INTERNATIONAL STANDARD

ISO/IEC 29341-20-12

First edition
2017-09

Information technology — UPnP Device Architecture —

Part 20-12: Audio video device control protocol — Level 4 — Content directory service

Technologies de l'information — Architecture de dispositif UPnP — Partie 20-12: Protocole de contrôle de dispositif audio-vidéo — Niveau 4 — Service d'Annuaire de contenu

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 29341-20-12:2017
https://standards.iteh.ai/catalog/standards/sist/f81ba8a5-4954-4625-a4df-85528cd38939/iso-iec-29341-20-12-2017

Reference number
ISO/IEC 29341-20-12:2017(E)

© ISO/IEC 2017

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/IEC 29341-20-12:2017
https://standards.iteh.ai/catalog/standards/sist/f81ba8a5-4954-4625-a4df-85528cd38939/iso-iec-29341-20-12-2017

COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2017, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

© ISO/IEC 2017 – All rights reserved

CONTENTS

1 Scope 1
2 Normative references 1
3 Terms, definitions, symbols and abbreviations....5
3.1 Provisioning terms 5
3.2 Symbols 5
4 Notations and Conventions 5
4.1 Notation 5
4.1.1 Data Types 6
4.1.2 Strings Embedded in Other Strings....6
4.1.3 Extended Backus-Naur Form....6
4.2 Derived Data Types 7
4.2.1 Summary 7
4.2.2 CSV Lists....7
4.3 Management of XML Namespaces in Standardized DCPs....8
4.3.1 Namespace Prefix Requirements....12
4.3.2 Namespace Names, Namespace Versioning and Schema Versioning 13
4.3.3 Namespace Usage Examples 15
4.4 Vendor-defined Extensions 15
4.4.1 Vendor-defined Action Names....15
4.4.2 Vendor-defined State Variable Names....15
4.4.3 Vendor-defined XML Elements and attributes 16
4.4.4 Vendor-defined Property Names....16
5 Service Modeling Definitions....16
5.1 Service Type 16
5.2 Key Concepts 16
5.2.1 *On-line* and *Off-line* Network States....16
5.2.2 object 16
5.2.3 Object Identity 17
5.2.4 Object Lifetime....18
5.2.5 Object Modification 18
5.2.6 class....19
5.2.7 *item* 19
5.2.8 *container* 19
5.2.9 Container Modification 19
5.2.10 ContentDirectory Tracking Changes Option 20
5.2.11 *ContainerUpdateIDValue* Indicator....20
5.2.12 ContentDirectory Service Object Organization 21
5.2.13 Hierarchical location 21
5.2.14 Subtree....22
5.2.15 Subtree Updates 22
5.2.16 XML Document 23
5.2.17 XML Fragment 23
5.2.18 DIDL-Lite XML Document....24
5.2.19 *CDS View* 25
5.2.20 *CDS Properties*....26

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 29341-20-12:2017
https://standards.iteh.ai/catalog/standards/sist/f81ba8a5-4954-4625-a4df-85528ed38939/iso-iec-29341-20-12-2017

5.2.21 *reference*, *reference item*, *referenced item* 27
5.2.22 *CDS feature* 28
5.2.23 Metadata vs. Foreign Metadata 28
5.2.24 Embedded XML Documents 28
5.2.25 Device Protection Option 28
5.2.26 Device Mode Option 30
5.2.27 Shortcut 30
5.3 State Variables 30
5.3.1 State Variable Overview 31
5.3.2 *SearchCapabilities* 32
5.3.3 *SortCapabilities* 32
5.3.4 *SortExtensionCapabilities* 33
5.3.5 *SystemUpdateID* 33
5.3.6 *ContainerUpdateIDs* 35
5.3.7 *ServiceResetToken* 36
5.3.8 *LastChange* 37
5.3.9 *TransferIDs* 41
5.3.10 *FeatureList* 41
5.3.11 *DeviceMode* 41
5.3.12 *DeviceModeStatus* 42
5.3.13 *PermissionsInfo* 43
5.3.14 *A_ARG_TYPE_ObjectID* 45
5.3.15 *A_ARG_TYPE_Result* 45
5.3.16 *A_ARG_TYPE_SearchCriteria* 45
5.3.17 *A_ARG_TYPE_BrowseFlag* 47
5.3.18 *A_ARG_TYPE_Filter* 47
5.3.19 *A_ARG_TYPE_SortCriteria* 49
5.3.20 *A_ARG_TYPE_Index* 50
5.3.21 *A_ARG_TYPE_Count* 50
5.3.22 *A_ARG_TYPE_UpdateID* 50
5.3.23 *A_ARG_TYPE_TransferID* 50
5.3.24 *A_ARG_TYPE_TransferStatus* 51
5.3.25 *A_ARG_TYPE_TransferLength* 51
5.3.26 *A_ARG_TYPE_TransferTotal* 51
5.3.27 *A_ARG_TYPE_TagValueList* 51
5.3.28 *A_ARG_TYPE_URI* 51
5.3.29 *A_ARG_TYPE_CDSView* 51
5.3.30 *A_ARG_TYPE_QueryRequest* 51
5.3.31 *A_ARG_TYPE_QueryResult* 52
5.3.32 *A_ARG_TYPE_FFQCapabilities* 53
5.3.33 *A_ARG_TYPE_CPID* 54
5.3.34 *A_ARG_TYPE_DeviceModeID* 55
5.3.35 *A_ARG_TYPE_DeviceModeRequest* 55
5.4 Eventing and Moderation 58
5.5 Actions 59
5.5.1 Action Overview 59
5.5.2 *GetSearchCapabilities()* 61
5.5.3 *GetSortCapabilities()* 61

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 29341-20-12:2017
https://standards.iteh.ai/catalog/standards/sist/f81ba8a5-4954-4625-a4df-e55d6e0a7c5a/iso-29341-20-12-2017

 © ISO/IEC 2017 – All rights reserved

5.5.4 GetSortExtensionCapabilities() 61
5.5.5 GetFeatureList() 62
5.5.6 GetSystemUpdateID() 62
5.5.7 GetServiceResetToken() 63
5.5.8 Browse() 63
5.5.9 Search() 65
5.5.10 CreateObject() 66
5.5.11 DestroyObject() 72
5.5.12 UpdateObject() 73
5.5.13 MoveObject() 79
5.5.14 ImportResource() 80
5.5.15 ExportResource() 81
5.5.16 DeleteResource() 82
5.5.17 StopTransferResource() 83
5.5.18 GetTransferProgress() 84
5.5.19 CreateReference() 84
5.5.20 FreeFormQuery() 85
5.5.21 GetFreeFormQueryCapabilities() 87
5.5.22 RequestDeviceMode() 88
5.5.23 ExtendDeviceMode() 89
5.5.24 CancelDeviceMode() 90
5.5.25 GetDeviceMode() 91
5.5.26 GetDeviceModeStatus() 91
5.5.27 GetPermissionsInfo() 92
5.5.28 Non-Standard Actions Implemented by a UPnP Vendor 92
5.5.29 Common Error Codes 92
6 XML Service Description 94
7 Test 106
Annex A (normative) Schemas 107
A.1 DIDL-Lite 107
A.2 UPnP Elements 107
A.3 Dublin Core Subset Elements 107
A.4 Event Schema 107
A.5 FeatureList State Variable Schema 107
Annex B (normative) AV Working Committee Properties 108
B.1 Base Properties 117
B.1.1 @id 117
B.1.2 @parentID 118
B.1.3 @refID 118
B.1.4 @restricted 118
B.1.5 @searchable 118
B.1.6 @childCount 118
B.1.7 @childContainerCount 118
B.1.8 dc:title 119
B.1.9 dc:creator 119
B.1.10 res 119
B.1.11 res@id 119
B.1.12 upnp:class 119

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 29341-20-12:2017
https://standards.iteh.ai/catalog/standards/sist/f81ba8a5-4954-4625-a4df-85528edd8939/iso-iec-29341-20-12-2017

B.1.13 *upnp:searchClass* 121
B.1.14 *upnp:createClass* 121
B.1.15 *upnp:writeStatus* 122
B.2 Resource Encoding Characteristics Properties 123
B.2.1 *res* 123
B.3 Resource Encoding Extension Properties 128
B.3.1 *upnp:resExt* 128
B.3.2 *upnp:resExt::uniqueContentIdentification* 129
B.4 Contributor-related Properties 130
B.4.1 *upnp:artist* 130
B.4.2 *upnp:actor* 130
B.4.3 *upnp:author* 130
B.4.4 *upnp:producer* 131
B.4.5 *upnp:director* 131
B.4.6 *dc:publisher* 131
B.4.7 *dc:contributor* 131
B.5 Affiliation-related Properties 131
B.5.1 *upnp:genre* 131
B.5.2 *upnp:album* 132
B.5.3 *upnp:playlist* 132
B.6 Associated Resources Properties 132
B.6.1 *upnp:albumArtURI* 132
B.6.2 *upnp:artistDiscographyURI* 133
B.6.3 *upnp:lyricsURI* 133
B.6.4 *dc:relation* 133
B.7 Storage-Related Properties 133
B.7.1 *upnp:storageTotal* 133
B.7.2 *upnp:storageUsed* 133
B.7.3 *upnp:storageFree* 133
B.7.4 *upnp:storageMaxPartition* 134
B.7.5 *upnp:storageMedium* 134
B.8 General Description (mainly for UI purposes) Properties 135
B.8.1 *dc:description* 135
B.8.2 *upnp:longDescription* 135
B.8.3 *upnp:icon* 135
B.8.4 *upnp:region* 136
B.8.5 *upnp:rights* 136
B.8.6 *dc:date* 136
B.8.7 *dc:language* 136
B.8.8 *upnp:playbackCount* 136
B.8.9 *upnp:lastPlaybackTime* 137
B.8.10 *upnp:lastPlaybackPosition* 137
B.8.11 *upnp:recordedStartDateTime* 137
B.8.12 *upnp:recordedEndDateTime* 138
B.8.13 *upnp:recordedDuration* 138
B.8.14 *upnp:recordedDayOfWeek* 138
B.8.15 *upnp:srsRecordScheduleID* 139
B.8.16 *upnp:srsRecordTaskID* 139

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 29341-20-12:2017
https://standards.iteh.ai/catalog/standards/sist/f81ba8a5-4954-4625-a4df-a5e2ad38939/iso-iec-29341-20-12-2017

 © ISO/IEC 2017 – All rights reserved

B.8.17 *upnp:recordable* 139
B.9 Recorded Object-related Properties 140
B.9.1 *upnp:programTitle* 140
B.9.2 *upnp:seriesTitle* 140
B.9.3 *upnp:programID* 141
B.9.4 *upnp:seriesID* 141
B.9.5 *upnp:channelID* 141
B.9.6 *upnp:episodeType* 143
B.9.7 *upnp:episodeCount* 143
B.9.8 *upnp:episodeNumber* 143
B.9.9 *upnp:episodeSeason* 143
B.9.10 *upnp:programCode* 143
B.9.11 *upnp:rating* 144
B.9.12 *upnp:recommendationID* 145
B.10 User Channel and EPG Related Properties 145
B.10.1 *upnp:channelGroupName* 145
B.10.2 *upnp:callSign* 146
B.10.3 *upnp:networkAffiliation* 146
B.10.4 *upnp:serviceProvider* 146
B.10.5 *upnp:price* 147
B.10.6 *upnp:payPerView* 147
B.10.7 *upnp:epgProviderName* 147
B.10.8 *upnp:dateTimeRange* 147
B.11 Preserved Program Properties 148
B.11.1 *upnp:programPreserved* 148
B.11.2 *upnp:preservedTimeRange* 149
B.11.3 *upnp:programList* 151
B.12 Radio Broadcast Properties 151
B.12.1 *upnp:radioCallSign* 151
B.12.2 *upnp:radioStationID* 151
B.12.3 *upnp:radioBand* 152
B.13 Video Broadcast Properties 152
B.13.1 *upnp:channelNr* 152
B.13.2 *upnp:channelName* 153
B.13.3 *upnp:scheduledStartTime* 153
B.13.4 *upnp:scheduledEndTime* 153
B.13.5 *upnp:scheduledDuration* 154
B.14 Physical Tuner Status-related Properties 154
B.14.1 *upnp:signalStrength* 154
B.14.2 *upnp:signalLocked* 154
B.14.3 *upnp:tuned* 155
B.15 MultiStream-related Properties 156
B.15.1 *upnp:resExt::isSyncAnchor* 157
B.15.2 *upnp:resExt::componentInfo* 157
B.16 Segmentation-related Properties 163
B.16.1 *upnp:segmentID* 164
B.16.2 *upnp:resExt::segmentInfo* 164
B.17 Bookmark-related Properties 166

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 29341-20-12:2017
https://standards.iteh.ai/catalog/standards/sist/f81ba8a5-4954-4625-a4df-ed38939/iso-iec-29341-20-12-2017

B.17.1 *@neverPlayable* 166
B.17.2 *upnp:bookmarkID* 167
B.17.3 *upnp:bookmarkedObjectID* 167
B.17.4 *upnp:deviceUDN* 167
B.17.5 *upnp:stateVariableCollection* 167
B.18 Miscellaneous Properties 168
B.18.1 *upnp:DVDRegionCode* 169
B.18.2 *upnp:originalTrackNumber* 169
B.18.3 *upnp:toc* 169
B.18.4 *upnp:userAnnotation* 169
B.18.5 *desc* 169
B.19 Object Tracking Properties 170
B.19.1 *upnp:containerUpdateID* 170
B.19.2 *upnp:objectUpdateID* 170
B.19.3 *upnp:totalDeletedChildCount* 171
B.19.4 *res@updateCount* 171
B.20 Permission Properties 172
B.20.1 *upnp:inclusionControl* 172
B.21 Ownership Properties 172
B.21.1 *upnp:objectOwner* 173
B.22 Object Linking Properties 174
B.22.1 *upnp:objectLink* 174
B.22.2 *upnp:objectLinkRef* 178
B.23 Foreign Metadata-related Properties 180
B.23.1 *upnp:foreignMetadata* 180
B.24 Synchronized Playback-related Properties 187
B.24.1 *upnp:resExt::clockSync* 187
B.25 DRMInfo-related Overview Properties 188
B.25.1 *upnp:resExt::DRMInfo* 188
Annex C (normative) AV Working Committee Class Definitions 189
C.1 Class Hierarchy 189
C.1.1 Class name syntax 190
C.1.2 Class Properties Overview 191
C.2 *object* (Base Class) 203
C.2.1 *item:object* 203
C.2.2 *container:object* 211
Annex D (Informative) Theory of Operation 219
D.1 Introduction 219
D.2 Generating Object ID Values 219
D.3 Content Setup for Browsing and Searching 220
D.4 Browsing 220
D.4.1 Retrieving Sort Capabilities 221
D.4.2 Browsing the Root Level Metadata 221
D.4.3 Browsing the Children of the Root Level 222
D.4.4 Browsing the Children of the My Music Folder 223
D.4.5 Browsing the Children of the Singles Soundtrack Music Album 223
D.4.6 Browsing the Children of the Album Art Folder 224
D.5 Searching 225

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 29341-20-12:2017
https://standards.iteh.ai/catalog/standards/sist/f81ba8a5-4954-4625-a4df-[illegible]/iso-iec-29341-20-12-2017

 © ISO/IEC 2017 – All rights reserved

D.5.1 Retrieving Search Capabilities 225
D.5.2 Search for All Content Created by the performer Sting 225
D.5.3 Search for all Photos Taken During the Month of October 227
D.5.4 Search for All Objects in the My Photos Folder Containing the Word "Christmas" 227
D.5.5 Search for all *album* objects in the ContentDirectory service 228
D.6 Browsing, Searching, and References 229
D.6.1 Creating a reference to a photo in the Mexico Trip album inside the Christmas album 229
D.6.2 Search for All Photos Taken During the Month of October 229
D.6.3 Deletion of the Reference to the Photo in the Mexico Trip Album 230
D.7 Object Creation 230
D.7.1 Creating a New Object 230
D.7.2 Creating a New MusicTrack 230
D.8 Object Resource Binding (Importing a Resource) 231
D.8.1 Transfer Using the *ImportResource()* Action 231
D.8.2 Transfer Using Direct HTTP POST 232
D.9 Exporting ContentDirectory Resources 232
D.9.1 Transfer Using the *ExportResource()* Action 233
D.9.2 Transfer using HTTP GET 234
D.10 Playlist Manipulation 234
D.10.1 Playlist File Representation in the ContentDirectory Service 234
D.10.2 Playlist File Generation 234
D.11 Internet Content Representation 236
D.12 Multi-component media representation 236
D.12.1 Creating a multi-component video object 238
D.12.2 Adding a component to a multi-component video object 240
D.13 Segments Manipulation 243
D.13.1 Segment Item Example 243
D.13.2 Creating, Destroying and Updating Segments 244
D.13.3 Browse and Search Segment Items 246
D.14 Bookmark Manipulation 246
D.14.1 *bookmarkItem* Example 246
D.14.2 Creating and Destroying Bookmarks 248
D.14.3 Browsing Bookmarks 252
D.15 Processing FreeForm Queries 257
D.15.1 Retrieving the title of all music albums 258
D.15.2 Retrieving the audio items of Album 1 258
D.15.3 Retrieving a limited number of photo items 259
D.16 Foreign Metadata 260
D.16.1 Determining the Supported Foreign Metadata Types 260
D.16.2 Determining Whether an Object Contains Foreign Metadata 261
D.17 Monitoring Changes 262
D.17.1 Monitoring Changes while *on-line* 263
D.17.2 Monitoring Changes while *off-line* 268
D.18 Browsing preserved transitory content 270
D.18.1 Browsing broadcast items with preserved history 270
D.18.2 Browsing program items indicating preserved history (EPG data available but not exposed to control point) 271

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 29341-20-12:2017
https://standards.iteh.ai/catalog/standards/sist/f81ba8a5-4954-4625-a4df-85528cd38939/iso-iec-29341-20-12-2017

D.18.3 Browsing program items for recording (EPG exposed to control point) 272
D.19 Object Linking 274
D.19.1 Displaying Object Link titles 274
D.19.2 Locating the head Object Link property of an Object Linked list 275
D.19.3 Starting an Object Linked presentation 275
D.19.4 Object Linking Example 275
D.20 *DEVICE_MODE feature* 282
D.20.1 Initiating and Managing *ActionBurst* mode 283
D.20.2 Initiating and Managing *ExclusiveOwnership* mode 287
D.21 Synchronized Playback 290
D.21.1 Precision Time Synchronized Playback for RTSP-RTP Transport 290
D.21.2 Precision Time Synchronized Playback for HTTP Transport 293
D.22 Usage of the *CONTAINER_SHORTCUTS feature* 294
Annex E (normative) EBNF Syntax Definitions 296
E.1 Summary 296
E.2 Date&time Syntax 296
Annex F (normative) *CDS features* 297
F.1 Requirements for the *EPG feature*, Version 1 298
F.2 Requirements for the *TUNER feature*, Version 1 299
F.3 Requirements for the *BOOKMARK feature*, Version 1 300
F.4 Requirements for the *FOREIGN_METADATA feature*, Version 1 300
F.5 Requirements for the *FFQ feature*, Version 1 301
F.6 Requirements for the *MULTI_STREAM feature*, Version 1 302
F.7 Requirements for the *SEGMENTATION feature*, Version 1 303
F.8 Requirements for the *DEVICE_MODE feature*, Version 1 304
F.9 Requirements for the *CLOCKSYNC feature*, Version 1 306
F.10 Requirements for the *CONTENT_PROTECTION feature*, Version 1 306
F.11 Requirements for the *CONTAINER_SHORTCUTS* feature, Version 1 307
Annex G (normative) *CONTENT_PROTECTION feature* 312
G.1 AV Roles for *CONTENT_PROTECTION* 312
G.1.1 Access at action level 313
G.1.2 Restrictable and Non-Restrictable Actions 313
G.1.3 *Action Level Access* using pre-defined AV *Roles* 314
G.1.4 Access at object level 315
G.1.5 *Role* assignments for unrecognized control points 316
G.1.6 Implicit role assignments 316
G.2 Behavior of actions with *CONTENT_PROTECTION feature* 317
G.2.1 *CreateObject()* action with *CONTENT_PROTECTION feature* 317
G.2.2 *UpdateObject()* action with *CONTENT_PROTECTION feature* 318
G.2.3 *Browse()* action with *CONTENT_PROTECTION feature* 319
G.2.4 *Search()* action with *CONTENT_PROTECTION feature* 319
G.2.5 *FreeFormQuery()* action with *CONTENT_PROTECTION feature* 320
G.2.6 *DestroyObject()* action with *CONTENT_PROTECTION feature* 320
G.2.7 *MoveObject()* action with *CONTENT_PROTECTION feature* 320
G.2.8 *DeleteResource()* action with *CONTENT_PROTECTION feature* 320
Annex H (informative) Content Authoring using Object Linking 321
H.1 Introduction 321
H.2 Object Linking Metadata Properties 321

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 29341-20-12:2017

 © ISO/IEC 2017 – All rights reserved

H.3 Table of Contents (Index) Lists 322
H.4 Playback and Step Lists 323
H.5 References between lists of items 324
H.6 Sharing items in multiple lists 324
H.7 Return Model 325
H.8 Control Point processing of Object Linked items 325
Annex I (informative) Example ContentDirectory Hierarchy 327
Annex J (informative) Bibliography 334

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 29341-20-12:2017
https://standards.iteh.ai/catalog/standards/sist/f81ba8a5-4954-4625-a4df-85528cd38939/iso-iec-29341-20-12-2017

© ISO/IEC 2017 – All rights reserved

List of Tables

Table 1 — EBNF Operators....7
Table 2 — CSV Examples....8
Table 3 — Namespace Definitions....9
Table 4 — Schema-related Information....11
Table 5 — Default Namespaces for the AV Specifications....13
Table 6 — Properties in XML....26
Table 7 — State variables....31
Table 8 — *SearchCapabilities* requirements for supporting *Tracking Changes Option*....32
Table 9 — Sort Modifiers....33
Table 10 — *ContainerUpdateIDs* Example....35
Table 11 — *ContainerUpdateIDs* Example....36
Table 12 — Event moderation....58
Table 13 — Actions....60
Table 14 — Arguments for *GetSearchCapabilities()*....61
Table 15 — Error Codes for *GetSearchCapabilities()*....61
Table 16 — Arguments for *GetSortCapabilities()*....61
Table 17 — Error Codes for *GetSortCapabilities()*....61
Table 18 — Arguments for *GetSortExtensionCapabilities()*....62
Table 19 — Error Codes for *GetSortExtensionCapabilities()*....62
Table 20 — Arguments for *GetFeatureList()*....62
Table 21 — Error Codes for *GetFeatureList()*....62
Table 22 — Arguments for *GetSystemUpdateID()*....62
Table 23 — Error Codes for *GetSystemUpdateID()*....63
Table 24 — Arguments for *GetServiceResetToken()*....63
Table 25 — Error Codes for *GetServiceResetToken()*....63
Table 26 — Arguments for *Browse()*....64
Table 27 — Error Codes for *Browse()*....65
Table 28 — Arguments for *Search()*....66
Table 29 — Error Codes for *Search()*....66
Table 30 — Arguments for *CreateObject()*....71
Table 31 — Error codes for *CreateObject()*....71
Table 32 — Arguments for *DestroyObject()*....73
Table 33 — Error Codes for *DestroyObject()*....73
Table 34 — Update examples....76
Table 35 — Arguments for *UpdateObject()*....78
Table 36 — Error Codes for *UpdateObject()*....78
Table 37 — Arguments for *MoveObject()*....80
Table 38 — Error Codes for *MoveObject()*....80
Table 39 — Arguments for *ImportResource()*....81
Table 40 — Error Codes for *ImportResource()*....81
Table 41 — Arguments for *ExportResource()*....82

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 29341-20-12:2017
https://standards.iteh.ai/catalog/standards/sist/f81ba8a5-4954-4625-a4df-85528cd38939/iso-iec-29341-20-12-2017

 © ISO/IEC 2017 – All rights reserved

Table 42 — Error Codes for *ExportResource()* 82
Table 43 — Arguments for *DeleteResource()* 83
Table 44 — Error Codes for *DeleteResource()* 83
Table 45 — Arguments for *StopTransferResource()* 83
Table 46 — Error Codes for *StopTransferResource()* 84
Table 47 — Arguments for *GetTransferProgress()* 84
Table 48 — Error Codes for *GetTransferProgress()* 84
Table 49 — Arguments for *CreateReference()* 85
Table 50 — Error Codes for *CreateReference()* 85
Table 51 — Arguments for *FreeFormQuery()* 86
Table 52 — Error Codes for *FreeFormQuery()* 87
Table 53 — Arguments for *GetFreeFormQueryCapabilities()* 87
Table 54 — Error Codes for *GetFreeFormQueryCapabilities()* 88
Table 55 — Arguments for *RequestDeviceMode()* 88
Table 56 — Error Codes for *RequestDeviceMode()* 89
Table 57 — Arguments for *ExtendDeviceMode()* 89
Table 58 — Error Codes for *ExtendDeviceMode()* 90
Table 59 — Arguments for *CancelDeviceMode()* 90
Table 60 — Error Codes for *CancelDeviceMode()* 91
Table 61 — Arguments for *GetDeviceMode()* 91
Table 62 — Error Codes for *GetDeviceMode()* 91
Table 63 — Arguments for *GetDeviceModeStatus()* 91
Table 64 — Error Codes for *GetDeviceModeStatus()* 92
Table 65 — Arguments for *GetPermissionsInfo()* 92
Table 66 — Error Codes for *GetPermissionsInfo()* 92
Table 67 — Common Error Codes 93
Table B.1 — ContentDirectory Service Properties Overview 108
Table B.2 — Base Properties Overview 117
Table B.3 — Allowed values for *upnp:class* 120
Table B.4 — Allowed values for *upnp:writeStatus* 122
Table B.5 — Resource Encoding Characteristics Properties Overview 123
Table B.6 — Allowed values for *res@daylightSaving* 128
Table B.7 — Resource Encoding Extension Properties Overview 128
Table B.9 — Contributor-related Properties Overview 130
Table B.10 — Affiliation-related Properties Overview 131
Table B.11 — Associated Resources Properties Overview 132
Table B.12 — Storage-Related Properties Overview 133
Table B.13 — General Description (mainly for UI purposes) Properties Overview 135
Table B.14 — Allowed values for *upnp:recordedDayOfWeek* 139
Table B.15 — Recorded Object-related Properties Overview 140
Table B.16 — User Channel and EPG Related Properties Overview 145
Table B.17 — Preserved Program Properties Overview 148
Table B.18 — Allowed values for *upnp:programPreserved* 148

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 29341-20-12:2017
https://standards.iteh.ai/catalog/standards/sist/81ba8a5-4954-4625-a4df-
ISO/IEC 29341-20-12:2017

Table B.19 — Radio Broadcast Properties Overview 151
Table B.20 — Allowed values for *upnp:radioBand* 152
Table B.21 — Video Broadcast Properties Overview 152
Table B.22 — Allowed values for *upnp:scheduledStartTime@usage* 153
Table B.23 — Physical Tuner Status-related Properties Overview 154
Table B.24 — MultiStream Properties Overview 156
Table B.25 — Allowed values for *upnp:resExt::componentInfo::componentGroup ::component::componentClass* 159
Table B.26 — Segmentation-related Properties Overview 163
Table B.27 — Bookmark-related Properties Overview 166
Table B.28 — Allowed values for *upnp:stateVariableCollection@rcsInstanceType* 168
Table B.29 — Miscellaneous Properties Overview 168
Table B.30 — Object Tracking Properties Overview 170
Table B.31 — Permission Properties Overview 172
Table B.32 — Ownership Properties Overview 172
Table B.33 — Object Linking Properties Overview 174
Table B.34 — Allowed values for *upnp:objectLink::mode* 176
Table B.35 — Allowed values for *upnp:objectLink::relatedInfo@role* 177
Table B.36 — Allowed values for *upnp:objectLink::endAction@action* 178
Table B.37 — Allowed values for *upnp:objectLinkRef::relatedInfo@role* 180
Table B.38 — Foreign Metadata-related Properties Overview 180
Table B.39 — Synchronized Playback Properties Overview 187
Table B.40 — DRMInfo-Related Properties Overview 188
Table C.1 — Class Properties Overview 191
Table C.2 — *object* Properties 203
Table C.3 — *item* Properties 203
Table C.4 — *imageItem:item* Properties 204
Table C.5 — *photo:imageItem* Properties 204
Table C.6 — *audioItem:item* Properties 204
Table C.7 — *musicTrack:audioItem* Properties 205
Table C.8 — *audioBroadcast:audioItem* Properties 205
Table C.9 — *audioBook:audioItem* Properties 205
Table C.10 — *videoItem:item* Properties 206
Table C.11 — *movie:videoItem* Properties 206
Table C.12 — *videoBroadcast:videoItem* Properties 207
Table C.13 — *musicVideoClip:videoItem* Properties 207
Table C.14 — *playlistItem:item* Properties 208
Table C.15 — *textItem:item* Properties 208
Table C.16 — *bookmarkItem:item* Properties 209
Table C.17 — *epgItem:item* Properties 210
Table C.18 — *audioProgram:epgItem* Properties 211
Table C.19 — *videoProgram:epgItem* Properties 211
Table C.20 — *container* Properties 212

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 29341-20-12:2017
https://standards.iteh.ai/catalog/standards/sist/f81ba8a5-4954-4625-a4df-85528cd58939/iso-iec-29341-20-12-2017

 © ISO/IEC 2017 – All rights reserved

Table C.21 — *person:container* Properties 212
Table C.22 — *musicArtist:person* Properties 212
Table C.23 — *playlistContainer:container* Properties 213
Table C.24 — *album:container* Properties 213
Table C.25 — *musicAlbum:album* Properties 214
Table C.26 — *photoAlbum:album* Properties 214
Table C.27 — *genre:container* Properties 214
Table C.28 — *channelGroup:container* Properties 215
Table C.29 — *epgContainer:container* Properties 216
Table C.30 — *storageSystem:container* Properties 217
Table C.31 — *storageVolume:container* Properties 217
Table C.32 — *storageFolder:container* Properties 218
Table C.33 — genre:container Properties 218
Table F.1 — *CDS features* 298
Table F.2 — Required characteristics of the *EPG feature* element 299
Table F.3 — Required characteristics of the *TUNER feature* element 299
Table F.4 — Required characteristics of the *BOOKMARK feature* element 300
Table F.5 — Required characteristics of the *FOREIGN_METADATA feature* element 301
Table F.6 — Required characteristics of the *FFQ feature* element 302
Table F.7 — Required characteristics of the *MULTI_STREAM feature* element 303
Table F.8 — Required characteristics of the *SEGMENTATION feature* element 304
Table F.9 — Required characteristics of the *DEVICE_MODE feature* element 305
Table F.10 — Required characteristics of the *CLOCKSYNC feature* element 306
Table F.11 — Required characteristics of the *CONTENT_PROTECTION feature* element 307
Table F.12 — Required characteristics of the *CONTAINER_SHORTCUTS feature* element 307
Table F.13 — Allowed values for the Shortcut Name element 308
Table G.1 — Pre-defined *AV Roles* and *Public* 312
Table G.2 — Error Codes for *Action Level Access* 313
Table G.3 — Pre-defined settings for *Restrictable and Non-Restrictable* AV Actions 314
Table G.4 — Pre-defined AV Action to AV *Role* permissions mapping 315
Table G.5 — Error Codes for *Object Level Access* 317
Table G.6 — Error Codes for *CreateObject()* and *UpdateObject()* action with *upnp:objectOwner* and *upnp:objectOwner* property 319
Table G.7 — Error Codes for *MoveObject()* action with *CONTENT_PROTECTION feature* 320
Table G.8 — Error Codes for *DeleteResource()* action with *CONTENT_PROTECTION feature* 320

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 29341-20-12:2017
https://standards.iteh.ai/catalog/standards/sist/81b8a8a5-4954-4625-a4df-