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Information technology — UPnP Device Architecture

Part 3-10: Audio Video Device Control
Protocol — Audio Video Transport Service

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**Information technology — UPnP
Device Architecture —**

**Part 3-10:
Audio Video Device Control Protocol —
Audio Video Transport Service**

Technologies de l'information — Architecture de dispositif UPnP —

*Partie 3-10: Protocole de contrôle de dispositif audio-vidéo — Service
de transport audio-vidéo*



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Foreword

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ISO/IEC 29341-3-10 was prepared by UPnP Implementers Corporation and adopted, under the PAS procedure, by joint technical committee ISO/IEC JTC 1. Information technology, in parallel with its approval by national bodies of ISO and IEC.

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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](#).

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

UPnP Document Title	ISO/IEC 29341 Part
UPnP Device Architecture 1.0	ISO/IEC 29341-1
UPnP Basic:1 Device	ISO/IEC 29341-2
UPnP AV Architecture:1	ISO/IEC 29341-3-1
UPnP MediaRenderer:1 Device	ISO/IEC 29341-3-2
UPnP MediaServer:1 Device	ISO/IEC 29341-3-3
UPnP AVTransport:1 Service	ISO/IEC 29341-3-10
UPnP ConnectionManager:1 Service	ISO/IEC 29341-3-11
UPnP ContentDirectory:1 Service	ISO/IEC 29341-3-12
UPnP RenderingControl:1 Service	ISO/IEC 29341-3-13
UPnP MediaRenderer:2 Device	ISO/IEC 29341-4-2
UPnP MediaServer:2 Device	ISO/IEC 29341-4-3
UPnP AV Datastructure Template:1	ISO/IEC 29341-4-4
UPnP AVTransport:2 Service	ISO/IEC 29341-4-10
UPnP ConnectionManager:2 Service	ISO/IEC 29341-4-11
UPnP ContentDirectory:2 Service	ISO/IEC 29341-4-12
UPnP RenderingControl:2 Service	ISO/IEC 29341-4-13
UPnP ScheduledRecording:1	ISO/IEC 29341-4-14
UPnP DigitalSecurityCamera:1 Device	ISO/IEC 29341-5-1
UPnP DigitalSecurityCameraMotionImage:1 Service	ISO/IEC 29341-5-10
UPnP DigitalSecurityCameraSettings:1 Service	ISO/IEC 29341-5-11
UPnP DigitalSecurityCameraStillImage:1 Service	ISO/IEC 29341-5-12
UPnP HVAC_System:1 Device	ISO/IEC 29341-6-1
UPnP HVAC_ZoneThermostat:1 Device	ISO/IEC 29341-6-2
UPnP ControlValve:1 Service	ISO/IEC 29341-6-10
UPnP HVAC_FanOperatingMode:1 Service	ISO/IEC 29341-6-11
UPnP FanSpeed:1 Service	ISO/IEC 29341-6-12
UPnP HouseStatus:1 Service	ISO/IEC 29341-6-13
UPnP HVAC_SetpointSchedule:1 Service	ISO/IEC 29341-6-14
UPnP TemperatureSensor:1 Service	ISO/IEC 29341-6-15
UPnP TemperatureSetpoint:1 Service	ISO/IEC 29341-6-16
UPnP HVAC_UserOperatingMode:1 Service	ISO/IEC 29341-6-17
UPnP BinaryLight:1 Device	ISO/IEC 29341-7-1
UPnP DimmableLight:1 Device	ISO/IEC 29341-7-2
UPnP Dimming:1 Service	ISO/IEC 29341-7-10
UPnP SwitchPower:1 Service	ISO/IEC 29341-7-11
UPnP InternetGatewayDevice:1 Device	ISO/IEC 29341-8-1
UPnP LANDevice:1 Device	ISO/IEC 29341-8-2
UPnP WANDevice:1 Device	ISO/IEC 29341-8-3
UPnP WANConnectionDevice:1 Device	ISO/IEC 29341-8-4
UPnP WLANAccessPointDevice:1 Device	ISO/IEC 29341-8-5
UPnP LANHostConfigManagement:1 Service	ISO/IEC 29341-8-10
UPnP Layer3Forwarding:1 Service	ISO/IEC 29341-8-11
UPnP LinkAuthentication:1 Service	ISO/IEC 29341-8-12
UPnP RadiusClient:1 Service	ISO/IEC 29341-8-13
UPnP WANCableLinkConfig:1 Service	ISO/IEC 29341-8-14
UPnP WANCommonInterfaceConfig:1 Service	ISO/IEC 29341-8-15
UPnP WANDSLLinkConfig:1 Service	ISO/IEC 29341-8-16
UPnP WANEthernetLinkConfig:1 Service	ISO/IEC 29341-8-17
UPnP WANIPConnection:1 Service	ISO/IEC 29341-8-18
UPnP WANPOTSLinkConfig:1 Service	ISO/IEC 29341-8-19
UPnP WANPPPOConnection:1 Service	ISO/IEC 29341-8-20
UPnP WLANConfiguration:1 Service	ISO/IEC 29341-8-21
UPnP Printer:1 Device	ISO/IEC 29341-9-1
UPnP Scanner:1.0 Device	ISO/IEC 29341-9-2
UPnP ExternalActivity:1 Service	ISO/IEC 29341-9-10
UPnP Feeder:1.0 Service	ISO/IEC 29341-9-11
UPnP PrintBasic:1 Service	ISO/IEC 29341-9-12

UPnP Document Title	ISO/IEC 29341 Part
UPnP Scan:1 Service	ISO/IEC 29341-9-13
UPnP QoS Architecture:1.0	ISO/IEC 29341-10-1
UPnP QoSDevice:1 Service	ISO/IEC 29341-10-10
UPnP QosManager:1 Service	ISO/IEC 29341-10-11
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UPnP RemoteUIClientDevice:1 Device	ISO/IEC 29341-12-1
UPnP RemoteUIServerDevice:1 Device	ISO/IEC 29341-12-2
UPnP RemoteUIClient:1 Service	ISO/IEC 29341-12-10
UPnP RemoteUIServer:1 Service	ISO/IEC 29341-12-11
UPnP DeviceSecurity:1 Service	ISO/IEC 29341-13-10
UPnP SecurityConsole:1 Service	ISO/IEC 29341-13-11

INFORMATION TECHNOLOGY – UPNP DEVICE ARCHITECTURE –

Part 3-10: Audio Video Device Control Protocol – Audio Video Transport Service

1. Scope

This service definition is compliant with the UPnP Device Architecture version 1.0.

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 meta data embedded in the resource itself.

This service type does not offer *scheduled* recording.

2. Service Modeling Definitions

2.1. ServiceType

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

urn:schemas-upnp-org:service:AVTransport:1

2.2. State Variables

Table 1: State Variables

Variable Name	Req. or Opt. ¹	Data Type	Allowed Value	Default Value	Eng. Units
<u>TransportState</u>	<u>R</u>	<u>string</u>	<u>“STOPPED”</u> <u>“PLAYING”</u> see Table 1.1		
<u>TransportStatus</u>	<u>R</u>	<u>string</u>	<u>“OK”</u> , <u>“ERROR_OCCURRED”</u> <i>vendor-extensible</i>		
<u>PlaybackStorageMedium</u>	<u>R</u>	<u>string</u>	see Table 1.2		
<u>RecordStorageMedium</u>	<u>R</u>	<u>string</u>	see Table 1.2		
<u>PossiblePlaybackStorageMedia</u>	<u>R</u>	<u>string</u>	CSV ² (string)		
<u>PossibleRecordStorageMedia</u>	<u>R</u>	<u>string</u>	CSV (string)		
<u>CurrentPlayMode</u>	<u>R</u>	<u>string</u>	<u>“NORMAL”</u> see Table 1.3	<u>“NORM AL”</u>	
<u>TransportPlaySpeed</u>	<u>R</u>	<u>string</u>	<u>“1”</u>	<u>“1”</u>	
<u>RecordMediumWriteStatus</u>	<u>R</u>	<u>string</u>	see Table 1.4		
<u>CurrentRecordQualityMode</u>	<u>R</u>	<u>string</u>	see Table 1.5		
<u>PossibleRecordQualityModes</u>	<u>R</u>	<u>string</u>	CSV (string)		
<u>NumberOfTracks</u>	<u>R</u>	<u>ui4</u>	<u>Min = 0</u> see Table 1.6		
<u>CurrentTrack</u>	<u>R</u>	<u>ui4</u>	<u>Min = 0</u> <u>Step = 1</u> see Table 1.7		
<u>CurrentTrackDuration</u>	<u>R</u>	<u>string</u>			
<u>CurrentMediaDuration</u>	<u>R</u>	<u>string</u>			
<u>CurrentTrackMetaData</u>	<u>R</u>	<u>string</u>			
<u>CurrentTrackURI</u>	<u>R</u>	<u>string</u>			
<u>AVTransportURI</u>	<u>R</u>	<u>string</u>			
<u>AVTransportURIMetaData</u>	<u>R</u>	<u>string</u>			
<u>NextAVTransportURI</u>	<u>R</u>	<u>string</u>			
<u>NextAVTransportURIMetaData</u>	<u>R</u>	<u>string</u>			
<u>RelativeTimePosition</u>	<u>R</u>	<u>string</u>			

Variable Name	Req. or Opt. ¹	Data Type	Allowed Value	Default Value	Eng. Units
<u><i>AbsoluteTimePosition</i></u>	<u><i>R</i></u>	<u><i>string</i></u>			
<u><i>RelativeCounterPosition</i></u>	<u><i>R</i></u>	<u><i>i4</i></u>			
<u><i>AbsoluteCounterPosition</i></u>	<u><i>R</i></u>	<u><i>i4</i></u>			
<u><i>CurrentTransportActions</i></u>	<u><i>O</i></u>	<u><i>string</i></u>	CSV (string)		
<u><i>LastChange</i></u>	<u><i>R</i></u>	<u><i>string</i></u>			
<u><i>A_ARG_TYPE_SeekMode</i></u>	<u><i>R</i></u>	<u><i>string</i></u>	<u><i>“TRACK_NR”</i></u> see Table 1.8	<u><i>n/a</i></u>	
<u><i>A_ARG_TYPE_SeekTarget</i></u>	<u><i>R</i></u>	<u><i>string</i></u>		<u><i>n/a</i></u>	
<u><i>A_ARG_TYPE_InstanceID</i></u>	<u><i>R</i></u>	<u><i>ui4</i></u>		<u><i>n/a</i></u>	

¹ R = Required, O = Optional, X = Non-standard.

² 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.

Table 1.1: allowedValueList for *TransportState*

Value	Req. or Opt.
<u><i>“STOPPED”</i></u>	<u><i>R</i></u>
<u><i>“PLAYING”</i></u>	<u><i>R</i></u>
<u><i>“TRANSITIONING”</i></u>	<u><i>O</i></u>
<u><i>“PAUSED_PLAYBACK”</i></u>	<u><i>O</i></u>
<u><i>“PAUSED_RECORDING”</i></u>	<u><i>O</i></u>
<u><i>“RECORDING”</i></u>	<u><i>O</i></u>
<u><i>“NO_MEDIA_PRESENT”</i></u>	<u><i>O</i></u>

Table 1.2: allowedValueList for **PlaybackStorageMedium**

Value	Req. or Opt.
<u>“UNKNOWN”</u>	<u>Q</u>
<u>”DV”</u>	<u>Q</u>
<u>“MINI-DV”</u>	<u>Q</u>
<u>“VHS”</u>	<u>Q</u>
<u>”W-VHS”</u>	<u>Q</u>
<u>“S-VHS”</u>	<u>Q</u>
<u>“D-VHS”</u>	<u>Q</u>
<u>“VHSC”</u>	<u>Q</u>
<u>“VIDEO8”</u>	<u>Q</u>
<u>“HI8”</u>	<u>Q</u>
<u>“CD-ROM”</u>	<u>Q</u>
<u>“CD-DA”</u>	<u>Q</u>
<u>“CD-R”</u>	<u>Q</u>
<u>“CD-RW”</u>	<u>Q</u>
<u>“VIDEO-CD”</u>	<u>Q</u>
<u>”SACD”</u>	<u>Q</u>
<u>“MD-AUDIO”</u>	<u>Q</u>
<u>“MD-PICTURE”</u>	<u>Q</u>
<u>“DVD-ROM”</u>	<u>Q</u>
<u>“DVD-VIDEO”</u>	<u>Q</u>
<u>“DVD-R”</u>	<u>Q</u>
<u>“DVD+RW”</u>	<u>Q</u>
<u>“DVD-RW”</u>	<u>Q</u>
<u>“DVD-RAM”</u>	<u>Q</u>
<u>“DVD-AUDIO”</u>	<u>Q</u>
<u>“DAT”</u>	<u>Q</u>
<u>“LD”</u>	<u>Q</u>
<u>“HDD”</u>	<u>Q</u>
<u>“MICRO-MV”</u>	<u>Q</u>
<u>“NETWORK”</u>	<u>Q</u>

<u>"NONE"</u>	<u>Q</u>
<u>"NOT_IMPLEMENTED"</u>	<u>Q</u>
<i>Vendor-defined</i>	<u>Q</u>

Table 1.3: allowedValueList for CurrentPlayMode

Value	Req. or Opt.
<u>"NORMAL"</u>	<u>R</u>
<u>"SHUFFLE"</u>	<u>Q</u>
<u>"REPEAT_ONE"</u>	<u>Q</u>
<u>"REPEAT_ALL"</u>	<u>Q</u>
<u>"RANDOM"</u>	<u>Q</u>
<u>"DIRECT_1"</u>	<u>Q</u>
<u>"INTRO"</u>	<u>Q</u>
<i>Vendor-defined</i>	<u>Q</u>

Table 1.4: allowedValueList for RecordMediumWriteStatus

Value	Req. or Opt.
<u>"WRITABLE"</u>	<u>Q</u>
<u>"PROTECTED"</u>	<u>Q</u>
<u>"NOT_WRITABLE"</u>	<u>Q</u>
<u>"UNKNOWN"</u>	<u>Q</u>
<u>"NOT_IMPLEMENTED"</u>	<u>Q</u>

Table 1.5: allowedValueList for CurrentRecordQualityMode

Value	Req. or Opt.
<u>"0:EP"</u>	<u>Q</u>
<u>"1:LP"</u>	<u>Q</u>
<u>"2:SP"</u>	<u>Q</u>
<u>"0:BASIC"</u>	<u>Q</u>
<u>"1:MEDIUM"</u>	<u>Q</u>
<u>"2:HIGH"</u>	<u>Q</u>

<i>"NOT_IMPLEMENTED"</i>	<u>Q</u>
<i>Vendor-defined</i>	<u>Q</u>

Table 1.6: allowedValueRange for ***NumberOfTracks***

	Value	Req. or Opt.
minimum	<u>0</u>	<u>R</u>
maximum	<i>vendor-defined</i>	<u>R</u>

Table 1.7: allowedValueRange for ***CurrentTrack***

	Value	Req. or Opt.
minimum	<u>0</u>	<u>R</u>
maximum	<i>vendor-defined</i>	<u>R</u>
step	<u>1</u>	<u>R</u>

Table 1.8: allowedValueList for ***A ARG TYPE SeekMode***

Value	Req. or Opt.
<u>"TRACK_NR"</u>	<u>R</u>
<u>"ABS_TIME"</u>	<u>Q</u>
<u>"REL_TIME"</u>	<u>Q</u>
<u>"ABS_COUNT"</u>	<u>Q</u>
<u>"REL_COUNT"</u>	<u>Q</u>
<u>"CHANNEL_FREQ"</u>	<u>Q</u>
<u>"TAPE-INDEX"</u>	<u>Q</u>
<u>"FRAME"</u>	<u>Q</u>

2.2.1. ***TransportState***

This state variable forms the 'core' of the AVTransport service. It defines the conceptually 'top-level' state of the transport, e.g., whether it is playing, recording, etc. Device vendors do not need to implement all allowed values of this variable, e.g., 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 may respond faster or more accurate. 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.

2.2.2. TransportStatus

During operation of the AVTransport service, asynchronous errors may occur 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 may be network congestion or server problems causing hiccups in the rendered media. These types of situations can be signalled to control points by setting this state variable to value “ERROR_OCCURRED”. More specific error descriptions may also be used, as vendor extensions. The 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.

2.2.3. PlaybackStorageMedium

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 may be added in a vendor-specific way.

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

2.2.4. RecordStorageMedium

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 may be added in a vendor-specific way.

Note that this variable is not intended for signal- or content-formats such as, e.g., MPEG2. Such type of information is exposed by the ConnectionManager service associated with this service. If the service implementation doesn’t supported recording then this state variable must be set to value “NOT_IMPLEMENTED”.

2.2.5. PossiblePlaybackStorageMedia

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

2.2.6. PossibleRecordStorageMedia

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 variable RecordStorageMedium. If the service implementation doesn’t supported recording then this state variable must be set to value “NOT_IMPLEMENTED”.

2.2.7. CurrentPlayMode

Indicates the current play mode (e.g., 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_1” 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.

2.2.8. TransportPlaySpeed

String representation of a rational fraction, indicates the speed relative to normal speed. Example values are '1', '1/2', '2', '-1', '1/10', etc. Actually supported speeds can be retrieved from the AllowedValueList of this state variable in the AVTransport service description. Value '1' is required, value '0' is not allowed.

2.2.9. RecordMediumWriteStatus

Write protection status of currently loaded media. NOT_WRITABLE indicates an inherent 'read-only' media (e.g., 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 (e.g., a protected VHS tape). If no media is loaded, the write status will be "UNKNOWN". If the service implementation doesn't support recording then this state variable must be set to value "NOT_IMPLEMENTED".

2.2.10. CurrentRecordQualityMode

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 doesn't support recording then this state variable must be set to value "NOT_IMPLEMENTED".

2.2.11. PossibleRecordQualityModes

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 doesn't support recording then this state variable must be set to value "NOT_IMPLEMENTED".

2.2.12. NumberOfTracks

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. Otherwise, it shall be 1 or higher.

For tape-based media that do not support the notion of tracks, this state variable will always be '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 1. However, if AVTransportURI points to a playlist file, for example, then NumberOfTracks shall be equal to the number of entries in the playlist.

2.2.13. CurrentTrack

If NumberOfTracks is 0, then CurrentTrack will be 0. Otherwise, this state variable will contain the sequence number of the currently selected track, starting at value '1', up to and including NumberOfTracks. For tape-based media that do not support the notion of tracks, this state variable will always be '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.

2.2.14. CurrentTrackDuration

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+ means one or more digits to indicate elapsed hours
- MM means exactly 2 digits to indicate minutes (00 to 59)
- SS means exactly 2 digits to indicate seconds (00 to 59)
- [.F+] means optionally a dot followed by one or more digits to indicate fractions of seconds
- [.F0/F1] means optionally a dot followed by a fraction, with F0 and F1 at least one digit long, and $F0 < F1$

The string may be preceded by an optional + or – sign, and the decimal point itself may be omitted if there are no fractional second digits. This variable does not apply to Tuners. If the service implementation doesn't support track duration information then this state variable must be set to value "NOT_IMPLEMENTED".

2.2.15. CurrentMediaDuration

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. 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 "00:00:00". If the service implementation doesn't support media duration information then this state variable must be set to value "NOT_IMPLEMENTED".

2.2.16. CurrentTrackMetaData

Metadata, in the form of a valid DIDL-Lite XML fragment (defined in the ContentDirectory service template), associated with the resource pointed to by state variable CurrentTrackURI. The meta data may have been extracted from state variable AVTransportURIMetaData, or extracted from the resource binary itself (e.g., embedded ID3 tags for MP3 audio). This is implementation dependent. If the service implementation doesn't support this feature then this state variable must be set to value "NOT_IMPLEMENTED".

2.2.17. CurrentTrackURI

Reference, in the form of a URI, to the current track. The URI enables a control point to retrieve any meta data associated with current track, such as, for example, title and author information, via the ContentDirectory service.

2.2.18. AVTransportURI

Reference, in the form of a URI of the resource controlled by the AVTransport instance. This URI may refer to a 'single' item (e.g., a song) or to a collection of items (e.g., 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, for example, title and author information, via the ContentDirectory service.

2.2.19. AVTransportURIMetaData

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 AVTransportURI. See the ContentDirectory service

specification for details. If the service implementation doesn't support this feature then this state variable must be set to value "NOT_IMPLEMENTED".

2.2.20. NextAVTransportURI

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 streaming protocols that need buffering (e.g. HTTP GET). If the service implementation doesn't support this feature then this state variable must be set to value "NOT_IMPLEMENTED".

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

2.2.21. NextAVTransportURIMetaData

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 NextAVTransportURI. See the ContentDirectory service specification for details. If the service implementation doesn't support this feature then this state variable must be set to value "NOT_IMPLEMENTED".

2.2.22. RelativeTimePosition

This state variable contains the current position, in terms of time, from the beginning of the current track. For tape-based media that do not support multiple tracks on a single tape, this state variable contains the position, in terms of time, from a *zero reference point* on the tape. The time format is the same as for state variable CurrentTrackDuration. If the service implementation doesn't support relative time-based position information then this state variable must be set to value "NOT_IMPLEMENTED".

2.2.23. AbsoluteTimePosition

This state variable contains the current position, in terms of a time, from the beginning of the media. The time format is the same as for state variable CurrentTrackDuration. If the service implementation doesn't support any kind of position information then this state variable must be set to value "NOT_IMPLEMENTED". Devices that don't have time position information, but which are able to detect whether they are at the end of the media or not should use special value "END_OF_MEDIA" when actually at the end, and "NOT_IMPLEMENTED" otherwise.

2.2.24. RelativeCounterPosition

This state variable contains the current position, in terms of a dimensionless counter, from the beginning of the current track. For tape-based media that do not support multiple tracks on a single tape, this state variable contains the position, in terms of a dimensionless counter, from a *zero reference point* on the tape. If the service implementation doesn't support relative count-based position information then this state variable must be set to the maximum value of the i4 data type.

2.2.25. AbsoluteCounterPosition

This state variable contains the current position, in terms of a dimensionless counter, from the beginning of the loaded media. If the service implementation doesn't support absolute count-based position information then this state variable must be set to the maximum value of the i4 data type.

2.2.26. CurrentTransportActions

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 will contain a subset of the following actions: Play, Stop, Pause, Seek, Next, Previous and Record. For example, when a live stream from the Internet is being controlled, the variable may be only “Play, Stop”. When a local audio CD is being controlled, the variable may be “Play, Stop, Pause, Seek, Next, Previous”. This information can be used, for example, to dynamically enable or disable play, stop, pause buttons, etc., on a user interface.

2.2.27. LastChange

This variable is used for eventing purposes to allow 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 Section 5. For additional information, refer to the ‘LastChange’ state variable defined in the RenderingControl service template.

2.2.28. A ARG TYPE SeekMode

This state variable is introduced to provide type information for the “seek mode” parameter 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 (e.g., for tapes with a indexing facility) or even a video frame. A device vendor is allowed to implement a subset of the allowed value list of this state variable. Only value ‘TRACK_NR’ is required.

2.2.29. A ARG TYPE SeekTarget

This state variable is introduced to provide type information for the “target” parameter 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 must contain string representations of values of UPnP types ‘ui4’ (ABS_COUNT, REL_COUNT, TRACK_NR, TAPE-INDEX, FRAME), ‘time’ (ABS_TIME, REL_TIME) or ‘float’ (CHANNEL_FREQ, in Hz). Supported ranges of these integer, time or float values are device-dependent.

2.2.30. A ARG TYPE InstanceID

This state variable is introduced to provide type information for the “InstanceID” input parameter 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 PrepareForConnection action.

If the device’s ConnectionManager does not implement the optional PrepareForConnection action, special value ‘0’ may be used for the “InstanceID” input parameter. In such a case, the device implements a single static AVTransport instance, and only 1 stream can be controlled and sent (or received) at any time.