

---

---

**Information technology — UPnP  
Device Architecture —**  
**Part 20-10:**  
**Audio video device control  
protocol — Level 4 — Audio video  
transport service**

*Technologies de l'information — Architecture de dispositif UPnP —  
Partie 20-10: Protocole de contrôle de dispositif audio-vidéo —  
Niveau 4 — Service de transport audio-vidéo*



IECNORM.COM : Click to view the full PDF of ISO/IEC 29341-20-10:2017



**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

## CONTENTS

|          |                                                                   |           |
|----------|-------------------------------------------------------------------|-----------|
| <b>1</b> | <b>Scope .....</b>                                                | <b>1</b>  |
| <b>2</b> | <b>Normative references .....</b>                                 | <b>1</b>  |
| <b>3</b> | <b>Terms, definitions, symbols and abbreviations .....</b>        | <b>4</b>  |
| 3.1      | Provisioning terms .....                                          | 4         |
| 3.2      | Symbols .....                                                     | 5         |
| <b>4</b> | <b>Notations and Conventions .....</b>                            | <b>5</b>  |
| 4.1      | Notation .....                                                    | 5         |
| 4.1.1    | Data Types .....                                                  | 5         |
| 4.1.2    | Strings Embedded in Other Strings .....                           | 5         |
| 4.1.3    | Extended Backus-Naur Form .....                                   | 6         |
| 4.2      | Derived Data Types .....                                          | 6         |
| 4.2.1    | Summary .....                                                     | 6         |
| 4.2.2    | CSV Lists .....                                                   | 6         |
| 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        |
| <b>5</b> | <b>Service Modeling Definitions .....</b>                         | <b>16</b> |
| 5.1      | ServiceType .....                                                 | 16        |
| 5.2      | State Variables .....                                             | 16        |
| 5.2.1    | State Variable Overview .....                                     | 16        |
| 5.2.2    | <u>TransportState</u> .....                                       | 18        |
| 5.2.3    | <u>TransportStatus</u> .....                                      | 19        |
| 5.2.4    | <u>CurrentMediaCategory</u> .....                                 | 19        |
| 5.2.5    | <u>PlaybackStorageMedium</u> .....                                | 19        |
| 5.2.6    | <u>RecordStorageMedium</u> .....                                  | 21        |
| 5.2.7    | <u>PossiblePlaybackStorageMedia</u> .....                         | 21        |
| 5.2.8    | <u>PossibleRecordStorageMedia</u> .....                           | 21        |
| 5.2.9    | <u>CurrentPlayMode</u> .....                                      | 21        |
| 5.2.10   | <u>TransportPlaySpeed</u> .....                                   | 21        |
| 5.2.11   | <u>RecordMediumWriteStatus</u> .....                              | 21        |
| 5.2.12   | <u>CurrentRecordQualityMode</u> .....                             | 22        |
| 5.2.13   | <u>PossibleRecordQualityModes</u> .....                           | 22        |
| 5.2.14   | <u>NumberOfTracks</u> .....                                       | 22        |
| 5.2.15   | <u>CurrentTrack</u> .....                                         | 23        |
| 5.2.16   | <u>CurrentTrackDuration</u> .....                                 | 23        |
| 5.2.17   | <u>CurrentMediaDuration</u> .....                                 | 23        |
| 5.2.18   | <u>CurrentTrackMetaData</u> .....                                 | 24        |
| 5.2.19   | <u>CurrentTrackURI</u> .....                                      | 24        |
| 5.2.20   | <u>AVTransportURI</u> .....                                       | 24        |

|        |                                           |    |
|--------|-------------------------------------------|----|
| 5.2.21 | <u>AVTransportURIMetaData</u>             | 24 |
| 5.2.22 | <u>NextAVTransportURI</u>                 | 24 |
| 5.2.23 | <u>NextAVTransportURIMetaData</u>         | 24 |
| 5.2.24 | <u>RelativeTimePosition</u>               | 25 |
| 5.2.25 | <u>AbsoluteTimePosition</u>               | 25 |
| 5.2.26 | <u>RelativeCounterPosition</u>            | 25 |
| 5.2.27 | <u>AbsoluteCounterPosition</u>            | 25 |
| 5.2.28 | <u>CurrentTransportActions</u>            | 26 |
| 5.2.29 | <u>LastChange</u>                         | 26 |
| 5.2.30 | <u>DRMState</u>                           | 26 |
| 5.2.31 | <u>SyncOffset</u>                         | 27 |
| 5.2.32 | <u>A ARG TYPE SeekMode</u>                | 28 |
| 5.2.33 | <u>A ARG TYPE SeekTarget</u>              | 28 |
| 5.2.34 | <u>A ARG TYPE InstanceID</u>              | 29 |
| 5.2.35 | <u>A ARG TYPE DeviceUDN</u>               | 29 |
| 5.2.36 | <u>A ARG TYPE ServiceType</u>             | 29 |
| 5.2.37 | <u>A ARG TYPE ServiceID</u>               | 29 |
| 5.2.38 | <u>A ARG TYPE StateVariableValuePairs</u> | 29 |
| 5.2.39 | <u>A ARG TYPE StateVariableList</u>       | 30 |
| 5.2.40 | <u>A ARG TYPE PlaylistData</u>            | 30 |
| 5.2.41 | <u>A ARG TYPE PlaylistDataLength</u>      | 30 |
| 5.2.42 | <u>A ARG TYPE PlaylistOffset</u>          | 30 |
| 5.2.43 | <u>A ARG TYPE PlaylistTotalLength</u>     | 30 |
| 5.2.44 | <u>A ARG TYPE PlaylistMIMEType</u>        | 31 |
| 5.2.45 | <u>A ARG TYPE PlaylistExtendedType</u>    | 31 |
| 5.2.46 | <u>A ARG TYPE PlaylistStep</u>            | 31 |
| 5.2.47 | <u>A ARG TYPE PlaylistType</u>            | 31 |
| 5.2.48 | <u>A ARG TYPE PlaylistInfo</u>            | 32 |
| 5.2.49 | <u>A ARG TYPE PlaylistStartObjID</u>      | 35 |
| 5.2.50 | <u>A ARG TYPE PlaylistStartGroupID</u>    | 35 |
| 5.2.51 | <u>A ARG TYPE SyncOffsetAdj</u>           | 35 |
| 5.2.52 | <u>A ARG TYPE PresentationTime</u>        | 36 |
| 5.2.53 | <u>A ARG TYPE ClockID</u>                 | 36 |
| 5.3    | Eventing and Moderation                   | 36 |
| 5.3.1  | Eventing and Moderation Overview          | 36 |
| 5.3.2  | Event Model                               | 38 |
| 5.4    | Actions                                   | 39 |
| 5.4.1  | Action Overview                           | 39 |
| 5.4.2  | <u>SetAVTransportURI()</u>                | 41 |
| 5.4.3  | <u>SetNextAVTransportURI()</u>            | 42 |
| 5.4.4  | <u>GetMediaInfo()</u>                     | 44 |
| 5.4.5  | <u>GetMediaInfo Ext()</u>                 | 45 |
| 5.4.6  | <u>GetTransportInfo()</u>                 | 45 |
| 5.4.7  | <u>GetPositionInfo()</u>                  | 46 |
| 5.4.8  | <u>GetDeviceCapabilities()</u>            | 47 |
| 5.4.9  | <u>GetTransportSettings()</u>             | 47 |
| 5.4.10 | <u>Stop()</u>                             | 48 |
| 5.4.11 | <u>Play()</u>                             | 49 |
| 5.4.12 | <u>Pause()</u>                            | 50 |

|                              |                                                       |           |
|------------------------------|-------------------------------------------------------|-----------|
| 5.4.13                       | <u>Record()</u>                                       | 51        |
| 5.4.14                       | <u>Seek()</u>                                         | 52        |
| 5.4.15                       | <u>Next()</u>                                         | 54        |
| 5.4.16                       | <u>Previous()</u>                                     | 55        |
| 5.4.17                       | <u>SetPlayMode()</u>                                  | 56        |
| 5.4.18                       | <u>SetRecordQualityMode()</u>                         | 57        |
| 5.4.19                       | <u>GetCurrentTransportActions()</u>                   | 57        |
| 5.4.20                       | <u>GetDRMState()</u>                                  | 58        |
| 5.4.21                       | <u>GetStateVariables()</u>                            | 58        |
| 5.4.22                       | <u>SetStateVariables()</u>                            | 59        |
| 5.4.23                       | <u>GetSyncOffset()</u>                                | 60        |
| 5.4.24                       | <u>SetSyncOffset()</u>                                | 61        |
| 5.4.25                       | <u>AdjustSyncOffset()</u>                             | 61        |
| 5.4.26                       | <u>SyncPlay()</u>                                     | 62        |
| 5.4.27                       | <u>SyncStop()</u>                                     | 64        |
| 5.4.28                       | <u>SyncPause()</u>                                    | 65        |
| 5.4.29                       | <u>SetStaticPlaylist()</u>                            | 66        |
| 5.4.30                       | <u>SetStreamingPlaylist()</u>                         | 68        |
| 5.4.31                       | <u>GetPlaylistInfo()</u>                              | 69        |
| 5.4.32                       | Common Error Codes                                    | 70        |
| <b>6</b>                     | <b>XML Service Description</b>                        | <b>72</b> |
| <b>7</b>                     | <b>Test</b>                                           | <b>92</b> |
| <b>Annex A (normative)</b>   | <b><u>SetAVTransportURI()</u> Protocol Specifics</b>  | <b>93</b> |
| A.1                          | Application to HTTP Streaming                         | 93        |
| A.1.1                        | <u>AVTransportURI</u> Definition                      | 93        |
| A.1.2                        | Control Point Behavior for <u>SetAVTransportURI()</u> | 93        |
| A.1.3                        | Implementation of <u>SetAVTransportURI()</u>          | 93        |
| A.1.4                        | Cleanup                                               | 93        |
| A.2                          | Application to RTSP/RTP/UDP Streaming                 | 93        |
| A.2.1                        | <u>AVTransportURI</u> Definition                      | 93        |
| A.2.2                        | Control Point behavior for <u>SetAVTransportURI()</u> | 93        |
| A.2.3                        | Implementation of <u>SetAVTransportURI()</u>          | 94        |
| A.2.4                        | Cleanup                                               | 94        |
| A.2.5                        | Implementation of Transport Controls                  | 94        |
| A.3                          | Application to Internal Streaming                     | 95        |
| A.3.1                        | <u>AVTransportURI</u> Definition                      | 95        |
| A.3.2                        | Implementation of <u>SetAVTransportURI()</u>          | 95        |
| A.3.3                        | Cleanup                                               | 95        |
| A.4                          | Application to IEC61883 Streaming                     | 95        |
| A.4.1                        | <u>AVTransportURI</u> Definition                      | 95        |
| A.4.2                        | Implementation of <u>SetAVTransportURI()</u>          | 95        |
| A.4.3                        | Cleanup                                               | 95        |
| A.5                          | Application to Vendor-specific Streaming              | 95        |
| A.5.1                        | <u>AVTransportURI</u> Definition                      | 95        |
| A.5.2                        | Implementation of <u>SetAVTransportURI()</u>          | 96        |
| A.5.3                        | Cleanup                                               | 96        |
| <b>Annex B (informative)</b> | <b>Theory of Operation</b>                            | <b>97</b> |
| B.1                          | TransportState Control                                | 97        |

## ISO/IEC 29341-20-10:2017(E)

|                              |                                                        |            |
|------------------------------|--------------------------------------------------------|------------|
| B.2                          | Transport Settings .....                               | 98         |
| B.3                          | Navigation .....                                       | 98         |
| B.4                          | AVTransportURI Concept.....                            | 98         |
| B.5                          | AVTransport Abstraction .....                          | 99         |
| B.6                          | Supporting Multiple Virtual Transports.....            | 101        |
| B.7                          | Playlist Playback .....                                | 102        |
| B.8                          | Dynamic Playlists .....                                | 103        |
| B.8.1                        | Playlist Updating .....                                | 103        |
| B.8.2                        | Determining Playlist Rendering Capabilities.....       | 103        |
| B.8.3                        | Submitting a Streaming Playlist .....                  | 104        |
| B.8.4                        | Modifying a Current Playlist.....                      | 105        |
| B.8.5                        | Submitting a Static Playlist .....                     | 106        |
| B.8.6                        | Retrieving a Current Static Playlist .....             | 107        |
| B.9                          | <i>CLOCKSYNC feature</i> : Synchronized Playback ..... | 108        |
| B.9.2                        | Example of <u>SyncOffset</u> State Variable .....      | 109        |
| B.9.3                        | Example Scenarios for <u>SyncPlay()</u> Action .....   | 109        |
| <b>Annex C (informative)</b> | <b>Bibliography .....</b>                              | <b>113</b> |

## List of Tables

|                                                                       |    |
|-----------------------------------------------------------------------|----|
| Table 1 — EBNF Operators.....                                         | 6  |
| Table 2 — CSV Examples.....                                           | 7  |
| Table 3 — Namespace Definitions.....                                  | 9  |
| Table 4 — Schema-related Information.....                             | 11 |
| Table 5 — Default Namespaces for the AV Specifications.....           | 13 |
| Table 6 — State Variables .....                                       | 17 |
| Table 7 — allowedValueList for <u>TransportState</u> .....            | 19 |
| Table 8 — allowedValueRange for <u>TransportStatus</u> .....          | 19 |
| Table 9 — allowedValueList for <u>CurrentMediaCategory</u> .....      | 19 |
| Table 10 — allowedValueList for <u>PlaybackStorageMedium</u> .....    | 20 |
| Table 11 — allowedValueList for <u>CurrentPlayMode</u> .....          | 21 |
| Table 12 — allowedValueList for <u>RecordMediumWriteStatus</u> .....  | 22 |
| Table 13 — allowedValueList for <u>CurrentRecordQualityMode</u> ..... | 22 |
| Table 14 — allowedValueRange for <u>NumberOfTracks</u> .....          | 23 |
| Table 15 — allowedValueRange for <u>CurrentTrack</u> .....            | 23 |
| Table 16 — allowedValueList for <u>CurrentTransportActions</u> .....  | 26 |
| Table 17 — allowedValueList for <u>DRMState</u> .....                 | 27 |
| Table 18 — allowedValueRange for <u>SyncOffset</u> .....              | 28 |
| Table 19 — allowedValueList for <u>A_ARG_TYPE_SeekMode</u> .....      | 28 |
| Table 20 — Format of <u>A_ARG_TYPE_SeekTarget</u> .....               | 29 |
| Table 21 — allowedValueList for <u>A_ARG_TYPE_PlaylistStep</u> .....  | 31 |
| Table 22 — allowedValueList for <u>A_ARG_TYPE_PlaylistType</u> .....  | 31 |
| Table 23 — Event Moderation .....                                     | 36 |
| Table 24 — Actions.....                                               | 39 |
| Table 25 — Arguments for <u>SetAVTransportURI()</u> .....             | 41 |
| Table 26 — Error Codes for <u>SetAVTransportURI()</u> .....           | 42 |
| Table 27 — Arguments for <u>SetNextAVTransportURI()</u> .....         | 43 |
| Table 28 — Error Codes for <u>SetNextAVTransportURI()</u> .....       | 44 |
| Table 29 — Arguments for <u>GetMediaInfo()</u> .....                  | 44 |
| Table 30 — Error Codes for <u>GetMediaInfo()</u> .....                | 45 |
| Table 31 — Arguments for <u>GetMediaInfo_Ext()</u> .....              | 45 |
| Table 32 — Error Codes for <u>GetMediaInfo_Ext()</u> .....            | 45 |
| Table 33 — Arguments for <u>GetTransportInfo()</u> .....              | 46 |
| Table 34 — Error Codes for <u>GetTransportInfo()</u> .....            | 46 |
| Table 35 — Arguments for <u>GetPositionInfo()</u> .....               | 46 |
| Table 36 — Error Codes for <u>GetPositionInfo()</u> .....             | 47 |
| Table 37 — Arguments for <u>GetDeviceCapabilities()</u> .....         | 47 |
| Table 38 — Error Codes for <u>GetDeviceCapabilities()</u> .....       | 47 |
| Table 39 — Arguments for <u>GetTransportSettings()</u> .....          | 47 |
| Table 40 — Error Codes for <u>GetTransportSettings()</u> .....        | 48 |
| Table 41 — Arguments for <u>Stop()</u> .....                          | 48 |

## ISO/IEC 29341-20-10:2017(E)

|                                                                      |    |
|----------------------------------------------------------------------|----|
| Table 42 — Error Codes for <u>Stop()</u> .....                       | 49 |
| Table 43 — Arguments for <u>Play()</u> .....                         | 49 |
| Table 44 — Error Codes for <u>Play()</u> .....                       | 50 |
| Table 45 — Arguments for <u>Pause()</u> .....                        | 51 |
| Table 46 — Error Codes for <u>Pause()</u> .....                      | 51 |
| Table 47 — Arguments for <u>Record()</u> .....                       | 51 |
| Table 48 — Error Codes for <u>Record()</u> .....                     | 52 |
| Table 49 — Arguments for <u>Seek()</u> .....                         | 53 |
| Table 50 — Error Codes for <u>Seek()</u> .....                       | 54 |
| Table 51 — Arguments for <u>Next()</u> .....                         | 54 |
| Table 52 — Error Codes for <u>Next()</u> .....                       | 55 |
| Table 53 — Arguments for <u>Previous()</u> .....                     | 55 |
| Table 54 — Error Codes for <u>Previous()</u> .....                   | 56 |
| Table 55 — Arguments for <u>SetPlayMode()</u> .....                  | 56 |
| Table 56 — Error Codes for <u>SetPlayMode()</u> .....                | 57 |
| Table 57 — Arguments for <u>SetRecordQualityMode()</u> .....         | 57 |
| Table 58 — Error Codes for <u>SetRecordQualityMode()</u> .....       | 57 |
| Table 59 — Arguments for <u>GetCurrentTransportActions()</u> .....   | 58 |
| Table 60 — Error Codes for <u>GetCurrentTransportActions()</u> ..... | 58 |
| Table 61 — Arguments for <u>GetDRMState()</u> .....                  | 58 |
| Table 62 — Error Codes for <u>GetDRMState()</u> .....                | 58 |
| Table 63 — Arguments for <u>GetStateVariables()</u> .....            | 59 |
| Table 64 — Error Codes for <u>GetStateVariables()</u> .....          | 59 |
| Table 65 — Arguments for <u>SetStateVariables()</u> .....            | 60 |
| Table 66 — Error Codes for <u>SetStateVariables()</u> .....          | 60 |
| Table 67 — Arguments for <u>GetSyncOffset()</u> .....                | 60 |
| Table 68 — Error Codes for <u>GetSyncOffset()</u> .....              | 61 |
| Table 69 — Arguments for <u>SetSyncOffset()</u> .....                | 61 |
| Table 70 — Error Codes for <u>SetSyncOffset()</u> .....              | 61 |
| Table 71 — Arguments for <u>AdjustSyncOffset()</u> .....             | 62 |
| Table 72 — Error Codes for <u>AdjustSyncOffset()</u> .....           | 62 |
| Table 73 — Arguments for <u>SyncPlay()</u> .....                     | 63 |
| Table 74 — Error Codes for <u>SyncPlay()</u> .....                   | 64 |
| Table 75 — Arguments for <u>SyncStop()</u> .....                     | 65 |
| Table 76 — Error Codes for <u>SyncStop()</u> .....                   | 65 |
| Table 77 — Arguments for <u>SyncPause()</u> .....                    | 66 |
| Table 78 — Error Codes for <u>SyncPause()</u> .....                  | 66 |
| Table 79 — Arguments for <u>SetStaticPlaylist()</u> .....            | 67 |
| Table 80 — Error Codes for <u>SetStaticPlaylist()</u> .....          | 68 |
| Table 81 — Arguments for <u>SetStreamingPlaylist()</u> .....         | 68 |
| Table 82 — Error Codes for <u>SetStreamingPlaylist()</u> .....       | 69 |
| Table 83 — Arguments for <u>GetPlaylistInfo()</u> .....              | 69 |
| Table 84 — Error Codes for <u>GetPlaylistInfo()</u> .....            | 70 |

|                                                                                           |     |
|-------------------------------------------------------------------------------------------|-----|
| Table 85 — Common Error Codes .....                                                       | 71  |
| Table B.1 — Allowed AVTransportURIs .....                                                 | 99  |
| Table B.2 — Example mappings of resources type to track sequences .....                   | 100 |
| Table B.3 — Example seek modes, play modes and transport actions, per resource type ..... | 101 |

### List of Figures

|                                                                                              |     |
|----------------------------------------------------------------------------------------------|-----|
| Figure B.1 — <u>TransportState</u> Transitions - INFORMATIVE .....                           | 97  |
| Figure B.2 — <u>SyncPlay()</u> with past presentation time .....                             | 110 |
| Figure B.3 — <u>SyncPlay()</u> with future presentation time .....                           | 111 |
| Figure B.4 — <u>SyncPlay()</u> with future presentation time and reference positioning ..... | 112 |

## Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see <http://www.iso.org/directives>).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of Standard, the meaning of the ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword – Supplementary information](#)

ISO/IEC 29341-20-10 was prepared by UPnP Forum and adopted, under the PAS procedure, by joint technical committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

The list of all currently available parts of ISO/IEC 29341 series, under the general title *Information technology — UPnP Device Architecture*, can be found on the [ISO web site](#).

## Introduction

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

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

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

Information may be obtained from:

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

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

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

Information may be obtained from:

Microsoft Corporation  
One Microsoft Way  
USA – Redmond WA 98052

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

Information may be obtained from:

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

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

Information may be obtained from:

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

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

Information may be obtained from:

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

## ISO/IEC 29341-20-10:2017(E)

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

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

Information may be obtained from:

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

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

Information may be obtained from:

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

Huawei Technologies Co., Ltd. has informed IEC and ISO that it has patent applications or granted patents.

Information may be obtained from:

Huawei Technologies Co., Ltd.  
Administration Building, Bantian Longgang District  
Shenzhen – China 518129

Qualcomm Incorporated has informed IEC and ISO that it has patent applications or granted patents.

Information may be obtained from:

Qualcomm Incorporated  
5775 Morehouse Drive  
San Diego, CA – USA 92121

Telecom Italia S.p.A. has informed IEC and ISO that it has patent applications or granted patents.

Information may be obtained from:

Telecom Italia S.p.A.  
Via Reiss Romoli, 274  
Turin - Italy 10148

Cisco Systems informed IEC and ISO that it has patent applications or granted patents.

Information may be obtained from:

Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA – USA 95134

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

**Original UPnP Document**

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 and later by UPnP Forum. The following table indicates the original UPnP document titles and the corresponding part of ISO/IEC 29341:

| <b>UPnP Document Title</b>                      | <b>ISO/IEC 29341 Part</b> |
|-------------------------------------------------|---------------------------|
| UPnP Device Architecture 1.0                    | ISO/IEC 29341-1:2008      |
| UPnP Device Architecture Version 1.0            | ISO/IEC 29341-1:2011      |
| UPnP Device Architecture 1.1                    | ISO/IEC 29341-1-1:2011    |
| UPnP Device Architecture 2.0                    | ISO/IEC 29341-1-2         |
| UPnP Basic:1 Device                             | ISO/IEC 29341-2           |
| UPnP AV Architecture:1                          | ISO/IEC 29341-3-1:2008    |
| UPnP AV Architecture:1                          | ISO/IEC 29341-3-1:2011    |
| 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:1 Device                     | ISO/IEC 29341-3-2         |
| UPnP MediaRenderer:2 Device                     | ISO/IEC 29341-3-2:2011    |
| UPnP MediaServer:1 Device                       | ISO/IEC 29341-3-3         |
| UPnP AVTransport:2 Service                      | ISO/IEC 29341-4-10:2008   |
| UPnP AVTransport:2 Service                      | ISO/IEC 29341-4-10:2011   |
| UPnP ConnectionManager:2 Service                | ISO/IEC 29341-4-11:2008   |
| UPnP ConnectionManager:2 Service                | ISO/IEC 29341-4-11:2011   |
| UPnP ContentDirectory:2 Service                 | ISO/IEC 29341-4-12        |
| UPnP RenderingControl:2 Service                 | ISO/IEC 29341-4-13:2008   |
| UPnP RenderingControl:2 Service                 | ISO/IEC 29341-4-13:2011   |
| UPnP ScheduledRecording:1                       | ISO/IEC 29341-4-14        |
| UPnP ScheduledRecording:2                       | ISO/IEC 29341-4-14:2011   |
| 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 29341-4-4:2008    |
| UPnP AV Datastructure Template:1                | ISO/IEC 29341-4-4:2011    |
| 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 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 HVAC_ZoneThermostat:1 Device               | ISO/IEC 29341-6-2         |

## ISO/IEC 29341-20-10:2017(E)

|                                         |                          |
|-----------------------------------------|--------------------------|
| UPnP BinaryLight:1 Device               | ISO/IEC 29341-7-1        |
| UPnP Dimming:1 Service                  | ISO/IEC 29341-7-10       |
| UPnP SwitchPower:1 Service              | ISO/IEC 29341-7-11       |
| UPnP DimmableLight:1 Device             | ISO/IEC 29341-7-2        |
| UPnP InternetGatewayDevice:1 Device     | ISO/IEC 29341-8-1        |
| 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 LANDevice:1 Device                 | ISO/IEC 29341-8-2        |
| UPnP WANPPPPConnection:1 Service        | ISO/IEC 29341-8-20       |
| UPnP WLANConfiguration:1 Service        | ISO/IEC 29341-8-21       |
| 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 Printer:1 Device                   | ISO/IEC 29341-9-1        |
| 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 Scanner:1.0 Device                 | ISO/IEC 29341-9-2        |
| 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 QosDevice:2 Service                | ISO/IEC 29341-11-10      |
| UPnP QosManager:2 Service               | ISO/IEC 29341-11-11      |
| UPnP QosPolicyHolder:2 Service          | ISO/IEC 29341-11-12      |
| UPnP QOS v2 Schema Files                | ISO/IEC 29341-11-2       |
| UPnP RemoteUIClientDevice:1 Device      | ISO/IEC 29341-12-1       |
| UPnP RemoteUIClient:1 Service           | ISO/IEC 29341-12-10      |
| UPnP RemoteUIServer:1 Service           | ISO/IEC 29341-12-11      |
| UPnP RemoteUIServerDevice:1 Device      | ISO/IEC 29341-12-2       |
| UPnP DeviceSecurity:1 Service           | ISO/IEC 29341-13-10      |
| UPnP SecurityConsole:1 Service          | ISO/IEC 29341-13-11      |
| UPnP ContentDirectory:3 Service         | ISO/IEC 29341-14-12:2011 |
| UPnP MediaServer:3 Device               | ISO/IEC 29341-14-3:2011  |
| UPnP ContentSync:1                      | ISO/IEC 29341-15-10:2011 |
| UPnP Low Power Architecture:1           | ISO/IEC 29341-16-1:2011  |
| UPnP LowPowerProxy:1 Service            | ISO/IEC 29341-16-10:2011 |

|                                                         |                          |
|---------------------------------------------------------|--------------------------|
| UPnP LowPowerDevice:1 Service                           | ISO/IEC 29341-16-11:2011 |
| UPnP QoS Architecture:3                                 | ISO/IEC 29341-17-1:2011  |
| UPnP QoSDevice:3 Service                                | ISO/IEC 29341-17-10:2011 |
| UPnP QoSManager:3 Service                               | ISO/IEC 29341-17-11:2011 |
| UPnP QoSPolicyHolder:3 Service                          | ISO/IEC 29341-17-12:2011 |
| UPnP QoSDevice:3 Addendum                               | ISO/IEC 29341-17-13:2011 |
| UPnP RemoteAccessArchitecture:1                         | ISO/IEC 29341-18-1:2011  |
| UPnP InboundConnectionConfig:1 Service                  | ISO/IEC 29341-18-10:2011 |
| UPnP RADACfg:1 Service                                  | ISO/IEC 29341-18-11:2011 |
| UPnP RADASync:1 Service                                 | ISO/IEC 29341-18-12:2011 |
| UPnP RATAConfig:1 Service                               | ISO/IEC 29341-18-13:2011 |
| UPnP RAClient:1 Device                                  | ISO/IEC 29341-18-2:2011  |
| UPnP RAServer:1 Device                                  | ISO/IEC 29341-18-3:2011  |
| UPnP RADiscoveryAgent:1 Device                          | ISO/IEC 29341-18-4:2011  |
| UPnP SolarProtectionBlind:1 Device                      | ISO/IEC 29341-19-1:2011  |
| UPnP TwoWayMotionMotor:1 Service                        | ISO/IEC 29341-19-10:2011 |
| UPnP AV Architecture:2                                  | ISO/IEC 29341-20-1       |
| UPnP AVTransport:3 Service                              | ISO/IEC 29341-20-10      |
| UPnP ConnectionManager:3 Service                        | ISO/IEC 29341-20-11      |
| UPnP ContentDirectory:4 Device                          | ISO/IEC 29341-20-12      |
| UPnP RenderingControl:3 Service                         | ISO/IEC 29341-20-13      |
| UPnP ScheduledRecording:2 Service                       | ISO/IEC 29341-20-14      |
| UPnP MediaRenderer:3 Service                            | ISO/IEC 29341-20-2       |
| UPnP MediaServer:4 Device                               | ISO/IEC 29341-20-3       |
| UPnP AV Datastructure Template:1                        | ISO/IEC 29341-20-4       |
| UPnP InternetGatewayDevice:2 Device                     | ISO/IEC 29341-24-1       |
| UPnP WANIPConnection:2 Service                          | ISO/IEC 29341-24-10      |
| UPnP WANIPv6FirewallControl:1 Service                   | ISO/IEC 29341-24-11      |
| UPnP WANConnectionDevice:2 Service                      | ISO/IEC 29341-24-2       |
| UPnP WANDevice:2 Device                                 | ISO/IEC 29341-24-3       |
| UPnP Telephony Architecture:2                           | ISO/IEC 29341-26-1       |
| UPnP CallManagement:2 Service                           | ISO/IEC 29341-26-10      |
| UPnP MediaManagement:2 Service                          | ISO/IEC 29341-26-11      |
| UPnP Messaging:2 Service                                | ISO/IEC 29341-26-12      |
| UPnP PhoneManagement:2 Service                          | ISO/IEC 29341-26-13      |
| UPnP AddressBook:1 Service                              | ISO/IEC 29341-26-14      |
| UPnP Calendar:1 Service                                 | ISO/IEC 29341-26-15      |
| UPnP Presense:1 Service                                 | ISO/IEC 29341-26-16      |
| UPnP TelephonyClient:2 Device                           | ISO/IEC 29341-26-2       |
| UPnP TelephonyServer:2 Device                           | ISO/IEC 29341-26-3       |
| UPnP Friendly Info Update:1 Service                     | ISO/IEC 29341-27-1       |
| UPnP MultiScreen MultiScreen Architecture:1             | ISO/IEC 29341-28-1       |
| UPnP MultiScreen Application Management:1 Service       | ISO/IEC 29341-28-10      |
| UPnP MultiScreen Screen:1 Device                        | ISO/IEC 29341-28-2       |
| UPnP MultiScreen Application Management:2 Service       | ISO/IEC 29341-29-10      |
| UPnP MultiScreen Screen:2 Device                        | ISO/IEC 29341-29-2       |
| UPnP IoT Management and Control Architecture Overview:1 | ISO/IEC 29341-30-1       |

## ISO/IEC 29341-20-10:2017(E)

|                                                             |                     |
|-------------------------------------------------------------|---------------------|
| UPnP DataStore:1 Service                                    | ISO/IEC 29341-30-10 |
| UPnP IoT Management and Control Data Model:1 Service        | ISO/IEC 29341-30-11 |
| UPnP IoT Management and Control Transport Generic:1 Service | ISO/IEC 29341-30-12 |
| UPnP IoT Management and Control:1 Device                    | ISO/IEC 29341-30-2  |
| UPnP Energy Management:1 Service                            | ISO/IEC 29341-31-1  |

IECNORM.COM : Click to view the full PDF of ISO/IEC 29341-20-10:2017

## 1 Scope

This service definition is compliant with UPnP Device Architecture version 1.0 [14].

This service type enables control over the transport of audio and video streams. The service type defines a common model for A/V transport control suitable for a generic user interface. It can be used to control a wide variety of disc, tape and solid-state based media devices such as CD players, VCRs and MP3 players. A minimal implementation of this service can be used to control tuners.

The service type is related to the ConnectionManager service type, which describes A/V connection setup procedures, and the ContentDirectory service, which offers meta-information about the resource stored on the media. AVTransport also offers an action to retrieve any metadata embedded in the resource itself.

This service type does not offer scheduled recording.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

[1] – *XML Schema for RenderingControl AllowedTransformSettings*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/schemas/av/AllowedTransformSettings-v1-20130331.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/AllowedTransformSettings.xsd>.

[2] – *AV Datastructure Template:1*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/specs/av/UPnP-av-AVDataStructureTemplate-v1-20130331.pdf>.

Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-AVDataStructureTemplate-v1.pdf>.

[3] – *XML Schema for UPnP AV Common XML Data Types*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/schemas/av/av-v3-20130331.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/av.xsd>.

[4] – *XML Schema for UPnP AV Common XML Structures*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/schemas/av/avs-v3-20130331.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/avs.xsd>.

[5] – *AVTransport:3*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/specs/av/UPnP-av-AVTransport-v3-Service-20130331.pdf>.

Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-AVTransport-v3-Service.pdf>.

[6] – *XML Schema for AVTransport LastChange Eventing*, UPnP Forum, September 30, 2008.

Available at: <http://www.upnp.org/schemas/av/avt-event-v2-20080930.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/avt-event.xsd>.

[7] – *ContentDirectory:4*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/specs/av/UPnP-av-ContentDirectory-v4-Service-20130331.pdf>.

Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-ContentDirectory-v4-Service.pdf>.

[8] – *XML Schema for ContentDirectory LastChange Eventing*, UPnP Forum, September 30, 2008.

Available at: <http://www.upnp.org/schemas/av/cds-event-v1-20080930.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/cds-event.xsd>.

## ISO/IEC 29341-20-10:2017(E)

- [9] – *ConnectionManager:3*, UPnP Forum, March 31, 2013.  
Available at: <http://www.upnp.org/specs/av/UPnP-av-ConnectionManager-v3-Service-20130331.pdf>.  
Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-ConnectionManager-v3-Service.pdf>.
- [10] – *XML Schema for ConnectionManager DeviceClockInfoUpdates*, UPnP Forum, December 31, 2010.  
Available at: <http://www.upnp.org/schemas/av/cm-deviceClockInfoUpdates-v1-20101231.xsd>.  
Latest version available at: <http://www.upnp.org/schemas/av/cm-deviceClockInfoUpdates.xsd>.
- [11] – *XML Schema for ConnectionManager Features*, UPnP Forum, December 31, 2010.  
Available at: <http://www.upnp.org/schemas/av/cm-featureList-v1-20101231.xsd>.  
Latest version available at: <http://www.upnp.org/schemas/av/cm-featureList.xsd>.
- [12] – *XML Schema for UPnP AV Dublin Core*.  
Available at: <http://www.dublincore.org/schemas/xmls/simpledc20020312.xsd>.
- [13] – *DCMI term declarations represented in XML schema language*.  
Available at: <http://www.dublincore.org/schemas/xmls>.
- [14] – *UPnP Device Architecture, version 1.0*, UPnP Forum, October 15, 2008.  
Available at: <http://www.upnp.org/specs/arch/UPnP-arch-DeviceArchitecture-v1.0-20081015.pdf>.  
Latest version available at: <http://www.upnp.org/specs/arch/UPnP-arch-DeviceArchitecture-v1.0.pdf>.
- [15] – *XML Schema for ContentDirectory Structure and Metadata (DIDL-Lite)*, UPnP Forum, March 31, 2013.  
Available at: <http://www.upnp.org/schemas/av/didl-lite-v3-20130331.xsd>.  
Latest version available at: <http://www.upnp.org/schemas/av/didl-lite.xsd>.
- [16] – *XML Schema for ContentDirectory DeviceMode*, UPnP Forum, December 31, 2010.  
Available at: <http://www.upnp.org/schemas/av/dmo-v1-20101231.xsd>.  
Latest version available at: <http://www.upnp.org/schemas/av/dmo.xsd>.
- [17] – *XML Schema for ContentDirectory DeviceModeRequest*, UPnP Forum, December 31, 2010.  
Available at: <http://www.upnp.org/schemas/av/dmor-v1-20101231.xsd>.  
Latest version available at: <http://www.upnp.org/schemas/av/dmor.xsd>.
- [18] – *XML Schema for ContentDirectory DeviceModeStatus*, UPnP Forum, December 31, 2010.  
Available at: <http://www.upnp.org/schemas/av/dmos-v1-20101231.xsd>.  
Latest version available at: <http://www.upnp.org/schemas/av/dmos.xsd>.
- [19] – ISO/IEC 14977, *Information technology - Syntactic metalanguage - Extended BNF*, December 1996.
- [20] – *XML Schema for ContentDirectory PermissionsInfo*, UPnP Forum, December 31, 2010.  
Available at: <http://www.upnp.org/schemas/av/pi-v1-20101231.xsd>.  
Latest version available at: <http://www.upnp.org/schemas/av/pi.xsd>.
- [21] – *RenderingControl:3*, UPnP Forum, March 31, 2013.  
Available at: <http://www.upnp.org/specs/av/UPnP-av-RenderingControl-v3-Service-20130331.pdf>.  
Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-RenderingControl-v3-Service.pdf>.
- [22] – *XML Schema for RenderingControl LastChange Eventing*, UPnP Forum, December 31, 2010.  
Available at: <http://www.upnp.org/schemas/av/rcs-event-v3-20101231.xsd>.  
Latest version available at: <http://www.upnp.org/schemas/av/rcs-event.xsd>.

- [23] – *XML Schema for ConnectionManager RendererInfo*, UPnP Forum, December 31, 2010.  
Available at: <http://www.upnp.org/schemas/av/rri-v1-20101231.xsd>.  
Latest version available at: <http://www.upnp.org/schemas/av/rri.xsd>.
- [24] – *XML Schema for AVTransport PlaylistInfo*, UPnP Forum, March 31, 2013.  
Available at: <http://www.upnp.org/schemas/av/rpl-v1-20130331.xsd>.  
Latest version available at: <http://www.upnp.org/schemas/av/rpl.xsd>.
- [25] – *ScheduledRecording:2*, UPnP Forum, March 31, 2013.  
Available at: <http://www.upnp.org/specs/av/UPnP-av-ScheduledRecording-v2-Service-20130331.pdf>.  
Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-ScheduledRecording-v2-Service.pdf>.
- [26] – *XML Schema for ScheduledRecording Metadata and Structure*, UPnP Forum, March 31, 2013.  
Available at: <http://www.upnp.org/schemas/av/srs-v2-20130331.xsd>.  
Latest version available at: <http://www.upnp.org/schemas/av/srs.xsd>.
- [27] – *XML Schema for ScheduledRecording LastChange Eventing*, UPnP Forum, September 30, 2008.  
Available at: <http://www.upnp.org/schemas/av/srs-event-v1-20080930.xsd>.  
Latest version available at: <http://www.upnp.org/schemas/av/srs-event.xsd>.
- [28] – *XML Schema for RenderingControl TransformSettings*, UPnP Forum, March 31, 2013.  
Available at: <http://www.upnp.org/schemas/av/TransformSettings-v1-20130331.xsd>.  
Latest version available at: <http://www.upnp.org/schemas/av/TransformSettings.xsd>.
- [29] – *XML Schema for ContentDirectory Metadata*, UPnP Forum, March 31, 2013.  
Available at: <http://www.upnp.org/schemas/av/upnp-v4-20130331.xsd>.  
Latest version available at: <http://www.upnp.org/schemas/av/upnp.xsd>.
- [30] – *The “xml:” Namespace*, November 3, 2004.  
Available at: <http://www.w3.org/XML/1998/namespace>.
- [31] – *XML Schema for the “xml:” Namespace*.  
Available at: <http://www.w3.org/2001/xml.xsd>.
- [32] – *Namespaces in XML*, Tim Bray, Dave Hollander, Andrew Layman, eds., W3C Recommendation, January 14, 1999.  
Available at: <http://www.w3.org/TR/1999/REC-xml-names-19990114>.
- [33] – *XML Schema Part 1: Structures, Second Edition*, Henry S. Thompson, David Beech, Murray Maloney, Noah Mendelsohn, W3C Recommendation, 28 October 2004.  
Available at: <http://www.w3.org/TR/2004/REC-xmlschema-1-20041028>.
- [34] – *XML Schema Part 2: Data Types, Second Edition*, Paul V. Biron, Ashok Malhotra, W3C Recommendation, 28 October 2004.  
Available at: <http://www.w3.org/TR/2004/REC-xmlschema-2-20041028>.
- [35] – *XML Schema for XML Schema*.  
Available at: <http://www.w3.org/2001/XMLSchema.xsd>.
- [36] – *Data elements and interchange formats – Information interchange -- Representation of dates and times*, International Standards Organization, December 21, 2000.  
Available at: [ISO 8601:2000](http://www.iso.org/iso/8601).
- [37] – *HyperText Transport Protocol – HTTP/1.1*, R. Fielding, J. Gettys, J. Mogul, H. Frystyk, L. Masinter, P. Leach, T. Berners-Lee, June 1999.  
Available at: <http://www.ietf.org/rfc/rfc2616.txt>.

## ISO/IEC 29341-20-10:2017(E)

[38] – *IETF RFC 1738, Uniform Resource Locators (URL)*, Tim Berners-Lee, et. Al., December 1994.

Available at: <http://www.ietf.org/rfc/rfc1738.txt>.

[39] – *IETF RFC 2326, Real Time Streaming Protocol (RTSP)*, H. Schulzrinne, A. Rao, R. Lanphier, April 1998.

Available at: <http://www.ietf.org/rfc/rfc2326.txt>.

[40] – *IETF RFC 3986, Uniform Resource Identifiers (URI): Generic Syntax*, January 2005.

Available at: <http://www.ietf.org/rfc/rfc3986.txt>.

[41] – *IETF RFC 3550, RTP: A Transport Protocol for Real-Time Applications*, H. Schulzrinne, S. Casner, R. Frederick, V. Jacobson, July 2003.

Available at: <http://www.ietf.org/rfc/rfc3550.txt>.

### 3 Terms, definitions, symbols and abbreviations

For the purposes of this document, the terms and definitions given in [14] and the following subclauses 3.1 and 3.2 apply.

#### 3.1 Provisioning terms

##### 3.1.1

##### **allowed**

**A**

The definition or behavior is allowed.

##### 3.1.2

##### **conditionally allowed**

**CA**

The definition or behavior depends on a condition. If the specified condition is met, then the definition or behavior is allowed, otherwise it is not allowed.

##### 3.1.3

##### **conditionally required**

**CR**

The definition or behavior depends on a condition. If the specified condition is met, then the definition or behavior is required. Otherwise the definition or behavior is allowed as default unless specifically defined as not allowed.

##### 3.1.4

##### **required**

**R**

The definition or behavior is required.

##### 3.1.5

##### **R/A**

Used in a table column heading to indicate that each abbreviated entry in the column declares the provisioning status of the item named in the entry's row.

##### 3.1.6

**X**

Vendor-defined, non-standard.

##### 3.1.7

**-D**

Declares that the item referred to is deprecated, when it is appended to any of the other abbreviated provisioning terms.

## 3.1.8

**CSV list (or CSV)**

Comma separated value list. List—or one-dimensional array—of values contained in a string and separated by commas

## 3.2 Symbols

## 3.2.1

::

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.

## 4 Notations and Conventions

## 4.1 Notation

- UPnP interface names defined in the UPnP Device Architecture specification [14] are styled in **green bold underlined** text.
- UPnP interface names defined outside of the UPnP Device Architecture specification [14] are styled in **red italic underlined** text.
- Some additional non-interface names and terms are styled in *italic* text.
- Words that are emphasized are also styled in *italic* text. The difference between italic terms and italics for emphasis will be apparent by context.
- Strings that are to be taken literally are enclosed in “double quotes”.

## 4.1.1 Data Types

Data type definitions come from three sources:

- All state variable and action argument data types are defined in [14].
- Basic data types for properties are defined in [34].
- Additional data types for properties are defined in the XML schema(s) (see [3]) associated with this service.

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 shall be accepted. Nevertheless, it is strongly recommended that all **boolean** 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 shall be accepted. Nevertheless, it is strongly recommended that all Boolean properties be represented as “0” and “1”.

## 4.1.2 Strings Embedded in Other Strings

Some string variables and arguments described in this document contain substrings that shall 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 subclause 4.2.2) 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

#### 4.1.3 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 [19].

##### 4.1.3.1 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 shall 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 in Table 1:

Table 1 — EBNF Operators

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

## 4.2 Derived Data Types

### 4.2.1 Summary

Subclause 4.2 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 in subclause 4.2.2 applies to both string data types.

### 4.2.2 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 [14], 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 (all values can be of different types). 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 ({a,b,c},{x, y, z}), where a, b, c, x, y and z are the types of the individual values in the subsequence and the subsequences 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 [14] (that is: allowed leading sign, allowed leading zeroes, numeric US-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 [14]: **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 [34]: 0, false, 1, true.
- Escaping conventions for the comma and backslash characters are defined in 4.1.2.
- 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 2 — CSV Examples

| Type refinement of string                                                      | Value                                         | Comments                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CSV ( <b>string</b> ) or CSV (xsd:string)                                      | "+artist,-date"                               | List of 2 property sort criteria.                                                                                                                                                                                                                                               |
| CSV ( <b>int</b> ) or CSV (xsd:integer)                                        | "1,-5,006,0,+7"                               | List of 5 integers.                                                                                                                                                                                                                                                             |
| CSV ( <b>boolean</b> ) or CSV (xsd:Boolean)                                    | "0,1,1,0"                                     | List of 4 booleans                                                                                                                                                                                                                                                              |
| CSV ( <b>string</b> ) or CSV (xsd:string)                                      | "Smith\\, Fred\\, Jones\\, Davey"             | List of 2 names, "Smith, Fred" and "Jones, Davey"                                                                                                                                                                                                                               |
| CSV ( <b>i4, string, ui2</b> ) 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 ( <b>i4</b> ) or CSV (xsd:int)                                             | "3, 4"                                        | Illegal CSV. White space is not allowed as part of an integer value.                                                                                                                                                                                                            |
| CSV ( <b>string</b> ) 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 <b>string</b> , a department <b>string</b> and years-of-service <b>ui2</b> or a name xsd:string, a department xsd:string and years-of-service xsd:unsignedShort. |

### 4.3 Management of XML Namespaces in Standardized DCPs

UPnP specifications make extensive use of XML namespaces. This enables 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 shall 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 shall be locally unique to the document. Any valid XML no-colon-name may be used. And, in formal XML usage, different XML documents may use different namespace prefixes to refer to the same namespace. The creation and use of the namespace prefix was standardized by the W3C XML Committee in [32] 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. For example, action arguments which refer to CDS properties, such as the [SearchCriteria](#) argument of the [Search\(\)](#) action or the [Filter](#) argument of the [Browse\(\)](#) action, shall use the predefined namespace prefixes when referring to CDS properties ("upnp:", "dc:", etc).

All of the namespaces used in this specification are listed in Table 3 and Table 4. For each such namespace, Table 3 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. For example, since the ScheduledRecording service depends on and refers to the ContentDirectory service, the predefined "srs:" namespace prefix is included. The individual specifications in such collections all use the same standard prefix. The standard prefixes are also used in Table 4 to cross-reference additional namespace information. Table 4 includes each namespace's valid XML document root element(s) (if any), its schema file name, versioning information (to be discussed in more detail below), and a link to the entry in Clause 2 for its associated schema.

The normative definitions for these namespaces are the documents referenced in Table 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 3 — Namespace Definitions

| Standard Name-space Prefix                     | Namespace Name                                    | Namespace Description                                                                                           | Normative Definition Document Reference |
|------------------------------------------------|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| <i>AV Working Committee defined namespaces</i> |                                                   |                                                                                                                 |                                         |
| atrs                                           | urn:schemas-upnp-org:av:AllowedTransformSettings  | <u>AllowedTransformSettings</u> and <u>AllowedDefaultTransformSettings</u> state variables for RenderingControl | [21]                                    |
| av                                             | urn:schemas-upnp-org:av:av                        | Common data types for use in AV schemas                                                                         | [3]                                     |
| avdt                                           | urn:schemas-upnp-org:av:avdt                      | Datastructure Template                                                                                          | [2]                                     |
| avs                                            | urn:schemas-upnp-org:av:avs                       | Common structures for use in AV schemas                                                                         | [4]                                     |
| avt-event                                      | urn:schemas-upnp-org:metadata-1-0/AVT/            | Evented <u>LastChange</u> state variable for AVTransport                                                        | [5]                                     |
| cds-event                                      | urn:schemas-upnp-org:av:cds-event                 | Evented <u>LastChange</u> state variable for ContentDirectory                                                   | [7]                                     |
| cm-dciu                                        | urn:schemas-upnp-org:av:cm-deviceClockInfoUpdates | Evented <u>DeviceClockInfoUpdates</u> state variable for ConnectionManager                                      | [9]                                     |
| cm-ftrlist                                     | urn:schemas-upnp-org:av:cm-featureList            | <u>FeatureList</u> state variable for ConnectionManager                                                         | [9]                                     |
| didl-lite                                      | urn:schemas-upnp-org:metadata-1-0/DIDL-Lite/      | Structure and metadata for ContentDirectory                                                                     | [7]                                     |
| dmo                                            | urn:schemas-upnp.org:av:dmo                       | Evented <u>DeviceMode</u> state variable for ContentDirectory                                                   | [7]                                     |
| dmor                                           | urn:schemas-upnp.org:av:dmor                      | <u>A_ARG_TYPE_DeviceModeRequest</u> state variable for ContentDirectory                                         | [7]                                     |
| dmos                                           | urn:schemas-upnp.org:av:dmos                      | <u>DeviceModeStatus</u> state variable for ContentDirectory                                                     | [7]                                     |
| pi                                             | urn:schemas-upnp.org:av:pi                        | <u>PermissionsInfo</u> state variable for ContentDirectory                                                      | [7]                                     |
| rds-event                                      | urn:schemas-upnp-org:metadata-1-0/RCS/            | Evented <u>LastChange</u> state variable for RenderingControl                                                   | [21]                                    |
| rii                                            | urn:schemas-upnp-org:av:rii                       | <u>A_ARG_TYPE_RenderingInfoList</u> state variable for ConnectionManager                                        | [9]                                     |
| rpl                                            | urn:schemas-upnp-org:av:rpl                       | <u>A_ARG_TYPE_PlaylistInfo</u> state variable for AVTransport                                                   | [5]                                     |
| srs                                            | urn:schemas-upnp-org:av:srs                       | Metadata and structure for ScheduledRecording                                                                   | [25]                                    |
| srs-event                                      | urn:schemas-upnp-org:av:srs-event                 | Evented <u>LastChange</u> state variable for ScheduledRecording                                                 | [25]                                    |
| trs                                            | urn:schemas-upnp-org:av:TransformSettings         | <u>TransformSettings</u> and <u>DefaultTransformSettings</u> state variables for RenderingControl               | [21]                                    |
| upnp                                           | urn:schemas-upnp-org:metadata-1-0/upnp/           | Metadata for ContentDirectory                                                                                   | [7]                                     |

## ISO/IEC 29341-20-10:2017(E)

| Standard Name-space Prefix           | Namespace Name                            | Namespace Description               | Normative Definition Document Reference |
|--------------------------------------|-------------------------------------------|-------------------------------------|-----------------------------------------|
| <i>Externally defined namespaces</i> |                                           |                                     |                                         |
| dc                                   | http://purl.org/dc/elements/1.1/          | Dublin Core                         | [13]                                    |
| xsd                                  | http://www.w3.org/2001/XMLSchema          | XML Schema Language 1.0             | [33], [34]                              |
| xsi                                  | http://www.w3.org/2001/XMLSchema-instance | XML Schema Instance Document schema | [33] 2.6 & 3.2.7                        |
| xml                                  | http://www.w3.org/XML/1998/namespace      | The "xml:" Namespace                | [30]                                    |

Table 4 — Schema-related Information

| Standard Name-space Prefix                     | Relative URI and File Name <sup>a</sup><br>• Form 1, Form 2, Form3                                                                     | Valid Root Element(s)                                     | Schema Reference |
|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|------------------|
| <i>AV Working Committee Defined Namespaces</i> |                                                                                                                                        |                                                           |                  |
| atrs                                           | AllowedTransformSetting<br>s-vn-yyyymmdd.xsd<br>AllowedTransformSetting<br>s-vn.xsd<br>AllowedTransformSetting<br>s.xsd                | <TransformList>                                           | [1]              |
| av                                             | av-vn-yyyymmdd.xsd<br>av-vn.xsd<br>av.xsd                                                                                              | n/a                                                       | [3]              |
| avdt                                           | avdt-vn-yyyymmdd.xsd<br>avdt-vn.xsd<br>avdt.xsd                                                                                        | <AVDT>                                                    | [2]              |
| avs                                            | avs-vn-yyyymmdd.xsd<br>avs-vn.xsd<br>avs.xsd                                                                                           | <Capabilities><br><Features><br><stateVariableValuePairs> | [4]              |
| avt-event                                      | avt-event-vn-<br>yyyymmdd.xsd<br>avt-event-vn.xsd<br>avt-event.xsd                                                                     | <Event>                                                   | [6]              |
| cds-event                                      | cds-event-vn-<br>yyyymmdd.xsd<br>cds-event-vn.xsd<br>cds-event.xsd                                                                     | <StateEvent>                                              | [8]              |
| cm-dciu                                        | cm-<br>deviceClockInfoUpdates-<br>vn-yyyymmdd.xsd<br>cm-<br>deviceClockInfoUpdates<br>-vn.xsd<br>cm-<br>deviceClockInfoUpdates.<br>xsd | <DeviceClockInfoUpdates>                                  | [10]             |
| cm-ftrlist                                     | cm-featureList-vn-<br>yyyymmdd.xsd<br>cm-featureList-vn.xsd<br>cm-featureList.xsd                                                      | <Features>                                                | [11]             |
| didl-lite                                      | didl-lite-vn-<br>yyyymmdd.xsd<br>didl-lite-vn.xsd<br>didl-lite.xsd                                                                     | <DIDL-Lite>                                               | [15]             |
| dmo                                            | dmo-vn-yyyymmdd.xsd<br>dmo-vn.xsd<br>dmo.xsd                                                                                           | <DeviceMode>                                              | [16]             |
| dmor                                           | dmor-vn-yyyymmdd.xsd<br>dmor-vn.xsd<br>dmor.xsd                                                                                        | <DeviceModeRequest>                                       | [17]             |
| dmos                                           | dmos-vn-yyyymmdd.xsd<br>dmos-vn.xsd<br>dmos.xsd                                                                                        | <DeviceModeStatus>                                        | [18]             |

## ISO/IEC 29341-20-10:2017(E)

| Standard Name-space Prefix                                                                                                                                     | Relative URI and File Name <sup>a</sup><br>• Form 1, Form 2, Form3                                                                          | Valid Root Element(s) | Schema Reference |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------------------|
| pi                                                                                                                                                             | pi-vn-yyyymmdd.xsd<br>pi-vn.xsd<br>pi.xsd                                                                                                   | <PermissionsInfo>     | [20]             |
| rce-event                                                                                                                                                      | rce-event-vn-yyyymmdd.xsd<br>rce-event-vn.xsd<br>rce-event.xsd                                                                              | <Event>               | [22]             |
| rii                                                                                                                                                            | rii-vn-yyyymmdd.xsd<br>rii-vn.xsd<br>rii.xsd                                                                                                | <rendererInfo>        | [23]             |
| rpl                                                                                                                                                            | rpl-vn-yyyymmdd.xsd<br>rpl-vn.xsd<br>rpl.xsd                                                                                                | <PlaylistInfo>        | [24]             |
| trs                                                                                                                                                            | TransformSettings-vn-yyyymmdd.xsd<br>TransformSettings-vn.xsd<br>TransformSettings.xsd                                                      | <TransformSettings>   | [28]             |
| srs                                                                                                                                                            | srs-vn-yyyymmdd.xsd<br>srs-vn.xsd<br>srs.xsd                                                                                                | <srs>                 | [26]             |
| srs-event                                                                                                                                                      | srs-event-vn-yyyymmdd.xsd<br>srs-event-vn.xsd<br>srs-event.xsd                                                                              | <StateEvent>          | [27]             |
| upnp                                                                                                                                                           | upnp-vn-yyyymmdd.xsd<br>upnp-vn.xsd<br>upnp.xsd                                                                                             | n/a                   | [29]             |
| <b>Externally Defined Namespaces</b>                                                                                                                           |                                                                                                                                             |                       |                  |
| dc                                                                                                                                                             | Absolute URL: <a href="http://dublincore.org/schemas/xmls/simpledc20021212.xsd">http://dublincore.org/schemas/xmls/simpledc20021212.xsd</a> |                       | [12]             |
| xsd                                                                                                                                                            | n/a                                                                                                                                         | <schema>              | [35]             |
| xsi                                                                                                                                                            | n/a                                                                                                                                         |                       | n/a              |
| xml                                                                                                                                                            | n/a                                                                                                                                         |                       | [31]             |
| <sup>a</sup> Absolute URIs are generated by prefixing the relative URIs with " <a href="http://www.upnp.org/schemas/av/">http://www.upnp.org/schemas/av/</a> " |                                                                                                                                             |                       |                  |

### 4.3.1 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 shall use the standard namespace prefixes as declared in Table 3. In order to properly process the XML documents described herein, control points and devices shall use namespace-aware XML processors [32] for both reading and writing. As allowed by [32], 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 shall be able to correctly process any valid XML instance document, even when it uses a non-standard prefix for ordinary XML names. However, 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. However, 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 5.

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

**Table 5 — Default Namespaces for the AV Specifications**

| AV Specification Name | Default Namespace Prefix |
|-----------------------|--------------------------|
| AVTransport           | avt-event                |
| ConnectionManager     | n/a                      |
| ContentDirectory      | didl-lite                |
| MediaRenderer         | n/a                      |
| MediaServer           | n/a                      |
| RenderingControl      | rcs-event                |
| ScheduledRecording    | srs                      |

### 4.3.2 Namespace Names, Namespace Versioning and Schema Versioning

The UPnP AV service specifications define several data structures (such as state variables and action arguments) whose format is an XML instance document that complies with one or more specific XML schemas, which define XML namespaces. Each namespace is uniquely identified by an assigned namespace name. The namespace names that are defined by the AV Working Committee are URNs. See Table 3 for a current list of namespace names. Additionally, each namespace corresponds to an XML schema document that provides a machine-readable representation of the associated namespace to enable automated validation of the XML (state variable or action parameter) instance documents.

Within an XML schema and XML instance document, the name of each corresponding namespace appears as the value of an `xmlns` attribute within the root element. Each `xmlns` attribute also includes a namespace prefix that is associated with that namespace in order to qualify and disambiguate element and attribute names that are defined within different namespaces. The schemas that correspond to the listed namespaces are identified by URI values that are listed in the `schemaLocation` attribute also within the root element (see subclause 4.3.3).

In order to enable both forward and backward compatibility, namespace names are permanently assigned and shall not change even when a new version of a specification changes the definition of a namespace. However, all changes to a namespace definition shall be backward-compatible. In other words, the updated definition of a namespace shall not invalidate any XML documents that comply with an earlier definition of that same namespace. This means, for example, that a namespace shall not be changed so that a new element or attribute becomes required in a conforming instance document. Although namespace names shall not change, namespaces still have version numbers that reflect a specific set of definitional changes. Each time the definition of a namespace is changed, the namespace's version number is incremented by one.

Whenever a new namespace version is created, a new XML schema document (.xsd) is created and published so that the new namespace definition is represented in a machine-readable form. Since a XML schema document is just a representation of a namespace definition, translation errors can occur. Therefore, it is sometime necessary to re-release a published schema in order to correct typos or other namespace representation errors. In order to easily identify the potential multiplicity of schema releases for the same namespace, the URI of each released schema shall conform to the following format (called Form 1):

Form 1: "http://www.upnp.org/schemas/av/" **schema-root-name** "-v" **ver** "-" **yyyymmdd** where

- **schema-root-name** is the name of the root element of the namespace that this schema represents.
- **ver** corresponds to the version number of the namespace that is represented by the schema.

## ISO/IEC 29341-20-10:2017(E)

- **yyyymmdd** is the year, month and day (in the Gregorian calendar) that this schema was released.

Table 4 identifies the URI formats for each of the namespaces that are currently defined by the UPnP AV Working Committee.

As an example, the original schema URI for the “rcs-event” namespace (that was released with the original publication of the UPnP AV service specifications in the year 2002) was “<http://www.upnp.org/schemas/av/rcs-event-v1-20020625.xsd>”. When the UPnP AV service specifications were subsequently updated in the year 2006, the URI for the updated version of the “rcs-event” namespace was “<http://www.upnp.org/schemas/av/rcs-event-v2-20060531.xsd>”. However, in 2006, the schema URI for the newly created “srs-event” namespace was “<http://www.upnp.org/schemas/av/srs-event-v1-20060531.xsd>”. Note the version field for the “srs-event” schema is “v1” since it was first version of that namespace whereas the version field for the “rcs-event” schema is “v2” since it was the second version of that namespace.

In addition to the dated schema URIs that are associated with each namespace, each namespace also has a set of undated schema URIs. These undated schema URIs have two distinct formats with slightly different meanings:

Form 2: “<http://www.upnp.org/schemas/av/>” *schema-root-name* “-v” **ver**  
where **ver** is described above.

Form 3: “<http://www.upnp.org/schemas/av/>” *schema-root-name*

Form 2 of the undated schema URI is always linked to the most recent release of the schema that represents the version of the namespace indicated by **ver**. For example, the undated URI “.../av/rcs-event-v2.xsd” is linked to the most recent schema release of version 2 of the “rcs-event” namespace. Therefore, on May 31, 2006 (20060531), the undated schema URI was linked to the schema that is otherwise known as “.../av/rcs-event-v2-20060531.xsd”. Furthermore, if the schema for version 2 of the “rcs-event” namespace was ever re-released, for example to fix a typo in the 20060531 schema, then the same undated schema URI (“.../av/rcs-event-v2.xsd”) would automatically be updated to link to the updated version 2 schema for the “rcs-event” namespace.

Form 3 of the undated schema URI is always linked to the most recent release of the schema that represents the highest version of the namespace that has been published. For example, on June 25, 2002 (20020625), the undated schema URI “.../av/rcs-event.xsd” was linked to the schema that is otherwise known as “.../av/rcs-event-v1-20020625.xsd”. However, on May 31, 2006 (20060531), that same undated schema URI was linked to the schema that is otherwise known as “.../av/rcs-event-v2-20060531.xsd”.

When referencing a schema URI within an XML instance document or a referencing XML schema document, the following usage rules apply:

- All instance documents, whether generated by a service or a control point, shall use Form 3.
- All UPnP AV published schemas that reference other UPnP AV schemas shall also use Form 3.

Within an XML instance document, the definition for the `schemaLocation` attribute comes from the XML Schema 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 that is interpreted as a 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.

In addition to the schema URI naming and usage rules described above, each released schema shall contain a `version` attribute in the `<schema>` root element. Its value shall correspond to the format:

**ver** “-” **yyyymmdd** where **ver** and **yyyymmdd** are described above.

The `version` attribute provides self-identification of the namespace version and release date of the schema itself. For example, within the original schema released for the “rcs-event” namespace (`.../rcs-event-v2-20020625.xsd`), the `<schema>` root element contains the following attribute: `version="2-20020625"`.

### 4.3.3 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 Instance Document*. Note that the references to the UPnP AV schemas do not contain any version or release date information. In other words, the references follow Form 3 from above. Consequently, this example is valid for all releases of the UPnP AV service specifications.

```
<?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.xsd
    urn:schemas-upnp-org:metadata-1-0/upnp/
      http://www.upnp.org/schemas/av/upnp.xsd">
  <item id="18" parentID="13" restricted="0">
    ...
  </item>
</DIDL-Lite>
```

## 4.4 Vendor-defined Extensions

Whenever vendors create additional vendor-defined state variables, actions or properties, their assigned names and XML representation shall follow the naming conventions and XML rules as specified below in subclauses 4.4.1 to 4.4.4.

### 4.4.1 Vendor-defined Action Names

Vendor-defined action names shall begin with “**X**”. Additionally, it should be followed by an ICANN assigned domain name owned by the vendor followed by the underscore character (“\_”). It shall then be followed by the vendor-assigned action name. The vendor-assigned action name shall not contain a hyphen character (“-”, 2D Hex in UTF-8) nor a hash character (“#”, 23 Hex in UTF-8). Vendor-assigned action names are case sensitive. The first character of the name shall be a US-ASCII letter (“A”-“Z”, “a”-“z”), US-ASCII digit (“0”-“9”), an underscore (“\_”), or a non-experimental Unicode letter or digit greater than U+007F. Succeeding characters shall be a US-ASCII letter (“A”-“Z”, “a”-“z”), US-ASCII digit (“0”-“9”), an underscore (“\_”), a period (“.”), a Unicode combiningchar, an extender, or a non-experimental Unicode letter or digit greater than U+007F. The first three letters shall not be “XML” in any combination of case.

### 4.4.2 Vendor-defined State Variable Names

Vendor-defined state variable names shall begin with “**X**”. Additionally, it should be followed by an ICANN assigned domain name owned by the vendor, followed by the underscore character (“\_”). It shall then be followed by the vendor-assigned state variable name. The vendor-assigned state variable name shall not contain a hyphen character (“-”, 2D Hex in UTF-8). Vendor-assigned action names are case sensitive. The first character of the name shall be a US-ASCII letter (“A”-“Z”, “a”-“z”), US-ASCII digit (“0”-“9”), an underscore (“\_”), or a non-experimental Unicode letter or digit greater than U+007F. Succeeding characters shall be

a US-ASCII letter ("A"-"Z", "a"-"z"), US-ASCII digit ("0"-"9"), an underscore ("\_"), a period ("."), a Unicode combiningchar, an extender, or a non-experimental Unicode letter or digit greater than U+007F. The first three letters shall not be "XML" in any combination of case.

#### 4.4.3 Vendor-defined XML Elements and attributes

UPnP vendors may add non-standard elements and attributes to a UPnP standard XML document, such as a device or service description. Each addition shall be scoped by a vendor-owned XML namespace. Arbitrary XML shall be enclosed in an element that begins with "X," and this element shall be a sub element of a standard complex type. Non-standard attributes may be added to standard elements provided these attributes are scoped by a vendor-owned XML namespace and begin with "X".

#### 4.4.4 Vendor-defined Property Names

UPnP vendors may add non-standard properties to the ContentDirectory service. Each property addition shall be scoped by a vendor-owned namespace. The vendor-assigned property name shall not contain a hyphen character ("-", 2D Hex in UTF-8). Vendor-assigned property names are case sensitive. The first character of the name shall be a US-ASCII letter ("A"-"Z", "a"-"z"), US-ASCII digit ("0"-"9"), an underscore ("\_"), or a non-experimental Unicode letter or digit greater than U+007F. Succeeding characters shall be a US-ASCII letter ("A"-"Z", "a"-"z"), US-ASCII digit ("0"-"9"), an underscore ("\_"), a period ("."), a Unicode combiningchar, an extender, or a non-experimental Unicode letter or digit greater than U+007F. The first three letters shall not be "XML" in any combination of case.

### 5 Service Modeling Definitions

#### 5.1 ServiceType

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

urn:schemas-upnp-org:service:AVTransport:3

#### 5.2 State Variables

##### 5.2.1 State Variable Overview

Table 6 — State Variables

| Variable Name                             | R/A <sup>a</sup>       | Data Type     | Allowed Value                                   | Default Value    | Eng. Units |
|-------------------------------------------|------------------------|---------------|-------------------------------------------------|------------------|------------|
| <u>TransportState</u>                     | <u>R</u>               | <u>string</u> | See 5.2.2                                       |                  |            |
| <u>TransportStatus</u>                    | <u>R</u>               | <u>string</u> | See 5.2.3                                       |                  |            |
| <u>CurrentMediaCategory</u>               | <u>R</u>               | <u>string</u> | See 5.2.4                                       |                  |            |
| <u>PlaybackStorageMedium</u>              | <u>R</u>               | <u>string</u> | See 5.2.5                                       |                  |            |
| <u>RecordStorageMedium</u>                | <u>R</u>               | <u>string</u> | See 5.2.6                                       |                  |            |
| <u>PossiblePlaybackStorageMedia</u>       | <u>R</u>               | <u>string</u> | CSV <sup>b</sup> ( <u>string</u> )<br>See 5.2.7 |                  |            |
| <u>PossibleRecordStorageMedia</u>         | <u>R</u>               | <u>string</u> | CSV ( <u>string</u> )<br>See 5.2.8              |                  |            |
| <u>CurrentPlayMode</u>                    | <u>R</u>               | <u>string</u> | See 5.2.9                                       | <u>"NORMAL"</u>  |            |
| <u>TransportPlaySpeed</u>                 | <u>R</u>               | <u>string</u> | See 5.2.10                                      | <u>"1"</u>       |            |
| <u>RecordMediumWriteStatus</u>            | <u>R</u>               | <u>string</u> | See 5.2.11                                      |                  |            |
| <u>CurrentRecordQualityMode</u>           | <u>R</u>               | <u>string</u> | See 5.2.12                                      |                  |            |
| <u>PossibleRecordQualityModes</u>         | <u>R</u>               | <u>string</u> | CSV ( <u>string</u> )<br>See 5.2.13             |                  |            |
| <u>NumberOfTracks</u>                     | <u>R</u>               | <u>ui4</u>    | See 5.2.14                                      |                  |            |
| <u>CurrentTrack</u>                       | <u>R</u>               | <u>ui4</u>    | See 5.2.15                                      |                  |            |
| <u>CurrentTrackDuration</u>               | <u>R</u>               | <u>string</u> | See 5.2.16                                      |                  |            |
| <u>CurrentMediaDuration</u>               | <u>R</u>               | <u>string</u> | See 5.2.17                                      |                  |            |
| <u>CurrentTrackMetaData</u>               | <u>R</u>               | <u>string</u> | See 5.2.18                                      |                  |            |
| <u>CurrentTrackURI</u>                    | <u>R</u>               | <u>string</u> | See 5.2.19                                      |                  |            |
| <u>AVTransportURI</u>                     | <u>R</u>               | <u>string</u> | See 5.2.20                                      |                  |            |
| <u>AVTransportURIMetaData</u>             | <u>R</u>               | <u>string</u> | See 5.2.21                                      |                  |            |
| <u>NextAVTransportURI</u>                 | <u>R</u>               | <u>string</u> | See 5.2.22                                      |                  |            |
| <u>NextAVTransportURIMetaData</u>         | <u>R</u>               | <u>string</u> | See 5.2.23                                      |                  |            |
| <u>RelativeTimePosition</u>               | <u>R</u>               | <u>string</u> | See 5.2.24                                      |                  |            |
| <u>AbsoluteTimePosition</u>               | <u>R</u>               | <u>string</u> | See 5.2.25                                      |                  |            |
| <u>RelativeCounterPosition</u>            | <u>R</u>               | <u>i4</u>     | See 5.2.26                                      |                  |            |
| <u>AbsoluteCounterPosition</u>            | <u>R</u>               | <u>ui4</u>    | See 5.2.27                                      |                  |            |
| <u>CurrentTransportActions</u>            | <u>CR</u> <sup>c</sup> | <u>string</u> | CSV ( <u>string</u> )<br>See 5.2.28             |                  |            |
| <u>LastChange</u>                         | <u>R</u>               | <u>string</u> | See 5.2.29                                      |                  |            |
| <u>DRMState</u>                           | <u>CR</u> <sup>c</sup> | <u>string</u> | See 5.2.30                                      | <u>"UNKNOWN"</u> |            |
| <u>SyncOffset</u>                         | <u>CR</u> <sup>c</sup> | <u>string</u> | See 5.2.31                                      |                  |            |
| <u>A_ARG_TYPE_SeekMode</u>                | <u>R</u>               | <u>string</u> | See 5.2.32                                      |                  |            |
| <u>A_ARG_TYPE_SeekTarget</u>              | <u>R</u>               | <u>string</u> | See 5.2.33                                      |                  |            |
| <u>A_ARG_TYPE_InstanceID</u>              | <u>R</u>               | <u>ui4</u>    | See 5.2.34                                      |                  |            |
| <u>A_ARG_TYPE_DeviceUDN</u>               | <u>CR</u> <sup>c</sup> | <u>string</u> | See 5.2.35                                      |                  |            |
| <u>A_ARG_TYPE_ServiceType</u>             | <u>CR</u> <sup>c</sup> | <u>string</u> | See 5.2.36                                      |                  |            |
| <u>A_ARG_TYPE_ServiceID</u>               | <u>CR</u> <sup>c</sup> | <u>string</u> | See 5.2.37                                      |                  |            |
| <u>A_ARG_TYPE_StateVariableValuePairs</u> | <u>CR</u> <sup>c</sup> | <u>string</u> | See 5.2.38                                      |                  |            |
| <u>A_ARG_TYPE_StateVariableList</u>       | <u>CR</u> <sup>c</sup> | <u>string</u> | CSV ( <u>string</u> )<br>See 5.2.39             |                  |            |

| Variable Name                                                            | R/A <sup>a</sup>       | Data Type     | Allowed Value                                                                  | Default Value | Eng. Units |
|--------------------------------------------------------------------------|------------------------|---------------|--------------------------------------------------------------------------------|---------------|------------|
| <u><a href="#">A_ARG_TYPE_PlaylistData</a></u>                           | <u>CR</u> <sup>c</sup> | <u>string</u> | See 5.2.40                                                                     |               |            |
| <u><a href="#">A_ARG_TYPE_PlaylistDataLength</a></u>                     | <u>CR</u> <sup>c</sup> | <u>ui4</u>    | See 5.2.41                                                                     |               |            |
| <u><a href="#">A_ARG_TYPE_PlaylistOffset</a></u>                         | <u>CR</u> <sup>c</sup> | <u>ui4</u>    | See 5.2.42                                                                     |               |            |
| <u><a href="#">A_ARG_TYPE_PlaylistTotalLength</a></u>                    | <u>CR</u> <sup>c</sup> | <u>ui4</u>    | See 5.2.43                                                                     |               |            |
| <u><a href="#">A_ARG_TYPE_PlaylistMIMEType</a></u>                       | <u>CR</u> <sup>c</sup> | <u>string</u> | 3 <sup>rd</sup> field of <u><a href="#">res@protocolInfo</a></u><br>See 5.2.44 |               |            |
| <u><a href="#">A_ARG_TYPE_PlaylistExtendedType</a></u>                   | <u>CR</u> <sup>c</sup> | <u>string</u> | 4 <sup>th</sup> field of <u><a href="#">res@protocolInfo</a></u><br>See 5.2.45 |               |            |
| <u><a href="#">A_ARG_TYPE_PlaylistStep</a></u>                           | <u>CR</u> <sup>c</sup> | <u>string</u> | See 5.2.46                                                                     |               |            |
| <u><a href="#">A_ARG_TYPE_PlaylistType</a></u>                           | <u>CR</u> <sup>c</sup> | <u>string</u> | See 5.2.47                                                                     |               |            |
| <u><a href="#">A_ARG_TYPE_PlaylistInfo</a></u>                           | <u>CR</u> <sup>c</sup> | <u>string</u> | See 5.2.48                                                                     |               |            |
| <u><a href="#">A_ARG_TYPE_PlaylistStartObjID</a></u>                     | <u>CR</u> <sup>c</sup> | <u>string</u> | See 5.2.49                                                                     |               |            |
| <u><a href="#">A_ARG_TYPE_PlaylistStartGroupID</a></u>                   | <u>CR</u> <sup>c</sup> | <u>string</u> | See 5.2.50                                                                     |               |            |
| <u><a href="#">A_ARG_TYPE_SyncOffsetAdj</a></u>                          | <u>CR</u> <sup>c</sup> | <u>string</u> | See 5.2.51                                                                     |               |            |
| <u><a href="#">A_ARG_TYPE_PresentationTime</a></u>                       | <u>CR</u> <sup>c</sup> | <u>string</u> | See 5.2.52                                                                     |               |            |
| <u><a href="#">A_ARG_TYPE_ClockId</a></u>                                | <u>CR</u> <sup>c</sup> | <u>string</u> | See 5.2.53                                                                     |               |            |
| <i>Non-standard state variables implemented by a UPnP vendor go here</i> | <u>X</u>               | <u>TBD</u>    | <u>TBD</u>                                                                     | <u>TBD</u>    | <u>TBD</u> |

<sup>a</sup> For a device this column indicates whether the state variable shall be implemented or not, where R = required, A = allowed, CR = conditionally required, CA = conditionally allowed, X = non-standard, add -D when deprecated (e.g., R-D, A-D).

<sup>b</sup> CSV stands for Comma-Separated Value list. The type between brackets denotes the UPnP data type used for the elements inside the list. CSV is defined more formally in the ContentDirectory service template.

<sup>c</sup> See referenced subclause for conditions under which implementation of this state variable is required.

### 5.2.2 TransportState

This required state variable forms the core of the AVTransport service. It defines the conceptually top-level state of the transport, for example, whether it is playing, recording, etc. Device vendors do not need to implement all allowed values of this variable, for example, non-recordable media will not implement the "RECORDING" state.

The "PAUSED\_RECORDING" state is different from the "STOPPED" state in the sense that the transport is already prepared for recording and can respond faster or more accurately. The "PAUSED\_PLAYBACK" state is different from the "PAUSED\_RECORDING" state in the sense that in case the media contains video, it indicates output of a still image. The other TransportState values are self explanatory.

Note that *dubbing* of media at various speeds is not supported in this version of the AVTransport, mainly because there are no standards for cross-device dubbing speeds.

Device vendors are allowed to implement additional vendor-defined transport states. However, since the semantic meaning of these transport states is not specified, control points that find a AVTransport service in a transport state that they do not understand are encouraged to refrain from interacting with that AVTransport service (for example, forcing the service into the "STOPPED" state). Rather, they are encouraged to wait until the service transits back into a transport state that they understand.

Table 7 — allowedValueList for TransportState

| Value                     | R/A                                                                                     |
|---------------------------|-----------------------------------------------------------------------------------------|
| <u>"STOPPED"</u>          | <u>R</u>                                                                                |
| <u>"PLAYING"</u>          | <u>R</u>                                                                                |
| <u>"TRANSITIONING"</u>    | <u>R</u>                                                                                |
| <u>"PAUSED_PLAYBACK"</u>  | <u>CR</u> , required if <u>Pause()</u> action is implemented                            |
| <u>"PAUSED_RECORDING"</u> | <u>CR</u> , required if both <u>Pause()</u> and <u>Record()</u> actions are implemented |
| <u>"RECORDING"</u>        | <u>CR</u> , required if <u>Record()</u> action is implemented                           |
| <u>"NO_MEDIA_PRESENT"</u> | <u>A</u>                                                                                |
| Vendor-defined            | <u>X</u>                                                                                |

### 5.2.3 TransportStatus

This required state variable is used to indicate if asynchronous errors have occurred, during operation of the AVTransport service, that cannot be returned by a normal action. For example, some time after playback of a stream has been started (via SetAVTransportURI() and Play() actions), there can be network congestion or server problems causing hiccups in the rendered media. These types of situations can be signaled to control points by setting this state variable to value "ERROR\_OCCURRED". More specific error descriptions may also be used as vendor extensions. The value of TransportState after an error has occurred is implementation-dependent; some implementations may go to "STOPPED" while other implementations may be able to continue playing after an error. The time at which this state variable returns to "OK" after an error situation is also implementation dependent.

Table 8 — allowedValueRange for TransportStatus

| Value                   | R/A      |
|-------------------------|----------|
| <u>"OK"</u>             | <u>R</u> |
| <u>"ERROR_OCCURRED"</u> | <u>R</u> |
| Vendor-defined          | <u>X</u> |

### 5.2.4 CurrentMediaCategory

This required state variable indicates whether the current media is track-aware (both single and multi-track) or track-unaware (e.g. VHS-tape). The semantics of state variables RelativeTimePosition, AbsoluteTimePosition, RelativeCounterPosition, AbsoluteCounterPosition and of the Seek() action change, depending on this state variable.

Table 9 — allowedValueList for CurrentMediaCategory

| Value                  | R/A      |
|------------------------|----------|
| <u>"NO_MEDIA"</u>      | <u>R</u> |
| <u>"TRACK_AWARE"</u>   | <u>R</u> |
| <u>"TRACK_UNAWARE"</u> | <u>R</u> |

### 5.2.5 PlaybackStorageMedium

This required state variable indicates the storage medium of the resource specified by AVTransportURI. If no resource is specified, then the state variable is set to "NONE". If AVTransportURI refers to a resource received from the UPnP network, the state variable is set to "NETWORK". Device vendors may extend the specified allowed value list of this variable. For example, various types of solid-state media formats can be added in a vendor-specific way.

Note that this variable is not intended for signal- or content-formats such as MPEG2. Such type of information is exposed by the ConnectionManager service associated with this service.

Table 10 — allowedValueList for **PlaybackStorageMedium**

| Value                      | R/A      | Description                              |
|----------------------------|----------|------------------------------------------|
| " <u>UNKNOWN</u> "         | <u>A</u> | Unknown medium                           |
| " <u>DV</u> "              | <u>A</u> | Digital Video Tape medium                |
| " <u>MINI-DV</u> "         | <u>A</u> | Mini Digital Video Tape medium           |
| " <u>VHS</u> "             | <u>A</u> | VHS Tape medium                          |
| " <u>W-VHS</u> "           | <u>A</u> | W-VHS Tape medium                        |
| " <u>S-VHS</u> "           | <u>A</u> | Super VHS Tape medium                    |
| " <u>D-VHS</u> "           | <u>A</u> | Digital VHS Tape medium                  |
| " <u>VHSC</u> "            | <u>A</u> | Compact VHS medium                       |
| " <u>VIDEO8</u> "          | <u>A</u> | 8 mm Video Tape medium                   |
| " <u>Hi8</u> "             | <u>A</u> | High resolution 8 mm Video Tape medium   |
| " <u>CD-ROM</u> "          | <u>A</u> | Compact Disc-Read Only Memory medium     |
| " <u>CD-DA</u> "           | <u>A</u> | Compact Disc-Digital Audio medium        |
| " <u>CD-R</u> "            | <u>A</u> | Compact Disc-Recordable medium           |
| " <u>CD-RW</u> "           | <u>A</u> | Compact Disc-Rewritable medium           |
| " <u>VIDEO-CD</u> "        | <u>A</u> | Video Compact Disc medium                |
| " <u>SACD</u> "            | <u>A</u> | Super Audio Compact Disc medium          |
| " <u>MD-AUDIO</u> "        | <u>A</u> | Mini Disc Audio medium                   |
| " <u>MD-PICTURE</u> "      | <u>A</u> | Mini Disc Picture medium                 |
| " <u>DVD-ROM</u> "         | <u>A</u> | DVD Read Only medium                     |
| " <u>DVD-VIDEO</u> "       | <u>A</u> | DVD Video medium                         |
| " <u>DVD+R</u> "           | <u>A</u> | DVD Recordable medium                    |
| " <u>DVD-R</u> "           | <u>A</u> | DVD Recordable medium                    |
| " <u>DVD+RW</u> "          | <u>A</u> | DVD Rewritable medium                    |
| " <u>DVD-RW</u> "          | <u>A</u> | DVD Rewritable medium                    |
| " <u>DVD-RAM</u> "         | <u>A</u> | DVD RAM medium                           |
| " <u>DVD-AUDIO</u> "       | <u>A</u> | DVD Audio medium                         |
| " <u>DAT</u> "             | <u>A</u> | Digital Audio Tape medium                |
| " <u>LD</u> "              | <u>A</u> | Laser Disk medium                        |
| " <u>HDD</u> "             | <u>A</u> | Hard Disk Drive medium                   |
| " <u>MICRO-MV</u> "        | <u>A</u> | Micro MV Tape medium                     |
| " <u>NETWORK</u> "         | <u>A</u> | Network Interface medium                 |
| " <u>NONE</u> "            | <u>A</u> | No medium present                        |
| " <u>NOT_IMPLEMENTED</u> " | <u>A</u> | Medium type discovery is not implemented |
| " <u>SD</u> "              | <u>A</u> | SD (Secure Digital) Memory Card medium   |
| " <u>PC-CARD</u> "         | <u>A</u> | PC Card medium                           |
| " <u>MMC</u> "             | <u>A</u> | MultimediaCard medium                    |
| " <u>CF</u> "              | <u>A</u> | Compact Flash medium                     |
| " <u>BD</u> "              | <u>A</u> | Blu-ray Disc medium                      |
| " <u>MS</u> "              | <u>A</u> | Memory Stick medium                      |
| " <u>HD_DVD</u> "          | <u>A</u> | HD DVD medium                            |
| Vendor-defined             | <u>X</u> |                                          |

### 5.2.6 RecordStorageMedium

This required state variable indicates the storage medium where the resource specified by AVTransportURI will be recorded when a Record action is issued. If no resource is specified, then the state variable is set to "NONE". Device vendors may extend the allowed value list of this variable. For example, various types of solid-state media formats can be added in a vendor-specific way.

Note that this variable is not intended for signal- or content-formats such as MPEG2. Such type of information is exposed by the ConnectionManager service associated with this service. If the service implementation does not support recording, then this state variable shall be set to "NOT IMPLEMENTED". The allowed values for this state variable are the same as the PlaybackStorageMedium state variable.

### 5.2.7 PossiblePlaybackStorageMedia

This required state variable contains a static, comma-separated list of storage media that the device can play. Recommended values are defined in the allowed value list for state variable PlaybackStorageMedium.

### 5.2.8 PossibleRecordStorageMedia

This required state variable contains a static, comma-separated list of storage media onto which the device can record. Recommended values are defined in the allowed value list for state variable RecordStorageMedium. If the service implementation does not support recording, then this state variable shall be set to "NOT IMPLEMENTED".

### 5.2.9 CurrentPlayMode

This required state variable indicates the current play mode (for example, random play, repeated play, etc.). This notion is typical for CD-based audio media, but is generally not supported by tape-based media. Value "DIRECT" indicates playing a single track and then stop (don't play the next track). Value "INTRO" indicates playing a short sample (typically 10 seconds or so) of each track on the media. Other play mode values are self explanatory.

Table 11 — allowedValueList for CurrentPlayMode

| Value                 | R/A      |
|-----------------------|----------|
| " <u>NORMAL</u> "     | <u>R</u> |
| " <u>SHUFFLE</u> "    | <u>A</u> |
| " <u>REPEAT ONE</u> " | <u>A</u> |
| " <u>REPEAT ALL</u> " | <u>A</u> |
| " <u>RANDOM</u> "     | <u>A</u> |
| " <u>DIRECT 1</u> "   | <u>A</u> |
| " <u>INTRO</u> "      | <u>A</u> |
| Vendor-defined        | <u>X</u> |

### 5.2.10 TransportPlaySpeed

This required state variable is a string representation of a rational fraction that indicates the speed relative to normal speed. Example values are "1", "1/2", "2", "-1", "1/10", etc. Value "1" is required, value "0" is not allowed. Device vendors may support additional play speeds. Negative values indicate reverse playback. Actually supported speeds can be retrieved from the allowed value list of this state variable in the AVTransport service description.

### 5.2.11 RecordMediumWriteStatus

This required state variable reflects the write protection status of the currently loaded media. "NOT WRITABLE" indicates an inherent *read-only* media (for example, a DVD-ROM disc) or the device doesn't support recording on the current media. "PROTECTED" indicates a writable media that is currently write-protected (for example, a protected VHS tape). If no media is loaded, the write status will be "UNKNOWN". If the service implementation does not support recording, then this state variable shall be set to "NOT IMPLEMENTED".

Table 12 — allowedValueList for RecordMediumWriteStatus

| Value                    | R/A      |
|--------------------------|----------|
| <u>"WRITABLE"</u>        | <u>A</u> |
| <u>"PROTECTED"</u>       | <u>A</u> |
| <u>"NOT_WRITABLE"</u>    | <u>A</u> |
| <u>"UNKNOWN"</u>         | <u>A</u> |
| <u>"NOT_IMPLEMENTED"</u> | <u>A</u> |
| Vendor-defined           | <u>X</u> |

### 5.2.12 CurrentRecordQualityMode

This required state variable indicates the currently set record quality mode. Such a setting takes the form of "Quality Ordinal:label". The Quality Ordinal indicates a particular relative quality level available in the device, from 0 (lowest quality) to n (highest quality). The label associated with the ordinal provides a human-readable indication of the ordinal's meaning. If the service implementation does not support recording, then this state variable shall be set to "NOT\_IMPLEMENTED".

Table 13 — allowedValueList for CurrentRecordQualityMode

| Value                    | R/A      |
|--------------------------|----------|
| <u>"0:EP"</u>            | <u>A</u> |
| <u>"1:LP"</u>            | <u>A</u> |
| <u>"2:SP"</u>            | <u>A</u> |
| <u>"0:BASIC"</u>         | <u>A</u> |
| <u>"1:MEDIUM"</u>        | <u>A</u> |
| <u>"2:HIGH"</u>          | <u>A</u> |
| <u>"NOT_IMPLEMENTED"</u> | <u>A</u> |
| Vendor-defined           | <u>X</u> |

### 5.2.13 PossibleRecordQualityModes

This required state variable contains a static, comma-separated list of recording quality modes that the device supports. For example, for an analog VHS recorder the string would be "0:EP,1:LP,2:SP", while for a PVR the string would be "0:BASIC,1:MEDIUM,2:HIGH". The string specifics depend on the type of device containing the AVTransport. Note that record quality modes are independent of the *content-format* that may be exposed to the network through a ConnectionManager service. If the service implementation does not support recording, then this state variable shall be set to "NOT\_IMPLEMENTED".

### 5.2.14 NumberOfTracks

This required state variable contains the number of tracks controlled by the AVTransport instance. If no resource is associated with the AVTransport instance (via SetAVTransportURI()), and there is no *default* resource (for example, a loaded disc) then NumberOfTracks shall be 0. Also, if the implementation is never able to determine the number of tracks in the currently selected media, NumberOfTracks shall be set to 0. Otherwise, it shall be 1 or higher. In some cases, for example, large playlist, it can take a long time to determine the exact number of tracks. Until the exact number is determined, the value of the state variable is implementation dependent, for example, keeping it to 1 until determined or updating the value periodically. Note that in any case, the AVTransport service shall generate a LastChange event with defined moderation period when the exposed value is updated.

For track-unaware media, this state variable will always be set to 1. For LD and DVD media, a track is defined as a chapter number. For Tuners that provide an indexed list of channels, a track is defined as an index number in such a list. This state variable has to be consistent with the resource identified by AVTransportURI. For example, if AVTransportURI points to a single

MP3 file, then NumberOfTracks shall be set to 1. However, if AVTransportURI points to a playlist file, then NumberOfTracks shall be equal to the number of entries in the playlist.

**Table 14 — allowedValueRange for NumberOfTracks**

|                | Value          | R/A |
|----------------|----------------|-----|
| <u>minimum</u> | 0              | R   |
| <u>maximum</u> | vendor-defined | R   |

### 5.2.15 CurrentTrack

This is a required state variable. If NumberOfTracks is 0, then CurrentTrack will be 0. Otherwise, this state variable contains the sequence number of the currently selected track, starting at value 1, up to and including NumberOfTracks. For track-unaware media, this state variable is always 1. For LD and DVD media, the notion of track equals the notion of chapter number. For Tuners that provide an indexed list of channels, the current track is defined as the current index number in such a list.

**Table 15 — allowedValueRange for CurrentTrack**

|                | Value          | R/A |
|----------------|----------------|-----|
| <u>minimum</u> | 0              | R   |
| <u>maximum</u> | vendor-defined | R   |
| <u>step</u>    | 1              | R   |

### 5.2.16 CurrentTrackDuration

This required state variable contains the duration of the current track, specified as a string of the following form:

H+:MM:SS[.F+] or H+:MM:SS[.F0/F1]

where:

- H+: one or more digits to indicate elapsed hours,
- MM: exactly 2 digits to indicate minutes (00 to 59),
- SS: exactly 2 digits to indicate seconds (00 to 59),
- F+: one or more digits to indicate fractions of seconds,
- F0/F1: a fraction, with F0 and F1 at least one digit long, and F0 < F1.

The string may be preceded by an allowed "+" or "-" sign, and the decimal point itself shall be omitted if there are no fractional second digits. This variable does not apply to Tuners. If the implementation is never able to determine the duration of the current track, CurrentTrackDuration shall be set to "00:00:00". If the optional fractional components are included, they shall be set to either "0" or "0/<F1>". In some cases, it can take a long time to determine the exact duration of tracks. Until the exact duration is determined, the value of the state variable is implementation dependent, for example, keeping it to "00:00:00" or updating the value periodically. Note that in any case, the AVTransport service shall generate a LastChange event with defined moderation period when the exposed value is updated. If the service implementation does not support track duration information then this state variable shall be set to "NOT\_IMPLEMENTED".

### 5.2.17 CurrentMediaDuration

This required state variable contains the duration of the media, as identified by state variable AVTransportURI. In case the AVTransportURI represents only 1 track, this state variable is equal to CurrentTrackDuration. The format of this variable is the same as the format for CurrentTrackDuration, described above in 5.2.16. If no content is associated with the AVTransport instance (via SetAVTransportURI()), and there is no default content (for example, a loaded disc) then CurrentMediaDuration shall be set to "00:00:00". Also, if the implementation is never able to determine the duration of the currently selected media,

CurrentMediaDuration shall be set to "00:00:00". If the optional fractional components are included, they shall be set to either "0" or "0/<F1>". In some cases, it can take a long time to determine the exact duration of the media. Until the exact duration is determined, the value of the state variable is implementation dependent, for example, keeping it to "00:00:00" or updating the value periodically. Note that in any cases, the AVTransport service shall generate a LastChange event with defined moderation period when the exposed value is updated. If the service implementation does not support media duration information, then this state variable shall be set to "NOT IMPLEMENTED".

#### 5.2.18 CurrentTrackMetaData

This required state variable contains the metadata, in the form of a *DIDL-Lite XML Fragment* (defined in the ContentDirectory service template), associated with the resource pointed to by state variable CurrentTrackURI. The metadata could have been extracted from state variable AVTransportURIMetaData, or extracted from the resource binary itself (for example, embedded ID3 tags for MP3 audio). This is implementation dependent. If the service implementation does not support this feature, then this state variable shall be set to "NOT IMPLEMENTED".

#### 5.2.19 CurrentTrackURI

This required state variable contains a reference, in the form of a URI, to the current track. The URI can enable a control point to retrieve any meta-data associated with the current track, such as title and author information, via the ContentDirectory service Browse() and/or Search() action. In case the media does contain multi-track content, but there is no separate URI associated with each track, CurrentTrackURI shall be set equal to AVTransportURI.

#### 5.2.20 AVTransportURI

This required state variable contains a reference, in the form of a URI, to the resource controlled by the AVTransport instance. This URI can refer to a single item (for example, a song) or to a collection of items (for example, a playlist). In the *single item* case, the AVTransport will have 1 track and AVTransportURI is equal to CurrentTrackURI. In the *collection of items* case, the AVTransport will have multiple tracks, and AVTransportURI will remain constant during track changes. The URI enables a control point to retrieve any meta-data associated with the AVTransport instance, such as title and author information, via the ContentDirectory service.

#### 5.2.21 AVTransportURIMetaData

This required state variable contains the meta-data, in the form of a *DIDL-Lite XML Fragment* (defined in the ContentDirectory service template), associated with the resource pointed to by state variable AVTransportURI. See the ContentDirectory service specification [7] for details. If the service implementation does not support this feature, then this state variable shall be set to "NOT IMPLEMENTED".

#### 5.2.22 NextAVTransportURI

This required state variable contains the AVTransportURI value to be played when the playback of the current AVTransportURI finishes. Setting this variable ahead of time (via action SetNextAVTransportURI()) enables a device to provide seamless transitions between resources for certain data transfer protocols that need buffering (for example, HTTP). If the service implementation does not support this feature, then this state variable shall be set to "NOT IMPLEMENTED".

Do not confuse transitions between AVTransportURI and NextAVTransportURI with track transitions. When AVTransportURI is set to a playlist, NextAVTransportURI will be played when the whole playlist finishes, not when the current playlist entry (CurrentTrackURI) finishes.

#### 5.2.23 NextAVTransportURIMetaData

This required state variable contains the meta-data, in the form of a *DIDL-Lite XML Fragment* (defined in the ContentDirectory service template), associated with the resource pointed to by state variable NextAVTransportURI. See the ContentDirectory service specification [7] for

details. If the service implementation does not support this feature then this state variable shall be set to "NOT IMPLEMENTED".

#### 5.2.24 RelativeTimePosition

For track-aware media, this required state variable contains the current position in the current track, in terms of time, measured from the beginning of the current track. The range for this state variable is from "00:00:00" to the duration of the current track as indicated by the CurrentTrackDuration state variable. For track-aware media, this state variable always contains a positive value.

For track-unaware media (e.g. a single tape), this state variable contains the position, in terms of time, measured from a *zero reference point* on the media. The range for this state variable is from the beginning of the media, measured from the zero reference point to the end of the media, also measured from the zero reference point. For track-unaware media, this state variable can be negative. Indeed, when the zero reference point does not coincide with the beginning of the media, all positions before the zero reference point are expressed as negative values.

The time format used for the RelativeTimePosition state variable is the same as for state variable CurrentTrackDuration. If the service implementation does not support relative time-based position information, then this state variable shall be set to "NOT IMPLEMENTED".

#### 5.2.25 AbsoluteTimePosition

This required state variable contains the current position, in terms of time, measured from the beginning of the media. The time format used for the AbsoluteTimePosition state variable is the same as for state variable CurrentTrackDuration. The range for this state variable is from "00:00:00" to the duration of the current media as indicated by the CurrentMediaDuration state variable. This state variable always contains a positive value.

If the service implementation does not support any kind of position information, then this state variable shall be set to "NOT IMPLEMENTED". Devices that do not have time position information, but are able to detect whether they are at the end of the media shall use special value "END OF MEDIA" when actually at the end, and the value "NOT IMPLEMENTED" otherwise.

#### 5.2.26 RelativeCounterPosition

For track-aware media, this required state variable contains the current position in the current track, in terms of a dimensionless counter, measured from the beginning of the current track. The range for this state variable is from 0 to the counter value that corresponds to the end of the current track. For track-aware media, this state variable always contains a positive value.

For track-unaware media (e.g. a single tape), this state variable contains the position, in terms of a dimensionless counter, measured from a *zero reference point* on the media. The range for this state variable is from the counter value that corresponds to the beginning of the media, measured from the zero reference point to the counter value that corresponds to the end of the media, also measured from the zero reference point. For track-unaware media, this state variable can be negative. Indeed, when the zero reference point does not coincide with the beginning of the media, all positions before the zero reference point are expressed as negative values.

For devices that support media with addressable ranges that equal or exceed the allowed range of this counter, the AVTransport service shall scale actual media addresses to counter values to fit within the range allowed for this counter.

If the service implementation does not support relative count-based position information, then this state variable shall be set to the maximum value of the i4 data type.

#### 5.2.27 AbsoluteCounterPosition

This required state variable contains the current position, in terms of a dimensionless counter, measured from the beginning of the loaded media. The allowed range for this variable is [0, 2147483646]. For devices that support media with addressable ranges that equal or exceed

the allowed range of this counter, the AVTransport service shall scale actual media addresses to counter values to fit within the range allowed for this counter. If the service implementation does not support absolute count-based position information, then this state variable shall be set to the value 2147483647.

Note: Although the data type for state variable AbsoluteCounterPosition is ui4, the range is restricted to [0, Max(i4)] for backwards compatibility reasons.

### 5.2.28 CurrentTransportActions

This conditionally required state variable shall be supported if the AVTransport service implements the GetCurrentTransportActions() action, otherwise it is not allowed. This state variable contains a comma-separated list of transport-controlling actions that can be successfully invoked for the current resource at this specific point in time. The list shall contain a subset (including the empty set) of the following action names: “Play”, “Stop”, “Pause”, “Seek”, “Next”, “Previous” and “Record”. In addition, the list may be augmented by a subset of vendor-defined transport-controlling action names. For example, when a live stream from the Internet is being controlled, the variable can be only “Play,Stop”. When a local audio CD is being controlled, the variable can be “Play,Stop,Pause,Seek,Next,Previous”. This information can be used, for example, to dynamically enable or disable play, stop, and pause buttons, etc., on a user interface.

Table 16 — allowedValueList for CurrentTransportActions

| Value               | R/A                                                                                   |
|---------------------|---------------------------------------------------------------------------------------|
| “ <u>PLAY</u> ”     | <u>R</u>                                                                              |
| “ <u>STOP</u> ”     | <u>R</u>                                                                              |
| “ <u>PAUSE</u> ”    | <u>CR</u> , required if <u>Pause()</u> action is implemented. Not allowed otherwise.  |
| “ <u>SEEK</u> ”     | <u>R</u>                                                                              |
| “ <u>NEXT</u> ”     | <u>R</u>                                                                              |
| “ <u>PREVIOUS</u> ” | <u>R</u>                                                                              |
| “ <u>RECORD</u> ”   | <u>CR</u> , required if <u>Record()</u> action is implemented. Not allowed otherwise. |
| Vendor-defined      | <u>X</u>                                                                              |

### 5.2.29 LastChange

This required state variable is used for eventing purposes to enable clients to receive meaningful event notifications whenever the state of the AVTransport changes. Logically, it contains a list of pairs, one element being an AVTransport instance ID and the second element the name and new value of the state variable for that instance. The format of the LastChange state variable is defined in [6]. The LastChange state variable follows the behavior of the LastChange state variable as described in the RenderingControl service specification [21], subclause 5.2.1.

### 5.2.30 DRMState

This conditionally required state variable shall be supported if the AVTransport service implements the GetDRMState() action and the AVTransport service supports controlling of the transport for DRM-controlled content, otherwise it is not allowed.

The DRMState state variable is used by instances of the AVTransport service to inform control points about process failures and other AVTransport instance state changes that can occur independently of AVTransport actions.

Table 17 below details the allowed values for the DRMState state variable:

Table 17 — allowedValueList for **DRMState**

| Allowed Value                                                                                                                                                | R/A      | Description                                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| " <u>OK</u> "                                                                                                                                                | <u>R</u> | This setting indicates that DRM related processing has completed successfully. This setting also applies, to items which do not have DRM protection applied.                                                      |
| " <u>UNKNOWN</u> "                                                                                                                                           | <u>A</u> | This setting indicates that the state of the DRM subsystem is not known. For example, this would be the case when the DRM system is first initialized and the content-binary location has not yet been specified. |
| " <u>PROCESSING CONTENT KEY</u> " <sup>a</sup>                                                                                                               | <u>A</u> | This setting indicates that the DRM system is currently deriving a decryption key to decrypt a content-binary.                                                                                                    |
| " <u>CONTENT KEY FAILURE</u> "                                                                                                                               | <u>A</u> | This setting indicates that a content key needed to start or continue media transport was either not received or has failed verification.                                                                         |
| " <u>ATTEMPTING AUTHENTICATION</u> " <sup>a</sup>                                                                                                            | <u>A</u> | This setting indicates that the authentication process is currently in progress, but has not yet completed.                                                                                                       |
| " <u>FAILED AUTHENTICATION</u> "                                                                                                                             | <u>A</u> | This setting indicates that an attempted authentication process has failed.                                                                                                                                       |
| " <u>NOT AUTHENTICATED</u> "                                                                                                                                 | <u>A</u> | This setting indicates that authentication has not yet taken place or that a previously successful authentication has transitioned to a non-authenticated state for example due to a timeout or other condition.  |
| " <u>DEVICE REVOCATION</u> "                                                                                                                                 | <u>A</u> | This setting indicates that the DRM system has detected that this device has been revoked, i.e. the device has been explicitly prohibited from accessing any DRM protected content on this server.                |
| " <u>DRM SYSTEM NOT SUPPORTED</u> "                                                                                                                          | <u>A</u> | This setting indicates that the device cannot decrypt the content-binary since it does not support the DRM technology used to encode this content.                                                                |
| " <u>LICENSE DENIED</u> "                                                                                                                                    | <u>A</u> | This setting indicates that this device is not able to obtain any license for this content-binary.                                                                                                                |
| " <u>LICENSE EXPIRED</u> "                                                                                                                                   | <u>A</u> | This setting indicates that a previously valid license obtained by this device has expired.                                                                                                                       |
| " <u>LICENSE INSUFFICIENT</u> "                                                                                                                              | <u>A</u> | This setting indicates that a license granted to the device does not permit an attempted operation on the content-binary.                                                                                         |
| <sup>a</sup> This setting indicates a transient DRM state. As DRM processing continues, this state would be expected to transition to a non-transient state. |          |                                                                                                                                                                                                                   |

### 5.2.31 **SyncOffset**

This conditionally required state variable shall be supported if the AVTransport service implements **GetSyncOffset()** and **SetSyncOffset()** actions, otherwise it is not allowed. Note that if either action is implemented, both shall be implemented. This state variable indicates a high-precision time offset that is used to adjust the actual timing of the ConnectionManager **CLOCKSYNC** feature for a specific instance. Its value is used to automatically and uniformly shift all of the presentation time values that are associated with the ConnectionManager **CLOCKSYNC** feature. Some examples include the **RelativePresentationTime** input argument of the **SyncPlay()** action or the presentation timestamps associated with a content stream.

A positive value indicates that the relevant time-of-day value(s) shall be increased by the specified amount, thus, causing a slight delay. Conversely, a negative value indicates that the relevant time-of-day value(s) shall be decreased by the specified amount, thus, causing the associated effect to occur sooner than would have otherwise occurred.

The **SyncOffset** state variable is of type string and has the following format:

```

duration      ::= ['-'] 'P' time
time          ::= HH ':' MM ':' SS '.' MilliS MicroS NanoS
HH            ::= 2DIGIT (* 00-23 *)
MM            ::= 2DIGIT (* 00-59 *)
SS            ::= 2DIGIT (* 00-59 *)
MilliS        ::= 3DIGIT

```

MicroS ::= 3DIGIT  
 NanoS ::= 3DIGIT

Table 18 — allowedValueRangefor **SyncOffset**

|                       | Value          | R/A      |
|-----------------------|----------------|----------|
| <b><u>minimum</u></b> | >= P00:00:00   | <u>R</u> |
| <b><u>maximum</u></b> | Vendor defined | <u>R</u> |
| <b><u>step</u></b>    | Vendor defined | <u>R</u> |

### 5.2.32 **A ARG TYPE SeekMode**

This required state variable is introduced to provide type information for the **Unit** argument in action **Seek()**. It indicates the allowed units in which the amount of seeking to be performed is specified. It can be specified as a time (relative or absolute), a count (relative or absolute), a track number, a tape-index (for example, for tapes with an indexing facility; relative or absolute) or even a video frame (relative or absolute). A device vendor may implement a subset of the allowed value list of this state variable. Only the value "**TRACK\_NR**" is required.

Table 19 — allowedValueList for **A ARG TYPE SeekMode**

| Value                            | R/A      |
|----------------------------------|----------|
| " <b><u>TRACK_NR</u></b> "       | <u>R</u> |
| " <b><u>ABS_TIME</u></b> "       | <u>A</u> |
| " <b><u>REL_TIME</u></b> "       | <u>A</u> |
| " <b><u>ABS_COUNT</u></b> "      | <u>A</u> |
| " <b><u>REL_COUNT</u></b> "      | <u>A</u> |
| " <b><u>CHANNEL_FREQ</u></b> "   | <u>A</u> |
| " <b><u>TAPE_INDEX</u></b> "     | <u>A</u> |
| " <b><u>REL_TAPE_INDEX</u></b> " | <u>A</u> |
| " <b><u>FRAME</u></b> "          | <u>A</u> |
| " <b><u>REL_FRAME</u></b> "      | <u>A</u> |
| Vendor-defined                   | <u>X</u> |

### 5.2.33 **A ARG TYPE SeekTarget**

This required state variable is introduced to provide type information for the **Target** argument in action **Seek()**. It indicates the target position of the **Seek()** action, in terms of units defined by state variable **A ARG TYPE SeekMode**. The data type of this variable is **string**. However, depending on the actual seek mode used, it shall contain string representations of values as defined in Table 20 below:

Table 20 — Format of A\_ARG\_TYPE SeekTarget

| Value of <u>A_ARG_TYPE SeekMode</u> | Format of <u>A_ARG_TYPE SeekTarget</u>     |
|-------------------------------------|--------------------------------------------|
| " <u>TRACK_NR</u> "                 | <u>ui4</u>                                 |
| " <u>ABS_TIME</u> "                 | Formatted as specified in subclause 5.2.16 |
| " <u>REL_TIME</u> "                 | Formatted as specified in subclause 5.2.16 |
| " <u>ABS_COUNT</u> "                | <u>ui4</u>                                 |
| " <u>REL_COUNT</u> "                | <u>i4</u>                                  |
| " <u>CHANNEL_FREQ</u> "             | <u>float</u> , expressed in Hz.            |
| " <u>TAPE-INDEX</u> "               | <u>ui4</u>                                 |
| " <u>REL TAPE-INDEX</u> "           | <u>i4</u>                                  |
| " <u>FRAME</u> "                    | <u>ui4</u>                                 |
| " <u>REL FRAME</u> "                | <u>i4</u>                                  |

Supported ranges of these integer, time or float values are device-dependent.

#### 5.2.34 A\_ARG\_TYPE InstanceID

This required state variable is introduced to provide type information for the InstanceID input argument present in all AVTransport actions. It identifies the virtual instance of the AVTransport service to which the action applies. A valid InstanceID is obtained from a *factory* method in the ConnectionManager service: the ConnectionManager::PrepareForConnection() action.

If the device's ConnectionManager does not implement the optional ConnectionManager::PrepareForConnection() action, special value "0" shall be used for the InstanceID input argument. In such a case, the device implements a single static AVTransport instance, and only one stream can be controlled and sent (or received) at any time.

#### 5.2.35 A\_ARG\_TYPE DeviceUDN

This conditionally required state variable shall be supported if the AVTransport service implements the SetStateVariables() action, otherwise it is not allowed. The state variable is introduced to provide type information for the AVTransportUDN argument in that action. It is a string value containing the UDN of the device.

#### 5.2.36 A\_ARG\_TYPE ServiceType

This conditionally required state variable shall be supported if the AVTransport service implements the SetStateVariables() action, otherwise it is not allowed. The state variable is introduced to provide type information for the ServiceType argument in that action. It is a string value containing the service type and version number of a service such as "AVTransport.3".

#### 5.2.37 A\_ARG\_TYPE ServiceID

This conditionally required state variable shall be supported if the AVTransport service implements the SetStateVariables() action, otherwise it is not allowed. The state variable is introduced to provide type information for the ServiceID argument in that action. It is a string value containing the service ID of a service.

#### 5.2.38 A\_ARG\_TYPE StateVariableValuePairs

This conditionally required state variable shall be supported if the AVTransport service implements the GetStateVariables() and SetStateVariables() actions, otherwise it is not allowed. Note that if either action is implemented, both shall be implemented. The state variable is introduced to provide type information for the StateVariableValuePairs argument in that action. This state variable contains a list of state variable names and their values. The list of state variables whose name/value pair is requested is given by another argument to the action. The structure of the StateVariableValuePairs argument is defined in [4].

## ISO/IEC 29341-20-10:2017(E)

The following *stateVariableValuePairs* XML Document illustrates a typical example of the schema:

```
<?xml version="1.0" encoding="UTF-8"?>
<stateVariableValuePairs
  xmlns="urn:schemas-upnp-org:av:avs"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:avs
    http://www.upnp.org/schemas/av/avs.xsd">
  <stateVariable variableName="CurrentPlayMode">
    NORMAL
  </stateVariable>
  <stateVariable variableName="CurrentTrack">
    3
  </stateVariable>
  <!-- More state variable value pairs can be inserted here -->
</stateVariableValuePairs>
```

The relevant variable names shall be either all or a subset (as required) of the defined AVTransport state variables except for LastChange and any A\_ARG\_TYPE xxx state variables.

### 5.2.39 A\_ARG\_TYPE StateVariableList

This conditionally required state variable shall be supported if the AVTransport service implements the GetStateVariables() and SetStateVariables() actions, otherwise it is not allowed. Note that if either action is implemented, both shall be implemented. The state variable is introduced to provide type information for the StateVariableList argument in that action. It is a CSV list of state variable names. This variable may contain one or more (as required) of the defined AVTransport state variable names except LastChange and any A\_ARG\_TYPE xxx state variable names. The asterisk ("\*") can be specified to indicate all relevant variable names (excluding LastChange and any A\_ARG\_TYPE xxx state variables.)

### 5.2.40 A\_ARG\_TYPE PlaylistData

This conditionally required state variable shall be supported if the AVTransport service implements either the SetStaticPlaylist() or SetStreamingPlaylist() actions, otherwise it is not allowed. This state variable is introduced to provide a chunk of a playlist document to the device. It is a string value.

### 5.2.41 A\_ARG\_TYPE PlaylistDataLength

This conditionally required state variable shall be supported if the AVTransport service implements either the SetStaticPlaylist() or SetStreamingPlaylist() actions, otherwise it is not allowed. This state variable is introduced to indicate the chunk's length of the playlist document. It is a ui4 value. The data length shall match the XML-escaped representation of the associated string value.

### 5.2.42 A\_ARG\_TYPE PlaylistOffset

This conditionally required state variable shall be supported if the AVTransport service implements the SetStaticPlaylist() action, otherwise it is not allowed. This state variable is introduced to provide a zero-based offset into the playlist document being passed to the renderer. The state variable contains a ui4 value. The offset value shall correspond to the the XML-escaped representation of the aggregate playlist.

### 5.2.43 A\_ARG\_TYPE PlaylistTotalLength

This conditionally required state variable shall be supported if the AVTransport service implements the SetStaticPlaylist() action, otherwise it is not allowed. This state variable is introduced to provide the total length of the entire playlist document. The state variable contains a ui4 value. The total length shall match the XML-escaped representation of the aggregate playlist.

**5.2.44 A\_ARG\_TYPE\_PlaylistMIMETYPE**

This conditionally required state variable shall be supported if the AVTransport service implements either the SetStaticPlaylist() or SetStreamingPlaylist() actions, otherwise it is not allowed. This state variable is introduced to provide the MIME type of the playlist provided to the device. The value of this argument corresponds to the contents of the res@protocolInfo property 3<sup>rd</sup> field. The state variable contains a string value.

**5.2.45 A\_ARG\_TYPE\_PlaylistExtendedType**

This conditionally required state variable shall be supported if the AVTransport service implements either the SetStaticPlaylist() or SetStreamingPlaylist() actions, otherwise it is not allowed. This state variable is introduced to provide extended type information of the playlist provided to the device. The value of this argument corresponds to the contents of the res@protocolInfo property 4<sup>th</sup> field. The state variable contains a string value.

**5.2.46 A\_ARG\_TYPE\_PlaylistStep**

This conditionally required state variable shall be supported if the AVTransport service implements the SetStreamingPlaylist() action, otherwise it is not allowed. This state variable is introduced to provide step information for a streaming playlist operation. The state variable contains a string value.

**Table 21 — allowedValueList for A\_ARG\_TYPE\_PlaylistStep**

| Value               | R/A      | Description                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| " <u>Initial</u> "  | <u>R</u> | Indicates that this is the start of streaming playlist operation.                                                                                                                                                                                                                                                                                                                                   |
| " <u>Continue</u> " | <u>R</u> | Indicates that this is a continuation of a streaming playlist operation.                                                                                                                                                                                                                                                                                                                            |
| " <u>Stop</u> "     | <u>R</u> | Indicates that the current streaming playlist operation will end when all pending playlist data at the device is consumed.                                                                                                                                                                                                                                                                          |
| " <u>Reset</u> "    | <u>R</u> | Indicates that processing of the current streaming playlist ends immediately. Any pending playlist data for the streaming playlist is discarded.                                                                                                                                                                                                                                                    |
| " <u>Replace</u> "  | <u>A</u> | Indicates the current streaming playlist contents be replaced with the contents provided by this operation. If the playlist is being actively rendered, then the current playback selection shall not be interrupted. Processing of the replacement playlist tracks shall begin at the next track transition. Additional playlist entries may be delivered using the " <u>Continue</u> " operation. |

**5.2.47 A\_ARG\_TYPE\_PlaylistType**

This conditionally required state variable shall be supported if the AVTransport service implements the GetPlaylistInfo() action, otherwise it is not allowed. This state variable describes the playlist types supported by the implementation. The state variable contains a string value.

**Table 22 — allowedValueList for A\_ARG\_TYPE\_PlaylistType**

| Value                          | R/A                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| " <u>Static</u> "              | <u>CR</u> , required if the information returned by the <u>GetPlaylistInfo()</u> action refers to a static (non-streaming) playlist. Not allowed otherwise. If the <u>SetStaticPlaylist()</u> action is supported, then this allowed value shall be provided.                                                                                                                                                |
| " <u>StaticPIContents</u> "    | <u>CA</u> , allowed if the information returned by the <u>GetPlaylistInfo()</u> action refers to a static (non-streaming) playlist. Otherwise not allowed. If the <u>SetStaticPlaylist()</u> action is supported, then this allowed value may be provided. If this allowed value is implemented then the <playlistContents> element of the <u>A_ARG_TYPE_PlaylistInfo</u> state variable shall be supported. |
| " <u>Streaming</u> "           | <u>CR</u> , required if the information returned by the <u>GetPlaylistInfo()</u> action refers to a streaming playlist. Not allowed otherwise. If the <u>SetStreamingPlaylist()</u> action is supported, then this allowed value shall be provided.                                                                                                                                                          |
| " <u>StreamingPIContents</u> " | <u>CA</u> , allowed if the information returned by the <u>GetPlaylistInfo()</u> action refers to a streaming playlist. Otherwise not allowed. If the <u>SetStreamingPlaylist()</u> action is supported, then this allowed value may be provided. If this allowed value is implemented then the <playlistContents> element of the <u>A_ARG_TYPE_PlaylistInfo</u> state variable shall be supported.           |

**5.2.48 A\_ARG\_TYPE\_PlaylistInfo**

This conditionally required state variable shall be supported if the AVTransport service implements the [GetPlaylistInfo\(\)](#) action, otherwise it is not allowed. This state variable is a document detailing whether the implementation can play the indicated item formats. The state variable contains a [string](#) value. The structure of the document is as follows:

[A\\_ARG\\_TYPE\\_PlaylistInfo](#) state variable for Streaming Playlist operation:

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

  <streamingPlaylistInfo>
    <playlistState>
      Idle | Ready | Active
    </playlistState>

    <playlistChunkLengthMax>
      maximum allowed length of a playlist chunk, in its XML-escaped form
    </playlistChunkLengthMax>

    <playlistDataLengthUsed>
      length of playlist data currently stored at device, in its XML-escaped
      form
    </playlistDataLengthUsed>

    <playlistTotalLengthAvail>
      length of playlist storage currently available on device, in its XML-
      escaped form
    </playlistTotalLengthAvail>

    <playlistTrackMin>
      current minimum available track number for this playlist
    </playlistTrackMin>

    <playlistTrackMax>
      current maximum available track number for this playlist
    </playlistTrackMax>

    <playlistCurrentFormat>
      <contentType
        MIMEType="playlist MIME type"
        extendedType="res@protocolInfo 4th field value" />
    </playlistCurrentFormat>

    <playlistAllowedFormats>
      <contentType
        MIMEType="playlist MIME type"
        extendedType="res@protocolInfo 4th field value" />
      <!-- Additional supported streaming <contentType> elements -->
    </playlistAllowedFormats>

    <!-- PlaylistType == StreamingPlContents -->
    <!-- See GetPlaylistInfo() and A_ARG_TYPE_PlaylistInfo -->

    <playlistContents currentTrack="current track number">
      streaming playlist contents
    </playlistContents>

  </streamingPlaylistInfo>
</playlistInfo>
```

A\_ARG\_TYPE\_PlaylistInfo state variable for Static Playlist operation:

```

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

  <staticPlaylistInfo>

    <playlistState>
      Idle | Incomplete | Ready | Active
    </playlistState>

    <playlistChunkLengthMax>
      maximum allowed length of a playlist chunk
    </playlistChunkLengthMax>

    <playlistTotalLengthMax>
      length of playlist storage currently available on device
    </playlistTotalLengthMax>

    <playlistCurrentFormat>
      <contentType
        MIMEType="playlist MIME type"
        extendedType="res@protocolInfo 4th field value" />
    </playlistCurrentFormat>

    <playlistAllowedFormats>
      <contentType
        MIMEType="playlist MIME type"
        extendedType="res@protocolInfo 4th field value" />
      <!-- Additional supported static <contentType> elements -->
    </playlistAllowedFormats>

    <!-- PlaylistType == StaticPlContents -->
    <!-- See GetPlaylistInfo() and A_ARG_TYPE_PlaylistInfo -->

    <playlistContents currentObjectID="current playlist item identifier">
      Static (XML) playlist contents
    </playlistContents>

  </staticPlaylistInfo>
</playlistInfo>

```

xml

Allowed. Case sensitive.

playlistInfo

Required. Shall include a namespace declaration for the PlaylistInfo schema ("urn:schemas-upnp-org:av:rpl"). Shall include zero or one of the following elements. This namespace defines the following elements and attributes:

streamingPlaylistInfo

Required. <XML>. Provides information about a streaming playlist operation. It consists of a series of dependent elements that describe various aspects of a streaming playlist operation.

playlistState

Required. xsd:string, Provides state information for a streaming playlist operation. The possible states for the playlist state are:

Idle – The device instance is not currently processing a streaming playlist.

Ready – A streaming playlist operation is in progress and sufficient playlist data has been sent to the device instance to start playback. However, a Play() action has not been invoked.

Active – The device instance is currently playing a streaming playlist.

playlistChunkLengthMax

Required. xsd:unsignedInt, Provides the maximum allowable length for a playlist data chunk.

playlistDataLengthUsed

Required. xsd:unsignedInt, Provides the number of playlist bytes currently available (stored) at the device for this instance.

playlistTotalLengthAvail

Required. xsd:unsignedInt, Provides the maximum number of playlist bytes that will currently be accepted by the device for this instance.

playlistTrackMin

Required. xsd:unsignedInt, Provides the current minimum track number that the media renderer has in its playlist buffer for this instance

playlistTrackMax

Required. xsd:unsignedint, Provides the current maximum track number that the media renderer has in its playlist buffer for this instance.

playlistCurrentFormat

Required. <XML>, Provides MIME type and extended type information for the current playlist. If the device is not processing a playlist, this element shall be empty.

contentType

Allowed. <XML>, Identifies the MIME type and extended type information for the playlist.

@MIMETYPE

Required. xsd:string, Provides the MIME type for the playlist.

@extendedType

Required. xsd:string, Provides the extended type information for the playlist. This information should contain information typically provided by a [res@protocolInfo](#) property 4<sup>th</sup> field element.

playlistAllowedFormats

Required. <XML>, Provides zero or more <contentType> elements indicating streaming playlist types supported by the device.

contentType

Allowed. <XML>, See <contentType> element as defined above.

playlistContents

Conditionally required. xsd:string, Element shall be present if the [PlaylistType](#) argument of the [GetPlaylistInfo\(\)](#) action is set to "[StreamingPLContents](#)" (see subclause 5.2.47 for further details), otherwise not allowed. This element value is a copy of the device streaming playlist. If the current <playlistState> element value is not "[Ready](#)" or "[Active](#)", this element shall be empty. Playlist data returned by this element's value shall be XML escaped.

@currentTrack

Required. xsd:unsignedint, Provides the current track number for the streaming playlist. The track number reported shall be within the track number range reported by the <playlistTrackMin> and <playlistTrackMax> elements.

staticPlaylistInfo

Required. <XML>, Provides information about a static playlist operation. It consists of a series of dependent elements that describe various aspects of a static playlist operation.

playlistState

Required. xsd:string, Provides state information for a static playlist operation. The possible states for the playlist state are:

[Idle](#) – The device instance is not currently processing a static playlist.

[Incomplete](#) – A static playlist operation has been started on the device instance but the full playlist has not been sent to the device instance.

[Ready](#) - A static playlist operation is in progress and the full playlist has been sent and accepted by the device. However, a [Play\(\)](#) action has not been invoked.

[Active](#) – The device instance is currently playing a static playlist.

playlistChunkLengthMax

Required. xsd:unsignedInt, Provides the maximum allowable length for a playlist data chunk for this device instance.

playlistTotalLengthMax

Required. xsd:unsignedInt, Provides the maximum number of playlist bytes that will currently be accepted by the device for this instance.

playlistCurrentFormat

Required. <XML>, Provides MIME type and extended type information for the current playlist. If the device is not processing a playlist, this element shall be empty.

contentType

Allowed. <XML>, See <contentType> element as defined above.

playlistAllowedFormats

Required. <XML>, Provides zero or more <contentType> elements indicating static playlist types supported by the device.

contentType

Allowed. <XML>, See <contentType> element as defined above.

playlistContents

Conditionally required. xsd:string. Element shall be present if the PlaylistType argument of the GetPlaylistInfo() action is set to "StaticPiContents" (see subclause 5.2.47 for further details), otherwise not allowed. This element value is a copy of the device static playlist. If the current <playlistState> element value is not "Ready" or "Active", this element shall be empty. Playlist data returned by this element's value shall be XML escaped.

@currentObjID

Required. xsd:string, Provides an identifier for the currently playing playlist object. For XML formatted playlists (DIDL-Lite) the identifier value corresponds to the @id property. Identifier values for non-DIDL-Lite formats are playlist format specific.

**5.2.49 A ARG TYPE PlaylistStartObjID**

This conditionally required state variable shall be supported if the AVTransport service implements the SetStaticPlaylist() action, otherwise it is not allowed. This argument provides a starting object @id property value for playlists which employ object linking properties. The state variable contains a string value. For playlists that do not employ object linking properties this state variable should be set to "".

**5.2.50 A ARG TYPE PlaylistStartGroupID**

This conditionally required state variable shall be supported if the AVTransport service implements the SetStaticPlaylist() action, otherwise it is not allowed. This argument provides a starting target group ID objectLink@groupID value for playlists which employ object linking properties. The state variable contains a string value. For playlists that do not employ object linking properties this state variable should be set to "".

**5.2.51 A ARG TYPE SyncOffsetAdj**

This conditionally required state variable shall be supported if the AVTransport service implements the AdjustSyncOffset() action, otherwise it is not allowed. This state variable indicates a high-precision time offset that is used to adjust the actual timing of the ConnectionManager CLOCKSYNC feature for a specific instance. Its value is used to automatically and uniformly shift all of the presentation time values that are associated with the ConnectionManager CLOCKSYNC feature. Some examples include the RelativePresentationTime input argument of the SyncPlay() action or the presentation timestamps associated with a content stream.

A positive value indicates that the relevant time-of-day value(s) shall be increased by the specified amount, thus, causing a slight delay. Conversely, a negative value indicates that the relevant time-of-day value(s) shall be decreased by the specified amount, thus, causing the associated effect to occur sooner than would have otherwise occurred.

The A ARG TYPE SyncOffsetAdj state variable is of type string and has the following format:

```
duration      ::= ['-'] 'P' time
time          ::= HH ':' MM ':' SS '.' MilliS MicroS NanoS
HH            ::= 2DIGIT (* 00-23 *)
MM            ::= 2DIGIT (* 00-59 *)
SS            ::= 2DIGIT (* 00-59 *)
MilliS        ::= 3DIGIT
MicroS        ::= 3DIGIT
NanoS         ::= 3DIGIT
```

**5.2.52 A\_ARG\_TYPE\_PresentationTime**

This conditionally required state variable shall be implemented if the AVTransport service implements the [SyncPlay\(\)](#), [SyncStop\(\)](#), or [SyncPause\(\)](#) actions, otherwise it is not allowed. This state variable is introduced to provide type information for the [ReferencePresentationTime](#) and other similar input arguments for AVTransport actions related to *CLOCKSYNC feature*. It represents a high-precision point in time (corresponding to a specific time on a specific day) that is used to designate the exact time when certain time-sensitive operations are to be performed.

The [A\\_ARG\\_TYPE\\_PresentationTime](#) state variable is of type **string** and represents a point in time as specified by [36]. The format is as follows:

```

date-time          ::= yyyy '-' mm '-' dd T-labeled-time
T-labeled-time     ::= 'T' time 'Z'
time               ::= HH ':' MM ':' SS '.' MilliS MicroS NanoS
HH                 ::= 2DIGIT (* 00-23 *)
MM                 ::= 2DIGIT (* 00-59 *)
SS                 ::= 2DIGIT (* 00-59 *)
MilliS             ::= 3DIGIT
MicroS             ::= 3DIGIT
NanoS              ::= 3DIGIT

```

**5.2.53 A\_ARG\_TYPE\_ClockId**

This conditionally required state variable shall be implemented if the AVTransport service implements the [SyncPlay\(\)](#), [SyncStop\(\)](#), or [SyncPause\(\)](#) actions, otherwise it is not allowed. This state variable is introduced to provide type information for the [ReferenceClockId](#) input argument for AVTransport actions related to *CLOCKSYNC feature*. It represents a unique **string** identifier for the <deviceClockInfo> instance which in turn identifies the clock sync protocol, master clock, clock accuracy and supported timestamp mechanisms (if any). The [A\\_ARG\\_TYPE\\_ClockId](#) value shall be one of the deviceClockInfo@id values, which are declared in the [ConnectionManager::FeatureList](#) state variable. In this case the referenced ConnectionManager service has the same parent device as this AVTransport service.

**5.3 Eventing and Moderation****5.3.1 Eventing and Moderation Overview****Table 23 — Event Moderation**

| Variable Name                                | Evented            | Moderated Event    | Min Event Interval <sup>a</sup> (seconds) | Logical Combination | Min Delta per Event <sup>b</sup> |
|----------------------------------------------|--------------------|--------------------|-------------------------------------------|---------------------|----------------------------------|
| <a href="#">TransportState</a>               | <a href="#">NO</a> | <a href="#">NO</a> |                                           |                     |                                  |
| <a href="#">TransportStatus</a>              | <a href="#">NO</a> | <a href="#">NO</a> |                                           |                     |                                  |
| <a href="#">CurrentMediaCategory</a>         | <a href="#">NO</a> | <a href="#">NO</a> |                                           |                     |                                  |
| <a href="#">PlaybackStorageMedium</a>        | <a href="#">NO</a> | <a href="#">NO</a> |                                           |                     |                                  |
| <a href="#">RecordStorageMedium</a>          | <a href="#">NO</a> | <a href="#">NO</a> |                                           |                     |                                  |
| <a href="#">PossiblePlaybackStorageMedia</a> | <a href="#">NO</a> | <a href="#">NO</a> |                                           |                     |                                  |
| <a href="#">PossibleRecordStorageMedia</a>   | <a href="#">NO</a> | <a href="#">NO</a> |                                           |                     |                                  |
| <a href="#">CurrentPlayMode</a>              | <a href="#">NO</a> | <a href="#">NO</a> |                                           |                     |                                  |
| <a href="#">TransportPlaySpeed</a>           | <a href="#">NO</a> | <a href="#">NO</a> |                                           |                     |                                  |
| <a href="#">RecordMediumWriteStatus</a>      | <a href="#">NO</a> | <a href="#">NO</a> |                                           |                     |                                  |
| <a href="#">PossibleRecordQualityModes</a>   | <a href="#">NO</a> | <a href="#">NO</a> |                                           |                     |                                  |
| <a href="#">CurrentRecordQualityMode</a>     | <a href="#">NO</a> | <a href="#">NO</a> |                                           |                     |                                  |
| <a href="#">NumberOfTracks</a>               | <a href="#">NO</a> | <a href="#">NO</a> |                                           |                     |                                  |
| <a href="#">CurrentTrack</a>                 | <a href="#">NO</a> | <a href="#">NO</a> |                                           |                     |                                  |
| <a href="#">CurrentTrackDuration</a>         | <a href="#">NO</a> | <a href="#">NO</a> |                                           |                     |                                  |

| Variable Name                                                                                                                                                              | Evented    | Moderated Event | Min Event Interval <sup>a</sup> (seconds) | Logical Combination | Min Delta per Event <sup>b</sup> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------------|-------------------------------------------|---------------------|----------------------------------|
| <u>CurrentMediaDuration</u>                                                                                                                                                | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>CurrentTrackURI</u>                                                                                                                                                     | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>CurrentTrackMetaData</u>                                                                                                                                                | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>AVTransportURI</u>                                                                                                                                                      | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>AVTransportURIMetaData</u>                                                                                                                                              | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>NextAVTransportURI</u>                                                                                                                                                  | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>NextAVTransportURIMetaData</u>                                                                                                                                          | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>RelativeTimePosition</u>                                                                                                                                                | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>AbsoluteTimePosition</u>                                                                                                                                                | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>RelativeCounterPosition</u>                                                                                                                                             | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>AbsoluteCounterPosition</u>                                                                                                                                             | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>CurrentTransportActions</u>                                                                                                                                             | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>LastChange</u>                                                                                                                                                          | <u>YES</u> | <u>YES</u>      | 0.2                                       |                     |                                  |
| <u>DRMState</u>                                                                                                                                                            | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>SyncOffset</u>                                                                                                                                                          | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>A_ARG_TYPE_SeekMode</u>                                                                                                                                                 | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>A_ARG_TYPE_SeekTarget</u>                                                                                                                                               | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>A_ARG_TYPE_InstanceID</u>                                                                                                                                               | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>A_ARG_TYPE_DeviceUDN</u>                                                                                                                                                | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>A_ARG_TYPE_ServiceType</u>                                                                                                                                              | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>A_ARG_TYPE_ServiceID</u>                                                                                                                                                | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>A_ARG_TYPE_StateVariableValuePairs</u>                                                                                                                                  | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>A_ARG_TYPE_PlaylistData</u>                                                                                                                                             | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>A_ARG_TYPE_PlaylistDataLength</u>                                                                                                                                       | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>A_ARG_TYPE_PlaylistOffset</u>                                                                                                                                           | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>A_ARG_TYPE_PlaylistTotalLength</u>                                                                                                                                      | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>A_ARG_TYPE_PlaylistMIMEType</u>                                                                                                                                         | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>A_ARG_TYPE_PlaylistExtendedType</u>                                                                                                                                     | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>A_ARG_TYPE_PlaylistStep</u>                                                                                                                                             | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>A_ARG_TYPE_PlaylistType</u>                                                                                                                                             | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>A_ARG_TYPE_PlaylistInfo</u>                                                                                                                                             | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>A_ARG_TYPE_PlaylistStartObjID</u>                                                                                                                                       | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>A_ARG_TYPE_PlaylistStartGroupID</u>                                                                                                                                     | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>A_ARG_TYPE_StateVariableList</u>                                                                                                                                        | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>A_ARG_TYPE_PresentationTime</u>                                                                                                                                         | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>A_ARG_TYPE_ClockID</u>                                                                                                                                                  | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <u>A_ARG_TYPE_SyncOffsetAdj</u>                                                                                                                                            | <u>NO</u>  | <u>NO</u>       |                                           |                     |                                  |
| <i>Non-standard state variables implemented by a UPnP vendor go here</i>                                                                                                   | <i>TBD</i> | <i>TBD</i>      | <i>TBD</i>                                | <i>TBD</i>          | <i>TBD</i>                       |
| <sup>a</sup> Max event rate is determined by $N$ , where $Rate = 1/N$ , where $N$ is the Min Event Interval in seconds.<br><sup>b</sup> $(N) * (allowedValueRange Step)$ . |            |                 |                                           |                     |                                  |

Note that non-standard state variables shall also be evented through the LastChange event mechanism.

### 5.3.2 Event Model

Since the AVTransport service supports multiple virtual instances (via the InstanceID argument included in each action), the traditional UPnP eventing model is unable to differentiate between multiple instances of the same state variable. Therefore, the AVTransport service event model defines a specialized state variable (LastChange) that is used exclusively for eventing individual state changes. In this model, the LastChange state change is the only variable that is evented using the standard UPnP event mechanism. All other state variables, except the position-related state variables listed as a) to d) below, are indirectly evented via the LastChange state variable. (Note: A\_ARG\_TYPE\_ state variables are not evented, either directly or indirectly). More details about the LastChange-based event mechanism can be found in the RenderingControl service specification [21], subclause 5.3.1.

The AVTransport service contains various state variables that, during certain transport states, change almost continuously. The following variables are therefore not evented via LastChange:

- a) RelativeTimePosition
- b) AbsoluteTimePosition
- c) RelativeCounterPosition
- d) AbsoluteCounterPosition

Each control point can poll for these values at a rate appropriate for their application, whenever they need to. For example, a control point can invoke GetPositionInfo() every second when the TransportState is "PLAYING", "RECORDING" or "TRANSITIONING". This is more efficient and flexible than requiring event notifications to be sent to all subscribing control points, in all cases.

Evented state variables shall only be evented if their value actually changes. Writing the same value to a state variable does not generate an event. For example, a transition from the state "PLAYING" to the state "PLAYING" with a different speed does not generate an event for state variable TransportState ("PLAYING" → "PLAYING"). However, this transition will generate an event for the state variable TransportPlaySpeed. If a moderated state variable is evented and it returns the same value, this means that within the moderation time, its value has actually changed and then changed back to its previous value.

## 5.4 Actions

## 5.4.1 Action Overview

Table 24 — Actions

| Name                                                      | R/A <sup>a</sup>       | Control Point R/A <sup>b</sup> |
|-----------------------------------------------------------|------------------------|--------------------------------|
| <u>SetAVTransportURI()</u>                                | <u>R</u>               | <u>R</u>                       |
| <u>SetNextAVTransportURI()</u>                            | <u>A</u>               | <u>A</u>                       |
| <u>GetMediaInfo()</u>                                     | <u>R</u>               | <u>A</u>                       |
| <u>GetMediaInfo_Ext()</u>                                 | <u>R</u>               | <u>A</u>                       |
| <u>GetTransportInfo()</u>                                 | <u>R</u>               | <u>A</u>                       |
| <u>GetPositionInfo()</u>                                  | <u>R</u>               | <u>A</u>                       |
| <u>GetDeviceCapabilities()</u>                            | <u>R</u>               | <u>A</u>                       |
| <u>GetTransportSettings()</u>                             | <u>R</u>               | <u>A</u>                       |
| <u>Stop()</u>                                             | <u>R</u>               | <u>R</u> <sup>c</sup>          |
| <u>Play()</u>                                             | <u>R</u>               | <u>R</u> <sup>c</sup>          |
| <u>Pause()</u>                                            | <u>A</u>               | <u>A</u>                       |
| <u>Record()</u>                                           | <u>A</u>               | <u>A</u>                       |
| <u>Seek()</u>                                             | <u>R</u>               | <u>A</u>                       |
| <u>Next()</u>                                             | <u>R</u>               | <u>A</u>                       |
| <u>Previous()</u>                                         | <u>R</u>               | <u>A</u>                       |
| <u>SetPlayMode()</u>                                      | <u>A</u>               | <u>A</u>                       |
| <u>SetRecordQualityMode()</u>                             | <u>CA</u> <sup>d</sup> | <u>A</u>                       |
| <u>GetCurrentTransportActions()</u>                       | <u>A</u>               | <u>A</u>                       |
| <u>GetDRMState()</u>                                      | <u>CR</u> <sup>e</sup> | <u>A</u>                       |
| <u>GetStateVariables()</u>                                | <u>CR</u> <sup>e</sup> | <u>A</u>                       |
| <u>SetStateVariables()</u>                                | <u>CR</u> <sup>e</sup> | <u>A</u>                       |
| <u>GetSyncOffset()</u>                                    | <u>CR</u> <sup>e</sup> | <u>A</u>                       |
| <u>AdjustSyncOffset()</u>                                 | <u>CR</u> <sup>e</sup> | <u>A</u>                       |
| <u>SetSyncOffset()</u>                                    | <u>CR</u> <sup>e</sup> | <u>A</u>                       |
| <u>SyncPlay()</u>                                         | <u>CR</u> <sup>e</sup> | <u>A</u>                       |
| <u>SyncStop()</u>                                         | <u>CR</u> <sup>e</sup> | <u>A</u>                       |
| <u>SyncPause()</u>                                        | <u>CA</u> <sup>d</sup> | <u>A</u>                       |
| <u>SetStaticPlaylist()</u>                                | <u>A</u>               | <u>A</u>                       |
| <u>SetStreamingPlaylist()</u>                             | <u>A</u>               | <u>A</u>                       |
| <u>GetPlaylistInfo()</u>                                  | <u>CR</u> <sup>e</sup> | <u>A</u>                       |
| Non-standard actions implemented by a UPnP vendor go here | <u>X</u>               | <u>X</u>                       |

## ISO/IEC 29341-20-10:2017(E)

| Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | R/A <sup>a</sup> | Control Point R/A <sup>b</sup> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------------------------------|
| <p><sup>a</sup> For a device this column indicates whether the action shall be implemented or not, where <u>R</u> = required, <u>A</u> = allowed, <u>CR</u> = conditionally required, <u>CA</u> = conditionally allowed, <u>X</u> = non-standard, add <u>-D</u> when deprecated (e.g., <u>R-D</u>, <u>A-D</u>).</p> <p><sup>b</sup> For a control point this column indicates whether a control point shall be capable of invoking this action, where <u>R</u> = required, <u>A</u> = allowed, <u>CR</u> = conditionally required, <u>CA</u> = conditionally allowed, <u>X</u> = non-standard, add <u>-D</u> when deprecated (e.g., <u>R-D</u>, <u>A-D</u>).</p> <p><sup>c</sup> Required only if the control point implements interaction with the AVTransport service.</p> <p><sup>d</sup> See action description for conditions under which implementation of this action is allowed. If the condition is not met implementation of this action is not allowed.</p> <p><sup>e</sup> See action description for conditions under which implementation of this action is required.</p> |                  |                                |

IECNORM.COM : Click to view the full PDF of ISO/IEC 29341-20-10:2017

Note that non-standard actions shall be implemented in such a way that they do not interfere with the basic operation of the AVTransport service; that is: these actions shall be allowed, and shall not need to be invoked for the AVTransport service to operate normally.

#### 5.4.2 SetAVTransportURI()

This required action specifies the URI of the resource to be controlled by the specified AVTransport instance. It is recommended that the AVTransport service checks the MIME-type of the specified resource when executing this action. For AVTransport instances that control the transport of DRM-controlled content, the authentication process is also recommended to start as a result of executing this action. The SetAVTransportURI() action is successful even when a necessary authentication or revocation check cannot be completed before the expiration of time allotted for the completion of the SetAVTransportURI() action. In the case of AVTransport instances that control the transport of DRM-controlled content, the subsequent detection of conditions that need to be communicated to the control point, like an authentication failure, a revocation condition, etc. are indicated via the DRMState state variable. A control point can supply metadata associated with the specified resource, using a *DIDL-Lite XML Fragment* (defined in the ContentDirectory service specification), in argument CurrentURIMetaData. If supported by the AVTransport instance, this metadata is stored in a state variable, and returned as output argument as part of the GetMediaInfo() action and the GetMediaInfo\_Ext() action. If a control point does not want to use this feature it can supply the empty string for the CurrentURIMetaData argument.

A resource may have descriptions of the embedded media components associated with it, as indicated by the metadata property upnp:resExt::componentInfo (see the ContentDirectory service specification). This description can be used by the device implementation to provide an extended user experience (for example, by offering a choice between different subtitle languages). Some associated components can have their own resource (e.g. URI), these resources are known as secondary resources. A control point can supply the metadata including the secondary resources in the CurrentURIMetadata argument. The AVTransport service implementation can use this information to offer a selection of alternative playback components to a control point.

If a playback component is a secondary resource, the device shall support synchronized playback of these resources upon invocation of the Play() action. Similarly, actions such as Stop() and Pause() shall affect all the secondary resources as well. If the AVTransport service implementation does not support this feature, or if the control point does not supply the metadata, then only the URI of the primary resource will be played back. As all secondary resources are synchronized with the primary resource during playback, implementations can implement retrieval of the state information of an AVTransport instance (via the actions GetMediaInfo(), GetMediaInfo\_Ext(), GetTransportInfo() and GetPositionInfo()) based on the state of the primary resource.

Note: The time resolution of what is considered synchronized playback is dependent on the application.

##### 5.4.2.1 Arguments

Table 25 — Arguments for SetAVTransportURI()

| Argument                  | Direction | relatedStateVariable          |
|---------------------------|-----------|-------------------------------|
| <u>InstanceID</u>         | <u>IN</u> | <u>A_ARG_TYPE InstanceID</u>  |
| <u>CurrentURI</u>         | <u>IN</u> | <u>AVTransportURI</u>         |
| <u>CurrentURIMetaData</u> | <u>IN</u> | <u>AVTransportURIMetaData</u> |

##### 5.4.2.2 Dependency on State

None.

##### 5.4.2.3 Effect on State

Depending on the URI, the number of tracks available on this instance could have changed. For example, if the URI points to a single audio file, state variable NumberOfTracks changes

to 1. However, if the URI points to an audio playlist, state variable *NumberOfTracks* changes to the number of entries in the playlist.

If the renderer fails to locate or download the resource at the URI the *TransportState* shall change to "*STOPPED*". If the current transport state is "*PLAYING*", and it would take a noticeable amount of time before a human user would actually see or hear the media at the new URI playing, the AVTransport may temporarily go to the "*TRANSITIONING*" state before going back to "*PLAYING*". This might be appropriate for devices that need to start buffering or completely download the media before playback can start. If the current transport state is "*NO MEDIA PRESENT*" the transport state changes to "*STOPPED*". In all other cases, this action does not change the transport state of the specified instance.

#### 5.4.2.4 Errors

Table 26 — Error Codes for *SetAVTransportURI()*

| ErrorCode | errorDescription              | Description                                                                                                                           |
|-----------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| 400-499   | TBD                           | See clause 3 in UPnP Device Architecture [14].                                                                                        |
| 500-599   | TBD                           | See clause 3 in UPnP Device Architecture [14].                                                                                        |
| 600-699   | TBD                           | See clause 3 in UPnP Device Architecture [14].                                                                                        |
| 714       | Illegal MIME-type             | The specified resource has a MIME-type which is not supported by the AVTransport service.                                             |
| 715       | Content 'BUSY'                | This indicates that the resource is already in use at this time.                                                                      |
| 716       | Resource not found            | The specified resource cannot be found in the network.                                                                                |
| 718       | Invalid <i>InstanceID</i>     | The specified <i>InstanceID</i> is invalid for this AVTransport.                                                                      |
| 719       | DRM error                     | The action failed because an unspecified DRM error occurred.                                                                          |
| 720       | Expired content               | The action failed because the content use validity interval has expired.                                                              |
| 721       | Non-allowed use               | The action failed because the requested content use is disallowed.                                                                    |
| 722       | Can't determine allowed uses  | The action failed because the allowed content uses cannot be verified.                                                                |
| 723       | Exhausted allowed use         | The action failed because the number of times this content has been used as requested has reached the maximum allowed number of uses. |
| 724       | Device authentication failure | The action failed because of a device authentication failure between the media source device and the media sink device.               |
| 725       | Device revocation             | The action failed because either the media source device or the media sink device has been revoked.                                   |
| 737       | No DNS Server                 | The DNS Server is not available (HTTP error 503).                                                                                     |
| 738       | Bad Domain Name               | Unable to resolve the Fully Qualified Domain Name (HTTP error 502).                                                                   |
| 739       | Server Error                  | The server that hosts the resource is unreachable or unresponsive (HTTP error 404/410).                                               |

#### 5.4.3 *SetNextAVTransportURI()*

This allowed action specifies the URI of the resource to be controlled when the playback of the current resource (set earlier via *SetAVTransportURI()*) finishes. This action enables a device to *prefetch* the data to be played next, in order to provide a seamless transition between resources. This type of prefetching or buffering is particularly useful for protocols such as HTTP, where the data is usually buffered before playback. It is recommended that the AVTransport service checks the MIME-type of the specified resource when executing this action. For AVTransport instances that control the transport of DRM-controlled content, the authentication process is also recommended to start as a result of executing this action. The *SetNextAVTransportURI()* action is successful even when a necessary authentication or revocation check cannot be completed before the expiration of time allotted for the completion of the *SetNextAVTransportURI()* action. In the case of AVTransport instances that control the transport of DRM-controlled content, the subsequent detection of conditions that need to be communicated to the control point, like an authentication failure, a revocation condition, etc. are indicated via the *DRMState* state variable.

A control point can supply metadata, using a *DIDL-Lite XML Fragment* (defined in the ContentDirectory service specification), via argument [NextURIMetaData](#). If supported by the AVTransport service, this metadata is stored in a state variable, and returned as an output argument as part of actions [GetMediaInfo\(\)](#) and [GetMediaInfo Ext\(\)](#). If a control point does not want to use this feature it can supply the empty string for the [NextURIMetaData](#) argument.

A resource may have descriptions of the embedded media components associated with it, as indicated by the metadata property [upnp:resExt::componentInfo](#) (see the ContentDirectory service specification). This description can be used by the device implementation to provide an extended user experience (for example, by offering a choice between different subtitle languages). Some associated components can have their own resource (e.g. URI), these resources are known as secondary resources. A control point can supply the metadata including the secondary resources in the [NextURIMetadata](#) argument. The AVTransport service implementation can use this information to offer a selection of alternative playback components to a control point.

If a playback component is a secondary resource, the device shall support synchronized playback of these resources upon invocation of the [Play\(\)](#) action. Similarly, actions such as [Stop\(\)](#) and [Pause\(\)](#) shall affect all the secondary resources as well. If the AVTransport service implementation does not support this feature, or if the control point does not supply the metadata, then only the URI of the primary resource will be played back. As all secondary resources are synchronized with the primary resource during playback, implementations can implement retrieval of the state information of an AVTransport instance (via the actions [GetMediaInfo\(\)](#), [GetMediaInfo Ext\(\)](#), [GetTransportInfo\(\)](#) and [GetPositionInfo\(\)](#)) based on the state of the primary resource.

Note: The time resolution of what is considered synchronized playback is dependent on the application.

#### 5.4.3.1 Arguments

Table 27 — Arguments for [SetNextAVTransportURI\(\)](#)

| Argument                               | Direction                 | relatedStateVariable                              |
|----------------------------------------|---------------------------|---------------------------------------------------|
| <u><a href="#">InstanceID</a></u>      | <u><a href="#">IN</a></u> | <u><a href="#">A_ARG_TYPE InstanceID</a></u>      |
| <u><a href="#">NextURI</a></u>         | <u><a href="#">IN</a></u> | <u><a href="#">NextAVTransportURI</a></u>         |
| <u><a href="#">NextURIMetaData</a></u> | <u><a href="#">IN</a></u> | <u><a href="#">NextAVTransportURIMetaData</a></u> |

#### 5.4.3.2 Dependency on State

None.

#### 5.4.3.3 Effect on State

This action does **not** change the transport state of the specified instance. In case that the next URI buffer exists (that is: a legal URI which will be rendered next has been located), when the playback of the current resource finishes, state variable [AVTransportURI](#) changes to the value of state variable [NextAVTransportURI](#). The same holds for [AVTransportURIMetaData](#) and [NextAVTransportURIMetaData](#). The process repeats itself until there is no more URI to be rendered. In such case, the state variable [NextAVTransportURI](#) will be set to the empty string.

If an illegal URI is used for the [SetNextAVTransportURI\(\)](#) action, which is detected immediately and most likely while the current URI is still being rendered, the current transport state shall be kept. After the current URI finishes playing, the transition to that illegal URI cannot be made and [TransportState](#) shall be set to "[STOPPED](#)".

## 5.4.3.4 Errors

Table 28 — Error Codes for SetNextAVTransportURI()

| ErrorCode | errorDescription              | Description                                                                                                                           |
|-----------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| 400-499   | TBD                           | See clause 3 in UPnP Device Architecture [14].                                                                                        |
| 500-599   | TBD                           | See clause 3 in UPnP Device Architecture [14].                                                                                        |
| 600-699   | TBD                           | See clause 3 in UPnP Device Architecture [14].                                                                                        |
| 714       | Illegal MIME-type             | The specified resource has a MIME-type which is not supported by the AVTransport service.                                             |
| 715       | Content 'BUSY'                | This indicates that the resource is already in use at this time.                                                                      |
| 716       | Resource not found            | The specified resource cannot be found in the network.                                                                                |
| 718       | Invalid <u>InstanceID</u>     | The specified <u>InstanceID</u> is invalid for this AVTransport.                                                                      |
| 719       | DRM error                     | The action failed because an unspecified DRM error occurred.                                                                          |
| 720       | Expired content               | The action failed because the content use validity interval has expired.                                                              |
| 721       | Non-allowed use               | The action failed because the requested content use is disallowed.                                                                    |
| 722       | Can't determine allowed uses  | The action failed because the allowed content uses cannot be verified.                                                                |
| 723       | Exhausted allowed use         | The action failed because the number of times this content has been used as requested has reached the maximum allowed number of uses. |
| 724       | Device authentication failure | The action failed because of a device authentication failure between the media source device and the media sink device.               |
| 725       | Device revocation             | The action failed because either the media source device or the media sink device has been revoked.                                   |
| 737       | No DNS Server                 | The DNS Server is not available (HTTP error 503).                                                                                     |
| 738       | Bad Domain Name               | Unable to resolve the Fully Qualified Domain Name (HTTP error 502).                                                                   |
| 739       | Server Error                  | The server that hosts the resource is unreachable or unresponsive (HTTP error 404/410).                                               |

5.4.4 GetMediaInfo()

This required action returns information associated with the current media of the specified instance; it has no effect on state.

## 5.4.4.1 Arguments

Table 29 — Arguments for GetMediaInfo()

| Argument                  | Direction  | relatedStateVariable              |
|---------------------------|------------|-----------------------------------|
| <u>InstanceID</u>         | <u>IN</u>  | <u>A_ARG_TYPE InstanceID</u>      |
| <u>NrTracks</u>           | <u>OUT</u> | <u>NumberOfTracks</u>             |
| <u>MediaDuration</u>      | <u>OUT</u> | <u>CurrentMediaDuration</u>       |
| <u>CurrentURI</u>         | <u>OUT</u> | <u>AVTransportURI</u>             |
| <u>CurrentURIMetaData</u> | <u>OUT</u> | <u>AVTransportURIMetaData</u>     |
| <u>NextURI</u>            | <u>OUT</u> | <u>NextAVTransportURI</u>         |
| <u>NextURIMetaData</u>    | <u>OUT</u> | <u>NextAVTransportURIMetaData</u> |
| <u>PlayMedium</u>         | <u>OUT</u> | <u>PlaybackStorageMedium</u>      |
| <u>RecordMedium</u>       | <u>OUT</u> | <u>RecordStorageMedium</u>        |
| <u>WriteStatus</u>        | <u>OUT</u> | <u>RecordMediumWriteStatus</u>    |

## 5.4.4.2 Dependency on State

None.

**5.4.4.3 Effect on State**

None.

**5.4.4.4 Errors****Table 30 — Error Codes for GetMediaInfo()**

| ErrorCode | errorDescription          | Description                                                      |
|-----------|---------------------------|------------------------------------------------------------------|
| 400-499   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 500-599   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 600-699   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 718       | Invalid <u>InstanceID</u> | The specified <u>InstanceID</u> is invalid for this AVTransport. |

**5.4.5 GetMediaInfo Ext()**

This required action returns information associated with the current media of the specified instance; it has no effect on state. The information returned is identical to the information returned by the GetMediaInfo() action, except for the additionally returned CurrentType argument

**5.4.5.1 Arguments****Table 31 — Arguments for GetMediaInfo Ext()**

| Argument                  | Direction  | relatedStateVariable              |
|---------------------------|------------|-----------------------------------|
| <u>InstanceID</u>         | <u>IN</u>  | <u>A_ARG_TYPE InstanceID</u>      |
| <u>CurrentType</u>        | <u>OUT</u> | <u>CurrentMediaCategory</u>       |
| <u>NrTracks</u>           | <u>OUT</u> | <u>NumberOfTracks</u>             |
| <u>MediaDuration</u>      | <u>OUT</u> | <u>CurrentMediaDuration</u>       |
| <u>CurrentURI</u>         | <u>OUT</u> | <u>AVTransportURI</u>             |
| <u>CurrentURIMetaData</u> | <u>OUT</u> | <u>AVTransportURIMetaData</u>     |
| <u>NextURI</u>            | <u>OUT</u> | <u>NextAVTransportURI</u>         |
| <u>NextURIMetaData</u>    | <u>OUT</u> | <u>NextAVTransportURIMetaData</u> |
| <u>PlayMedium</u>         | <u>OUT</u> | <u>PlaybackStorageMedium</u>      |
| <u>RecordMedium</u>       | <u>OUT</u> | <u>RecordStorageMedium</u>        |
| <u>WriteStatus</u>        | <u>OUT</u> | <u>RecordMediumWriteStatus</u>    |

**5.4.5.2 Dependency on State**

None.

**5.4.5.3 Effect on State**

None.

**5.4.5.4 Errors****Table 32 — Error Codes for GetMediaInfo Ext()**

| ErrorCode | errorDescription          | Description                                                      |
|-----------|---------------------------|------------------------------------------------------------------|
| 400-499   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 500-599   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 600-699   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 718       | Invalid <u>InstanceID</u> | The specified <u>InstanceID</u> is invalid for this AVTransport. |

**5.4.6 GetTransportInfo()**

This required action returns information associated with the current transport state of the specified instance; it has no effect on state.

## 5.4.6.1 Arguments

Table 33 — Arguments for **GetTransportInfo()**

| Argument                      | Direction  | relatedStateVariable         |
|-------------------------------|------------|------------------------------|
| <u>InstanceID</u>             | <u>IN</u>  | <u>A_ARG_TYPE_InstanceID</u> |
| <u>CurrentTransportState</u>  | <u>OUT</u> | <u>TransportState</u>        |
| <u>CurrentTransportStatus</u> | <u>OUT</u> | <u>TransportStatus</u>       |
| <u>CurrentSpeed</u>           | <u>OUT</u> | <u>TransportPlaySpeed</u>    |

## 5.4.6.2 Dependency on State

None.

## 5.4.6.3 Effect on State

None.

## 5.4.6.4 Errors

Table 34 — Error Codes for **GetTransportInfo()**

| ErrorCode | errorDescription          | Description                                                      |
|-----------|---------------------------|------------------------------------------------------------------|
| 400-499   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 500-599   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 600-699   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 718       | Invalid <u>InstanceID</u> | The specified <u>InstanceID</u> is invalid for this AVTransport. |

5.4.7 **GetPositionInfo()**

This required action returns information associated with the current position of the transport of the specified instance; it has no effect on state.

## 5.4.7.1 Arguments

Table 35 — Arguments for **GetPositionInfo()**

| Argument             | Direction  | relatedStateVariable           |
|----------------------|------------|--------------------------------|
| <u>InstanceID</u>    | <u>IN</u>  | <u>A_ARG_TYPE_InstanceID</u>   |
| <u>Track</u>         | <u>OUT</u> | <u>CurrentTrack</u>            |
| <u>TrackDuration</u> | <u>OUT</u> | <u>CurrentTrackDuration</u>    |
| <u>TrackMetaData</u> | <u>OUT</u> | <u>CurrentTrackMetaData</u>    |
| <u>TrackURI</u>      | <u>OUT</u> | <u>CurrentTrackURI</u>         |
| <u>RelTime</u>       | <u>OUT</u> | <u>RelativeTimePosition</u>    |
| <u>AbsTime</u>       | <u>OUT</u> | <u>AbsoluteTimePosition</u>    |
| <u>RelCount</u>      | <u>OUT</u> | <u>RelativeCounterPosition</u> |
| <u>AbsCount</u>      | <u>OUT</u> | <u>AbsoluteCounterPosition</u> |

## 5.4.7.2 Dependency on State

None.

## 5.4.7.3 Effect on State

None.

## 5.4.7.4 Errors

Table 36 — Error Codes for GetPositionInfo()

| ErrorCode | errorDescription          | Description                                                      |
|-----------|---------------------------|------------------------------------------------------------------|
| 400-499   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 500-599   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 600-699   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 718       | Invalid <u>InstanceID</u> | The specified <u>InstanceID</u> is invalid for this AVTransport. |

5.4.8 GetDeviceCapabilities()

This required action returns information on device capabilities of the specified instance, such as the supported playback and recording formats, and the supported quality levels for recording. This action has no effect on state.

## 5.4.8.1 Arguments

Table 37 — Arguments for GetDeviceCapabilities()

| Argument               | Direction  | relatedStateVariable                |
|------------------------|------------|-------------------------------------|
| <u>InstanceID</u>      | <u>IN</u>  | <u>A_ARG_TYPE_InstanceID</u>        |
| <u>PlayMedia</u>       | <u>OUT</u> | <u>PossiblePlaybackStorageMedia</u> |
| <u>RecMedia</u>        | <u>OUT</u> | <u>PossibleRecordStorageMedia</u>   |
| <u>RecQualityModes</u> | <u>OUT</u> | <u>PossibleRecordQualityModes</u>   |

## 5.4.8.2 Dependency on State

None.

## 5.4.8.3 Effect on State

None.

## 5.4.8.4 Errors

Table 38 — Error Codes for GetDeviceCapabilities()

| ErrorCode | errorDescription          | Description                                                      |
|-----------|---------------------------|------------------------------------------------------------------|
| 400-499   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 500-599   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 600-699   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 718       | Invalid <u>InstanceID</u> | The specified <u>InstanceID</u> is invalid for this AVTransport. |

5.4.9 GetTransportSettings()

This required action returns information on various settings of the specified instance, such as the current play mode and the current recording quality mode. This action has no effect on state.

## 5.4.9.1 Arguments

Table 39 — Arguments for GetTransportSettings()

| Argument              | Direction  | relatedStateVariable            |
|-----------------------|------------|---------------------------------|
| <u>InstanceID</u>     | <u>IN</u>  | <u>A_ARG_TYPE_InstanceID</u>    |
| <u>PlayMode</u>       | <u>OUT</u> | <u>CurrentPlayMode</u>          |
| <u>RecQualityMode</u> | <u>OUT</u> | <u>CurrentRecordQualityMode</u> |

## 5.4.9.2 Dependency on State

None.

**5.4.9.3 Effect on State**

None.

**5.4.9.4 Errors****Table 40 — Error Codes for GetTransportSettings()**

| ErrorCode | errorDescription          | Description                                                      |
|-----------|---------------------------|------------------------------------------------------------------|
| 400-499   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 500-599   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 600-699   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 718       | Invalid <u>InstanceID</u> | The specified <u>InstanceID</u> is invalid for this AVTransport. |

**5.4.10 Stop()**

This required action stops the progression of the current resource that is associated with the specified instance. Additionally, it is recommended that the *output of the device* (defined below) should change to something other than the current snippet of resource. Although the exact nature of this change varies from device to device, a common behavior is to immediately cease all output from the device. Nevertheless, the exact behavior is defined by the manufacturer of the device.

On some devices, the current position on the transport changes as a result of the Stop() action. This can be detected by control points via event notification of state variable CurrentTrack. Alternatively, a control point can poll using the GetPositionInfo() action.

*Output of a device:* In this context, the term *output of the device* (used above) has different semantics depending on the type of device that has implemented this AVTransport service. Some devices (for example, MediaServer devices) output media content to the network while other devices (for example, a MediaRenderer) output a visual and/or audio representation of media content that was received from the network.

**5.4.10.1 Arguments****Table 41 — Arguments for Stop()**

| Argument          | Direction | relatedStateVariable         |
|-------------------|-----------|------------------------------|
| <u>InstanceID</u> | <u>IN</u> | <u>A_ARG_TYPE InstanceID</u> |

**5.4.10.2 Dependency on State**

This action is allowed in all transport states except in state "NO MEDIA PRESENT".

**5.4.10.3 Effect on State**

This action changes TransportState to "STOPPED". If it would take a noticeable amount of time before a human user would actually see or hear the media playback has stopped, the AVTransport may temporarily go to the "TRANSITIONING" state before going to "STOPPED".

## 5.4.10.4 Errors

Table 42 — Error Codes for **Stop()**

| ErrorCode | errorDescription          | Description                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 400-499   | TBD                       | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 500-599   | TBD                       | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 600-699   | TBD                       | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 701       | Transition not available  | The immediate transition from current transport state to desired transport state is not supported by this device.                                                                                                                                                                                                                                                                               |
| 705       | Transport is locked       | The transport is <i>hold locked</i> . (Some portable mobile devices have a small mechanical toggle switch called a <i>hold lock switch</i> . While this switch is ON (the transport is hold locked), the device is guarded against operations such as accidental power on when not in use, or interruption of play or record from accidental pressing of a front panel button or a GUI button.) |
| 718       | Invalid <u>InstanceID</u> | The specified <u>InstanceID</u> is invalid for this AVTransport.                                                                                                                                                                                                                                                                                                                                |

5.4.11 **Play()**

This required action starts playing the resource of the specified instance, at the specified speed, starting at the current position, according to the current play mode. Playing shall continue until the resource ends or the transport state is changed via actions **Stop()** or **Pause()**. The device shall do a *best effort* to match the specified play speed. Actually supported speeds can be retrieved from the allowed value list of the TransportPlaySpeed state variable in the AVTransport service description.

If no AVTransportURI is set, the resource being played is device-dependent.

## 5.4.11.1 Arguments

Table 43 — Arguments for **Play()**

| Argument          | Direction | relatedStateVariable         |
|-------------------|-----------|------------------------------|
| <u>InstanceID</u> | <u>IN</u> | <u>A_ARG_TYPE InstanceID</u> |
| <u>Speed</u>      | <u>IN</u> | <u>TransportPlaySpeed</u>    |

## 5.4.11.2 Dependency on State

This action is allowed in the “**STOPPED**”, “**PLAYING**”, and “**PAUSED PLAYBACK**” transport states. In other states the action may also succeed or it may fail with error code 701.

## 5.4.11.3 Effect on State

This action changes TransportState to “**PLAYING**” and TransportPlaySpeed to the value specified in the Speed argument of the **Play()** action. If it would take a noticeable amount of time before a human user would actually see or hear the media playing, the AVTransport may temporarily go to the “**TRANSITIONING**” state before going to “**PLAYING**”. This might be appropriate, for example, for devices that need to start buffering or completely download the media before playback can start.

## 5.4.11.4 Errors

Table 44 — Error Codes for *Play()*

| errorCode | errorDescription                  | Description                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 400-499   | TBD                               | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 500-599   | TBD                               | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 600-699   | TBD                               | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 701       | Transition not available          | The immediate transition from current transport state to desired transport state is not supported by this device.                                                                                                                                                                                                                                                                               |
| 702       | No contents                       | The media does not contain any contents that can be played.                                                                                                                                                                                                                                                                                                                                     |
| 703       | Read error                        | The media cannot be read (for example, because of dust or a scratch).                                                                                                                                                                                                                                                                                                                           |
| 704       | Format not supported for playback | The storage format of the currently loaded media is not supported for playback by this device.                                                                                                                                                                                                                                                                                                  |
| 705       | Transport is locked               | The transport is <i>hold locked</i> . (Some portable mobile devices have a small mechanical toggle switch called a <i>hold lock switch</i> . While this switch is ON (the transport is hold locked), the device is guarded against operations such as accidental power on when not in use, or interruption of play or record from accidental pressing of a front panel button or a GUI button.) |
| 714       | Illegal MIME-type                 | The resource to be played has a MIME-type which is not supported by the AVTransport service.                                                                                                                                                                                                                                                                                                    |
| 715       | Content 'BUSY'                    | This indicates that the resource is already in use at this time.                                                                                                                                                                                                                                                                                                                                |
| 716       | Resource not found                | The resource to be played cannot be found in the network.                                                                                                                                                                                                                                                                                                                                       |
| 717       | Play speed not supported          | The specified playback speed is not supported by the AVTransport service.                                                                                                                                                                                                                                                                                                                       |
| 718       | Invalid <i>InstanceID</i>         | The specified <i>InstanceID</i> is invalid for this AVTransport.                                                                                                                                                                                                                                                                                                                                |
| 719       | DRM error                         | The action failed because an unspecified DRM error occurred.                                                                                                                                                                                                                                                                                                                                    |
| 720       | Expired content                   | The action failed because the content use validity interval has expired.                                                                                                                                                                                                                                                                                                                        |
| 721       | Non-allowed use                   | The action failed because the requested content use is disallowed.                                                                                                                                                                                                                                                                                                                              |
| 722       | Can't determine allowed uses      | The action failed because the allowed content uses cannot be verified.                                                                                                                                                                                                                                                                                                                          |
| 723       | Exhausted allowed use             | The action failed because the number of times this content has been used as requested has reached the maximum allowed number of uses.                                                                                                                                                                                                                                                           |
| 724       | Device authentication failure     | The action failed because of a device authentication failure between the media source device and the media sink device.                                                                                                                                                                                                                                                                         |
| 725       | Device revocation                 | The action failed because either the media source device or the media sink device has been revoked.                                                                                                                                                                                                                                                                                             |

5.4.12 *Pause()*

This is an allowed action. While the device is in a playing state, that is: *TransportState* is "*PLAYING*", this action halts the progression of the resource that is associated with the specified *InstanceID*. Any visual representation of the resource should remain displayed in a static manner (for example, the last frame of video remains displayed). Any audio representation of the resource should be muted. The difference between *Pause()* and *Stop()* is that *Pause()* shall remain at the current position within the resource and the current resource shall persist as described above (for example, the current video resource continues to be transmitted/displayed).

When the device is recording, that is: the *TransportState* is "*RECORDING*", the device shall maintain its current recording position, but will not accept any more data to record. Any data received after the *Pause()* action and before the next *Record()* action will be lost.

#### 5.4.12.1 Arguments

Table 45 — Arguments for ***Pause()***

| Argument                 | Direction        | relatedStateVariable                |
|--------------------------|------------------|-------------------------------------|
| <u><i>InstanceID</i></u> | <u><i>IN</i></u> | <u><i>A_ARG_TYPE_InstanceID</i></u> |

#### 5.4.12.2 Dependency on State

This action is always allowed while playing or recording. In other cases, the action may fail with error code 701.

#### 5.4.12.3 Effect on State

When recording, this action changes *TransportState* to "***PAUSED RECORDING***". When playing, this action changes *TransportState* to "***PAUSED PLAYBACK***". The ***Pause()*** action does not operate as a toggle.

If it would take a noticeable amount of time before a human user would actually see or hear the media is paused, the AVTransport may temporarily go to the "***TRANSITIONING***" state before going to "***PAUSED PLAYBACK***".

Similarly, if it would take a noticeable amount of time before recording is paused, the AVTransport may temporarily go to the "***TRANSITIONING***" state before going to "***PAUSED RECORDING***".

#### 5.4.12.4 Errors

Table 46 — Error Codes for ***Pause()***

| ErrorCode | errorDescription                 | Description                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 400-499   | TBD                              | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 500-599   | TBD                              | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 600-699   | TBD                              | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 701       | Transition not available         | The immediate transition from current transport state to desired transport state is not supported by this device.                                                                                                                                                                                                                                                                               |
| 705       | Transport is locked              | The transport is <i>hold locked</i> . (Some portable mobile devices have a small mechanical toggle switch called a <i>hold lock switch</i> . While this switch is ON (the transport is hold locked), the device is guarded against operations such as accidental power on when not in use, or interruption of play or record from accidental pressing of a front panel button or a GUI button.) |
| 718       | Invalid <u><i>InstanceID</i></u> | The specified <u><i>InstanceID</i></u> is invalid for this AVTransport.                                                                                                                                                                                                                                                                                                                         |

#### 5.4.13 ***Record()***

This allowed action starts recording on the specified transport instance, at the current position on the media, according to the currently specified recording quality, and returns immediately. If *AVTransportURI* is set (differs from the empty string) then that resource will be recorded. If no *AVTransportURI* is set (equals the empty string), then the source of the content being recorded is device-dependent. In both cases, whether the device outputs the resource to a screen or speakers while recording is device-dependent. If the device implementing the ***Record()*** action also has a ContentDirectory service, then recorded content will be added to this ContentDirectory in a device-dependent way. Specifically, there is no UPnP mechanism to specify the location of the recorded content in the ContentDirectory hierarchy.

#### 5.4.13.1 Arguments

Table 47 — Arguments for ***Record()***

| Argument                 | Direction        | relatedStateVariable                |
|--------------------------|------------------|-------------------------------------|
| <u><i>InstanceID</i></u> | <u><i>IN</i></u> | <u><i>A_ARG_TYPE_InstanceID</i></u> |

#### 5.4.13.2 Dependency on State

This action is allowed in the “STOPPED” or “PAUSED RECORDING” transport states. In other states the action may fail with error code 701.

#### 5.4.13.3 Effect on State

This action changes TransportState to “RECORDING”. If it would take a noticeable amount of time before recording starts, the AVTransport may temporarily go to the “TRANSITIONING” state before going to “RECORDING”.

#### 5.4.13.4 Errors

Table 48 — Error Codes for Record()

| errorCode | errorDescription                   | Description                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 400-499   | TBD                                | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 500-599   | TBD                                | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 600-699   | TBD                                | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 701       | Transition not available           | The immediate transition from current transport state to desired transport state is not supported by this device.                                                                                                                                                                                                                                                                               |
| 705       | Transport is locked                | The transport is <i>hold locked</i> . (Some portable mobile devices have a small mechanical toggle switch called a <i>hold lock switch</i> . While this switch is ON (the transport is hold locked), the device is guarded against operations such as accidental power on when not in use, or interruption of play or record from accidental pressing of a front panel button or a GUI button.) |
| 706       | Write error                        | The media cannot be written (for example, because of dust or a scratch)                                                                                                                                                                                                                                                                                                                         |
| 707       | Media is protected or not writable | The media is write-protected or is of a not writable type.                                                                                                                                                                                                                                                                                                                                      |
| 708       | Format not supported for recording | The storage format of the currently loaded media is not supported for recording by this device.                                                                                                                                                                                                                                                                                                 |
| 709       | Media is full                      | There is no free space left on the loaded media.                                                                                                                                                                                                                                                                                                                                                |
| 718       | Invalid <u>InstanceID</u>          | The specified <u>InstanceID</u> is invalid for this AVTransport.                                                                                                                                                                                                                                                                                                                                |

#### 5.4.14 Seek()

This required action starts seeking through the resource controlled by the specified instance - as fast as possible - to the position, specified in the Target argument. The value in the Unit argument indicates how the Target argument needs to be interpreted.

Unit value “TRACK\_NR” indicates seeking to the beginning of a particular track number. For track-unaware media (such as VCRs), Seek(InstanceID, “TRACK\_NR”, “1”) is equivalent to the common *FastReverse* VCR functionality. Special track number “0” is used to indicate the end of the media. Hence, Seek(InstanceID, “TRACK\_NR”, “0”) is equivalent to the common *FastForward* VCR functionality.

For Unit values “ABS\_TIME”, “REL\_TIME”, “ABS\_COUNT”, and “REL\_COUNT”, the semantics defined by the corresponding state variables shall be respected. After the Seek() action completes, the appropriate state variable shall contain the value, specified in the Target argument. For example, if the RelativeTimePosition state variable contains the value “00:05:30” before the Seek() action, then Seek(InstanceID, “REL\_TIME”, “00:00:10”) will move the current position to 10 seconds from the beginning of the track and the RelativeTimePosition state variable will contain the value “00:00:10” after the Seek() action is completed.

For Unit value “REL\_FRAME”, the semantics of the Target argument is defined as follows:

- For track-aware media, the Target argument contains the desired position in the current track, in terms of frames, measured from the beginning of the current track. The range for the Target argument is from “0” to the duration of the current track,

measured in number of frames. For track-aware media, the Target argument shall always contain a positive value.

- For track-unaware media (e.g. a single tape), the Target argument contains the desired position, in terms of frames, measured from a zero reference point on the media. The range for the Target argument is from the beginning of the media, measured from the zero reference point to the end of the media, also measured from the zero reference point. For track-unaware media, the Target argument can be negative. Indeed, when the zero reference point does not coincide with the beginning of the media, all positions before the zero reference point are expressed as negative values.

For Unit value "FRAME", the Target argument contains the desired position, in terms of frames, measured from the beginning of the media. The range for the Target argument is from "0" to the total duration of the current media, expressed in frames. The Target argument shall always contain a positive value.

The Unit values "TAPE-INDEX" and "REL TAPE-INDEX" only apply for track-unaware media. It is assumed that the media contains a set of subsequent 'marks' that indicate some relevant position on the media (a scene change in a video, for instance). The position of these marks and how these marks are inserted on the media is completely device dependent. However, it is further assumed that these marks are sequentially numbered from one to the total number of marks on the media. Furthermore, the first mark is always assumed to be present at the beginning of the media and the last mark is always assumed to be present at the end of the media.

For Unit value "REL TAPE-INDEX", the Target argument contains the desired position, in terms of tape index marks, measured from the current position on the media. The range for the Target argument is the i4 data type range. If a value is specified that is outside the range of available tape index marks, then the resulting position will be either the first tape mark position (Target < 0) i.e. the beginning of the media, or the last tape mark position (Target > 0) i.e. the end of the media.

For Unit value "TAPE-INDEX", the Target argument contains the desired position, in terms of tape index marks, measured from the beginning of the media. The range for the Target argument is from "1" (the first mark on the tape, at the beginning of the tape) to the total number of tape marks on the media. The Target argument shall always contain a positive value.

#### 5.4.14.1 Arguments

Table 49 — Arguments for Seek()

| Argument          | Direction | relatedStateVariable         |
|-------------------|-----------|------------------------------|
| <u>InstanceID</u> | <u>IN</u> | <u>A_ARG_TYPE InstanceID</u> |
| <u>Unit</u>       | <u>IN</u> | <u>A_ARG_TYPE SeekMode</u>   |
| <u>Target</u>     | <u>IN</u> | <u>A_ARG_TYPE SeekTarget</u> |

#### 5.4.14.2 Dependency on State

This action is allowed in the "STOPPED" and "PLAYING" transport states, in other states the action may fail with error code 701.

#### 5.4.14.3 Effect on State

This action changes TransportState to "TRANSITIONING" and then returns immediately. When the desired position is reached, TransportState will return to the previous transport state (typically "STOPPED" or "PLAYING"). Note that the new transport state can be detected through the eventing mechanism.

## 5.4.14.4 Errors

Table 50 — Error Codes for Seek()

| errorCode | errorDescription              | Description                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 400-499   | TBD                           | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 500-599   | TBD                           | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 600-699   | TBD                           | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 701       | Transition not available      | The immediate transition from current transport state to desired transport state is not supported by this device.                                                                                                                                                                                                                                                                               |
| 705       | Transport is locked           | The transport is <i>hold locked</i> . (Some portable mobile devices have a small mechanical toggle switch called a <i>hold lock switch</i> . While this switch is ON (the transport is hold locked), the device is guarded against operations such as accidental power on when not in use, or interruption of play or record from accidental pressing of a front panel button or a GUI button.) |
| 710       | Seek mode not supported       | The specified seek mode is not supported by the device.                                                                                                                                                                                                                                                                                                                                         |
| 711       | Illegal seek target           | The specified seek target is not present on the media or is not specified in terms of the seek mode.                                                                                                                                                                                                                                                                                            |
| 718       | Invalid <u>InstanceID</u>     | The specified <u>InstanceID</u> is invalid for this AVTransport.                                                                                                                                                                                                                                                                                                                                |
| 719       | DRM error                     | The action failed because an unspecified DRM error occurred.                                                                                                                                                                                                                                                                                                                                    |
| 720       | Expired content               | The action failed because the content use validity interval has expired.                                                                                                                                                                                                                                                                                                                        |
| 721       | Non-allowed use               | The action failed because the requested content use is disallowed.                                                                                                                                                                                                                                                                                                                              |
| 722       | Can't determine allowed uses  | The action failed because the allowed content uses cannot be verified.                                                                                                                                                                                                                                                                                                                          |
| 723       | Exhausted allowed use         | The action failed because the number of times this content has been used as requested has reached the maximum allowed number of uses.                                                                                                                                                                                                                                                           |
| 724       | Device authentication failure | The action failed because of a device authentication failure between the media source device and the media sink device.                                                                                                                                                                                                                                                                         |
| 725       | Device revocation             | The action failed because either the media source device or the media sink device has been revoked.                                                                                                                                                                                                                                                                                             |

5.4.15 Next()

This required action is used to advance to the next track. This action is functionally equivalent to `Seek("TRACK_NR", "CurrentTrackNr+1")`. This action does not *cycle back* to the first track.

## 5.4.15.1 Arguments

Table 51 — Arguments for Next()

| Argument          | Direction | relatedStateVariable         |
|-------------------|-----------|------------------------------|
| <u>InstanceID</u> | <u>IN</u> | <u>A_ARG_TYPE InstanceID</u> |

## 5.4.15.2 Dependency on State

This action is allowed in the "STOPPED" and "PLAYING" transport states, in other states the action may succeed or it may fail with error code 701.

## 5.4.15.3 Effect on State

This action changes TransportState to "TRANSITIONING" and then returns immediately. When the desired position is reached, TransportState will return to the previous transport state (typically "STOPPED"). Note that this can be detected through the eventing mechanism.

## 5.4.15.4 Errors

Table 52 — Error Codes for Next()

| errorCode | errorDescription              | Description                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 400-499   | TBD                           | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                 |
| 500-599   | TBD                           | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                 |
| 600-699   | TBD                           | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                 |
| 701       | Transition not available      | The immediate transition from current transport state to desired transport state is not supported by this device.                                                                                                                                                                                                                                                                              |
| 705       | Transport is locked           | The transport is <i>hold locked</i> . (Some portable mobile devices have a small mechanical toggle switch called a <i>hold lock switch</i> . While this switch is ON (the transport is hold locked) the device is guarded against operations such as accidental power on when not in use, or interruption of play or record from accidental pressing of a front panel button or a GUI button.) |
| 711       | Illegal seek target           | The specified seek target is not present on the media.                                                                                                                                                                                                                                                                                                                                         |
| 718       | Invalid <u>InstanceID</u>     | The specified <u>InstanceID</u> is invalid for this AVTransport.                                                                                                                                                                                                                                                                                                                               |
| 719       | DRM error                     | The action failed because an unspecified DRM error occurred.                                                                                                                                                                                                                                                                                                                                   |
| 720       | Expired content               | The action failed because the content use validity interval has expired.                                                                                                                                                                                                                                                                                                                       |
| 721       | Non-allowed use               | The action failed because the requested content use is disallowed.                                                                                                                                                                                                                                                                                                                             |
| 722       | Can't determine allowed uses  | The action failed because the allowed content uses cannot be verified.                                                                                                                                                                                                                                                                                                                         |
| 723       | Exhausted allowed use         | The action failed because the number of times this content has been used as requested has reached the maximum allowed number of uses.                                                                                                                                                                                                                                                          |
| 724       | Device authentication failure | The action failed because of a device authentication failure between the media source device and the media sink device.                                                                                                                                                                                                                                                                        |
| 725       | Device revocation             | The action failed because either the media source device or the media sink device has been revoked.                                                                                                                                                                                                                                                                                            |

5.4.16 Previous()

This required action is used to advance to the previous track. This action is functionally equivalent to `Seek("TRACK_NR", "CurrentTrackNr-1")`. This action does not *cycle back* to the last track.

## 5.4.16.1 Arguments

Table 53 — Arguments for Previous()

| Argument          | Direction | relatedStateVariable         |
|-------------------|-----------|------------------------------|
| <u>InstanceID</u> | <u>IN</u> | <u>A_ARG_TYPE_InstanceID</u> |

## 5.4.16.2 Dependency on State

This action is allowed in the "STOPPED" and "PLAYING" transport states, in other states the action may succeed or it may fail with error code 701.

## 5.4.16.3 Effect on State

This action changes TransportState to "TRANSITIONING" and then returns immediately. When the desired position is reached, TransportState will return to the previous transport state (typically "STOPPED"). Note that this can be detected through the eventing mechanism.

## 5.4.16.4 Errors

Table 54 — Error Codes for *Previous()*

| errorCode | errorDescription              | Description                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 400-499   | TBD                           | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                 |
| 500-599   | TBD                           | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                 |
| 600-699   | TBD                           | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                 |
| 701       | Transition not available      | The immediate transition from current transport state to desired transport state is not supported by this device.                                                                                                                                                                                                                                                                              |
| 705       | Transport is locked           | The transport is <i>hold locked</i> . (Some portable mobile devices have a small mechanical toggle switch called a <i>hold lock switch</i> . While this switch is ON (the transport is hold locked) the device is guarded against operations such as accidental power on when not in use, or interruption of play or record from accidental pressing of a front panel button or a GUI button.) |
| 711       | Illegal seek target           | The specified seek target is not present on the media.                                                                                                                                                                                                                                                                                                                                         |
| 718       | Invalid <i>InstanceID</i>     | The specified <i>InstanceID</i> is invalid for this AVTransport.                                                                                                                                                                                                                                                                                                                               |
| 719       | DRM error                     | The action failed because an unspecified DRM error occurred.                                                                                                                                                                                                                                                                                                                                   |
| 720       | Expired content               | The action failed because the content use validity interval has expired.                                                                                                                                                                                                                                                                                                                       |
| 721       | Non-allowed use               | The action failed because the requested content use is disallowed.                                                                                                                                                                                                                                                                                                                             |
| 722       | Can't determine allowed uses  | The action failed because the allowed content uses cannot be verified.                                                                                                                                                                                                                                                                                                                         |
| 723       | Exhausted allowed use         | The action failed because the number of times this content has been used as requested has reached the maximum allowed number of uses.                                                                                                                                                                                                                                                          |
| 724       | Device authentication failure | The action failed because of a device authentication failure between the media source device and the media sink device.                                                                                                                                                                                                                                                                        |
| 725       | Device revocation             | The action failed because either the media source device or the media sink device has been revoked.                                                                                                                                                                                                                                                                                            |

5.4.17 *SetPlayMode()*

This allowed action sets the play mode of the specified AVTransport instance.

## 5.4.17.1 Arguments

Table 55 — Arguments for *SetPlayMode()*

| Argument           | Direction | relatedStateVariable         |
|--------------------|-----------|------------------------------|
| <i>InstanceID</i>  | <i>IN</i> | <i>A_ARG_TYPE_InstanceID</i> |
| <i>NewPlayMode</i> | <i>IN</i> | <i>CurrentPlayMode</i>       |

## 5.4.17.2 Dependency on State

None.

## 5.4.17.3 Effect on State

This action sets the play mode of the specified instance to the specified value. A subsequent *Play()* action for this instance will behave according to the set play mode.

## 5.4.17.4 Errors

Table 56 — Error Codes for SetPlayMode()

| ErrorCode | errorDescription          | Description                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 400-499   | TBD                       | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                 |
| 500-599   | TBD                       | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                 |
| 600-699   | TBD                       | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                 |
| 712       | Play mode not supported   | The specified play mode is not supported by the device.                                                                                                                                                                                                                                                                                                                                        |
| 705       | Transport is locked       | The transport is <i>hold locked</i> . (Some portable mobile devices have a small mechanical toggle switch called a <i>hold lock switch</i> . While this switch is ON (the transport is hold locked) the device is guarded against operations such as accidental power on when not in use, or interruption of play or record from accidental pressing of a front panel button or a GUI button.) |
| 718       | Invalid <u>InstanceID</u> | The specified <u>InstanceID</u> is invalid for this AVTransport.                                                                                                                                                                                                                                                                                                                               |

5.4.18 SetRecordQualityMode()

This conditionally allowed action may be implemented if the AVTransport service implements the Record() action. Otherwise, implementing the action is not allowed. This action sets the record quality mode of the specified AVTransport instance.

## 5.4.18.1 Arguments

Table 57 — Arguments for SetRecordQualityMode()

| Argument                    | Direction | relatedStateVariable            |
|-----------------------------|-----------|---------------------------------|
| <u>InstanceID</u>           | <u>IN</u> | <u>A_ARG_TYPE_InstanceID</u>    |
| <u>NewRecordQualityMode</u> | <u>IN</u> | <u>CurrentRecordQualityMode</u> |

## 5.4.18.2 Dependency on State

None.

## 5.4.18.3 Effect on State

This action sets CurrentRecordQualityMode of the specified instance to the specified record quality mode. A subsequent Record() action will behave according to the specified record quality mode. This action does not change any ongoing recordings.

## 5.4.18.4 Errors

Table 58 — Error Codes for SetRecordQualityMode()

| ErrorCode | errorDescription             | Description                                                      |
|-----------|------------------------------|------------------------------------------------------------------|
| 400-499   | TBD                          | See clause 3 in UPnP Device Architecture [14].                   |
| 500-599   | TBD                          | See clause 3 in UPnP Device Architecture [14].                   |
| 600-699   | TBD                          | See clause 3 in UPnP Device Architecture [14].                   |
| 713       | Record quality not supported | The specified record quality is not supported by the device.     |
| 718       | Invalid <u>InstanceID</u>    | The specified <u>InstanceID</u> is invalid for this AVTransport. |

5.4.19 GetCurrentTransportActions()

This allowed action returns the CurrentTransportActions state variable for the specified instance.

## 5.4.19.1 Arguments

Table 59 — Arguments for GetCurrentTransportActions()

| Argument          | Direction  | relatedStateVariable           |
|-------------------|------------|--------------------------------|
| <u>InstanceID</u> | <u>IN</u>  | <u>A_ARG_TYPE_InstanceID</u>   |
| <u>Actions</u>    | <u>OUT</u> | <u>CurrentTransportActions</u> |

## 5.4.19.2 Dependency on State

None.

## 5.4.19.3 Effect on State

None.

## 5.4.19.4 Errors

Table 60 — Error Codes for GetCurrentTransportActions()

| errorCode | errorDescription          | Description                                                      |
|-----------|---------------------------|------------------------------------------------------------------|
| 400-499   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 500-599   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 600-699   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 718       | Invalid <u>InstanceID</u> | The specified <u>InstanceID</u> is invalid for this AVTransport. |

5.4.20 GetDRMState()

This conditionally required action shall be implemented if the AVTransport service implements the DRMState state variable, otherwise it is not allowed. This action returns information associated with the current DRM state of the specified instance. It has no effect on state.

## 5.4.20.1 Arguments

Table 61 — Arguments for GetDRMState()

| Argument               | Direction  | relatedStateVariable         |
|------------------------|------------|------------------------------|
| <u>InstanceID</u>      | <u>IN</u>  | <u>A_ARG_TYPE_InstanceID</u> |
| <u>CurrentDRMState</u> | <u>OUT</u> | <u>DRMState</u>              |

## 5.4.20.2 Dependency on State

None.

## 5.4.20.3 Effect on State

None.

## 5.4.20.4 Errors

Table 62 — Error Codes for GetDRMState()

| errorCode | errorDescription          | Description                                                      |
|-----------|---------------------------|------------------------------------------------------------------|
| 400-499   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 500-599   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 600-699   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 718       | Invalid <u>InstanceID</u> | The specified <u>InstanceID</u> is invalid for this AVTransport. |

5.4.21 GetStateVariables()

This conditionally required action shall be supported if the AVTransport service supports bookmarks (see *BOOKMARK feature, as defined by the ContentDirectory service specification*), otherwise it is not allowed. Note that the service shall always implement GetStateVariables() and SetStateVariables() as a pair; either the service includes or omits

both actions in the same implementation. This action returns the current collection of AVTransport state variable names and their respective values that are associated with the AVTransport instance indicated by the input argument InstanceID. The StateVariableList argument specifies which state variables are captured. Vendor-extended state variables can be specified in this argument as well. If the value of the StateVariableList argument is set to "\*", the action shall return all the supported state variables of the service, including the vendor-extended state variables except for LastChange and any A\_ARG\_TYPE xxx variables. When the action fails and the error code indicates "invalid StateVariableList", the control point is encouraged to inspect the list or invoke successive Getxxx() actions for each of the state variables instead. AVTransport service implementations that want to participate in scenarios that use bookmarks shall implement this action. Furthermore, when creating or manipulating bookmarks, control points are encouraged to set the StateVariableList argument to "\*" when invoking this action. This ensures that the maximum available set of state information is stored within the bookmark item.

#### 5.4.21.1 Arguments

Table 63 — Arguments for GetStateVariables()

| Argument                       | Direction  | relatedStateVariable                      |
|--------------------------------|------------|-------------------------------------------|
| <u>InstanceID</u>              | <u>IN</u>  | <u>A_ARG_TYPE InstanceID</u>              |
| <u>StateVariableList</u>       | <u>IN</u>  | <u>A_ARG_TYPE StateVariableList</u>       |
| <u>StateVariableValuePairs</u> | <u>OUT</u> | <u>A_ARG_TYPE StateVariableValuePairs</u> |

#### 5.4.21.2 Dependency on State

None.

#### 5.4.21.3 Effect on State

None.

#### 5.4.21.4 Errors

Table 64 — Error Codes for GetStateVariables()

| errorCode | errorDescription                 | Description                                                      |
|-----------|----------------------------------|------------------------------------------------------------------|
| 400-499   | TBD                              | See clause 3 in UPnP Device Architecture [14].                   |
| 500-599   | TBD                              | See clause 3 in UPnP Device Architecture [14].                   |
| 600-699   | TBD                              | See clause 3 in UPnP Device Architecture [14].                   |
| 718       | Invalid <u>InstanceID</u>        | The specified <u>InstanceID</u> is invalid for this AVTransport. |
| 726       | Invalid <u>StateVariableList</u> | Some of the variables are invalid.                               |
| 727       | Ill-formed CSV List              | The CSV list is not well formed.                                 |

#### 5.4.22 SetStateVariables()

This conditionally required action shall be supported if the AVTransport service supports bookmarks (see *BOOKMARK feature, as defined by the ContentDirectory service specification*), otherwise it is not allowed. Note that the service shall always implement GetStateVariables() and SetStateVariables() as a pair; either the service includes or omits both actions in the same implementation. This action extracts the values from the StateVariableValuePairs IN argument and copies these values to the corresponding AVTransport state variables associated with the AVTransport instance indicated by the input argument InstanceID. The AVTransportUDN, ServiceType and ServiceId argument values are used for compatibility checking by the device. If this action is invoked to replace all of the state variable values, the device shall check whether the AVTransportUDN, ServiceType and ServiceId input arguments match those of the device. If this is the case, all state variable values will be replaced. Otherwise, the device only sets the state variable values that are relevant. The StateVariableList argument is a CSV list of state variable names that were accepted by the AVTransport service. AVTransport service implementations that want to participate in scenarios that use bookmarks shall implement this action.

## 5.4.22.1 Arguments

Table 65 — Arguments for SetStateVariables()

| Argument                       | Direction  | relatedStateVariable                      |
|--------------------------------|------------|-------------------------------------------|
| <u>InstanceID</u>              | <u>IN</u>  | <u>A_ARG_TYPE_InstanceID</u>              |
| <u>AVTransportUDN</u>          | <u>IN</u>  | <u>A_ARG_TYPE_DeviceUDN</u>               |
| <u>ServiceType</u>             | <u>IN</u>  | <u>A_ARG_TYPE_ServiceType</u>             |
| <u>ServiceId</u>               | <u>IN</u>  | <u>A_ARG_TYPE_ServiceID</u>               |
| <u>StateVariableValuePairs</u> | <u>IN</u>  | <u>A_ARG_TYPE_StateVariableValuePairs</u> |
| <u>StateVariableList</u>       | <u>OUT</u> | <u>A_ARG_TYPE_StateVariableList</u>       |

## 5.4.22.2 Dependency on State

None.

## 5.4.22.3 Effect on State

None.

## 5.4.22.4 Errors

Table 66 — Error Codes for SetStateVariables()

| errorCode | errorDescription                    | Description                                                          |
|-----------|-------------------------------------|----------------------------------------------------------------------|
| 400-499   | TBD                                 | See clause 3 in UPnP Device Architecture [14].                       |
| 500-599   | TBD                                 | See clause 3 in UPnP Device Architecture [14].                       |
| 600-699   | TBD                                 | See clause 3 in UPnP Device Architecture [14].                       |
| 718       | Invalid <u>InstanceID</u>           | The specified <u>InstanceID</u> is invalid for this AVTransport.     |
| 728       | Invalid <u>State Variable Value</u> | One of the <u>StateVariableValuePairs</u> contains an invalid value. |
| 729       | Invalid Service Type                | The specified <u>ServiceType</u> is invalid.                         |
| 730       | Invalid Service Id                  | The specified <u>ServiceId</u> is invalid.                           |

5.4.23 GetSyncOffset()

This conditionally required action shall be implemented if the AVTransport service supports the ConnectionManager *CLOCKSYNC* feature, otherwise it is not allowed. If this action is implemented, then the AVTransport service shall implement all of these actions: GetSyncOffset(), SetSyncOffset(), and AdjustSyncOffset(). This action is used to retrieve the current value of the SyncOffset state variable. See subclause 5.2.31 for details.

## 5.4.23.1 Arguments

Table 67 — Arguments for GetSyncOffset()

| Argument                 | Direction  | relatedStateVariable         |
|--------------------------|------------|------------------------------|
| <u>InstanceID</u>        | <u>IN</u>  | <u>A_ARG_TYPE_InstanceID</u> |
| <u>CurrentSyncOffset</u> | <u>OUT</u> | <u>SyncOffset</u>            |

## 5.4.23.2 Dependency on State

None.

## 5.4.23.3 Effect on State

None.

## 5.4.23.4 Errors

Table 68 — Error Codes for GetSyncOffset()

| errorCode | errorDescription          | Description                                                      |
|-----------|---------------------------|------------------------------------------------------------------|
| 400-499   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 500-599   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 600-699   | TBD                       | See clause 3 in UPnP Device Architecture [14].                   |
| 718       | Invalid <u>InstanceID</u> | The specified <u>InstanceID</u> is invalid for this AVTransport. |

5.4.24 SetSyncOffset()

This conditionally required action shall be implemented if the AVTransport service supports the ConnectionManager *CLOCKSYNC* feature, otherwise it is not allowed. If this action is implemented, then the AVTransport service shall implement all of these actions: GetSyncOffset(), SetSyncOffset(), and AdjustSyncOffset(). This action is used to set the value of the SyncOffset state variable. See subclause 5.2.31 for details.

## 5.4.24.1 Arguments

Table 69 — Arguments for SetSyncOffset()

| Argument             | Direction | relatedStateVariable         |
|----------------------|-----------|------------------------------|
| <u>InstanceID</u>    | <u>IN</u> | <u>A_ARG_TYPE InstanceID</u> |
| <u>NewSyncOffset</u> | <u>IN</u> | <u>SyncOffset</u>            |

## 5.4.24.2 Dependency on State

None.

## 5.4.24.3 Effect on State

As a result of this action the SyncOffset state variable is updated consistent with the value of the NewSyncOffset input argument.

## 5.4.24.4 Errors

Table 70 — Error Codes for SetSyncOffset()

| errorCode | errorDescription                        | Description                                                                                           |
|-----------|-----------------------------------------|-------------------------------------------------------------------------------------------------------|
| 400-499   | TBD                                     | See clause 3 in UPnP Device Architecture [14].                                                        |
| 500-599   | TBD                                     | See clause 3 in UPnP Device Architecture [14].                                                        |
| 600-699   | TBD                                     | See clause 3 in UPnP Device Architecture [14].                                                        |
| 718       | Invalid <u>InstanceID</u>               | The specified <u>InstanceID</u> is invalid for this AVTransport.                                      |
| 731       | Invalid time, offset, or position value | The action failed because the supplied time, offset, or position value for an argument was not valid. |

5.4.25 AdjustSyncOffset()

This conditionally required action shall be implemented if the AVTransport service supports the ConnectionManager *CLOCKSYNC* feature, otherwise it is not allowed. If this action is implemented, then the AVTransport service shall implement all of these actions: GetSyncOffset(), SetSyncOffset(), and AdjustSyncOffset(). This action is used to adjust the current value of the SyncOffset state variable. Successive invocations of this action have a cumulative effect. In other words, an invocation of this action changes the current value of the SyncOffset state variable by the specified amount. For example, assuming the current value of the SyncOffset state variable is P00:00:00.020, an invocation of this action with an adjustment value of P00:00:00.010 followed by another invocation of this action with an adjustment value of - P00:00:00.005 will result in a final SyncOffset value of P00:00:025.0. See subclause 5.2.31 for details.

If the SyncOffset state variable has been implemented, then the GetSyncOffset(), SetSyncOffset(), and AdjustSyncOffset() actions shall also be implemented.

## 5.4.25.1 Arguments

Table 71 — Arguments for AdjustSyncOffset()

| Argument          | Direction | relatedStateVariable            |
|-------------------|-----------|---------------------------------|
| <u>InstanceID</u> | <u>IN</u> | <u>A_ARG_TYPE_InstanceID</u>    |
| <u>Adjustment</u> | <u>IN</u> | <u>A_ARG_TYPE_SyncOffsetAdj</u> |

## 5.4.25.2 Dependency on State

None.

## 5.4.25.3 Effect on State

As a result of this action the SyncOffset state variable is updated consistent with the value of the Adjustment input argument.

## 5.4.25.4 Errors

Table 72 — Error Codes for AdjustSyncOffset()

| errorCode | errorDescription                        | Description                                                                                           |
|-----------|-----------------------------------------|-------------------------------------------------------------------------------------------------------|
| 400-499   | TBD                                     | See clause 3 in UPnP Device Architecture [14].                                                        |
| 500-599   | TBD                                     | See clause 3 in UPnP Device Architecture [14].                                                        |
| 600-699   | TBD                                     | See clause 3 in UPnP Device Architecture [14].                                                        |
| 718       | Invalid <u>InstanceID</u>               | The specified <u>InstanceID</u> is invalid for this AVTransport.                                      |
| 731       | Invalid time, offset, or position value | The action failed because the supplied time, offset, or position value for an argument was not valid. |

5.4.26 SyncPlay()

This conditionally required action shall be implemented if the AVTransport service supports the ConnectionManager CLOCKSYNC feature, otherwise it is not allowed. This action behaves the same as the Play() action except that the playback of the current content binary shall be synchronized with the device's internal time-of-day clock as specified by the ReferencePosition and ReferencePresentationTime input arguments. ReferenceClockId identifies the <deviceClockInfo> element of the device. The renderer shall start rendering the content at the ReferencePresentationTime argument at an offset inside the content specified by ReferencePosition argument. The ReferencePositionUnits argument identifies the format of the ReferencePosition argument, for example, time vs. frame count, etc. The ReferencePosition argument identifies a specific location within the content binary, for example, 1 hour, 10 minutes, and 34 seconds from the beginning. The ReferencePresentationTime argument identifies a precise time of day at which the ReferencePosition is to be played for example, June 6, 2009 at 21 hours, 14 minutes, and 36.152 seconds (past midnight). As described below, there are three distinct scenarios, depending on how the presentation time, specified by the ReferencePresentationTime argument, relates to the point in time that this action is invoked.

Upon receipt of SyncPlay() action, the MediaRenderer compares the MIME type of the requested content item with its local listing of <supportedTimestamps> elements to determine the applicable <supportedTimestamps> element for that particular MIME type.

The combination of the protocol attribute and the format attribute shall select one and only one <supportedTimestamps> element for a given MIME type and transport protocol.

In the simple case (when the specified presentation time occurs in the near future), the device goes to the TRANSITIONING state, prepares itself to render the specified position within the content, then waits for the specified presentation time to occur before the content is actually presented. The content then progresses at the specified speed.

In a more complicated case, the specified ReferencePresentationTime argument refers to a time-of-day well into the future (for example hours, days, or even months). In this case, the device goes to the TRANSITIONING state, prepares itself to render the specified position

within the content, then waits for the specified presentation time to occur before the content is actually presented. The content then progresses at the specified speed.

Lastly, it is possible that the ReferencePresentationTime identifies a point in time that has already occurred. Similar to the scenario above, the ReferencePosition and ReferencePresentationTime represent a “time-anchor” for the entire content. For a given time-anchor, each and every fragment of the content corresponds to an exact predetermined presentation time such that if the content were played (uninterrupted) at the specified speed, then the specified ReferencePosition would be presented exactly at the specified ReferencePresentationTime. In order to accommodate presentation times in the past, the device shall calculate the correct position within the content that corresponds to the time-of-day when the action is invoked. In other words, the device shall begin presenting the portion of the content that would have been presented to the end-user (at the time the action was invoked) if device had begun rendering the specified ReferencePosition at the specified ReferencePresentationTime (assuming the content progressed at specified playback speed).

In all cases, the net result shall be that after the content begins to play, each fragment of content is presented to the end-user at the exact point in time according to the specified ReferencePosition and ReferencePresentationTime (in other words, according to the time-anchor). In a time-based seek, if the exact instant requested by ReferencePosition falls inside a frame, the renderer might need to round it off. In this case, the renderer shall start rendering the content at the earliest instant possible. If the device is unable to achieve the requested playback behavior, the device shall return an error code 732 (“Unable to calculate sync point”). Additionally, if the device is unable to render the content at the specified speed, then this action shall return error code 717 (“Play speed not supported”).

#### 5.4.26.1 Arguments

Table 73 — Arguments for SyncPlay()

| Argument                         |           |                                    |
|----------------------------------|-----------|------------------------------------|
| <u>InstanceID</u>                | <u>IN</u> | <u>A_ARG_TYPE_InstanceID</u>       |
| <u>Speed</u>                     | <u>IN</u> | <u>TransportPlaySpeed</u>          |
| <u>ReferencePositionUnits</u>    | <u>IN</u> | <u>A_ARG_TYPE_SeekMode</u>         |
| <u>ReferencePosition</u>         | <u>IN</u> | <u>A_ARG_TYPE_SeekTarget</u>       |
| <u>ReferencePresentationTime</u> | <u>IN</u> | <u>A_ARG_TYPE_PresentationTime</u> |
| <u>ReferenceClockId</u>          | <u>IN</u> | <u>A_ARG_TYPE_ClockId</u>          |

#### 5.4.26.2 Dependency on State

This action is allowed in the “STOPPED”, “PLAYING”, and “PAUSED PLAYBACK” transport states. In other states the action may also succeed or it may fail with error code 701.

#### 5.4.26.3 Effect on State

This action changes TransportState to “PLAYING” and TransportPlaySpeed to the value specified in the Speed argument of the Play() action. If it would take a noticeable amount of time before a human user would actually see or hear the media playing, the AVTransport may temporarily go to the “TRANSITIONING” state before going to “PLAYING”. This might be appropriate, for example, for devices that need to start buffering or completely download the media before playback can start.

## 5.4.26.4 Errors

Table 74 — Error Codes for *SyncPlay()*

| errorCode | errorDescription                        | Description                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 400-499   | TBD                                     | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 500-599   | TBD                                     | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 600-699   | TBD                                     | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 701       | Transition not available                | The immediate transition from current transport state to desired transport state is not supported by this device.                                                                                                                                                                                                                                                                               |
| 702       | No contents                             | The media does not contain any contents that can be played.                                                                                                                                                                                                                                                                                                                                     |
| 703       | Read error                              | The media cannot be read (for example, because of dust or a scratch).                                                                                                                                                                                                                                                                                                                           |
| 704       | Format not supported for playback       | The storage format of the currently loaded media is not supported for playback by this device.                                                                                                                                                                                                                                                                                                  |
| 705       | Transport is locked                     | The transport is <i>hold locked</i> . (Some portable mobile devices have a small mechanical toggle switch called a <i>hold lock switch</i> . While this switch is ON (the transport is hold locked), the device is guarded against operations such as accidental power on when not in use, or interruption of play or record from accidental pressing of a front panel button or a GUI button.) |
| 710       | Seek mode not supported                 | The specified seek mode is not supported by the device.                                                                                                                                                                                                                                                                                                                                         |
| 711       | Illegal seek target                     | The specified seek target is not present on the media or is not specified in terms of the seek mode.                                                                                                                                                                                                                                                                                            |
| 714       | Illegal MIME-type                       | The resource to be played has a MIME-type which is not supported by the AVTransport service.                                                                                                                                                                                                                                                                                                    |
| 715       | Content 'BUSY'                          | This indicates that the resource is already in use at this time.                                                                                                                                                                                                                                                                                                                                |
| 716       | Resource not found                      | The resource to be played cannot be found in the network.                                                                                                                                                                                                                                                                                                                                       |
| 717       | Play speed not supported                | The specified playback speed is not supported by the AVTransport service.                                                                                                                                                                                                                                                                                                                       |
| 718       | Invalid <u>InstanceID</u>               | The specified <i>InstanceID</i> is invalid for this AVTransport.                                                                                                                                                                                                                                                                                                                                |
| 719       | DRM error                               | The action failed because an unspecified DRM error occurred.                                                                                                                                                                                                                                                                                                                                    |
| 720       | Expired content                         | The action failed because the content use validity interval has expired.                                                                                                                                                                                                                                                                                                                        |
| 721       | Non-allowed use                         | The action failed because the requested content use is disallowed.                                                                                                                                                                                                                                                                                                                              |
| 722       | Can't determine allowed uses            | The action failed because the allowed content uses cannot be verified.                                                                                                                                                                                                                                                                                                                          |
| 723       | Exhausted allowed use                   | The action failed because the number of times this content has been used as requested has reached the maximum allowed number of uses.                                                                                                                                                                                                                                                           |
| 724       | Device authentication failure           | The action failed because of a device authentication failure between the media source device and the media sink device.                                                                                                                                                                                                                                                                         |
| 725       | Device revocation                       | The action failed because either the media source device or the media sink device has been revoked.                                                                                                                                                                                                                                                                                             |
| 731       | Invalid time, offset, or position value | The action failed because the supplied time, offset, or position value for an argument was not valid.                                                                                                                                                                                                                                                                                           |
| 732       | Unable to calculate sync point          | The action failed because the system was not able to calculate a synchronization point using the supplied time, offset, or position information.                                                                                                                                                                                                                                                |

5.4.27 *SyncStop()*

This conditionally required action shall be implemented if the AVTransport service supports the ConnectionManager *CLOCKSYNC* feature, otherwise it is not allowed. The *SyncStop()* action behaves the same as the *Stop()* action except that the content is stopped at the specified time as indicated by the *StopTime* input argument. If the device is not able to stop at the exact time specified (for example, the device can only stop at the beginning of the next video frame), the device shall stop the content as quickly as possible but after the specified stop time.

If the specified stop time has already passed (for example, if the action request is received after the specified stop time), the [SyncStop\(\)](#) action shall stop the playback of content as soon as possible.

#### 5.4.27.1 Arguments

Table 75 — Arguments for [SyncStop\(\)](#)

| Argument                                | Direction                 | relatedStateVariable                               |
|-----------------------------------------|---------------------------|----------------------------------------------------|
| <u><a href="#">InstanceID</a></u>       | <u><a href="#">IN</a></u> | <u><a href="#">A_ARG_TYPE InstanceID</a></u>       |
| <u><a href="#">StopTime</a></u>         | <u><a href="#">IN</a></u> | <u><a href="#">A_ARG_TYPE PresentationTime</a></u> |
| <u><a href="#">ReferenceClockId</a></u> | <u><a href="#">IN</a></u> | <u><a href="#">A_ARG_TYPE ClockId</a></u>          |

#### 5.4.27.2 Dependency on State

This action is allowed in all transport states except in state "[NO MEDIA PRESENT](#)".

#### 5.4.27.3 Effect on State

This action changes [TransportState](#) to "[STOPPED](#)". If it would take a noticeable amount of time before a human user would actually see or hear the media has stopped, the AVTransport may temporarily go to the "[TRANSITIONING](#)" state before going to "[STOPPED](#)".

#### 5.4.27.4 Errors

Table 76 — Error Codes for [SyncStop\(\)](#)

| errorCode | errorDescription                             | Description                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 400-499   | TBD                                          | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 500-599   | TBD                                          | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 600-699   | TBD                                          | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 701       | Transition not available                     | The immediate transition from current transport state to desired transport state is not supported by this device.                                                                                                                                                                                                                                                                               |
| 705       | Transport is locked                          | The transport is <i>hold locked</i> . (Some portable mobile devices have a small mechanical toggle switch called a <i>hold lock switch</i> . While this switch is ON (the transport is hold locked), the device is guarded against operations such as accidental power on when not in use, or interruption of play or record from accidental pressing of a front panel button or a GUI button.) |
| 718       | Invalid <u><a href="#">InstanceID</a></u>    | The specified <u><a href="#">InstanceID</a></u> is invalid for this AVTransport.                                                                                                                                                                                                                                                                                                                |
| 731       | Invalid time, offset, or position value      | The action failed because the supplied time, offset, or position value for an argument was not valid.                                                                                                                                                                                                                                                                                           |
| 733       | Sync, position, or offset too early or small | The action failed because the specified or calculated synchronization point, time, or position occurred too quickly (or in the past) for the device to complete the action.                                                                                                                                                                                                                     |

#### 5.4.28 [SyncPause\(\)](#)

This conditionally allowed action may be implemented if the AVTransport service supports the ConnectionManager [CLOCKSYNC feature](#). Otherwise it is not allowed. The [SyncPause\(\)](#) action behaves the same as the [Pause\(\)](#) action except that the content is paused at the specified time as indicated by the [PauseTime](#) input argument. If the device is not able to pause at the exact time specified (for example, the device can only pause at the beginning of the next video frame), the device shall pause the content as quickly as possible but after the specified pause time.

If the adjusted pause time has already passed (for example, if the action request is received after the adjusted pause time), the [SyncPause\(\)](#) action shall pause as soon as possible.

## 5.4.28.1 Arguments

Table 77 — Arguments for SyncPause()

| Argument                | Direction | relatedStateVariable               |
|-------------------------|-----------|------------------------------------|
| <u>InstanceID</u>       | <u>IN</u> | <u>A_ARG_TYPE_InstanceID</u>       |
| <u>PauseTime</u>        | <u>IN</u> | <u>A_ARG_TYPE_PresentationTime</u> |
| <u>ReferenceClockId</u> | <u>IN</u> | <u>A_ARG_TYPE_ClockId</u>          |

## 5.4.28.2 Dependency on State

This action is always allowed while playing. In other cases, the action may fail with error code 701.

## 5.4.28.3 Effect on State

When playing, this action changes TransportState to "PAUSED PLAYBACK". The SyncPause() action does not operate as a toggle. If it would take a noticeable amount of time before a human user would actually see or hear the media is paused, the AVTransport may temporarily go to the "TRANSITIONING" state before going to "PAUSED PLAYBACK".

## 5.4.28.4 Errors

Table 78 — Error Codes for SyncPause()

| errorCode | errorDescription                             | Description                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 400-499   | TBD                                          | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 500-599   | TBD                                          | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 600-699   | TBD                                          | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                  |
| 701       | Transition not available                     | The immediate transition from current transport state to desired transport state is not supported by this device.                                                                                                                                                                                                                                                                               |
| 705       | Transport is locked                          | The transport is <i>hold locked</i> . (Some portable mobile devices have a small mechanical toggle switch called a <i>hold lock switch</i> . While this switch is ON (the transport is hold locked), the device is guarded against operations such as accidental power on when not in use, or interruption of play or record from accidental pressing of a front panel button or a GUI button.) |
| 718       | Invalid InstanceID                           | The specific <u>InstanceID</u> is invalid for the AVTransport.                                                                                                                                                                                                                                                                                                                                  |
| 731       | Invalid time, offset, or position value      | The action failed because the supplied time, offset, or position value for an argument was not valid.                                                                                                                                                                                                                                                                                           |
| 733       | Sync, position, or offset too early or small | The action failed because the specified or calculated synchronization point, time, or position occurred too quickly (or in the past) for the device to complete the action.                                                                                                                                                                                                                     |

5.4.29 SetStaticPlaylist()

This allowed action passes a static playlist document to the device. The playlist may be delivered using multiple invocations of the SetStaticPlaylist() action to conform to any limitations on SOAP packet sizes.

The value in the PlaylistData argument provides a chunk of a playlist. Terminating characters shall not be appended to the PlaylistData value unless these characters appear in the original playlist. The value in the PlaylistDataLength argument identifies the length of the PlaylistData argument value provided.

The value in the PlaylistOffset argument provides the offset into the playlist document being passed to the renderer. The initial invocation of the SetStaticPlaylist() action the PlaylistOffset argument shall be zero. If multiple invocations of the SetStaticPlaylist() action are needed, the PlaylistOffset argument shall be increased by the PlaylistDataLength argument from the last invocation.

The value in the PlaylistTotalLength argument identifies the aggregate total length of playlist data using a series one or more invocations of the SetStaticPlaylist() action. The series begins with a SetStaticPlaylist() with a PlaylistOffset argument value of zero and ends when

the total PlaylistDataLength is reached. When the length of playlist data indicated by the PlaylistTotalLength argument is provided, syntactic and/or semantic checks (see note) on the playlist should be performed. Playlist data provided in excess of PlaylistDataLength shall be considered an error.

A SetStaticPlaylist() action with a PlaylistTotalLength argument of 0 shall reset playlist processing, including discarding any pending playlist data. In this case, the action argument values other than InstanceID shall be ignored.

If a device implements the SetStaticPlaylist() action, then the GetPlaylistInfo() action shall also be implemented and shall support the <staticPlaylistInfo> element of the returned A\_ARG\_TYPE\_PlaylistInfo XML document. In addition, the PlaylistType argument shall support the Static allowed value.

The PlaylistStartObj and PlaylistStartGroup arguments provide a starting object @id and starting group ID for playlists which employ object linking properties. If these arguments are non-empty, then the device should process playlist elements in the order specified by the objectLink@nextObjID and objectLink@prevObjID elements for the indicated object linking GroupID. For playlists that do not employ object linking properties, these arguments should be set to "". See the ContentDirectory service specification [7] for further details on object linking metadata properties.

Note that syntactic/semantic checks should be restricted to validation that can be performed using the playlist data. These checks can include whether an XML based playlist is well-formed, and/or that all the items referenced by an object linking playlist were included. However, checks should not be performed that involve retrieving media objects associated with the playlist.

#### 5.4.29.1 Arguments

Table 79 — Arguments for SetStaticPlaylist()

| Argument                    | Direction | relatedStateVariable                   |
|-----------------------------|-----------|----------------------------------------|
| <u>InstanceID</u>           | <u>IN</u> | <u>A_ARG_TYPE_InstanceID</u>           |
| <u>PlaylistData</u>         | <u>IN</u> | <u>A_ARG_TYPE_PlaylistData</u>         |
| <u>PlaylistDataLength</u>   | <u>IN</u> | <u>A_ARG_TYPE_PlaylistDataLength</u>   |
| <u>PlaylistOffset</u>       | <u>IN</u> | <u>A_ARG_TYPE_PlaylistOffset</u>       |
| <u>PlaylistTotalLength</u>  | <u>IN</u> | <u>A_ARG_TYPE_PlaylistTotalLength</u>  |
| <u>PlaylistMIMEType</u>     | <u>IN</u> | <u>A_ARG_TYPE_PlaylistMIMEType</u>     |
| <u>PlaylistExtendedType</u> | <u>IN</u> | <u>A_ARG_TYPE_PlaylistExtendedType</u> |
| <u>PlaylistStartObj</u>     | <u>IN</u> | <u>A_ARG_TYPE_PlaylistStartObjID</u>   |
| <u>PlaylistStartGroup</u>   | <u>IN</u> | <u>A_ARG_TYPE_PlaylistStartGroupID</u> |

#### 5.4.29.2 Dependency on State

None

#### 5.4.29.3 Effect on State

When a playlist delivery operation is initiated but has not completed, the renderer shall set its TransportState state variable to the value "TRANSITIONING". When the playlist deliver operation completes the renderer should transition to its previously established state, i.e. "STOPPED" or "PLAYING".

Static playlists are considered track-aware media. Specifically the Next() and Previous() actions should be supported. However, since static playlists do not use numeric track numbers, the CurrentTrack state variable shall be set to 0.

The AVTransport service shall set the CurrentTrackDuration, CurrentTrackURI and CurrentTrackMetadata state variables to the values corresponding to the current playlist XML

element when processing static playlists. The [GetPositionInfo\(\)](#) action can be used to obtain current values for these state variables during static playlist operations.

The AVTransport service shall generate a [LastChange](#) event after modifications to the [CurrentTrackDuration](#), [CurrentTrackURI](#) or [CurrentTrackMetadata](#) state variables.

#### 5.4.29.4 Errors

Table 80 — Error Codes for [SetStaticPlaylist\(\)](#)

| errorCode | errorDescription                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 400-499   | TBD                                    | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 500-599   | TBD                                    | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 600-699   | TBD                                    | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 714       | Illegal MIME-type                      | The specified resource has a MIME-type which is not supported by the AVTransport service.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 718       | Invalid <a href="#">InstanceID</a>     | The specified <a href="#">InstanceID</a> is invalid for this AVTransport.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 734       | Illegal <a href="#">PlaylistOffset</a> | The <a href="#">PlaylistOffset</a> specified would result in a missing section of a playlist. The <a href="#">PlaylistOffset</a> for an initial invocation of the <a href="#">SetStaticPlaylist()</a> action is non-zero.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 735       | Incorrect Playlist length              | A playlist section as defined by <a href="#">PlaylistOffset</a> and <a href="#">PlaylistDataLength</a> exceeds <a href="#">PlaylistTotalLength</a> .<br>The <a href="#">PlaylistDataLength</a> argument value is zero or negative.<br>The <a href="#">PlaylistTotalLength</a> parameter is invalid (negative).<br>The <a href="#">PlaylistTotalLength</a> parameter changed during a series of this action. (Outside of a 0 value to reset static playlist processing).<br>The device does not have sufficient memory capacity to process the playlist.<br>An attempt to issue an operation: <a href="#">Play()</a> , <a href="#">Next()</a> , <a href="#">Prev()</a> , <a href="#">Stop()</a> on a playlist where <a href="#">PlaylistTotalLength</a> was not reached. |
| 736       | Illegal Playlist                       | The playlist delivered failed syntactic or semantic checks.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

#### 5.4.30 [SetStreamingPlaylist\(\)](#)

This allowed action initiates and maintains a streaming playlist operation to a device. The [PlaylistStep](#) argument indicates whether this action is a request to initiate, continue, end, or reset a streaming playlist operation.

If a device implements the [SetStreamingPlaylist\(\)](#) action, then the [GetPlaylistInfo\(\)](#) action shall be also be implemented and shall support the <streamingPlaylistInfo> element of the returned [A\\_ARG\\_TYPE\\_PlaylistInfo](#) XML document. In addition, the PlaylistType argument shall support the [Streaming](#) allowed value.

The device is responsible for “gracefully” handling conditions associated with renderer playlist underrun(s), i.e. the device exhausts all currently delivered playlist items.

##### 5.4.30.1 Arguments

Table 81 — Arguments for [SetStreamingPlaylist\(\)](#)

| Argument                             | Direction          | relatedStateVariable                            |
|--------------------------------------|--------------------|-------------------------------------------------|
| <a href="#">InstanceID</a>           | <a href="#">IN</a> | <a href="#">A_ARG_TYPE_InstanceID</a>           |
| <a href="#">PlaylistData</a>         | <a href="#">IN</a> | <a href="#">A_ARG_TYPE_PlaylistData</a>         |
| <a href="#">PlaylistDataLength</a>   | <a href="#">IN</a> | <a href="#">A_ARG_TYPE_PlaylistDataLength</a>   |
| <a href="#">PlaylistMIMEType</a>     | <a href="#">IN</a> | <a href="#">A_ARG_TYPE_PlaylistMIMEType</a>     |
| <a href="#">PlaylistExtendedType</a> | <a href="#">IN</a> | <a href="#">A_ARG_TYPE_PlaylistExtendedType</a> |
| <a href="#">PlaylistStep</a>         | <a href="#">IN</a> | <a href="#">A_ARG_TYPE_PlaylistStep</a>         |

##### 5.4.30.2 Dependency on State

None.

### 5.4.30.3 Effect on State

When a playlist delivery operation is initiated, the renderer may set its *TransportState* state variable to the value “*TRANSITIONING*”. As soon as the renderer has determined a *CurrentTrackURI* the renderer should transition to its previously established state, i.e. “*STOPPED*” or “*PLAYING*”.

Streaming playlists are considered track-aware media. Specifically, the *Seek()*, *Next()* and *Previous()* actions should be supported.

The AVTransport service shall set the *CurrentTrack* state variable to facilitate issuing *Seek()* actions within streaming playlists. Note that it is possible some previous playlist tracks are no longer available. The *GetPlaylistInfo()* action can be used to get the accessible track ranges for streaming playlist operations.

The AVTransport service shall also set the *CurrentTrackDuration*, *CurrentTrackURI* and *CurrentTrackMetadata* state variables to values corresponding to the current playlist track when processing streaming playlists. The *GetPositionInfo()* action can also be used to obtain current values for these state variables during streaming playlist operations.

The AVTransport service shall generate a *LastChange* event after modifications to the *CurrentTrack*, *CurrentTrackDuration*, *CurrentTrackURI* or *CurrentTrackMetadata* state variables.

### 5.4.30.4 Errors

Table 82 — Error Codes for *SetStreamingPlaylist()*

| errorCode | errorDescription          | Description                                                                                                                                       |
|-----------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 400-499   | TBD                       | See clause 3 in UPnP Device Architecture [14].                                                                                                    |
| 500-599   | TBD                       | See clause 3 in UPnP Device Architecture [14].                                                                                                    |
| 600-699   | TBD                       | See clause 3 in UPnP Device Architecture [14].                                                                                                    |
| 714       | Illegal MIME-type         | The specified resource has a MIME-type which is not supported by the AVTransport service.                                                         |
| 718       | Invalid <i>InstanceID</i> | The specified <i>InstanceID</i> is invalid for this AVTransport.                                                                                  |
| 735       | Incorrect Playlist length | The <i>PlaylistDataLength</i> argument value is zero or negative.<br>The device does not have sufficient memory capacity to process the playlist. |
| 736       | Illegal Playlist          | The playlist delivered failed syntactic or semantic checks.                                                                                       |

### 5.4.31 *GetPlaylistInfo()*

This conditionally required action shall be implemented if the AVTransport service supports either the *SetStaticPlaylist()* or *SetStreamingPlaylist()* actions, otherwise it is not allowed. This action provides information about a streaming or static playlist operation. The *PlaylistType* argument indicates the target playlist type. The requested playlist information is returned in the *PlaylistInfo* argument as an XML document.

#### 5.4.31.1 Arguments

Table 83 — Arguments for *GetPlaylistInfo()*

| Argument            | Direction  | relatedStateVariable           |
|---------------------|------------|--------------------------------|
| <i>InstanceID</i>   | <i>IN</i>  | <i>A_ARG_TYPE InstanceID</i>   |
| <i>PlaylistType</i> | <i>IN</i>  | <i>A_ARG_TYPE PlaylistType</i> |
| <i>PlaylistInfo</i> | <i>OUT</i> | <i>A_ARG_TYPE PlaylistInfo</i> |

#### 5.4.31.2 Dependency on State

None.

**5.4.31.3 Effect on State**

None.

**5.4.31.4 Errors****Table 84 — Error Codes for GetPlaylistInfo()**

| errorCode | errorDescription          | Description                                                                   |
|-----------|---------------------------|-------------------------------------------------------------------------------|
| 400-499   | TBD                       | See clause 3 in UPnP Device Architecture [14].                                |
| 500-599   | TBD                       | See clause 3 in UPnP Device Architecture [14].                                |
| 600-699   | TBD                       | See clause 3 in UPnP Device Architecture [14].                                |
| 714       | Illegal MIME-type         | The specified resource has a MIME-type which is not supported by the service. |
| 718       | Invalid <u>InstanceID</u> | The specified <u>InstanceID</u> is invalid for this AVTransport.              |

**5.4.32 Common Error Codes**

Table 85 below lists error codes common to actions for this service type. If an action results in multiple errors, the most specific error should be returned.

Table 85 — Common Error Codes

| errorCode | errorDescription                   | Description                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 400-499   | TBD                                | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                 |
| 500-599   | TBD                                | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                 |
| 600-699   | TBD                                | See clause 3 in UPnP Device Architecture [14].                                                                                                                                                                                                                                                                                                                                                 |
| 701       | Transition not available           | The immediate transition from current transport state to desired transport state is not supported by this device.                                                                                                                                                                                                                                                                              |
| 702       | No contents                        | The media does not contain any contents that can be played.                                                                                                                                                                                                                                                                                                                                    |
| 703       | Read error                         | The media cannot be read (for example, because of dust or a scratch).                                                                                                                                                                                                                                                                                                                          |
| 704       | Format not supported for playback  | The storage format of the currently loaded media is not supported for playback by this device.                                                                                                                                                                                                                                                                                                 |
| 705       | Transport is locked                | The transport is <i>hold locked</i> . (Some portable mobile devices have a small mechanical toggle switch called a <i>hold lock switch</i> . While this switch is ON (the transport is hold locked) the device is guarded against operations such as accidental power on when not in use, or interruption of play or record from accidental pressing of a front panel button or a GUI button.) |
| 706       | Write error                        | The media cannot be written. (for example, because of dust or a scratch)                                                                                                                                                                                                                                                                                                                       |
| 707       | Media is protected or not writable | The media is write-protected or is of a not writable type.                                                                                                                                                                                                                                                                                                                                     |
| 708       | Format not supported for recording | The storage format of the currently loaded media is not supported for recording by this device.                                                                                                                                                                                                                                                                                                |
| 709       | Media is full                      | There is no free space left on the loaded media.                                                                                                                                                                                                                                                                                                                                               |
| 710       | Seek mode not supported            | The specified seek mode is not supported by the device.                                                                                                                                                                                                                                                                                                                                        |
| 711       | Illegal seek target                | The specified seek target is not present on the media or is not specified in terms of the seek mode.                                                                                                                                                                                                                                                                                           |
| 712       | Play mode not supported            | The specified play mode is not supported by the device.                                                                                                                                                                                                                                                                                                                                        |
| 713       | Record quality not supported       | The specified record quality is not supported by the device.                                                                                                                                                                                                                                                                                                                                   |
| 714       | Illegal MIME-type                  | The specified resource has a MIME-type which is not supported by the AVTransport service.                                                                                                                                                                                                                                                                                                      |
| 715       | Content 'BUSY'                     | This indicates that the resource is already in use at this time.                                                                                                                                                                                                                                                                                                                               |
| 716       | Resource not found                 | The specified resource cannot be found in the network.                                                                                                                                                                                                                                                                                                                                         |
| 717       | Play speed not supported           | The specified playback speed is not supported by the AVTransport service.                                                                                                                                                                                                                                                                                                                      |
| 718       | Invalid <u>InstanceID</u>          | The specified <u>InstanceID</u> is invalid for this AVTransport.                                                                                                                                                                                                                                                                                                                               |
| 719       | DRM error                          | The action failed because an unspecified DRM error occurred.                                                                                                                                                                                                                                                                                                                                   |
| 720       | Expired content                    | The action failed because the content use validity interval has expired.                                                                                                                                                                                                                                                                                                                       |
| 721       | Non-allowed use                    | The action failed because the requested content use is disallowed.                                                                                                                                                                                                                                                                                                                             |
| 722       | Can't determine allowed uses       | The action failed because the allowed content uses cannot be verified.                                                                                                                                                                                                                                                                                                                         |
| 723       | Exhausted allowed use              | The action failed because the number of times this content has been used as requested has reached the maximum allowed number of uses.                                                                                                                                                                                                                                                          |
| 724       | Device authentication failure      | The action failed because of a device authentication failure between the media source device and the media sink device.                                                                                                                                                                                                                                                                        |
| 725       | Device revocation                  | The action failed because either the media source device or the media sink device has been revoked.                                                                                                                                                                                                                                                                                            |
| 726       | Invalid <u>StateVariableList</u>   | Some of the variables are invalid.                                                                                                                                                                                                                                                                                                                                                             |
| 727       | Ill-formed CSV List                | The CSV list is not well formed.                                                                                                                                                                                                                                                                                                                                                               |

| errorCode | errorDescription                             | Description                                                                                                                                                                                    |
|-----------|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 728       | Invalid <u>State Variable Value</u>          | One of the <u>StateVariableValuePairs</u> contains an invalid value.                                                                                                                           |
| 729       | Invalid Service Type                         | The specified <u>ServiceType</u> is invalid.                                                                                                                                                   |
| 730       | Invalid Service Id                           | The specified <u>ServiceId</u> is invalid.                                                                                                                                                     |
| 731       | Invalid time, offset, or position value      | The action failed because the supplied time, offset, or position value for an argument was not valid.                                                                                          |
| 732       | Unable to calculate sync point               | The action failed because the system was not able to calculate a synchronization point using the supplied time, offset, or position information.                                               |
| 733       | Sync, position, or offset too early or small | The action failed because the specified or calculated synchronization point, time, or position occurred too quickly (or in the past) for the device to complete the action.                    |
| 734       | Illegal <u>PlaylistOffset</u>                | The <u>PlaylistOffset</u> specified would result in a missing section of a playlist. The <u>PlaylistOffset</u> for an initial invocation of the <u>SetStaticPlaylist()</u> action is non-zero. |
| 735       | Incorrect Playlist length                    | Playlist length is incorrect or exceeds storage capacity of device. See action description for specific error conditions.                                                                      |
| 736       | Illegal Playlist                             | The playlist delivered failed syntactic or semantic checks.                                                                                                                                    |
| 737       | No DNS Server                                | The DNS Server is not available (HTTP error 503).                                                                                                                                              |
| 738       | Bad Domain Name                              | Unable to resolve the Fully Qualified Domain Name (HTTP error 502).                                                                                                                            |
| 739       | Server Error                                 | The server that hosts the resource is unreachable or unresponsive (HTTP error 404/410).                                                                                                        |

Note: The errorDescription field returned by an action does not necessarily contain human-readable text (for example, as indicated in the second column of the Error Code tables.) It can contain machine-readable information that provides more detailed information about the error. It is therefore not advisable for a control point to blindly display the errorDescription field contents to the user.

Note that 800-899 Error Codes are not permitted for standard actions. See clause 3 of the UPnP Device Architecture [14] for more details.

## 6 XML Service Description

```
<?xml version="1.0"?>
<scpd xmlns="urn:schemas-upnp-org:service-1-0">
  <specVersion>
    <major>1</major>
    <minor>0</minor>
  </specVersion>
  <actionList>
    <action>
      <name>SetAVTransportURI</name>
      <argumentList>
        <argument>
          <name>InstanceID</name>
          <direction>in</direction>
          <relatedStateVariable>
            A_ARG_TYPE_InstanceID
          </relatedStateVariable>
        </argument>
        <argument>
          <name>CurrentURI</name>
          <direction>in</direction>
          <relatedStateVariable>
            AVTransportURI
          </relatedStateVariable>
        </argument>
        <argument>
          <name>CurrentURIMetaData</name>
          <direction>in</direction>
          <relatedStateVariable>
```

```

        AVTransportURIMetaData
    </relatedStateVariable>
</argument>
</argumentList>
</action>
<action>
    <name>SetNextAVTransportURI</name>
    <argumentList>
        <argument>
            <name>InstanceID</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE InstanceID
            </relatedStateVariable>
        </argument>
        <argument>
            <name>NextURI</name>
            <direction>in</direction>
            <relatedStateVariable>
                NextAVTransportURI
            </relatedStateVariable>
        </argument>
        <argument>
            <name>NextURIMetaData</name>
            <direction>in</direction>
            <relatedStateVariable>
                NextAVTransportURIMetaData
            </relatedStateVariable>
        </argument>
    </argumentList>
</action>
<action>
    <name>GetMediaInfo</name>
    <argumentList>
        <argument>
            <name>InstanceID</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE InstanceID
            </relatedStateVariable>
        </argument>
        <argument>
            <name>NrTracks</name>
            <direction>out</direction>
            <relatedStateVariable>
                NumberOfTracks
            </relatedStateVariable>
        </argument>
        <argument>
            <name>MediaDuration</name>
            <direction>out</direction>
            <relatedStateVariable>
                CurrentMediaDuration
            </relatedStateVariable>
        </argument>
        <argument>
            <name>CurrentURI</name>
            <direction>out</direction>
            <relatedStateVariable>
                AVTransportURI
            </relatedStateVariable>
        </argument>
        <argument>
            <name>CurrentURIMetaData</name>
            <direction>out</direction>
            <relatedStateVariable>
                AVTransportURIMetaData
            </relatedStateVariable>
        </argument>
    </argumentList>
</action>

```

```

<argument>
  <name>NextURI</name>
  <direction>out</direction>
  <relatedStateVariable>
    NextAVTransportURI
  </relatedStateVariable>
</argument>
<argument>
  <name>NextURIMetaData</name>
  <direction>out</direction>
  <relatedStateVariable>
    NextAVTransportURIMetaData
  </relatedStateVariable>
</argument>
<argument>
  <name>PlayMedium</name>
  <direction>out</direction>
  <relatedStateVariable>
    PlaybackStorageMedium
  </relatedStateVariable>
</argument>
<argument>
  <name>RecordMedium</name>
  <direction>out</direction>
  <relatedStateVariable>
    RecordStorageMedium
  </relatedStateVariable>
</argument>
<argument>
  <name>WriteStatus</name>
  <direction>out</direction>
  <relatedStateVariable>
    RecordMediumWriteStatus
  </relatedStateVariable>
</argument>
</argumentList>
</action>
<action>
  <name>GetMediaInfo Ext</name>
  <argumentList>
    <argument>
      <name>InstanceID</name>
      <direction>in</direction>
      <relatedStateVariable>
        A_ARG_TYPE_InstanceID
      </relatedStateVariable>
    </argument>
    <argument>
      <name>CurrentType</name>
      <direction>out</direction>
      <relatedStateVariable>
        CurrentMediaCategory
      </relatedStateVariable>
    </argument>
    <argument>
      <name>NrTracks</name>
      <direction>out</direction>
      <relatedStateVariable>
        NumberOfTracks
      </relatedStateVariable>
    </argument>
    <argument>
      <name>MediaDuration</name>
      <direction>out</direction>
      <relatedStateVariable>
        CurrentMediaDuration
      </relatedStateVariable>
    </argument>
  </argumentList>
</action>

```

```

        <name>CurrentURI</name>
        <direction>out</direction>
        <relatedStateVariable>
            AVTransportURI
        </relatedStateVariable>
    </argument>
    <argument>
        <name>CurrentURIMetaData</name>
        <direction>out</direction>
        <relatedStateVariable>
            AVTransportURIMetaData
        </relatedStateVariable>
    </argument>
    <argument>
        <name>NextURI</name>
        <direction>out</direction>
        <relatedStateVariable>
            NextAVTransportURI
        </relatedStateVariable>
    </argument>
    <argument>
        <name>NextURIMetaData</name>
        <direction>out</direction>
        <relatedStateVariable>
            NextAVTransportURIMetaData
        </relatedStateVariable>
    </argument>
    <argument>
        <name>PlayMedium</name>
        <direction>out</direction>
        <relatedStateVariable>
            PlaybackStorageMedium
        </relatedStateVariable>
    </argument>
    <argument>
        <name>RecordMedium</name>
        <direction>out</direction>
        <relatedStateVariable>
            RecordStorageMedium
        </relatedStateVariable>
    </argument>
    <argument>
        <name>WriteStatus</name>
        <direction>out</direction>
        <relatedStateVariable>
            RecordMediumWriteStatus
        </relatedStateVariable>
    </argument>
</argumentList>
</action>
<action>
    <name>GetTransportInfo</name>
    <argumentList>
        <argument>
            <name>InstanceID</name>
            <direction>in</direction>
            <relatedStateVariable>
                A_ARG_TYPE_InstanceID
            </relatedStateVariable>
        </argument>
        <argument>
            <name>CurrentTransportState</name>
            <direction>out</direction>
            <relatedStateVariable>
                TransportState
            </relatedStateVariable>
        </argument>
        <argument>
            <name>CurrentTransportStatus</name>

```

```

        <direction>out</direction>
        <relatedStateVariable>
            TransportStatus
        </relatedStateVariable>
    </argument>
    <argument>
        <name>CurrentSpeed</name>
        <direction>out</direction>
        <relatedStateVariable>
            TransportPlaySpeed
        </relatedStateVariable>
    </argument>
</argumentList>
</action>
<action>
    <name>GetPositionInfo</name>
    <argumentList>
        <argument>
            <name>InstanceID</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE InstanceID
            </relatedStateVariable>
        </argument>
        <argument>
            <name>Track</name>
            <direction>out</direction>
            <relatedStateVariable>
                CurrentTrack
            </relatedStateVariable>
        </argument>
        <argument>
            <name>TrackDuration</name>
            <direction>out</direction>
            <relatedStateVariable>
                CurrentTrackDuration
            </relatedStateVariable>
        </argument>
        <argument>
            <name>TrackMetaData</name>
            <direction>out</direction>
            <relatedStateVariable>
                CurrentTrackMetaData
            </relatedStateVariable>
        </argument>
        <argument>
            <name>TrackURI</name>
            <direction>out</direction>
            <relatedStateVariable>
                CurrentTrackURI
            </relatedStateVariable>
        </argument>
        <argument>
            <name>RelTime</name>
            <direction>out</direction>
            <relatedStateVariable>
                RelativeTimePosition
            </relatedStateVariable>
        </argument>
        <argument>
            <name>AbsTime</name>
            <direction>out</direction>
            <relatedStateVariable>
                AbsoluteTimePosition
            </relatedStateVariable>
        </argument>
        <argument>
            <name>RelCount</name>
            <direction>out</direction>

```

```

        <relatedStateVariable>
            RelativeCounterPosition
        </relatedStateVariable>
    </argument>
    <argument>
        <name>AbsCount</name>
        <direction>out</direction>
        <relatedStateVariable>
            AbsoluteCounterPosition
        </relatedStateVariable>
    </argument>
</argumentList>
</action>
<action>
    <name>GetDeviceCapabilities</name>
    <argumentList>
        <argument>
            <name>InstanceID</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE InstanceID
            </relatedStateVariable>
        </argument>
        <argument>
            <name>PlayMedia</name>
            <direction>out</direction>
            <relatedStateVariable>
                PossiblePlaybackStorageMedia
            </relatedStateVariable>
        </argument>
        <argument>
            <name>RecMedia</name>
            <direction>out</direction>
            <relatedStateVariable>
                PossibleRecordStorageMedia
            </relatedStateVariable>
        </argument>
        <argument>
            <name>RecQualityModes</name>
            <direction>out</direction>
            <relatedStateVariable>
                PossibleRecordQualityModes
            </relatedStateVariable>
        </argument>
    </argumentList>
</action>
<action>
    <name>GetTransportSettings</name>
    <argumentList>
        <argument>
            <name>InstanceID</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE InstanceID
            </relatedStateVariable>
        </argument>
        <argument>
            <name>PlayMode</name>
            <direction>out</direction>
            <relatedStateVariable>
                CurrentPlayMode
            </relatedStateVariable>
        </argument>
        <argument>
            <name>RecQualityMode</name>
            <direction>out</direction>
            <relatedStateVariable>
                CurrentRecordQualityMode
            </relatedStateVariable>
        </argument>
    </argumentList>
</action>

```

```

    </argument>
  </argumentList>
</action>
<action>
  <name>Stop</name>
  <argumentList>
    <argument>
      <name>InstanceID</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE InstanceID
      </relatedStateVariable>
    </argument>
  </argumentList>
</action>
<action>
  <name>Play</name>
  <argumentList>
    <argument>
      <name>InstanceID</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE InstanceID
      </relatedStateVariable>
    </argument>
    <argument>
      <name>Speed</name>
      <direction>in</direction>
      <relatedStateVariable>
        TransportPlaySpeed
      </relatedStateVariable>
    </argument>
  </argumentList>
</action>
<action>
  <name>Pause</name>
  <argumentList>
    <argument>
      <name>InstanceID</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE InstanceID
      </relatedStateVariable>
    </argument>
  </argumentList>
</action>
<action>
  <name>Record</name>
  <argumentList>
    <argument>
      <name>InstanceID</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE InstanceID
      </relatedStateVariable>
    </argument>
  </argumentList>
</action>
<action>
  <name>Seek</name>
  <argumentList>
    <argument>
      <name>InstanceID</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE InstanceID
      </relatedStateVariable>
    </argument>
  </argumentList>

```

```

        <name>Unit</name>
        <direction>in</direction>
        <relatedStateVariable>
            A ARG TYPE SeekMode
        </relatedStateVariable>
    </argument>
    <argument>
        <name>Target</name>
        <direction>in</direction>
        <relatedStateVariable>
            A ARG TYPE SeekTarget
        </relatedStateVariable>
    </argument>
</argumentList>
</action>
<action>
    <name>Next</name>
    <argumentList>
        <argument>
            <name>InstanceID</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE InstanceID
            </relatedStateVariable>
        </argument>
    </argumentList>
</action>
<action>
    <name>Previous</name>
    <argumentList>
        <argument>
            <name>InstanceID</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE InstanceID
            </relatedStateVariable>
        </argument>
    </argumentList>
</action>
<action>
    <name>SetPlayMode</name>
    <argumentList>
        <argument>
            <name>InstanceID</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE InstanceID
            </relatedStateVariable>
        </argument>
        <argument>
            <name>NewPlayMode</name>
            <direction>in</direction>
            <relatedStateVariable>
                CurrentPlayMode
            </relatedStateVariable>
        </argument>
    </argumentList>
</action>
<action>
    <name>SetRecordQualityMode</name>
    <argumentList>
        <argument>
            <name>InstanceID</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE InstanceID
            </relatedStateVariable>
        </argument>
    </argumentList>

```

```

        <name>NewRecordQualityMode</name>
        <direction>in</direction>
        <relatedStateVariable>
            CurrentRecordQualityMode
        </relatedStateVariable>
    </argument>
</argumentList>
</action>
<action>
    <name>GetCurrentTransportActions</name>
    <argumentList>
        <argument>
            <name>InstanceID</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE InstanceID
            </relatedStateVariable>
        </argument>
        <argument>
            <name>Actions</name>
            <direction>out</direction>
            <relatedStateVariable>
                CurrentTransportActions
            </relatedStateVariable>
        </argument>
    </argumentList>
</action>
<action>
    <name>GetDRMState</name>
    <argumentList>
        <argument>
            <name>InstanceID</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE InstanceID
            </relatedStateVariable>
        </argument>
        <argument>
            <name>CurrentDRMState</name>
            <direction>out</direction>
            <relatedStateVariable>
                DRMState
            </relatedStateVariable>
        </argument>
    </argumentList>
</action>
<action>
    <name>GetStateVariables</name>
    <argumentList>
        <argument>
            <name>InstanceID</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE InstanceID
            </relatedStateVariable>
        </argument>
        <argument>
            <name>StateVariableList</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE StateVariableList
            </relatedStateVariable>
        </argument>
        <argument>
            <name>StateVariableValuePairs</name>
            <direction>out</direction>
            <relatedStateVariable>
                A ARG TYPE StateVariableValuePairs
            </relatedStateVariable>
        </argument>
    </argumentList>
</action>

```

```

    </argument>
  </argumentList>
</action>
<action>
  <name>SetStateVariables</name>
  <argumentList>
    <argument>
      <name>InstanceID</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE InstanceID
      </relatedStateVariable>
    </argument>
    <argument>
      <name>AVTransportUDN</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE DeviceUDN
      </relatedStateVariable>
    </argument>
    <argument>
      <name>ServiceType</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE ServiceType
      </relatedStateVariable>
    </argument>
    <argument>
      <name>ServiceId</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE ServiceID
      </relatedStateVariable>
    </argument>
    <argument>
      <name>StateVariableValuePairs</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE StateVariableValuePairs
      </relatedStateVariable>
    </argument>
    <argument>
      <name>StateVariableList</name>
      <direction>out</direction>
      <relatedStateVariable>
        A ARG TYPE StateVariableList
      </relatedStateVariable>
    </argument>
  </argumentList>
</action>
<action>
  <name>SetStaticPlaylist</name>
  <argumentList>
    <argument>
      <name>InstanceID</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE InstanceID
      </relatedStateVariable>
    </argument>
    <argument>
      <name>PlaylistData</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE PlaylistData
      </relatedStateVariable>
    </argument>
    <argument>
      <name>PlaylistDataLength</name>

```

```

        <direction>in</direction>
        <relatedStateVariable>
            A ARG TYPE PlaylistDataLength
        </relatedStateVariable>
    </argument>
    <argument>
        <name>PlaylistOffset</name>
        <direction>in</direction>
        <relatedStateVariable>
            A ARG TYPE PlaylistOffset
        </relatedStateVariable>
    </argument>
    <argument>
        <name>PlaylistTotalLength</name>
        <direction>in</direction>
        <relatedStateVariable>
            A ARG TYPE PlaylistTotalLength
        </relatedStateVariable>
    </argument>
    <argument>
        <name>PlaylistMIMETYPE</name>
        <direction>in</direction>
        <relatedStateVariable>
            A ARG TYPE PlaylistMIMETYPE
        </relatedStateVariable>
    </argument>
    <argument>
        <name>PlaylistExtendedType</name>
        <direction>in</direction>
        <relatedStateVariable>
            A ARG TYPE PlaylistExtendedType
        </relatedStateVariable>
    </argument>
    <argument>
        <name>PlaylistStartObj</name>
        <direction>in</direction>
        <relatedStateVariable>
            A ARG TYPE PlaylistStartObjID
        </relatedStateVariable>
    </argument>
    <argument>
        <name>PlaylistStartGroup</name>
        <direction>in</direction>
        <relatedStateVariable>
            A ARG TYPE PlaylistStartGroupID
        </relatedStateVariable>
    </argument>
</argumentList>
</action>
<action>
    <name>SetStreamingPlaylist</name>
    <argumentList>
        <argument>
            <name>InstanceID</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE InstanceID
            </relatedStateVariable>
        </argument>
        <argument>
            <name>PlaylistData</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE PlaylistData
            </relatedStateVariable>
        </argument>
        <argument>
            <name>PlaylistDataLength</name>
            <direction>in</direction>

```

```

        <relatedStateVariable>
            A ARG TYPE PlaylistDataLength
        </relatedStateVariable>
    </argument>
    <argument>
        <name>PlaylistMIMETYPE</name>
        <direction>in</direction>
        <relatedStateVariable>
            A ARG TYPE PlaylistMIMETYPE
        </relatedStateVariable>
    </argument>
    <argument>
        <name>PlaylistExtendedType</name>
        <direction>in</direction>
        <relatedStateVariable>
            A ARG TYPE PlaylistExtendedType
        </relatedStateVariable>
    </argument>
    <argument>
        <name>PlaylistStep</name>
        <direction>in</direction>
        <relatedStateVariable>
            A ARG TYPE PlaylistStep
        </relatedStateVariable>
    </argument>
</argumentList>
</action>
<action>
    <name>GetPlaylistInfo</name>
    <argumentList>
        <argument>
            <name>InstanceID</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE InstanceID
            </relatedStateVariable>
        </argument>
        <argument>
            <name>PlaylistType</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE PlaylistType
            </relatedStateVariable>
        </argument>
        <argument>
            <name>PlaylistInfo</name>
            <direction>out</direction>
            <relatedStateVariable>
                A ARG TYPE PlaylistInfo
            </relatedStateVariable>
        </argument>
    </argumentList>
</action>
<action>
    <name>AdjustSyncOffset</name>
    <argumentList>
        <argument>
            <name>InstanceID</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE InstanceID
            </relatedStateVariable>
        </argument>
        <argument>
            <name>Adjustment</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE SyncOffsetAdj
            </relatedStateVariable>
        </argument>
    </argumentList>
</action>

```

```

    </argument>
  </argumentList>
</action>
<action>
  <name>GetSyncOffset</name>
  <argumentList>
    <argument>
      <name>InstanceID</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE InstanceID
      </relatedStateVariable>
    </argument>
    <argument>
      <name>CurrentSyncOffset</name>
      <direction>out</direction>
      <relatedStateVariable>
        SyncOffset
      </relatedStateVariable>
    </argument>
  </argumentList>
</action>
<action>
  <name>SetSyncOffset</name>
  <argumentList>
    <argument>
      <name>InstanceID</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE InstanceID
      </relatedStateVariable>
    </argument>
    <argument>
      <name>NewSyncOffset</name>
      <direction>in</direction>
      <relatedStateVariable>
        SyncOffset
      </relatedStateVariable>
    </argument>
  </argumentList>
</action>
<action>
  <name>SyncPlay</name>
  <argumentList>
    <argument>
      <name>InstanceID</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE InstanceID
      </relatedStateVariable>
    </argument>
    <argument>
      <name>Speed</name>
      <direction>in</direction>
      <relatedStateVariable>
        TransportPlaySpeed
      </relatedStateVariable>
    </argument>
    <argument>
      <name>ReferencePositionUnits</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE SeekMode
      </relatedStateVariable>
    </argument>
    <argument>
      <name>ReferencePosition</name>
      <direction>in</direction>
      <relatedStateVariable>

```

```

        A ARG TYPE SeekTarget
    </relatedStateVariable>
</argument>
<argument>
    <name>ReferencePresentationTime</name>
    <direction>in</direction>
    <relatedStateVariable>
        A ARG TYPE PresentationTime
    </relatedStateVariable>
</argument>
<argument>
    <name>ReferenceClockId</name>
    <direction>in</direction>
    <relatedStateVariable>
        A ARG TYPE ClockId
    </relatedStateVariable>
</argument>
</argumentList>
</action>
<action>
    <name>SyncPause</name>
    <argumentList>
        <argument>
            <name>InstanceID</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE InstanceID
            </relatedStateVariable>
        </argument>
        <argument>
            <name>PauseTime</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE PresentationTime
            </relatedStateVariable>
        </argument>
        <argument>
            <name>ReferenceClockId</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE ClockId
            </relatedStateVariable>
        </argument>
    </argumentList>
</action>
<action>
    <name>SyncStop</name>
    <argumentList>
        <argument>
            <name>InstanceID</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE InstanceID
            </relatedStateVariable>
        </argument>
        <argument>
            <name>StopTime</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE PresentationTime
            </relatedStateVariable>
        </argument>
        <argument>
            <name>ReferenceClockId</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE ClockId
            </relatedStateVariable>
        </argument>
    </argumentList>
</action>

```

```

    </argumentList>
  </action>
</actionList>
<serviceStateTable>
  <stateVariable sendEvents="no">
    <name>TransportState</name>
    <dataType>string</dataType>
    <allowedValueList>
      <allowedValue>STOPPED</allowedValue>
      <allowedValue>PAUSED PLAYBACK</allowedValue>
      <allowedValue>PAUSED RECORDING</allowedValue>
      <allowedValue>PLAYING</allowedValue>
      <allowedValue>RECORDING</allowedValue>
      <allowedValue>TRANSITIONING</allowedValue>
      <allowedValue>NO MEDIA PRESENT</allowedValue>
      <allowedValue>vendor-defined </allowedValue>
    </allowedValueList>
  </stateVariable>
  <stateVariable sendEvents="no">
    <name>TransportStatus</name>
    <dataType>string</dataType>
    <allowedValueList>
      <allowedValue>OK</allowedValue>
      <allowedValue>ERROR OCCURRED</allowedValue>
      <allowedValue>vendor-defined </allowedValue>
    </allowedValueList>
  </stateVariable>
  <stateVariable sendEvents="no">
    <name>CurrentMediaCategory</name>
    <dataType>string</dataType>
    <allowedValueList>
      <allowedValue>NO MEDIA</allowedValue>
      <allowedValue>TRACK AWARE</allowedValue>
      <allowedValue>TRACK UNAWARE</allowedValue>
    </allowedValueList>
  </stateVariable>
  <stateVariable sendEvents="no">
    <name>PlaybackStorageMedium</name>
    <dataType>string</dataType>
    <allowedValueList>
      <allowedValue>UNKNOWN</allowedValue>
      <allowedValue>DV</allowedValue>
      <allowedValue>MINI-DV</allowedValue>
      <allowedValue>VHS</allowedValue>
      <allowedValue>W-VHS</allowedValue>
      <allowedValue>S-VHS</allowedValue>
      <allowedValue>D-VHS</allowedValue>
      <allowedValue>VHSC</allowedValue>
      <allowedValue>VIDEO8</allowedValue>
      <allowedValue>HI8</allowedValue>
      <allowedValue>CD-ROM</allowedValue>
      <allowedValue>CD-DA</allowedValue>
      <allowedValue>CD-R</allowedValue>
      <allowedValue>CD-RW</allowedValue>
      <allowedValue>VIDEO-CD</allowedValue>
      <allowedValue>SACD</allowedValue>
      <allowedValue>MD-AUDIO</allowedValue>
      <allowedValue>MD-PICTURE</allowedValue>
      <allowedValue>DVD-ROM</allowedValue>
      <allowedValue>DVD-VIDEO</allowedValue>
      <allowedValue>DVD+R</allowedValue>
      <allowedValue>DVD-R</allowedValue>
      <allowedValue>DVD+RW</allowedValue>
      <allowedValue>DVD-RW</allowedValue>
      <allowedValue>DVD-RAM</allowedValue>
      <allowedValue>DVD-AUDIO</allowedValue>
      <allowedValue>DAT</allowedValue>
      <allowedValue>LD</allowedValue>
      <allowedValue>HDD</allowedValue>
    </allowedValueList>
  </stateVariable>
</serviceStateTable>

```

```

    <allowedValue>MICRO-MV</allowedValue>
    <allowedValue>NETWORK</allowedValue>
    <allowedValue>NONE</allowedValue>
    <allowedValue>NOT_IMPLEMENTED</allowedValue>
    <allowedValue>SD</allowedValue>
    <allowedValue>PC-CARD</allowedValue>
    <allowedValue>MMC</allowedValue>
    <allowedValue>CF</allowedValue>
    <allowedValue>BD</allowedValue>
    <allowedValue>MS</allowedValue>
    <allowedValue>HD DVD</allowedValue>
    <allowedValue>vendor-defined </allowedValue>
  </allowedValueList>
</stateVariable>
<stateVariable sendEvents="no">
  <name>RecordStorageMedium</name>
  <dataType>string</dataType>
  <allowedValueList>
    <allowedValue>UNKNOWN</allowedValue>
    <allowedValue>DV</allowedValue>
    <allowedValue>MINI-DV</allowedValue>
    <allowedValue>VHS</allowedValue>
    <allowedValue>W-VHS</allowedValue>
    <allowedValue>S-VHS</allowedValue>
    <allowedValue>D-VHS</allowedValue>
    <allowedValue>VHSC</allowedValue>
    <allowedValue>VIDEO8</allowedValue>
    <allowedValue>HI8</allowedValue>
    <allowedValue>CD-ROM</allowedValue>
    <allowedValue>CD-DA</allowedValue>
    <allowedValue>CD-R</allowedValue>
    <allowedValue>CD-RW</allowedValue>
    <allowedValue>VIDEO-CD</allowedValue>
    <allowedValue>SACD</allowedValue>
    <allowedValue>MD-AUDIO</allowedValue>
    <allowedValue>MD-PICTURE</allowedValue>
    <allowedValue>DVD-ROM</allowedValue>
    <allowedValue>DVD-VIDEO</allowedValue>
    <allowedValue>DVD+R</allowedValue>
    <allowedValue>DVD-R</allowedValue>
    <allowedValue>DVD+RW</allowedValue>
    <allowedValue>DVD-RW</allowedValue>
    <allowedValue>DVD-RAM</allowedValue>
    <allowedValue>DVD-AUDIO</allowedValue>
    <allowedValue>DAT</allowedValue>
    <allowedValue>LD</allowedValue>
    <allowedValue>HDD</allowedValue>
    <allowedValue>MICRO-MV</allowedValue>
    <allowedValue>NETWORK</allowedValue>
    <allowedValue>NONE</allowedValue>
    <allowedValue>NOT_IMPLEMENTED</allowedValue>
    <allowedValue>SD</allowedValue>
    <allowedValue>PC-CARD</allowedValue>
    <allowedValue>MMC</allowedValue>
    <allowedValue>CF</allowedValue>
    <allowedValue>BD</allowedValue>
    <allowedValue>MS</allowedValue>
    <allowedValue>HD DVD</allowedValue>
    <allowedValue>vendor-defined </allowedValue>
  </allowedValueList>
</stateVariable>
<stateVariable sendEvents="no">
  <name>PossiblePlaybackStorageMedia</name>
  <dataType>string</dataType>
</stateVariable>
<stateVariable sendEvents="no">
  <name>PossibleRecordStorageMedia</name>
  <dataType>string</dataType>
</stateVariable>

```

```

<stateVariable sendEvents="no">
  <name>CurrentPlayMode</name>
  <dataType>string</dataType>
  <allowedValueList>
    <allowedValue>NORMAL</allowedValue>
    <allowedValue>SHUFFLE</allowedValue>
    <allowedValue>REPEAT ONE</allowedValue>
    <allowedValue>REPEAT ALL</allowedValue>
    <allowedValue>RANDOM</allowedValue>
    <allowedValue>DIRECT 1</allowedValue>
    <allowedValue>INTRO</allowedValue>
    <allowedValue>vendor-defined </allowedValue>
  </allowedValueList>
  <defaultValue>NORMAL</defaultValue>
</stateVariable>
<stateVariable sendEvents="no">
  <name>TransportPlaySpeed</name>
  <dataType>string</dataType>
  <allowedValueList>
    <allowedValue>1</allowedValue>
    <allowedValue>vendor-defined </allowedValue>
  </allowedValueList>
  <defaultValue>1</defaultValue>
</stateVariable>
<stateVariable sendEvents="no">
  <name>RecordMediumWriteStatus</name>
  <dataType>string</dataType>
  <allowedValueList>
    <allowedValue>WRITABLE</allowedValue>
    <allowedValue>PROTECTED</allowedValue>
    <allowedValue>NOT WRITABLE</allowedValue>
    <allowedValue>UNKNOWN</allowedValue>
    <allowedValue>NOT IMPLEMENTED</allowedValue>
    <allowedValue>vendor-defined </allowedValue>
  </allowedValueList>
</stateVariable>
<stateVariable sendEvents="no">
  <name>CurrentRecordQualityMode</name>
  <dataType>string</dataType>
  <allowedValueList>
    <allowedValue>0:EP</allowedValue>
    <allowedValue>1:LP</allowedValue>
    <allowedValue>2:SP</allowedValue>
    <allowedValue>0:BASIC</allowedValue>
    <allowedValue>1:MEDIUM</allowedValue>
    <allowedValue>2:HIGH</allowedValue>
    <allowedValue>NOT IMPLEMENTED</allowedValue>
    <allowedValue>vendor-defined </allowedValue>
  </allowedValueList>
</stateVariable>
<stateVariable sendEvents="no">
  <name>PossibleRecordQualityModes</name>
  <dataType>string</dataType>
</stateVariable>
<stateVariable sendEvents="no">
  <name>NumberOfTracks</name>
  <dataType>ui4</dataType>
  <allowedValueRange>
    <minimum>0</minimum>
    <maximum>vendor-defined </maximum>
  </allowedValueRange>
</stateVariable>
<stateVariable sendEvents="no">
  <name>CurrentTrack</name>
  <dataType>ui4</dataType>
  <allowedValueRange>
    <minimum>0</minimum>
    <maximum>vendor-defined </maximum>
    <step>1</step>
  </allowedValueRange>

```

```

    </allowedValueRange>
  </stateVariable>
  <stateVariable sendEvents="no">
    <name>CurrentTrackDuration</name>
    <dataType>string</dataType>
  </stateVariable>
  <stateVariable sendEvents="no">
    <name>CurrentMediaDuration</name>
    <dataType>string</dataType>
  </stateVariable>
  <stateVariable sendEvents="no">
    <name>CurrentTrackMetaData</name>
    <dataType>string</dataType>
  </stateVariable>
  <stateVariable sendEvents="no">
    <name>CurrentTrackURI</name>
    <dataType>string</dataType>
  </stateVariable>
  <stateVariable sendEvents="no">
    <name>AVTransportURI</name>
    <dataType>string</dataType>
  </stateVariable>
  <stateVariable sendEvents="no">
    <name>AVTransportURIMetaData</name>
    <dataType>string</dataType>
  </stateVariable>
  <stateVariable sendEvents="no">
    <name>NextAVTransportURI</name>
    <dataType>string</dataType>
  </stateVariable>
  <stateVariable sendEvents="no">
    <name>NextAVTransportURIMetaData</name>
    <dataType>string</dataType>
  </stateVariable>
  <stateVariable sendEvents="no">
    <name>RelativeTimePosition</name>
    <dataType>string</dataType>
  </stateVariable>
  <stateVariable sendEvents="no">
    <name>AbsoluteTimePosition</name>
    <dataType>string</dataType>
  </stateVariable>
  <stateVariable sendEvents="no">
    <name>RelativeCounterPosition</name>
    <dataType>i4</dataType>
  </stateVariable>
  <stateVariable sendEvents="no">
    <name>AbsoluteCounterPosition</name>
    <dataType>ui4</dataType>
  </stateVariable>
  <stateVariable sendEvents="no">
    <name>CurrentTransportActions</name>
    <dataType>string</dataType>
    <allowedValueList>
      <allowedValue>PLAY</allowedValue>
      <allowedValue>STOP</allowedValue>
      <allowedValue>PAUSE</allowedValue>
      <allowedValue>SEEK</allowedValue>
      <allowedValue>NEXT</allowedValue>
      <allowedValue>PREVIOUS</allowedValue>
      <allowedValue>RECORD</allowedValue>
      <allowedValue>vendor-defined</allowedValue>
    </allowedValueList>
  </stateVariable>
  <stateVariable sendEvents="yes">
    <name>LastChange</name>
    <dataType>string</dataType>
  </stateVariable>
  <stateVariable sendEvents="yes">

```