can

confirm this with a validating parser that uses the referenced schema(s). The second is based on UPnP AV namespace semantics. The receiving processor knows that the XML instance document is supposed to conform to one or more specific UPnP AV specifications. Since the second context is actually the more important context for instance document processing, the receiving processor MAY validate the instance document against any version of a schema that satisfies its needs in assessing the acceptability of the received instance document.

1.4.3 Namespace Usage Examples

The `schemaLocation` attribute for XML instance documents comes from the XML Schema instance namespace “`http://www.w3.org/2002/XMLSchema-instance`”. A single occurrence of the attribute can declare the location of one or more schemas. The `schemaLocation` attribute value consists of a whitespace separated list of values: namespace name followed by its schema location URL. This pair-sequence is repeated as necessary for the schemas that need to be located for this instance document.

Example 1:

Sample *DIDL-Lite XML Document*. This document assumes version-date 2-20060531 of the “`didl-lite:`” namespace/schema combination and (a possible later) version 2-20061231 of “`upnp:`”. The lines with the gray background show how to express this versioning information in the instance document.

```
<?xml version="1.0" encoding="UTF-8"?>
<DIDL-Lite
  xmlns:dc="http://purl.org/dc/elements/1.1/"
  xmlns="urn:schemas-upnp-org:metadata-1-0/DIDL-Lite/"
  xmlns:upnp="urn:schemas-upnp-org:metadata-1-0/upnp/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:metadata-1-0/DIDL-Lite/
    http://www.upnp.org/schemas/av/didl-lite-v2-20060531.xsd
    urn:schemas-upnp-org:metadata-1-0/upnp/
    http://www.upnp.org/schemas/av/upnp-v2-20061231.xsd">
  <item id="18" parentID="13" restricted="0">
    ...
  </item>
</DIDL-Lite>
```

Example 2:

Sample *srs XML Document*. This document assumes version 1-20060531 of the “`srs:`” namespace/schema combination. Again, the lines with the gray background show how to express this versioning information in the instance document.

```
<?xml version="1.0" encoding="UTF-8"?>
<srs
  xmlns="urn:schemas-upnp-org:av:srs"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:srs
    http://www.upnp.org/schemas/av/srs-v1-20060531.xsd">
  ...
</srs>
```

1.5 Vendor-defined Extensions

Whenever vendors create additional vendor-defined state variables, actions or properties, their assigned names and XML representation MUST follow the naming conventions and XML rules as specified in [DEVICE], Section 2.5, “Description: Non-standard vendor extensions”.

1.6 References

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