ISO/IEC 29341-14-12:2011-09 (E)

Information technology - UPnP Device Architecture - Part 14-12: Audio Video Device Control Protocol - Level 3 - Audio Video Content Directory Service

Contents

Page

1 Overview and Scope 10
1.1 Introduction 10
1.2 Notation 10
1.2.1 Data Types 11
1.2.2 Strings Embedded in Other Strings 11
1.2.3 Extended Backus-Naur Form 11
1.3 Derived Data Types 12
1.3.1 Comma Separated Value (CSV) Lists 12
1.4 Management of XML Namespaces in Standardized DCPs 13
1.4.1 Namespace Prefix Requirements 16
1.4.2 Namespace Names, Namespace Versioning and Schema Versioning 17
1.4.3 Namespace Usage Examples 19
1.5 Vendor-defined Extensions 19
1.5.1 Vendor-defined Action Names 19
1.5.2 Vendor-defined State Variable Names 19
1.5.3 Vendor-defined XML Elements and attributes 20
1.5.4 Vendor-defined Property Names 20
1.6 References 20
2 Service Modeling Definitions 23
2.1 Service Type 23
2.2 Key Concepts 24
2.2.1 *On-line* and *Off-line* Network States 24
2.2.2 object 24
2.2.3 Object Identity 25
2.2.4 Object Lifetime 25
2.2.5 Object Modification 26
2.2.6 class 26
2.2.7 *item* 26
2.2.8 *container* 27
2.2.9 Container Modification 27
2.2.10 ContentDirectory Tracking Changes Option 27
2.2.11 *ContainerUpdateIDValue* Indicator 28
2.2.12 ContentDirectory Service Object Organization 29
2.2.13 Hierarchical location 29
2.2.14 Subtree 30
2.2.15 Subtree Updates 30
2.2.16 XML Document 31
2.2.17 XML Fragment 31
2.2.18 *DIDL-Lite XML Document* 32
2.2.19 *CDS View* 34
2.2.20 property 34
2.2.21 *reference*, *reference item*, *referenced item* 35
2.2.22 CDS feature 36
2.2.23 Metadata vs. Foreign Metadata 36
2.2.24 Embedded XML Documents 37

2.3 State Variables 37
2.3.1 State Variable Overview 37
2.3.2 *SearchCapabilities* 38
2.3.3 *SortCapabilities* 39
2.3.4 *SortExtensionCapabilities* 39
2.3.5 *SystemUpdateID* 39
2.3.6 *ContainerUpdateIDs* 41
2.3.7 *ServiceResetToken* 43
2.3.8 *LastChange* 44
2.3.9 *TransferIDs* 47
2.3.10 *FeatureList* 47
2.3.11 *A_ARG_TYPE_ObjectID* 48
2.3.12 *A_ARG_TYPE_Result* 48
2.3.13 *A_ARG_TYPE_SearchCriteria* 48
2.3.14 *A_ARG_TYPE_BrowseFlag* 50
2.3.15 *A_ARG_TYPE_Filter* 50
2.3.16 *A_ARG_TYPE_SortCriteria* 52
2.3.17 *A_ARG_TYPE_Index* 53
2.3.18 *A_ARG_TYPE_Count* 53
2.3.19 *A_ARG_TYPE_UpdateID* 53
2.3.20 *A_ARG_TYPE_TransferID* 53
2.3.21 *A_ARG_TYPE_TransferStatus* 53
2.3.22 *A_ARG_TYPE_TransferLength* 54
2.3.23 *A_ARG_TYPE_TransferTotal* 54
2.3.24 *A_ARG_TYPE_TagValueList* 54
2.3.25 *A_ARG_TYPE_URI* 54
2.3.26 *A_ARG_TYPE_CDSView* 54
2.3.27 *A_ARG_TYPE_QueryRequest* 54
2.3.28 *A_ARG_TYPE_QueryResult* 55
2.3.29 *A_ARG_TYPE_FFQCapabilities* 55
2.4 Eventing and Moderation 57
2.5 Actions 58
2.5.1 *GetSearchCapabilities()* 59
2.5.2 *GetSortCapabilities()* 60
2.5.3 *GetSortExtensionCapabilities()* 60
2.5.4 *GetFeatureList()* 61
2.5.5 *GetSystemUpdateID()* 61
2.5.6 *GetServiceResetToken()* 62
2.5.7 *Browse()* 62
2.5.8 *Search()* 64
2.5.9 *CreateObject()* 65
2.5.10 *DestroyObject()* 69
2.5.11 *UpdateObject()* 71
2.5.12 *MoveObject()* 76
2.5.13 *ImportResource()* 77
2.5.14 *ExportResource()* 78
2.5.15 *DeleteResource()* 79
2.5.16 *StopTransferResource()* 80
2.5.17 *GetTransferProgress()* 81

2.5.18 *CreateReference()* 82
2.5.19 *FreeFormQuery()* 82
2.5.20 *GetFreeFormQueryCapabilities()* 84
2.5.21 Non-Standard Actions Implemented by a UPnP Vendor 85
2.5.22 Common Error Codes 85
2.6 Theory of Operation (Informative) 86
2.6.1 Introduction 86
2.6.2 Generating Object ID Values 87
2.6.3 Content Setup for Browsing and Searching 87
2.6.4 Browsing 88
2.6.5 Searching 93
2.6.6 Browsing, Searching, and References 97
2.6.7 Object Creation 98
2.6.8 Object Resource Binding (Importing a Resource) 99
2.6.9 Exporting ContentDirectory Resources 101
2.6.10 Playlist Manipulation 102
2.6.11 Internet Content Representation 104
2.6.12 Bookmark Manipulation 104
2.6.13 Processing FreeForm Queries 116
2.6.14 Foreign Metadata 119
2.6.15 Monitoring Changes 121
XML Service Description 129
Test 138
Annex A (normative) Schemas 139
A.1 DIDL-Lite 139
A.2 UPnP Elements 139
A.3 Dublin Core Subset Elements 139
A.4 Event Schema 139
A.5 *FeatureList* State Variable Schema 139
Annex B (normative) AV Working Committee Properties 141
B.1 Base Properties 145
B.1.1 *@id* 146
B.1.2 *@parentID* 146
B.1.3 *@refID* 146
B.1.4 *@restricted* 147
B.1.5 *@searchable* 147
B.1.6 *@childCount* 147
B.1.7 *dc:title* 147
B.1.8 *dc:creator* 147
B.1.9 *res* 148
B.1.10 *upnp:class* 148
B.1.11 *upnp:searchClass* 149
B.1.12 *upnp:createClass* 150
B.1.13 *upnp:writeStatus* 151
B.2 Resource Encoding Characteristics Properties 151
B.2.1 *res* 152
B.3 Contributor-related Properties 157
B.3.1 *upnp:artist* 158

B.3.2 *upnp:actor* 158
B.3.3 *upnp:author* 158
B.3.4 *upnp:producer* 159
B.3.5 *upnp:director* 159
B.3.6 *dc:publisher* 159
B.3.7 *dc:contributor* 159
B.4 Affiliation-related Properties 159
B.4.1 *upnp:genre* 160
B.4.2 *upnp:album* 160
B.4.3 *upnp:playlist* 160
B.5 Associated Resources Properties 161
B.5.1 *upnp:albumArtURI* 161
B.5.2 *upnp:artistDiscographyURI* 161
B.5.3 *upnp:lyricsURI* 161
B.5.4 *dc:relation* 161
B.6 Storage-Related Properties 161
B.6.1 *upnp:storageTotal* 162
B.6.2 *upnp:storageUsed* 162
B.6.3 *upnp:storageFree* 162
B.6.4 *upnp:storageMaxPartition* 162
B.6.5 *upnp:storageMedium* 162
B.7 General Description (mainly for UI purposes) Properties 163
B.7.1 *dc:description* 163
B.7.2 *upnp:longDescription* 163
B.7.3 *upnp:icon* 164
B.7.4 *upnp:region* 164
B.7.5 *upnp:rights* 164
B.7.6 *dc:date* 164
B.7.7 *dc:language* 165
B.7.8 *upnp:playbackCount* 165
B.7.9 *upnp:lastPlaybackTime* 165
B.7.10 *upnp:lastPlaybackPosition* 166
B.7.11 *upnp:recordedStartDateTime* 166
B.7.12 *upnp:recordedDuration* 167
B.7.13 *upnp:recordedDayOfWeek* 167
B.7.14 *upnp:srsRecordScheduleID* 167
B.7.15 *upnp:srsRecordTaskID* 167
B.7.16 *upnp:recordable* 168
B.8 Recorded Object-related Properties 168
B.8.1 *upnp:programTitle* 168
B.8.2 *upnp:seriesTitle* 169
B.8.3 *upnp:programID* 169
B.8.4 *upnp:seriesID* 169
B.8.5 *upnp:channelID* 170
B.8.6 *upnp:episodeCount* 171
B.8.7 *upnp:episodeNumber* 171
B.8.8 *upnp:programCode* 171
B.8.9 *upnp:rating* 172
B.8.10 *upnp:episodeType* 172

B.9 User Channel and EPG Related Properties 173
B.9.1 *upnp:channelGroupName* 173
B.9.2 *upnp:callSign* 174
B.9.3 *upnp:networkAffiliation* 174
B.9.4 *upnp:serviceProvider* 174
B.9.5 *upnp:price* 174
B.9.6 *upnp:payPerView* 175
B.9.7 *upnp:epgProviderName* 175
B.9.8 *upnp:dateTimeRange* 175
B.10 Radio Broadcast Properties 176
B.10.1 *upnp:radioCallSign* 176
B.10.2 *upnp:radioStationID* 176
B.10.3 *upnp:radioBand* 176
B.11 Video Broadcast Properties 176
B.11.1 *upnp:channelNr* 177
B.11.2 *upnp:channelName* 177
B.11.3 *upnp:scheduledStartTime* 177
B.11.4 *upnp:scheduledEndTime* 178
B.11.5 *upnp:scheduledDuration* 179
B.12 Physical Tuner Status-related Properties 179
B.12.1 *upnp:signalStrength* 179
B.12.2 *upnp:signalLocked* 179
B.12.3 *upnp:tuned* 180
B.13 Bookmark-related Properties 180
B.13.1 *@neverPlayable* 180
B.13.2 *upnp:bookmarkID* 180
B.13.3 *upnp:bookmarkedObjectID* 181
B.13.4 *upnp:deviceUDN* 181
B.13.5 *upnp:stateVariableCollection* 181
B.14 Miscellaneous Properties 183
B.14.1 *upnp:DVDRegionCode* 183
B.14.2 *upnp:originalTrackNumber* 183
B.14.3 *upnp:toc* 183
B.14.4 *upnp:userAnnotation* 183
B.14.5 *desc* 183
B.15 Object Tracking Properties 184
B.15.1 *upnp:containerUpdateID* 184
B.15.2 *upnp:objectUpdateID* 185
B.15.3 *upnp:totalDeletedChildCount* 186
B.15.4 *res@updateCount* 186
B.16 Foreign Metadata-related Properties 186
B.16.1 *upnp:foreignMetadata* 187
Annex C (normative) AV Working Committee Class Definitions 194
C.1 Class Hierarchy 194
C.1.1 Class name syntax 195
C.1.2 Class Properties Overview 196
C.2 *object* (Base Class) 200
C.2.1 *item:object* 200
C.2.2 *container:object* 208

Annex D (normative) EBNF Syntax Definitions 215
D.1 Date&time Syntax 215
Annex E (normative) CDS features 216
E.1 Requirements for the *EPG feature*, Version 1 217
E.2 Requirements for the *TUNER feature*, Version 1 218
E.3 Requirements for the *BOOKMARK feature*, Version 1 218
E.4 Requirements for the *FOREIGN_METADATA feature*, Version 1 219
E.5 Requirements for the *FFQ feature*, Version 1 220
Annex F (informative) Example ContentDirectory Hierarchy 222

Figure 1 — ContentDirectory Service Object Organization. 29
Figure 2 — Flattened DIDL-Lite hierarchical structure. 33
Figure 3 — Class hierarchy for the item base class. 195
Figure 4 — Class hierarchy for the container base class. 195

Table 1-1 — EBNF Operators 12
Table 1-2 — CSV Examples 13
Table 1-3 — Namespace Definitions 14
Table 1-4 — Schema-related Information 15
Table 1-5 — Default Namespaces for the AV Specifications 16
Table 2-1 — Properties in XML 35
Table 2-2 — State variables 37
Table 2-3 — *SearchCapabilities* requirements for supporting *Tracking Changes Option* 38
Table 2-4 — Sort Modifiers 39
Table 2-5 — *ContainerUpdateIDs* Example 42
Table 2-6 — *ContainerUpdateIDs* Example 42
Table 2-7 — Event moderation 57
Table 2-8 — Actions 58
Table 2-9 — Arguments for *GetSearchCapabilities()* 59
Table 2-10 — Error Codes for *GetSearchCapabilities()* 59
Table 2-11 — Arguments for *GetSortCapabilities()* 60
Table 2-12 — Error Codes for *GetSortCapabilities()* 60
Table 2-13 — Arguments for *GetSortExtensionCapabilities()* 60
Table 2-14 — Error Codes for *GetSortExtensionCapabilities()* 60
Table 2-15 — Arguments for *GetFeatureList()* 61
Table 2-16 — Error Codes for *GetFeatureList()* 61
Table 2-17 — Arguments for *GetSystemUpdateID()* 61
Table 2-18 — Error Codes for *GetSystemUpdateID()* 61
Table 2-19 — Arguments for *GetServiceResetToken()* 62
Table 2-20 — Error Codes for *GetServiceResetToken()* 62
Table 2-21 — Arguments for *Browse()* 63
Table 2-22 — Error Codes for *Browse()* 63
Table 2-23 — Arguments for *Search()* 64
Table 2-24 — Error Codes for *Search()* 65

Table 2-25 — Arguments for *CreateObject()* 69
Table 2-26 — Error codes for *CreateObject()* 69
Table 2-27 — Arguments for *DestroyObject()* 70
Table 2-28 — Error Codes for *DestroyObject()* 71
Table 2-29 — Update examples 73
Table 2-30 — Arguments for *UpdateObject()* 75
Table 2-31 — Error Codes for *UpdateObject()* 75
Table 2-32 — Arguments for *MoveObject()* 77
Table 2-33 — Error Codes for *MoveObject()* 77
Table 2-34 — Arguments for *ImportResource()* 78
Table 2-35 — Error Codes for *ImportResource()* 78
Table 2-36 — Arguments for *ExportResource()* 79
Table 2-37 — Error Codes for *ExportResource()* 79
Table 2-38 — Arguments for *DeleteResource()* 80
Table 2-39 — Error Codes for *DeleteResource()* 80
Table 2-40 — Arguments for *StopTransferResource()* 80
Table 2-41 — Error Codes for *StopTransferResource()* 81
Table 2-42 — Arguments for *GetTransferProgress()* 81
Table 2-43 — Error Codes for *GetTransferProgress()* 81
Table 2-44 — Arguments for *CreateReference()* 82
Table 2-45 — Error Codes for *CreateReference()* 82
Table 2-46 — Arguments for *FreeFormQuery()* 83
Table 2-47 — Error Codes for *FreeFormQuery()* 84
Table 2-48 — Arguments for *GetFreeFormQueryCapabilities()* 84
Table 2-49 — Error Codes for *GetFreeFormQueryCapabilities()* 85
Table 2-50 — Common Error Codes 85
Table B.1 — ContentDirectory Service Properties Overview 141
Table B.2 — Base Properties Overview 145
Table B.3 — allowedValueList for the *upnp:class* Property 148
Table B.4 — allowedValueList for the *upnp:writeStatus* Property 151
Table B.5 — Resource Encoding Characteristics Properties Overview 151
Table B.6 — allowedValueList for the *res@daylightSaving* Property 157
Table B.7 — Contributor-related Properties Overview 157
Table B.8 — Affiliation-related Properties Overview 159
Table B.9 — Associated Resources Properties Overview 161
Table B.10 — Storage-Related Properties Overview 161
Table B.11 — General Description (mainly for UI purposes) Properties Overview 163
Table B.12 — allowedValueList for the upnp:recordedDayOfWeek Property 167
Table B.13 — Recorded Object-related Properties Overview 168
Table B.14 — User Channel and EPG Related Properties Overview 173
Table B.15 — Radio Broadcast Properties Overview 176
Table B.16 — allowedValueList for the *upnp:radioBand* Property 176
Table B.17 — Video Broadcast Properties Overview 176

Table B.18 — allowedValueList for the *upnp:scheduledStartTime@usage* Property 178
Table B.19 — Physical Tuner Status-related Properties Overview 179
Table B.20 — Bookmark-related Properties Overview 180
Table B.21 — allowedValueList for the upnp:stateVariableCollection@rcsInstanceType Property 182
Table B.22 — Miscellaneous Properties Overview 183
Table B.23 — Object Tracking Properties Overview 184
Table B.24 — Foreign Metadata-related Properties Overview 186
Table C.1 — Class Properties Overview 196
Table C.2 — *object* Properties 200
Table C.3 — *item* Properties 201
Table C.4 — *imageItem:item* Properties 201
Table C.5 — *photo:imageItem* Properties 201
Table C.6 — *audioItem:item* Properties 202
Table C.7 — *musicTrack:audioItem* Properties 202
Table C.8 — *audioBroadcast:audioItem* Properties 202
Table C.9 — *audioBook:audioItem* Properties 203
Table C.10 — *videoItem:item* Properties 203
Table C.11 — *movie:videoItem* Properties 203
Table C.12 — *videoBroadcast:videoItem* Properties 204
Table C.13 — *musicVideoClip:videoItem* Properties 204
Table C.14 — *playlistItem:item* Properties 205
Table C.15 — *textItem:item* Properties 205
Table C.16 — *bookmarkItem:item* Properties 206
Table C.17 — *epgItem:item* Properties 206
Table C.18 — *audioProgram:epgItem* Properties 207
Table C.19 — *videoProgram:epgItem* Properties 208
Table C.20 — *container* Properties 208
Table C.21 — *person:container* Properties 208
Table C.22 — *musicArtist:person* Properties 209
Table C.23 — *playlistContainer:container* Properties 209
Table C.24 — *album:container* Properties 209
Table C.25 — *musicAlbum:album* Properties 210
Table C.26 — *photoAlbum:album* Properties 210
Table C.27 — *genre:container* Properties 210
Table C.28 — *channelGroup:container* Properties 211
Table C.29 — *epgContainer:container* Properties 212
Table C.30 — *storageSystem:container* Properties 213
Table C.31 — *storageVolume:container* Properties 213
Table C.32 — *storageFolder:container* Properties 214
Table C.33 — genre:container Properties 214
Table E.1 — *CDS features* 216
Table E.2 — REQUIRED characteristics of the *EPG Feature* element 217

Table E.3 — REQUIRED characteristics of the *TUNER Feature* element 218
Table E.4 — REQUIRED characteristics of the *BOOKMARK feature* element 219
Table E.5 — REQUIRED characteristics of the *FOREIGN_METADATA Feature* element 220
Table E.6 — REQUIRED characteristics of the *FFQ Feature* element 221